Attitude towards Wearable Gadgets and Mobile Health Applications for Obesity Management in GCC: Kuwait Case Study.

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ABSTRACT

The purpose of the study was to investigate the impact of m-health tech and wearable gadgets on a better lifestyle. The study investigated the impact of obesity phenomena, obesity management, people's knowledge, diet management, and physical exercise. Primary data was gathered by a mixed method which is a combination of both quantitative and qualitative research methods. Total sample of n=16 semi structural interviews have been conducted from 25 participants. The first section of the interview suggested four main themes i.e., obesity phenomena, dietary habits, obesity management, and time required to lose weight. The second section suggested exposure to health tech, knowledge of health tech, and results. The third section proposed life after using health tech applications, the impact of health tech on their wellbeing, and outlook of life. Data analysis from SPSS suggested people's knowledge and diet management be significant predictors of a better lifestyle. Findings also suggests that people's attitudes partially mediated the relationship between people's knowledge and a better lifestyle. People's attitudes partially mediate the relationship between diet management and a better lifestyle. Lastly, findings suggest that technology partially moderated the relationship between the better lifestyle and obesity phenomenon, obesity management people's knowledge, diet management, and physical exercise. Findings of the study poses significant implications for health care experts, obese Kuwaiti nationals and heath care gadgets manufacturers to integrate key elements to further penetrate GCC market to fight to epidemic of obesity.

Keywords: Obesity Phenomenon, Obesity Management, Diet management, People Knowledge

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Glossary of Key Terms Related to Obesity Management

Obesity Phenomenon

The obesity phenomenon refers to the accumulation of fat in the human body beyond the amount required for normal body function which results in weight gain.

Obesity Management

Obesity management refers to the prevention of obesity through adequate weight management for overweight and obese patients.

Fitness

Fitness refers to the state of being physically fit and healthy through proper exercise, diet, and sleep habits.

Dietary Changes

Dietary changes are modifications made during food preparation, processing, and consumption to increase the bioavailability of micronutrients and reduce micronutrient deficiencies in food at the commercial or individual/household level.

Technology Acceptance Model

The technology acceptance model (TAM) is an information systems theory that models how users come to accept and use technology.

Lifestyle

The application of environmental, behavioural, medical, and motivational principles to the management of lifestyle-related health problems in a clinical setting.

m-health

Medical and public health practice is supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices.

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CHAPTER 1: Introduction

The present thesis comprises the phenomena of obesity as a public health problem prevailing worldwide at an alarming rate. The research study focuses on both quantitative and qualitative previous research studies to identify the prevailing obesity problem among the people, identify main causative factors for control, and the positive and negative impacts of modern technologies. The first chapter consists of the groundwork, background, and reasons to conduct the study (research questions), geographical context, objectives, problem statements, conceptual framework, hypothesis, and an overview (scope) of the current thesis.

This chapter is organised in the following manner. Section 1.1 comprised a background of the research. Next, the section comprises of objectives and aims behind this research. The next section aims to highlight the importance of this proposed study for the industry and academic contribution. Section 1.4 describes the structure of the thesis by specifying details for each chapter. This chapter serves as an essential blueprint for:

1.1 Research Background

1.1.1 Obesity Prevalence Worldwide

Obesity has been prevailing at an alarming rate for two decades, with women being the most disproportionately affected by this phenomenon. Industrialisation and modern technologies are the major indicators of urbanisation and improved lifestyle that are causing the phenomena of obesity alongside providing an inactive and sedentary lifestyle to the people. The Arabian Gulf countries are significantly developing and improving the lifestyle using the rich oil deposits reserves (Alshaikh *et al.*, 2017). Obesity has been considered a public health emergency since the advent of the 20th when developed nations like the US, Canada, and Britain reported alarming obesity rates. (Popkin and Gordon-Larsen, 2004). Obesity was officially declared a global epidemic in

1997 by world health organisation consultation (WHO Technical report series 894). The global estimates indicate obesity is increasing from 30 % to 100 % in developing countries using longitudinal and cross-sectional data from the previous decades (Popkin, 2004).

Initially, the obesity emergence was recognised in higher socioeconomic strata of the population, but now it has broadened in the lower economic levels. In 1989 a similar trend was observed in Brazil, where obesity was higher amongst the higher income class, further penetrating the middle-income class in a decade (Monteiro *et al.,* 2004). The "dual burden of disease" phenomenon is constantly increasing in the arena, including both undernourished children and overweight adults (Slining *et al.,* 2010).

Obesity in developing countries is associated with multiple causal factors such as food, lifestyle, socioeconomic status, dietary values but the most important ones are urbanisation and globalisation. Urbanisation is a major cause of energy imbalance as lower energy expenditure among peoples due to inactive lifestyles and higher energy consumption rate due to higher availability of food variety as compared to a rural lifestyle where higher expenditure is required for multiple purposes and lower energy consumption due to availability of limited healthy food options. By the advent of industrialisation, energy-consuming manual labour work was replaced with mechanical jobs impeding from high urbanisation, where the role of labour mostly revolved around a sedentary desk or sidewalk jobs. Furthermore, modern transportation infrastructure superseded long walks, which played an essential role in controlling obesity prevalence amongst working classes. On the other hand, globalisation has changed the commerce style, food production, transformed marketing and introduced the technology in daily routine and the addition of energy-dense foods at a relatively low cost. Cold-pressed foods are relatively cheap as compared to healthy GMO food options. Developing countries spend 60% of their household income on food

which is triggered by the sponsorship of campaigns and promotions offered by a multimillion-dollar multinational corporation. These factors, coupled with imbalanced energy consumption, have increased the obesity rates amongst adults and stunted growth in children due to the low nutrient content of these "high energy" foods. A similar phenomenon is prevailing in the rural communities due to marketing campaigns, particularly in women, due to more influencing aptitudes towards advertisements (Popkin and Gordon-Larsen, 2004).

The prevalence of over weightiness among pre-school children is 1.9 % - 21.9 %, school children are 7 % - 45 %, whereas in adults it stands at 25 % - 81.9 % in the Eastern Mediterranean region. Many factors are identified such as a transition in nutrition, sedentary lifestyle, urbanisation, increased frequency of snacks, skiing breakfast, higher intake of sugary products, synthetic beverages, frequent hoteling and higher time spending with technology (TV, Internet, and Mobile and other gadgets), cultural concerns, and others. The higher obesity rate was identified among women in all countries of the Eastern Mediterranean region (Musaiger, 2011).

1.1.2 Obesity Phenomenon in the GCC Region

Gulf Cooperation Council (GCC) cooperates with six Middle Eastern countries for political and economic collaboration. GCC includes the Middle Eastern countries. A test was done by Nikoloski (2020), which calculated the cost of the five most prevalent non-communicable diseases in GCC, which was approximately $36.2 billion using both direct and indirect costs. It has been hypothesised that this cost may increase to $67.9 billion in the next five years, which is approximately equivalent to 150 % of the health care budget of all six governments of GCC. Lifestyle, host metabolism, the relationship of intestinal bacteria, and inflammation besides genetic predisposition have been hypothesised as important in creating the obesogenic environment in GCC countries (Sindhu *et al.,* 2015). In the context of Gulf Council countries, obesity is a

particularly important public health concern, especially amongst women (Chan *et al.*, 2017). It was suggested that weight-management program plans, especially targeting premenopausal women in GCC, should consider the number of different factors and cultural influences that affect their behaviour to reduce over-weightiness and obesity.

1.1.3 The growing importance of Obesity Management

The appropriate measures can prevent over weightiness, obesity, and other associated diseases. The introduction of a supportive environment to make healthier food choices and physical activates can minimise the necessity of bariatric surgery, which is often reported as an easy alternative for highly obese GCC nationals. The communities can play an active role in influencing the behaviours of people to maintain a healthy lifestyle which is a less costly alternative to tackle the epidemic of obesity in GCC as compared to bariatric surgery, which is increasing at a higher rate to overcome the obesity problem often leading to health complications and mortality (Stefan *et al.*, 2018).

Weight loss could be achieved from different senses, although continuing to remain slim is much more challenging. On the other hand, obesity reducing any intervention which typically results in rapid weight loss is followed by progressive regain and a weight plateau. Another important strategy is lifestyle changes and behavioural intervention, which is self-monitoring of behaviour causing obesity. The self-monitoring concept consists of observing one's schedule and feedback (Yeager and Karp, 2019). Self-monitoring helps in increasing awareness about controlling food intake as per the target. Besides, its function is an indicator that shows the risk of gaining weight (Yeager and Karp, 2019). Even though doctors can monitor health, they still face difficulties while treating people bound to gain weight (James, 2008).

Health care applications and wearable gadgets have gained significant popularity amongst tech savvy millennials, which helps monitor health and maintain a healthy lifestyle. Weight loss has changed the concept of weight monitoring by turning the process by allowing other people to check progress and be held accountable for their lifestyle (Vincent *et al* 2008). For example, Fat Secret's Calorie Counter, MyFitnessPal, Lose it! Moreover, Spark is a popular mobile application with features that can track the calorie intake of users (Tang *et al.,* 2015).

1.1.4 Research Problem and Gaps

Lifestyle changes have led to a crisis all over the Middle East, especially in gulf council countries which have experienced a substantial increase in income of its citizens over the last five decades. The prevalence of obesity in GCC is highest amongst the world as per WHO. More than 37% of the UAE, 40% of the Kuwaiti and 42 % of the Qatari population are obese (Oguoma *et al.*, 2021). Kuwait has the world highest percentage of obese nationals as evidence from Abdul-Rasoul, (2012) suggested that a high prevalence of obesity amongst Kuwaiti pre-schools ranges from (8 % to 9 %) and amongst Kuwaiti adolescents, which ranges from (40%–46%) which has lead to increase the risk for type 2 diabetes: T2DM and the metabolic disorder. Thus, immediate measures are required to tackle this epidemic which poses a significant risk to the welfare of Kuwait. Evidence from Alrashidi (2016) suggests the high cost of obesity, which can be categorised into indirect and direct costs. The indirect cost of obesity includes more risk for other non-contagious diseases such as hypertension. In Kuwait, obesity accounted for 12% of the total deaths amongst the age group of 20-79 years old. The direct cost of obesity includes hospital care which has surpassed $5.6 billion, equivalent to 7% of their entire GDP.

Evidence from (Swan, 2012; Schulz, 2017; Smahel *et al.*, 2018) suggests significant implications of healthcare applications and wearable gadgets in containing the obesity phenomenon. However,

fewer studies have been done in countries like GCC. The studies conducted previously generally focused on the problem of obesity and its consequences, solution, and impact of tech addiction. However, less focus was on purpose behind it or the tech addiction on the positive side. Obesity is considered amongst the significant problem in the GCC countries, particularly Kuwait. Despite the significance of using health care applications and wearable gadgets, there were fewer research studies in exploiting these perspectives for the management of the obesity issues among the Kuwaiti population. There is a need to study the significant theories and their integration to modify the Kuwaiti population's lifestyle and reduce obesity related illnesses.

Therefore, this research was taken into consideration the theories and their applications to enhance the knowledge and awareness of the people about the adoption of technologies. Fewer research studies explored the attitudes and behaviour of the Kuwaiti population towards obesity management practices in the form of exercise, dietary changes, and bariatric surgery. The research gaps were observed in terms of knowledge of mobile health technology and the use of wearable gadgets in managing obesity. Furthermore, fewer research studies were observed in terms of investigating the perception of people and the moderating role of the use of technology to achieve the outcome of a better lifestyle amongst Kuwaiti nationals.

1.2 Research Aim and Objective

The objectives of this research are mentioned below: "Investigate the effectiveness of wearable gadgets and healthcare applications for containing obesity amongst GCC nations and Kuwait in particular".

- To examine the lifestyle influencing the increasing obesity phenomenon amongst the Kuwaitis.

- To study in detail the theoretical contributions in exploring the utilisation of technologies for managing obesity among people.
- To review the literature regarding the type of technologies used for obesity management by the people.
- To examine the attitude of Kuwaiti towards obesity management practices in the form of exercise, dietary changes, and bariatric surgery.
- To identify the strategies used by people in managing obesity.
- To assess their knowledge of m-health tech and wearable gadgets in managing obesity.
- To study the people's perception of m-health tech and wearable gadgets on a better lifestyle.
- To investigate the people's perception of obesity phenomena, obesity management, and people's knowledge in having a better lifestyle.
- To investigate the people perception of the mediating role of people attitudes towards technology and healthcare applications on a better lifestyle.
- To investigate the people's perception of the moderating role of technology and healthcare applications on a better lifestyle.

1.3 Significance of the Study

Weight management prevents people from obesity and further health-related challenges. The present study helped highlight the issue of obesity among the people in GCC countries, particularly Kuwait. The present study's findings also contributed to examining the efficacy of using wearable gadgets and applications of health care for managing weight and obesity amongst the people in

GCC regions, particularly in Kuwait. Effective weight management strategies also include interventions to change the behaviour of the people for the improvement in their lifestyle. The present study explored the efficacy of wearable technologies was explored in the present study for reducing obesity and managing weight issues among people. These strategies include enhancing physical exercise practices among the people, assessing food consumption, and enhancing the support and communication for the people by using wearable technologies.

The study provided helpful information based on the information system theory, which showed how obese people are motivated to accept technology. The theory is based on the technology adoption model that recommends the use of technologies to manage the lifestyle of the people. The study helped understand these technology-based adoption models and their theory to understand the efficacy of these technologies and the participants' adoption of these advanced procedures in their daily lives. Additionally, the model proposed the strategies to measure the outcomes of using the interventions of these technologies and explained that in the case of challenges involved in using the technology, the dissatisfaction and compliance issues were increased. The research study was beneficial to understand the in-depth analysis of these interventions by using the models and theories.

The behavioural change theory was also observed to be implemented in this study as it was required to change the behaviours of the people towards the use of technology by the obese people. The five stages of the theory were analysed that were considered necessary to bring changes in the behaviour of people. These stages include pre-contemplation, contemplation, preparation, action, and maintenance. The present study highlighted the significance of these theories to modify and evaluate the behaviour of people towards the use of technology. Furthermore, the utilisation of social exchange theory was also evaluated in the study that was related to explaining the process

of decision making by the people for assessing the costs and rewards of the performed actions for seeking the maximum benefits. The research study outcomes provided information about the theoretical contributions such as information system theory, technology adoption model, behavioural change theory, and social exchange theory. They highlighted their utilisation and significance for using technology by the people to improve their health and lifestyle. Additionally, the study provided comprehensive information about using environmental support strategies to be employed by consultants for people with a lower socioeconomic status because they cannot afford a fitness tracker.

The research studies stated that health applications and wearable gadgets could play a vital role in improving individuals' health. Medical errors in the past have caused thousands of deaths. However, healthcare applications such as telemedicine, e-prescription, etc., have reduced those numbers significantly through the integration of technology in medicine management has improved medication adherence in the form of interventions' requirements among Kuwait's people as the study was conducted by assessing the requirements of the interventions among the people of Kuwait who experience obesity and need to overcome the problem through diet, exercise, and other means. Thus, the study also provided empirical evidence for the better equipment of the individuals through knowledge and the latest tools to enhance their awareness. The outcomes are helpful for the government organisations for accessing the management of obesity among Kuwaiti citizens. Therefore, new approaches were employed to achieve the desired results about the use of technology for the management of obesity issues among Kuwaiti residents for the improvement of a better lifestyle. It was observed that the development in technologies has also transformed health services such as m-health technology and smartwatches, which support the moderators in tackling health-related issues effectively and efficiently. The study provided comprehensive information

about the attitudes of individuals towards health applications and the use of wearable smartwatches. It was noticed in the studies that health tech applications had played an important role in enhancing physical activities and individuals' wellbeing through health tech applications.

The research provided comprehensive information about the strategies employed by the people in Kuwait to manage obesity and their knowledge level of m-health tech and wearable gadgets to manage obesity issues. The study also provided information about the perceptions of the people in Kuwait about m-health technology and the use of wearable gadgets to achieve a better lifestyle. The study's findings also enhanced the knowledge about the perceptions of obesity management and its associated phenomenon to adopt a better lifestyle. Additionally, the investigation of the people's perceptions associated with the moderating role of technology and healthcare applications for a healthy lifestyle was carried out in the study. It was observed that health tech applications support health professionals in monitoring patients virtually, whereas it empowers patients to access information, reminders, results, etc. Healthcare technology application for health follow-up is effective for immediate consultation and wearable gadgets and sensors that help diagnose patients without any physical intervention. In a nutshell, E-health is a time-efficient and cost-effective approach to living a healthy lifestyle. The study's findings can benefit original equipment manufacturers of healthcare gadgets and wearable gadgets in their R&D activities by providing key insight into consumer perspectives of healthcare applications and wearable gadgets.

1.4 Organization of the thesis

The thesis is structured progressively and logically, according to the University Guidelines. The thesis begins with an Abstract section that highlights major findings to any reader clearly and concisely. This thesis comprises seven chapters as follows.

Chapter 1 possess the introduction of the research problem being investigated by the researcher. Describe in chapter 1 are the background of the research, the significance of this study, rationale, and impact of this study. The background of the study builds a rationale for the need for research in healthcare technologies and wearable gadgets. The research objectives and research questions provide insight on key questions and aims which researcher intends to answer by achieving these research outcomes.

Chapter 2 takes the reader into the journey of previous literature, which has been published in various peer reviewed articles and renowned journals. A progressive and logical pattern can be found in Chapter 2, which builds the reader's knowledge based on previous research and mentions the strategies and results obtained from the proceedings of previous studies published over the last two decades on healthcare applications and their role in tackling the obesity crisis.

Chapter 3, concerned with the formulation of the conceptual framework, takes an in-depth examination of theoretical models and perspectives applicable in this study. It does a good job of highlighting why the framework being utilised in this study is particularly important and what gaps it will address if followed.

Chapter 4 involves all the technical aspects of the study and mentions the design, methods, techniques, and strategies. The statistical tools used for analysis and underpinning justifications for the analysis and interpretation of data followed by ethical consideration of the research.

Chapter 5 emphasizes on qualitative aspect of the study providing rationale for qualitative analysis through transcription, coding and theme generation used to test the key research prepositions.

Chapter 6, emphasizes on the quantitative aspect of the study testing proposed research hypothesis and providing discussion with respect to the study conducted by previous recent researches. The results are compared and contrasted to show if the same results were obtained in different studies while providing reasoning.

Chapter 7 builds on the knowledge of previous chapters and provides comprehensive and scientific comments on the findings. Furthermore, the chapter mentions theoretical contribution of the study along with recommendations, limitations and implications for future researchers using the current framework to pave the way for other researchers to fill the gaps.

CHAPTER 2: Literature Review

2.1. Introduction

This chapter will provide detailed information on previously published literature on the "People Attitude of people towards using health technologies" and "implications of healthcare technologies on better lifestyle". The chapter will be divided into the sub-sections such as obesity as a severe health issue, obesity management, significance of obesity management, knowledge and attitude of people regarding obesity management, E-health and M-health applications, use of healthcare applications and wearable gadgets for obesity management, knowledge, attitudes and perceptions among Kuwaiti population regarding healthcare applications by proposing a theoretical model for the study.

2.2. Obesity, a serious health issue

Obesity has become a worldwide issue, with more than 2 billion adults being affected (World Health Organization, 2016). The research studies provided evidence for the rise in obesity rates in third-world countries (Musaiger *et al.*, 2012; Gupta *et al.*, 2013). The change in the trends due to modernisation impacted the dietary intake negatively, which has resulted in chronic diseases like obesity, diabetes, and hypertension (Zaghloul *et al.*, 2011). Evidence from the study by Popkin and Gordon-Larsen (2004) identified behavioural change techniques as an excellent tool for managing health and diet. According to Popkin and Gordon-Larsen (2004), obesity has emerged as a worldwide epidemic and has become characterised as an issue of great concern. In the Middle East context, more than one-third of Kuwait's and Saudi Arabia's adult population are fat or obese. The United States alone reported a 34.3% increase in obesity amongst the population from 1980 to 2018. If the same trend continues by 2030, it is estimated that about 86% of the U.S. population

will be obese and overweight. This increase in the waist was prevailing amongst the U.S. population and has also been observed globally.

In Europe alone, more than 50% of men and women were overweight in 2008, as per the World Health Organization (WHO). The obesity phenomenon poses a significant threat to government spending on healthcare as obese individuals are more likely to suffer from different diseases, including diabetes, cardiovascular disease, stroke, cancer, and hypertension. There are numerous reasons for being obese, which is impeded by high calories intake. Food prices and caloric expenditure are unlikely to be the major contributors to the obesity phenomenon worldwide (Sartorius *et al.*, 2015). Obesity is thus characterised as a chronic and severe disease by the WHO. Weight gain is a consequence of genetic factors that decide body weight by 25-40%, impeding environmental factors. Obesity is defined as an "*accumulation of fat in the human body beyond the amount required for the normal body function which results in weight gain*." Body fat can be characterised into two types, which include (a) essential and (b) stored fat, where fat can be a prerequisite requirement for the typical functioning of the body, which is stored in the heart, bone marrow, liver, lungs, spleen, breast, hips, and muscles.

On the contrary, stored fat gets saved in the subcutaneous tissue impeding more energy attained through nutritious food. Body fat comprises about 20 % of men's body weight and 25 % of the entire weight of women's bodies (Krosel *et al.*, 2016). The distribution of fat significantly varies across central and regional obesity. Obesity is characterised by the areas where fat is stored in the user's torso, basically in the abdominal area amongst men. On the contrary, obesity among the local population has been characterised by shifting fat in thighs and hips and is more common amongst women. Obesity is related to more health risks than obesity since it leads to several chronic diseases, namely cardiovascular disease, hypertension, heart attack, and type 2 diabetes.

The intensity of obesity can be measured by calculating the distribution of fat in the body using Body Mass Index (B.M.I.) and skinfold measurement. B.M.I. is the most commonly used measure to classify patients because it creates a strong linear association between B.M.I. and fat percentage. If a person's B.M.I. is > 30 kg/cm^2, he is considered severely obese. The skinfold measurement technique is also a simple method for measuring body fat, whereas Waist Circumference (W.C.) gives weight gain information (Al-Ghamdi, 2018).

Obesity affects every function of human life negatively. It associates it with significant diseases, as evidence from Fotopoulou and O'Riordan (2017) suggests that weight gain is extremely risky, which signifies that type 2 diabetes mellitus (D.M.) is impeding from higher B.M.I. The findings of Al-Ghamdi (2019) suggest that loss of 9 kg can reduce the risk for type 2 diabetes mellitus amongst adults. American Society of Cardiology has called obesity an important factor contributing to heart diseases as it exposes individuals to numerous cardiovascular risks like hypertension, dyslipidemia, and hyperglycemia.

Contrary to the physical aspects, obesity also affects the social aspects of human life, as evidence from Rabeea *et al.,* (2019) suggests that 8000 obese women reported lower satisfaction with a family relationship, professional life, partner relationship, and social activities. Other studies conducted by Al Hammadi and Reilly (2019) suggested a strong correlation between symptoms of depression and obesity because such individuals are most likely to suffer from depression. Obesity is influenced by eating behaviour and subjective wellbeing, stress, and low life satisfaction, as findings of Alhyas *et al.,* (2011) showed that prevalence of high levels of stress and low personal satisfaction are significant predictors of obesity. In a nutshell, obesity is inversely correlated with subjective wellbeing amongst males and females.

2.3. Obesity Management

Akter *et al*., (2017) define obesity management as a "*Prevention of obesity; weight management for overweight and obese patients*". The overweight and obese phenomenon can be managed using a multidisciplinary approach that requires physicians, nutritionists, and exercise therapists. In a particular situation, it sometimes requires psychiatrists/psychologists or other specialists. Combined intervention is the best technique to overcome the obese phenomenon where multidisciplinary teams work together maintaining weight. Physicians have an active role in detecting obese patients. In a nutshell, people lose weight through negative energy balance by reducing calorie intake and increasing physical activity to burn the calorie. Dietary modification is the most commonly used technique prescribed by a physician. Energy intake is less than the energy expenditure as at least 500 Kcal/day is required to lose weight. Dietary intake is customised and tailored to the individual preference to reduce calorie intake and restrict unbalanced diets. (Cwerner and Gadsby, 2014).

Physicians distribute caloric intake by consuming five meals a day. Behavioural therapy is a widely used approach to address the obese phenomenon among individuals who change their eating and exercising habits, directly contributing to the obese phenomenon. This approach comprises five components, which include (a) self-monitoring, (b) goal setting, (c) stimulus control, (d) cognitive restructuring, and (e) problem-solving. *Self-monitoring* requires keeping track that enables patients to identify areas of success and areas which require substantial improvement. *Goal setting* requires patients to set realistic goals to assess success to discourage an unhealthy lifestyle adequately. *Stimulus control* refers to the recognition and avoidance of triggers that result in unplanned eating. It includes an examination of environmental cues and events which result in an overheating phenomenon. Cognitive restructuring is about changing thinking patterns to create awareness

amongst obese patients because many obese individuals have lower self-esteem and self-image. Lastly, *problem-solving* refers to managing stress amongst patients, an essential antecedent of relapse and overeating (Musetti *et al.*, 2017).

The masterstroke of any weight loss program should be analysed over a more extended period as obese people experience significant weight changes impeding from social, personal, and other reasons. Since obese people can lose significant weight in four months, developing confidence and restricting weight gain is better. Prevention of weight gain should be an essential objective of weight management programs to cure obesity for good. Behavioural, dietary, and lifestyle interventions are essential to prolonging the waistline's management (Cwerner and Gadsby, 2014). Obesity management can be facilitated by making dietary lifestyle changes, doing exercise, and bariatric surgery. Dietary lifestyle change is an essential determinant of obesity management, emphasising reducing consumption and exercising. Altering bad eating habits poses significant implications for obesity management. Dietary control is the essential treatment for natural weight loss, which exhibits the metabolism principle to reduce calorie intake and create a negative energy balance. Scientists have developed medically proven diets that are dedicated to weight loss services. However, a clinical intervention can enable the patients to select an adequate diet based upon their body type. The majority of the diet emphasises reducing fat and carbohydrates by incorporating a smaller portion of the meal and combining different food to reduce total energy intake. Food and diet patterns significantly prevent and protect against chronic diseases such as diabetes (Raynor and Champagne, 2016).

Obesity negatively affects health, and it has a high degree of prevalence in modern societies. Obesity prompts cardiovascular diseases, cancer diseases, diabetes, and other chronic illnesses. Alarming obesity rates have encouraged health and technology professionals to identify effective

ways to promote healthier eating habits and fitness lifestyles (Coughlin *et al.*, 2016). A healthy diet is an adequate diet that encourages growth and development among individuals and maintains an optimal health level to prevent chronic illnesses. A balanced diet level is referred to as *"adequate proportions of carbohydrates, fats, and proteins, along with the recommended daily allowances of all essential vitamins, minerals, and health-promoting substances.* A healthy lifestyle can be measured using several indicators*: good nature, liveliness, alertness, good appetite, normal body temperature, pulse rate, and adequate B.M.I. index levels.* According to Cwerner and Gadsby (2014), eating healthy refers to *"consuming the right quantities of foods from all food groups to ensure an individual's body is appropriately nourished and capable of functioning appropriately, dependent on lifestyle and activity levels"*. The study focuses on the use of health tech applications for measuring diet and behaviours of healthy eating. Though the topic is recent, research is being done on this subject matter.

Pieniak *et al.,* (2016) conducted research that studied smartphone applications' impact on young consumers under a randomised controlled trial using qualitative research methods. Data was gathered by sending tailored messages on participants phones to create accountability for healthy eating. The study's findings revealed that smartphone technologies could support health care facilitators to behaviour young adults' behaviour to eating. It also compared their strategies for dietary assessment and users' feedback based on several installations and reviews. The selected criteria were based on the English language and a minimum of one million installs or reviews. The findings of the study revealed that 13 as had been classified. In contrast, nine applications had a food diary feature. 4 out of 13 applications had innovative features related to motivational coaching and diet plans, while only the Fat Secret application connected a user with the health professional and S-Health comprised of nutrients balance score.

The study of Flaherty *et al.*, (2017) examined food purchasing behaviour by conducting descriptive comparative analysis for eleven mobile applications based on nutrition, behaviour change, and user quality. The study found variation in the result, and it identified a need for improvement in the applications to ensure a healthy behavioural change process on a larger scale. It was also found that the as were weak in focusing on behaviour change as limited techniques were used to influence behaviour change among the user. The users had to put a significant effort due to the complicated design and interface of the applications, which means design and an interface directly relate to the appropriate use of the health application. Lastly, the researchers concluded that smartphone health applications could support purchasing behaviour towards healthier food; thus, it requires a simple interface and an effective engagement technique to influence healthy eating behaviour. Samdal (2017) did a systematic review of effective behavioural change techniques that study a link between eating well and exercising in obese adults. The findings revealed that different behaviour change techniques (BCT) could support and promote healthy eating and physical activities. Therefore, health tech smartphone applications should use innovative techniques to influence behavioural changes in eating habits.

A cross-sectional survey was done by West (2017) on 217 participants for six months to examine and identify behavioural changes that are linked to dieting and healthy eating applications. The study used regression analysis to identify changes in theory and actual behaviour. These study findings showed that health tech application increased motivation, self-efficacy, and desire to attain healthier eating habits.127 out of 217 participants at a 58.5% percentage level agreed that the health tech application led to changes in their behaviour towards a healthier diet. 125 out of 217 participants at 57.6% percentage level agreed that the health tech application increased their frequency of eating healthy food, whereas 118 out of 217 participants at 54.4% percentage level

agreed that the health tech application increased their consistency in consuming healthier foods. It was also identified that the predictors, *"Theory* (P*<0.001), engagement (p<0.001), use* (*p < 0.003), and education (p < 0.010),"* were positively related with diet-related symptoms influencing behaviour change. Hence, the study concluded that weight management has a positive impact.

The study was done by Mauch (2018) to examine and review the popular food- and nutrition-related mobile that promotes healthy food eating behaviour based on behavioural analysis of content and a scope, quality. Quality of mobile application was accessed using a mobile rating system, which had four domains *"engagement, functionality, aesthetics, and information".* Results showed that 23 provide recipes, 12 for meal planning, 10 for a shopping list, four for family organising, and two for food choice applications. It was found that the food choice and family organiser application showed the highest score based on quality with a mean of 3.5/5. At the same time, others also score reasonably well based on functionality except for engagement. The standard content and features analysis that showed potential for health care applications to support healthier food consumption was 26 meal planners, 44 shopping lists, and 48 sharing features. Few behavioural change techniques (BCT) were identified with a mean score of 3.9/5 per on-the-base behavioural support features. Thus, the researchers concluded that smartphone applications positively support healthy food provision, but improvements are required in engaging the user.

Empirical evidence from Holzmann *et al.,* (2017) quality of nutrients revealed several available on the play store market. Still, there have been no standardised criteria for the evaluation of the as. However, the study evaluated three as (Kalorienrechner, Kalorientabellen, and Scanner) on the criteria of nutritional values with information of software (Opti Diet PLUS) collected from a German database (Bundeslebensmittelschlüssel, B.L.S.). The research findings concluded that the as selected for the study could assist users as a support tool for self-monitoring. They suggested

that nutrition experts be part of the development team to increase quality and enhance healthy eating behaviour.

The research of Honary *et al.,* (2019) identified the risks involved in mobile health applications. The study was conducted in two phases using both survey and experimentation. Firstly, the survey was distributed amongst a hundred and six participants, followed by two workshops with eight people, which was organised to assess the youth's perception of healthy eating and fitness. Furthermore, three interviews were conducted to assess the role of eating disorders and body image, and a list of 100 fitness and diet as on the internet was reviewed. All the participants are aged between 18 to 25 years. The findings of this study showed that participants indicated negative experiences in the form of guilt formation due to the persuasiveness of the models, fear of receiving negative responses, feelings of being controlled, and social isolation. Thus, findings concluded that the applications promoted positive health outcomes but reported possible negative experiences and behaviours.

Schoffman *et al.,* (2013) investigated mobile applications' role in promoting weight gain prevention, healthy eating, physical activity, and weight loss treatment. Fifty-seven participants were tested using experimentation for the study, whereas 61.4 % lacked expert recommendations. Therefore, it was recommended that health tech mobile applications be strengthened with comprehensive information to support change in weight and set exercise goals.

A systematic review conducted by Kankanhalli *et al.,* (2019) of 30 studies about the usage of diet as change reported that all examinations had text input methods while 5 of the examinations allowed digital inputs. The data comprised *"user's demographics, medication, health behaviours, and goals,"* and the study judged six groups of applicants, i.e., "*self-monitoring, feedback, gamification, goal reviews, social support, and educational information".* Self-monitoring was

identified as a critical component of intervention in all of the studies. Additionally, 18 research studies identified personalised feedback components. 10 studies identified gamification components. In contrast, others identified goal reviews, social support, and educational information respectively. Moreover, 13 studies have impacted health outcomes, and 12 cases observed the impact on the eating pattern, while 5 cases examined the impact of eating pattern and health.

Empirical evidence from the research of Stephanie *et al.,* (2016) reported that a-based interventions effectively improved dietary and sedentary behaviours and enhanced the level of physical activity among individuals. Salim *et al.,* (2017) evaluated the mobile applications that implement a persuasive design for the elderly to ensure a healthier diet. A health application was developed for the study to suggest menus and calorie intake based on Body Mass Index (B.M.I.). Several persuasive techniques were used, and a *"Unified Theory of Acceptance* and Use of Technology (UTAUT)" was also used to evaluate the study. A sample of 9 students, as part of the study, reported a 90% positive response on the factors of usefulness, consistent quality, monitoring, and others. Lastly, it was identified that the health education showed improvement in diet intake behaviours from day 1 to 3.

The study of Ernsting *et al.,* (2017) investigated the influence of health applications on changing medical patterns and severe conditions management. Samples for 4144 individuals of 35 and above ages were part of the study. At the same time, data was collected using a questionnaire based on socio-demographic factors such as *"chronic conditions, health behaviours, quality of life, and health literacy, use of the Internet, smartphone, and health as."* Logistic regression tests revealed 2538 out of 4144 participants with 61.25 % used smartphone applications, 521 out of 2538 individuals used health as with 20.53 %, 232 out of 521 with 44.25 % resulted in smoking

cessation, 201 out 521 with 38.6%, and 121 out 521 with 23.2 % showed weight loss and healthy diet. The health applications' common characteristics were planning, reminding, prompting motivation, and providing information. Moreover, the study's findings showed a significant relationship in health behaviour, planning, physical activity, a significant relationship between monitoring or feedback and physical activity, and a significant relationship between adhering to the doctor's advice and feedback.

Gilliland *et al.,* (2016) identified nudging as an essential feature that should be part of healthcare applications. Nudges are essentially used for boosting social psychology to realise the desired outcome. Gilliland *et al.,* (2015) studied the impact of the smartphone application *"Smart Petite"* on dietary behaviour. The study's findings showed that the smartphone application *"Smart Petite"* was operative in improving eating behaviours through behaviour change techniques and a behavioural economic approach. Thus the consumption of healthy foods was increased. The findings of Coughlin *et al.,* (2016) revealed that usage of smartphone applications that promote health indicated better dietary behaviours with lower-calorie, low fat, and a higher degree of weight loss.

In contrast, higher consumption of healthier foods and a higher level of physical activity was also identified. On the other hand, diet tracking using wearable gadgets is the biggest challenge for self-tracking due to the unavailability of an accurate automatic tracking system for the intake of amount and calories by users or other relevant information. Thus, extensive research and resources are needed to develop automatic A.I. wearable gadgets to manage metabolic syndrome (Kim, 2014).

AHRQ, (2018) conducted a study and evaluated the effectiveness, usability, and features of commercially available healthcare mobile applications for the self-management of diabetes. After going through hundreds of applications, 11 as were found appropriate to provide health outcomes.

Still, only 5 of them showed clinically significant improvements as a self-management tool for patients. In contrast, none of the other applications showed improved quality of life, blood pressure, weight, or body mass index. Five participants showed a 0.5 % reduction level in HbA1c than usual care (AHRQ, 2018). The study of Coughlin *et al*., (2016) reported that eHealth applications could improve a patient's medicine management journey. The health application encourages better adherence from consultation with a medical expert, booking appointments, decision-making, and monitoring to learning medicines management.

With the evolution of technologies, information sharing and transmission systems have also evolved. One of the healthcare industry's challenges from early times is medical errors in medicine management, as 10 % of people worldwide are affected. Technologies such as m-Health applications are becoming a key source in providing solutions to the patients and health professionals for the non-adherence issues in medication (Farhadyar and Safdari, 2018). Various Health tech applications include clinical support systems (CDSS), electronic medical record (E.M.R.), electronic health record (E.H.R.), electronic discharge summary (E.D.S.), electronic medication management (E.M.M.), health information exchange (HIE), hospital information system (HIS), personal health record (PHR), picture archiving and communication system (PACS) and many others. Most of the above applications are part of Medical Informatics Applications (MeSH). Other commonly used health tech applications are Medication alert systems, Electronic medication management and patient record system.

The American Pharmacists Association (2018) reports suggest telemedicine technology can play a crucial role in reducing medical errors and improving medication management, supported by evidence from various U.S. hospitals implementing telemedicine programs to improve medicine management practices. Previously, the hospital provided medication consultancy with a

pharmacist who reported a medication error higher than 70 %. When the hospital implemented the telehealth program, the medication management drastically improved, saving pharmacists' hours while reducing discrepancies. Additionally, it increased the quality and accuracy through remote monitoring of pharma technologies.

Telemedicine has enabled health professionals to provide consultation to patients from any place worldwide by overcoming barriers of distance. Various health tech applications having telemedicine functionality, such as telemedical devices, provide healthcare support to patients, thus facilitating critical care in emergencies. Telemedicine is time-efficient as it does not require the patient and the health professional to be present at the same time as within the telemedicine store-and-forward feature supports in the transmission of medical images, bio-signals, and other relevant information for specialists to assist in providing asynchronous consultations, thus, reducing the time in the overall treatment of the patients. Various health applications facilitate patients by providing health consultancy remotely that are active in providing real-time diagnosis, management, counselling, and monitoring (Jones, 2018).

According to the Federation of International Pharmaceutical F.I.P. (2019), health-tech applications can benefit pharmacists in maintaining updated stock inventories, access drug information systems, reviewing patient health information. Moreover, mobile applications can support medication adherence and recording health history that can improve patient management. Health-tech applications play a huge role as m-Health can assist millions of individuals through safe, effective, and efficient patient care. Choi *et al.*, (2015) analysed the studies on the effect of mobile applications in medicine management. Findings of the study based upon the systematic review of 33 articles, reports, and hundreds of medication-related applications revealed that m-Health applications have a significant positive impact on medicine management as improvements were

seen among caregivers, patient's quality of life, healthcare providers and pharmacists. However, concerns were reported related to privacy issues.

According to the study of Lux Research (2016), smart technologies can be applied at a larger scale to reduce the negative impact of diseases, prevention, and treatments, though it can expand medication adherence rates among the patients. Moreover, the findings of the report revealed that patients prefer applications that are simple and inexpensive. The significant barrier to these solutions is the added cost, such as telemedicine increases the cost of care due to frequent interaction between the patients and the doctor. To increase the adoption rate of health tech applications, developers must provide a user-friendly interface to overcome problems as a lack of technical capabilities of older patients and less tech well-informed people. Furthermore, the findings revealed that m-Health technology could save costs in medication management up to $300 billion.

Health tech applications, video communication, and other digital tools can improve medication adherence. Other technologies, such as if the patient takes a smart pill, can measure the data from inside the patient. Proteus Digital Health and Lake Tahoe's Barton Health developed a smart pill technology to measure hypertension in patients. Companies like Medisafe are trying health tech platforms that integrate the patient's medical record with mobile medication history. All technologies are beneficial, but the benefits cannot be appropriately reaped unless the patients consistently use these technologies. The government and insurance companies bear the costs to make medical consultation and therapies accessible to all patients (Wicklund, 2017).

A web application company named MediSafe released a report showing that the individuals who used MediSafe showed better blood sugar levels due to improved adherence to medication. A World Health Organization report revealed 50 % medication adherence in developed countries,

whereas the MediSafe study revealed 86 % adherence to the medication of those who used MediSafe. MediSafe application provides timely reminders to patients for their medication and notifies them to refill medications before it goes empty. Health tech applications can improve adherence to medication for people who are suffering from chronic disease. It is recommended that health tech companies, with the support of governments, need to seek out more ways to integrate Health tech applications with different technologies to enhance medication management performance (Gruessner, 2015).

Lee *et al.* (2018) revealed that the mHealth application positively impacts the patients' health in support service and medication. A review study was identified by Ahmed (2018) on medication prescription a's role in improving the patient's health. The 420 analysed applications revealed that three primary strategies used for medication adherence were based on the *reminder, behavioural* and *educational*. Furthermore, 250 used a single strategy, 149 used two strategies, whereas only 22 used all three strategies. More healthcare professionals (H.C.P.s) and other stakeholders are required for higher quality and better adherence.

Morawski *et al.,* (2018) investigated the association of a mobile application blood pressure control and medication adherence. A sample of 411 individuals was tested that reported a low degree of improvement in self-reported medication adherence. In contrast, no significant improvements were seen in the blood pressure levels amongst the patients. Mira *et al.,* (2014) conducted an experimental study in Spain to evaluate the effectiveness of a medication self-management IOS and Android a named "ALICE" designed by a group of professionals and patients. A random sample of 99 elderly individuals was part of the study that used the application for three months. The application maintained the personalisation of prescriptions, medical advice, display images of medications, and medication management reminders. This case found a significant improvement

as the "ALICE" application reduced medication-taking errors in the patients, and a better adherence rate was found from patients. In contrast, the overall satisfaction score was high, with 8.5 ratings out of 10. The research concluded that the application helped the patients improve medicine management, reduced forgetfulness rates, saved patients from medication errors, and positively empowered them to manage their medication.

The research of Park *et al.,* (2019) has indicated a positive influence of mobile health applications on medication adherence. It was identified that behavioural strategies such as *"alerts, reminders, and logs"* enhance medication adherence. Empirical evidence from the study of Stuck *et al*., (2017) identified that older people face usability issues while using medication management as; However, there is a positive impact of medication management on health. If used effectively, a more straightforward interface is recommended.

Al-Ghamdi (2018) investigated the effects of smart e-medicine applications on patient care in Saudi Arabia. Data collected for the study was from a random sample of 384 physician participants by using a questionnaire. 300 (78.5 %) physicians filled the questionnaires. About 88.3 % of the respondents reported using a smart device, whereas 86.3% used a medical application, and 53% used the smartwatch at least once daily. Another study was conducted by Sailer *et al.,* (2015) to analyse prototype smartwatches as a tool to enhance drug use and showed a positive response (Sailer *et al.,* 2015). Thus, based on the evaluation of various peer-reviewed articles, it was concluded that health technology applications have a significant impact on patient care. It is gradually taming the people's willingness to accept them as a moderator in improving the patient wellbeing.

The majority of mobile technology users are youth which made Margaret *et al.,* (2016) investigate the effectiveness of m-Health in communicating all information to teenagers. The study used a

survey to gather data from a sample of 439 patients between the age group of 14 to 19. Findings showed that 58% of the respondent's text 30 times a day, 61 % of the respondent's used email more than once. On the other hand, 47% of the respondents have shown interest in using smartphones for discharge information, 48 % of the respondents used smartphones for physicians' referrals and test results, 38% of the respondents used smartphones medication information, and 41% used the smartphone for medication and other reminders.

Georgiou *et al.,* (2019) conducted a study to investigate the impact of health applications on clinicians' work practices and engage the patient in the follow-up of test results. The study's findings suggest that technological advances in health services such as health I.T. and m-Health lack awareness among physicians, and the results of m-Health were not significant and showed weak follow-up. Moreover, it was found that healthcare applications can subsequently improve test follow-up and awareness by 15 % and 28 %, respectively, among the clinicians in engaging the patients.

Narasimhan *et al.,* (2013) investigated the use of m-Health in upgrading adherence to tuberculosis treatment and its follow-up in Peninsular India. The study results identified that voice call reminders were the most critical function that helped improve adherence towards drugs as they showed a high success rate in the treatment of T.B. patients. Pew Research Centre conducted an internet survey on the smartphone usage of Americans in 2015, which revealed that 62% of the users in America use a smartphone to get information regarding their health and the majority of them belonging to age groups 18 to 29 that use the smartphone for health information and follow-ups (Smith, 2015).

Lima *et al.,* (2018) investigated Web-4 technologies like WhatsApp and its impact on health follow-up amongst H.I.V. patients. Primary data was gathered using interviews from the sample

of 26 H.I.V. positive patients, which revealed that WhatsApp was reserved as a channel of communication and improved access to health professionals for various health treatments.

Nystrom *et al.,* (2018) conducted a longitudinal study over twelve months where follow-up using mHealth to prevent obesity behaviours among children. Findings revealed significant results in 6 months follow-up based on dietary and physical activity variables except for fat mass index (F.M.I.). After 12 months, the results identified improved F.M.I., dietary, and physical activity variables.

Timely access to health care is challenging for people under critical health conditions. Technological advancements can improve health care through video conferencing and other tools that make health care more accessible to patients. A study conducted by Kingston Health Sciences Centre for stroke prevention using e-Visits reduced healthcare costs such as patient travel and expense. Moreover, the findings of the study revealed that the patient's conventional faster-following health care at an average of 10 minutes as compared to in-person health care of 60 to 112 minutes, whereas the total times saved by patients was 124 minutes (80 minutes for e-Visits and 44 minutes of travel time with an estimated savings of $52 per patient. The study concluded that the patients had to wait for shorter appointments through E-visits and received better follow-up at a lower cost (Aireddy *et al.,* 2019).

Empirical evidence from the research was done by Mendez *et al*., (2019) on the effectiveness of a prototype educational a for nursing revealed that health applications could significantly improve health care follow-up among patients and the reduced cost that incurs for health care. Maraba *et al*., (2018) examined the role of mHealth in improving tuberculosis treatment of 457 patients in South Africa. The study revealed that the time acquired in sputum collection until the start of T.B.

treatment was reduced to three days and was not significant, whereas delivering results through a text message service.

