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MULTI-DISCIPLINARY APPROACH TO OBESITY MANAGEMENT AND BARIATRIC SURGER

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ABBREVIATIONS

1. ACE: Angiotensin Converting Enzyme
2. BMI: Body Mass Index
3. CVDs: Cardiovascular disease
4. DM: Diabetes Mellitus
5. DRD: Dopamine Receptor Gene
6. FDA: Food and Drug Administration
7. GAD2: Glutamic acid decarboxylase gene
8. GB: Gastric Bypass
9. GCC: Gulf Cooperation Council
10. HTN: Hypertension
11. LEP: Leptin obesity homologue
12. NCDs: Non-communicable Diseases
13. NHBLI: National heart, lung and blood institute
14. SA: Subcutaneous Abdominal
15. UAE: United Arab Emirates
16. UCP: Uncoupling Proteins
17. VA: Visceral Fat
18. VBG: Vertical Banded Gastroplasty
19. WC: Waist Circumference
20. WHO: World Health Organisation
21. WHR: Waist Hip Ratio

INTRODUCTION

1.1 Pathology of Obesity

Obesity is defined as an accretion of anomalous and unnecessary fat in the body resulting in the impairment of health **(Kim., 2016)**. It occurs when anomalous quantities of triglycerides are stored in adipose tissue and are release in the form of free fatty acids with side effects. Hippocrates, Greek Physician was the first person to connect obesity with disease. He stated the fact that unexpected mortality rate is higher and common in persons that are naturally fat as compared to those who are lean **(Xia & Grant., 2013).** Obesity is a condition of increased adipose tissue. Adipose tissue considerably differs between individuals. However, it is wrong to look down upon adipose tissue as single entity as many subtypes of adipose tissue exists (likewise visceral and subcutaneous). Both these forms have different impact on human health. This tissue acts both as storage tissue as well as endocrine organ releasing several chemical messengers that have a direct or indirect effect on other tissues. One of the topmost global concern is the dramatically increased prevalence of obesity. In the last few decades much of literature has been reported on the regulation of obesity. It is much dependent on the regulation of appetite i.e. calorie intake should be equal to calorie expenditure in the same way as positive energy balances disturbed lipids and glucose metabolism. Obesity not only plays a key role in altering the metabolic functions involving lipids and glucose metabolism, but it also alters and effects organ functions involving cardiac, liver, pulmonary, endocrine and reproductive functions. It is basically an embellishment of normal adiposity and it plays a key role in the manifestation of severe health problems such as diabetes mellitus, insulin resistance, dyslipidaemia, hypertension, atherosclerosis and sleep apnoea. Extra amount of adipokines secretes several cytokines that causes dysfunction of vascular system which in turn leads to several metabolic heath issues. Adipokines are the mediators secreted by the adipose tissue and its action alters many obesity related diseases. Several studies reported that leptin and ghrelin are two major hormones that influences appetite to a greater extent. They are produced peripherally and controls their appetite through their action on central nervous system. Both these hormones and other hormones regulating appetite acts on hypothalamus. Ghrelin produced in stomach plays a role in modulating short term appetite control (i.e. when to eat and when not to eat). On

the other hand leptin produced by adipose tissue signals fat storage reserves in the body and mediates long term appetitive controls i:e to eat in excess when low fat reserves are there and to eat less when abundant fat reserve is there). Obesity has become a multifaceted situation with serious social and emotional aspects affecting all ages and socioeconomic groups. Expert consultation committee on obesity (WHO) in 1997 notified that almost all countries in the world will be facing obesity outbreak and this situation of obesogenic environment will develop a high risk of non communicable diseases (NCDs) **(Sulaiman et al., 2017).** In general, practice, BMI (Body Mass Index), WHR (Waist Hip Ratio) and other anthropometric measurements are use for the measurement of obesity.BMI scale is used for the measurement and clinical screening of obesity levels in the individuals. It is the ratio of body weight for height, reveals the total body weight, and is used as most acceptable tool for defining overweight. BMI range above 25 kg/m^2 i.e. between 25 and 29.9 kg/m2 and above 30 kg/m2 were defined as obese or overweight respectively. WHR is measured as the ration of waist circumference (WC) to hip circumference and is characterized using sex specific median (0.91 for men and 0.85 for women) Due to ease in use and measurement BMI is extensively used as a marker for measuring obesity not only in epidemiological studies but also in the clinical practice **(Pasco et al., 2014).** The fraction of people with BMI of 25 kg/m^2 has gradually increased from 28.8% to 36.6% in males and 29.8% to 38% in females between the years 1980 -2013 and further reports depict that there will an increase in this trend in future obesity levels **(Sulaiman et al., 2017).**

BMI= Weight of an individual (Kg)

$$\frac{\text{Weight of an individual (Kg)}}{\text{Height}^2\ (m^2)}$$

1.2 Epidemiology of Obesity: This disease of uncontrolled weight gain is caused by a complex interplay of genes, environment, human behaviour and genetic predisposition. Out of all these factors environmental factors are the major contributors to the obesity epidemic. It is certain fact that obesity is caused by the imbalance between the energy intake and energy expenditure but the actual factors contributing to this imbalance is still confusing. Studies by several researchers demonstrated that lack of physical activity, increased intake of carbonated drinks or high calorie food, sedentary lifestyle etc has a great impact on obesity epidemic.

1.2.1 Environmental Factors

Obesogenic environment is defined as environment or surroundings that support increased food intake and decreased physical activity. Environmental and lifestyle factors play a key role in the progression of obesity **(Brehm & Alession., 2014).** Lifestyle and dietary patterns have a greater impact on the health of an individual. Diet and physical inactivity are the cornerstone of obesity and globalization has led to comforting lifestyle that involves minimized physical activity. Sociodemographic factors such as age, education level, economic status etc are related to obesity **(Harrison et al., 2017).**

1.2.2 Genetic Factors

The pathogenesis of obesity is quite complicated involving multiple interactions among behavioural, genetic and non-genetic factors. Several research reports provided strong evidences for the genetic factors playing a significant function in risk of becoming obese. The Genome Wide Association Studies (GWAS) and Human Obesity Gene Map have identified more than 300 genes that are responsible for causing obesity and provide a robust to genetic association to disease. Gene defect or polymorphism in the appetite regulation results in the hyperphagia the underlying cause for the obesity. Several candidate genes responsible for the manifestation of obesity are: GAD2 (Glutamic acid decarboxylase gene), ACE (Angiotensin Converting Enzyme), DRD (Dopamine Receptor Gene), LEP (Leptin obesity homologue), UCP series (Uncoupling Proteins), FTO etc **(Walley et al., 2006).**

1.2.2 Behavioural Factors

Social interactions and habits to some extent contribute to the obesity. Alcohol and smoking tend to add on high calories, stimulants such as nicotine increase the appetite and it hinders person's

capacity to make choice between healthy food and required amount of food. Sedentary lifestyle and intake of high calorie food, junk foods, soft drink etc adds on to the risk of developing excess of fat in the body **(Kolb & Martin., 2017).**

1.2.5 Associated Health Diseases

Obesity is a multifactorial disorder and is associated with number of serious lives limiting diseases such as diabetes, cardiovascular disease (CVDs), hypertension (HTN), cancers, sleep apnoea etc. According to WHO reports, 20% of population in world suffers from obesity related hypertension. Several epidemiological studies reported that obese women have 30-50% greater risk of developing breast cancer as compared to lean women **(Crowther., 2005).**

1.3 Obesity Management

Yumuk et al (2015) gave the European guidelines for obesity management in adults. In this study, Yumuk and his co-workers explained a guide to patients to select their first level of intervention. This guide explains BMI vs. waist circumference in men and women and the level of co morbidities. Moreover, the guide also explained the role of clinical pathways in determining the overweight and obesity levels. These guidelines are extremely significant in explaining the clinical and non-clinical management of obese adults and the guide also helps in providing stepwise management of obesity in adults. The central aim of these guidelines is not only weight reduction but the improvement in the health and quality of life and management of co morbidities. These guidelines presented a set of weight management opportunities that can be alter as per patients' approach.

1. Lifestyle Modifications
2. Physiological Support
3. Cognitive Behavioural Therapy
4. Pharmacological Interventions
5. Surgical Interventions

1.4 Multidisciplinary Approaches for Management and Treatments of Obesity.

Montesi and his associates (2016) in their research report explained that major challenge in obesity treatment is not weight loss but the long-term management of weight loss. Several

factors such as environmental, behavioural, biological and cognitive factors interfere with interfere with the management of weight loss. A team of multidisciplinary professional and specialized strategies is involved in research setting and their role in the management of weight loss. Since, there are multiple risk factors that cause obesity; therefore, there are several options available for the treatment of obesity. The team of National heart, lung and blood institute (NHLBI) in collaboration with American association for the study of obesity (NAASO) produced practical guide to the "*Identification, Evaluation and Treatment of Overweight and Obesity in Adults"*. The NHLBI and NAASO contain specific guidelines for the treatment of obese people depending upon their BMI and disease risk **(Fabricatore & Waaden., 2003).** The team of multidisciplinary doctors and specialists ideally manages treatment and management of obese people. This includes physicians, dieticians, surgeons, exercise therapist etc (**Blaz &Svab., 2015).**

1.4.1 Lifestyle Modification: As per the guidelines, individuals with BMI > 30kg/m^2 or with BMI 25-29.9 kg/m^2 are attempted to weight loss program by sticking to programmed diet, exercise and behavioural therapy. These three aspects complete the base of lifestyle modifications and are cornerstone of obesity treatment. Dieting mean staying on particular regime for weight loss whereas lifestyle modifications involve implementation of dietary and behavioural changes that can be sustained to promote health **(Fabricatore & Waaden., 2003).**

Dietary Intervention: It involves interventions that are designed to create negative energy balance by reducing the daily intake of calories, monitoring their portion size and recording their regular calorie intake. More of self-monitoring records help patients to lose weight more rapidly. Structured diet plan and intake of low-calorie diet also helps patients in reducing and maintaining their gross weight. Very low-calorie diet is recommended for the patients whose BMI > 30 Kg/m^2.