Armstrong *et al*., (2017) findings on the impact of home monitoring, using applications, on the number of in-person visits following an ambulatory surgery revealed that 65 women were part of a study with a mean age of 47 to 49 % in the mobile as a group and around 51 % in the in-person care group. Simultaneously, mobile groups reported 0.66 in-person visits compared to 1.64 visits of in-person care groups. Additionally, the cell phone application sent more follow-up emails and a higher convenience score with no difference in conversations, satisfactory scores, and complication rates. Thus, it was concluded that an m-Health follow-up is an essential tool for improving the health follow-up process by providing convenience to the patients.

Findings of Eno *et al.,* (2017) revealed that mHealth has a high potential to improve follow-up health care but requires patients' engagement at a more significant level and the ability to adapt to technology. Braun *et al*., (2016) revealed that health application positively impacts the efficiency of health follow-up among patients. Wang *et al.,* (2019) investigated the influence of chat-based instant messaging support integrated as an intervention tool to cease smoking among 1185 individuals from 18th June 2017 to 30th September 2017. The findings reported low and no significant difference in smoking cessation services.

Gay and Leijdekkers (2013) investigated the impact of the health and fitness mobile application of *"my Fitness Companion®"* for chronic disease management. Data has been collected from 5500 users in the past seven months. It was found that *"my Fitness Companion®"* was effective in disease management, whereas weight, blood pressure, and glucose monitoring were the most common features used. The two driving factors for using the application were based on its simplicity and motivation. Health follow-up was immediate and allowed full user personalisation

to track and manage their progress. The application's strengths are that most of the functions are for free or a nominal price and are effective for patients who need to monitor their health for a more extended period. Manual entry was one of the weaknesses of the application that could result in inaccurate data entry. Aelboom *et al.* (2014) stated that using innovative techs, wearable devices, and mobile health could improve health follow-up. For instance, wearable gadgets can track basic parameters such as temperature, blood pressure, heart rate, exercise, diet, and psychological state. Further usage of mobile health as introduced the monitored health metrics using a patient-centric approach for creating health follow-up data.

2.4. Significance of obesity management

Obesity management is considered significant for the maintenance of the health conditions of people as the obesity phenomenon has emerged as a major threat for humans posing numerous negative health consequences. It can lead to many diseases and is considered the primary factor in increased morbidity and mortality rates (Georgiou *et al.,* 2019). The prevention of obesity can be possible among people by increasing physical activities. Obesity management is essential to maintain the physical and mental health of individuals. It helped bring the modification to the people's lifestyles, which also increased the life span of the individuals. The study showed that people used to manage their lifestyles in developed countries so the obesity issues could be prevented. The management of obesity presented significant effects on people's health because it was usually done by adopting dietary habits and exercise modifications.

These habits improved the lifestyle of the people and exerted positive effects on the people by making them healthy along with the management of the weight for both the short term and long-term, although combining with exercise and counselling provide more significant results. It helps people in the maintenance of personal and professional life with more physical and mental health

capabilities. The study indicated the beneficial impacts of weight management on increasing the intellectual abilities of people (Dima-Cozma *et al.,* 2014). It also helped in the decrease of psychological distress among the people. Another study presented that obesity management reduces the risk of chronic diseases such as cardiovascular issues, hypertension, diabetes, and different cancers. It was also documented that obesity management modified the behaviour of the people towards the adoption of healthy lifestyles (Al-Hazzaa, 2018).

2.4.1 Better Lifestyle

According to Dima-Cozma *et al.,* (2014), lifestyle tends to describe a complex set of behavioural strategies and routines being incorporated by the society based upon social norms, values, and attitudes of an individual or group social context. The word lifestyle was first derived in the twentieth century by sociologists, medical practitioners, and beyond to indicate social integration, status, satisfaction, quality of life, and consumer needs. Egger (2008) defines lifestyle as "*the application of environmental, behavioural, medical and motivational principles to the management of lifestyle-related health problems in a clinical setting*". A healthy lifestyle incorporates diet and physical exercise to achieve wellbeing, an instrument for building good health W.H.O. defines a healthy lifestyle as "*a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*" (Dima-Cozma *et al.,* 2014).

Matheson *et al*., (2012) conducted studies to investigate the linear association between a healthy lifestyle and mortality rate. It has been widely accepted that adherence to a healthy lifestyle affects obese people and normal and overweight individuals. The findings of the study showed a significant association between healthy lifestyle habits and mortality. Researchers have measured a healthy lifestyle using dietary practices, exercise, moderate alcohol consumption, and no smoking, where mortality is stratified by body mass index (B.M.I.). This research was done using

11,761 participants from 1988 to 1994. The study's findings were proposed based upon the multivariate analysis, which suggests that adopting healthy habits influenced all groups of people. However, the most significant benefits are seen within the obese group.

Al-Hazzaa, (2018) suggests that unhealthy lifestyle behaviour is caused by lack of physical activity, unhealthy diet, sedentary behaviour, and insufficient sleep, resulting in excessive weight gain, unfavourable mental health, unfavourable metabolism, and immune system, reduced cardiorespiratory and musculoskeletal function. Al-Hazzaa, (2018) conducted a study on Saudi teens using the Arab Teen Lifestyle Study (ATLS), which suggests that Saudi youth significantly possess an unhealthy lifestyle in the form of lack of physical activity, high screen lime, short sleep duration, and unfavourable dietary habits which care contributing towards an unhealthy lifestyle. Findings suggest that Saudi Arabia's female youth are at high risk compared to their male counterparts, similar to the male students enrolled in private schools in Saudi Arabia.

Wortley *et al.* (2017) conducted a study investigating wearable gadgets and digital applications' role in achieving better wellbeing and lifestyle. Findings show that long-run use of passive body monitoring and wearable gadgets aids better lifestyle by tracking user lifestyle behaviour for better personal health management, which results in positive health outcomes. Sunyaev *et al.,* (2017) conducted studies investigating wearable gadgets' impact on a healthy lifestyle aided by health monitoring capabilities. The findings show that these wearable gadgets are increasingly used during gamification, which is an intriguing phenomenon to motivate and enrich interaction to drive a healthy lifestyle. Findings have been proposed based upon the mixed research methodology where interviews and surveys were conducted to propose the idea that wearable gadgets aided by gamification have a significant positive impact on better lifestyle as activity tracking, fitness, and

health functionality are the essential attributes which consumer perceives in the pursuit of achieving a better lifestyle.

Goodyear, Kerver and Quennerstedt (2017) conducted a cross-sectional study to investigate the impact of wearable healthy lifestyle technologies on adolescent motivation on physical activity. The study uses a mixed-method sequential design where a longitudinal study was conducted to gather primary data from 84 adolescents asked to wear Fitbit for eight weeks and fill pre- and post-questionnaire. On the contrary, focus group interviews of adolescence were conducted after wearing Fitbit for eight weeks. The study's findings suggested a significant increase in adolescents' motivation after wearing wearable gadgets for eight weeks. On the contrary, qualitative evidence using focus group interviews suggests a short-term increase in motivation as wearable gadgets resulted in feelings such as completion, guilt, and internal pressure.

A critical review of past studies explaining the association between obesity and better lifestyle with the mediating role of health care applications and wearable gadgets. It provides insight into the benefits of wearable gadgets and digital healthcare applications. The detail provides insight into the obesity phenomenon and its implications on individuals' health by analysing the risk being posed by the obesity phenomenon to public healthcare with a significant contribution towards chronic disease and psychological problems. Section 2.4.2 provides insight into previous studies conducted on the management of obesity to contain obesity phenomenon by incorporating dietary changes, exercise, health tracking, mediational support, and bariatric surgery. It also provides insight into people's knowledge of wearable gadgets and digital healthcare applications and their implications for adapting e-health and m-health. Section 2.6.1 provides insight into the linear association between patients' attitudes towards healthcare application acceptance and lifestyle. Section 2.7.2 provides insight into previous studies investigating the impact of using healthcare

applications and wearable gadgets on achieving lifestyle through physical activity and dietary changes. Section 2.8.2 provides insight into the linear association between healthcare applications and wearable gadgets with a better lifestyle by containing the obesity phenomenon.

An integrative model was not available, translating into how wearable gadgets and healthcare applications enable consumers to achieve a better lifestyle. The majority of the previous studies (Liao *et al.,* 2019; Nasir and Yurder, 2015; Peng *et al.,* 2016; Piwek *et al.,* 2016) emphasise consumers' motivational aspects instead of a better lifestyle. Secondly, the obesity phenomenon is mostly explored by the previous researcher (Ball, Crawford, and Kenardy, 2005; Crosnoe, 2005; Korkeila *et al.,* 1998; Singla *et al.,* 2019) in the context of its health implications on patients. There is no significant statistical relationship between the obesity phenomenon moderated by healthcare and wearable gadgets that influence a better lifestyle. Thirdly, empirical evidence from literature from (Aelboom *et al.,* 2014; Armstrong *et al.,* 2017; Al-Ghamdi, 2018; Braun 2016; Car 2017; Eno 2017; Farhadyar and Safdari, 2018; Gay and Leijdekkers, 2013; Georgiou *et al.,* 2019; Gruessner, 2015; Jones, 2018; Lima *et al.,* 2018; Lee *et al.,* 2018; Lux Research, 2016; Margaret *et al.,* 2016; Mendez *et al.,* 2019; Morawski *et al.,* 2018; Narasimhan *et al.,* 2013; Nystrom *et al.,* 2018; Park *et al.,* 2019; Smith, 2015; Stuck *et al.,* 2017; Wicklund, 2017) emphasises on obesity management and role of wearable gadgets and digital healthcare applicationson dietary changes, improved medication and physical exercise while ignoring the role of achieving better lifestyle Fourthly, there is no integrated model which provides insight on mediating role of people attitudes towards wearable gadgets and healthcare applications on achieving better lifestyle as the majority of researchers (Abadel and Saifuddeen, 2017; Almarri and Bhatti, 2015; Hossain *et al.,* 2018; Hussein *et al.,* 2017; Sezgin and Yıldırım, 2014; Vo *et al.,* 2019) emphasises on consumer

attitudes and factors influencing the behaviroal intention to use healthcare application and wearable gadgets.

Fifthly, none of the studies investigates the moderating role of the use of technology and wearable gadget to contain the obesity problem to achieve a better lifestyle as the majority of the previous studies conducted by (Gowin *et al.*, 2015; Herrmann and Kim, 2017; Jee, 2017; Kelley, 2014; Marcolino *et al.*, 2018; Mejova and Kalimeri, 2019; Middelweerd *et al.*, (2014; Middelweerd *et al.*, 2014; Padmasekara, 2014; Seiler and Hüttermann, 2015; Shih *et al.*, 2015) emphasises on the outcome of using technology and wearable gadgets in the form of better lifestyle through exercise and dietary changes. The theory of the transtheoretical model was based on the phenomenon to provide the strategies related to the change of behaviour to adopt the healthier strategies for the management of obesity and finally to achieve better lifestyle forming the hypothesis that "there is a significant statistical relationship between obesity management and a better lifestyle". The theory promotes the acceptance of the modifications that will help the individuals to adopt a healthy lifestyle.

2.5 Knowledge and attitude of people regarding obesity management

People's knowledge is a vague concept without any connection with the real world. Knowing is one of the most specific human processes to achieve an outcome, which is knowledge. The most theoretical understanding of information is "justified true belief" proposed by (Bolisani and Bratianu, 2018), which incorporates three essential elements and conditions. The first condition is that if one knows the theory, then it most definitely is true. However, if the theory is not valid, in that case, the person has no idea what he is saying. The second condition is a belief that one knows the preposition and then believes in the preposition. The third condition is justification which needs practicality for justifying the belief that one is true.

Advancement in the field of technology and communication systems has led the world to experience new inventions. The uprising of smartphone technology has assisted in the emergence of smart tech wearable gadgets. Wearable gadgets such as smartwatches, wristbands, and others have become popular accessories in the modern world. However, the trend of wearable gadgets has yet to be well established in healthcare to its full maximisation. A study examined the adoption of wearable healthcare technology and identified a strong influence of perceived usefulness on the consumer for the adoption of wearable gadgets for healthcare benefits such as fitness checking, health consultation, and evaluation of health-related issues (Cheung *et al.*, 2019).

According to Higgins (2016), fitness is *"the state of being physically fit and healthy through proper exercise, diet, and sleep habits".* Health tech applications are an essential part of electronic health as it has made health care accessible through various smartphones, wearables, and other communication techs. Fitness and diet are the new trends in the modern-day world due to social applications' unique role. This trend has given rise to the usage of health and fitness applications. Social Applications have become a source of encouragement through trends like "fitspiration" that have led individuals towards fitness applications such as 30-Day Fitness Challenge Pro and Strava: Run, Ride or Swim. Various health-tech applications are available on the play store, but the question remains of these applications' effectiveness. Analysis of the *"30 Day Fitness Challenge Pro"* application that provides a 30-day routine exercise with different suggestions and daily reminders revealed that many users were satisfied with the application as positive results were seen within two weeks. The application increased self-efficacy towards exercise. (Mason, 2018).

Millennials have reported barriers faced in using health applications like ineffective promotion of health applications, lack of importance given to health applications, negative perception, poor interface and animations, lack of customisation, and lack of real-time feedback. Health

applications that are inexpensive and simple with higher user ratings are preferred over expensive applications available on Google Play Store and Apple Store. The *"WORK"* a is an application that tracks movement and gives users points on the movement that can be exchanged for real prizes. *"Burn Your Fat with Me!"* is an animated dating game health application in which user impress their anime dream dates by making simulated muscles. The "Superhero Workout" is another application that uses a smartphone camera as a motion tracker to track movements and reps. Furthermore, this application is a game simulation in which the user must defend the earth against invasions and encourage individuals to complete a set of exercises to unlock various items. Health tech applications can play an essential role in encouraging a healthier lifestyle through effective adherence to exercise (Ludwig, 2018).

Evidence from Adams (2010) suggested that health education through a higher level of engagement results in better benefits with significant implications on the perception of social support, self-efficacy, patient satisfaction, and coping skills. Peprah *et al.*, (2019) investigated the people's knowledge about m-Health applications amongst the students in Ghana. Information was collected through random samples of 963 students. These students were from Kwame Nkrumah University of Science and Technology (KNUST) and analysed using Pearson's Chi-square and regression tests. Findings of the study showed that knowledge of m-Health among students was significantly high; 51% of the respondents showed awareness and use of m-Health, whereas the respondents' attitudes were positively related to health. In addition to the attitudes, 99% of respondents of the study believed use m-Health provides greater health security, 72% of the respondents believed that using smartphones to access health information is a good source for information sharing with colleagues, and 65% of the respondents believed m-Health provides them

convenience as compared to other sources. Though, the respondent's attitudes regarding the effectiveness of m-Health decreased with the student's increasing class level.

Raj (2019) examined knowledge towards using m-health applications amongst 120 Finnish and 61 Lithuanian nurses, which shows that most nurses were aware of m-Health applications. Lack of technological infrastructure and awareness were the two significant barriers identified by the nurses regarding m-Health. The automation of recording data was considered the most important function of health. Both Finnish and Lithuanian Nurses showed a positive attitude towards m-Health. Further, Lithuanian nurses are more interested in learning more about m-Health than their Finnish counterparts.

The term attitude originated from an Italian word, defined in various dictionaries as *"settled opinion"* and behaviour based on conscious or unconscious mental views. Altmann (2008) defines attitude as "*a complex mental state involving beliefs and feelings and values and dispositions to act in certain ways*" On the contrary, personal attitudes referred as an "*individual disposition to react in a certain degree of favourableness or un favourableness towards an object, behaviour, person, institution, and event*" (Krebs and Schmidt, 1993). People can have favourable and unfavourable attitudes towards healthcare applications, enabling them to achieve a better lifestyle.

A cross-sectional study was conducted using convenience sampling to investigate the awareness and attitude of 199 individuals in Singapore towards m-Health. Descriptive and multiple regression analyses were used to analyse awareness and attitudes towards m-Health. The findings revealed that the respondents were aware of 4 out of 7 functions of m-Health. Men with 93% and women with 83% showed the highest awareness towards managing appointments, followed by fitness/diet with 80 % and 59 %, respectively. The most influencing factors for using m-Health were the simple interface and data security features of the application. 64% of the participants were interested to

learn the application, and 49.7% used m-Health due to reasons such as it can help in their health management. Moreover, 13% of individuals were satisfied with paying for the application. In a nutshell, the finding suggests a positive attitude towards the usage of m-Health applications while socioeconomic barriers prevented individuals from adopting m-Health applications (Hossain *et al.*, 2018).

Almarri and Bhatti (2015) investigated consumer attitudes towards "m-Health application amongst medical professionals using mixed research methods. Data was gathered from the respondents in a survey questionnaire and interview questions related to demographics, smartphone ownership, awareness, and medical application usage. The findings of the study revealed that both medical professionals reported a positive attitude towards m-health applications. In contrast, the significant features that medical professionals recommended as an add on to m-Health applications included medical service locator, medical education, patient caring, personal care, imaging, and patient monitoring.

Sezgin and Yıldırım (2014) conducted a systematic review of 31 scholarly studies to investigate attitudes and perceptions of health care professionals towards mHealth services revealed that the barrier towards the adoption of mHealth services is based on several reasons such as patient security, data security, electromagnetic risks, confidentiality, and distraction. Moreover, the study found that technology has a significant statistical impact on attitudes due to the changing lifestyle of individuals.

Vo *et al*. (2019) also conducted a systematic review of 356 qualitative studies from 2013 to 2018 regarding patients' perceptions of m-Health applications, which shows that patients have a positive attitude towards applications that engaged patients through self-care results in self-empowerment.

However, concerns were seen in the basic validity of this application, such as accessibility, appropriateness, and personalisation.

Abadel and Saifuddeen, (2017) conducted a cross-sectional study within the government's primary health care centres in Jeddah, Kingdom of Saudi Arabia, using a cluster sampling method where the questionnaire was used to gather data from the sample of n=178 resident doctors. Findings revealed that 92 % of the respondents were aware of the m-Health application and showed a positive attitude towards m-Health applications as 89.3 % installed the application and 88.5 % recommended using certain m-health applications to their colleagues. In contrast, free applications on the play store were the most popular m-Health applications. About 71 % of the respondents used the application daily, followed by 24% using it once a week, whereas only 3% used it once a month.

Hussein *et al.,* (2017) conducted a quantitative study on consumer attitudes towards health care applications. The study used questionnaires to collect data from the sample of n=488 smartphone users, analysed using Regression analysis and Pearson correlation which suggests attitude was positively correlated to the use of healthcare applications amongst smartphone users. Furthermore, findings suggest that intention to use mediates the relationship between attitude and usage of healthcare applications amongst students.

2.6. E-health and M-health Applications

According to Randolph (2013), a smartphone application is a *"software application, designed to perform specific tasks that run on smartphones and tablets"*. Global Health Observatory (G.H.O.) defines m-health as "*medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (P.D.A.s), and other wireless devices*" (World Health Organization, 2011). Hussein (2017) defined m-health as

an *"application based on the use of smartphones and its function is to educate consumers about preventive health care services and transform the services for better".* A mobile health application can be defined as a software application designed to perform health-related tasks and functions. M-Health is a phenomenon that denotes how mobile and wireless technologies can have an essential role in improving health-related services. The combination of smartphone technology and health services has made mobile applications possible to upgrade people's health. The use of m-Health applications has increased over the years among medical professionals and consumers of health services. More than 40000 health-related applications are found on the Play Store of smartphones. The rise in awareness of the concept of m-Health started back in 2009 when the m-Health alliance was being formed to improve health services using smartphone technology (Almarri and Bhatti, 2015).

Health care applications have turned out to be assistance for patients in monitoring their health-related problems. These applications help in various ways such as medication assistance, monitoring of the disease and self-accountability. These health applications come in handy as they provide reminders that increase medication adherence and reduce the frequency of missed appointments. The role of m-Health has become increasingly important with an increasing advancement in artificial intelligence and smartphone technologies (Whitehead and Seaton, 2016). m-Health applications have high potential in optimising healthcare systems around the world as it results in numerous benefits for both healthcare providers and patients in the form of cost reduction, access to healthcare facilities while improving the diagnostic ability of physicians.

Peng (2016) investigated several factors leading to the discontinuation of e-health and m-health application usage, including lack of realisation, lack of need, lack of cost, lack of tech-savviness, and lack of motivation. Furthermore, Peng (2016) investigated user e-health and m-health

application usage, including social competition, tangible and intangible rewards, and hedonic factors. Findings further suggest significant implications of creators of applications to provide personalised guidance features in the form of credibility, reminders, tracking, and goal setting and social sharing options.

Piwek (2016) identified various benefits of integrating hardware with healthcare applications that can provide health-related data benefiting primary healthcare experts in medical diagnosis and as a tool for behaviour change interventions. Moreover, some popular gadgets are headbands, smartwatches, headbands, sensors embedded in clothing, and camera clips. Patients can measure their heart rate using an oximeter ring; muscle activities can be measured with the help of sensors embedded in clothing. The stress level can be measured using wristbands with an integrated electrodermal sensor. Findings furthermore show that 50 % of users discontinue using wearable gadgets after a year due to the poor user experience that requires too much effort.

On the other hand, it has also been observed that wearable gadgets positively influence managing chronic diseases. These gadgets have high potential in the healthcare system as they can measure sleep duration and physical activity. Wearable gadgets can also measure depressive symptoms and breathing volume through monitoring heart rate and snoring. In a nutshell, these gadgets can influence positive behaviour as evidence reveals that Pedometres improve physical activity levels, body mass levels, stress levels, body measure index (B.M.I.), and blood pressure.

A study conducted by Nasir and Yurder (2015) explained people and physicians' paradigm about high-tech wearable gadgets. Wearable techs are expected to cope with the health challenges by monitoring fitness activities, communicating with physicians, and identifying risk factors to prevent, maintain wellness and early treatments. The perceived usefulness can intervene in the elevation in chronic illness and expensive treatment. The study verdicts that the perceived

usefulness of wearable gadgets positively influences users' perception, but users are negatively influenced by perceived complexity.

2.7. Use of Healthcare Applications and Wearable Gadgets for obesity management

The definition of the use of applications refers to the "*degree to which a person has formulated conscious plan to perform or not to perform some specified behaviour of using a smartphone, and digital application*" action aims to prioritise behavioural objectives. Thousands of fitness applications are available over the counter on the digital marketplace, offering tangible and intangible benefits. Still, many of them lack behaviour change factors that can retain behaviour change through motivation. A study was conducted to analyse the CalFit application that has important behaviours change features. The study used 13 students at the age of 22 years (77 % females) that were divided into two random groups of 6 (intervention groups) and 7 (control groups) students.

Further, the study analysed the effectiveness of using Mobile Student Activity Reinforcement (m-STAR). Both groups were given identical steps to run on the ^{first} week, whereas 10 thousand steps a day on the second week. On the contrary, the intervention group's daily goals were set using the *"B.A.A. algorithm"* for the following weeks. The baseline mean of daily steps was higher for the control group (6,829 steps) than the intervention group (5,387 steps). Linear mixed-effects model (L.M.M.) tests showed that the intervention group increased the intervention group's steps by 700 daily steps and showed a decrease within the control group by 1520 daily steps. In addition to this, the *"B.A.A. algorithm" results* showed an average difference of 6,000 steps and 8,000 steps. Within the first five weeks, the daily steps had not much difference, whereas, within the last three weeks, the intervention group showed an increase of 1000 steps at an average compared to the 2000 steps decrease of the control group. The difference based on adherence was not significant because of

the small sample size. Thus, it was concluded that customisation positively impacts physical activity and exercise (Zhou *et al.*, 2018).

Evidence from Kelley (2014) shows a positive association between B.M.I. and mobile use, thus identifying that smartphone technology is not an effective tool for adopting a healthier lifestyle. It is identified that there is a high tendency to leave the application for a while. Secondly, most mobile users have shown a higher weight gain after using a smartphone, making it difficult to track the impact of fitness applications. However, the study has emphasised that the platform of health applications has excellent potential if integrated in a much better way. These innovative and integrated turnkey solutions can help develop a healthier lifestyle among both fit and overweight individuals.

Jee (2017) reviewed ten articles on health and fitness smartphone applications from 2014 to 2017. Results showed that smartphone applications and wearable gadgets reported a higher physical activity and motivation rate than the convention tools. Physical activities and motivation are positively correlated along with user perception of the usefulness of the application. The findings of the study of Herrmann and Kim (2017) analysed the impact of three fitness applications on the fitness state of 47 individuals after usage of five months. Theory Planned Behaviour was applied using a survey with post-test checkpoints and design on the 1st month, third month, and the fifth month to evaluate the performance. Cross-sectional research methods were used to analyse the effectiveness and differentiate between the pre and post-tests.

Furthermore, the researcher also analysed the difference between users to non-users of the cell phone applications through sign tests, *T*-tests, linear regression, Fisher's exact tests, and logistic regression. The study results reported a significant difference reported in the post-test attitude towards application usage, which was reported to be more favourable among non-users. Within

five months, the perception regarding strength, flexibility, cardiovascular fitness, endurance, or body composition remained the same. Moreover, a relation between A usage and effectiveness with usefulness and perceived behaviour control was found. In contrast, the intention to use the selected application decreased over the period, and peer influence had no impact on exercise and on using fitness.

Mejova and Kalimeri (2019) conducted a study on the impact of technology used on exercise. A sample of 15k U.S. residents combined technology with a survey on moral views, human values, and emotional cognition. It was found that individuals that give priority to purity are more likely to use such applications. Furthermore, the usage of applications showed more effective performance. The study findings showed a positive relationship between exercise with socioeconomic status and happiness.

Results of Middelweerd (2014) on the base of analysis conducted using taxonomy on 1,913 as in iTunes and around 5,540 as on Google Play and their impacts on physical activity promotion through applications showed no behaviour change among the individuals except for five applications. Jacek *et al.,* (2016) examined the impact of mobile fitness applications on fitness centre attenders. A sample of 92 comprising 48 male and 44 female fitness centre attendees took part in the survey, and the study used the Diagnostic poll method. The study's findings showed that 48.89% of users reported that the application motivated them to exercise and 28 % of individuals shared their results on social media.

Gowin *et al*., (2015) conducted a study using a qualitative research method to explore the impact of health/fitness on changing behaviour among a sample of 27 college students ages 18 to 30 in the southwestern part of the United States. The top 3 downloaded mobile applications by the students to meet their health goals were *"MyFitnessPal, LoseIt!, and RunKeeper".* About 37% of

the candidates reported using fitness applications for more than a year, 25.9% used health tech for less than three months, 18.5 % used health applications for three months to 6 months, 11% used for 6 to 9 months, and 7.4 % used the a for 9 to 12 months. Other study findings indicated that cost and simplicity are two main driving factors to use the health a. lastly, health applications usage showed a positive change in health and fitness-related behaviours. Marcolino *et al.,* (2018) revealed that m-Health applications improve chronic disease management for asthma, heart failure, blood pressure, and glycemic control symptoms by reducing hospitalisations and death rates. In addition to this health, applications help reduce weight among overweight and obese patients. Middelweerd *et al.,* (2014) examined the effect of health education on physical activity. Findings revealed that the health applications successfully resulted in 5 out of 23 possible behavioural changes resulting in a better lifestyle.

Padmasekara (2014) examined the effect of fitness applications of the Ale 4S smartphone's "A Store" on individuals' physical activity. The exercise criteria for the pilot study were based upon *"Nike Training Club, Instant Fitness, and Gorilla Workout Free."* Further, the calorie levels were measured by comparing them with the control exercise. The study findings revealed that jogging was the best exercise for burning calories, with 7.9 calories burned on average per minute. In contrast, it was also identified that Nike Training Club was better than Gorilla Workout, and the Nike Training Club and Instant Fitness were found to be as effective as R.P.M. and WiiF it Plus groups. It was concluded that smartphone technology has great potential as fitness is as effective as a gym class based on weight loss. The use of wearable gadgets is widely adopted for different purposes, particularly for the activity trackers are used for physical activities and exercises. A study by Shih *et al.* (2015) narrated the positive response of 30 users using physical activity trackers that were used for six weeks to know about users' personal preferences and behaviour

(Shih *et al.*, 2015). Another empirical study shows the positive effect of as and wearable tracking devices on the regularity of exercise and improving their performance (Seiler and Huttermann, 2015). The advancement in smartphone technologies and wearable gadgets is revolutionising health care services to facilitate better communication between patients and physicians to optimise the services for life-threatening epidemics, obesity (Mohammed *et al.*, 2018).

2.8. Theoretical structure for this study

The above information emphasises the occurrence of the obesity phenomenon, obesity management, and the role of healthcare applications and wearable gadgets in promoting the obesity management phenomenon. This research emphasises the role of the obesity phenomenon, obesity management, and peoples' attitude on achieving a better lifestyle with the moderating role of people's attitude and the mediating role of Technology in wearable gadgets healthcare applications. These factors significantly influence an individual to achieve a better lifestyle by enhancing the individual ability to cope with obesity prevalence in GCC, which has emerged as a pandemic and a major public health concern for the population of GCC.

The following section describes how these theories aim to explain the theoretical research framework. There are three theories employed to propose the structure of the study. These theories include the transtheoretical model, model for the acceptance of Technology, and complex adaptive systems. These models proposed information about the change of the behaviour to adopt healthier strategies for the management of obesity and adopt better lifestyles. These theories and models can work together because these provide the strategies that change the processes and guide the individuals towards adopting better lifestyles. The transtheoretical model was introduced by Prochaska and Velicer, (1997) within the late 1970s. A transtheoretical model was developed after examining the experiences of smokers who quit smoking on their own without any treatment

compared to those who require treatment to understand why some people could quit smoking on their own. The examination concluded that readiness to quit smoking positively influenced the individuals to quit smoking. Thus, we can say that the decision process influences behavioural changes within the Transtheoretical Model and can be referred to as a model of intentional change. The model has six stages that reflect behaviour change as a cyclical process. Behavioural change gradually over time, and the model should not be confused as a theory; therefore, various behavioural change theories can be applied at different model stages. This system's six stages are *"pre-contemplation, contemplation, preparation, action, maintenance, and termination"*, often applied for changes in health-related behaviours. Pre-contemplation is the first stage of the model in which the subjects have no intention to change their behaviours immediately or shortly as such: individuals are unaware of the negative consequences of their behaviours. The positive impact regarding behavioural changes is underestimated at this stage. Contemplation is a stage in which a person intends to change their behaviours by showing an inclination towards healthy behaviour in the foreseeable future. i.e. within six months or so. The individuals understand the problematic effect in their behaviour; thus, they emphasise understanding the pros and cons of behaviour change.

Preparation (Determination) is when individuals can change and start changing their behaviours towards a healthier lifestyle. Individuals thoroughly believe that behaviour change will positively impact their health; therefore, they tend to take action and bring changes to their behaviour in the next 30 days. The action is a stage, people have changed their behaviours within six months. They intend to maintain a healthier lifestyle by improving their problematic behaviours, and individuals may adopt healthy behaviour attitudes. Maintenance is the stage where individuals have maintained a healthy behaviour for more than six months or so and intend to keep this change in

behaviour in the future and put effort to avoid relapsing to previous stages. The termination is when the individuals intend to keep healthy behaviours with no desire to become involved in any unhealthy patterns again. At this level, individuals are confident about maintaining their behavioural change.

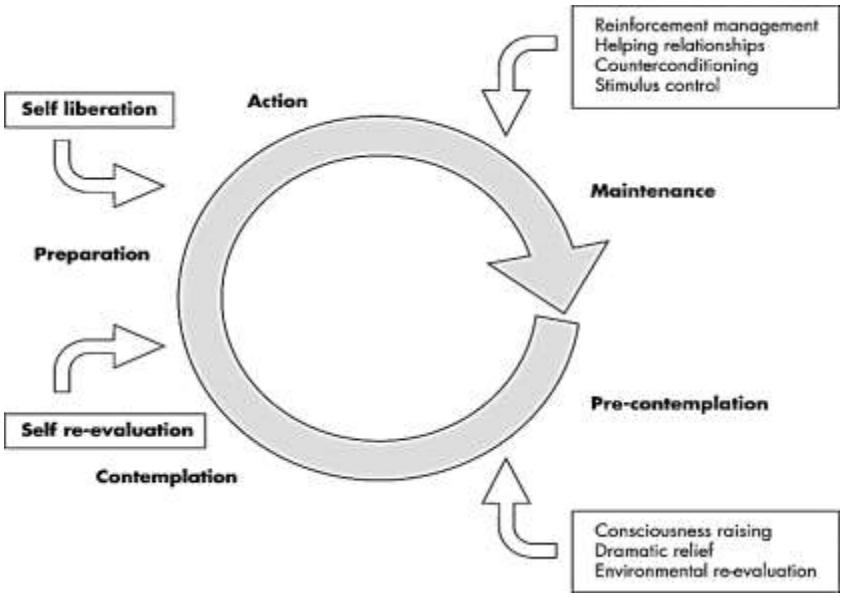

Figure 1: Transtheoretical Model by Prochaska and Velicer, (1997)

The cycle of behavioural change requires individuals to apply various processes of cognition and evaluation. Ten processes have been identified that support making and maintaining change. The first process is Consciousness, in which an individual's awareness is increased related to healthy behaviour. The second process is Dramatic Relief, which refers to negative and positive emotions towards healthy behaviours. The third process is Self-Reevaluation, in which social pressures take over the individual's unhealthy behaviours, and the effect of unhealthy behaviour is realised on others. Social liberation is the next step that reflects healthier behaviour change in individuals through supporting the social environment. The process of Self-Liberation is the belief that supports the commitment of an individual towards healthy behaviour as an attainable outcome. Helping Relationships are those relationships that support and encourage behaviour change within

the individuals. Counter Conditioning is the way of changing thoughts that develop healthy behaviours with thoughts that develop unhealthy behaviours. The process of Reinforcement Management rewards behaviours with healthier outcomes while reducing rewards that come with being unhealthy. Stimulus Control also refers to the reengineering process that keeps reminding and recalling the positive change instated within the behaviours by reducing unhealthy behaviours (Jenkins, 2003). The theoretical model by Prochaska and Velicer, (1997) supports the development of our research framework for the behavioural change of people by using moderators (mobile applications and wearable watches) to enhance their healthy lifestyle by influencing physical activities, diet, and medication management.

Another theory and model employed to accept Technology in daily life activities for obesity management and to improve people's attitudes is the model of Technology. In 1986, the *"Model for the Acceptance of Technology".* The basis of the TAM model is based on the acceptance of users towards information systems or technologies. Davis's first model has two specific beliefs influenced by external variables that motivate users' attitudes and behavioural intention in using new Technology. Both these beliefs include Perceived Usefulness (PU), i.e. "the potential user's subjective likelihood that the use of a certain system that improves his/her action" and the Distinguishably Easily Used (PEU), i.e., "the degree to which the potential user expects the target system to be effortless." The model was modified over the years by Davis along with various other researchers. However, the model developed by Lai (2016) included system features and capabilities in which the design and security are the stimuli, and that will serve the purpose of external variables in our research (Lai, 2017).

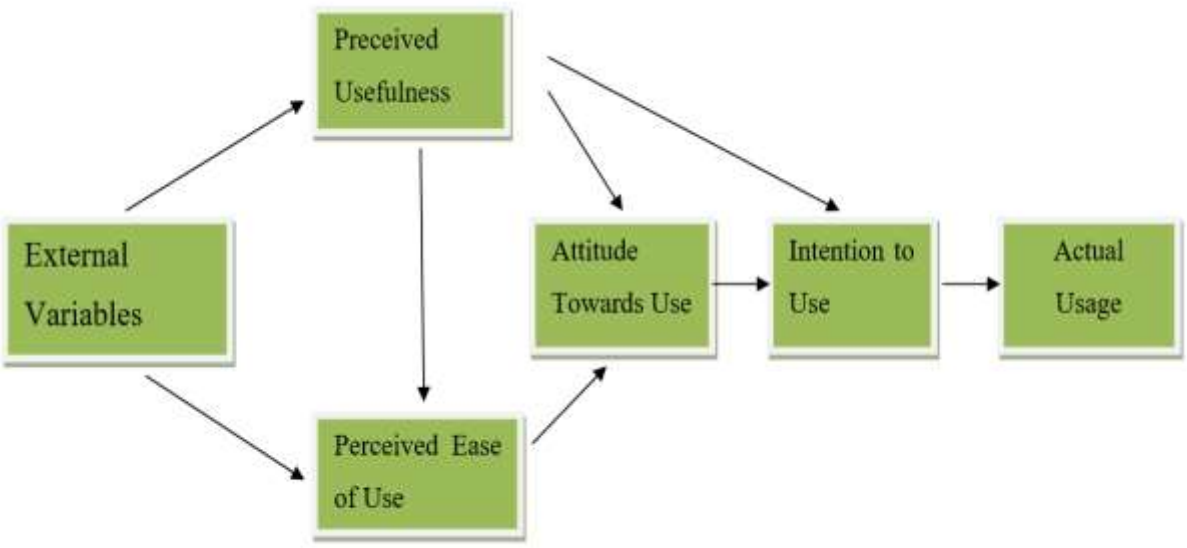

Figure 2: TAM Model Source: (Lai, 2017)

The model by Lai (2017) supports the development of our research framework with the influence of design and security will serve as external variables based on which health professionals and patients measure the perceived comfort when using the Technology and the perceived usefulness, thus influencing the intentions and attitudes towards actual usage of the health tech applications and wearable technologies. The "*adaptive Complex System"* is rising in the world of Technology has shown the high potential of MedTech in upgrading the standard of life of the patients. Modern Technology has already provided patients with wearable devices, special vehicles, and other technologies. These devices have improved self-management and monitoring of the patients remotely with proactive diagnostics and interventions. The origin of the adaptive systems started back in the 1980s at New Mexico think tank, "Santa Fe Institute." As per John Holland, the systematic and flexible system is "a dynamic network of agents acting in parallel, constantly reacting to what the other agents are doing, which in turn influences behaviour and the network as a whole." A systematic and flexible system is "the study of how relationships between components give rise to the collective behaviours of a system and how the system interacts and forms

relationships with its environment" (Clancy *et al.*, 2008). The healthcare system processes are becoming complicated, and the integration of new technologies within the healthcare system is one of the reasons behind the complexities. New applications for complex healthcare systems have made it necessary to analyse and understand the behaviour of new actions and the benefits and drawbacks of using complex simulations before implementing them (Clancy *et al.*, 2008).

2.9. Conceptual model of the study

The study's conceptual model was based on explaining the different variables of the study in which there were control variables, manipulated variables, dependent and independent variables. The figure showed the study's conceptual framework in which control variables were age, gender, occupation, and socioeconomic status. The dependent variables were the use of technology and wearable gadgets. The independent variables were obesity phenomenon, obesity management, education and knowledge, diet management, and physical exercises. The outcomes of these variables were better lifestyles that were the main objective of the study. The controlled variable (CV), which is the variable that remains constant over the research study, includes Age, Gender, occupation, social-economic status, and BMI. Independent variables (IV) refers to the manipulated variable which does not remain constant includes five variables referred to as obesity phenomenon, obesity management, education and knowledge of people, diet management, and physical exercise. Moderator variables referred to as MV include people's attitudes and behaviour, whereas mediating variables include MedV, including technology and wearable gadgets. Lastly, the dependent variable (DV), which refers to the variable which has been tested, is a better lifestyle, as shown in Figure 3 below.

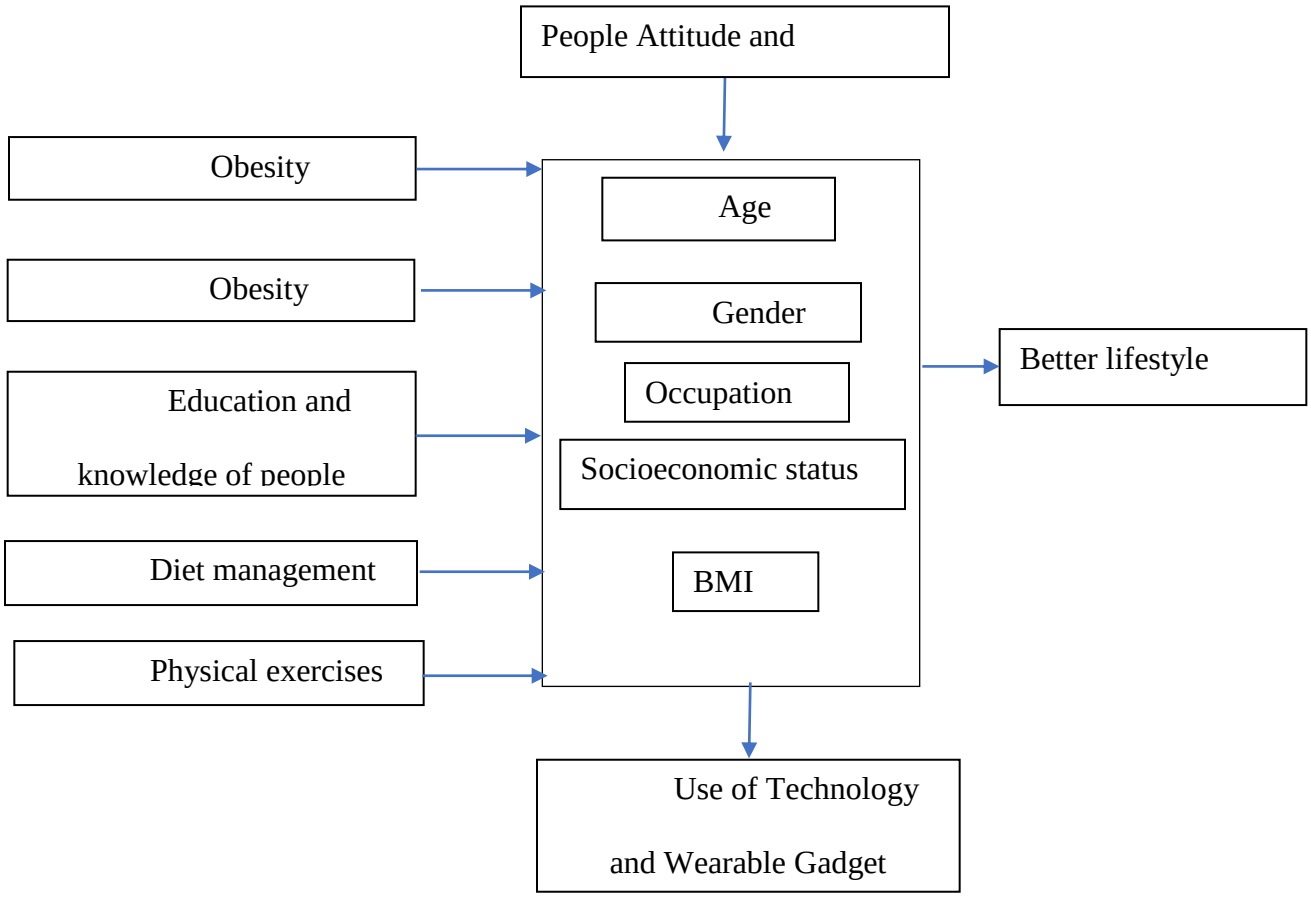

Figure 3: Conceptual framework

2.10. The rationale of the Proposed hypothesis

Previous studies suggest a rationale for formulating ten hypotheses proposed for the study, including the following.

- H1: There is a significant statistical relationship between the obesity phenomenon and a better lifestyle.
- H2: There is a significant statistical relationship between obesity management and a better lifestyle.

- H3: There is a significant statistical relationship between people's knowledge and a better lifestyle.
- H4: There is a significant statistical relationship between diet management and a better lifestyle.
- H5: There is a significant statistical relationship between physical exercise and a better lifestyle.
- H6: People's attitude partly arbitrates the relationship between the obesity phenomenon and a better lifestyle.
- H7: People's attitude partly arbitrates the relationship between obesity management and a better lifestyle.
- H8: People's attitude partly arbitrates the relationship between people's knowledge and a better lifestyle.
- H9: People's attitude partly arbitrates the relationship between diet management and a better lifestyle.
- H10: People's attitude partly arbitrates the relationship between physical exercise and a better lifestyle.
- H11: Use of Technology partly moderates the relationship between the obesity phenomenon and a better lifestyle.
- H12: The use of Technology partially moderates the relationship between obesity management and a better lifestyle.
- H13: The use of Technology partially moderates the relationship between people's knowledge and a better lifestyle.
- H14: The use of Technology partially moderates the relationship between diet management and a better lifestyle.

- H15: The use of Technology partially moderates the relationship between physical exercise and a better lifestyle.
- H16: There is a statistically significant effect of gender on obesity phenomena and diet management.
- H17: There is a statistically significant effect of age on people's knowledge, physical exercise, better lifestyle, people attitude, and use of Technology.
- H18: There is a statistically significant effect of education on obesity phenomena, people knowledge, diet management, better lifestyle, people attitude and use of Technology
- H19: There is a statistically significant effect of occupation on obesity management, people knowledge, physical exercise, better lifestyle, people attitude, and use of Technology
- H20: There is a statistically significant effect of income on obesity management and diet management
- H21: There is a statistically significant effect of BMI on obesity phenomena, people knowledge, diet management, better lifestyle, people attitude, and use of Technology.

2.11. Chapter Summary

This chapter provided comprehensive information about past empirical studies on the use of digital healthcare applications and wearable gadgets for obesity management. The people's behaviour, knowledge, and attitudes were analysed regarding the use of wearable gadgets to manage obesity. The chapter considered the comprehensive information and discussed relevant concepts and theories that supported the use of digital healthcare applications and wearable gadgets to manage obesity and achieve a better lifestyle through adequate obesity management strategies and sufficient knowledge. Furthermore, the literature emphasised the people's attitude towards healthcare applications and the use of technological and wearable gadgets to achieve a better lifestyle.