Physical Activity: Physical activity is the second main component of lifestyle interventions. Advantages of physical activity includes inducing negative energy balance between the calorie intake and expenditure, physical output helps patients to reduce extra fat mass, reduces the risk of CVDs, DM and HTN. A regular walk of 40-45 minutes is recommended to obese patients and it helps in reducing as well as managing the proper weight of an individual. Physical activity is categorized into two parts programmed and lifestyle activity.

Behaviour Therapy: This is non-invasive and low-cost intervention focusing on promoting lifestyle changes. It includes time and dedication both on the part of patient and care provider. Several hospitals and health care centres carry out programs on weight losing sessions. Health care providers set up specific goals for patients depending upon their BMI. Registered dietitian nationalists are involved in the health goals. Aspects involved in this intervention involve self-control, stimulus control, relapse prevention and cognitive restructuring (**Kelley *et al.*, 2016).**

1.4.2 Pharmacological Interventions: This therapy is use in patients who fail to lose extra fat mass through Lifestyle modifications and have two or more obesity related co morbidities. Pharmacotherapy approved by Food and Drug Administration (FDA) for long-term treatment proves to be successful treatment for treating high-risk obese patients. Drugs are used for treating obesity if there is failure from lifestyle interventions after an interval of 6 months. Sibutramine (Meridia) and orlistat (Xenical) are two drugs that are approve by FDA for the induction and maintenance of weight loss in patients **(Lemos., 2018).**

1.4.3 Surgical Interventions: Bariatric surgery is the most intensive treatment of obesity. According to US practice guidelines, patients qualify for bariatric surgery with a body mass index of 35 kg/m $^{(2)}$ and associated co morbidities, or a body mass index of 40 kg/m $^{(2),}$ after failure of conservative weight loss measures **(Kissler & Settmatcher., 2013).** The surgery involves the reduction in weight by reducing the size of stomach and this is facilitated either by removing a part of stomach or by reducing the size of stomach by using gastric band. Two most common procedures of surgery involve vertical banded gastroplasty (VBG) and gastric bypass (GB). Bariatric surgery helps in average weight reduction of 25% (VBG) to 30% (GB) of starting weight and it helps in significant improvement of HTN, sleep apnoea and diabetes. Several randomized trials showed that GB has better significant results than VBG **(Grunchy & Eligar., 2017).**

1.5 Health Policies in Obesity Management

To the greater extent obesity epidemic has been endorsed to the changes in our day to day life and in our work culture (increased consumption of high calorie food and decreased work out level for the energy expenditure). Public health policies are playing a significant role in helping people to lose and maintain weight. They are of key importance in assisting people who are in trouble with their excess body weight. These health policies help people in shedding out extra

weight and in the further management of their body weight. They assist people to have more bend towards the low-calorie diets, eating food in smaller portions, and adequate intake of roughage and to develop walk or exercise as regular regime. Health policies has a greater impact on the health of obese people by moving them towards healthy and obesogenic free environment. Prevention of overweight and obesity is high on public health agenda. But these programmes have certain ethical pitfalls. It is significantly important to consider these ethical pitfalls that harm human values.

1.6 Role of Follow up Programs in Weight Management

After weight loss programme, there is a critical need of follow up programme for the management of lose weight. Follow up programmes are significant from two major perspectives: success of management plan for weight loss and another is ethical perspective. These follow up programmes helps individual to select the appropriate weight range in which he or she can realistically stay and minimize health risks. Assist them in understanding and implementing the concept of balancing the energy. Self-monitoring is fundamental in long term management of weight loss. It also helps patients in maintaining their newly attained lifestyle changes for longer period of time till the time these new habits turn into their behaviours. Moreover, ethically it is essential for weight loss programmes to have followed up programmes for the further management of weight in patients **(Have et al., 2012).**

The first line treatment for the management of obesity is by the use of multidisciplinary approaches such as modification of lifestyle, behavioural and environmental patterns. Some patients prefer to lose weight at one go and for lifetime while some prefer to undergo lifestyle modifications interventions for losing weight rather than undergoing any surgeries. Surgeries are effective treatment in morbid obese patients **(Elte et al., 2008).**

1.7 Prevalence of Obesity in Different Countries

The word Obesity can also be renamed as “New World Syndrome”. Globally, the incidence of obesity and overweight is skyrocketed in all the countries. It is Worldwide Obesity has reached epidemic section with more than one billion overweight adults and more that 400 million people are obese globally. In the last 10 years statistical analysis reveals the logistic analysis showing that the incidence of obesity has increased from 12 to 20% in men and 16 to 25% in women. Several studies in USA proposed that enhanced incidence of overweight and obesity could lead to turn down in the life expectancy rate **(Ng et al., 2014).** Estimates of 2014, revealed that nearly

11% of adult men and 15% of adult women were obese and under the age of 5 more than 42 million children are obese. In US, more that 36% of adults over the age of 20 and 17 % children are obese. Obesity in US varies with gender and socio-economic status (38.3% of women and 34.3% of men are obese). Incidence of obesity in youngsters and children is lower in Canada as compared to US **(Johnson & Mincey., 2016).** Studies in European countries also explained that there is 15 to 20% progression in the trend of obesity rates in middle aged European population **(Nammi et al., 2004).** A systematic review study conducted by **Nohair (2014)** in Gulf countries reported that 48% of males and 35% of females are overweight and 24% males and 40 % females are obese in Gulf Cooperation Council (GCC). **Wijnhoven et al (2014)** conducted their research study to analyse the prevalence of obesity in 15 European countries and it was revealed from the report that the value 18 to 50% of girls is overweight and 18 to 57% boys are overweight. Mexican countries also suffered a great increase in the obesity incidence between the years 1990-2010 **(Barquera et al., 2009).** Obesity is on higher range in England. 27% of men and women are obese and this ratio is predicted to be doubled by 2050 **(Kyle et al., 2017).**

1.8 Interest of the Study: The present study was designed keeping in view that it's a need of hour for further research further research and survey into relationship between obesity and multidisciplinary approaches for the treatment and management of the disease. Due to the lack of sufficient literature and research, finding it seems appropriate to investigate the associated health risk factors associated with obese patients and the multidisciplinary approaches available to manage obesity. As, bariatric surgery has recently come over in Middle East not much work has been reported on obesity and bariatric surgery. However, the populace in Middle East shows a tremendous increase in the obesity incidence and prevalence. So, keeping all these points in mind our interest was inclined to carry out a research study on '*Obesity Management through Bariatric Surgery*". Underpinned are the main study objectives that will be covered in our research study.

1.9 Main Objectives of the Study

- To rule out the association between obesity and associated risk factors.
- To explore participants knowledge about obesity and associated risk factors

- To explore participants knowledge on available obesity treatment.
- To determine the role of Bariatric Surgery in long term management of Obesity
- To assess the issues faced by patients in postoperative care and treatment.
- To assess the ethical implications, involve in obesity management.
- Role of health policies in obesity management
- To evaluate the participation of patient and its family before and after the implementation of bariatric surgery
- To highlight the most relevant ethical questions associated with bariatric surgery treatment.
- To evaluate whether bariatric surgery is safe and effective method to treat obesity.
- To highlight the significance of informed consent in bariatric surgery.

1.10 METHDOLOGY DESIGNED FOR PRESENT SRTUDY

The present study was designed in Dr. Mohammad Al-Zitawi Obesity Management Centre between the years 2015-2018. A total of 154 patients between the age group of 20 to 50s were enrolled in the underlined study. Most of the recruited patients were from Jordan, Iraq and Gulf countries. Since, all the patients enrolled were from Gulf and Jordan, they were informed about the study over phone.

For the study purpose, a detailed questionnaire was designed to fill up the complete details of patients and the questionnaire was explained to the patients in their native language only. It's a retrospective kind of study and the consent was also obtained from patients on phone only. Moreover, a detailed knowledge was also imparted to the patients about the ethical aspects of the study about the privacy and confidentiality of their information and they have full freedom to leave the interview in between if they feel at any point that they are treated biased.

1.11 RESULTS: The findings of our study proposed that obesity was not at all significantly associated with most of studied risk factors in our study participants. It was also documented from our findings that most of the patients were not having adequate knowledge about the obesity and also about the associated risk factors. Moreover, they hardly have any knowledge about the treatment and management procedures. Patients were not well equipped in their knowledge about medications and surgical procedures. Only small fraction of people has wee knowledge about the diet and exercise interventions. On the other hand, the role of bariatric surgery, it was reported in our findings that bariatric surgery is one of the well opted treatment and management intervention for obese people when other interventions failed because of comorbidities such as diabetes and hypertension. On the basis of study findings, bariatric surgery has been generally successful as undertaken in Jordan with a policy guideline being in place for determining when and how bariatric surgery should be undertaken in Jordan and who should be involved before and after the bariatric surgery. Several ethical questions are however evident in relation to how obesity management is undertaken in Jordan before and after the bariatric surgery.