CHAPTER 3: Research Context

3.1. Introduction

Obesity is one of the leading problems among GCC countries, i.e. Kuwait, Bahrain, Oman, Qatar, UAE, and Saudi Arabia *(Hvidt, 2013).* The main purpose of this study is Attitude towards Wearable Gadgets and Mobile Health Applications for Obesity Management in GCC. The present chapter will provide comprehensive and detailed information about the research context of this study. Additionally, the factors causing obesity in GCC countries will be explained. Furthermore, a review of previous frameworks on obesity management using wearable technology and healthcare gadgets will be explored. The chapter will also include details about the model and the selected factors that explain the contexts of the present research study.

3.2. Overview of GCC countries

GCC countries include Kuwait, Bahrain, Qatar, UAE, Oman, and Saudi Arabia. The vision of GCC countries is to achieve development through economic gains. Therefore, as a result, these countries created gulf cooperation in 1981 (Weber *et al.,* 2017). It was observed that these countries had achieved transformation due to these shared visions. The per capita GDP of GCC countries is $33,225.8. It was reported that countries of GCC depend on the revenue generated from oil export that counts for about 40% of the whole world's oil reserves. In addition, most GCC countries depend on the economy generated from the oil sector and non-oil sectors. There has been high economic development in the countries of GCC in the past few years, resulting in changes in peoples lifestyles (AL-Nohair *et al.,* 2014).

The business of international food chains was found to be increased among the people living in GCC countries. This fact enhanced the problem of obesity among people. The study reported a higher intake of fast food and adopting a lifestyle with less exercise (Alhyas and Reilly, 2019).

The study highlighted the high prevalence of obesity among the people of GCC countries, and it was at the highest rate in the world. Additionally, it was also found that the people living in GCC countries are among the top ten obese nations. Another study documented that Kuwait was ranked highest amongst obese nations with a prevalence of about 42.8 % (Mabry *et al.*, 2010).

3.3. Prevalence of obesity in GCC countries

As mentioned above, there are many people with obesity issues in GCC countries, particularly Kuwait. Figure 1 shows the prevalence rate of obesity among the people of GCC countries. It was observed that the problem of obesity is not only specific for the specific age group or gender, but it was a common issue for the male, female, and the children. The data in figure 1 shows the prevalence of obesity among the people in GCC countries. According to the data of Kuwait, the obesity prevalence among males was 36 %, and females were 48%. On the other hand, the prevalence of obesity among the male population of Saudi Arabia was 24 % and among the female population was 44 % (Rabeea *et al.*, 2019).

The study further demonstrated that the prevalence of obesity among the male and female population of UAE was 25 and 42 %. In addition, the obesity rate among the male and female population of Bahrain was 21 and 38 %. In Qatar, the male population reported an obesity rate of 19 %, whereas the female population reported32 %. In Oman, the obesity prevalence rate among the male population was 8 % and among the female population was 17 %. These statistics reveal an alarming situation for the people living in GCC countries, particularly Kuwait. (Moradi-Lakeh *et al.*, 2017).

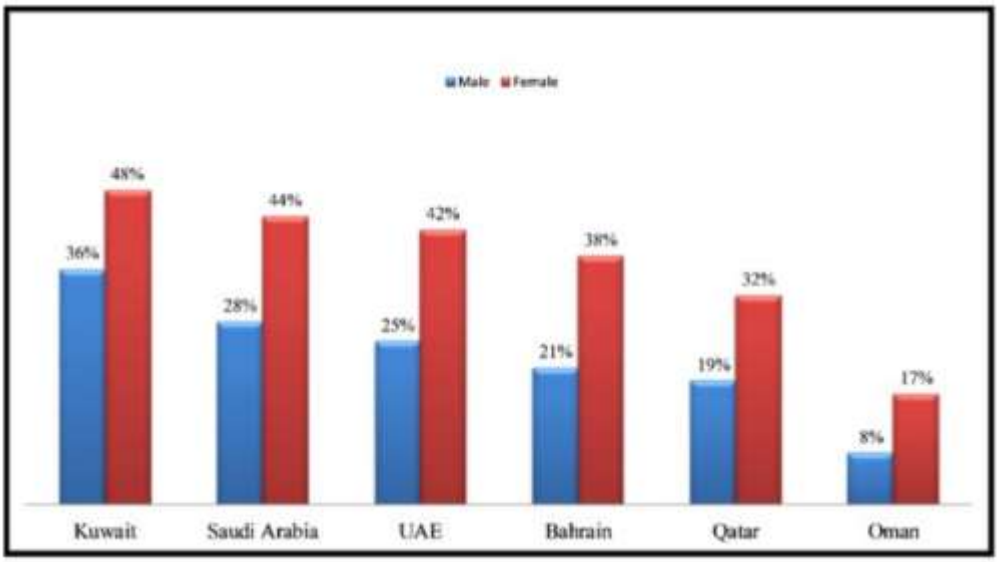

Figure 4: Prevalence of obesity in GCC countries

(Source: Moradi-Lake et al., 2017)

3.4. Factors causing obesity issues among people of GCC countries

One study noticed that the high rate of obesity among GCC countries was due to different factors such as social-economic and biological factors. On the other hand, it was reported that the main reason for the enhancement of obesity prevalence was the socioeconomic condition in the gulf region (Nahhas *et al.*, 2018). Most of the occupations in the gulf region do not require physical efforts that increase laziness and practice less exercise by the people. For instance, the study found that the people of Saudi Arabia ranked third in the Arab world in which most of the people do not practice exercise and ranked first in laziness (ALNohair, 2014). According to the data, Kuwait is ranked seventh for laziness among the people in the world. One of the studies stated that the highest rate of obesity among the Kuwaiti population was more meat consumption. The statistics showed that the Kuwaiti population was the second-largest meat consumer, with 119 kilograms per capita per year (Ram, 2014).

Furthermore, the gulf people mostly consume food such as rice, meat, and sweetened products. Their unhealthy food eating habits increase the issue of obesity among them. It was also observed that the weather conditions could contribute to the lack of physical exercise among the people living in GCC countries. Mostly, the weather of GCC countries is hot that restricts the people to carry out physical activities, particularly during the summertime. Psychological issues, including depression and stress, also played an important role in increasing obesity (Abdul-Rasoul, 2012). It was estimated that the prevalence of depression among the people of Kuwait was 20 %. However, the prevalence of depression issues among the people of UAE was 30 %. It was observed that western culture negatively influences the food eating habits of the people living in GCC countries. among these countries, a high rate of obesity was found among the Kuwaiti population that enhances the risk of chronic diseases for those people. People's lifestyle has changed significantly due to the adoption of modern lifestyle and fast transportation system that affects the prevalence of obesity (Rabeea *et al.,* 2019).

3.5. Health-related technology and its applications

There are a lot of health-related technologies introduced in recent years, such as wearable gadgets used to increase the healthy lifestyle of people. The role of healthcare technologies is considered significant in adopting healthier eating habits, physical activities, health follow-up, and usage of medicines. Healthcare technology is defined as the techniques used to improve the processes of the healthcare system. The significance of healthcare technologies is related to improving the diagnosis, treatment, and management of patients. The study presented the information that mobile health applications can change behaviour by targeting weight management. The behaviour will be improved related to the self-monitoring, tracking of dietary intake, physical exercise, and activity of reminders. Additionally, mobile health application enables appropriate communication due to

integrating the components related to testing and tracking technology. These create powerful tools that also assist health care professionals and patients achieve their goals and modify their lifestyles (Rabeea *et al.,* 2019).

The use of the mobile a can be combined with traditional-based treatment such as face-to-face counselling to enhance the efficacy of the treatment methods. Mobile health can be used to improve health by the patients because it is one of the cost-effective methods that patients can use to modify their behaviour and lifestyle. Furthermore, it was noticed that mobile health was effective for the weight management of the population screened with different medical issues (Azar *et al.,* 2013). Weight management can be possible by improvement of eating behaviour due to enhancing adherence to the recommended treatment methods. These healthcare technologies can be used for self-monitoring purposes that allow the patients to record their food intake. In addition, the patient can monitor the fats consumption in grams and calorie intake along with the increase of medication adherence to achieve a better lifestyle (Anderson *et al.,* 2012).

Patients can set the goals to integrate healthy interventions through consultation and strengthen usage of health tech applications. It was found that the use of wearable gadgets and health tech applications increased social competition along with tangible and intangible rewards. These applications were found useful due to their simplicity and reduce cost. Some factors impacted positively for the patients and healthcare professionals to use wearable gadgets and health tech applications. These factors include real-time diagnosis, counselling, monitoring, and management. There were some barriers identified in the research studies related to the use of wearable gadgets and health tech applications, including socioeconomic factors, less customization, less real-time feedback, less self-empowerment, lack of technological infrastructure, less knowledge and awareness, and privacy issues (Allen *et al.,* 2014). The study presented the advantages of surgery

for weight loss, but it was also suggested that this must be the last option for patients with obesity issues. Overall, the mobile as was found useful for the assistance of patients and healthcare professionals to perform the significant task. These tasks include information management, time management maintenance of health records, consultation references, decision making, training, and medical education. This health enhances patients' experience and provides them with more satisfaction in a short time (Allen *et al.,* 2014).

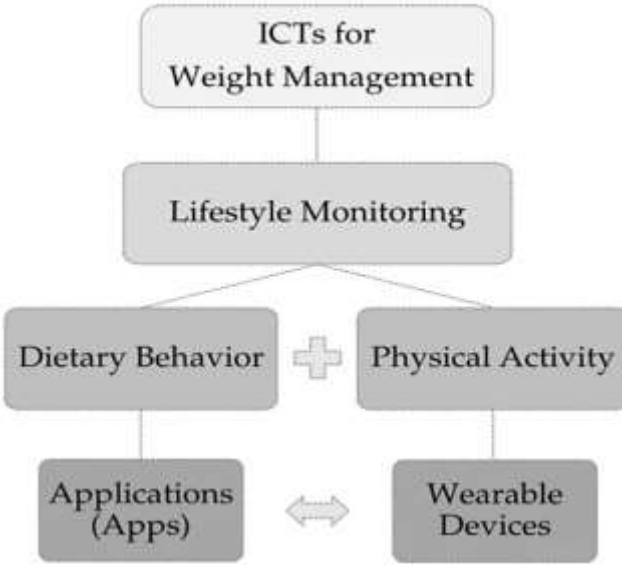

Figure 5: *Role of information and communication technology in weight management.*

(Source: Allen et al., 2014)

3.6. Healthcare Technologies acceptance in GCC

In GCC countries, people use health care technologies to maintain obesity issues, leading them to get involved in chronic diseases. The study showed that people in GCC countries use mobile health applications to receive health care services (Street *et al.,* 2013). Wearable gadgets were also found as emerging technology used by people due to higher performance, facilitating conditions, and less effort. It was observed that the reason for higher acceptance of the people related to the health care technologies was due to the more use of smartphones by the people of GCC countries. According

to the statistics, there are more the 174 million users of smartphones in the middle east region. People use to access the internet by the heavy use of smartphones. Figure 3 presents information about the user of the internet in Kuwait (Kaposi, 2014). The ratio of smartphone users among the people of Kuwait was also found high (figure 7).

It was observed that there were about 7.1 million mobile phone subscribers in Kuwait. The study showed that about 99.5 % of the people in Kuwait use smartphones. The healthcare-related applications can be downloaded from the play store that provides several advantages in daily life. There were important benefits of using the wearable gadgets found that include maintaining fitness management of health acquiring knowledge and other benefits related to tourism and transportation (Martinez-Pérez *et al.,* 2013). On the other hand, it was also observed that the people in GCC countries, particularly in Kuwait, were not regular or efficient users of health care technologies and wearable gadgets as policies related to the integration of health care technology into the mainstream healthcare system is still not mature. The fewer policies were also due to security concerns. Therefore, the government should take the necessary actions related to making the policies for upgrading healthcare technologies to integrate patients and healthcare professionals (Banos *et al.*, 2014). The Kuwaiti governments introduced some policies called the *"National program for healthy living"* to enhance adopting a healthy lifestyle. There were some barriers and challenges identified among the people of Kuwait that increased the issues of obesity due to the lack of implementation of obesity prevention and counselling programs on obesity-related illness. Thus, the lack of decision-making of patients increased the issues of obesity for the people living in GCC countries (Alaslawi *et al.,* 2019).

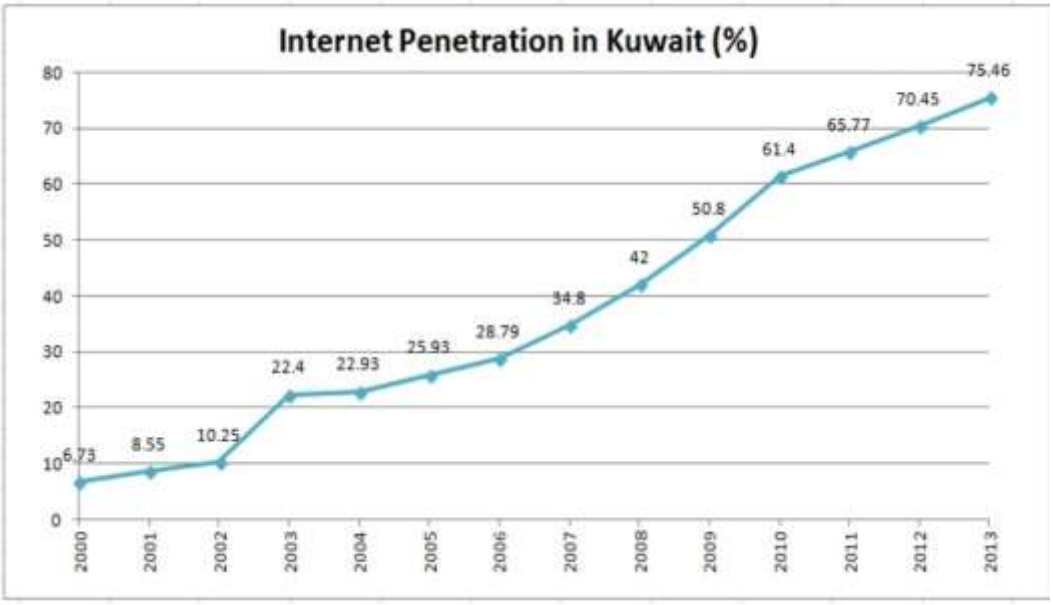

Figure 6: Internet penetration in Kuwait.

(Source: Kaposi, 2014)

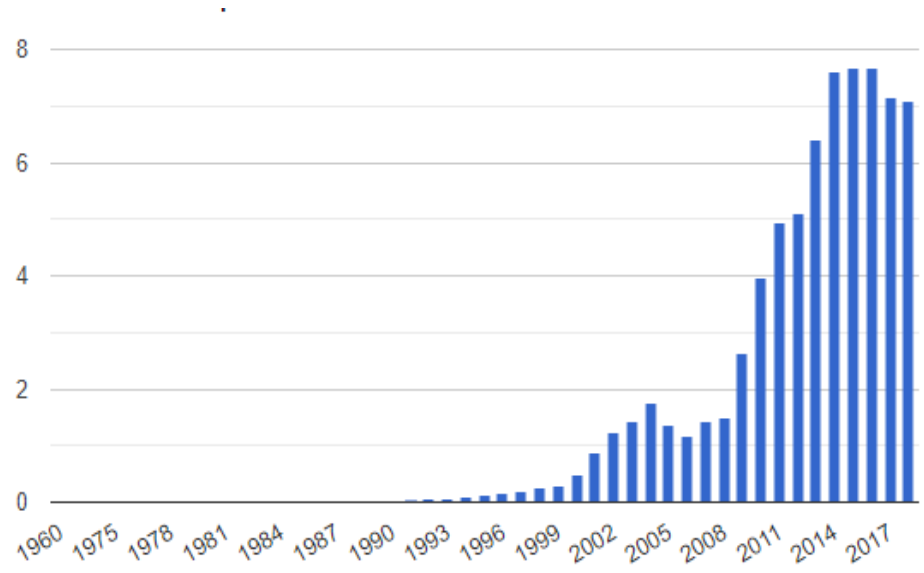

Figure 7: Smartphones user in Kuwait. (*Source: Sulaiman and Dashti, 2018)*

3.7. Frameworks related to obesity management in the literature

There are different frameworks used in the previous studies related to obesity management. These were based on the models and theories to modify the behaviours to enhance the lifestyle to

manage weight. It was observed that the transtheoretical model of change was based on the different steps involved to manage the behaviours and upgrade the lifestyle of people (Figure 5). This model explained the factors based on intentional changes adopted by the people. It was based on six stages that showed the systematic behaviour change process (Mastellos *et al.,* 2014). The change in the behaviour occurred with time, particularly the changes related to health and lifestyle. In another study, the researcher proposed the TAM model and provided the information that the two specific beliefs affected by the external variables enhance the motivation and positive attitude among the people regarding the use of new technology (figure 6) (Jeon and Park, 2015).

These beliefs comprised of perceived usefulness and perceived ease of use. The perceived usefulness is associated with the individuals' perceptions that certain systems will enhance his or her actions. On the other hand, the perceived ease of use was referred to as the extent to which the potential use expects the target to be effortless. This model supports our research framework in which the patients and healthcare professionals perceived convenience in the use of technology along with the usefulness. Thus, the factors involved in the model impacted the intentions and attitude of the people towards the use of variable technologies and healthcare applications. The framework provided by the theory of adapted complex systems presented the high potential of integrating the technologies to enhance a patient's life (Noh *et al.,* 2012).

The model supported the statement that the use of variable devices improved the self-management and monitoring of patients remotely by using the process of proactive diagnostic and interventions. The theory of an adapted complex system was documented as a flexible and systemic process that constitutes a network of agents that influence people's behaviour and the other agents involved in the network. It was also explained as the study that how the relationship between the different factors in the network leads towards the generation of the behaviour in the system. The *"Theory of*

planned behaviour (TPB)" stated that the ability of the individuals to control their behaviour and attitudes served as a motivation for them to manage their weight and increase the ability to deal with obesity issues (Rhoades *et al.,* 2011). The study demonstrated that TPB is a psychological-based theory that combines the perception and beliefs of an individual with their behaviours. There were three main components of a theory that significantly modified the individual's behavioural intentions. These components include subjective norms, perception of behaviour control, and attitude. For instance, the theory further supported the idea that healthy behaviour such as regular exercise is associated with the capability and strength to change his behaviour and modify his lifestyle. It was also noticed that TPB theory and the proposed interventions effectively reduced weight among people with weight issues and obesity (Chevance *et al.,* 2017).

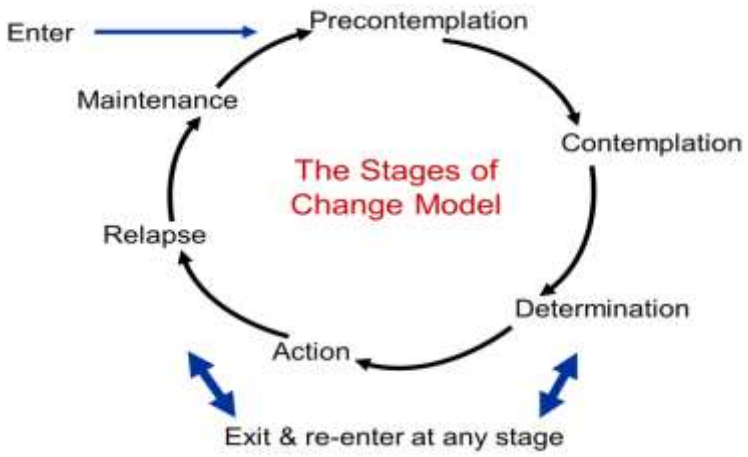

Figure 8: The transtheoretical model of change

(Source: Mastellos et al., 2014)

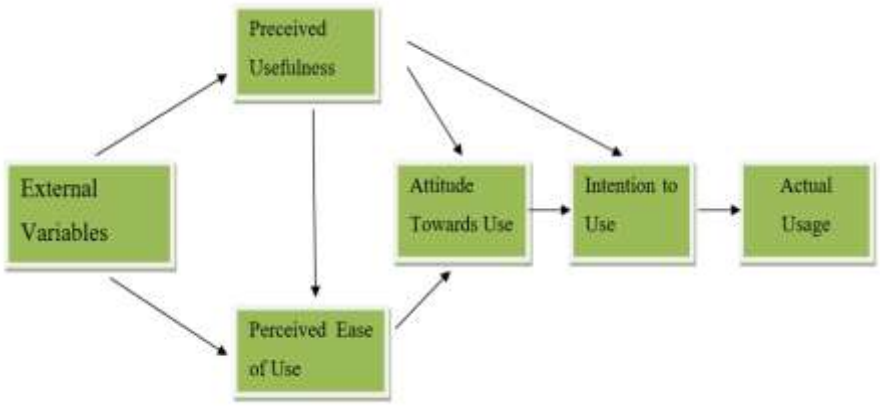

Figure 9 Technology acceptance model.

(Source: Rhoades *et al.*, 2011)

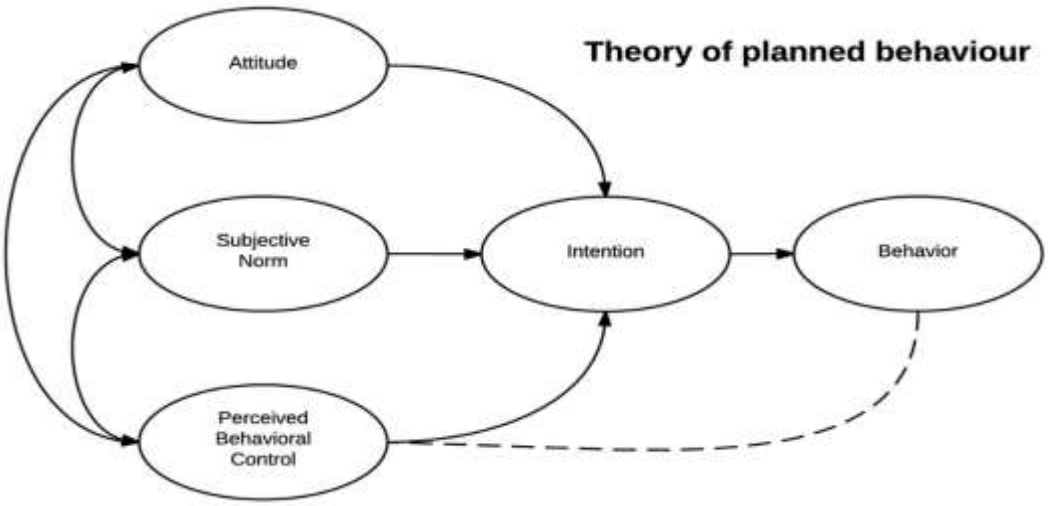

Figure 10: Theory of planned behaviour

(Source: Chevance et al., 2017)

3.8. Proposed framework of the present study

The models and theories proposed in the previous research studies lead toward formulating a new framework used in the present study to explore the impacts of using healthcare technologies and wearable gadgets for obesity management in the Kuwaiti population. The proposed framework of this study is presented in figure 11. This conceptual model is based on the different models and theories proposed in the previous studies that explained the different factors and their impact on

the causes of obesity and its management. Technology and wearable gadgets were among the factors used to manage obesity in the affected people.

The present study analyzed the different variables and how they are interrelated to upgrade people's lifestyles. That was the final objective of this study. The studied variable includes dependent, independent, manipulated, and control variables. According to the proposed framework of the present study, the list of independent variables was obesity phenomenon, obesity management, education and knowledge of people, diet management, and physical exercise. The manipulated variables in the study were people's attitudes and behaviours. The dependent variables of the present study were the better lifestyle, and the moderating variable was the use of technology and wearable gadgets.

Furthermore, the control variables include age, gender, occupation, income, and BMI. Finally, these variables were studied in interaction to explore the effect of one variable on others to achieve a better lifestyle. The controlled variable referred to as CV includes Age, Gender, occupation, social-economic status, and BMI. Independent variables referred to as IV includes five variables which are obesity phenomenon, obesity management, education and knowledge of people, diet management, and physical exercise. Moderator variables referred to as MV include people attitudes and behaviour, whereas mediating variables referred to as MedV include technology and wearable gadgets. Lastly, the dependent variable referred to as DV is a better lifestyle.

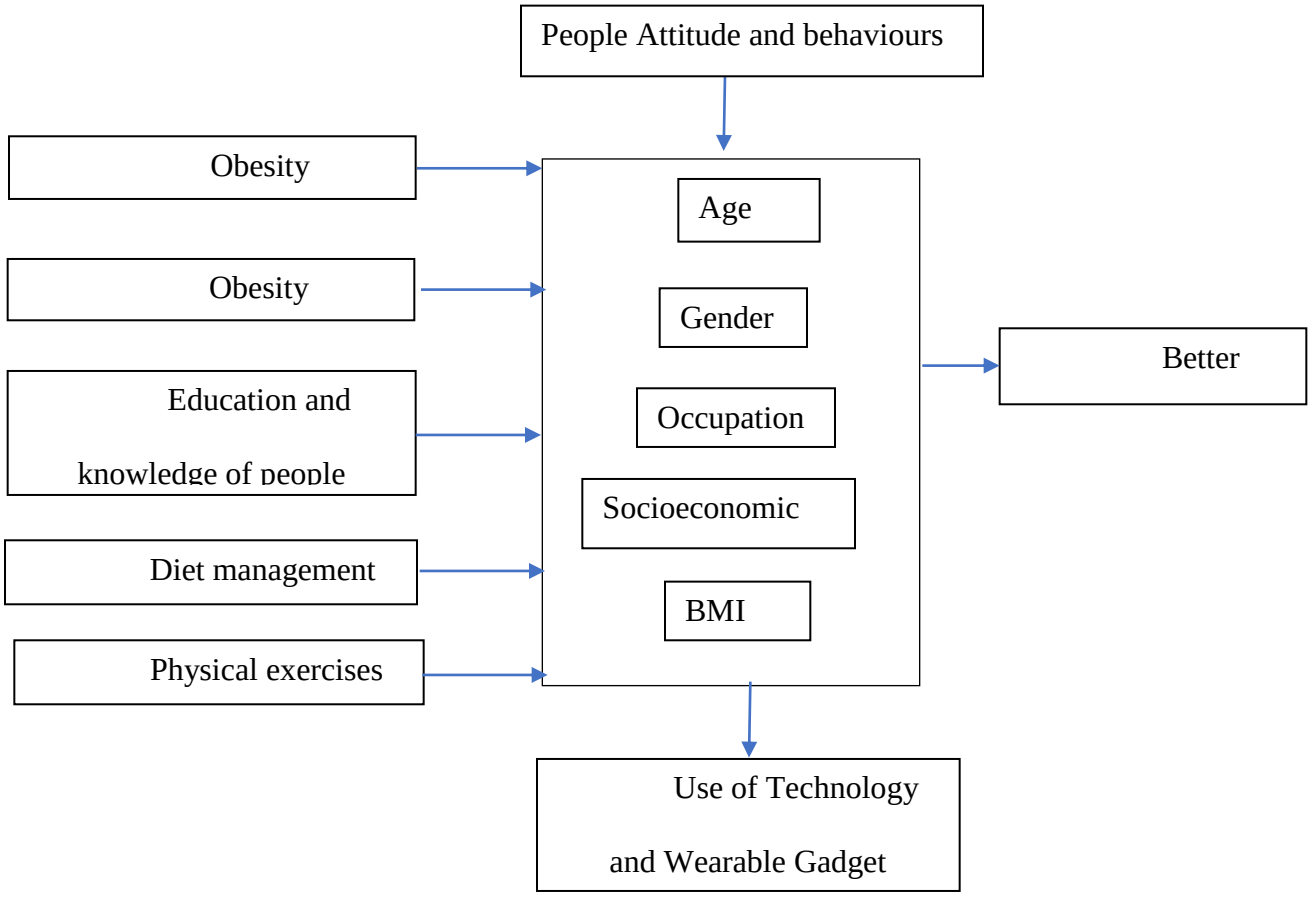

Figure 11: The proposed framework of this study.

3.9. Chapter Summary

The information in this chapter provided the details related to the research context of the present study. It was stated that the present research study was focused on the issue of obesity among the people of GCC countries, particularly the Kuwaiti population. The detailed research on this topic showed that obesity has a high prevalence rate among the people living in GCC countries. This can be due to the sedentary lifestyle of the people, which increases laziness, abnormal eating habits, and lack of physical exercise. The use of wearable gadgets and healthcare technologies such as

mobile health-related has affected the management of obesity among people. People nowadays know using these healthcare technologies for reducing prevention and management of obesity issues. However, fewer policies related to the implementation of mobile healthcare applications in the GCC countries resulted in the lack of knowledge and awareness among the people living in Kuwait or other GCC countries. It was observed that the people's attitudes and behaviour were positive about using wearable gadgets and healthcare technologies to achieve a better lifestyle. Different theories were proposed in the previous studies that led to the development of a new framework suggested in the present study.

CHAPTER 4: Research Methodology

4.1. Introduction

This chapter provided information about the research methodology used to achieve the study objectives. It was based on the strategies adopted by the researcher to conduct this research study. This chapter will explain the research approach, philosophy, design, data collection methods, and analysis. The summary will be presented at the end that provides a picture of the whole methodology used in the study.

4.2. Theoretical Objectives

This study follows a pragmatic research model. The pragmatic model for the study is based upon Mead, Pierce, Dewey, and James (Cherryholmes, 1992) that utilises both positivism and phenomenologist. Positivism conceives in itself the fact that social reality and human perception are independent entities (May 1999). On the contrary, from the phenomenological perspective, insight is gained on human behaviour through the participant's frame of reference and experiences. A positivist perspective is usually concerned with quantification based upon the variable of interest; from a positivist perspective, the research quality is measured in terms of reliability and validity and the rigorousness of quantitative analysis. On the other hand, the phenomenological approach assumes that behaviours and attitudes are motivated and affected by the social settings; thus, the behaviours and attitudes are "socially constructed," emphasising the researcher to see insights, understand, explore and explain a phenomenon a particular and localised setting.

Contrary to the phenomenological perspective, this study uses pragmatism based on the deconstructive paradigm, suggesting a mixed research method. It is best to use a multi-method approach to address the hypothesis leading to knowledge construction and understanding the diverse representation of pragmatism. Pragmatism aims to give more practical solutions for the

age-old problems which people have experienced. The approach believes that the results of scientific research require both analysis and reflection (Giacobbi *et al.,* 2005)

The research used a mixed-method instead of taking only one research method. The rationale for selecting the approach was that a diverse range of data could be gathered using these methods. Additionally, the procedure is considered beneficial in understanding the contradictions between the results obtained from qualitative and quantitative data findings. In the present study, the mixed-method approach provided the strengths that restrict the weaknesses of both qualitative and quantitative data sets. The strength of each method covers the weakness of other procedures, and extensive data can be collected by using both perspectives. Mixed-method approaches were employed to collect the data from the participants. The researcher believes that using both research methods will complement each other and better understand the hypothesis. According to Giacobbi *et al.*, (2005), research methods are *"procedures, tools, or strategies of researching while methodology refers to larger issues in the research process such as why particular methods are chosen*" The following chapters provide guidelines for research design.

4.3. Research Design

The research design is defined as *"A systematic and unbiased way of solving a problem (by answering questions or supporting hypotheses) through generating verifiable data".* The research design is an overall strategy that guides the researcher in gathering and analysing the data. There were both deductive and inductive approaches used in the study. The inductive approach was employed to come up with the building of a new theory from the findings. Ion the other hand, the deductive approach was also employed that was used to determine if the theory was based on fact and truth. Therefore, both inductive and deductive reasoning was used in the present study. In this present study, the relationship between obesity management, obesity phenomenon, peoples'

knowledge, use of healthcare applications, and consumers' attitude towards healthcare applications has been hypothesised in the light of the literature review.

The primary objective is to find the effects of obesity phenomena, obesity management, and peoples' knowledge on having a better lifestyle. Creswell (2003) mentioned using qualitative, quantitative, and mixed-method of research while planning the research. The quantitative method caters to the logical aspects of the examination, while the qualitative deals more with the research's textual basis. A mixed-method of research takes into account both methods. It manifests itself in the instrument used to collect data and later in the research data analysis and interpretation stages. This study has used a mixed methodology (QUAN + QUAL) to test the hypothesis and establish the connection between the independent and dependent variables. People's knowledge and attitude towards health as for obesity management and better lifestyle would be assessed, and in-depth interviews of their accounts of using health as and obesity phenomena will also be recorded. (Giacobbi *et al.,* 2005) The rationale for using quantitative methodology here is to obtain factual data on the phenomenon under consideration.

While the qualitative aspect of the methodology chosen here to get an in-depth insight into the phenomenon of obesity prevalence in Kuwait, along with the way people use health and health tech and the raw experiences, based upon the hypothesised research model explained in Figure 4, the interviews of respondents using healthcare applications and wearable gadgets would be interviewed using a structural approach to interviews. Following the interviews, quantitative research will be conducted where primary data will be gathered using a survey to justify the given qualitative analysis model. This figure shows the holistic picture of the research design being selected by the researcher.

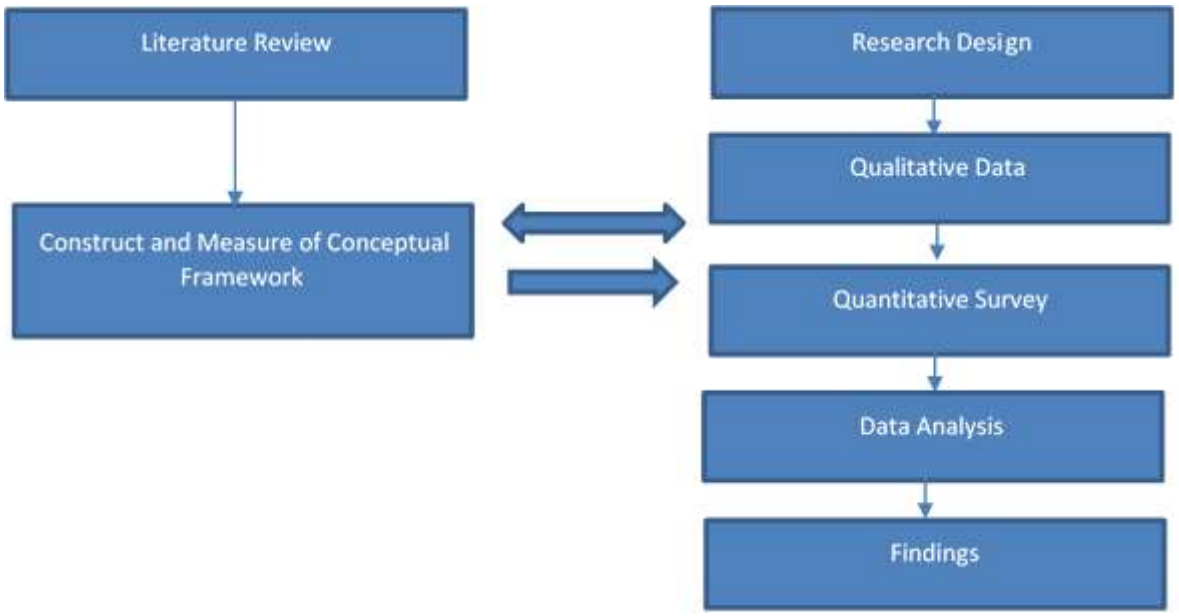

Figure 12: Research Design (Self-generated)

4.4. Qualitative approach used in the study

In the present research study, the qualitative research approach was employed. The purpose of selecting this approach was to understand obesity and people's attitude towards healthcare technology. There was an association between the attributes to explain the association between healthcare technology and its role in obesity and achieving a better lifestyle. The qualitative study comprises semi-structural interviews, which provide standardised insight on the topic of interest and results in the emergence of a new topic critical to the broad problem area. The topic of interest was the obesity phenomenon in Kuwait, obesity management strategies being used by the patients, people's knowledge of healthcare technology, people's attitude towards healthcare technology, the use of healthcare technology, and whether all these attributes predict a better lifestyle.

4.4.1. Qualitative sample

The data has been gathered from Kuwait citizens older than 18 years of age and suffering from obesity. Furthermore, the sample includes people who have been using a health and over the last six months. The interview sample participants do not include expatriates, have normal BMI, and

do not want to participate in the study. All the interviewees were obese individuals with a BMI higher than 30. The study caters to a sample size of n=25 that was selected until the data obtained showed saturation.

i. Inclusion Criteria

- Citizens of Kuwait.
- Older than 18 and capable of permitting to conduct this research.
- People who are overweight and obese with a BMI > 30.
- People who have been using healthcare applications and wearable gadgets.

ii. Exclusion criteria

- Tourists who were visiting Kuwait.
- People who did not consent to the study.
- Expatriates living in Kuwait.
- People who have developed sewer medical conditions caused by obesity.
- People who have never used healthcare applications of wearable gadgets in their smartphones.
- People who have a BMI < 30.

4.4.2. Collection of Qualitative Data

Qualitative data was gathered using interview guides adapted from the qualitative aspects of the questionnaire mentioned in appendix A. The interviews were conducted face-to-face. A recorder was used to record audio of the interview to be utilised later besides other qualitative studies conducted that utilised a similar sample size which provides information of a considerably small sample (Almarri and Bhatti, 2015; Gowin *et al.*, 2015; Kernera and Goodyear, Kerver and Quennerstedt (2017); Pieniak *et al.*, 2016). Semi-structural interviews are considered helpful in getting information regarding the participant's experience. Qualitative data was collected by gathering primary data through semi-structural interviews for an in-depth understanding of

healthcare's role in achieving a better lifestyle by making good dietary changes and physical activity to contain obesity.

4.4.3 Observation data collection

The research study also included the observation method on users' health and found that more frequent runners in Kuwait's park had one or more fitness bands. These observations further guided the development of the qualitative questionnaire.

4.4.4 Semi Structural Interviews

Semi-structural interviews have been developed to investigate the research objectives, which require a conversation with one respondent using a blend of close and open-ended questions often accompanied by why and how questions (Adams, 2015). Each interview introduces the respondents to the researcher's background, research objectives, and research ethics issues. Interviews were conducted in a meeting room where both interviewer and interview will sit face-to-face, so the interviews can encourage verbal and nonverbal language to elaborate the research plan further. The interview time was approximately 15±4 minutes long to minimise fatigue for both interviewer and respondents.

A detailed interview guide was developed to guide the process of qualitative data collection. The interview guide was adapted by keeping in mind the qualitative aspects of the interview presented in Appendix - A. The interview guide was divided into four sections to smooth-line the process of qualitative data. The guide had open-ended questions to get a more far-reaching and overall picture of the respondents' experiences without limiting their responses. In the first section, section A recorded the demographics of the respondents. Section B has questions that aim to record the experiences regarding the obesity phenomenon and obesity management among the respondents. The purpose of these sections was to gain insights into the obesity phenomenon and its contributing

factors. Section C has questions to obtain the data on people's experiences regarding health techs like smartwatches and health applications. This section aimed to illuminate the way people perceive health and their experiences while using them. This section was also supposed to shed light on the motivating factors behind using these devices and. Section D included the questions to depict the life satisfaction the respondents were experiencing regarding the use of health tech and as.

4.4.5 Recruitment of Participants

According to Bolderston (2012), the interview can be categorised into different types, including face-to-face interviews, group interviews, telephonic interviews, and email or internet interviews. The author used face-to-face interviews to probe and clarify issues related to the obesity phenomenon in Kuwait, obesity management techniques, and the use of healthcare applications and wearable gadgets. Interview respondents were selected randomly in "Al Shaheed Park" and "Salmiya Park" using any healthcare tech, including fitness trackers, smartwatches, and body devices. The recruitment drive was planned where the researcher was carrying a consent form that promised confidentiality to respondents. Respondents were motivated to participate in the Survey in return for a gift voucher of KWD 10, which was redeemable at "yougotagift.com." Using this approach demonstrated that researchers value their time and information, resulting in high engagement between interviewees and participants, resulting in a sense of obligation and commitment towards the research outcomes. The study participants were informed of the researcher's clear goals to increase the participants' willingness and achieve a higher response rate. The interview settings for the face-to-face interview were a park where the researcher has shortlisted a private space with minimal background noise distraction. The interview's total time was between 20-30 minutes to avoid fatigue and inattention, impacting the data quality.

4.4.6 Procedure for Qualitative Data Analysis

The data obtained from interviews was analysed by doing a thematic analysis of the interview content. Thematic analysis was done to identify, organise, gain valuable insights and illuminate meaning patterns across the whole dataset. The thematic analysis enables a researcher to make sense of the data via assigning meanings to the experiences. Thus, thematic analysis was done to find the common patterns and occurrences among a dataset. Thematic analysis is done in 6 phases. The first phase involves familiarisation with the data, which is done via the data's initial transcription. The transcription was done during the interview period and for three months after the interview period. Transcribing provided an understanding of the interview and gave a partial understanding of the underlying experiences as well. The second step involves the creation of codes and categories among these transcribed interviews. Similar codes are grouped into common categories, scrutinised to search for common themes in the third phase. The fourth phase involves a review of these themes, after which the themes are defined and named. Then in the sixth phase, conclusions are drawn from the themes in light of the researcher's positioning. A final report is then drafted in which the researcher explains her findings.

4.4.7 Validity

The accuracy of the information in alignment with the reality concluded the internal validity of the research. Therefore, reliance upon the coding of a single interview creates a problem in assessing the research's internal validity. On the other hand, external validity concerns itself with the generalizability of the findings of a study infer to a larger population (Lee, 1998).

4.5. Quantitative Approach

Unlike qualitative research methods, quantitative research methods are more likely to follow an analytical procedure where an appropriate measurement method is used to analyze the relationship

between such measurements. The quantitative survey methodology was selected to test the hypothesis of the research model, which was developed from the qualitative surveys. According to Showkat and Parveen (2017) survey is a well-organized activity that enables the researcher to gather information directly from the people. This study uses a sample survey as obese people with inclusion criteria constitute a large population. In addition, the present study used a cross-sectional survey as data that was recorded only once to achieve research outcomes (Showkat and Parveen, 2017). The measured variables were established based on the study objectives, which determined the dependent, control, and independent variables.

4.5.1 Data Sample

The sample size was calculated using Kuwait's obese population as the target population for the quantitative part. Kuwait's current population is 4.137 million (Government of Kuwait, 2015). The current population of Kuwait's obese people is 41% (Al-Kandari, 2006). 41% of 4.137 million yields 1696170; using it as a base, the sample size was estimated using OpenEpi to be n=387.

Sample Size (n) for a various confidence interval

Confidence Interval	Sample Size
95%	379
80%	162
90%	267
97%	465
99%	654
99.9%	1067
99.99%	1492

Table 1: Sample Size of Survey (self-generated)

$$\text{Sample size} = [DEFE * Np\ (1-p)]/[\ d^2/\ Z^2_{1-\emptyset/_2}{}^{*}(N-1) + p * (1-P)$$

Equation 1: Sample Size Calculations

In this study, the cluster sampling method was used to divide Kuwait into clusters, and then participants would be conveniently selected. Kuwait was divided into six geographic divisions as Kuwait has six governorates: Capital, Hawalli, Farwaniyah, Ahmedi, Jahra, and Mubarak Al-Kabeer. The geographical sampling technique was used since all the governorates have different population densities. This technique aimed to gather responses from each neighbourhood to ensure a representative data set to achieve unbiasedness. Out of 387 participants selected for this research study, 59% were males, and 31% were females. The participants were selected in proportion to their respective governorate population. Out of 387 participants, 53 were selected Al-Asimah, 81 from Al-Hawalli, 91 from Farwaniyah, 23 from Mubarak Al-Kabeer, 89 from Ahmedi, and 50 participants were selected from Jahra.

i. Inclusion Criteria

- Citizens of Kuwait.
- Older than 18 and capable of permitting to conduct this research.
- People with a BMI >30.
- People who have been through bariatric surgery.
- People who have been managing their obesity in the gym, diet centres, and clinics.

ii. Exclusion criteria

- Tourists who were visiting Kuwait.
- People who did not consent to the study.
- Expatriates living in Kuwait.
- People with a BMI <30.

4.5.2 Designing the Survey

4.5.2.1 Different Types of the Survey

Data primarily in surveys or questionnaires can be gathered using several methods, including observation, postal surveys, personal interviews, electronic surveys, and telephonic interviews. Observation is a systematic and purposeful way to uncover a phenomenon using sensory abilities such as watching and listening (McGrath *et al.*, 2018). Telephonic interview is another method for gathering primary data, which is a cheap alternative to a personal interview and is reliable in concealing the participant's identity. The postal Survey is another method that is less expensive and offers substantial advantages in the anonymity of participants. Lastly, another essential tool for gathering primary data is an electronic survey, enabling the researcher to collect large-scale data.

The technology in the form of Survey Wiz, Google docs, QUIS, Factor Wiz, Zoomerang, Survey Pro, Survey Said, and Web Surveyor, and Survey Monkey provides an inexpensive mechanism for gathering data online from a vast number of respondents, unlike postal mail. The electronic Survey offers significant advantages in speedy distribution and response cycles as it allows automatic verification. In contrast, the survey response is automatically captured in the database while eliminating manual reconstruction of data. Andrews *et al.,* (2003) state that a survey is an imperfect vehicle for gathering information that requires participants to remember their past behaviour acquired from observation. The electronic Survey is organized into two categories, which include emails, surveys, and web-based surveys. Each of these methods offers numerous advantages. For example, an email survey enables the researcher to communicate directly with the respondents, unlike web-based surveys, which do not allow the researcher to communicate directly. On the contrary, a web-based survey offers an advantage where the response is automatically processed

in a database that can be easily analyzed without any administration and manual data transition into the analysis software package. The following table shows the rationale of the researcher's decision to use a web-based electronic survey and offline surveys where individuals were reached directly to achieve from parks and gymnasium.

In this present study, questionnaire data has been gathered using both offline and electronic surveys, where web-based techniques have been utilized by the researcher using Google Forms. The rationale to use both offline and web-based electronic Surveys was used due to the cost-effectiveness of the data collection and sped up the data collection process from n=387 respondents. The questionnaire link to Google drive was shared by respondents using Google forms. The rationale for using Google forms was that it was convenient, and since the sample size was large, it was only feasible to use a cost-effective and time-saving way. Another rationale behind the researcher's decision to use offline and a web-based survey was flexibility, as offline surveys enabled the researcher to cater to the dynamics of graphical sophistication where the researcher can quickly gather data from the different population clusters.