2. REVIEW OF LITERATURE

Obesity, defined as a surplus body weight is a never-ending and fastest growing health crisis in the world. It presents a chief plethora for several Non-communicable diseases (NCDs) such as diabetes, HTN, CVDs, cancers etc and is also known as "New World Syndrome" causing a massive social and economic burden in developing countries. Obesity and non-communicable disease have become a serious health issue not only in prosperous and wealthy culture, but its impact is getting high in rising nations also **(Piernas et al., 2016)**. The World Health Organization has defined "Obesity" as one of the most neglected health issues affective the entire globe. Obesity is multifaceted disease that involves the interplay of genetic and environmental factors. Globalization and urbanization have changed the dietary pattern and lifestyle mode of inhabitants in society. Anomalous build-up of fatty tissue in the abdominal region is due to energy disproportion. This imbalance in energy is due to the interface of several factors such as excess intake of energy dense food and less output of exercise **(Greenberg & Martin 2006).**

2.1 History of Obesity

Neel (1962) postulated a theory that genes that are metabolically "thrifty" take a survival advantage at times of starvation and famine. Whenever food is in plenty, these genes aid in the efficient metabolism and enables rapid fat to build up. This facilitates survival during food shortage. However, whenever food is in abundant this build up turns into disadvantage of excess fat storage that converts into obesity. Almost half of Americans are Obese or overweight. Medical and public health recommendations call for weight loss in these patients. Authors in this study reported that obese or overweight people are at higher risk of developing several adverse health consequences and weight loss is mandatory in obese people to avoid further health hazards. Obese patients should be encouraged to make lifestyle changes to manage their weight **(Bray., 2004).** Present medical scenario considers obesity as a disease. However, it is a biological adaptation that has occurred as the result of evolution **(Chaput et al., 2012).** During pre-agricultural and preindustrial times, humans tend to be hunters or food gatherers and at the time of food famine, the individuals who possess the capability to store extra energy in their fat tissues were survivors **(Pontzer et al., 2012).**

2.2 Obesity Measurements

Seidell & Flegal (1997) explained in their study that obesity is defined by the use of measurements. BMI is use as standards for measuring obesity. Folks having their body mass index greater than 30 KG/M^2 are categorized as obese and those with body mass index lying between 25 and 30 Kg/m^2 are graded as overweight**. Aronne (2002)** also explained in his report that classification and assessment of obesity is done by BMI and WHR. Central obesity is measured by using appropriate anthropometric measurements such as BNI, WHR and WC. As per guidelines of WHO BMI between 24.9 kg/m2 , overweight 25 to 29.9 kg/m2 and obese >30 kg/m2 adults, Waist Circumference (WC): > 35 inches (88 cm) in women and > 40 inches (102 cm) in men. Waist- Hip Ratio (WHR): >9.0 in men and >8.5 in women. WC and WHR are use as markers for central obesity **(Welborn and Dhaliwal., 2007 & Srikanthan et al., 2009).** Anuradha and her colleagues also proposed a statement that WC measurement is an easy, accurate and suitable way for assessing obesity and risk of obesity related diseases **(Anuradha et al., 2012).**

2.3 Body Fat Distribution

The excess accretion of adipose tissue in the body turns into obesity. It is a chronic disease in which the normal body weight exceeds by 20% and this abnormally increased body weight becomes a social, economic and a major trouble for the society. The major limitation of BMI is that it is specified and measures surplus weight of body but fails to measure body fat and also the variation in fat distribution within the body. Health issues of fatness are not only because of having obese body but also due to uneven distribution of body fat. **Bray & Gary (1988)** gave two classifications of obesity: upper body obesity android or male type is apple shaped whereas lower body obesity female or gynoid type is pear shaped. In android obesity fat deposition is more in upper abdominal area compared to hips and thighs while in female's fat deposition is more prominent in lower areas i:e hips and thighs. Waist hip ratio (WHR) is most commonly used method for assessing fat distribution. Wu and associates undertake a research analysis to rule out, among waist hip ratio (WHR), waist circumference (WC), body mass index (BMI), waist to height ratio (WHtR) which one is better indicator of subcutaneous abdominal (SA) adipose tissue and visceral fat (VA) in men and it was found that WHtR is best assessment tool for measuring VA and SA **(Wu *et al.,* 2009).** WC and WHR are considered as markers for

central obesity and are perfect indicators of cardiovascular and metabolic threat factors than WC or BMI **(Sahakyan *et al*., 2015).**

2.4 Prevalence of Obesity

Obesity incidence has reached heights in last decade and has become one of the most significant health hazards globally **(Popkin et al., 2012 & Mohammed et al., 2014).** Reports from WHO predicts that obesity has become a mounting trouble for both developed and underdeveloped countries **(Ogunbode et al., 2011).** Several researchers in their reports documented about the scenario of obesity incidence at international levels and it was found that globally almost one in ten inhabitants is overweight. Moreover, the obesity rates are double among women as compared to men in international scenario **(Mohammed et al., 2014 & Gho &Gho., 2013).** However, the national scenario for obesity incidence indicates that in India obesity is the major health burden affecting almost 5% of country population. In Punjab state of India, prevalence of obesity is very high in women as compared to men population. In men obesity trends show variation depending upon their age, sex and wealth index **(Kalra & Unnikrishnan., 2012).**

2.5 Factors Contributing to Weight Gain and Obesity

Obesity is a multifaceted disease. Numerous genetic and non genetic aspects are held responsible for the manifestation and the succession of the disease. However, energy imbalance is the core reason i.e. when intake energy in the body increases the energy expended. This energy imbalance takes place at physiological level and is inclined by several aspects such as age, sex and genetic makeup as well as external factors such as changes in environment like food habit and lifestyle change. Both internal and external factors overlap with each other and can have an additive effect on each other:

2.5.1 Age

Obesity can occur at any age. In industrialized nation, obesity starts at infancy stage and nearly more than half of newborns are obese in industrialized population. Attempts were made to collect data from school only limited data was collected and was shown that prevalence is between 6 -15% and there is growing trend in the occurrence of obesity in school children **(WHO., 2000).** However, in both developed and developing the prevalence obesity is increasing

in young adults and prevalence rate is exceeding the national standards. Obesity related morbidities are rare in children and are restricted to extremely obese kids. Childhood obesity or overweight is one of the major reasons for obesity in adults. Possible justification for the overweight and obesity is revolution in lifestyle and dietary pattern. More adaptation of sedentary lifestyle, no physical workout, kids getting busier in technology use, complete absence of outdoor activity and consumption of fast food etc adds on to the risk of obesity in children. Global prevalence of obesity in school going children is 3.3% **(Mozaffari & Nabaei., 2007).**

2.5.2 Sex/ Gender

Obesity affects all gender and all age groups. However, some studies predict that women are more affected by the disease while some suggest that males are more affected by the disease. Pregnancy is major reason for weight gain in females and higher incidence of weight gain in women compared to men is mainly due to childbearing **(Krishnamoorthy et al., 2006).** Kerrigan and associates carried out a retrospective study on the incidence of maternal obesity in England on 8176 women who gave birth at recruited hospital and was found that 17.7 % of women were clinically obese and obesity rates are increasing with the increasing age **(Kerrigan *et al*., 2010)**. Being obese in pregnancy is harmful for both mother and baby. **Ozdemir (2015)** in their study recognizes the effect of obesity on mothers and concluded that it is essential to evaluate the risk factors associated with obesity in women and this concern needs to be handled at national and global levels. **Khabazkhoob (2017)** also reported in their study that obesity rates are elevated in women in comparison to men.

Male obesity is reproductive age has increased at an alarming rate and it coincides with the male infertility. This increasing prevalence of obesity in males is also associated with serious effects on body and it calls for the need of grater clinical awareness. **Stefan et al (2010)** in their study reported that obesity is connected with higher incidence of male infertility. Several mechanisms like sleep apnea, hormonal disturbances and rise in scrotal temperature etc account for the effect of obesity on male infertility. All these factors cause decrease in sperm count. **Katib (2015)** carried out a research study and reported that obesity in men is associated with infertility. There occurs a hormonal imbalance in obese man and is known as hypotestosteronemia. This causes alteration in spermatogenesis leading to poor fecundability. However, some researchers reported that many obese men don't suffer from infertility. Teerds and group of researchers searched

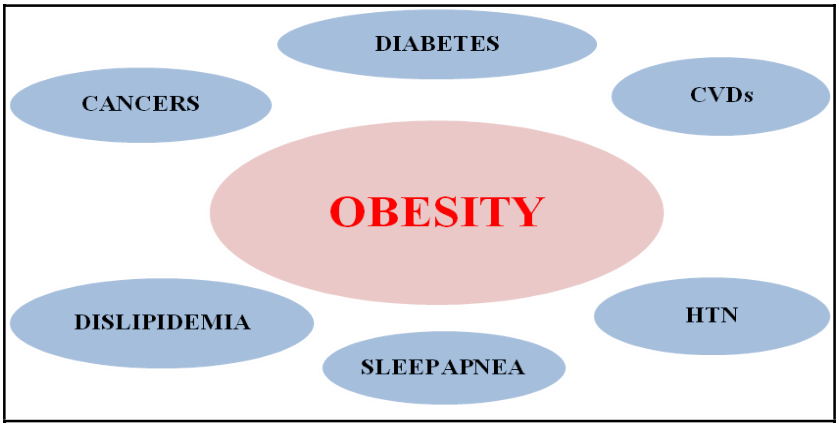
records from Pubmed, Web of Science and Google Scholar between September 2009 to October 2010 and found that majority of obese don't suffer from significant fertility issues. Group of subjects those suffer from infertility are due to decreased hypothalamic/ Kiss expression. It is a potent regulator of LH/FSH release **(Teerds et al., 2011).**