Key Issues	Reasons
Response	● The Postal questionnaire is a somehow expensive method as it requires the researcher to bear the cost of postal stamps and envelopes. ● The Postal questionnaire is not realistic and would have resulted in a substantial administrative cost to evaluate whether the questionnaire has been posted back by the respondents. (Cartwright, 1988) ● Postal surveys have a very low response rate, and increasing the response rate requires the researcher to offer incentives to the respondents against the principles of researcher ethics and morality. Thus, researchers have used a combination of both offline and electronic surveys. ● Many previous researchers (Almarri and Bhatti, 2015; Sartorius *et al.*, 2015) who have conducted studies on healthcare technology adaption have implemented a similar approach where primary data has been gathered using both offline and web-based Survey validates researchers' decision to engage in the research process using a web-based survey.
Sampling	● It was desirable to use a web-based survey to gather data from a significant sample of n=387 respondents situated around Kuwait. The large population required the researcher to gather data from many respondents using health-tech applications and wearable gadgets. ● The distribution of questionnaires around the entire country instead of just Kuwait City serves numerous benefits as it strengthens the external generality and validity of research findings.
Research Constraints	● Researchers have been facing several constraints in the form of cost and time, mainly as the researcher was gathering all the data during the period of Pandemic, where it was merely impossible for a researcher to gather data using personal interaction with the respondents and participants. ● The researcher has substantially relied on convenient sampling to gather responses from people that are easy to reach and contact as restrictive movement measures are taken during the researcher abide by the researcher to travel to different Kuwait cities.
Methodological Issues	● Construct and variables to be measured have been developed and well supported by literature, offering a balanced measurement scale. Thus, clarification of the data generation instrument supported the rationale behind using the web method.

Table 2: Methodological issues

4.5.2.2 Survey Procedure

Numerous survey procedures are used in quantitative research. In contrast, the Total Design Method (TDM), which D.A. Dillman proposed, is the most effective procedure that guarantees an 80% response rate using social exchange theory which improves the quality of survey response by

organizing data in such a way that it increases the trust by creating rewards of responding if they fill the questionnaire. (Hoddinott and Bass, 1986). Using the approach proposed by D.A. Dillman, the ordering of questions has been arranged where questions are arranged so that exciting questions come first, followed by a cover letter. Secondly, the researcher has designed an attractive user interface that makes the response user-friendly. Thirdly, researchers have designed an attractive cover page with the size of pages smaller with minimal questions to reduce respondents' scrolling behaviour. Lastly, the researcher has set follow-up reminders to participants every four weeks to generate responses.

4.5.3 Instrumentation

A questionnaire was developed using an extensive literature review and Kuwait's demographics to assess all the research variables. The questionnaire was a 69-scale item. Pilot testing was done to evaluate the questionnaire's content and face validity along with its reliability score, which came above 0.8, indicating that the questionnaire is highly valid. The researcher assessed the obesity level amongst the study participants, which included BMI assessment as a part of the questionnaire to better relate it to health and gadgets. A questionnaire was developed using extensive literature search and keeping in mind the proposed framework and objectives of this paper to answer the hypothesis. The questionnaire comprises four sections where Section A comprises Demographics and BMI data. Section B has data related to obesity management with exercise, diet, and bariatric surgery. This section's questions were adapted from the study of Reethesh *et al.,* 2019, and UR Highland Hospital's questionnaire regarding bariatric surgery. Section C focuses on knowledge, attitude, and wearable gadgets to maintain weight and manage obesity. The questionnaire in this section is adapted from Sunyaven, Thieves, and Balan (2017). Section D has questions to assess life satisfaction regarding the use of wearable gadgets for obesity management. The World Health

Organization Quality of Life-Brief tool was adapted to formulate the questions of this section. The questionnaire was reviewed by the supervisor, who provided a constructive critique to polish it further. Section A of the questionnaire is concerned with control variables; Section B has an independent variable, section C contains a moderate variable, and section D is presented, the dependent variable.

The questionnaire was subjected to reliability analysis. George and Mallery (2003) provide guidelines to assess the reliability of a questionnaire. The study's recommendations are values for Cronbach alpha, which should be above 0.8 to ensure the overall reliability of the questionnaire. Bivariate correlations were performed to assess the questionnaire's construct in the context; its measures value was obtained at 0.7, meaning the questionnaire has a strong construct in content. The questionnaire was designed effectively to collect primary data efficiently on the objectives it was supposed to achieve.

4.5.3.1 Pilot Testing and Study

The pilot study is a complete small-scale. The goal of the pilot study was to ensure the reliability of the research instrument. Questionnaires were targeted at 50 participants. The pilot study helped gain insights into its cultural suitability and fulfil the need for re-adjustment such as changing, removing, or adding any instruments in the questionnaire before conducting the primary research study. This research study incorporated both primary and secondary outcomes in the research instruments. The primary outcomes of the study were:

- The study's primary outcome was identifying previously dominated obesity management techniques in GCC nationals, particularly Kuwaiti residents.

- The second primary goal of the study is to know the level of awareness among participants of Kuwaiti and expatriates residing in Kuwait relevant to health applications and wearable gadgets.

- The third primary goal of the research study was to pinpoint participants' attitudes towards using high-tech technology for health-related concerns.

- The fourth primary goal is to identify participants' attitudes towards a healthy lifestyle and obesity management using diet management, exercise, health follow-ups, and medicine management. The secondary outcomes that were deduced from the research study and are incorporated as:

- The use of technology can solve obesity among obese participants even though the technology is considered a primary causative agent in obesity problems.

- Participants' attitudes are tempted differently for different demographic characteristics as the study will consider diverse age groups, gender, marital status, occupation, and educational background while conducting research.

4.5.3.2 The Descriptive Analysis

Descriptive analysis is an essential step in conducting any statistical analysis as it provides insight into the distribution of data, helping the researcher identify the association between variables. The author will also use descriptive statistics to analyze the demographics of respondents, where pie charts will be used to analyze the responses across the questionnaire developed using the Thurston and Likert Scale.

4.5.3.3 Correlation Analysis

Correlation analysis is a commonly used tool for statistical testing, helping researchers evaluate the linear association between the variables or dataset used in the study (Senthilnathan, 2019). Correlation can be measured using the correlation coefficient (r) to provide insight into the relationship and association between two variables and construct. Correlation can be both positive and negative, where the positive value of r, which is nearer to 1, suggests a robust linear relationship between the variables. In contrast, if this value is nearer to 0, it will be considered weak. It will provide insight into whether it is right to proceed to other analyses such as OLS regression and Hayes mediation and moderator analysis.

4.5.4 Methods for Analysing Data

Researchers have used statistical Package for Social Sciences (SPSS) version 26 to conduct the data analysis. It is used to make conclusions about a specific phenomenon from a wider one. IBM SPSS (v 26) was consumed to examine the data collected throughout the study. Statistical significance was fixed a $p < 0.05$. The alpha level of 0.05 states that if we analyze variables by choosing an alpha of 0.05, our results would be consistent at 95% if the alpha is below 0.05. Thus, in a sense, it is the opposite of inductive analysis. In this present study, the testing techniques used for the data analysis in this research are mentioned below;

- Statistics of a descriptive nature
- Correlation Analysis
- Reliability and Validity Test
- Regression Analysis
- Hayes Macro Mediation and Moderator Analysis
- Independent T-test
- One Way Anova

4.5.5 Validity and Reliability Test

Chronbach's Alpha test is one of the best tests used to measure questionnaires' validity and reliability. This test aims to measure internal consistency and stability in the data by suggesting whether the internal consistency is high or low based upon the coefficient, which is calculated based upon the positive linear association between each variable to one. If Chronbach's Alpha is nearer to 1, there is a high internal consistency, and the instrument is deemed reliable. In contrast, if the alpha value is closer to 0, there is a weak consistency, and the instrument is deemed weak and non-reliable.

4.5.6 Regression Analysis

Regression analysis is a useful analytical tool. It is used to show the relationship between two qualitative variables. It indicates whether the relationship is positive or negative. Regression analysis can predict an outcome or phenomena using one or more predictor variables as if only one variable to predict the outcome of the dependent variable; it is referred to as simple multiple regression. In contrast, if more than one predictor variable is used to predict a dependent variable's value, it is called multiple regression. This study used multiple regression to predict the outcome of having a better lifestyle using predictor variables, including the obesity phenomenon, obesity management, and people's knowledge. Diet management and physical activity of healthcare technology (healthcare applications and wearable gadgets). The regression model can be explained using a linear equation that includes

$$\mathbf{Yi = (ßo + ß, Xi + ß, Xii + ß, Xiii)}$$

Equation 2: Regression Equation

4.5.7 PROCESS Hayes Macro Mediation and Moderator Analysis

PROCESS is the variable OLS. It is an advanced tool applied to estimate the direct and indirect effect of single or multiple mediators or moderator models. PROCESS uses two-way or three-way interactions for the moderation samples, besides regions and slopes of importance, to question connections and effects in mediation models with multiple or single mediators. (Hayes, 2017) The below table shows a summary of the survey methods used for this study.

Procedures	Contents
1. Research Design	
1. Survey	Cross-Sectional Study, web-based electronic survey
2. A Mix of Research Method	Mixed Research Methods using quantitative and qualitative.
3. Unit of Analysis	Kuwaiti Population
4. Respondents	Kuwaiti population using health tech applications and gadgets.
5. Research Hypothesis	21 Hypothesis
6. Design for Data Analysis	Descriptive Statistics, Pearson Correlation, Regression, Process Macros, T-Test, ANOVA

Table 3: Summary of Methodology

2. Sampling Procedure	Pilot Study	Main Survey
1. Type of Sampling	Non-probability Sampling	Cluster-Based Sampling
2. Criterion	Non-Systematic Selection	Systematic Selection
3. Sample Size	n=50	n=387
4. Survey Type	Google Form	Google Form
3. Data Collection	**Pilot Study**	**Main Survey**
1. Pre-test of questions	With Kuwaiti Residents	Through the Pilot Survey
2. Response rate	50/63=0.79>79%.	387/469=0.82>82%.
3. A Mix of data collections	Single Method	Single Method
4. Data Analysis	**Pilot Study**	**Main Survey**
1. Testing Method	Multiple Regression	Multiple Regression, PROCESS Macros, T-Test, ANOVA
2. Level of Significance	P-value (0.01,0.05,0.1)	P-value (0.01,0.05,0.1)
3. Analysis Tool	SPSS Version 26	SPSS Version 26

Table 4: Sampling Procedure

4.6 Ethical Considerations

Ethical consideration is an essential component of the present study as this research focuses on the public-related matter, i.e., obesity that can be quite a sensitive topic. Human participants are involved here concerning the nature of conducting research. Here, the main objective was to balance the proposed study's needs and protect and safeguard participants. Before conducting the study, a research proposal was submitted to the university's ethics committee for institutional

review to assess the proposed study's usefulness and identify any critical issues that need careful attention. The respect for participants' dignity was preserved informed consent, and their anonymity was assured by immediately discarding any information that could potentially identify them. They were informed of their right to withdraw from the study without providing any justification. Collected data was secured on a password-protected computer, and any offline data was secured in a locked file cabinet. In general, all ethical guidelines prescribed by the Declaration of Helsinki were strictly followed. The research supervisor was consulted for advice and guidance in the event of any potential ethical dilemmas.

4.7 Chapter Summary

The chapter provided guidelines on research philosophy; research approaches being used by the researcher. This chapter provides a rationale for using a mixed research approach where the parameters for both research methods from a methodological perspective provide an in-depth explanation of data collection procedures, population, sample size, strategy, and data analysis tools being used by the researcher. The study used qualitative and quantitative methods and the deductive and inductive approach to prepare the hypothesis and test it. The ethical consideration was explained in detail in which the confidentiality and anonymity of the individuals were preserved.

CHAPTER 5: Qualitative Data: Findings and Analysis

5.0 Introduction

The chapter involves an analysis of the qualitative data collected through interviews. People's knowledge and attitude towards health applications for obesity management and better lifestyle have been assessed using unstructured in-depth interviews. Thematic analysis has been conducted to interpret the findings of the interviews. A six-phase process of thematic analysis included an agreement to the data, searching patterns, assigning codes, defining and naming themes, reviewing themes, and producing the report. Section 5.1 showed the respondent's profile, whereas section 5.2 showed transcript analysis by interpreting the findings of the interview transcripts in the form of primary and sub-themes. The last section, 5.3, summarized all of the above findings.

DEMOGRAPHICS		RESPONSE FREQUENCY in %
GENDER		
Male	12	48
Female	13	52
AGE		
18-30	9	36
31-49	9	36
50-69	6	24
70 and above	1	4
EDUCATION		
High School	3	12
Graduate	19	76
Postgraduate	3	12
Others	0	

Table 5: Demographic Background of Interview Participants (Part a)

OCCUPATION		
Employed	16	64
Unemployed	3	12
Self-Employed	6	24
Student	0	0
Income		
Below 1000 KD	5	20
1000 – 2000 KD	14	56
2000-3000 KD	6	24
ABOVE 3000 KD	0	0
BMI		
BELOW 30	0	0
30-34.9	11	44
35-40.9	7	28
41-45	7	28

Table 6: Demographic Background of Interview Participants (Part b)

5.1 Profile of the Respondents

A total of 25 people were interviewed that use health tech applications and wearable gadgets in Kuwait. The above tables showed the background profile of the interviewees. Of the 25 respondents, 48% were males, and 52% were females. The similarity in the inclusion of genders suggests there are not many differences between both genders in terms of obesity concerns validating the previous findings of Alshaikh *et al*.,(2017), which suggests that females are mostly affected by the obesity epidemic GCC region. Furthermore, there are no significant differences amongst genders regarding the use of healthcare applications and wearable gadgets as both genders are tech-savvy and optimistic about weight loss to achieve a better lifestyle. Participants' demographics revealed that 36% of the interview participant belong from the age group of 18 to 30 years of old.

In contrast, a similar percentage was for the respondents belonging to 31 to 49 years. About 24 % of the respondents belonged to the 50 to 69 age group, whereas only 4% belonged to 70 and above

ages. This shows a high prevalence of obesity amongst the general population from 18 to 49 years of age. Furthermore, this revealed that the generation Y and Millennial exhibits a positive attitude towards healthcare applications and wearable gadgets, unlike the older generation who don't tend to have the favourable attitude to achieve a better lifestyle through weight loss by engaging in various obesity management phenomenon, which includes dietary changes, daily exercise, and bariatric surgery. The educational background showed that 12% of the participants had a higher academic achievement for high school.

It was also noticed that about 76 % of the participants had a bachelor's degree, and the remaining 12 % had a postgraduate qualification. This suggested that higher qualifications participants exhibit a positive outlook towards obesity management and know healthcare applications and wearable gadgets. This means that people from higher education backgrounds have a positive outlook of a better lifestyle aided by obesity management techniques and knowledge of healthcare applications and wearable gadgets. Interview findings showed that 64% of the participants were employed, 24% were self-employed, and 12% were unemployed. This showed high penetration of technology-aided by health management gadgets amongst white-collar employees compared to the people having other occupations as the white-collar nature of jobs limits physical movement. Thus, it can be concluded that employees have limited physical movement leading to serious obesity concerns amongst Kuwaitis. Interview proceedings reveal that participants from numerous monthly income brackets ranged between 1000 KD to 3000 KD, where 20 % of the participants exhibited income below 1000 KD, 56% of the participant's monthly income ranged from 1000 KD to 2000 KD. Lastly, the remaining 24 % of the interview participants reported monthly income between 2000 KD to 3000 KD. This suggested a high prevalence of obesity concerns amongst participants with a monthly income ranged between 1000 KD to 2000 KD who want to achieve a

better lifestyle aided by health tech applications and wearable gadgets. The higher income bracket suggests high disposable income spent on wearable gadgets and healthcare applications, and bariatric surgery, which is yet a costly procedure to get rid of obesity.

Furthermore, proceedings from the interview also revealed that the higher the Kuwaiti's income, the more likely they desire to achieve a better lifestyle through dietary changes and physical exercise. The interviewer enquires about the BMI of interview participants, which suggests that 44% of participants had a BMI of between 30 to 34.9, 28% of respondents had a BMI of 35 to 40.9, and the remaining 28 % had the respondent a BMI of 31 to 45. Proceedings from the interview suggest that the majority of interviewed applicants reported moderate obesity which suggests that usage of healthcare applications have subsequently helped participants to lose weight through physical exercise and dietary changes using healthcare applications and wearable gadget as a tracking tool to keep an eye on their physical fitness and rising obesity (Refer to Figure 13).

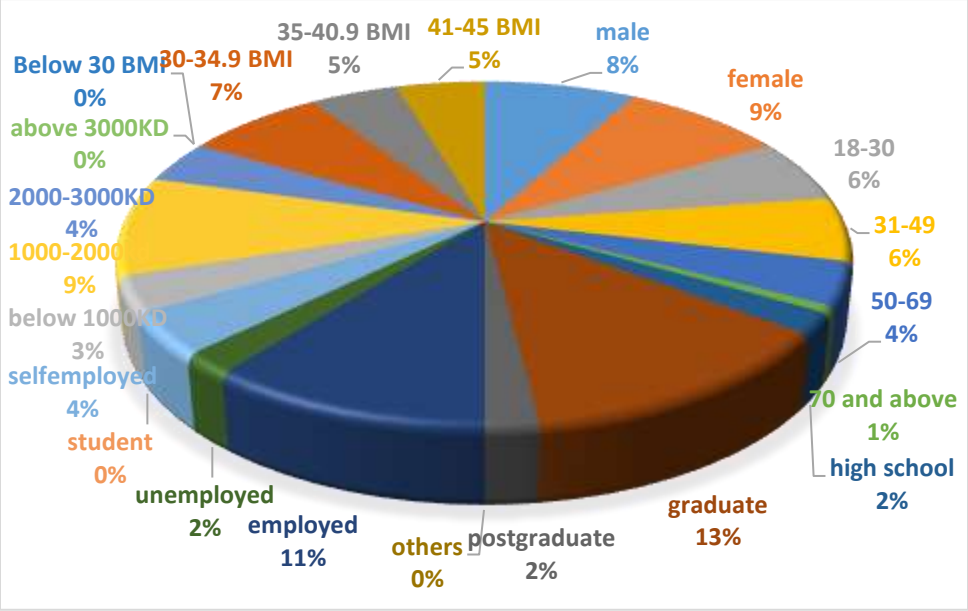

Figure 13: Demographic Characteristics

5.2 Transcript Analysis

In this section, several themes have been identified through an in-depth review of the interview transcripts. Unstructured interviews had three sections; the first section, i.e., section A, included the respondents' background profiles that have been explained in section 5.1. Three sections (sections B, C, and D) were analyzed using thematic analysis methodology. These sections will have main themes, and under the main themes, sub-themes have been generated from the interview transcripts showing the most frequency of terms used by the interviewees within their answers to the 25 unstructured questions.

5.2.1 Obesity in Kuwait

There were 16 interview questions asked from the 25 participants shortlisted for semi-structural interviews being conducted face to face. Four main themes have been generated, i.e., obesity phenomena, dietary habits, obesity management, and time required to lose weight. These four themes have two subthemes for each central theme: dietary habits, obesity management, and the time required to lose weight. Starting with the first theme of the obesity phenomenon. 13 out of 25 respondents believed they are obese and overweight. One participant's statements can be seen below when they were asked how they perceived their weight. Participant 4 stated, *"I am overweight and obese and need to make changes to my life."*

Participants of the survey were asked whether factors lead to increasing obesity amongst behaviour. All participants reported that dietary habits substantially influence obesity as one of the participants stated, "*yes, I think so. Dietary habits have a main contribution, for example when a person skiing breakfast other meal is affected. From my experience, when I skip one meal, my portion in other remaining meals increased*". 12 out of 25 respondents believed that they have

health problems due to obesity. One of the participant's statements can be seen below when they were asked what problems they faced due to being overweight.

Participant 2 stated, *"I have suffered several health problems, but one of the major health issues is that I have become a diabetic patient after being overweight for long."* Participants revealed essential information about their dietary habits. 10 out of 25 respondents have reported unhealthy eating habits being one reason behind their obesity and overweight. One of the participant's statements can be seen below when they were asked about how they perceive their dietary habits.

Participant 4 stated, *"I am having difficulty due to bad dietary habits, but I am also high determined to change."*7 out of 25 respondents have made dietary changes within their eating lifestyle to tackle their weight problems. One of the participant's statements can be seen below when they were asked about changing their lifestyle towards weight management. Participant 1 stated that *"I am visiting dietitian and follow diet program with diet canters, going to gym three times a week, educating myself through mobile as and keep track of my activity through my ale watch."*

The second theme emphasizes the obesity management strategies being used by Kuwaiti to contain obesity. 9 out of 25 respondents have stated that to manage their weight, they exercise. One of the participant's statements can be seen below when they were asked about managing weight. Participant 17 have stated, *"Diet followed by exercise then continue education myself with the healthy food and exercise activity.*

Participants were asked whether they had gone through bariatric surgery. 9 out of 25 respondents have stated that to manage their weight through surgery. One of the participant's statements can be seen below when they were asked about how they managed to reduce their weight stated, "*it must be when you try everything and not work plus you face Health and psychological problems"*8 out

of 25 participants believed that the obese phenomenon could only be addressed by making substantial changes in the dietary plan as participant 1 reported that "I am aware of my problem and having changed my lifestyle which involves both diet and exercise." Surprisingly, 8 out of 25 participants reported that bariatric surgery is the only solution to their obesity problem.

Participants of the interview were sceptical and had negative feelings and emotions about bariatric surgery. Participant 20 reported the decision to go for bariatric surgery as a last resort as they reported that "*I do not like or not recommended, but sometimes it should be done. Like in my case. My obesity cause is genetics*." Lastly, 9 participants consider exercise and physical activity an essential strategy to lose excess fat accumulation in their bodies. Lastly, interview participants were asked about the results they have achieved and how long it takes to lose weight. Nine respondents out of 25 respondents reported that it takes them at least three months to get a meaningful result using various obesity management strategies. Various remaining 16 participants reported that it takes more than three months to lose a substantial body fat amount. Below table 4 shows the set of themes being nominated from the interviews conducted to investigate Kuwait's obesity trend.

Respondents	OBESITY							
	Obesity phenomenon		Dietary Habits		Obesity Management		Time to lose weight	
	obese and overweight	Health problems	Unhealthy eating habits	Dietary Changes	Exercise	Bariatric Surgery	More than 3 months	Less than three months
1	x	x	x					x
2	x	x	x	x			x	
3	x	x	x	x			x	
4	x		x	x				x
5	x	x	x	x			x	
6	x							x
7	x		x				x	
8	x	x	x				x	
9			x		x	x		
10					x	x		
11					x			
12	x	x					x	
13				x		x		x
14				x	x	x		x
15								
16		x				x		x
17		x		x	x			x
18	x	x				x	x	
19						x		
20					x			
21					x			
22	x	x			x			x
23	x	x	x			x	x	
24	x	x	x			x	x	
25		x			x			

Table 7: Obesity in Kuwait

5.2.2 Perception about Healthcare Technology and Wearable Gadgets

Participants of the study were about their perception of healthcare technology and wearable gadgets. A total of three main themes was generated based upon the coding of interview findings.

The first theme provides insight into the exposure of Kuwaitis to health-tech applications and wearable gadgets. 23 out of 25 participants reported that they have a favourable attitude towards health tech applications. Participant 1 suggests that "health as can help a lot in obesity management but we should be careful of it not all they are goods. The reviews ask dictation/doctor recommendation when choosing" 23 participants believe that health tech applications play an essential role in obesity management as participant 4 reported that "it monitors of physical activity and weight and stimulates habits to change" 4 out of 25 participants suggest that healthcare applications must be used under assistance and supervision of doctors, physician or dietician. As participant 11 stated that "Some are good and some not. So, it should use under doctor supervision and dietician."

Participants of the interview were asked about the role of healthcare applications and wearable gadgets 18 participants out of 25 participants reported that this application plays a supportive role, whereas 4 participants reported that these applications had played an essential role in containing the knowledge of healthcare applications and wearable gadgets amongst the participants as 10 participants out of 25 reported substantial knowledge of these applications as participant 1 reported that their technologies are beneficial "to educate me of the health information and to keep track of my activates" 14 out of 25 participants reported that features and recommendations from reference group such as social networking website friends are essential to them while buying a health care tech and gadgets.

24 out of 25 participants reported successful weight loss after using healthcare applications, as participant 10 reported that *"using these gadgets keeps me motivated to be active and track my health."* 23 out of 25 participants reported that they would recommend health tech applications and wearable gadgets to others without hesitation. One of the participants stated that *"it is a*

secondary factor to lose your weight. It helps you manage your weight and change your lifestyle. it a combination works between you and technology, not technology alone". Below table 5 shows the set of themes being nominated from the interviews conducted to investigate the relationship between obesity control and healthcare technology.

Respondents	Obesity Control using health technology and Wearable Gadgets					
	Exposure to Health tech		Knowledge of health Tech		Results	
	Favorable Attitude towards e-health	Usage of health tech	Effective to lose weight	Features an important factor	Successful Results	Recommend Others
1	x	x			x	x
2	x	x		x		x
3	x				x	x
4	x	x			x	x
5	x	x		x	x	
6	x	x			x	x
7	x	x			x	x
8	x	x			x	x
9	x	x			x	x
10		x	x		x	x
11	x	x	x	x	x	x
12	x	x			x	x
13	x	x	x	x	x	x
14	x	x	x	x	x	x
15	x	x		x	x	x
16	x	x	x		x	x
17	x	x		x	x	x
18	x	x	x		x	x
19	x	x	x	x	x	x
20	x	x	x	x	x	x
21	x	x		x	x	x
22	x	x	x	x	x	x
23	x	x	x	x	x	x
24	x	x		x	x	x
25		x		x	x	

Table 8: Perception of Health Care technology & Wearable Gadgets

5.2.3 Lifestyle Quality

Participants of the study provided information about achieving lifestyle changes using healthcare technology and wearable gadgets. Total lifestyle has been divided into three themes: life after using health tech applications, the impact of health tech on their wellbeing, and outlook of life. 23 out of 25 participants reported that they have a positive perception about life as one of the participants stated that by using health technology and wearable gadgets, "A person can change his habits, but he will have a determination and take the right decision at the right time."

Participant 2 stated that by owning these health tech gadgets, *"There is hope to lose weight with determination, persistence, and continuity."* All the respondents reported that using this application has subsequently increased life satisfaction among them. One of the participants reported that they have become "More Organized and active. My weight loss" another participant reported *that "Life has become easier when you obtain health information faster."* The second theme of the study was the impact of health tech on quality of life where participants reported that they have subsequently increased self-confidence as 9 out of 25 participants reported an increase in self-confidence as participants are self-motivated to know new health activity as participant 19 reported that "my life become more satisfied". Another aspect of using health tech applications is a subsequent increase in social life. Participants are more likely to share their activity being monitored on health tech applications with friends and family as one of the participants 24 reported that "my life become more sociable and comfort in my relation."

Respondents reported that their lifestyle has substantially improved as one of participant 4 reported that *"My activity increases my sleep comfort".* Another participant states that "life is good when we know how to live it right." The last theme of the interview was the outlook of participants using

health tech applications towards lifestyle as 24 out of 25 participants reported a positive lifestyle with these applications as one of the participant's states, *"it was long and hard but with them and stick with my diet plan and exercise and ecology aids I achieve my goal to lose my weight, and I will continue on that way to keep may lose weight"*. This suggested that there is commitment amongst participants for continued use of healthcare applications and wearable gadgets. The table below shows the themes being nominated from the interviews conducted to investigate life satisfaction and quality aided by health tech applications and wearable gadgets.

Respondents	Life Satisfaction and Quality					
	Life after using health tech		Impact of health tech		Outlook of lifestyle with Health tech	
	Improved quality of life	Increased life Satisfaction	Self confidence	Healthy and Active	Favorable	Requires continuity
1	x	x	x	x	x	x
2		x		x		x
3		x		x	x	
4	x	x			x	x
5	x	x		x	x	x
6	x	x		x	x	x
7	x	x	x		x	x
8	x	x	x	x	x	x
9	x	x	x	x	x	
10	x	x			x	x
11	x	x		x	x	x
12	x	x			x	x
13	x	x	x	x	x	
14	x	x	x		x	
15	x	x		x	x	
16	x	x	x		x	
17	x	x			x	x
18	x	x	x	x	x	
19	x	x	x	x	x	x
20	x	x			x	x
21	x	x		x	x	x
22	x	x		x	x	x
23	x	x		x	x	
24	x	x		x	x	
25	x	x			x	x

Table 9: Implications of Wearable Gadgets on Lifestyle Quality

5.3 Preposition Testing

P1: Obesity phenomenon amongst the Kuwaitis have substantially contributed towards numerous health-related problems and illness.

The interview results suggested that about 48% of the participants believed that obesity substantially contributed to health-related issues like hypertension, diabetes type 2, coronary heart diseases, and mental illness. Results validate the previous study (Abusnana *et al.,* 2018; Cmrecak *et al.,* 2020). Evidence from Cmrecak et al., (2020) findings suggested that overweight related comorbidities result in a significant impact on adipose tissue and Ectopic lipids, which results in numerous health conditions such as coronary artery disease, lipotoxicity dyslipidemia, diabetes, obstructive sleep apnea, and systematic and pulmonary hypertension which are the primary cause of heart failure. Furthermore, our findings validate previous studies conducted by Abusnana *et al*.,(2018), which suggests that obesity behaviour is associated with morbidity for several health conditions, which tends to increase with the increasing BMI above 30 in the form of hyperlipidemia, hypertension, dyslipidemia, stroke, obstructive sleep apnea, cholelithiasis/gallstones, and breast cancer. The study of Abusnana *et al.,* (2018) suggested that the Body mass index of 30 kg/m^2 can result in numerous diseases and health conditions requiring pharmacologic treatment.

P2: Dietary habits amongst Kuwaitis have substantially contributed to the growing obesity trend amongst Kuwaitis.

The interview suggests that 40% of interview participants believe that Kuwaiti residents' dietary habits have substantially contributed to the obesity phenomenon amongst the population. Participants believe that dietary habits included skiing breakfast, eating more than three meals a

day, eating less whole grain and fruits. Furthermore, respondents revealed that cultural orientation amongst Kuwaitis encourages people to engage in unhealthy diary habits and junk food intake, which leads to an ongoing problem of obesity amongst Kuwaitis. It was also noticed that about 28% of the participants believed that making dietary changes alone is the most effective strategy for mitigating the prevalence of obesity amongst the Kuwaiti population. Our findings validate previous studies (Al-Sejari, 2017; Alkazemi, 2019). Alkazemi (2019) suggests that in Kuwait, both genders reported unhealthy dietary habits with high consumption of meat, potato chips, and fatty salty snacks resulting in an increasing number of overweight and obese individuals. Al-Sejari (2017) suggested that an unhealthy diet coupled with a sedentary lifestyle is the primary source of the prevalence of obesity amongst students in Kuwait. Alkazemi (2019) suggested that unhealthy eating habits such as skiing breakfast are inversely associated with obesity amongst Kuwaiti adolescents.

P3: Lack of physical activity and exercise amongst Kuwaitis has substantially contributed to the growing obesity trend.

The study showed that about 36 % of the participants reported that they exercise regularly were the remaining participants recruited for a semi-structural interview do not exercise regularly. The majority of the respondents believed that exercise is an essential strategy to lose excess fat accumulation in their bodies. 36% of the participants believe that exercising for more than three months can help an individual lose weight, whereas 32% of participants reported that it takes less than three months to lose extra pounds on their body using exercise and other sedentary changes. Findings validate previous studies conducted by (Allafi and Waslien, 2014; Balhareth *et al.*, 2019). Allafi and Waslien (2014) suggested that exercise avoidance behaviours are strongly correlated with overweight individuals in Kuwait, whereas unhealthy exercise behaviour patterns are also

prevalent among Kuwaitis. Evidence from Balhareth *et al.,* (2019) shows that low physical activity and increasing age are strongly correlated with obesity amongst women in gulf countries. Lastly, our findings also validate previous studies conducted by Alyouhah *et al*., (2018), which suggest that high nutrition intake, lack of mobility, economic prosperity, technology, high television exposure, and socio-cultural belief which requires substantial healthcare intervention to respond to the epidemic and promote healthy lifestyles (Al-Kutbe *et al.,* 2017).

P4: Many Kuwaitis with high BMI often resort to bariatric surgery as a permanent solution to obesity.

12 out of 25 respondents, 36% of the total participants, believed that bariatric surgery is the permanent solution to obesity, validating previous studies conducted by (Rabeea *et al.,* 2019; Nguyen *et al.,* 2011). Evidence from Rabeea *et al*.,(2019) suggests the rationale behind high LSG as outcomes of Laparoscopic Re-Sleeve Gastrectomy (LRSG) neither laparoscopic Roux-en-Y gastric bypass (LRYGB) groups, the outcomes between patients is better for those who failed to lose weight directly after the primary surgery of LSG. Furthermore, Nguyen *et al*., (2011) suggest that LSG has emerged as the most effective bariatric intervention procedure with consistent yield, short term, and long-term weight loss to help people with severe obesity. Rabeea *et al*., (2019) also reveal that obese Kuwaitis have a favourable attitude towards bariatric surgery as in Kuwait alone, 4500-6000 LSG surgeries were performed during 2012 and 2015.

P5: Kuwaitis have a favourable attitude towards healthcare applications and wearable gadgets.

Proceedings from the interview suggested that 92 % of the Kuwaitis have a favourable attitude towards healthcare applications and wearable gadgets. 40% of the participants believe that

healthcare applications and wearable gadgets are helpful tools for weight loss, whereas 56% reported that they had generated good results using healthcare applications and wearable gadgets. 56% of the participants believed that they value health tech features before making any purchase decision. Findings validate previous studies conducted by (Almarri and Bhatti, 2015; Vo *et al.*, 2019; Hussein *et al.*, 2017). Almarri and Bhatti's (2015) findings showed that people positively attitude towards mobile health applications (MHA). Vos (2019) study also revealed that people have a positive attitude towards applications that engage patients to care for themselves through self-empowerment. Lastly, Hussein *et al.*, (2017) conducted a quantitative study on consumer attitudes towards m-Health, which shows that people have a favourable attitude, which is significantly correlated to use healthcare applications and wearable gadgets.

P6: Healthcare applications and wearable gadgets have played an essential role amongst Kuwaitis in mitigating the growing obesity phenomenon amongst its youth.

The study reported that about 96 % of the participants believed that one could achieve successful results by using health tech. Almost everyone agreed that they would recommend using health tech applications for obese people as it plays an essential in mitigating the prevalence of obesity amongst Kuwaiti residents. Findings validate previous studies conducted by Goodyear, Kerver and Quennerstedt (2017), which suggests that wearable healthy lifestyle technologies have significant implications on motivation to physical activity as it increases motivation after wearing wearable gadgets for eight weeks.

P7: Exposure to healthcare applications and wearable gadgets has substantially improved Kuwaitis quality of life.

The study reported that about 92% of respondents reported that healthcare applications and wearable gadgets have substantially improved lifestyle, whereas almost everyone agreed that use health tech is strongly associated with life satisfaction. About 32 % of the participant reported that they are more self-confident about their physical appearance. About 64% of the participants believe that using health tech applications has enabled them to stay healthy and active using the activity tracking features offered by these applications 96% of the interview participants believe that they have a favourable outlook of a better lifestyle using these applications. However, respondents reported better lifestyle benefits of these applications significantly depend upon their continuity, as 68% of participants believe that the continuity of these applications is a significant determinant in achieving a better lifestyle. The results validate the previous research of Sunyaev (2017), which suggested that health monitoring capabilities aid a healthy lifestyle. The findings showed that these wearable gadgets were increased using gamification, an intriguing phenomenon that motivates and enriches interaction to drive a healthy lifestyle.

CHAPTER 6: Quantitative Data: Findings and Analysis

Here research based upon the numerical research method being selected by the author as stated in Chapter 4, primary data has been gathered using quantitative research methods where questionnaires were distributed amongst the sample of n=387 respondents using a web-based electronic survey. This chapter has been organized, so section 6.1 provides discussion and interpretation based on the data collection and sample results. Section 6.2 provides a discussion on the frequency distribution. Section 6.3 provides insight into the Validity and Reliability of the instrument. Section 6.4 provides inferential statistics findings where correlation analysis, multiple regression analysis, and PROCESS macro mediation and moderator tests, T-test, and ANOVA test have been used to test the proposed research hypothesis. Section 6.5 talks about the results of the findings, and lastly, it summarizes the chapter.

6.1 Data Collection and Sample

As stated in Section 4.4.2.2, the researcher has selected a data sample based upon the inclusion and exclusion criteria, which only includes Kuwaiti residents who have been struggling with obesity and using health tech applications in the form of mobile applications and wearable gadgets in the pursuit to achieve better lifestyle via dietary changes and physical activity. The survey was shared electronically using social media platforms where every individual who complies with the inclusion and exclusion criteria was reached using D.M. with the survey's link. The researcher followed up with every individual to ensure whether they had participated or not participated in the survey. The complete set of n=469 links was rotated out of 82 respondents who refused to participate in the survey because of different reasons, such as lack of time and lack of interest, making an overall response rate of 82%. Here data will be analyzed in terms of Income, Gender, Age, Occupation and Education. The below table summarizes the demographics of respondents.

Question	Answer Options	Frequency	Percent
Age	18-30	170	43.9
	31-49	140	36.2
	50-69	69	17.8
	70 and Above	8	2.1
	Total	**387**	**100%**
Gender	Male	178	46.0
	Female	209	54.0
	Total	**387**	**100%**
Education	High School	28	7.2
	Graduate	178	46.0
	Postgraduate	58	15.0
	Others	123	31.8
	Total	**387**	**100%**
Occupation	Employed	126	32.6
	Unemployed	22	5.7
	Self – Employed	131	33.9
	Student	108	27.9
	Total	**387**	**100%**
Income	Below 1000 KD	139	35.9
	1000-2000 K.D.	79	20.4
	2001-3000 KD	83	21.4
	3001- 4000 KD	47	12.1
	4001-5000 KD	23	5.9
	>5000 KD	16	4.1
	Total	**387**	**100%**
BMI	Less than 20	7	1.8
	20-25	135	34.9
	25-30	221	57.1
	31-35	18	4.7
	36-40	6	1.6
	Total	**387**	**100**

Table 10: Participants Responses to Demographic Questions

The frequency table shows that most respondents' age was between 18 to 30 years (43.9 %), followed by (36.2%) of respondents from 31-49. The majority of respondents were female (54%), whereas the remaining (46%) were male. The majority of respondents were graduates (46%), followed by (31.8%) who had other qualifications such as foundations and diplomas. The majority of the participants were self-employed (33.9%), followed by (32.6%) of respondents who were employed in the public and private sector, (27.9%) of respondents were students, whereas the remaining (5.7%) were unemployed. Most of the respondents were from an income background

of less than 1000 KD (35.9%), followed by (21.4%) of respondents who had an income bracket of 2001-3000 KD. (20.4%) were from the income background of 1000-2000 K.D. The majority of the participants had BMI between 25-3- (57.1%), 34.9% had BMI between 20-25, 4.7% had between 31-35, 1.8% had between less than 20, and 1.6% had BMI between 36-40. (see Figure 16).

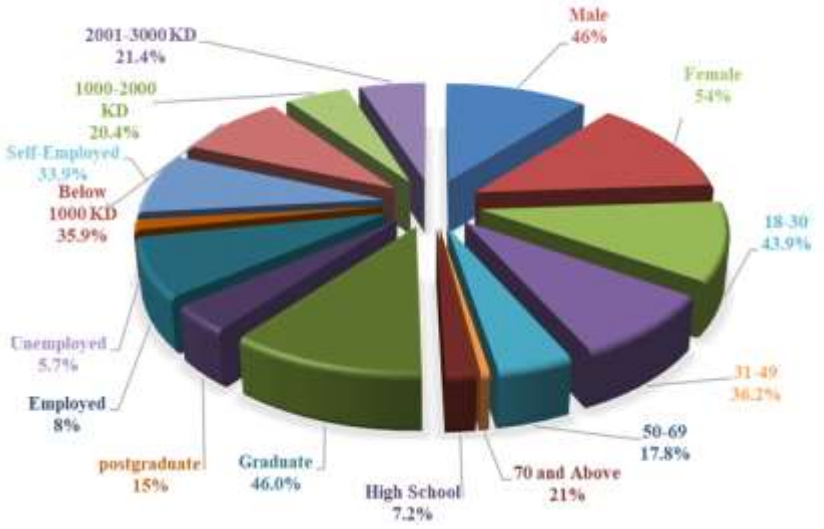

Figure 14: Demographic Characteristics

6.2 Frequency of the Analysis

A summary of the allocation of frequency is provided. In a nutshell, most items reveal positive responses with a few exceptions. Eight factors "variables" were identified from the literature review. The first three of them play a role in obesity management. Moreover, the two followed are influencer factors in the previous three, using the sixth that uses the Use of Technology and Wearable Gadget. The below table explores the people in the area's Perspective about each factor and whether they have impacted them somehow.

Factors	Statements	Frequency %					Mean	Std. Deviation
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)		
1. Obesity Phenomenon	1.1. I believe I do not have a healthy weight.	16.5	53.7	29.7	0	0	3.34	.94031
	1.2. I believe my weight is not healthy and I need to change it.	26.1	62.8	10.9	0	0	3.922	.76022
	1.3. I am motivated to change my weight.	22	69.5	8	0.5	0	3.94	.8233
	1.4. I am aware of the consequences of obesity.	29.2	66.1	4.7	0	0	4.090	.52817
	1.5 I believe I can lose weight on my own	20.7	70.3	9	0	0	3.958	.53327

Table 11: Participants' Perspective about Obesity Phenomena

Results for Obesity Phenomena show that most respondents agree that they don't have a healthy weight with the (mean μ= 3.34 and Std. Deviation 0.9403< 1). In general, it shows the community's understanding that they need to contain obesity phenomena using health tech applications with the (mean μ= 3.92 and Std. Deviation 0.7602< 1), in this almost 88% of the people believed that their weight is not ideal and they need to adjust their weight. In particular, respondents asserted that weight is unhealthy and must be managed and changed to achieve a better lifestyle amongst the community (mean μ= 3.94 and Std. Deviation .823< 1). People are predominantly motivated to change their weight, as 89.5% of the respondents were motivated to improve their BMI. It reflects their understanding of this factor's critical importance that embraces obesity management to a successful implementation after that. Almost 95% of the respondent were aware of the consequences of obesity, and the Respondents' inclination was toward the right of the spectrum showing their high awareness of obesity consequent; that Emphasizes society and people's

awareness of the consequences of obesity and its impact on life from different perspectives with the (mean μ= 4.090 and Std. Deviation .5287 < 1). Nevertheless, the respondents agree with the fact that they can lose weight on their own to achieve obesity management and reduce the consequences of the phenomena without any bariatric surgery (mean μ= 3.958 and Std. Deviation = .53327< 1), almost 91% of the respondents believed that with efficient management they could reduce their weight with their efforts.

Factors	**Statements**	**Frequency %**					**Mean**	**Std. Deviation**
		Strongly agree (5)	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly disagree (1)**		
2. Obesity Management	2.1 I Often drink sweet beverages	28.7	65.4	5.9	0	0	4.2248	.95419
	2.2 I often eat fried foods	45.2	51.4	3.4	0	0	4.3902	.78536
	2.3 I often eat high salty snacks	56.8	25.8	14	3.4	0	4.3333	1.02305
	2.4 I often eat saturated fat	40.1	46.3	12.1	1.6	0	4.2713	1.10171
	2.5 I often eat refine food items	53	37	9	1	0	4.3618	.78416

Table 12: Participants' Perspective about Obesity Management as obesity Management Action

Results for Obesity management show that most respondents agree that they do not manage their obesity. Most respondents agree that they drink sweet beverages (mean μ= 4.224 and Std. Deviation .95419< 1). Most of the participants agree that they consume fried food more often means μ= 4.390 and Std. Deviation .78536< 1). 56.8% of the participants agree that they have salted snacks with a mean of mean μ= 4.33 and Std. Deviation 1.02> 1). 46% agree that they often eat saturated food (mean μ= 4.271 and Std. Deviation 1.10>1). Most participants also strongly agree that they eat refined food (mean μ= 4.361 and Std. Deviation .78416< 1).