2.5.3 Lifestyle

Several etiological factors are implicated in the development of weight gain and obesity. Dietary factors function both as preventive and promoting factors for obesity. **Swinburn et al., 2004** in their study reported that sedentary lifestyle, intake of dense calorie food, junk food, soft drinks etc are the major reasons for increased obesity in developing countries. Nakeeb and his associates in their study examined lifestyle, health behaviour and risk factors of young adults at Qatar University found that all the students aged between 18-25 years have high prevalence of overweight and obesity **(Nakeeb et al., 2015). Livia (2016)** in their study explained that lifestyle modification programs are essential aspects for improving nutritional aspects, behavioural aspects and physical activity in obese patients. Rosiek reported in his study that apart from eating habits and physical activity, television and food commercials are causing an increase in obesity rates not only in adults but also among children **(Rosiek et al., 2015).**

2.6 Obesity and Associated Diseases

Numerous health issues and complications are connected with obesity. Obesity is not only a problem of physical appearance, but it is a serious health hazard. An overweight person has 20 times more risk of dying early as compared to an average weight person. The reason behind early mortality is that obesity is linked to several other diseases such as:



2.6.1 Diabetes

Obesity is an important risk factor for several major non communicable diseases such as diabetes, CVDs, HTN, sleep apnoea and some female cancers **(Webber et al., 2012 & Banjare & Bhalerao., 2016). Bambrick (2005)** carried out a study to rule out the interconnection between obesity and high risk for T2DM in aboriginal community. In their study they collected data for age, BMI, WC, family history, fasting glucose and HTN in 117 aboriginal adults (62 women & 55 adults) never diagnosed for diabetes and was found that all the women have central obesity below the BMI range and were not associated with diabetes. However, in case of men BMI was greater than 30 and have higher FG and BP levels. **Eckel et al., 2011** carried out a study to explore the relationship between obesity and type 2 diabetes and in their study, they reviewed and discussed the published and unpublished data and were found that more investigations are required to fully understand the pathogenesis of both the diseases. **Arner & Ryden (2014)** also analysed from their study that anomalous fatty acids lead to insulin resistance in obese individuals. Insulin resistance further leads to pancreatic cell dys-functioning and glycaemic control that result in type 2 diabetes.

2.6.2 Sleep Apnea

Keith and associates reported in their study that obesity can also leads to the development of several nonfatal health consequences such as sleep apnoea, osteoarthritis **(Mehra et al., 2008).** Obstructive sleep apnoea is common disorder linked to central obesity in Western world. **Schwartz et al (2008)** reported in their research that several behavioural, pharmacological and surgical interventions to weight loss can benefit the obese patients with sleep disorders. **Corral and colleagues (2010)** carried out a study on interactions between obstructive sleep apnoea (OSA) and excess body weight and was found that weight loss can help in reducing OSA, but it is hard to reduce weight using conservative approaches. Bariatric surgery can be used efficiently for reducing weight. Multidisciplinary and integrated approaches are needed for achieving long term and efficient results. United Arab Emirates (UAE) is a part of Gulf countries and ranks at 18^{th} number in the WHO list of fattest countries with nearly 70% of its inhabitants with unhealthy weight. **Mahboub et al (2013)** carried out a study on the association of obesity with

sleep apnoea. In their research they recruited obese female patients above 14 years of age and was found that one in five women in UAE are suffering from the problem of obstructive sleep apnoea syndrome (OSAS). **Jehan et al., 2017** also reported in their research report that treatment strategies and screening measures can reduce the obesity which in turn can cure OSA and other co morbidities such as CVDs, diabetes etc.

2.6.3 Dyslipidemia

Obesity is associated with the disturbed lipid profiling. Researchers are doing more research to evaluate and explain the development of dyslipidaemia in obese people which seems to be closely associated with insulin resistance condition. Undoubtedly dyslipidaemia condition plays a significant role in pathogenesis of atherosclerosis and CVDs **(Xu et al., 2015 & Rosa et al., 2015).** Components such as increased triglycerides, decreased HDL and increased LDL levels have shown to be atherogenic **(Klop et al., 2013).** Thus, abdominal obesity is associated with very low dyslipidaemia changes including elevated density of lipoproteins. **WHO(2004)** documented in their report that obese individuals have altered lipid levels, increased levels of serum, cholesterol, low density lipoproteins, high density lipoproteins, triglycerides etc are reported in obese people. Undoubtedly, dyslipidaemia plays a vital role in the progression and the manifestation of atherosclerosis and CVDs in obese patients. **Howard et al (2008)** reported in his report that all the factors of dyslipidaemia such as increased levels of triglycerides, HDL, LDL etc are atherogenic in nature. Fat distribution also has a great impact on the risk of development metabolic and cardiovascular diseases. Excessive accumulation of fat in abdominal area is a risk factor for coronary artery disease, hypertension, stroke, type 2 diabetes and dyslipidaemia **(Moly et al., 2004).**