Factors	Statement	Frequency %					Mean	Std. Deviation
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)		
3. Dietary management	3.1. I believe my dietary habits are perfectly healthy	28.7	65.4	5.9	0	0	4.22	0.543
	3.2 I believe I need to change my dietary habits to lose weight.	45.2	51.4	3.4	0	0	4.41	0.558
	3.3. I am following a dietary plan currently.	56.8	25.8	14	3.4	0	4.36	0.844
	3.4. I have problems sticking to the dietary plans.	40.1	46.3	12.1	1.6	0	4.24	0.723
	3.5. I believe my dietary habits affect my mood.	53	37	9	1	0	4.41	0.698

Table 13: Participants' Perspective about Diet management as obesity Management Action

Dietary management as an obesity Management Action" was the second variable. The result showed that most individuals believe their dietary habits are perfectly healthy (mean μ= 4.22 and Std. Deviation 0.543 < 1). Despite having a healthy diet, most respondents believed that they needed to change their dietary habits (mean μ= 4.41 and Std. Deviation 0.558< 1). This majority of consensus among participants indicates the significant need to change the dietary habits to lose weight under specialist supervision (dietician and health consultant). At the same time, respondents agreed on the critical role of dieticians and doctors because it is clear that personal diligence was predominant in the existing practice. Majority of the participant strongly agrees that

they are following a dietary plan currently with the (mean μ= 4.36 and Std. Deviation 0.844< 1) Majority of respondents agrees that they have problems sticking to the dietary plans with the (mean μ= 4.24 and Std. Deviation 0.723 < 1). That explains why they don't lose weight if they have perfect healthy dietary habits. They are not committed to their diet plan for numerous reasons, such as Kuwait's social, cultural, and climatic conditions. In the same context, respondents strongly agree on dietary habits affecting their mood (mean μ= 4.41 and Std. Deviation= 0.69< 1)

Factors	Statements	Frequency %					Mean	Std. Deviation
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)		
4Physical Exercise	4.1. I believe my daily physical activity level is sufficient.	3.4	38.2	20.9	31.5	5.9	4.0775	1.06613
	4.2. I exercise frequently.	9.3	43.7	20.7	26.4	0	.1292	.74053
	4.3. I am following a professionally prescribed exercise plan to manage weight.	3.1	39.0	19.9	33.1	4.9	.0517	.75759
	4.4. I believe my current exercise plan can help me keep myself healthy.	5.7	0	19.6	71.1	3.6	.0594	.90331
	4.5. I believe I can stick to an exercise plan.	10.3	44.4	20.4	22.5	2.3	4.1163	.80740

Table 14: Participants' Perspective about Doing Exercises as obesity Management Action

The findings for the third factor, "Doing Exercises as obesity Management Action" were similar where most respondents agree that their daily physical activity level is sufficient (mean μ= 4.0775 and Std. Deviation .1.00613> 1). Out of the total number of respondents, 43.7% agree that they frequently exercise (mean μ= 1.292 and Std. Deviation .74053< 1). This societal view suggests that incorporating a reduced sedentary lifestyle to a physically active lifestyle is key in spreading the necessary awareness. 39.0 % of the participants follow a professionally prescribed exercise plan to manage weight (mean μ= .0517 and Std. Deviation .75759> 1). That means more than 50

% following not profession prescribed exercise plan, which could lead to failure to achieve an individual goal or cause health problems. Which creates another problem instead of solving the existing problem. 44.4% of participant agreed that can stick to an exercise plan as obesity Management Action variable. That shows individuals' high level of commitment towards being physically active and efficiently exploited in obesity management. Where the Std. Deviation= 1.017> 1) suggesting this variation in responses.

Factors	Statements	Frequency %					Mean	Std. Deviation
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)		
5. Knowledge	5.1. I am aware there are health tech and wearable gadgets that can help with weight management.	19.6	65.9	8.8	4.1	1.6	3.8961	.84755
	5.2. Health tech and wearable gadgets can help me lose or maintain a healthy weight.	21.4	64.6	9.0	3.6	1.3	4.0129	.75312
	5.3. It is necessary to consult a doctor before using health tech and wearable gadgets.	22.7	63.3	8.0	5.4	0.5	4.0233	.75630
	5.4. People in my circles use health tech and wearable gadgets to stay healthy.	19.6	61.8	0.1	8.0	0.5	3.9199	.81202
	5.5. These health tech and wearable gadgets have helped people in my surroundings to lose/maintain weight.	21.7	62.8	0.6	4.4	0.5	4.0078	.73930

Table 15: Participants' Perspective about Knowledge of using health tech and wearable gadgets in obesity management.

The majority of participants agree with the (mean μ= 3.896 and Std. Deviation 84755 < 1) there is a high awareness of health tech and wearable gadgets that can help with weight management. More specifically, 64.6% of the respondents agreed that Health tech and wearable gadgets could help

them lose or maintain a healthy weight. Similarly, respondents tend to argue about the necessity to consult a doctor before using health tech and wearable gadgets. Out of the total number of participants, 63.3% agreed that It is necessary to consult a doctor before using health tech and wearable gadgets., while 8 % were neutral, leading to a mean μ= 4.023 and Std. Deviation= .7563< 1. It might suggest a good adoption of using health tech and wearable gadgets in obesity management in the gulf area, which can ultimately be viewed as a power key in achieving the objectives of using it in an effective proper way.

Factors	**Statements**	**Frequency %**					**Mean**	**Std. Deviation**
		Strongly agree (5)	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly disagree (1)**		
6. Attitude	6.1I am willing to use a wearable gadget.	16.5	72.1	10.6	0.8	0	4.0439	.54879
	6.2. I would not buy health tech and wearable gadgets of the brands I have never used.	5.9	73.4	4.5	6.2	0	3.7907	.63988
	6.3. Review of these health tech and wearable gadgets matter to me in buying them.	24.8	68	7.2	0	0	4.1757	.53879
	6.4. I believe these gadgets would highly aid obesity management.	20.7	67.7	1.4	0.3	0	4.1214	.53696
	6.5. I am fine with sharing my activity data with the government.	24.5	63.8	1.4	9.6	1.8	4.1266	59531

Table 16: Participants' Perspective about the influences of using health tech and wearable gadgets in obesity management on their attitude

The majority of Participants 'agreed with the willingness to use a wearable gadget for better results of obesity management (mean μ= 4.0439 and Std. Deviation .54879< 1). Notably, 73.4% agreed that they do not buy health tech and wearable gadgets from brands they have never used. That indicates the level of knowledge towards the wearable gadget for the better quality and benefit of the user

in lose/maintains weight is high amongst the respondents. Respondents tend to search for referrals using a review of the gadget before buying than with the (mean μ= 3.7907 and Std. Deviation .63988< 1) Likewise, 67.7% of the participants agreed on the fact these gadgets would highly aid the obesity management with the (mean μ= 4.121 and Std. Deviation .53696< 1). Most of the participants agreed that they don't mind sharing their activity data with the applications used by the government and other stakeholders, posing significant privacy concerns with the (mean μ= 4.126 and Std. Deviation .59531< 1). In a nutshell, it can be concluded that the respondents acknowledged the importance of the influences of using health tech and wearable gadgets in obesity management on their Attitude variables and appreciated the role of these factors in achieving success in obesity management. Though the responses also indicate that most respondents are not happy with the technology. Some questions ended in different responses claiming disagreements. It can be said that a difference between the fact individual level of using new technology and in using new tech in reality from the Perspective of several participants who used these wearable gadgets. Even still, this observation is not final and should be confirmed through empirical analysis.

Factors	Statements	Frequency %					Mean	Std. Deviation
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)		
7. Use of technology	7.1. I am currently using a wearable gadget to manage my weight.	14.5	2.0	9.3	9.6	4.7	3.7209	.98151
	7.2. I rely on my wearable gadget(s) to manage weight.	14.5	0.7	0.1	9.6	5.2	3.6977	1.00211
	7.3. Weight management functionality is essential while buying a wearable gadget.	22.0	4.3	8.3	4.7	0.8	4.0207	.74777
	7.4. I have effectively maintained/lost weight using health tech and wearable gadgets.	17.3	2.0	13.2	5.9	1.6	3.8760	.81763
	7.5. I would recommend using health tech and wearable gadgets for other people.	22.7	2.0	9.8	4.7	0.8	4.0129	.76337

Table 17: Participants' Perspective about the influences of use of technology and wearable gadgets

Most participants agreed that they are currently using a wearable gadget to manage their weight. (Mean μ= 3.7209 and Std. Deviation 98151< 1). Predominantly, 60.7% agreed that they rely on wearable gadget(s) to lose weight to improve the quality of their better lifestyle with the (Mean μ= 3.69 and Std. Deviation 1.002> 1). Equally, 64.3% of the participants agreed that Weight management functionality is essential when purchasing healthcare applications and wearable gadgets (Mean μ= 4.0207 and Std. Deviation .74777< 1).

Most participants agreed that they effectively maintained and lost their belly fat using health tech and wearable gadgets (Mean μ= 3.8760 and Std. Deviation .81763< 1). 62.0 % of participants are recommend using health tech and wearable gadgets to other people. That concludes that wearable gadgets (Mean μ= 4.0129 and Std. Deviation .76337< 1). Hence, in a nutshell, the sense of healthcare application and equipment offer an invaluable resource to people dealing with obesity and

individual alike for better health to keep track of their activities to stay healthy by making substantial dietary changes and engaging in physical activity to lose the extra fat.

Factors	Statements	Frequency %					Mean	Std. Deviation
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)		
Better lifestyle	8.1. Using health tech and wearable gadgets for weight have increased my satisfaction.	18.6	0	6.3	64.3	0.8	2.7132	1.15750
	8.2. My enthusiasm in life has increased using health tech and wearable gadgets to manage my weight.	19.4	0.5	5.2	4.1	0.8	3.9354	.76073
	8.3. My relationships have improved using health tech and wearable gadgets to manage my weight	19.1	9.2	5.8	4.9	1.0	3.9044	.79419
	8.4. I tend to feel fewer negative emotions now that I have been using health tech and wearable gadgets to manage my weight	18.1	9.9	6.5	4.1	1.3	3.8941	.78631
	8.5. My friends have been supportive of me using health tech	23.5	5.0	2.7	6.5	2.3	3.9096	.90742

Table 18:Participants' Perspective about a better lifestyle after using health tech and wearable gadgets in obesity management

The results show that "better lifestyle," most participants tend to disagree that Using health tech and wearable gadgets for weight management has increased the satisfaction with them with the mean of (μ= 2.71 and Std. Deviation of 1.15 > 1) was justified by 16.3% who were neutral and 18.6% who did agree on that using wearable gadgets increase satisfaction. However, responses varied concerning their enthusiasm in life has increased using health tech and wearable gadgets to manage their weight with the mean of (μ= 3.93 and Std. Deviation of .760< 1). Respondents

reported that weight management using health tech and wearable gadgets has substantially improved their relationships with the mean of (μ= 3.90 and Std. Deviation of .794 < 1).

People are predominantly motivated to engage with people who have the same interest. That helps them to reach their objectives quickly by encouragement. Noticeably, respondents' majority tend to feel fewer negative emotions after losing weight using modern health tech and wearable gadgets, emphasising the role these modern health tech and wearable gadgets play in containing the obesity phenomenon. Weight management has a significant impact on an individual physical and mental wellbeing. Similarly, 55% of the respondents agreed that friends had been supportive factors to health tech and wearable gadgets to achieve their goals. (Mean μ= 3.9 and Std. Deviation = .907 < 1). That concludes the idea is that new technology enters the scene; it can improve our lives. But, in some cases, it also has the potential to negatively affect physical and emotional health. It matters according to their knowledge and attitude to decide what, when, and who uses it.

6.3 The Quantitative Analysis of Data

Here the research hypothesis has been testing using OLS regression and the Hayes process Macros. In section 6.3.1, Pearson's 1-tailed correlation has been used to explain the linear association between the variables using bivariate correlation analysis. Section 6.3.2 provides information on the instrument's reliability testing, where Cronbach's Alpha is used to conduct the statistical analysis. Section 6.3.3 uses OLS regression analysis to test H1, H2, H3, H4, H5 based upon the linear association between the predictor and dependent variable. Section 6.3.4 uses PROCESS MACROS to test moderating and mediating the role of variables in predicting the phenomenon of a better lifestyle to test the remaining hypothesis, which H6, H7, H8, H9, H10, and H11, H12, H13, H14. Then T-test is used to test H15, and the ANOVA test is used to analyze H16, H17, H18, H19, H20, and H21.

6.3.1 Bivariate Correlation Analysis

Pearson correlation aims to evaluate whether there is enough statistical evidence for the linear relationship between the pairing of variables among the population. The interpretation of correlation is made using the correlation coefficient, also referred to as r. The value of r measures the direction and strength of the linear connection between pairing variables used for examination. Hence, the purpose of conducting this test is to evaluate whether there is any linear relationship between the pairing variables. If the value of r is -1, it means that there is a perfect negative linear relationship. If R is 0, it means that there isn't a relationship. Lastly, if R is +1, which means that there is a positive linear relationship. However, the relationship's strength can be gauged by guidelines where $.1 < | r | < .3$ than a small and weak correction. Similarly, if $3 < | r | < .5$ there is a medium and moderate correlation. Lastly, if $.5 < | r |$, there is a large and strong correlation between pairing variables (Perinetti, 2019). The below table shows the output processed in SPSS.

Variables in Table 18 were DV, a Better lifestyle, IV1, i.e. obesity phenomenon, IV2, i.e. obesity management, IV3, i.e. people knowledge of healthcare applications and wearable gadgets; IV4, i.e. diet management IV5, i.e. physical exercise. MED is the mediation variable of the study, which refers to the "people attitude towards healthcare applications and wearable gadgets." Lastly, MOD is the study's moderating variable, which refers to the "use of healthcare applications and wearable gadgets.

Correlation								
	BL	**OP**	**OM**	**DM**	**PE**	**PK**	**PA**	**UOT**
BL	1							
O.P.	-.087**	1						
OM	072**	-.032**	1					
DM	.520	.178	.230	1				
PE	.013	.535	.230	.077	1			
P.K.	.545**	-.129**	-.056**	.055	.044	1		
P.A.	.226**	-.148**	-.003**	.044	.066	.284**	1	
UOT	.657**	-.030**	-.119**	.055	.066	.685**	.281**	1
****. Correlation is significant at the 0.01 level (1-tailed).**								

Table 19: Bivariate Correlation Analysis

The study's findings suggest that the obesity phenomenon is negatively correlated with a healthy lifestyle with the value of r= -.087, which claims that there is a negative linear association between two variables as the obesity phenomenon tends to decrease with the increase in a healthy lifestyle. Furthermore, findings suggest that obesity management is positively correlated with a healthy lifestyle with a value of r= .072. Findings suggest that people's knowledge of healthcare applications and wearable gadgets positively correlates with a healthy lifestyle r= .520. Diet management is negatively correlated with a healthy lifestyle r= -.092. Findings of bivariate correlation suggest that physical exercise has a positive relationship with a healthy lifestyle with a coefficient of r=.013, which suggests an increase in physical exercise will subsequently increase a

healthy lifestyle. The study's mediator, people's attitude towards healthcare applications, is weak but positively correlated with a healthy lifestyle coefficient of r=0.226. Lastly, the moderator, which is the use of healthcare applications and wearable gadgets, has a strong linear association with a healthy lifestyle with the coefficient of r=.657, which is positively correlated with the value of coefficient closer to the value of 1.

6.3.2 Reliability and validity Test

The instrument used in this research was adapted and modified from an existing instrument to measure the pertaining phenomena of interest, a healthy lifestyle using healthcare applications, and wearable gadgets. The instrument used by the researcher was developed based on the Likert Scale, which measures obesity phenomenon, obesity management, people's knowledge, people's Attitude, and Use of healthcare applications and wearable gadgets to predict healthy lifestyles amongst Kuwaitis. An instrument used for the research must possess both Reliability and validity; where validity speaks about the range of an instrument with which it can measure the phenomenon of interest, whereas Reliability refers to the extent to which an instrument is expected to give the same measured outcomes when measured in repeated situations. Reliability is a construct of consistency of reading and calibration of an instrument to provide reliable inference. Cronbach's alpha is a widely used tool to measure the Reliability of responses, the most critical pervasive statistic in studies involving statistical test construction and use. In a nutshell, Cronbach's alpha, also referred to as "α," is an indicator of instrument quality and expressed in numbers ranging from .00 and 1.0. The value of 0 narrates that there is no consistency in measurement, while the alpha of value 1 indicates the perfect consistency in measuring variables (Taber, 2017).

Shemwell *et al.* (2015, p. 68) state that the instrument is considered reasonably reliable if the value of α is equal to or greater than 0.70. The higher value of alpha refers to the internal consistency

amongst the items is very high. The below table shows the Reliability of items for the four constructs used in this study. The below table shows the Reliability of an instrument. Alpha score is zero when the score hasn't yet been measured, and there is a faulty component. Alpha equals 1.0 when all items measure only the accurate score. It can be interpreted as a percentage of variance explaining hypothetical true scores with all possible items. It can be explained as a correlation of the observed scale with a probability of other scales explaining the same and using the same number of items. Through the convention, the lenient cut of 0.60 is standard in the exploratory study; however, the alpha should be at least 0.70 or higher. This proposed study obesity phenomenon reported an alpha of 0.746, which suggests that the alpha value exceeds the lenient cut-off value; obesity management reported an alpha score of 0.731, which suggests that the alpha value exceeds the lenient cut-off value. Obesity management comprises three sub-variables, which include dietary changes, exercise, and bariatric surgery. Dietary changes reported the lowest alpha score of 0.640, which exceeds the lenient cut of value as the instrument was self-developed and exploratory. The exercise comprises five items that reported the alpha score of 0.817, which is reliable as the alpha value is closer to 1.

A moderating variable, the use of health care applications and wearable gadgets, reported an alpha score of 0.911, which is considered to have a strong internal consistency between the variables. Lastly, the dependent variable, which includes a better lifestyle, reported an alpha score of 0.868, considered strongly reliable as the alpha value is closer to 1. In a nutshell, the overall instrument with fifty-five items reported a Reliability of 0.80, which is considered good, exceeding the lenient cut-off value shown in Table 20 below (Taber, 2017).

Variables		No. of Items	Mean	SD	Reliability Cronbach's
Obesity Phenomenon		5	3.5807	0.45031	0.746**
Obesity Management		15	4.101	0.4072	0.731**
Sub-1	Dietary Changes	5	4.33	0.437	0.640**
Sub-2	Exercise	5	3.02	0.738	0.817**
People Knowledge of Healthcare Applications and Wearable Gadgets		5	3.98	0.643	0.895**
People Attitude towards Healthcare Applications and Wearable Gadgets		5	4.05	0.39	0.710**
People usage of Healthcare Applications and Wearable Gadgets		5	3.86	0.746	0.911**
Better Healthy Lifestyle		5	3.67	0.723	0.868**
TOTAL NUMBER OF ITEMS		**55**	**3.87**	**0.332**	**0.80****

Table 20: Reliability and validity of Instrument

6.3.3 Multiple Regression Analysis

Regression analysis is usually conducted to determine the correlation between two and more variables having cause and effect relationships. Multivariate regression aims to account for the variation of the independent and dependent variables synchronically (Uyanık and Güler, 2013). The purpose of multiple regression is to predict the value of dependent variable Y using a set of p values, which refers to the explanatory variables to build a model, underlying assumptions, and interpretation of results. The following equation represents the multiple regression equation.

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots + \beta_p x_{pi} + e_i$$

Equation 1: Regression Equation

βo is the constant term in the equation, whereas β1 to βp are coefficients related to the p explanatory variables to the variables of interest. The multiple regression has been calculated using

SPSS, where each explanatory and controlled variable's mean values have been used. The below equation explains the linear association to create a model to predict a better lifestyle.

$$\gamma \text{ (Better Lifestyle)} = \alpha + \beta 1 \text{ (Obesity Phenomenon)} + \beta 2 \text{ (Obesity Management)} +$$

$$\beta 3 \text{ (Peoples Knowledge)} + \beta 4 \text{ (Diet Management)} + \beta 5 \text{ (Physical Exercise).}$$

Equation 3: Multiple Regression Equation to Predict Better Lifestyle

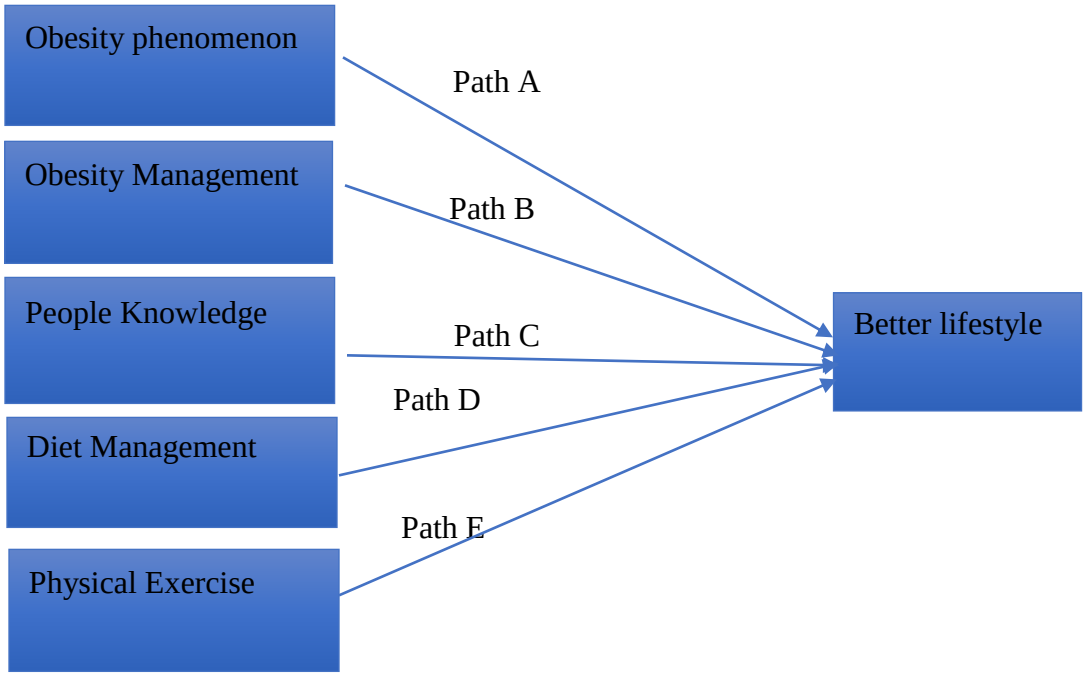

Figure 15: Path of Relationship between IV1 and DV

Below, Table 21 shows the model summary of regression, which suggests that the value of R for the multiple regression model is 0.54, which is equal to 54%. Thus, the model summary results reveal that predictor variables, including obesity phenomenon, obesity management, and people knowledge, diet management, and physical exercise, jointly explain 29% of the variance (R2) in predicting a better lifestyle amongst Kuwaiti. The value of Adjusted R square is .285, which means 28.5% of the variation that a better lifestyle is explained using predictor variables, including the obesity phenomenon, obesity management, and people knowledge, diet management, and physical

exercise. The significant change value is 0.00, which means that the model is significant as the value is less than 0.05, a significance level of the interval. The below figure shows the analysis of the ANOVA table.

The below figure shows the analysis of the ANOVA table.

Variable Name	Beta Value	T Value	Significance
Constant	1.70	4.315	.000
Obesity Phenomenon	.020	.376	.707
Obesity Management	.033	.753	.452
People Knowledge	.537	12.287	.000
Diet Management	-.158	-2.962	.003
Physical exercise	-.010	-.223	.824
R=.542[a,] R Square=.294, Sig= 0.00			

Table 21: Multiple Regression Analysis Interpretation

Table ANOVA table shows the residual value of regression, degree of freedom, mean square, F, and a significance level of the regression equation accounts for variability in the response variable. ANOVA table shows that the model has a significant mean value, which is less than 0.05.

The coefficient table 21 of multiple regression analysis shows the coefficients of regression with the constant value. The p-value of the coefficient table serves as a basis for hypothesis testing if the value of significance is less than 0.05, which is a significant level of the interval. Only then the model of the null hypothesis is valid. The value of significance for the obesity phenomenon coded as IV1 suggests a significance value of .707>0.05, which is not the interval's significance level. The t value is .376. In a nutshell, it can be concluded that there is no statistically significant relationship between the obesity phenomenon and better lifestyle; however, the R-value of -.87 in table 12 and t-value of .376 suggests a negative linear association, which is obvious as the obesity phenomenon have an inverse relationship with a better lifestyle.

The coefficient table 21 shows that obesity management coded as IV2 has a significance value of .452>0.05, a significant interval level. The t-test value .753, suggests that obesity management

without any mediation or moderating effect of other variable have no significant impact on a better lifestyle. In a nutshell, it can be concluded that there is no statistically significant relationship between obesity management and a better lifestyle; however, the r-value of r= .072 in table 22 and t-value of .753 suggests a linear association with a better lifestyle.

The coefficient table 21 shows that people's knowledge of healthcare applications and wearable gadgets coded as IV3 have a significance value of 0.000<0.05, a significant interval level. Findings shows a significant positive relationship between people's knowledge and better lifestyle with the β value of .537, which means if people's knowledge about healthcare applications and wearable gadgets tends to increase by 53.7%, the people's lifestyle will subsequently improve. In a nutshell, it can be concluded that there is a statistically significant relationship between people's knowledge and a better lifestyle.

The coefficient table 21 shows that diet management coded as IV4 has a significance value of 0.003<0.05, a significant interval level. Findings shows a significant positive relationship between diet management and a better lifestyle with the β value of .158, which means if diet management tends to increase by 15.8%, the people's lifestyle will subsequently improve. In a nutshell, it can be concluded that there is a statistically significant relationship between diet management and a better lifestyle.

The coefficient table 21 shows that physical exercise coded as IV5 has a significance value of .824>0.05, a significant interval level. The t-test value .223, suggests that physical exercise without any mediation or moderating effect of other variable have no significant impact on a better lifestyle. In a nutshell, it can be concluded that there is no statistically significant relationship between physical exercise and a better lifestyle; however, the R-value of r= .013 in table 22 and the t-value of .223 suggests a linear association with a better lifestyle.

6.3.4 Hayes PROCESS Macros

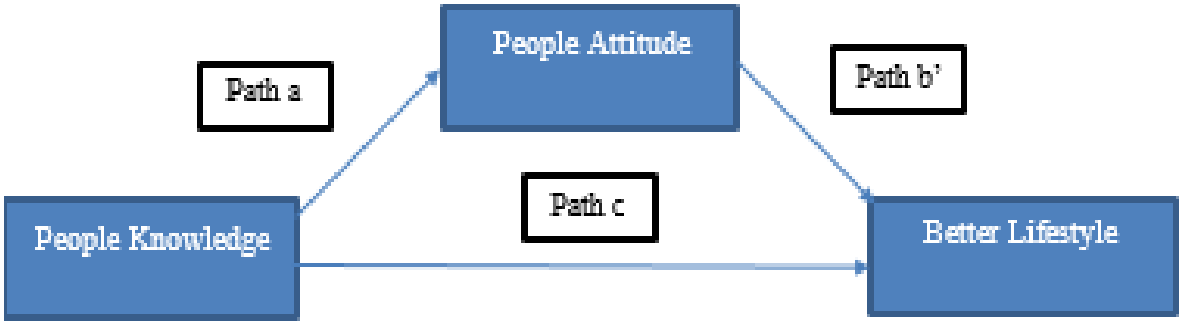

Figure 16: Mediating role of People Attitude using People Knowledge of Healthcare Applications and Wearable gadgets

Haye's output of regression values is given below in the table. This is our path ".

Table 22: Model 1 for the mediation role of people attitude

Model Summary	Model	Co-eff	T	p	LL CI	UL CI
R-Sq= .0809 **F= 33.8920** **P= .0000**	Constant	3.3637	28.1018	.0000	3.1 284	3.5 990
	People Knowledge	.1725	5.8217	.0000	.1142	.2307

R-Square for this model is 0.0809, which indicates that 8% variation in a better lifestyle is explained because of people's knowledge. F value is 33.8 and p=0.00000; hence p<0.05 indicates that the model is statistically significant. β is 3.3637, t=-28.10, p=0.0000. Hence p<0.05, and there is no "0" between LLCI and ULCI, which indicates that β is statistically significant. For people knowledge β1 coefficient value is 0.175, t=-5.82, p=0.0000. Hence p<0.05, and there is no "0" between LLCI and ULCI, which indicates that people's knowledge has a statistically significant relationship with a better lifestyle. Hayes's output of regression values is given below in the table. This is our path "c."

Model Summary	Model	Coeff	T	p	LLCI	ULCI
R-Sq= .3024 **F= 83.2398** **P= 0.0000**	Constant	.7432	2.1978	.0286	.0783	1.4081
	People Knowledge	.5877	11.7583	.0000	.4894	.6860
	People Attitude	.1441	1.7485	.0812	-.0179	.3062

Table 23: Model 2 for mediation of people attitude

R-Square for this model is .302, which indicates that 30% variation in people attitude is because of people knowledge. F value is 83.23 and p=0.0000; hence p<0.05 indicates that the model is statistically significant. β is 0.743, t=2.1978, p= 0.286. Hence p<0.05, and there is "0" between LLCI and ULCI, which indicates that β is statistically significant. For people's knowledge, the β1 coefficient value is 0.587, t=11.75., p=0.000. Hence p>0.05, and there is no"0" between LLCI and ULCI, which indicates that people's knowledge has had a statistically significant positive relationship with people attitudes. People's attitudes and better lifestyles can be explored using the same table 22 as for people attitude β2 coefficient value is 0.1441, t= 1.754, p=0080. Hence, p>0.05 makes the relationship "0" between LLCI and ULCI, indicating that people's attitude towards healthcare applications and wearable gadgets has no statistically significant positive relationship with a better lifestyle. The relation between people's knowledge and better lifestyle was a significant indirect effect and remained significant in indirect effect after applying the mediation variable of people attitude. Hence the change in the B value was observed. Before, it was .1725, and after introducing the mediator, it has increased to .5877. Hence there is statistically significant partial mediation in our model, but the value of indirect effect suggests that the model has no mediation; thus, people's attitude does not mediate the relationship between people's knowledge and better lifestyle.

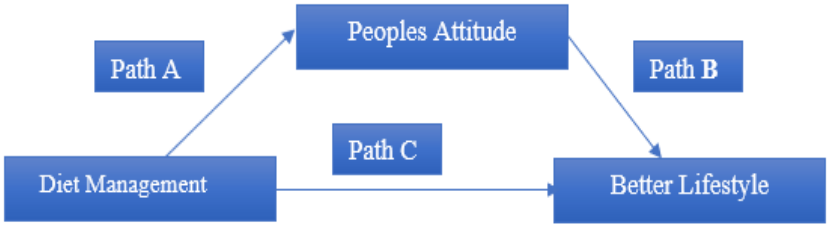

Figure 17 Mediating role of People Attitude using Diet management

Hayes's output of regression values is given below in the table. This is our path ".

Model Summary	**Model**	**Coeff**	**T**	**p**	**LLCI**	**ULCI**
R-Sq= .0119 **F= 4.635** **P= .0319**	Constant	4.4346	16.6137	.0000	3.9098	4.9594
	Diet management	-.1392	-2.1533	.0319	-.2663	-.0129

Table 24: Model 1 for the mediation role of people attitude

R-Square for this model is .0199, indicating that diet management explains a 1.9% variation in a better lifestyle. F value is 4.36 and p=0.00000; hence p<0.05 indicates that the model is statistically significant. β is 4.43, t=-16.61 p=0.0000. Hence p<0.05, and there is no "0" between LLCI and ULCI, which indicates that β is statistically significant. For diet management β1 coefficient value is -1.39, t=-2.15 p=0.31. Hence p<0.05, and there is no "0" between LLCI and ULCI, which indicates that diet management has a statistically significant relationship with a better lifestyle. Hayes's output of regression values is given below in the table. This is our path "c."

R-Square for this model is .4321, which indicates that 43.2% variation in people attitude is because of diet management. F value is 146.1 and p=0.0000; hence p<0.05 indicates that the model is statistically significant. β is 1.326, t=5.158, p= .000. Hence p<0.05, and there is "0" between LLCI and ULCI, which indicates that β is statistically significant. For diet management, the β1 coefficient value is -.0258, t=-.5392, p=.590. Hence p>0.05, and there is no"0" between LLCI and

ULCI, which indicates that diet management has no statistically significant relationship with people attitudes. People attitude and better lifestyle can be explored using the same table 22 as for people attitude β2 coefficient value is .6340, t= 16.924, p=000 Hence p<0.05, which makes the relationship and there is "0" between LLCI and ULCI, indicating that people's attitude has a statistically significant positive relationship with a better lifestyle. The relation between diet management and better lifestyle was a significant indirect effect, but it became insignificant in indirect effect after applying the mediation variable of people attitude. Hence the change in the B value was observed. Before, it was -1.39, and after introducing the mediator, it has increased to -.0258. Hence there is statistically significant partial mediation in our model. The value of indirect effect suggests that the model has mediation; thus, people's attitude mediates the relationship between diet management and a better lifestyle.

Model Summary	**Model**	**Coeff**	**T**	**p**	**LLCI**	**ULCI**
R-Sq= .4321 **F= 146.1059** **P= 0.0000**	Constant	1.3260	5.1583	.000	.8206	1.8314
	Diet management	-.0258	-.5392	.5900	-.1198	.6882
	People Attitude	.6340	16.9249	.000	.5603	.7076

Table 25: Model 2 for mediation of people attitude

6.3.4.1 Moderating Role of People Attitude

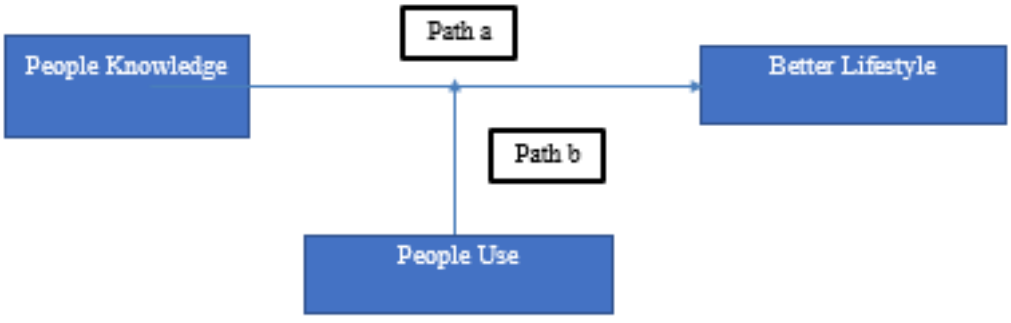

Figure 18 Moderating Role of Use of Health Application

Variable Name	Beta Value	T Value	Significance
Constant	1.379	2.911	.004
Obesity Phenomenon	-.014	-.197	.707
Obesity Management	-.023	-.300	.452
People Knowledge	.611	12.547	.001
Diet Management	-.087	-1.829	.003
Physical exercise	-.021	-.541	.824
R=.67, R Square=.454 Sig= 0.00			

Table 26: Moderating Role of Use of Healthcare Gadgets

The model summary table shows that the R-value is .670, which means 67% variation among respondents. But if we focus on our Model-1 for the impact of independent variable obesity phenomena on dependent variable better lifestyle R square value was .292, which is increased and become 45% after introducing moderator. The significant change value is 0.00, which means that the model is significant as the value is less than 0.05, a significance level of the interval. The below figure shows the analysis of the ANOVA table.

Table ANOVA table shows the residual value of regression, degree of freedom, mean square, F, and a significance level of the regression equation accounts for variability in the response variable. ANOVA table shows that the model has a significant mean value, which is less than 0.05.

The coefficient table reveals that people's knowledge coded as IV3 has a significance value of 0.01<0.05, a significant interval level. The diet management coded as IV4 has a significance value of .003, a significant interval level. However, the moderating variable uses of health tech applications are signed with the value of Sig=0.00<0.05. In a nutshell, it can be concluded that knowledge and diet management impact a better lifestyle. The below table shows the summary of

findings. There use of healthcare applications moderates the relationship between knowledge and diet management.

6.3.5 Independent T-test

Independent sample T-Test is used to compare the means of the two groups that are independent. This is done to explore whether there is any evidence related to the statistical difference between the population means. It only tests comparisons between two groups. It cannot be applied to more than two groups. In the current study, the independent sample t-test was run to explore the impact of the control variable gender on the independent variables, the dependent variables, moderating variable, and the mediating variable.

Scales	**Male**		**Female**		**T**	**Df**	**p**	**95% CI**	
	M	S.D.	**M**	**S.D.**				**LL**	**UL**
Obesity Phenomenon	3.77	.53610	3.9167	.54399	-2.526	385	.012	-.24	-.03
Obesity Management	4.2989	.82208	4.3311	.81774	-.385	385	.700	-.196	-.13
People Knowledge	3.9781	.64311	3.9684	.56053	.158	385	.875	-.11	.129
Diet Management	4.1685	.61278	4.0172	.55269	2.553	385	.011	.034	.267
Physical Exercise	3.5045	.80428	3.5139	.75768	-.118	385	.906	-.165	.146
People attitude	3.7101	.73216	3.6383	.71553	1.218	385	.224	-.073	.216
Use of technology	3.9157	.71583	3.8230	.77152	1.218	385	.224	-.056	.241
Better Lifestyle	3.9157	.71583	3.8230	.77152	.974	385	.331	-.506	.241

Table 27: T-test analysis

The above table shows the results for gender differences on the independent variable, dependent variable, moderating, and mediating variables. Statistically significant differences were found between males and females concerning the obesity phenomenon ($p<.05$). Females scored higher on it ($M=3.9167$, $S.D=.5439$) than males ($M=3.77$, $S.D=.53610$). Statistically insignificant differences were found between males and females concerning obesity management ($p>.05$). Females scored higher on it ($M=4.3311$, $S.D= .81774$) as compared to males ($M=4.2989$, $S.D= .82208$).Statistically insignificant differences were found between males and females concerning people's knowledge ($p>.05$). Males scored higher on it ($M=3.9781$, $S.D= .64311$) as compared to females ($M=3.9684$, $S.D= .56053$). Statistically significant differences were found between males and females concerning diet management ($p<.05$). Males scored higher on it ($M=4.1685$, $S.D= .61278$) than females ($M=4.0172$, $S.D=.55269$). Statistically insignificant differences were found between males and females concerning physical exercise ($p>.05$). Females scored higher on it ($M=3.5139$, $S.D= .75768$) as compared to males ($M=3.5045$, $S.D= .80428$). Statistically insignificant differences were found between males and females concerning people's attitudes ($p>.05$). Males scored higher on it ($M=3.7101$, $S.D= .73216$) as compared to females ($M=3.6383$, $S.D=.71553$). Statistically insignificant differences were found between males and females concerning the use of technology ($p>.05$). Females scored higher on it ($M=3.9157$, $S.D= .71583$) as compared to males ($M=3.8230$, $S.D= .77152$). Statistically insignificant differences were found between males and females concerning better lifestyles ($p>.05$). Males scored higher on it ($M= 3.9157$, $S.D=.71583$) as compared to females ($M=3.8230$, $S.D= .77152$).

6.3.6 Anova Analysis

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Obesity Phenomenon	Between Groups	.556	3	.185	.624	.600
	Within Groups	113.728	383	.297		
	Total	114.285	386			
Obesity Management	Between Groups	4.966	3	1.655	2.497	.059
	Within Groups	253.842	383	.663		
	Total	258.807	386			
People Knowledge	Between Groups	6.296	3	2.099	6.077	<.001
	Within Groups	132.269	383	.345		
	Total	138.565	386			
Diet Management	Between Groups	.487	3	.162	.472	.702
	Within Groups	131.715	383	.344		
	Total	132.203	386			
Physical Exercise	Between Groups	6.476	3	2.159	3.635	.013
	Within Groups	227.439	383	.594		
	Total	233.915	386			
Better Lifestyle	Between Groups	7.760	3	2.587	5.103	.002
	Within Groups	194.112	383	.507		
	Total	201.872	386			
People Attitude	Between Groups	8.971	3	2.990	5.550	<.001
	Within Groups	206.361	383	.539		
	Total	215.333	386			
Use of Technology & Gadgets	Between Groups	8.971	3	2.990	5.550	<.001
	Within Groups	206.361	383	.539		
	Total	215.333	386			

Table 28: Anova analysis of age

One-way ANOVA is used to explore statistical differences between the mean of two or more groups. These groups are independent and are not related to each other. The One Way Anova test tells that there are differences between the groups. It does not provide information about which two groups are statistically different. To further explore which groups significantly differ from

each other, a post hoc test is applied. In the current study, one-way ANOVA analysis was used to explore significant differences between the control variables and the independent, dependent, moderating, and mediating variables. The following table shows the mean differences between the control variables' age and the independent variables, IV1, IV2, IV3, IV4, IV5, the dependent variable's better lifestyle, the moderating variable use of technology, and the mediating variable people's attitude.

The above table shows the results for the one-way ANOVA analysis and whether there are statistically significant differences between the groups. The significance value for age and the IV1 obesity phenomenon is .600, which is more than the significance value of 0.05. Findings indicate no statistically significant differences between the age and the obesity phenomenon ($p>.05$).

The second column shows the significant value between the age and IV2 obesity management. The significance value for age and IV2 obesity management is .059, more than the significance value of .05. Findings indicate no statistically significant differences between age and obesity management ($p>.05$).

The third column shows the significant value between the age and the IV3 people's knowledge. The significance value for age and IV3 people's knowledge is .001, less than the significance value of .05. Findings indicate that there are statistically significant differences between age and people's knowledge. Further, the post hoc test indicates that there are statistically significant differences in people knowledge of the age group 18-30 and 70 and above, 31-49 and 70 and above, and 50-69 and 70 and above ($p<.05$)

The fourth column shows the significant value between the age and the IV4 diet management. The significance value for age and IV4 diet management is .72, more than .05. Findings indicate no statistically significant differences between age and diet management ($p>.05$).

The fifth column shows the significant value between the age and the IV5 physical exercise. The significance value for age and IV5 physical exercise is .013, less than the significance value of .05. Findings indicate that there are statistically significant differences between age and physical exercise. The post hoc test indicates significant differences in physical exercise between 18-30 and 70 and above, 31-49, and 70 and above ($p<.05$).

The sixth column shows the significant value between the age and the DV better lifestyle. The significance value for age and DV better lifestyle is .002, which is less than the significance value .05. Findings indicate that there are statistically significant differences between age and a better lifestyle. The post hoc test indicates a significant difference in the better lifestyles of the age group 18-30 and 70 and above, 31-49 and 70 and above, 50-69 and 70 and above ($p<.05$).

The seventh column shows the significant value between the age and the mediator of people's attitudes. The significance value for age and mediator use of technology is .001, which is less than the significance value .05. Findings indicate that there are statistically significant differences between the age and the mediator's use of technology. The post hoc test indicates a significant difference in the mediator of the age group 18-30 and 70 and above, 31-49 and 70 and above, 50-69 and 70 and above ($p<.05$).

The eighth column shows the significant value between the age and the moderator's use of technology. The significance value for age and moderator use of technology is .001, which is less than the significance value of .05. Findings indicate that there are statistically significant

differences between age and the use of technology. The post hoc test indicates a significant difference in the moderator of the age group 18-30 and 70 and above, 31-49 and 70 and above, 50-69 and 70 and above ($p<.05$).

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Obesity Phenomenon	Between Groups	2.718	3	.906	3.110	.026
	Within Groups	111.567	383	.291		
	Total	114.285	386			
Obesity Management	Between Groups	2.579	3	.860	1.285	.279
	Within Groups	256.228	383	.669		
	Total	258.807	386			
People Knowledge	Between Groups	10.715	3	3.572	10.699	<.001
	Within Groups	127.850	383	.334		
	Total	138.565	386			
Diet Management	Between Groups	2.791	3	.930	2.753	.042
	Within Groups	129.412	383	.338		
	Total	132.203	386			
Physical Exercise	Between Groups	1.643	3	.548	.903	.440
	Within Groups	232.272	383	.606		
	Total	233.915	386			
Better Lifestyle	Between Groups	6.859	3	2.286	4.491	.004
	Within Groups	195.012	383	.509		
	Total	201.872	386			
People Attitude	Between Groups	10.411	3	3.470	6.486	<.001
	Within Groups	204.922	383	.535		
	Total	215.333	386			
Use of Technology & Gadgets	Between Groups	10.411	3	3.470	6.486	<.001
	Within Groups	204.922	383	.535		
	Total	215.333	386			

Table 29: Anova analysis of education

The above table shows the results for the One-Way ANOVA analysis and whether there are statistically significant differences between the groups. The significance value for education and IV1 obesity phenomenon is .026, which is less than the significance value of .05. Findings indicate that there are statistically significant differences between education and the obesity phenomenon. The post hoc test indicates statistically significant differences in the obesity phenomenon of the education groups' high school and postgraduates ($p<.05$).

The second column shows the significant value between education and IV2 obesity management. The significance value for education and IV2 obesity management is .279, more than the significance value of .05. Findings indicate no statistically significant differences between education and obesity management ($p>.05$).

The third column shows the significant value between education and the IV3 people's knowledge. The significance value for education and IV3 people's knowledge is .001, which is less than the significance value .05. Findings indicate that there are statistically significant differences between education and people's knowledge. Further, the post hoc test indicates statistically significant differences in people's knowledge of the education groups high school and others, graduate and others, and postgraduate and others ($p<.05$).

The fourth column shows the significant value between education and the IV4 diet management. The significance value for education and IV4 diet management is .042, less than the significance value of .05. Findings indicate that there are statistically significant differences between education and diet management. Further, the post hoc test indicates statistically significant differences in diet management of the education groups high school and postgraduate ($p<.05$).

The fifth column shows the significant value between education and the IV5 physical exercise. The significance value for education and IV5 physical exercise is .440, more than the significance value of .05. Findingsindicates that there are no statistically significant differences between education and physical exercise ($p>.05$).

The sixth column shows the significant value between education and the DV better lifestyle. The significance value for education and DV better lifestyle is .004, which is less than the significance value of .05. Findings indicate that there are statistically significant differences between education and a better lifestyle. The post hoc test indicates a significant difference in the better lifestyles of education groups high school and graduate, high school, and others ($p<.05$).

The seventh column shows the significant value between education and the mediator people's attitude. The significance value for education and attitude is .001, which is less than the significance value .05. Findings indicate that there are statistically significant differences between education and people's attitude. The post hoc test indicates a significant difference in the people attitude of the education groups high school and others, postgraduate and others ($p<.05$).

The eighth column shows the significant value between education and the moderator's use of technology. The significance value for education and use of technology is .001, which is less than the significance value .05. Findingsindicates statistically significant differences between the use of technology and the education of high school and others, postgraduate and others ($p<.05$).

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Obesity Phenomenon	Between Groups	.745	3	.248	.838	.474
	Within Groups	113.539	383	.296		
	Total	114.285	386			
Obesity Management	Between Groups	6.639	3	2.213	3.361	.019
	Within Groups	252.168	383	.658		
	Total	258.807	386			
People Knowledge	Between Groups	10.443	3	3.481	10.406	<.001
	Within Groups	128.122	383	.335		
	Total	138.565	386			
Diet Management	Between Groups	1.546	3	.515	1.511	.211
	Within Groups	130.657	383	.341		
	Total	132.203	386			
Physical Exercise	Between Groups	11.804	3	3.935	6.785	<.001
	Within Groups	222.111	383	.580		
	Total	233.915	386			
Better Lifestyle	Between Groups	14.105	3	4.702	9.591	<.001
	Within Groups	187.766	383	.490		
	Total	201.872	386			
People Attitude	Between Groups	22.690	3	7.563	15.037	<.001
	Within Groups	192.643	383	.503		
	Total	215.333	386			
Use of Technology & Gadgets	Between Groups	22.690	3	7.563	15.037	<.001
	Within Groups	192.643	383	.503		
	Total	215.333	386			

Table 30: Anova analysis of occupation

The above table shows the results for the One-Way Anova analysis and whether there are statistically significant differences between the groups. The significance value for occupation and IV1 obesity phenomenon is .474, more than the significance value of .05, which that there are no statistically significant differences between the occupation and the obesity phenomenon (p>.05). The second column shows the significant value between the occupation and the IV2 obesity management. The significance value for occupation and IV2 obesity management is .019, less than the significance value of .05. Findings indicate that there are statistically significant differences

between occupation and obesity management. Further, the post hoc test indicates statistically significant differences in obesity management of the occupation self-employed and student ($p<.05$). The third column shows the significant value between education and the IV3 people's knowledge. The significance value for occupation and IV3 people's knowledge is .001, less than the significance value of .05. Findings indicate that there are statistically significant differences between the occupation and the people's knowledge. Further, the post hoc test indicates statistically significant differences in people's knowledge of the employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$). The fourth column shows the significant value between the occupation and the IV4 diet management. The significance value for occupation and IV4 diet management is .66, more than the significance value of .05. Findings indicate no statistically significant differences between occupation and diet management ($p>.05$). The fifth column shows the significant value between the occupation and the IV5 physical exercise. The significance value for occupation and IV5 physical exercise is .001, which is less than the significance value of .05. Findings indicate that there are statistically significant differences between occupation and physical exercise. The post hoc test indicates a significant difference in the physical exercise of employed and unemployed, unemployed and self-employed, unemployed and student ($p<.05$). The sixth column shows the significant value between the occupation and the DV better lifestyle. The significance value for occupation and DV better lifestyle is .001, which is less than the significance value .05. Findings indicate that there are statistically significant differences between the occupation and the better lifestyle. The post hoc test indicates a significant difference in the better lifestyles amongst the employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$).

The seventh column shows the significant value between the occupation and the mediator people's attitude. The significance value for occupation and attitude is 001, which is less than the significance value .05. Findings indicate that there are statistically significant differences between the occupation and the people's attitude. The post hoc test indicates a significant difference in the people attitude of the occupations of employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$). The eighth column shows the significant value between the occupation and the moderator's use of technology. The significance value for occupation and moderator use of technology is .001, which is less than the significance value of .05. Findings indicate statistically significant differences between the use of technology and the occupations employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$).

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Obesity Phenomenon	Between Groups	1.233	5	.247	.831	.528
	Within Groups	113.052	381	.297		
	Total	114.285	386			
Obesity Management	Between Groups	7.687	5	1.537	2.332	.042
	Within Groups	251.121	381	.659		
	Total	258.807	386			
People Knowledge	Between Groups	2.762	5	.552	1.550	.174
	Within Groups	135.803	381	.356		
	Total	138.565	386			
Diet Management	Between Groups	5.803	5	1.161	3.498	.004
	Within Groups	126.400	381	.332		
	Total	132.203	386			
Physical Exercise	Between Groups	4.824	5	.965	1.604	.158
	Within Groups	229.091	381	.601		
	Total	233.915	386			
Better Lifestyle	Between Groups	1.480	5	.296	.563	.729

	Within Groups	200.392	381	.526		
	Total	201.872	386			
People Attitude	Between Groups	2.850	5	.570	1.022	.404
	Within Groups	212.483	381	.558		
	Total	215.333	386			
Use of Technology & Gadgets	Between Groups	2.850	5	.570	1.022	.404
	Within Groups	212.483	381	.558		
	Total	215.333	386			

Table 31: Anova analysis of income

The above table shows the results for the one-way ANOVA analysis and whether there are statistically significant differences between the groups. The significance value for income and IV1 obesity phenomenon is .528, more than the significance value of .05. Findings indicate no statistically significant differences between the income and the obesity phenomenon (p>.05). The second column shows the significant value between the income and the IV2 obesity management. The significance value for income and IV2 obesity management is .042, less than the significance value of .05. Findings indicate that there are statistically significant differences between income and obesity management. Further, the post hoc test indicates statistically significant differences in obesity management between incomes below 1000KD and 3000-4000KD (p<.05). The third column shows the significant value between the income and the IV3 people's knowledge. The significance value for income and IV3 people's knowledge is .174, more than the significance value of .05. Findings indicate that there are no statistically significant differences between the income and the people knowledge (p>0.05)

The fourth column shows the significant value between the income and the IV4 diet management. The significance value for occupation and IV4 diet management is .004, which is less than .05. Findings indicate that there are statistically significant differences between income and diet

management. Further, the post hoc test indicates statistically significant differences in diet management of the incomes 2000-3000KD and 3000-4000KD ($p<.05$).

The fifth column shows the significant value between the income and the IV5 physical exercise. The significance value for income and IV5 physical exercise is .158, more than the significance value of .05. Findings indicate no statistically significant differences between income and physical exercise ($p>.05$).

The sixth column shows the significant value between the income and the DV better lifestyle as the significance value for income and a better lifestyle is .729, more than the significance value of .05. Thus, findings indicate no statistically significant differences between income and a better lifestyle ($p>.05$).

The seventh column shows the significant value between the income and the mediator people's attitude. The significance value for income and mediator people attitude is 1.001, more than the significance value of .05, which shows no statistically significant differences between the income and the mediator people's attitude ($p>.05$). The eighth column shows the significant value between the income and the moderator's use of technology. The significance value for income and moderator use of technology is 1.001, more than the significance value of .05. Findings indicate no statistically significant differences between the moderator use of technology and income ($p>.05$).

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Obesity Phenomenon	Between Groups	3.973	4	.993	3.440	.009
	Within Groups	110.312	382	.289		
	Total	114.285	386			
Obesity Management	Between Groups	6.053	4	1.513	2.287	.060
	Within Groups	252.755	382	.662		
	Total	258.807	386			
People Knowledge	Between Groups	12.329	4	3.082	9.327	<.001
	Within Groups	126.236	382	.330		
	Total	138.565	386			
Diet Management	Between Groups	5.611	4	1.403	4.233	.002
	Within Groups	126.591	382	.331		
	Total	132.203	386			
Physical Exercise	Between Groups	4.152	4	1.038	1.726	.143
	Within Groups	229.762	382	.601		
	Total	233.915	386			
Better Lifestyle	Between Groups	10.328	4	2.582	5.149	<.001
	Within Groups	191.544	382	.501		
	Total	201.872	386			
People Attitude	Between Groups	28.469	4	7.117	14.549	<.001
	Within Groups	186.864	382	.489		
	Total	215.333	386			
Use of Technology & Gadgets	Between Groups	28.469	4	7.117	14.549	<.001
	Within Groups	186.864	382	.489		
	Total	215.333	386			

Table 32: Anova analysis of BMI

The above table shows the One Way ANOVA analysis results and statistically significant differences between the groups. The significance value for BMI and IV1 obesity phenomenon is

.009, which is less than the significance level of the interval, which is 0.05. Findings indicate that there are statistically significant differences between the BMI and the obesity phenomenon. Further, the post hoc test indicates statistically significant differences in the obesity phenomenon of the BMI group 20-25 and 31-35 ($p<.05$). The second column shows the significant value between the BMI and the IV2 obesity management. The significance value for BMI and IV2 obesity management is .60, which is more than the significance value of .05. Findings indicate no statistically significant differences between BMI and obesity management ($p>.05$). The third column shows the significant value between the BMI and the IV3 people's knowledge. The significance value for BMI and IV3 people's knowledge is .001, which is less than the significance value of .05. TFindingsindicates that there are statistically significant differences between BMI and people's knowledge. Further, the post hoc test indicates that there are statistically significant differences in the obesity phenomenon of the BMI group less than 20 and 25-30, 20-25 and 25-30, 20-25 and 31-35, 25-20, and 31-35 ($p<.05$).

The fourth column shows the significant value between the BMI and the IV4 diet management. The significance value for BMI and IV4 diet management is .002, which is less than the significance value of .05. Findings indicate that there are statistically significant differences between BMI and diet management. The post hoc test indicates a significant difference in the better lifestyles of the BMI group 20-25 and 31-35, 25-30, and 31-35 ($p<.05$). The fifth column shows the significant value between the BMI and the IV5 physical exercise. The significance value for BMI and IV5 physical exercise is .143, more than the significance level of interval .05. Findings indicate no statistically significant differences between BMI and physical exercise ($p>.05$). The sixth column shows the significant value between the BMI and the DV better lifestyle. The significance value for BMI and DV better lifestyle is .001, which is less than the significance value

.05. Findings indicate that there are statistically significant differences between BMI and a better lifestyle. The post hoc test indicates a significant difference in the better lifestyles of the BMI group 20-25 and 31-35, 25-30, and 31-35 ($p<.05$). The seventh column shows the significant value between the BMI and the mediator people's attitude. The significance value for BMI and mediator people attitudes is .001, which is less than the significance value of .05. Findings indicate that there are statistically significant differences between the BMI and the mediator people's attitude. The post hoc test indicates that there is a significant difference in the people's attitude of the BMI less than 20 and 25-30, 20-25 and 25-30, 20-25 and 31-35, 20-25, and 36-40 ($p<.05$). The eighth column shows the significant value between the BMI and the moderator's use of technology. The significance value for BMI and moderator use of technology is .001, which is less than the significance value of .05. Findings indicate that there are statistically significant differences between BMI and the use of technology. The post hoc test indicates that there is a significant difference in the moderator of the BMI less than 20 and 25-30, 20-25 and 25-30, 20-25 and 31-35, 20-25 and 36 to 40, 25-30 and 31-35, 36-40 ($p<.05$)

6.5 Hypothesis Testing

Hypothesis	Statements	Outcome
H1	There is a significant statistical relationship between the obesity phenomenon and a better lifestyle.	Not Accepted
H2	There is a significant statistical relationship between obesity management and a better lifestyle.	Not Accepted
H3	There is a significant statistical relationship between people's knowledge and a better lifestyle.	Accepted
H4	There is a significant statistical relationship between diet management and a better lifestyle.	Accepted
H5	There is a significant statistical relationship between physical exercise and a better lifestyle.	Not Accepted
H6	People's attitude partly arbitrates the relationship between the obesity phenomenon and a better lifestyle.	Not Accepted
H7	People attitude partly arbitrates the relationship between obesity management and a better lifestyle.	Not Accepted
H8	People's attitude partly arbitrates the relationship between people's knowledge and a better lifestyle.	Accepted
H9	People's attitude partly arbitrates the relationship between diet management and a better lifestyle.	Accepted
H10	People's attitude partly arbitrates the relationship between physical exercise and a better lifestyle.	Not Accepted
H11	The use of technology partially moderates the relationship between the obesity phenomenon and a better lifestyle.	Accepted
H12	The use of technology partially moderates the relationship between obesity management and a better lifestyle.	Accepted
H13	Use of technology moderates the relationship between people's knowledge and a better lifestyle.	Accepted
H14	Use of technology moderates the relationship between diet management and a better lifestyle.	Accepted
H15	Use of technology moderates the relationship between physical exercise and a better lifestyle.	Accepted
H16	There is a statistically significant effect of gender on obesity phenomena and diet management.	Accepted

Table 33: Hypothesis Testing Summary (part 1)

H17	There is a statistically significant effect of age on people's knowledge, physical exercise, better lifestyle, people attitude, and use of technology.	Accepted
H18	There is a statistically significant effect of education on obesity phenomena, people's knowledge, diet management, better lifestyle, attitude and use of technology.	Accepted
H19	There is a statistically significant effect of occupation on obesity management, people's knowledge, physical exercise, better lifestyle, attitude and use of technology.	Accepted
H20	There is a statistically significant effect of income on obesity management and diet management.	Accepted
H21	There is a statistically significant effect of BMI on obesity phenomena, people's knowledge, diet management, better lifestyle, attitude and use of technology.	Accepted

Table 34: Hypothesis Testing Summary (part 2)

H1: There is a significant statistical relationship between the obesity phenomenon and a better lifestyle.

Hypothesis H1 has been rejected as the relationship between obesity, and a better lifestyle is statistically non-significant. The bivariate Pearson correlation findings suggest that the obesity phenomenon is negatively correlated with a better lifestyle with the value of r=-0.87, which is considered a negative and weak linear association. Furthermore, findings from multiple regression analysis revealed that the value of sig= 0.707>0.05 is a significant interval level. Hence the model is non-significant with the β value of β = .020, which is irrelevant as the model no longer explains the association with a better lifestyle.

H2: There is a significant statistical relationship between obesity management and a better lifestyle.

H2 has been rejected as the relationship between obesity management, and a better lifestyle is statistically non-significant. The bivariate Pearson correlation findings suggest that obesity management is negatively correlated with a better lifestyle with the value of r= .072, which is considered a negative and weak linear association. Furthermore, the multiple regression analysis findings revealed that the value of sig= .452>0.05 is a significant interval level. Hence the model is non-significant with the negative β value of β = .033, which is irrelevant as the model no longer explains the association with a better lifestyle.

H3: There is a significant statistical relationship between people's knowledge and a better lifestyle.

H3 has been accepted as our findings suggest a statistically significant relationship between people's knowledge and better lifestyle as the relationship encompasses a positive linear association and is statistically significant. The bivariate Pearson correlation findings suggest that people's knowledge is positively correlated with a better lifestyle with the correlation coefficient value of r= .545, which is considered a positive and moderate linear association. Furthermore, findings from multiple regression analysis revealed that the value of sig= .000<0.05 is a significant level of the interval. Hence the model is statistically significant with the β value of β = .537, which entails the power to predict better lifestyles using people's knowledge of healthcare applications and wearable gadgets.

H4: There is a significant statistical relationship between diet management and a better lifestyle.

Hypothesis H4 has been accepted as the relationship between diet management and a better lifestyle is statistically significant. The bivariate Pearson correlation findings suggest that diet

management is positively correlated with a better lifestyle with the value of r= .520, which is considered a positive and moderate association. Furthermore, findings from multiple regression analysis revealed that the value of sig= 0.03>0.05 is a significant interval level. Hence the model is significant with the negative β value of β =-.158

H5: There is a significant statistical relationship between physical exercise and a better lifestyle.

H5 has been rejected as the relationship between diet management and a better lifestyle is statistically non-significant. The bivariate Pearson correlation findings suggest that physical exercise is positively correlated with a better lifestyle with the value of r= .13, which is considered a positive and weak linear association. Furthermore, the multiple regression analysis findings revealed that the value of sig= .824>0.05 is a significant interval level. Hence the model is non-significant with the β value of β = -.010, which is irrelevant as the model no longer explains the association with a better lifestyle.

H6: People's Attitude partially mediates the relationship between the obesity phenomenon and a better lifestyle.

H6 has been rejected as findings show that people's attitude does not partially mediate the relationship between the obesity phenomenon and better lifestyle because the obesity phenomenon is not a significant predictor. The model summary for the obesity phenomenon suggests the value of Sig F change is Sig = 0.08>0.05. The model is non-significant as R's value is weak, which R is=0.087 and the value of R square is 0.008. The model is insufficient to be tested for partial testing of people's mediating role because there is a negative linear association between the independent and dependent variables.

H7: People's Attitude partially mediates the relationship between obesity management and a better lifestyle.

H7 has been rejected. People's attitude does not mediate the relationship between obesity management and better lifestyle because obesity management is not a significant predictor as the model summary for obesity management suggests a value of Sig F change is Sig = .158>0.05. The model is non-significant as R's value is weak, which R is=0.072 and the value of R square is 0.005. The model is not sufficient to test people's mediating role because there is no linear association between the independent and dependent variables.

H8: People's Attitude mediates the relationship between people's knowledge and a better lifestyle.

H8 has been accepted as people's attitude does not fully mediate but partially mediate the relationship between knowledge and a better lifestyle. Findings from the bivariate correlation suggest a positive linear association between people's knowledge and better lifestyle with the value of the correlation coefficient of r= 0.545, which is a moderate correlation. Inter correlation between people's knowledge and attitude towards healthcare application suggests the value of correlation coefficient of r= 0.284, which is considered weakly correlated. Hayes process macro analysis has been used to investigate people's mediating role, which suggests that R-Square for this model is .302, which indicates that 30% variation in people attitude is because of people knowledge. F value is 83.23 and p=0.0000; hence p<0.05 indicates that the model is statistically significant. β is 0.743, t=2.1978, p= 0.286. Hence p<0.05, and there is no "0" between LLCI and ULCI, which indicates that β is statistically significant. For people's knowledge, the β1 coefficient value is 0.587, t=11.75., p=0.000. Hence p>0.05, and there is no"0" between LLCI and ULCI, which indicates that people's knowledge has had a statistically significant positive relationship with people's

attitudes. People's attitude and better lifestyle can be explored where people attitude β2 coefficient value was 0.1441, t= 1.754, p=0080. Hence p>0.05 made the relationship, and there was "0" between LLCI and ULCI, which indicated that people's attitude towards healthcare applications and wearable gadgets had no statistically significant positive relationship with a better lifestyle. The relation between people's knowledge and better lifestyle was a significant indirect effect and remained significant in indirect effect after applying the mediation variable of people attitude. Hence the change in the B value was observed. Before, it was .1725, and after introducing the mediator, it has increased to .5877. Hence there was statistically significant partial mediation in our model, but the value of indirect effect suggested that the model had no mediation; thus, people's attitude did not mediate the relationship between people's knowledge and better lifestyle. Our research findings were supported by the previous finding of (Sajwani *et al.,* 2009; Shakkour, 2017; Girotto *et al.,* 2018), which stated that people attitude does not always play a role in impacting a better lifestyle. Similarly, findings of (Hamzah *et al.,* 2011; Kempen *et al.,* 2012; Askarian *et al.,* 2013; Amarasekara *et al.,* 2015) showed that people who know directly change their lifestyles towards the healthy one.

H9: People's Attitude partly arbitrates the relationship between diet management and a better lifestyle.

Proposed hypothesis H9 has been accepted, which shows that people's attitude partially mediates the relationship between diet management and a better lifestyle. Hayes process macro analysis was used to investigate people's mediating role, which suggested that R-Square for this model was .4321, which indicated that 43% variation in people attitude was because of diet management. F value was 146.1 and p=0.0000; hence p<0.05 indicated that the model was statistically significant. β was 1.326, t=5.158, p= 0.00. Hence p<0.05, and there was no "0" between LLCI and ULCI,

which indicated that β was statistically significant. For diet management, β1 coefficient value was -.0258, t=.5392, p= .590. Hence p>0.05, and there was no"0" between LLCI and ULCI, which indicated that diet management had no statistically significant positive relationship with people's attitudes. People attitude and better lifestyle can be explored where people attitude β2 coefficient value was .6340, t= 16.924, p=000 Hence p<0.05 made the relationship, and there was "0" between LLCI and ULCI, which indicated that people's attitude towards healthcare applications and wearable gadgets had a statistically significant positive relationship with a better lifestyle. The relation between diet management and better lifestyle was a significant indirect effect, but it became insignificant in indirect effect after applying the mediation variable of people attitude. Hence the change in the B value was observed. Before, it was -1.39, and after introducing the mediator, it has increased to .0258. Hence there was statistically significant partial mediation in our model. The value of indirect effect suggests that the model has mediation; thus, people's attitude mediated the relationship between diet management and a better lifestyle. The literature supports the results, stating that cognitive restructuring is about changing thinking patterns to create awareness amongst obese patients because many obese individuals have lower self-esteem and self-image. So when one works on him through patterns, it changes his attitude and helps in diet management and living a better lifestyle (Cwerner and Gadsby, 2014).

H10: People's Attitude partly arbitrates the relationship between physical exercise and a better lifestyle.

Proposed hypothesis H10 has been rejected, which shows that people's attitude partially mediates the relationship between physical activity and a better lifestyle. People's attitude did not mediate the relationship between physical exercise and a better lifestyle because physical exercise was not a significant predictor as the model summary for physical exercise suggested a value of Sig F

change was Sig = .158>0.05. The model was non-significant as R's value is weak, which R =0.072, and the value of R square was 0.005. The model was insufficient to test people's mediating role because there was no linear association between the independent and dependent variables. Our findings are not supported by the previous findings, which show a significant relationship in health behaviour, planning, physical activity and a significant relationship between monitoring or feedback and physical activity, as well as the significant relationship between adhering to the doctor's advice and feedback (Gilliland *et al.*, 2016).

H11: The use of technology partially moderates the relationship between the obesity phenomenon and a better lifestyle.

Proposed hypothesis H11 has been accepted as the use of technology partially moderates the relationship between the obesity phenomenon and a better lifestyle. The use of technology did not make entirely moderate but partially moderated the relationship between the obesity phenomenon and a better lifestyle. However, including a moderator in the model made it a significant model with a value of R= .67 and R square=0.45, which suggested a 45% variability that the given model explained the better lifestyle with the uses of technology and healthcare application as a moderator. The obesity phenomenon was not a significant predictor as the significance level value was Sig = .884>0.05. The use of technology as a moderator reported Sig=.000<0.05 and beta value of β2=.550. Findings suggested a partial moderation of healthcare technology as there was a statistically significant relationship between the uses of technology and a better lifestyle. Findings of this study validate previous studies conducted by (Padmasekara,2014; Seiler and Hüttermann, 2015; Shih *et al.,* 2015; Flores Mateo *et al.,* 2015; Jacek *et al.,* 2016) whereas rejected previous studies conducted by (Middelweerd *et al.,* 2014; Herrmann and Kim, 2017) which suggests that technology does not partially moderate connections. A non-randomized experiment by Mosqueda

revealed that no significant weight loss changes were found with the same baseline characteristics of participants *(Mosqueda et al.,* 2012). The findings of Almeida *et al.* (2015) have been accepted as more important uses of self-monitoring and management websites lead to increased user engagement with the website, which in return served to increase the users' physical activity.

H12: The use of technology partially moderates the relationship between obesity management and a better lifestyle.

Proposed hypothesis H12 has been accepted as technology partially moderates the relationship between obesity management and a better lifestyle. The use of technology did not make entirely moderate but partially moderated the relationship between obesity management and a better lifestyle. However, including a moderator in the model made it a significant model with a value of R= .67 and R square=0.45, which suggested a 45% variability that the given model explains the better lifestyle with the uses of technology and healthcare application as a moderator. Obesity management was not a significant predictor as the significance level value was Sig = .764>0.05. The use of technology as a moderator reported Sig=.000<0.05, the interval's significance level with the beta value of β2=.550. Findings suggested a partial moderation of healthcare technology users as there was a statistically significant relationship between the uses of technology and a better lifestyle. The results validate previous findings of (Brener and Nikitovic, 2013; Kelley, 2014; Wortley *et al.,* 2017; Sunyaev *et al.,* 2017; Goodyear, Kerver and Quennerstedt 2017; Marcolino *et al.,* 2018; Al-Hazzaa, 2018) while rejecting (Pagoto and Bennett, 2013; Middelweerd *et al.,* 2014; Herrmann and Kim, 2017;). Our findings reject Kerner and Goodyear (2017), which suggests that people's life satisfaction reduced significantly after the use of smartwatches. Moreover, the same study's qualitative findings revealed a short-term increase in life satisfaction caused by the fulfilment of early motivating factors like competition, feelings of

guilt, and pressure. Thus, Kerner argues that a healthy lifestyle and technology do not always increase long-term life satisfaction and motivation (Goodyear, Kerver and Quennerstedt 2017). Even though the health as and m-health interventions promote weight loss, a contrasting argument can be provided based on which reviewed 38 weight loss as related to bariatric surgery and found that a significant proportion of these did not have any input by the health professional (Stevens *et al.,* 2014).

H13: Use of technology moderates the relationship between people's knowledge and a better lifestyle.

Proposed hypothesis H13 has been accepted as the use of technology moderates the relationship between people's knowledge and a better lifestyle. The use of technology fully moderated the relationship between people's knowledge of healthcare applications and a better lifestyle. However, including a moderator in the model made it a significant model with a value of R= .670 and R square=0.45, which suggested a 45% of variability that the given model explained the better lifestyle with the uses of technology and healthcare application as a moderator. People's knowledge was a significant predictor as the significance level value was Sig = 0.00>0.05 with the β= .622. Introducing uses of the uses of technology as a moderator reported the value of significance level of Sig=.000<0.05, which was the interval's significance level with the beta value of β2=.550. Findings suggested that using healthcare applications and wearable gadgets moderated' relationship between knowledge and a better lifestyle. The findings of (Cho and Qi, 2008; Peprah *et al.,* 2019) Pagoto and Bennett, (2013) have also been accepted as the findings revealed that dietary adherence was higher and statistically significant in the group utilizing a smartphone-based a than the website and paper diary-based group.

H14: Use of technology moderates the relationship between diet management and a better lifestyle.

Proposed hypothesis H14 has been accepted as the use of technology moderates the relationship between diet management and a better lifestyle. The use of technology fully moderated the relationship between diet management and a better lifestyle. However, including a moderator in the model made it a significant model with a value of R= .670 and R square=0.45, which suggested a 45% of variability that the given model explained the better lifestyle with the uses of technology and healthcare application as a moderator. Diet management was a significant predictor as the significance level value was Sig = 0.03>0.05 with the β= .622. Introducing uses of the uses of technology as a moderator reported the value of significance level of Sig=.000<0.05, which was the interval's significance level with the beta value of β2=.550. Findings suggested that healthcare applications and wearable gadgets moderate the relationship between diet management and a better lifestyle. The results validated the report on *"Applied Behavioural Insights and Promotion of Healthy Eating"* conducted by Gilliland *et al.,* (2016), which identified nudging as an essential feature that should be part of health applications. Nudges are essential for boosting social psychology to realize the desired outcome. Gilliland *et al.,* (2015) studied the impact of the smartphone application *"Smart Petite"* on dietary behaviour. The study's findings showed that the smartphone application *"Smart Petite"* was operative in improving eating behaviours through behaviour change techniques and a behavioural economic approach. Thus the consumption of healthy foods was increased. The findings of Coughlin *et al*., (2016) revealed that usage of smartphone applications that promote health indicated better dietary behaviours with lower-calorie, low fat, and a higher degree of weight loss. In contrast, higher consumption of healthier foods and a higher level of physical activity was also identified. On the other hand, diet tracking

using wearable gadgets is the biggest challenge for self-tracking due to the unavailability of an accurate automatic tracking system for the intake of amount and calories by users or other relevant information. It is also the biggest challenge for managing obesity by controlling diet, so extensive research and resources are needed to develop automatic AI wearable gadgets to manage metabolic syndrome (Kim, 2014).

H15: Use of technology moderates the relationship between physical exercise and a better lifestyle.

Proposed hypothesis H15 has been accepted as the use of technology moderates the relationship between physical exercise and a better lifestyle. The use of technology fully moderated the relationship between physical exercise and a better lifestyle. However, including a moderator in the model made it a significant model with a value of R= .670 and R square=0.45, which suggested 45% of variability that the given model explained the better lifestyle with the uses of technology and healthcare application as a moderator. Physical exercise was not a significant predictor as the significance level value was Sig = 0.824>0.05 with the β= -.009. Introducing uses of the uses of technology as a moderator reported the value of significance level of Sig=.000<0.05, which was the interval's significance level with the beta value of β2=.550. Findings suggested that using healthcare applications and wearable gadgets moderated the relationship between physical exercise and a better lifestyle. The results validate the findings of Empirical evidence from the research of Stephanie *et al*., (2016) reported that a-based intervention effectively improved dietary and sedentary behaviours and enhanced the level of physical activity among individuals. Salim *et al*., (2017) evaluated the mobile applications that implement a persuasive design for the elderly to ensure a healthier diet. A health application was developed for the study to suggest menus and calorie intake based on Body Mass Index (BMI). Several persuasive techniques were used within,

and a *"Unified Theory of Acceptance* and Use of Technology (UTAUT)" was also applied to evaluate the study. A sample of 9 students, as part of the study, reported a 90% positive response on the factors of usefulness, consistent quality, monitoring, and others. Lastly, it was identified that the health application showed improvement in diet intake behaviours from day 1 to 3.

H16: There is a statistically significant effect of gender on obesity phenomena and diet management.

Proposed hypothesis H16 has been accepted as gender had a significant effect on obesity phenomena and diet management. There were significant differences in gender of obesity phenomenon and diet management. Statistically significant differences were found between males and females concerning the obesity phenomenon ($p<.05$). Females scored higher on it ($M=3.9167$, $S.D=.5439$) than males ($M=3.77$, $S.D=.53610$). Statistically significant differences were found between males and females concerning diet management ($p<.05$). Males scored higher on it ($M=4.1685$, $S.D= .61278$) than females ($M=4.0172$, $S.D=.55269$). Our findings validate the findings of the previous literature, which states that females are more engaged in the obesity phenomenon than males, and they are less manageable concerning their diet. While Males are reported to be found less in terms of obesity, and they also manage and take care of their diet more than the females (Al-Sejari, 2017; Alkazemi 2019).

H17: There is a statistically significant effect of age on people's knowledge, physical exercise, better lifestyle, people attitude, and use of technology.

Proposed hypothesis H17 has been accepted as age significantly impacts people's knowledge, physical exercise, better lifestyle, attitude, and use of technology. The significance value for age and IV3 people's knowledge was .001, which was less than the significance value of .05. Findings

indicated statistically significant differences between age and people's knowledge. Further, the post hoc test indicated statistically significant differences in people's knowledge of the age group 18-30 and 70 and above, 31-49 and 70 and above, and 50-69 and 70 and above ($p<.05$). The significance value for age and IV5 physical exercise was .013, less than the significance value of .05. Findings indicated statistically significant differences between age and physical exercise. The post hoc test indicated significant differences in physical exercise between age groups of 18-30 and 70 and above, 31-49, and 70 and above ($p<.05$). The significance value for age and DV better lifestyle was .002, which was less than the significance value of .05. Findings indicated statistically significant differences between the age and the better lifestyle. The post hoc test indicated a significant difference in the better lifestyles of the age group 18-30 and 70 and above, 31-49 and 70 and above, 50-69 and 70 and above ($p<.05$). The significance value for age and mediator use of technology is .001 was less than the significance value .05. Findings indicated statistically significant differences between the age and the mediator's use of technology. The post hoc test indicated a significant difference in the mediator of the age group 18-30 and 70 and above, 31-49 and 70 and above, 50-69 and 70 and above ($p<.05$). The significance value for age and moderator use of technology was .001, which was less than the significance value of .05. Findings indicated statistically significant differences between the age and the moderator. The post hoc test indicated a significant difference in the moderator of the age group 18-30 and 70 and above, 31-49 and 70 and above, 50-69 and 70 and above ($p<.05$). The findings are supported by the previous literature, which states that old people seem to have more knowledge regarding different things and issues, especially in terms of diet-related information. They are more cautious as well as aware. They gather good valuable data regarding the diet plan and management and have a proper attitude

towards their physical exercises and lifestyle compared to people with minor age or younger (Allafi and Waslien, 2014; Balhareth *et al.*, 2019).

H18: There is a statistically significant effect of education on obesity phenomena, people knowledge, diet management, better lifestyle, people attitude and use of technology.

Proposed hypothesis H18 has been accepted as education has a statistically significant effect on obesity phenomena, people knowledge, diet management, better lifestyle, people attitude and use of technology. **T**he significance value for education and IV1 obesity phenomenon was .026, less than the significance value of .05. Findings indicated a statistically significant difference between education and the obesity phenomenon. The post hoc test indicated statistically significant differences in the obesity phenomenon of the education groups' high school and postgraduates ($p<.05$). The significance value for education and IV3 people's knowledge was .001, which was less than the significance value of .05. Findings indicated statistically significant differences between education and people's knowledge. The post hoc test indicated statistically significant differences in high school education groups and others, graduate and others and postgraduate and others ($p<.05$). The significance value for education and IV4 diet management was .042, less than the significance value of .05. Findings indicated a statistically significant difference between education and diet management. The post hoc test indicated statistically significant differences in diet management of the education groups high school and postgraduate ($p<.05$). The significance value for education and DV better lifestyle was .004, less than the significance value of .05. Findings indicated statistically significant differences between education and a better lifestyle. The post hoc test indicated a significant difference in the better lifestyles of education groups high school and graduate, high school, and others ($p<.05$). The significance value for education and mediator use of technology was .001, which was less than the significance value of .05.

Findings indicated statistically significant differences between the education and the mediator use of technology. The post hoc test indicated a significant difference in the mediator between the education groups' high school and postgraduate and others ($p<.05$). The significance value for education and moderator use of technology was .001, less than the significance value .05. Findings indicated a statistically significant difference between the moderator and the education high school and others, postgraduate and others ($p<.05$). Our findings are supported by the previous literature, which states that education plays a vital role in providing people with valid and authentic information. People who are educated are capable of getting valuable and authentic data. They are more aware of the use of technology and the benefits and harmful effects of a particular activity and diet as compared to people who are less educated (Balhareth *et al.,* 2019)

H19: There is a statistically significant effect of occupation on obesity management, people knowledge, physical exercise, better lifestyle, people attitude and use of technology.

Proposed hypothesis H19 has been accepted as there is a statistically significant effect of occupation on obesity management, people knowledge, physical exercise, better lifestyle, people attitude, and use of technology. The significance value for occupation and IV2 obesity management was .019, less than the significance value of .05. Findings indicated a statistically significant difference between occupation and obesity management. The post hoc test indicated statistically significant differences in obesity management of the occupation self-employed and student ($p<.05$). The significance value for occupation and IV3 people's knowledge is .001 was less than the significance value .05. Findings indicated a statistically significant difference between the occupation and the people's knowledge. The post hoc test indicated statistically significant differences in people's knowledge of employed and unemployed, employed and student, unemployed and self-employed, and unemployed ($p<.05$). The significance value for occupation

and IV5 physical exercise is .001 was less than the significance value of .05. Findings indicated a statistically significant difference between the occupation and the physical exercise. The post hoc test indicated a significant difference in the physical exercise of employed and unemployed, unemployed and self-employed, unemployed and student ($p<.05$). The significance value for occupation and DV better lifestyle is .001 was less than the significance value .05. Findings indicated statistically significant differences between the occupation and the better lifestyle.

The post hoc test indicated a significant difference in the better lifestyles of employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$). The significance value for occupation and mediator use of technology was .001, which was less than the significance value of .05. Findings indicated statistically significant differences between the occupation and the mediator's use of technology. The post hoc test indicated a significant difference in the mediator of the occupations of employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$). The significance value for occupation and moderator use of technology was .001, which was less than the significance value of .05. Findings indicated a statistically significant difference between the moderator and the occupations employed and unemployed, employed and student, unemployed and self-employed, unemployed and student ($p<.05$). Our findings are supported by the literature findings, which state that occupation plays a vital role in impacting the management of obesity and physical exercise. The lifestyle is different of people who are employed, and they take care of their physical activity and obesity as compared to those who are unemployed and do not work (Alyouhah *et al.*, 2018),

H20: There is a statistically significant effect of income on obesity management and diet management.

Proposed hypothesis H20 has been accepted as income has a statistically significant effect on obesity management and diet management. The significance value for income and IV2 obesity management was .042, less than the significance value of .05. Findings indicated statistically significant differences between income and obesity management. Further, the post hoc test indicated statistically significant differences in obesity management between incomes below 1000KD and 3000-4000KD ($p<.05$). The significance value for occupation and IV4 diet management was .004, which was less than the significance level of the interval, i.e .05. Findings indicated a statistically significant difference between income and diet management. The post hoc test indicated statistically significant differences in diet management of the incomes 2000-3000KD and 3000-4000KD ($p<.05$). Our findings are supported by the previous findings, which state that people who have good income and can afford good diet plans and nutritionists have good management of their obesity and lifestyle compared to those who have less income (Al-Kutbe *et al.,* 2017).

H21: There is a statistically significant effect of BMI on obesity phenomena, people knowledge, diet management, better lifestyle, people attitude and use of technology.

Proposed hypothesis H21 has been accepted as there is a statistically significant effect of BMI on obesity phenomena, people's knowledge, diet management, better lifestyle, attitude, and use of technology. The significance value for BMI and IV1 obesity phenomenon was .009, which was less than .05. Findings indicated a statistically significant difference between the BMI and the obesity phenomenon. Further, the post hoc test indicated statistically significant differences in the obesity phenomenon of the BMI group 20-25 and 31-35 ($p<.05$). The significance value for BMI and IV3 people's knowledge was .001, less than the significance value of .05. Findings indicated a statistically significant difference between the BMI and the people's knowledge. Further, the post

hoc test indicated statistically significant differences in obesity phenomenon of the BMI group less than 20 and 25-30, 20-25 and 25-30, 20-25 and 31-35, 25-20 and 31-35 ($p<.05$). The significance value for BMI and IV4 diet management was .002, which was less than the significance value of .05. Findings indicated statistically significant differences between BMI and diet management. The post hoc test indicated a significant difference in the better lifestyles of the BMI group 20-25 and 31-35, 25-30, and 31-35 ($p<.05$). The significance value for BMI and DV better lifestyle was .001 less than the significance value .05. Findings indicated statistically significant differences between the BMI and the better lifestyle. The post hoc test indicated a significant difference in the better lifestyles of the BMI group 20-25 and 31-35, 25-30, and 31-35 ($p<.05$). The significance value for BMI and mediator use of technology was .001, which was less than the significance value of .05. Findings indicated a statistically significant difference between the BMI and the mediator use of technology. The post hoc test indicated a significant difference in the BMI mediator of less than 20 and 25-30, 20-25 and 25-30, 20-25 and 31-35, 20-25 and 36-40 ($p<.05$). The significance value for BMI and moderator use of technology was .001, which was less than the significance value of .05. Findings indicated a statistically significant difference between the BMI and the moderator. The post hoc test indicated a significant difference in the moderator of the BMI less than 20 and 25-30, 20-25 and 25-30, 20-25 and 31-35, 20-25 and 36 to 40, 25-30, and 31-35, 36-40 ($p<.05$). The findings are supported by the previous literature, which suggests that people who have high BMI's are more conscious, and they work more on their obesity by managing their diet and adopting a fixed diet routine. They use technology to gather information to work on their diet compared to those who have a lower BMI. They are less diet-conscious, which in turn makes them less aware of the diet-related information and management (Rabeea *et al.*, 2019)

CHAPTER 7: Contribution, Recommendations, and Conclusion

The positive impacts of health applications and wearable technology have been observed through in-depth literature study and data analysis within our study. This chapter will provide details on the contribution of the research study from the perspective of people dealing with obesity. Additionally, those who want to remain healthy, general practitioners and the developers of such technologies.

7.1 Contribution to the study

7.1.1 Theoretical Contribution towards the development of the New Conceptual framework

The proposed study adds valuable insight to the knowledge area by proposing a new framework to tackle obesity. This proposed framework is a new extension to the knowledge created by the different researchers (Cheung *et al.,* 2019; Sartorius *et al.,* 2015; Sven *et al.,* 2017; Vallis, 2016). France will enable future researchers and scientists to use the new research data, which can be interpreted and coded for future use to explain, predict and understand phenomena and challenges and to extend existing knowledge within the limits of critical bounding assumptions. The proposed theoretical models include the "*Trans-theoretical Model", "Technological Acceptance Model*", and "Adaptive Complex Systems". They provide an understanding of theories and concepts relevant to healthcare technology for addressing the epidemic of obesity and achieve a better lifestyle. Based on the Trans-Theoretical model, the current study proposed that behavioural change (including obesity management, obesity phenomenon, and people knowledge) for people using technology enhances their healthy lifestyle, which influences physical activities like exercise and dietary changes. Inconsistency with Technology Acceptance Model current study proposed that obesity management, Obesity Phenomenon, and people's knowledge motivate the people's attitude towards a healthy lifestyle which affects their behaviour of using the technology and

wearable gadget. By analyzing the application of Adaptive Complex Systems, the current study suggested that the use of technology and wearable gadgets helps improve people's lifestyles who want to overcome the obesity problem. Such devices motivated them to overcome their problems and improve their lifestyle.

Therefore, the current study framework intends to connect the researcher to existing knowledge by providing the intellectual transition. Setting unrealistic weight loss goals can also result in inconsistent following the health application-based diet plans or keeping up with set physical activity levels (Sven *et al.,* 2017). It has been observed through literature study that users of m-health technology stop using the health tech applications or wearable gadgets after some time, which means the reason behind such behavioural patterns should be researched upon in future research as well as how the health application can engage the user for a longer duration. Furthermore, it was also found that the relationship between the duration of usage of health tech applications and wearable gadgets and its impact on managing obesity. Furthermore, research can be done along with these factors that lead to the abandonment of health tech applications and wearable gadgets.

7.1.2 Contribution towards tackling Obesity-Related Health Concerns in GCC

This proposed study adds valuable insight to the GCC public dealing with the epidemic of obesity as findings of the study suggest that the use of wearable technology and healthcare application is highly effective and helpful in improving health and physical activity among the users due to the features that assist in the recording of BMI, footsteps, heart rate, sleep patterns and other valuable features. Findings showed that knowledge of healthcare applications and wearable gadgets mediated by people's attitudes and moderated by technology could enable GCC residents to achieve a better lifestyle. Kuwaiti nationals have a high rate of obesity; therefore, managing obesity

has become a key concern to live a healthier lifestyle. To manage obesity, health-tech applications and wearable technologies can play an essential and critical role. M-health is a technology that can bring improvements in the lifestyles of people. Obese individuals are recommended to use m-health technology in their daily lives as our research findings in support of the past findings suggested that usage of health tech applications and wearable technology can not only reduce the weight but also improve eating patterns and diet as well as help in improving physical activity levels that will ultimately improve their quality of life. So, it is recommended that the more extended the individuals will keep themselves engaged in such programs, the higher the chances will be for having good mental and physical health as reduced weight means reduced stress and higher satisfaction levels (Paul *et al.,* 2016).

7.1.3 Contribution towards Marketing of healthcare applications and Wearable Gadgets

The study's findings posed significant implications for companies marketing healthcare applications and wearable gadgets amongst consumers. Findings provided imperatives to market the value proposition of a better lifestyle achieved through the moderating role of people's attitude, knowledge, and diet management. This study posed significant implications for companies to focus their advertorials using the central route of persuasion to enhance knowledge and diet management mediated by attitude and moderated by healthcare applications to achieve a better lifestyle. According to the Internet World Stats (2019), Kuwait's internet penetration rate is above 96%, which suggests that there is high potential in terms of people's online engagement in the Kuwait region. Therefore, m-health can help manage obesity by engaging people in changing their lifestyle towards a healthier and fitness-based lifestyle. Kuwait ranks second among the MENA countries on the mobile connectivity index (GSMA, 2019). This means the technological structure is strong enough to support integrating the health care system and managing obesity.

7.2 Recommendations

7.2.1 Implications of Obese Individuals

Health applications and wearable gadgets are helpful for dietary self-monitoring as these devices can track blood pressure, blood glucose, and other health-related symptoms. Weight management is associated with behavioural patterns, and diet tracking is an essential feature that is recommended because of beneficial features such as it can help users keep a check on their calorie intake and plan healthier meals. So, it is recommended to study behavioural patterns that result in adoption or rejection and improve the health tech applications and wearable gadgets. Furthermore, other factors can be studied in m-health and wearable technology with its cause-and-effect relation with obesity in future research, such as investigating cognitive and environmental determinants of weight loss maintenance that can be improved by using health tech applications and wearable technology (Varkevisser 2018).

Individuals dealing with obesity issues tend to feel awkward or embarrassed to discuss their weight. At the same time, many of the people that are obese may not know or care if they are facing this problem. Another factor is that lifestyle change or joining a weight loss program may not appeal to obese people. To support the cause of managing obesity through health tech applications and wearable gadgets, the individuals who face such issues need to encourage through media and social campaigns to join such programs that can result in a better life for the individuals (Public Health England, 2014). Short-term weight loss programs also have helped reduce body mass and increase physical activity that uses activity-tracking monitors. So, individuals that do not like extended weight loss programs due to busy life or due to complacency but seek to reduce weight so short term or flexible programs can be developed within the smart tech applications with the help of consultants that support such individuals (Park, Hwang, and Choi, 2019).

It has been observed that quality of life is an essential factor in obesity as it can negatively impact an individual's health (Busutil *et al.,* 2017). It is recommended that researchers and health professionals work together to develop new technologies that can help manage health and weight, and energy balance more successfully. In addition, it is recommended that the researcher and developers analyze the positive and negative impacts of dietary habits (Sharpe *et al.*, 2018).

7.2.2 Implications for Research and Development of Healthcare technology

Medical practitioners can employ strategies such as Cognitive behaviour therapy (CBT), Social cognitive theory, Aberdeen, Coventry, and London-Refined (CALO-RE) taxonomy of behaviour changes techniques through virtual consultation that can help behaviour change among obese individuals. In addition to this, action planning strategies can be employed for individuals that do not know how to enhance activity. Environmental support strategies are required to be employed by consultants for elders and individuals who belong to low socioeconomic status as they cannot afford a fitness tracker. The authors recommended that accuracy in measuring physical activity and health is a critical factor in increasing the usage of health tech applications and wearable gadgets. The more reliable the results will be, the higher the confidence users will have in using the applications (Sulliva and Lachman, 2016).

It has been studied that users stop using health tech applications and wearable devices after some time. The developers of such applications and wearable devices can engage the users in rewards for achieving the goals and prolong the usage of health tech applications and wearable devices.

The hospitals can partner with fitness trainers, physiologists, and other related health professionals to bring efficiency. It has been found that the margin of error can be costly due to patients attributing symptoms of data that may be unreliable; therefore, medical training of patients is another implication. Researchers and developers of health tech applications and wearable gadgets

can employ instructional design methodologies to make the user interface and design simple and more comfortable. The training of health professionals is essential in the effective management of the obesity issue. The integrated system can improve the lack of proficiency among the health professionals in dealing with applications and wearable gadgets with training.

Studying the societal factors that lead to obesity and weight loss is vital. The social factors contributing to weight loss can be designed under an integrated framework that encourages physical activity and weight loss. If gadgets are to be integrated into health care systems, it is also necessary to begin developing programs aligned with proper training for doctors. This integration of the healthcare system can result in the standardization of information. There are various concerns about using consumer gadgets in health care. Therefore, the implication for medical practitioners is that they should try to work with researchers in an open, constructive dialogue in an attempt to effectively approach these advanced technologies in such a manner that certifies the safe use of wearable technology and making it a valuable asset for health care (Piwek *et al.*, 2016).

M-health technology is transforming the health care system around the world. The growth has been exceptional in using health tech applications and wearable gadgets over the last decade. The focus of the M-health care industry should be on improving the health tech applications and wearable gadgets by increasing processing capabilities, improving geospatial tracking, movement base accelerometers, and touch-screen technologies, reducing unit costs, extended functionality and remote monitoring features (Greenspun and Coughlin, 2012). Privacy has been one of the critical concerns found in the study. Such technologies need to ensure more privacy through security protocols in the application and gadget development.

System designs have been recommended to control obesity by Mohammed *et al*., (2018) need to involve both the physical and cognitive elements that should be backed up by positive feedback to

motivate patients in their weight loss process. Moreover, they have recommended a design that combines health-oriented WBANs and mobile applications in monitoring physical activity and eating behaviours. In the words of Mohammed *et al.*, (2018), WBAN is *"a set of low power devices such as microphones, headphones, or sensors used in the body that wirelessly communicates whit a central unit."*

It is recommended to use mobile interventions to manage obesity by gadgets that effectively reduce weight. It has been found that the armband device effectively reduces weight. It has also been seen that the technology base approaches have been cost-effective in weight loss compared to weight loss via lifestyle changes among obese individuals. It is recommended to make such health tech applications and wearable gadgets cost-effective to easily accessible to the concerned individuals (Paul *et al.*, 2016).

It is recommended to build such wearable gadgets integrated with health applications that help measure and reduce circumference to reduce weight for elder or disabled individuals (Paul *et al.*, 2016). It is recommended to identify and motivate individuals at the most significant risk for physical inactivity or poor health and study factors that act as barriers to increasing physical activity levels and barriers to adopting health tech applications and wearable technology. There is a high potential for using fitness technology in intervention research in the context of increasing physical activity. It is recommended to overcome issues such as the absence of publicly available algorithms and reproducibility. The focus should be on bringing standardization among these health applications and gadgets. Many measurement differences in these health applications and gadgets have been identified when used on different smartphone types (Sulliva and Lachman, 2016).

Strategies such as *"goal-setting, self-monitoring, feedback, rewards, social support, and coaching"* have been recommended by Sulliva and Lachman (2016) for improving behaviours that further can be applied by a health professional in consulting and modelling weights loss programs for the obese patients as well as for those carry different diseases caused by obesity. Some of the other ways to integrate health applications and gadgets with the health care system of hospitals can incorporate birth and death notifications via mobile devices can help record-keeping such as maternal health records linked with child health outcomes and timely health and social services such as vaccination. Digital stock management can help in potential cost savings in managing national ordering routines and local needs and the supervision of health workers, and in bringing accuracy in the forecasting of stock (World Health Organization, 2019).

The research and development of the clinical algorithms used within decision support aspects of health tech systems are at the moment imprecise. Therefore, there is a need to identify best practices to refine these algorithms to bring clinical effectiveness and higher acceptability of the health care applications and wearable gadgets (World Health Organization, 2019). Research and development can improve health worker performance and adherence by bringing effectiveness across various digital tracking platforms. Further, the focus should be on minimizing the dual burden on operating paper and digital systems' health workers. Artificial intelligence technology is recommended for developing health care applications systems and wearable gadgets technology (World Health Organization, 2019). It is suggested for health professionals to focus on targeted and direct client communication through tech applications and wearable technology to identify gaps and to increase effectiveness for health worker (HW) interventions, health system interventions, and client interventions (World Health Organization, 2019).

M-health has been an effective use of technology for treating health and weight-related issues. Despite the high number of users of Smartphone technology and health applications, the health tech applications lack features in the context of Arabic culture (Alnasser *et al.*, 2016). Therefore, it is recommended to develop health tech applications that match the culture of Kuwait. Kuwait should build a framework similar to that of the Drug and Food Administration of the United States and the *"National Medical Service"* in the UK to ensure innovation and patient safety and prevent regulatory duplication. Such a framework can regulate procedures that serve as an open-source and can assist the medical researcher in addressing patient data safety, security, and reliability concerns. The health care, the government, and IT professionals need to combine as a team and address future concerns such as decoding the "big data" from a wearable device as current feedback designed for patient's health wearable around statistics. Adding at this moment, they need to develop more personalized and user-friendly feedback and behavioural engagement (Piwek *et al.*, 2016). Wearable technology has changed the way to collect and analyze health care data in a clinically relevant manner. These health care devices require specific technology to support handling and visualization. Moreover, the outcomes and costs related to wearable care are unknown and have impeded the adoption at a large scale. Therefore, regulatory bodies need guidance and support for better implementation and wearable technology in healthcare services (Liao *et al.*, 2019).

7.2.3 Implications for Public Health

The research can be done to identify how these technologies can be implemented among marginalized populations. Further medical practitioners and policymakers can play their role in service delivery planning for those individuals and communities who opt out of or cannot afford to use such systems when implemented at a large scale (World Health Organization, 2019). Cost-

effective and affordable feasibility planning is recommended to incorporate these emerging technologies on a large scale. The government has a vital role in handling this plan as the government can invest in developing an infrastructure that promotes a healthier lifestyle. The government can lead mobile ad campaigns to promote health awareness and engage consumers in using health applications and wearable gadgets. The government should support the development of such health tech applications having a user interface and design that is simple and convenient to learn for people of all ages as it has been seen that the elderly face difficulties in operating wearable devices and health tech applications.

The government can provide health professionals training to equip professionals with the right tools and skills in using health tech applications and wearable devices. This training can improve effectiveness in managing obesity management and reduce medicine errors for patients dealing with numerous health issues caused by obesity. The government requires more funding to improve the research and development of applications and wearable gadgets. The government can support start-ups with unique ideas for effectively managing obesity using mobile technology and wearable devices. The government must take the initiative to implement a nationwide integrated system for health management and reduce the rising issue of obesity within the region of Kuwait. The government can partner with good health-tech organizations to develop a management information system and deploy it within their government hospitals to help integrate obese patients with the health professionals and connect patients with other chronic diseases. Interventions would ultimately assure timely follow-up to the patients, notify them of their results, engage them towards a healthier lifestyle, and reduce medical errors and patient rates. In order to achieve this goal, a high amount of funding would be required from the government and welfare organizations as this

project involves the cost of development and the cost of deployment and training and the hiring of professionals.

7.3 Limitations of the Study

The majority of the participants were from the region of Kuwait. Therefore, future research can include more participants from other regions of Kuwait as well. The research has used a convenient sampling methodology. Still, for future research, it has been recommended that a random sampling method should be used for the more accurate general applicability of the results. For future research, focus group discussions could be utilized in gaining a better understanding of the matter.

The current study has used correlation and regression tests to analyze the data; however, it is implied that a comparative analysis among the health tech users that are obese with those individuals that are not should be researched upon in the future based on their life satisfaction levels. Similar research can be implied on a lower age segment, diverse ethnic segments, and various occupational segments, etc. within Kuwait, as well as the future research, can be applied to other geographical locations than Kuwait such as the research could be conducted on a larger scale such as the impact of health tech applications and wearable gadgets can be studied on the Gulf Cooperation Council (GCC) region or even other regions of the world. This research faced a few limitations, such as time constraints and funding constraints. In-depth research in a cohort study is required to analyze individuals' different behaviours concerning the impact of health tech applications and wearable gadgets.

7.4 Implications for Future Researchers

Future researchers can investigate the investigated role of BMI. Still, it is also recommended to associate body image discrepancy (BID) among obese individuals and how it can be improved using health tech applications and wearable gadgets for decreasing weight. Further research can

focus on how to improve health service delivery channels for issues other than obesity. The focus in the future study should be identifying factors of follow-up, medicine management, eating behaviours, and physical activity levels that can engage the user through these applications in improving managing obesity and studying their impact on other health-related factors.

Future researchers can study factors that can contribute to m-learning and improving health system conditions. Moreover, barriers in implementing the intervention can be studied, such as barriers in shifting from face-to-face to m-Learning modalities (World Health Organization, 2019). A randomized controlled trial can be used for dietary self-monitoring using a digital personal dietary assistant (PDA) in the future to assess the increase in adherence, then only using a paper diary. There is a need to conduct a study on the subject matter of the research that establishes intervention that instead compels the individuals to act healthily and increase their physical activity. Moreover, there is a need to identify the critical interventions that compel to increase physical activity (Holzmann and Holzapfel, 2019). Future studies need to study how and which health tech applications can improve motivation in using health tech applications.

7.5 Conclusion

The obesity phenomenon has emerged as an area of public health concern that significantly reaches Gulf council countries. Obesity is characterized as one of the leading causes of death, leading to diabetes, high blood pressure, inflammation, and joint and bone pain. Other consequences of obesity include infertility amongst men and women, bacterial and fungal skin infections, and obesity may cause depression, psychological problems, and, finally, inappropriate physical appearance. The level of obesity has reached the limits of the pandemic and affected the entire population of the Gulf countries. The purpose of the study is to investigate the impact of m-health tech and wearable gadgets on a better lifestyle. The study investigates the impact of obesity

phenomena, obesity management, people's knowledge of having a better lifestyle, diet management, and physical exercise. Furthermore, the study investigated the mediating role of people's attitudes towards technology and healthcare applications on a better lifestyle and the moderating role of technology and healthcare applications on a better lifestyle.

Primary data has been gathered using a mixed-method, a combination of quantitative and qualitative research methods where both interview and survey have been conducted. A detailed interview guide for semi-structural interviews was developed to guide the qualitative data collection process, where 16 interview questions were asked from the 25 participants shortlisted for semi-structural interviews being conducted face to face. Data collected from interviews have been analyzed using a thematic analysis approach to data analysis. On the contrary, the author conducts a survey distributed amongst the sample of (n=387) healthcare application and wearable gadget users in Kuwait using cluster sampling to divide Kuwait into clusters, and then participants would be conveniently selected. Data collected from the survey was processed in *Statistical Package for Social Sciences (SPSS),* where Cronbach's Alpha, bi-vitiate correlation, descriptive analysis, multiple regression analysis, and Hayes process Macros.

Findings from the first section of the interview suggest four main themes have been generated from the first section to investigate the ongoing obesity epidemic and strategies to tackle this epidemic, i.e., obesity phenomena, dietary habits, obesity management, and time required to lose weight. The second section's findings, which investigate the perception of healthcare technology, resulted in three themes: exposure to health tech, knowledge of health tech, and results. The third section of the interview aimed to provide insight into achieving lifestyle changes using healthcare technology and wearable gadgets which proposes three themes: life after using health tech applications and the impact of health tech on their wellbeing and outlook.

Data analysis from SPSS suggests that H1 has been rejected as the relationship between the obesity phenomenon and a better lifestyle is insignificant due to the p-value of obesity phenomena, i.e., .707 is greater than the significance level of .05 while the β value of obesity phenomenon is .0.20 and obesity phenomenon is negatively correlated with better lifestyle with a correlation value of -0.87. H2 has been rejected as there is an insignificant relationship between obesity management and better lifestyle because the p-value of obesity management, i.e., .452, is greater than the significance value of 0.05 while the β value is .033 and obesity management is correlated with better lifestyle as the coefficient value is .072. H3 has been accepted as the p-value, i.e., 0.000 is significant and is less than the significance level of 0.05. There is a moderate and positive correlation of people's knowledge with a better lifestyle with the coefficient value, i.e., 0.520 is closer to 1 with a β value of .545 H4 has been accepted as the p-value, i.e., 0.03 is significant and is less than the significance level of 0.05. There is a moderate and positive correlation of diet management with a better lifestyle with the coefficient value, i.e., 0.520 is closer to 1 with a β value of -.158. H5 has been rejected as the p-value, i.e. .824 is insignificant and is more than the significance level of 0.05. There is a weak and positive correlation of physical activity with a better lifestyle with the coefficient value, i.e., .13, and with a β value of -.010

Proposed hypothesis H6 has been rejected as People's attitude does not fully or partially mediate the relationship between obesity and a better lifestyle. H7 has been rejected as people's attitudes do not partially mediate the relationship between obesity management and a better lifestyle. H8 has been accepted, showing that people's attitude partially mediates the relationship between knowledge and a better lifestyle. H9 has been accepted, as findings suggest that people's attitude partially mediates the relationship between diet management and a better lifestyle. H10 has been rejected, which shows that people's attitude does not partially mediate the relationship between

physical exercise and a better lifestyle. H11 has been accepted as findings suggest that technology partially moderates the relationship between obesity and a better lifestyle. H12 has been accepted as technology partially moderates the relationship between obesity management and a better lifestyle. H13 has been accepted as technology assists in developing the moderate relationship between people's knowledge and a better lifestyle. H14 has been accepted as a technology that assists in developing the moderate relationship between diet management and a better lifestyle. H15 has been accepted as technology assists in developing the moderate relationship between physical exercise and a better lifestyle.H16 has been accepted as there is a statistically significant effect of gender on obesity phenomena and diet management. H17 There is a statistically significant effect of age on people's knowledge, physical exercise, better lifestyle, people attitude, and use of technology. H18 has been accepted as a statistically significant effect of education on obesity phenomena, people's knowledge, diet management, better lifestyle, people's attitude, and use of technology. H19 has been accepted as a statistically significant effect of occupation on obesity management, people's knowledge, physical exercise, better lifestyle, people attitude, and use of technology. H20 has been accepted as a statistically significant effect of income on obesity management and diet management. H21 has been accepted as a statistically significant effect of BMI on obesity phenomena, people's knowledge, diet management, better lifestyle, people attitude, and use of technology.

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APPENDIX-A (INTERVIEW GUIDE)

The questionnaire is part of a current Ph.D. study. It is prepared for research purposes only. The research aims to explore the attitude of people in the GCC-Case study of Kuwait towards using Health technology like Apps and wearable watches to change their quality lifestyle and maintain weight loss in several aspects. I would be grateful if you would answer the questions in the questionnaire with all seriousness and credibility. The success of this work depends on the extent of your cooperation and your dedication to the answer, and all your information provided will be treated with care and credit. Sincerely, Your sincere appreciation for your response and contribution to the achievement of this scientific research. Read carefully all the sections and answer accordingly for the statements that apply to you.

Interview Questionnaires

These will be unstructured interviews (up to 15 minutes in length) for data collection to allow for detailed exploration of participants' decision making and thoughts surrounding the use of health apps and health tech in relation with the obesity and their effect on the life satisfaction. Open ended questions were used to avoid limiting discussion, by structuring interviews around the researcher's ideas and assumptions. Interviews will be conducted by researcher. Interviews with providers will be performed in Arabic and English, and interviews with beneficiaries will be conducted in Arabic to allow for maximum retention of quality information, and translated later on by local staff for analysis.

INTERVIEWER

- Introduce yourself as the researcher and inform of the goal of the study
- Please remind participants that this is a voluntary interview and that it will remain completely anonymous.

- No identifying information will be shared with anyone (depending on who you interview).
- Take consent from the respective subject you are interviewing and show a feeling of respect towards them.
- Take permission for audio recording.

Section A

Demographic Profile						
Age	16-30	31-49	50-69	70 and above		
Sex	Male	Female				
Education	High School	Graduate	Postgraduate	Others		
Occupation	Employed	Unemployed	Self-Employed	Student		
Income	Below 1000 KD	1000 – 2000 KD	2000-3000 KD	3000-4000 KD	4000-5000 KD	>5000 KD

Body Mass Index	
BMI	

Section B

Obesity
How do you perceive your weight?

Do you think your weight is ideal?
What problems have you had to face due to your weight?
How are you managing your weight?
What is your experience regarding weight management?
How long do you need to go to be your ideal weight?
Are you currently doing anything to change your weight?
How do you perceive your dietary habits?
Do you think your dietary habits are contributing to the obesity? Elaborate.
What issues do you face while sticking to your diet?
Do you think exercise can help with your obesity?
Has exercised helped you in this regard?
How is your experience sticking to the exercise plan?
Have you ever had a bariatric surgery?
Have you thought about getting one?
What are your general feelings towards it?

Section C

Experience regarding Health tech and health apps
How is your exposure with the technology? Like health apps etc.
What are your views regarding health apps?
What role do you think technology plays in our weight and obesity?
Do you use any health tech or health apps?

What's the reason behind you using these health apps?
How successful you have been in managing your weight using health apps?
What are the factors you keep in mind while investing in health tech?
How successful have you been in losing weight using health apps?
What factors motivated you to buy these health techs?
Do you have any privacy concerns regarding the use of health tech and apps?
What expectation did you have while buying these health apps?
What expectations do you have now regarding them?
Are they serving the purpose you bought them for?
How successful you have been in losing weight using health apps?
What recommendation do you have regarding them?

Section D

Life Satisfaction and Quality
How do you view life after buying health tech and health apps?
What differences have you noticed in life after using health tech and health apps?
What impact did they have on you?
What impact did they have on your life?
How do you feel about life now overall?
Summarize your whole experience using them?

APPENDIX-B (SURVEY QUESTIONS)

(Code No.): ___

QUESTIONNAIRE

The questionnaire is part of a current Ph.D. study. It is prepared for research purposes only. The research aims to explore the attitude of people in the GCC-Case study of Kuwait towards using Health technology like Apps and wearable watches to change their quality lifestyle and maintain weight loss in several aspects. I would be grateful if you would answer the questions in the questionnaire with all seriousness and credibility. The success of this work depends on the extent of your cooperation and your dedication to the answer, and all your information provided will be treated with care and credit. Sincerely, Your sincere appreciation for your response and contribution to the achievement of this scientific research.

Read carefully all the sections and answer accordingly for the statements that apply to you.

Section A

Demographic Profile				
Age	16-30	31-49	50-69	70 and above
Sex	Male		Female	
Education	High School	Graduate	Postgraduate	Others
Occupation	Employed	Unemployed	Self-Employed	Student

Income	Below 1000 KD	1000 – 2000 KD	2000-3000 KD	3000-4000 KD	4000-5000 KD	>5000 KD

Body Mass Index	
BMI	

The sections ahead are designed on a scale of 1-5, i.e., Strong Disagree is scored at 1, Disagree at 2, Not Sure at 3, Agree at 4 and Strongly Agree at 5. Answer accordingly.

Section B

Obesity Management					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I believe I have a healthy weight.					
I believe my weight is not healthy and I need to change it.					
I am motivated to change my weight.					
I am aware of the consequences of obesity.					
I believe I can lose weight on my own					

Dietary Changes to Manage Obesity					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I believe my dietary habits are perfectly healthy					
I believe I need to change my dietary habits to lose weight.					
I am following a dietary plan currently.					
I have problems sticking to the dietary plans.					
I believe my dietary habits affects my mood.					

Exercise to Manage Obesity					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I believe my daily physical activity level is sufficient.					
I exercise frequently.					
I am following a professionally prescribed exercise plan to manage weight.					

I believe my current exercise plan can help me keep me healthy.					
I believe I can stick to an exercise plan.					

Answer this Section if you had Bariatric surgery

Section B

Knowledge of Health tech and wearable gadgets					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I am aware there are health tech and wearable gadgets that can help with weight management.					
Health tech and wearable gadgets can help me lose or maintain a healthy weight.					
It is necessary to consult a doctor before using health tech and wearable gadgets.					
People in my circles use health tech and wearable gadgets to stay healthy.					
These health tech and wearable gadgets have helped people in my surroundings to lose/maintain weight.					

Attitude to health tech and wearable gadgets					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I am willing to use a wearable gadget.					
I would not buy health tech and wearable gadgets of the brands I have never used.					
Review of these health tech and wearable gadgets matter to me in buying them.					
I believe obesity management would be highly aided by these gadgets.					
I am fine with sharing my activity data with the government.					

Use of Health tech and wearable gadgets					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I am currently using a wearable gadget to manage my weight.					
I rely on my wearable gadget(s) to manage weight.					
Weight management functionality is important while buying a wearable gadget.					
I have effectively maintained/lost weight using health tech and wearable gadgets.					

I would recommend using health tech and wearable gadgets to other people.					

Section C

Effect of Obesity Management using Health tech and wearable gadgets on Life Satisfaction					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Using health tech and wearable gadgets for weight management has increased my satisfaction with me.					
My enthusiasm in life has increased using health tech and wearable gadgets to manage my weight.					
My personal relationships have improved using health tech and wearable gadgets to manage my weight					
I tend to feel fewer negative emotions now that I have been using health tech and wearable gadgets to manage my weight					
My friends have been supportive of myself using health tech and wearable gadgets to manage my weight.					

APPENDIX-B (SPSS OUTPUT)

Descriptives

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Frequencies

```
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Statistics

		Specify Your Age Group?	Specify Your Gender?	Specify Your Recent Qualification?	Specify Your Occupation?	Specify Your Monthly Income?	Please Specify Your BMI?
N	Valid	387	387	387	387	387	387
	Missing	0	0	0	0	0	0

Frequency Table

Specify Your Age Group?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	170	43.9	43.9	43.9
	31-49	140	36.2	36.2	80.1
	50-69	69	17.8	17.8	97.9
	70 and above	8	2.1	2.1	100.0
	Total	387	100.0	100.0	

Specify Your Gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	178	46.0	46.0	46.0
	Female	209	54.0	54.0	100.0
	Total	387	100.0	100.0	

Specify Your Recent Qualification?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High School	28	7.2	7.2	7.2
	Graduate	178	46.0	46.0	53.2
	Postgraduate	58	15.0	15.0	68.2
	Others	123	31.8	31.8	100.0
	Total	387	100.0	100.0	

Specify Your Occupation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed	126	32.6	32.6	32.6
	Unemployed	22	5.7	5.7	38.2
	Self-Employed	131	33.9	33.9	72.1
	Student	108	27.9	27.9	100.0
	Total	387	100.0	100.0	

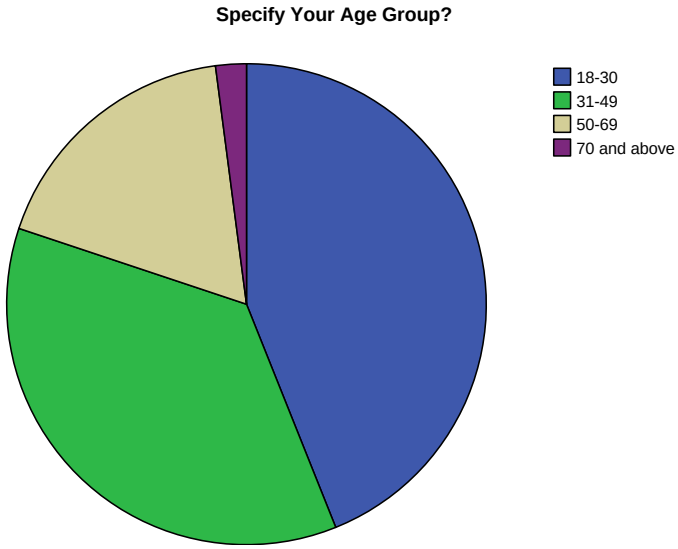
Specify Your Monthly Income?

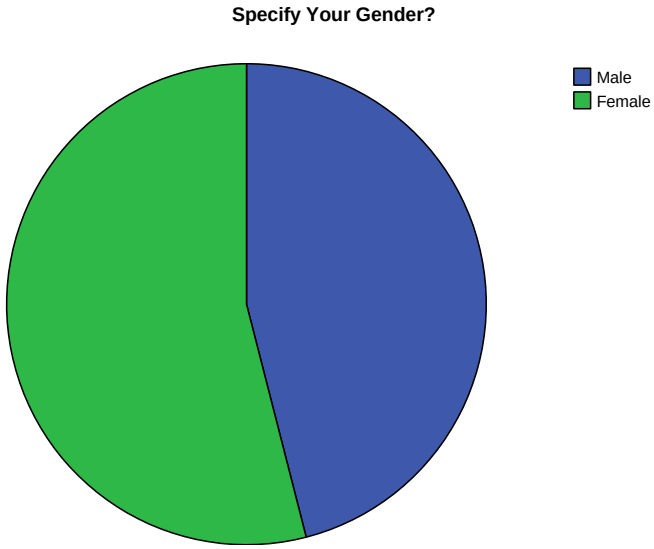
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 1000 KD	139	35.9	35.9	35.9
	1000 â€“ 2000 KD	79	20.4	20.4	56.3
	2000-3000 KD	83	21.4	21.4	77.8
	3000-4000 KD	47	12.1	12.1	89.9
	4000-5000 KD	23	5.9	5.9	95.9
	>5000 KD	16	4.1	4.1	100.0
	Total	387	100.0	100.0	

Please Specify Your BMI?

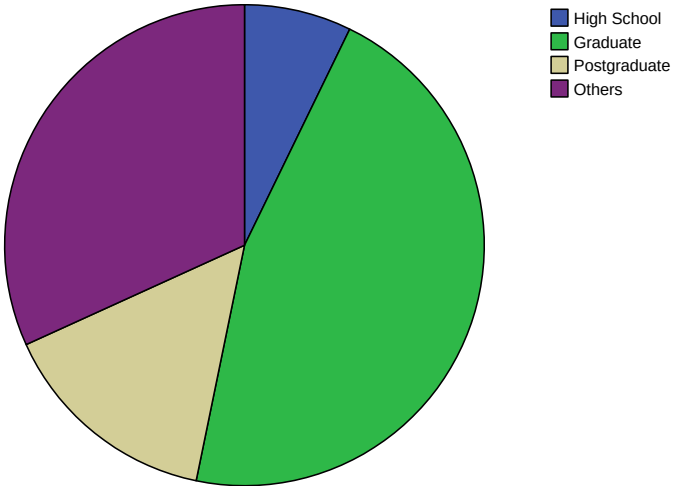
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20	7	1.8	1.8	1.8
	20 to 25	135	34.9	34.9	36.7
	25 to 30	221	57.1	57.1	93.8
	31 to 35	18	4.7	4.7	98.4
	36 to 40	6	1.6	1.6	100.0
	Total	387	100.0	100.0	

Pie Chart

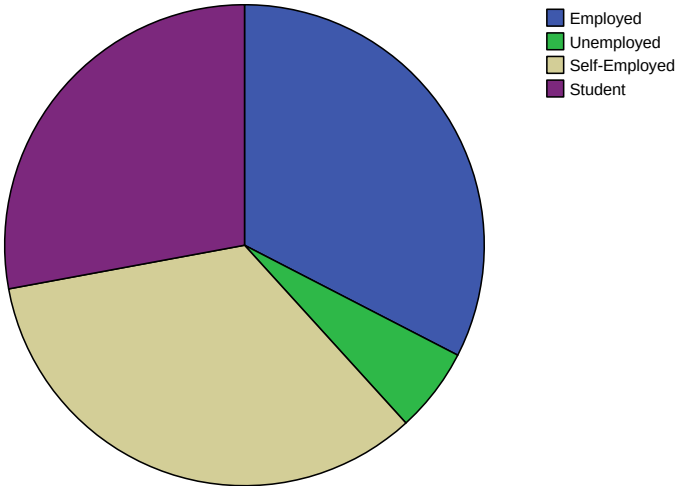

Specify Your Age Group?
18-30
31-49
50-69
70 and above


Specify Your Gender?
Male
Female

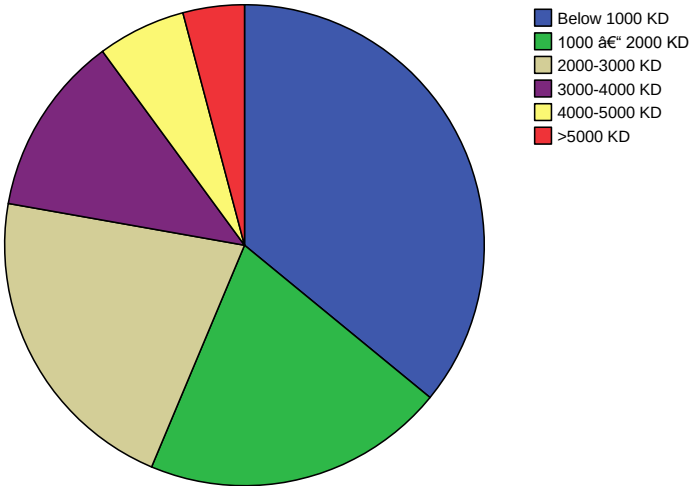
Specify Your Recent Qualification?

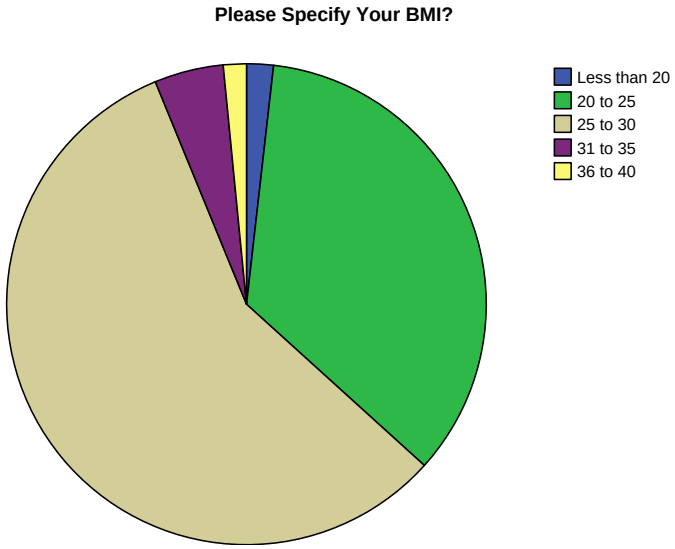


Specify Your Occupation?



Specify Your Monthly Income?





Descriptives

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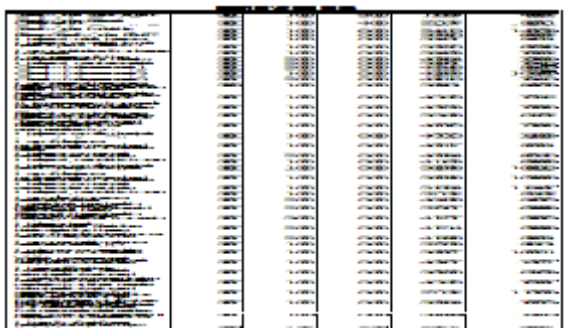
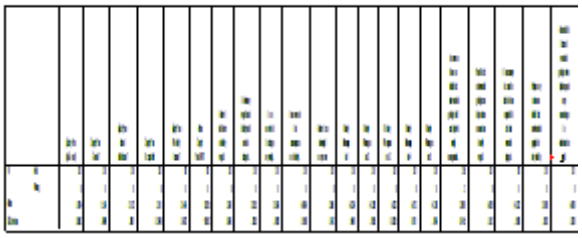
Descriptives

[DataSet1] C:\Users\Hp\Desktop\nada.sav



Frequencies

[DataSet1] C:\Users\Hp\Desktop\nada.sav



Frequency Table

Specify Your Age Group?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	170	43.9	43.9	43.9
	31-49	140	36.2	36.2	80.1
	50-69	69	17.8	17.8	97.9
	70 and above	8	2.1	2.1	100.0
	Total	387	100.0	100.0	

Specify Your Gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	178	46.0	46.0	46.0
	Female	209	54.0	54.0	100.0
	Total	387	100.0	100.0	

Specify Your Recent Qualification?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High School	28	7.2	7.2	7.2
	Graduate	178	46.0	46.0	53.2
	Postgraduate	58	15.0	15.0	68.2
	Others	123	31.8	31.8	100.0
	Total	387	100.0	100.0	

Specify Your Occupation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed	126	32.6	32.6	32.6
	Unemployed	22	5.7	5.7	38.2
	Self-Employed	131	33.9	33.9	72.1
	Student	108	27.9	27.9	100.0
	Total	387	100.0	100.0	

Specify Your Monthly Income?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 1000 KD	139	35.9	35.9	35.9
	1000 â€“ 2000 KD	79	20.4	20.4	56.3
	2000-3000 KD	83	21.4	21.4	77.8
	3000-4000 KD	47	12.1	12.1	89.9
	4000-5000 KD	23	5.9	5.9	95.9
	>5000 KD	16	4.1	4.1	100.0
	Total	387	100.0	100.0	

Please Specify Your BMI?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20	7	1.8	1.8	1.8
	20 to 25	135	34.9	34.9	36.7
	25 to 30	221	57.1	57.1	93.8
	31 to 35	18	4.7	4.7	98.4
	36 to 40	6	1.6	1.6	100.0
	Total	387	100.0	100.0	

I believe I don't have a healthy weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	32	8.3	8.3	8.3
	Not Sure	189	48.8	48.8	57.1
	Agree	135	34.9	34.9	92.0
	Strongly Agree	31	8.0	8.0	100.0
	Total	387	100.0	100.0	

I believe my weight is not healthy and I need to change it.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.5	.5	.5
	Disagree	19	4.9	4.9	5.4
	Not Sure	78	20.2	20.2	25.6
	Agree	196	50.6	50.6	76.2
	Strongly Agree	92	23.8	23.8	100.0
	Total	387	100.0	100.0	

I am motivated to change my weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.5	.5	.5
	Disagree	16	4.1	4.1	4.7
	Not Sure	62	16.0	16.0	20.7
	Agree	227	58.7	58.7	79.3
	Strongly Agree	80	20.7	20.7	100.0
	Total	387	100.0	100.0	

I am aware of the consequences of obesity.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	12	3.1	3.1	3.1
	Not Sure	59	15.2	15.2	18.3
	Agree	198	51.2	51.2	69.5
	Strongly Agree	118	30.5	30.5	100.0
	Total	387	100.0	100.0	

I believe I can lose weight on my own.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	17	4.4	4.4	4.4
	Not Sure	76	19.6	19.6	24.0
	Agree	200	51.7	51.7	75.7
	Strongly Agree	94	24.3	24.3	100.0
	Total	387	100.0	100.0	

Obesity_Management1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	30	7.8	7.8	7.8
	Not Sure	52	13.4	13.4	21.2
	Agree	106	27.4	27.4	48.6
	Strongly Agree	199	51.4	51.4	100.0
	Total	387	100.0	100.0	

Obesity_Management2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	7	1.8	1.8	1.8
	Not Sure	52	13.4	13.4	15.2
	Agree	111	28.7	28.7	43.9
	Strongly Agree	217	56.1	56.1	100.0
	Total	387	100.0	100.0	

Obesity_Management3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	14	3.6	3.6	3.6
	Disagree	7	1.8	1.8	5.4
	Not Sure	54	14.0	14.0	19.4
	Agree	73	18.9	18.9	38.2
	Strongly Agree	239	61.8	61.8	100.0
	Total	387	100.0	100.0	

Obesity_Managament4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	14	3.6	3.6	3.6
	Disagree	22	5.7	5.7	9.3
	Not Sure	46	11.9	11.9	21.2
	Agree	68	17.6	17.6	38.8
	Strongly Agree	237	61.2	61.2	100.0
	Total	387	100.0	100.0	

Obesity_Management5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	7	1.8	1.8	1.8
	Not Sure	53	13.7	13.7	15.5
	Agree	120	31.0	31.0	46.5
	Strongly Agree	207	53.5	53.5	100.0
	Total	387	100.0	100.0	

I am aware there are health tech and wearable gadgets that can help with weight management.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.0	1.0	1.0
	Disagree	26	6.7	6.8	7.8
	Not Sure	58	15.0	15.1	22.9
	Agree	215	55.6	55.8	78.7
	Strongly Agree	82	21.2	21.3	100.0
	Total	385	99.5	100.0	
Missing	System	2	.5		
Total		387	100.0		

Health tech and wearable gadgets can help me lose or maintain a healthy weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	1.3	1.3	1.3
	Disagree	14	3.6	3.6	4.9
	Not Sure	35	9.0	9.0	14.0
	Agree	250	64.6	64.6	78.6
	Strongly Agree	83	21.4	21.4	100.0
	Total	387	100.0	100.0	

t is necessary to consult a doctor before using health tech and wearable gadgets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.5	.5	.5
	Disagree	21	5.4	5.4	5.9
	Not Sure	31	8.0	8.0	14.0
	Agree	245	63.3	63.3	77.3
	Strongly Agree	88	22.7	22.7	100.0
	Total	387	100.0	100.0	

People in my circles use health tech and wearable gadgets to stay healthy.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.5	.5	.5
	Disagree	31	8.0	8.0	8.5
	Not Sure	39	10.1	10.1	18.6
	Agree	239	61.8	61.8	80.4
	Strongly Agree	76	19.6	19.6	100.0
	Total	387	100.0	100.0	

hese health tech and wearable gadgets have helped people in my surroundings t lose/maintain weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.5	.5	.5
	Disagree	17	4.4	4.4	4.9
	Not Sure	41	10.6	10.6	15.5
	Agree	243	62.8	62.8	78.3
	Strongly Agree	84	21.7	21.7	100.0
	Total	387	100.0	100.0	

I believe my daily physical activity level is sufficient.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.3	.3	.3
	Disagree	15	3.9	3.9	4.1
	Not Sure	41	10.6	10.6	14.7
	Agree	226	58.4	58.4	73.1
	Strongly Agree	104	26.9	26.9	100.0
	Total	387	100.0	100.0	

I exercise frequently.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	.8	.8	.8
	Disagree	10	2.6	2.6	3.4
	Not Sure	41	10.6	10.6	14.0
	Agree	213	55.0	55.0	69.0
	Strongly Agree	120	31.0	31.0	100.0
	Total	387	100.0	100.0	

I am following a professionally prescribed exercise plan to manage weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.5	.5	.5
	Disagree	20	5.2	5.2	5.7
	Not Sure	76	19.6	19.6	25.3
	Agree	147	38.0	38.0	63.3
	Strongly Agree	142	36.7	36.7	100.0
	Total	387	100.0	100.0	

I believe my current exercise plan can help me keep me healthy.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	16	4.1	4.1	4.1
	Not Sure	67	17.3	17.3	21.4
	Agree	182	47.0	47.0	68.5
	Strongly Agree	122	31.5	31.5	100.0
	Total	387	100.0	100.0	

I believe I can stick to an exercise plan.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.0	1.0	1.0
	Disagree	8	2.1	2.1	3.1
	Not Sure	68	17.6	17.6	20.7
	Agree	166	42.9	42.9	63.6
	Strongly Agree	141	36.4	36.4	100.0
	Total	387	100.0	100.0	

I believe my daily physical activity level is sufficient.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	15	3.9	3.9	3.9
	Disagree	63	16.3	16.3	20.2
	Not Sure	84	21.7	21.7	41.9
	Agree	162	41.9	41.9	83.7
	Strongly Agree	63	16.3	16.3	100.0
	Total	387	100.0	100.0	

I exercise frequently.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	54	14.0	14.0	14.0
	Not Sure	84	21.7	21.7	35.7
	Agree	188	48.6	48.6	84.2
	Strongly Agree	61	15.8	15.8	100.0
	Total	387	100.0	100.0	

I am following a professionally prescribed exercise plan to manage weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	14	3.6	3.6	3.6
	Disagree	59	15.2	15.2	18.9
	Not Sure	91	23.5	23.5	42.4
	Agree	164	42.4	42.4	84.8
	Strongly Agree	59	15.2	15.2	100.0
	Total	387	100.0	100.0	

I believe my current exercise plan can help me keep me healthy.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	13	3.4	3.4	3.4
	Disagree	132	34.1	34.1	37.5
	Not Sure	84	21.7	21.7	59.2
	Agree	94	24.3	24.3	83.5
	Strongly Agree	64	16.5	16.5	100.0
	Total	387	100.0	100.0	

I believe I can stick to an exercise plan.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	.8	.8	.8
	Disagree	47	12.1	12.1	12.9
	Not Sure	80	20.7	20.7	33.6
	Agree	185	47.8	47.8	81.4
	Strongly Agree	72	18.6	18.6	100.0
	Total	387	100.0	100.0	

I am willing to use a wearable gadget.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	.8	.8	.8
	Not Sure	41	10.6	10.6	11.4
	Agree	279	72.1	72.1	83.5
	Strongly Agree	64	16.5	16.5	100.0
	Total	387	100.0	100.0	

I would not buy health tech and wearable gadgets of the brands I have never used.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	24	6.2	6.2	6.2
	Not Sure	56	14.5	14.5	20.7
	Agree	284	73.4	73.4	94.1
	Strongly Agree	23	5.9	5.9	100.0
	Total	387	100.0	100.0	

Review of these health tech and wearable gadgets matter to me in buying them

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Sure	28	7.2	7.2	7.2
	Agree	263	68.0	68.0	75.2
	Strongly Agree	96	24.8	24.8	100.0
	Total	387	100.0	100.0	

I believe obesity management would be highly aided by these gadgets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	.3	.3	.3
	Not Sure	32	8.3	8.3	8.5
	Agree	273	70.5	70.5	79.1
	Strongly Agree	81	20.9	20.9	100.0
	Total	387	100.0	100.0	

I am fine with sharing my activity data with the government.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	.3	.3	.3
	Not Sure	44	11.4	11.4	11.6
	Agree	247	63.8	63.8	75.5
	Strongly Agree	95	24.5	24.5	100.0
	Total	387	100.0	100.0	

I am currently using a wearable gadget to manage my weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	18	4.7	4.7	4.7
	Disagree	37	9.6	9.6	14.2
	Not Sure	36	9.3	9.3	23.5
	Agree	240	62.0	62.0	85.5
	Strongly Agree	56	14.5	14.5	100.0
	Total	387	100.0	100.0	

I rely on my wearable gadget(s) to manage weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	20	5.2	5.2	5.2
	Disagree	37	9.6	9.6	14.7
	Not Sure	39	10.1	10.1	24.8
	Agree	235	60.7	60.7	85.5
	Strongly Agree	56	14.5	14.5	100.0
	Total	387	100.0	100.0	

Weight management functionality is important while buying a wearable gadget.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	.8	.8	.8
	Disagree	18	4.7	4.7	5.4
	Not Sure	32	8.3	8.3	13.7
	Agree	249	64.3	64.3	78.0
	Strongly Agree	85	22.0	22.0	100.0
	Total	387	100.0	100.0	

I have effectively maintained/lost weight using health tech and wearable gadgets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	1.6	1.6	1.6
	Disagree	23	5.9	5.9	7.5
	Not Sure	51	13.2	13.2	20.7
	Agree	240	62.0	62.0	82.7
	Strongly Agree	67	17.3	17.3	100.0
	Total	387	100.0	100.0	

I would recommend using health tech and wearable gadgets to other people.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	.8	.8	.8
	Disagree	18	4.7	4.7	5.4
	Not Sure	38	9.8	9.8	15.2
	Agree	240	62.0	62.0	77.3
	Strongly Agree	88	22.7	22.7	100.0
	Total	387	100.0	100.0	

Using health tech and wearable gadgets for weight have increased by satisfaction with me.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	.8	.8	.8
	Disagree	249	64.3	64.3	65.1
	Not Sure	63	16.3	16.3	81.4
	Strongly Agree	72	18.6	18.6	100.0
	Total	387	100.0	100.0	

My enthusiasm in life has increased using health tech and wearable gadget to manage my weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	.8	.8	.8
	Disagree	16	4.1	4.1	4.9
	Not Sure	59	15.2	15.2	20.2
	Agree	234	60.5	60.5	80.6
	Strongly Agree	75	19.4	19.4	100.0
	Total	387	100.0	100.0	

My personal relationships have improved using health tech and wearable gadgets to manage my weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.0	1.0	1.0
	Disagree	19	4.9	4.9	5.9
	Not Sure	61	15.8	15.8	21.7
	Agree	229	59.2	59.2	80.9
	Strongly Agree	74	19.1	19.1	100.0
	Total	387	100.0	100.0	

I tend to feel fewer negative emotions now that I have been using health tech and wearable gadgets to manage my weight.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	1.3	1.3	1.3
	Disagree	16	4.1	4.1	5.4
	Not Sure	64	16.5	16.5	22.0
	Agree	232	59.9	59.9	81.9
	Strongly Agree	70	18.1	18.1	100.0
	Total	387	100.0	100.0	

My friends have been supportive of myself using health tech applications and wearable gadgets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	9	2.3	2.3	2.3
	Disagree	25	6.5	6.5	8.8
	Not Sure	49	12.7	12.7	21.4
	Agree	213	55.0	55.0	76.5
	Strongly Agree	91	23.5	23.5	100.0
	Total	387	100.0	100.0	

Regression

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Descriptive Statistics

	Mean	Std. Deviation	N
Tot_DV	3.6713	.72318	387
Tot_IV1	3.8527	.54413	387
Tot_IV2	4.3163	.81883	387
Tot_IV3	3.9729	.59915	387
Tot_IV4	4.0868	.58523	387
Tot_IV5	3.5096	.77846	387

Correlations

		Tot_DV	Tot_IV1	Tot_IV2	Tot_IV3	Tot_IV4	Tot_IV5
Pearson Correlation	Tot_DV	1.000	-.087	.072	.520	-.092	.013
	Tot_IV1	-.087	1.000	-.125	-.029	.561	-.089
	Tot_IV2	.072	-.125	1.000	.053	-.081	-.016
	Tot_IV3	.520	-.029	.053	1.000	.108	.074
	Tot_IV4	-.092	.561	-.081	.108	1.000	.089
	Tot_IV5	.013	-.089	-.016	.074	.089	1.000
Sig. (1-tailed)	Tot_DV	.	.043	.079	.000	.035	.397
	Tot_IV1	.043	.	.007	.285	.000	.040
	Tot_IV2	.079	.007	.	.148	.055	.373
	Tot_IV3	.000	.285	.148	.	.017	.074
	Tot_IV4	.035	.000	.055	.017	.	.040
	Tot_IV5	.397	.040	.373	.074	.040	.
N	Tot_DV	387	387	387	387	387	387
	Tot_IV1	387	387	387	387	387	387
	Tot_IV2	387	387	387	387	387	387
	Tot_IV3	387	387	387	387	387	387
	Tot_IV4	387	387	387	387	387	387
	Tot_IV5	387	387	387	387	387	387

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Tot_IV5, Tot_IV2, Tot_IV3, Tot_IV1, Tot_IV4[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Tot_DV

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.542[a]	.294	.285	.61159	.294	31.740	5	381	.000

a. Predictors: (Constant), Tot_IV5, Tot_IV2, Tot_IV3, Tot_IV1, Tot_IV4

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.361	5	11.872	31.740	.000[a]
	Residual	142.511	381	.374		
	Total	201.872	386			

a. Predictors: (Constant), Tot_IV5, Tot_IV2, Tot_IV3, Tot_IV1, Tot_IV4

b. Dependent Variable: Tot_DV

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	1.700	.394		4.315	.000			
	Tot_IV1	.027	.071	.020	.376	.707	-.087	.019	.016
	Tot_IV2	.029	.038	.033	.753	.452	.072	.039	.032
	Tot_IV3	.648	.053	.537	12.287	.000	.520	.533	.529
	Tot_IV4	-.195	.066	-.158	-2.962	.003	-.092	-.150	-.128
	Tot_IV5	-.009	.041	-.010	-.223	.824	.013	-.011	-.010

a. Dependent Variable: Tot_DV

T-Test

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Group Statistics

	Specify Your Gender?	N	Mean	Std. Deviation	Std. Error Mean
Tot_IV1	Male	178	3.7775	.53610	.04018
	Female	209	3.9167	.54399	.03763
Tot_IV2	Male	178	4.2989	.82208	.06162
	Female	209	4.3311	.81774	.05656
Tot_IV3	Male	178	3.9781	.64311	.04820
	Female	209	3.9684	.56053	.03877
Tot_IV4	Male	178	4.1685	.61278	.04593
	Female	209	4.0172	.55269	.03823
Tot_IV5	Male	178	3.5045	.80428	.06028
	Female	209	3.5139	.75768	.05241
Tot_DV	Male	178	3.7101	.73216	.05488
	Female	209	3.6383	.71553	.04949
Tot_Mediator	Male	178	3.9157	.71583	.05365
	Female	209	3.8230	.77152	.05337
Tot_Moderator	Male	178	3.9157	.71583	.05365
	Female	209	3.8230	.77152	.05337

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Tot_IV1	Equal variances assumed	.010	.921	-2.526	385	.012	-.13922	.05511	-.24758	-.03086
	Equal variances not assumed			-2.529	376.903	.012	-.13922	.05505	-.24746	-.03097
Tot_IV2	Equal variances assumed	.044	.833	-.385	385	.700	-.03222	.08361	-.19661	.13216
	Equal variances not assumed			-.385	374.624	.700	-.03222	.08364	-.19669	.13225
Tot_IV3	Equal variances assumed	2.150	.143	.158	385	.875	.00967	.06119	-.11063	.12997
	Equal variances not assumed			.156	354.021	.876	.00967	.06186	-.11199	.13133
Tot_IV4	Equal variances assumed	1.463	.227	2.553	385	.011	.15131	.05927	.03479	.26784
	Equal variances not assumed			2.532	360.125	.012	.15131	.05976	.03379	.26884
Tot_IV5	Equal variances assumed	.313	.576	-.118	385	.906	-.00938	.07950	-.16569	.14693
	Equal variances not assumed			-.117	367.182	.907	-.00938	.07988	-.16646	.14770
Tot_DV	Equal variances assumed	1.230	.268	.974	385	.331	.07183	.07376	-.07320	.21687
	Equal variances not assumed			.972	372.393	.332	.07183	.07390	-.07348	.21715
Tot_Mediator	Equal variances assumed	1.084	.298	1.218	385	.224	.09276	.07613	-.05692	.24245
	Equal variances not assumed			1.226	382.164	.221	.09276	.07568	-.05603	.24156
Tot_Moderator	Equal variances assumed	1.084	.298	1.218	385	.224	.09276	.07613	-.05692	.24245
	Equal variances not assumed			1.226	382.164	.221	.09276	.07568	-.05603	.24156

Oneway

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ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Tot_IV1	Between Groups	.556	3	.185	.624	.600
	Within Groups	113.728	383	.297		
	Total	114.285	386			
Tot_IV2	Between Groups	4.966	3	1.655	2.497	.059
	Within Groups	253.842	383	.663		
	Total	258.807	386			
Tot_IV3	Between Groups	6.296	3	2.099	6.077	.000
	Within Groups	132.269	383	.345		
	Total	138.565	386			
Tot_IV4	Between Groups	.487	3	.162	.472	.702
	Within Groups	131.715	383	.344		
	Total	132.203	386			
Tot_IV5	Between Groups	6.476	3	2.159	3.635	.013
	Within Groups	227.439	383	.594		
	Total	233.915	386			
Tot_DV	Between Groups	7.760	3	2.587	5.103	.002
	Within Groups	194.112	383	.507		
	Total	201.872	386			
Tot_Mediator	Between Groups	8.971	3	2.990	5.550	.001
	Within Groups	206.361	383	.539		
	Total	215.333	386			
Tot_Moderator	Between Groups	8.971	3	2.990	5.550	.001
	Within Groups	206.361	383	.539		
	Total	215.333	386			

Post Hoc Tests

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Specify Your Age Group?	(J) Specify Your Age Group?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tot_IV1	18-30	31-49	.02714	.06219	.972	-.1333	.1876
		50-69	.01362	.07778	.998	-.1871	.2143
		70 and above	-.24000	.19714	.616	-.7487	.2687
	31-49	18-30	-.02714	.06219	.972	-.1876	.1333
		50-69	-.01352	.08015	.998	-.2203	.1933
		70 and above	-.26714	.19809	.533	-.7783	.2440
	50-69	18-30	-.01362	.07778	.998	-.2143	.1871
		31-49	.01352	.08015	.998	-.1933	.2203
		70 and above	-.25362	.20352	.598	-.7788	.2715
	70 and above	18-30	.24000	.19714	.616	-.2687	.7487
		31-49	.26714	.19809	.533	-.2440	.7783
		50-69	.25362	.20352	.598	-.2715	.7788
Tot_IV2	18-30	31-49	.17101	.09291	.256	-.0687	.4108
		50-69	.28747	.11621	.066	-.0124	.5873
		70 and above	.28529	.29453	.767	-.4747	1.0453
	31-49	18-30	-.17101	.09291	.256	-.4108	.0687
		50-69	.11646	.11975	.765	-.1925	.4254
		70 and above	.11429	.29594	.980	-.6493	.8779
	50-69	18-30	-.28747	.11621	.066	-.5873	.0124
		31-49	-.11646	.11975	.765	-.4254	.1925
		70 and above	-.00217	.30406	1.000	-.7868	.7824
	70 and above	18-30	-.28529	.29453	.767	-1.0453	.4747
		31-49	-.11429	.29594	.980	-.8779	.6493
		50-69	.00217	.30406	1.000	-.7824	.7868
Tot_IV3	18-30	31-49	-.00420	.06707	1.000	-.1773	.1689
		50-69	-.03735	.08388	.971	-.2538	.1791
		70 and above	.88294*	.21260	.000	.3344	1.4315
	31-49	18-30	.00420	.06707	1.000	-.1689	.1773
		50-69	-.03315	.08644	.981	-.2562	.1899
		70 and above	.88714*	.21362	.000	.3359	1.4384
	50-69	18-30	.03735	.08388	.971	-.1791	.2538
		31-49	.03315	.08644	.981	-.1899	.2562
		70 and above	.92029*	.21949	.000	.3539	1.4866
	70 and above	18-30	-.88294*	.21260	.000	-1.4315	-.3344
		31-49	-.88714*	.21362	.000	-1.4384	-.3359
		50-69	-.92029*	.21949	.000	-1.4866	-.3539
Tot_IV4	18-30	31-49	.07832	.06693	.646	-.0944	.2510
		50-69	.02552	.08371	.990	-.1905	.2415
		70 and above	.07118	.21216	.987	-.4763	.6186
	31-49	18-30	-.07832	.06693	.646	-.2510	.0944
		50-69	-.05280	.08626	.928	-.2754	.1698
		70 and above	-.00714	.21318	1.000	-.5572	.5429
	50-69	18-30	-.02552	.08371	.990	-.2415	.1905
		31-49	.05280	.08626	.928	-.1698	.2754
		70 and above	.04565	.21903	.997	-.5195	.6108
	70 and above	18-30	-.07118	.21216	.987	-.6186	.4763
		31-49	.00714	.21318	1.000	-.5429	.5572
		50-69	-.04565	.21903	.997	-.6108	.5195
Tot_IV5	18-30	31-49	.01059	.08795	.999	-.2163	.2375
		50-69	-.11260	.11000	.736	-.3964	.1712
		70 and above	.83559*	.27879	.015	.1162	1.5550
	31-49	18-30	-.01059	.08795	.999	-.2375	.2163
		50-69	-.12319	.11335	.698	-.4157	.1693
		70 and above	.82500*	.28013	.018	.1022	1.5478
	50-69	18-30	.11260	.11000	.736	-.1712	.3964
		31-49	.12319	.11335	.698	-.1693	.4157
		70 and above	.94819*	.28781	.006	.2055	1.6908
	70 and above	18-30	-.83559*	.27879	.015	-1.5550	-.1162
		31-49	-.82500*	.28013	.018	-1.5478	-.1022
		50-69	-.94819*	.28781	.006	-1.6908	-.2055
Tot_DV	18-30	31-49	-.01571	.08125	.997	-.2254	.1939
		50-69	.07971	.10162	.862	-.1825	.3419
		70 and above	.97500*	.25755	.001	.3104	1.6396
	31-49	18-30	.01571	.08125	.997	-.1939	.2254
		50-69	.09542	.10472	.799	-.1748	.3656
		70 and above	.99071*	.25879	.001	.3229	1.6585
	50-69	18-30	-.07971	.10162	.862	-.3419	.1825
		31-49	-.09542	.10472	.799	-.3656	.1748
		70 and above	.89529*	.26589	.005	.2092	1.5814
	70 and above	18-30	-.97500*	.25755	.001	-1.6396	-.3104
		31-49	-.99071*	.25879	.001	-1.6585	-.3229
		50-69	-.89529*	.26589	.005	-1.5814	-.2092
Tot_Mediator	18-30	31-49	-.03034	.08377	.984	-.2465	.1858
		50-69	-.04481	.10478	.974	-.3152	.2256
		70 and above	1.04324*	.26556	.001	.3580	1.7285
	31-49	18-30	.03034	.08377	.984	-.1858	.2465
		50-69	-.01447	.10797	.999	-.2931	.2641
		70 and above	1.07357*	.26683	.000	.3851	1.7621
	50-69	18-30	.04481	.10478	.974	-.2256	.3152
		31-49	.01447	.10797	.999	-.2641	.2931
		70 and above	1.08804*	.27415	.000	.3806	1.7954
	70 and above	18-30	-1.04324*	.26556	.001	-1.7285	-.3580
		31-49	-1.07357*	.26683	.000	-1.7621	-.3851
		50-69	-1.08804*	.27415	.000	-1.7954	-.3806
Tot_Moderator	18-30	31-49	-.03034	.08377	.984	-.2465	.1858
		50-69	-.04481	.10478	.974	-.3152	.2256
		70 and above	1.04324*	.26556	.001	.3580	1.7285
	31-49	18-30	.03034	.08377	.984	-.1858	.2465
		50-69	-.01447	.10797	.999	-.2931	.2641
		70 and above	1.07357*	.26683	.000	.3851	1.7621
	50-69	18-30	.04481	.10478	.974	-.2256	.3152
		31-49	.01447	.10797	.999	-.2641	.2931
		70 and above	1.08804*	.27415	.000	.3806	1.7954
	70 and above	18-30	-1.04324*	.26556	.001	-1.7285	-.3580
		31-49	-1.07357*	.26683	.000	-1.7621	-.3851
		50-69	-1.08804*	.27415	.000	-1.7954	-.3806

*. The mean difference is significant at the .05 level.

Homogeneous Subsets

Tot_IV1

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05 1
31-49	140	3.8329
50-69	69	3.8464
18-30	170	3.8600
70 and above	8	4.1000
Sig.		.287

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV2

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05 1
50-69	69	4.1478
70 and above	8	4.1500
31-49	140	4.2643
18-30	170	4.4353
Sig.		.577

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV3

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05	
		1	2
70 and above	8	3.1000	
18-30	170		3.9829
31-49	140		3.9871
50-69	69		4.0203
Sig.		1.000	.996

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV4

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05
		1
31-49	140	4.0429
70 and above	8	4.0500
50-69	69	4.0957
18-30	170	4.1212
Sig.		.963

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV5

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05	
		1	2
70 and above	8	2.6750	
31-49	140		3.5000
18-30	170		3.5106
50-69	69		3.6232
Sig.		1.000	.938

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_DV

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05	
		1	2
70 and above	8	2.7250	
50-69	69		3.6203
18-30	170		3.7000
31-49	140		3.7157
Sig.		1.000	.962

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Mediator

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05	
		1	2
70 and above	8	2.8250	
18-30	170		3.8682
31-49	140		3.8986
50-69	69		3.9130
Sig.		1.000	.996

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Moderator

Tukey HSD[a,b]

Specify Your Age Group?	N	Subset for alpha = .05	
		1	2
70 and above	8	2.8250	
18-30	170		3.8682
31-49	140		3.8986
50-69	69		3.9130
Sig.		1.000	.996

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 26.226.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Oneway

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ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Tot_IV1	Between Groups	2.718	3	.906	3.110	.026
	Within Groups	111.567	383	.291		
	Total	114.285	386			
Tot_IV2	Between Groups	2.579	3	.860	1.285	.279
	Within Groups	256.228	383	.669		
	Total	258.807	386			
Tot_IV3	Between Groups	10.715	3	3.572	10.699	.000
	Within Groups	127.850	383	.334		
	Total	138.565	386			
Tot_IV4	Between Groups	2.791	3	.930	2.753	.042
	Within Groups	129.412	383	.338		
	Total	132.203	386			
Tot_IV5	Between Groups	1.643	3	.548	.903	.440
	Within Groups	232.272	383	.606		
	Total	233.915	386			
Tot_DV	Between Groups	6.859	3	2.286	4.491	.004
	Within Groups	195.012	383	.509		
	Total	201.872	386			
Tot_Mediator	Between Groups	10.411	3	3.470	6.486	.000
	Within Groups	204.922	383	.535		
	Total	215.333	386			
Tot_Moderator	Between Groups	10.411	3	3.470	6.486	.000
	Within Groups	204.922	383	.535		
	Total	215.333	386			

Post Hoc Tests

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Specify Your Recent Qualification?	(J) Specify Your Recent Qualification?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tot_IV1	High School	Graduate	-.18900	.10973	.313	-.4721	.0941
		Postgraduate	-.36084*	.12420	.020	-.6813	-.0404
		Others	-.23908	.11301	.150	-.5307	.0525
	Graduate	High School	.18900	.10973	.313	-.0941	.4721
		Postgraduate	-.17183	.08160	.153	-.3824	.0387
		Others	-.05008	.06328	.858	-.2134	.1132
	Postgraduate	High School	.36084*	.12420	.020	.0404	.6813
		Graduate	.17183	.08160	.153	-.0387	.3824
		Others	.12175	.08597	.490	-.1001	.3436
	Others	High School	.23908	.11301	.150	-.0525	.5307
		Graduate	.05008	.06328	.858	-.1132	.2134
		Postgraduate	-.12175	.08597	.490	-.3436	.1001
Tot_IV2	High School	Graduate	-.20377	.16629	.611	-.6329	.2253
		Postgraduate	-.12783	.18822	.905	-.6135	.3578
		Others	-.03316	.17127	.997	-.4751	.4088
	Graduate	High School	.20377	.16629	.611	-.2253	.6329
		Postgraduate	.07594	.12366	.928	-.2432	.3950
		Others	.17061	.09590	.285	-.0769	.4181
	Postgraduate	High School	.12783	.18822	.905	-.3578	.6135
		Graduate	-.07594	.12366	.928	-.3950	.2432
		Others	.09467	.13028	.886	-.2415	.4308
	Others	High School	.03316	.17127	.997	-.4088	.4751
		Graduate	-.17061	.09590	.285	-.4181	.0769
		Postgraduate	-.09467	.13028	.886	-.4308	.2415
Tot_IV3	High School	Graduate	-.28764	.11746	.070	-.5907	.0155
		Postgraduate	-.13621	.13296	.735	-.4793	.2069
		Others	-.53537*	.12098	.000	-.8475	-.2232
	Graduate	High School	.28764	.11746	.070	-.0155	.5907
		Postgraduate	.15143	.08735	.308	-.0740	.3768
		Others	-.24773*	.06774	.002	-.4225	-.0729
	Postgraduate	High School	.13621	.13296	.735	-.2069	.4793
		Graduate	-.15143	.08735	.308	-.3768	.0740
		Others	-.39916*	.09203	.000	-.6366	-.1617
	Others	High School	.53537*	.12098	.000	.2232	.8475
		Graduate	.24773*	.06774	.002	.0729	.4225
		Postgraduate	.39916*	.09203	.000	.1617	.6366
Tot_IV4	High School	Graduate	-.23242	.11818	.202	-.5374	.0725
		Postgraduate	-.38128*	.13377	.024	-.7264	-.0361
		Others	-.25145	.12172	.166	-.5655	.0626
	Graduate	High School	.23242	.11818	.202	-.0725	.5374
		Postgraduate	-.14886	.08789	.328	-.3756	.0779
		Others	-.01903	.06816	.992	-.1949	.1568
	Postgraduate	High School	.38128*	.13377	.024	.0361	.7264
		Graduate	.14886	.08789	.328	-.0779	.3756
		Others	.12983	.09259	.499	-.1091	.3687
	Others	High School	.25145	.12172	.166	-.0626	.5655
		Graduate	.01903	.06816	.992	-.1568	.1949
		Postgraduate	-.12983	.09259	.499	-.3687	.1091
Tot_IV5	High School	Graduate	.04310	.15832	.993	-.3654	.4516
		Postgraduate	.05542	.17921	.990	-.4070	.5178
		Others	-.09611	.16306	.935	-.5169	.3247
	Graduate	High School	-.04310	.15832	.993	-.4516	.3654
		Postgraduate	.01232	.11774	1.000	-.2915	.3161
		Others	-.13921	.09131	.424	-.3748	.0964
	Postgraduate	High School	-.05542	.17921	.990	-.5178	.4070
		Graduate	-.01232	.11774	1.000	-.3161	.2915
		Others	-.15153	.12404	.614	-.4716	.1685
	Others	High School	.09611	.16306	.935	-.3247	.5169
		Graduate	.13921	.09131	.424	-.0964	.3748
		Postgraduate	.15153	.12404	.614	-.1685	.4716
Tot_DV	High School	Graduate	-.41549*	.14507	.023	-.7898	-.0412
		Postgraduate	-.32192	.16421	.205	-.7456	.1018
		Others	-.52758*	.14941	.003	-.9131	-.1420
	Graduate	High School	.41549*	.14507	.023	.0412	.7898
		Postgraduate	.09357	.10789	.822	-.1848	.3720
		Others	-.11209	.08367	.538	-.3280	.1038
	Postgraduate	High School	.32192	.16421	.205	-.1018	.7456
		Graduate	-.09357	.10789	.822	-.3720	.1848
		Others	-.20566	.11366	.270	-.4989	.0876
	Others	High School	.52758*	.14941	.003	.1420	.9131
		Graduate	.11209	.08367	.538	-.1038	.3280
		Postgraduate	.20566	.11366	.270	-.0876	.4989
Tot_Mediator	High School	Graduate	-.37496	.14871	.058	-.7587	.0088
		Postgraduate	-.18670	.16833	.684	-.6210	.2476
		Others	-.56469*	.15316	.001	-.9599	-.1695
	Graduate	High School	.37496	.14871	.058	-.0088	.7587
		Postgraduate	.18826	.11059	.324	-.0971	.4736
		Others	-.18973	.08577	.122	-.4110	.0316
	Postgraduate	High School	.18670	.16833	.684	-.2476	.6210
		Graduate	-.18826	.11059	.324	-.4736	.0971
		Others	-.37799*	.11651	.007	-.6786	-.0774
	Others	High School	.56469*	.15316	.001	.1695	.9599
		Graduate	.18973	.08577	.122	-.0316	.4110
		Postgraduate	.37799*	.11651	.007	.0774	.6786
Tot_Moderator	High School	Graduate	-.37496	.14871	.058	-.7587	.0088
		Postgraduate	-.18670	.16833	.684	-.6210	.2476
		Others	-.56469*	.15316	.001	-.9599	-.1695
	Graduate	High School	.37496	.14871	.058	-.0088	.7587
		Postgraduate	.18826	.11059	.324	-.0971	.4736
		Others	-.18973	.08577	.122	-.4110	.0316
	Postgraduate	High School	.18670	.16833	.684	-.2476	.6210
		Graduate	-.18826	.11059	.324	-.4736	.0971
		Others	-.37799*	.11651	.007	-.6786	-.0774
	Others	High School	.56469*	.15316	.001	.1695	.9599
		Graduate	.18973	.08577	.122	-.0316	.4110
		Postgraduate	.37799*	.11651	.007	.0774	.6786

*. The mean difference is significant at the .05 level.

Homogeneous Subsets

Tot_IV1

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05	
		1	2
High School	28	3.6357	
Graduate	178	3.8247	3.8247
Others	123	3.8748	3.8748
Postgraduate	58		3.9966
Sig.		.074	.303

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV2

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05
		1
High School	28	4.1929
Others	123	4.2260
Postgraduate	58	4.3207
Graduate	178	4.3966
Sig.		.523

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV3

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05		
		1	2	3
High School	28	3.6500		
Postgraduate	58	3.7862	3.7862	
Graduate	178		3.9376	3.9376
Others	123			4.1854
Sig.		.569	.478	.089

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV4

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05	
		1	2
High School	28	3.8429	
Graduate	178	4.0753	4.0753
Others	123	4.0943	4.0943
Postgraduate	58		4.2241
Sig.		.085	.499

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV5

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05
		1
Postgraduate	58	3.4517
Graduate	178	3.4640
High School	28	3.5071
Others	123	3.6033
Sig.		.711

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_DV

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05	
		1	2
High School	28	3.2643	
Postgraduate	58	3.5862	3.5862
Graduate	178		3.6798
Others	123		3.7919
Sig.		.066	.392

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Mediator

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05		
		1	2	3
High School	28	3.4857		
Postgraduate	58	3.6724	3.6724	
Graduate	178		3.8607	3.8607
Others	123			4.0504
Sig.		.502	.494	.487

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Moderator

Tukey HSD[a,b]

Specify Your Recent Qualification?	N	Subset for alpha = .05		
		1	2	3
High School	28	3.4857		
Postgraduate	58	3.6724	3.6724	
Graduate	178		3.8607	3.8607
Others	123			4.0504
Sig.		.502	.494	.487

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 59.967.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Oneway

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[DataSet1] C:\Users\Hp\Desktop\nada.sav
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ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Tot_IV1	Between Groups	.745	3	.248	.838	.474
	Within Groups	113.539	383	.296		
	Total	114.285	386			
Tot_IV2	Between Groups	6.639	3	2.213	3.361	.019
	Within Groups	252.168	383	.658		
	Total	258.807	386			
Tot_IV3	Between Groups	10.443	3	3.481	10.406	.000
	Within Groups	128.122	383	.335		
	Total	138.565	386			
Tot_IV4	Between Groups	1.546	3	.515	1.511	.211
	Within Groups	130.657	383	.341		
	Total	132.203	386			
Tot_IV5	Between Groups	11.804	3	3.935	6.785	.000
	Within Groups	222.111	383	.580		
	Total	233.915	386			
Tot_DV	Between Groups	14.105	3	4.702	9.591	.000
	Within Groups	187.766	383	.490		
	Total	201.872	386			
Tot_Mediator	Between Groups	22.690	3	7.563	15.037	.000
	Within Groups	192.643	383	.503		
	Total	215.333	386			
Tot_Moderator	Between Groups	22.690	3	7.563	15.037	.000
	Within Groups	192.643	383	.503		
	Total	215.333	386			

Post Hoc Tests

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Specify Your Occupation?	(J) Specify Your Occupation?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tot_IV1	Employed	Unemployed	-.07042	.12581	.944	-.3950	.2542
		Self-Employed	.08565	.06794	.589	-.0897	.2610
		Student	.02302	.07140	.988	-.1612	.2072
	Unemployed	Employed	.07042	.12581	.944	-.2542	.3950
		Self-Employed	.15607	.12545	.599	-.1676	.4798
		Student	.09343	.12736	.884	-.2352	.4221
	Self-Employed	Employed	-.08565	.06794	.589	-.2610	.0897
		Unemployed	-.15607	.12545	.599	-.4798	.1676
		Student	-.06264	.07077	.813	-.2452	.1200
	Student	Employed	-.02302	.07140	.988	-.2072	.1612
		Unemployed	-.09343	.12736	.884	-.4221	.2352
		Self-Employed	.06264	.07077	.813	-.1200	.2452
Tot_IV2	Employed	Unemployed	.23088	.18749	.607	-.2529	.7147
		Self-Employed	.10812	.10125	.709	-.1531	.3694
		Student	-.19101	.10640	.277	-.4656	.0836
	Unemployed	Employed	-.23088	.18749	.607	-.7147	.2529
		Self-Employed	-.12276	.18696	.913	-.6052	.3597
		Student	-.42189	.18980	.119	-.9116	.0679
	Self-Employed	Employed	-.10812	.10125	.709	-.3694	.1531
		Unemployed	.12276	.18696	.913	-.3597	.6052
		Student	-.29912*	.10546	.025	-.5713	-.0270
	Student	Employed	.19101	.10640	.277	-.0836	.4656
		Unemployed	.42189	.18980	.119	-.0679	.9116
		Self-Employed	.29912*	.10546	.025	.0270	.5713
Tot_IV3	Employed	Unemployed	.50440*	.13364	.001	.1596	.8492
		Self-Employed	-.07429	.07217	.732	-.2605	.1119
		Student	-.22540*	.07584	.017	-.4211	-.0297
	Unemployed	Employed	-.50440*	.13364	.001	-.8492	-.1596
		Self-Employed	-.57870*	.13326	.000	-.9226	-.2348
		Student	-.72980*	.13529	.000	-1.0789	-.3807
	Self-Employed	Employed	.07429	.07217	.732	-.1119	.2605
		Unemployed	.57870*	.13326	.000	.2348	.9226
		Student	-.15110	.07517	.186	-.3451	.0429
	Student	Employed	.22540*	.07584	.017	.0297	.4211
		Unemployed	.72980*	.13529	.000	.3807	1.0789
		Self-Employed	.15110	.07517	.186	-.0429	.3451
Tot_IV4	Employed	Unemployed	.17706	.13496	.556	-.1712	.5253
		Self-Employed	.05249	.07288	.889	-.1356	.2405
		Student	-.06958	.07659	.800	-.2672	.1281
	Unemployed	Employed	-.17706	.13496	.556	-.5253	.1712
		Self-Employed	-.12457	.13458	.791	-.4718	.2227
		Student	-.24663	.13662	.272	-.5992	.1059
	Self-Employed	Employed	-.05249	.07288	.889	-.2405	.1356
		Unemployed	.12457	.13458	.791	-.2227	.4718
		Student	-.12207	.07591	.375	-.3179	.0738
	Student	Employed	.06958	.07659	.800	-.1281	.2672
		Unemployed	.24663	.13662	.272	-.1059	.5992
		Self-Employed	.12207	.07591	.375	-.0738	.3179
Tot_IV5	Employed	Unemployed	.62496*	.17596	.002	.1709	1.0790
		Self-Employed	-.14367	.09502	.431	-.3889	.1015
		Student	.06958	.09986	.898	-.1881	.3273
	Unemployed	Employed	-.62496*	.17596	.002	-1.0790	-.1709
		Self-Employed	-.76863*	.17546	.000	-1.2214	-.3159
		Student	-.55539*	.17813	.011	-1.0150	-.0958
	Self-Employed	Employed	.14367	.09502	.431	-.1015	.3889
		Unemployed	.76863*	.17546	.000	.3159	1.2214
		Student	.21325	.09898	.138	-.0422	.4686
	Student	Employed	-.06958	.09986	.898	-.3273	.1881
		Unemployed	.55539*	.17813	.011	.0958	1.0150
		Self-Employed	-.21325	.09898	.138	-.4686	.0422
Tot_DV	Employed	Unemployed	.46696*	.16179	.021	.0495	.8844
		Self-Employed	-.22215	.08737	.055	-.4476	.0033
		Student	-.29735*	.09182	.007	-.5343	-.0604
	Unemployed	Employed	-.46696*	.16179	.021	-.8844	-.0495
		Self-Employed	-.68910*	.16133	.000	-1.1054	-.2728
		Student	-.76431*	.16378	.000	-1.1869	-.3417
	Self-Employed	Employed	.22215	.08737	.055	-.0033	.4476
		Unemployed	.68910*	.16133	.000	.2728	1.1054
		Student	-.07520	.09100	.842	-.3100	.1596
	Student	Employed	.29735*	.09182	.007	.0604	.5343
		Unemployed	.76431*	.16378	.000	.3417	1.1869
		Self-Employed	.07520	.09100	.842	-.1596	.3100
Tot_Mediator	Employed	Unemployed	.66219*	.16387	.000	.2393	1.0850
		Self-Employed	-.19180	.08850	.134	-.4201	.0366
		Student	-.37063*	.09300	.000	-.6106	-.1307
	Unemployed	Employed	-.66219*	.16387	.000	-1.0850	-.2393
		Self-Employed	-.85399*	.16341	.000	-1.2756	-.4323
		Student	-1.03283*	.16589	.000	-1.4609	-.6048
	Self-Employed	Employed	.19180	.08850	.134	-.0366	.4201
		Unemployed	.85399*	.16341	.000	.4323	1.2756
		Student	-.17884	.09218	.213	-.4167	.0590
	Student	Employed	.37063*	.09300	.000	.1307	.6106
		Unemployed	1.03283*	.16589	.000	.6048	1.4609
		Self-Employed	.17884	.09218	.213	-.0590	.4167
Tot_Moderator	Employed	Unemployed	.66219*	.16387	.000	.2393	1.0850
		Self-Employed	-.19180	.08850	.134	-.4201	.0366
		Student	-.37063*	.09300	.000	-.6106	-.1307
	Unemployed	Employed	-.66219*	.16387	.000	-1.0850	-.2393
		Self-Employed	-.85399*	.16341	.000	-1.2756	-.4323
		Student	-1.03283*	.16589	.000	-1.4609	-.6048
	Self-Employed	Employed	.19180	.08850	.134	-.0366	.4201
		Unemployed	.85399*	.16341	.000	.4323	1.2756
		Student	-.17884	.09218	.213	-.4167	.0590
	Student	Employed	.37063*	.09300	.000	.1307	.6106
		Unemployed	1.03283*	.16589	.000	.6048	1.4609
		Self-Employed	.17884	.09218	.213	-.0590	.4167

*. The mean difference is significant at the .05 level.

Homogeneous Subsets

Tot_IV1

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05 1
Self-Employed	131	3.7985
Student	108	3.8611
Employed	126	3.8841
Unemployed	22	3.9545
Sig.		.421

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV2

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05 1	2
Unemployed	22	4.0818	
Self-Employed	131	4.2046	4.2046
Employed	126	4.3127	4.3127
Student	108		4.5037
Sig.		.428	.203

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV3

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05	
		1	2
Unemployed	22	3.4091	
Employed	126		3.9135
Self-Employed	131		3.9878
Student	108		4.1389
Sig.		1.000	.162

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV4

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05
		1
Unemployed	22	3.9182
Self-Employed	131	4.0427
Employed	126	4.0952
Student	108	4.1648
Sig.		.111

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV5

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05	
		1	2
Unemployed	22	2.8909	
Student	108		3.4463
Employed	126		3.5159
Self-Employed	131		3.6595
Sig.		1.000	.442

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_DV

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05	
		1	2
Unemployed	22	3.0727	
Employed	126		3.5397
Self-Employed	131		3.7618
Student	108		3.8370
Sig.		1.000	.108

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Mediator

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05		
		1	2	3
Unemployed	22	3.0727		
Employed	126		3.7349	
Self-Employed	131		3.9267	3.9267
Student	108			4.1056
Sig.		1.000	.474	.535

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Moderator

Tukey HSD[a,b]

Specify Your Occupation?	N	Subset for alpha = .05		
		1	2	3
Unemployed	22	3.0727		
Employed	126		3.7349	
Self-Employed	131		3.9267	3.9267
Student	108			4.1056
Sig.		1.000	.474	.535

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 56.912.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Oneway

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[DataSet1] C:\Users\Hp\Desktop\nada.sav
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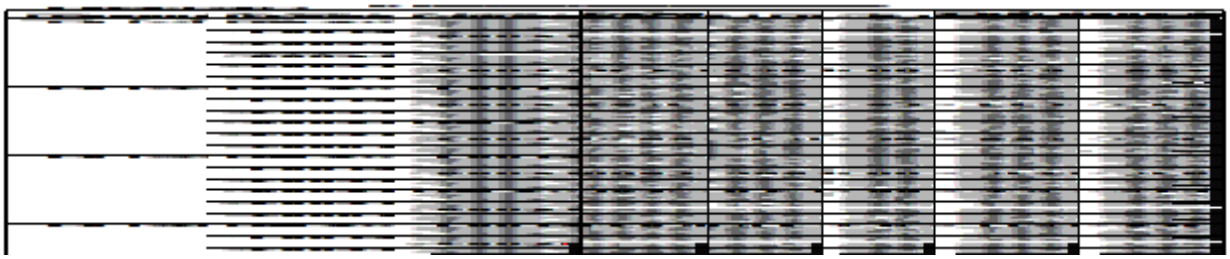
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Tot_IV1	Between Groups	1.233	5	.247	.831	.528
	Within Groups	113.052	381	.297		
	Total	114.285	386			
Tot_IV2	Between Groups	7.687	5	1.537	2.332	.042
	Within Groups	251.121	381	.659		
	Total	258.807	386			
Tot_IV3	Between Groups	2.762	5	.552	1.550	.174
	Within Groups	135.803	381	.356		
	Total	138.565	386			
Tot_IV4	Between Groups	5.803	5	1.161	3.498	.004
	Within Groups	126.400	381	.332		
	Total	132.203	386			
Tot_IV5	Between Groups	4.824	5	.965	1.604	.158
	Within Groups	229.091	381	.601		
	Total	233.915	386			
Tot_DV	Between Groups	1.480	5	.296	.563	.729
	Within Groups	200.392	381	.526		
	Total	201.872	386			
Tot_Mediator	Between Groups	2.850	5	.570	1.022	.404
	Within Groups	212.483	381	.558		
	Total	215.333	386			
Tot_Moderator	Between Groups	2.850	5	.570	1.022	.404
	Within Groups	212.483	381	.558		
	Total	215.333	386			

Post Hoc Tests



Homogeneous Subsets

Tot_IV1

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05
		1
>5000 KD	16	3.6875
2000-3000 KD	83	3.7880
4000-5000 KD	23	3.8087
Below 1000 KD	139	3.8777
1000 â€“ 2000 KD	79	3.8785
3000-4000 KD	47	3.9277
Sig.		.395

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV2

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05
		1
3000-4000 KD	47	4.0511
2000-3000 KD	83	4.1855
1000 â€“ 2000 KD	79	4.3392
4000-5000 KD	23	4.3652
Below 1000 KD	139	4.4360
>5000 KD	16	4.5500
Sig.		.084

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV3

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05	
		1	2
>5000 KD	16	3.5875	
4000-5000 KD	23	3.9043	3.9043
3000-4000 KD	47	3.9766	3.9766
1000 â€“ 2000 KD	79	3.9772	3.9772
2000-3000 KD	83		3.9880
Below 1000 KD	139		4.0158
Sig.		.054	.965

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV4

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05	
		1	2
>5000 KD	16	3.8125	
2000-3000 KD	83	3.9494	3.9494
1000 â€“ 2000 KD	79	4.0253	4.0253
Below 1000 KD	139	4.1453	4.1453
4000-5000 KD	23		4.2435
3000-4000 KD	47		4.2766
Sig.		.124	.137

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV5

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05
		1
Below 1000 KD	139	3.3842
4000-5000 KD	23	3.4435
3000-4000 KD	47	3.5319
1000 â€“ 2000 KD	79	3.5392
2000-3000 KD	83	3.6651
>5000 KD	16	3.6750
Sig.		.580

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_DV

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05
		1
>5000 KD	16	3.5250
3000-4000 KD	47	3.6000
1000 â€“ 2000 KD	79	3.6127
4000-5000 KD	23	3.6783
Below 1000 KD	139	3.6964
2000-3000 KD	83	3.7518
Sig.		.752

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Mediator

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05
		1
>5000 KD	16	3.5875
4000-5000 KD	23	3.7739
3000-4000 KD	47	3.8340
1000 â€“ 2000 KD	79	3.8506
Below 1000 KD	139	3.8561
2000-3000 KD	83	3.9928
Sig.		.175

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Moderator

Tukey HSD[a,b]

Specify Your Monthly Income?	N	Subset for alpha = .05
		1
>5000 KD	16	3.5875
4000-5000 KD	23	3.7739
3000-4000 KD	47	3.8340
1000 â€“ 2000 KD	79	3.8506
Below 1000 KD	139	3.8561
2000-3000 KD	83	3.9928
Sig.		.175

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 37.699.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

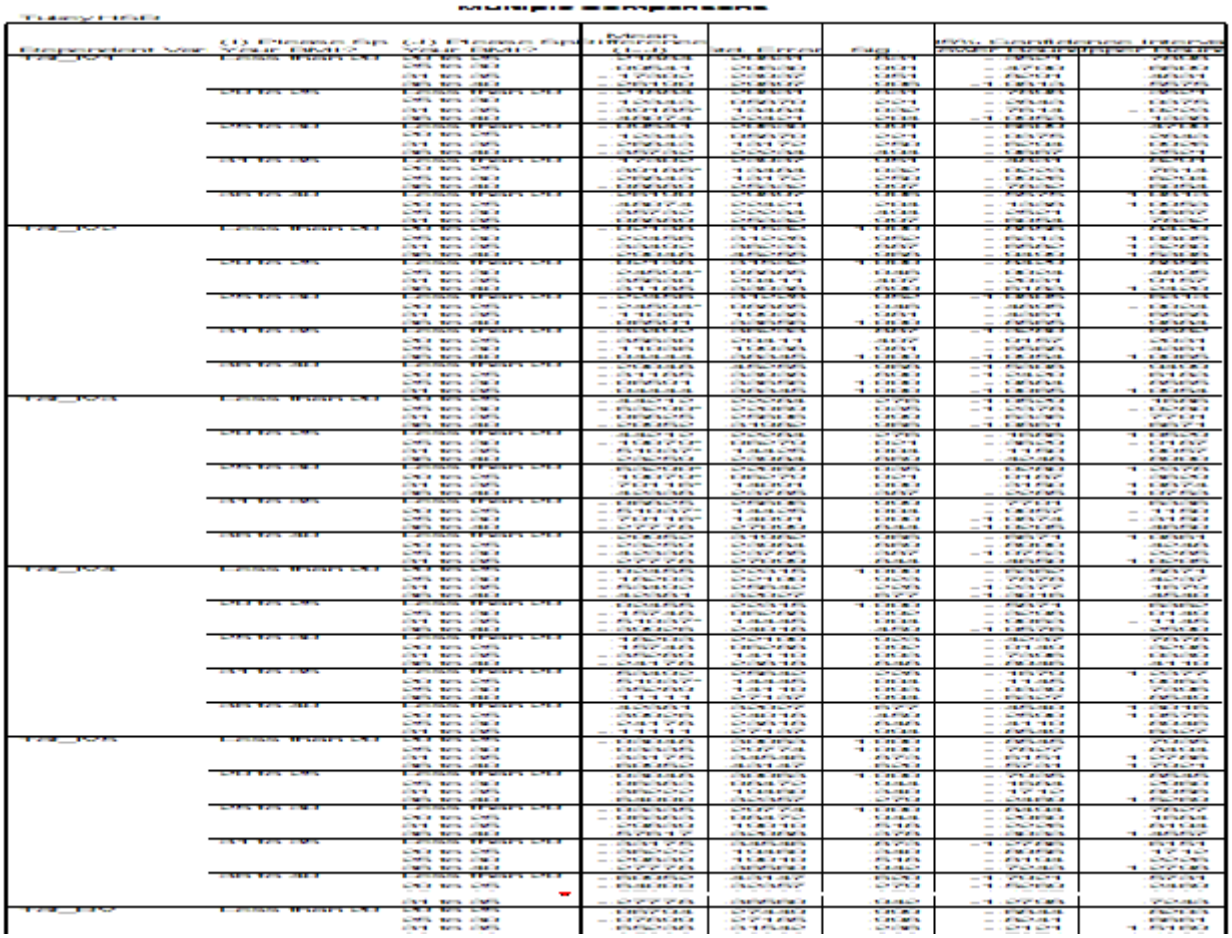
Oneway

```
[DataSet1] C:\Users\Hp\Desktop\nada.sav
```

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Tot_IV1	Between Groups	3.973	4	.993	3.440	.009
	Within Groups	110.312	382	.289		
	Total	114.285	386			
Tot_IV2	Between Groups	6.053	4	1.513	2.287	.060
	Within Groups	252.755	382	.662		
	Total	258.807	386			
Tot_IV3	Between Groups	12.329	4	3.082	9.327	.000
	Within Groups	126.236	382	.330		
	Total	138.565	386			
Tot_IV4	Between Groups	5.611	4	1.403	4.233	.002
	Within Groups	126.591	382	.331		
	Total	132.203	386			
Tot_IV5	Between Groups	4.152	4	1.038	1.726	.143
	Within Groups	229.762	382	.601		
	Total	233.915	386			
Tot_DV	Between Groups	10.328	4	2.582	5.149	.000
	Within Groups	191.544	382	.501		
	Total	201.872	386			
Tot_Mediator	Between Groups	28.469	4	7.117	14.549	.000
	Within Groups	186.864	382	.489		
	Total	215.333	386			
Tot_Moderator	Between Groups	28.469	4	7.117	14.549	.000
	Within Groups	186.864	382	.489		
	Total	215.333	386			

Post Hoc Tests



Homogeneous Subsets

Tot_IV1

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05
		1
20 to 25	135	3.7526
25 to 30	221	3.8760
Less than 20	7	3.9714
31 to 35	18	4.1444
36 to 40	6	4.2333
Sig.		.146

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV2

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05
		1
31 to 35	18	4.1222
36 to 40	6	4.1667
25 to 30	221	4.2326
Less than 20	7	4.4571
20 to 25	135	4.4785
Sig.		.792

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV3

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05	
		1	2
31 to 35	18	3.3889	
Less than 20	7	3.4571	
36 to 40	6	3.6667	3.6667
20 to 25	135	3.8993	3.8993
25 to 30	221		4.0900
Sig.		.152	.321

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV4

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05
		1
Less than 20	7	3.9429
20 to 25	135	3.9674
25 to 30	221	4.1249
36 to 40	6	4.3667
31 to 35	18	4.4778
Sig.		.119

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_IV5

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05
		1
36 to 40	6	2.9333
31 to 35	18	3.2111
25 to 30	221	3.5095
Less than 20	7	3.5429
20 to 25	135	3.5733
Sig.		.212

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_DV

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05
		1
31 to 35	18	3.0333
36 to 40	6	3.3333
20 to 25	135	3.6178
Less than 20	7	3.6857
25 to 30	221	3.7647
Sig.		.062

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Mediator

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05		
		1	2	3
36 to 40	6	2.9000		
31 to 35	18	3.0000		
Less than 20	7	3.2857	3.2857	
20 to 25	135		3.7822	3.7822
25 to 30	221			4.0317
Sig.		.615	.359	.890

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Tot_Moderator

Tukey HSD[a,b]

Please Specify Your BMI?	N	Subset for alpha = .05		
		1	2	3
36 to 40	6	2.9000		
31 to 35	18	3.0000		
Less than 20	7	3.2857	3.2857	
20 to 25	135		3.7822	3.7822
25 to 30	221			4.0317
Sig.		.615	.359	.890

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 13.262.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

PUBLICATION AND PRESENTATION

Journal Submit for Publishing

- Revie paper: Role of Healthcare Applications and wearable Gadgets to Achieve Better Lifestyle.

Journal Published

	Article Title	Journal	Authors
	Obesity Review in GCC and New Evaluation Strategy	KnE Social Sciences, PwR Symposium Annual PwR Doctoral Symposium 2018–2019,Volume 2019	Nada Rabeea , Tillal Eldabi, and Dalia M Kamel
	Tackling obesity in the GCC: Increasing Popularity of Bariatric Surgery to Replace a Healthy Lifestyle, Better Understanding for Policies and Regulations.	***Proceeding of Industrial Revolution & Business Management: 11th Annual PwR Doctoral Symposium (PWRDS) 2020***	***Nada Rabeea AlYouha,*** Weifeng-Chen, Dalia M Kamel

Conference

No	Article Title	Authors	Conference	Place and Date
1	-	-	8th PhD Symposium	Ahlia University – Bahrain.Feb 2017
2	Obesity Factors: A Review of The Literature	Nada Rabeea , Tillal Eldabi, and Muhammad M. Kamel	9th PhD Symposium	Ahlia University – Bahrain.Feb 2018
3	Obesity Review in GCC and New Evaluation Strategy	Nada Rabeea , Tillal Eldabi, and Dalia M Kamel	10th PhD Symposium	Ahlia University – Bahrain.Feb 2019

Awards

No	Article Title	Award Title	Organization	Place and Date

1	Obesity Factors: A Review of The Literature	the best paper award for literature review 9th PhD Symposium	Brunel University London/Ahlia University Bahrain	Feb 2018