2.6.4 Cardiovascular Diseases (CVDs)

Elevated levels of cholesterol are one of the most evident threats indicating the manifestation of heart problems in obese individuals. Moly and associates documented in their report that regional distribution of fat has a significant effect on the metabolic and cardiovascular risk factors. Regular profiling and measurement of fasting glucose and apolipoprotein B and fasting lipid profile can help in estimating the risk of CAD in patients with metabolic syndrome **(Moly et al., 2004)**. In blood cholesterol is transferred in two main ways: Low Density Lipoprotein (LDL) the

main function of LDL is to transport Cholesterol to the cells that need it and HDL plays a vital role in reducing risk of heart attacks as it is the healthy cholesterol. Obesity is the leading cause of elevated CVD mortality and morbidity. Increased LDL levels in obese patients increase risk of heart attack by 20 times **(Despres et al., 2008).** Obese patients with central obesity are at elevated levels of developing CVDs than those with peripheral obesity. Obesity is associated with several heart defects. **Luma (2011)** in their research studied the association between increased BMI and increased rate of CVD and high blood pressure in four southern states and Colorado and was found that high weight is associated with heart issues. Maintaining a healthy weight helps in reducing the risk of developing CVD. Umer and his associates carried out a Meta-analysis study to explore the association between childhood obesity and adult CVD and was reported that childhood obesity is a greater risk factor for adult CVD **(Cote et al., 2013 & Umer et al., 2017). Zakwani et al (2016)** in their research study on the people of Arabian Gulf found that people with high BMI levels and elevated LDL levels are at high risk of developing cardiovascular diseases. In UK stroke and heart disease is one of the leading causes of mortality in people. This risk for heart disease and strokes gets doubles in overweight and obese people as they have high blood pressure levels. Overweight also leads to sudden death and angina from heart disease without any signs or symptoms **(www. webmd.boots.com).**

American heart association documented in their findings that obesity is the core fundamental reason for the development of coronary heart diseases, heart attacks and strokes. Obese people are at an elevated level of risk factor and are more exposed to heart attacks before the age of 45 years as compared to non obese individuals. Moreover, the percentage of heart attacks is also high in obese adults before 35 years of age in contrast to non obese adults **(www.mediweightlossclinics.com).**

2.6.5 Hypertension

Increased levels of blood pressure are one of the most significant causes of mortality among Americans above 25 years of age. Blood pressure levels increases with the increase in the weight and age. Diet and physical exercise are two major factors that affect the body blood pressure. Increased consumption of salt, obesity and sedentary lifestyle are the core factors playing role in the alteration of blood pressure levels. Elevated levels of blood pressure are not curable, but it can be treated and managed with the help of medications and improved lifestyle habits

(www.healthcentral.com). Hypertension is strongly related with obesity. Several researchers documented in their study that Obesity is one of the major causes for hypertension and several population studies reported that nearly two-third of people suffering with obesity are at high risk of having hypertension. South Asian males constitute the major portion of UAE population. **Shah et al (2015)** carried out a study on the prevalence of hypertension in young male population and reported that the incidence of hypertension is relatively high in UAE population. **Segula (2014)** reported that obesity has stronger association with hypertension. Kotsis and his colleagues demonstrated in their study that there is strong association between obesity and hypertension in both children and adults. The pathway through which obesity causes hypertension is still not clear and it needs a lot of research in this area. Initiation of sympathetic nervous system plays an important role in the pathogenesis of obesity related hypertension **(Kotsis et al., 2010).** Another study conducted by Hall and his associates on the obesity related hypertension found that excess weight gain alters sympathetic nervous system and leads to imbalance in blood pressure levels of obese individuals **(Hall et al., 2010).** Research study documented by **Theodore et al (2008)** reported that increased levels of BMI are responsible for increased prevalence of hypertension in African Americans men and women. **Sjostorm et al (2004)** conducted a Swedish Obesity Study and reported that hypertension to be presented at baseline in 44-51 percent of obese subjects. **Jansen et al (2004)** documented in their report that WC is significantly important in assessing obesity and risk of HTN. Waist Circumference was considered as superior analyst for calculating risk rate for obesity associated HTN. Another Framingham study reported by **Wilson et al (2002)** showed that threat of HTN in overweight men and women were 1.46 & 1.75 respectively after adjustment for age. A research study on group of 82,473 applicants to analyse the association of HTN and BMI was carried out and researchers reported that BMI is significantly linked with high blood pressure levels at the age of 18 and midlife. There is a remarkable enhancement in the threat of getting prone to HTN with the increase in body weight **(Huang et al., 1998).**

Hormonal levels and their pathways in the body are also getting disturbed by the increased body weight. Renin –angiotensin-aldosterone system is one of the most altered hormonal systems. This system holds a significant position in sustaining the blood volume along with the sympathetic nervous system. The RAAS system holds a significant function in maintaining the sodium and water levels. These are responsible for the regulation and maintenance of blood

pressure, but obesity interferes with these systems and leads to hypertension and other renal diseases **(Cabandugama et al., 2017).** Akin results were accounted by **Thethi et al (2012)** that active component of RAAS influences body weight and adiposity. Another study conducted by **Manrique et al (2009)** reported that insulin resistance and RAAS mediated oxidative stress causes pathogenesis of hypertension. Overweight and obesity are connected with arterial hypertension. **Vogt et al (2007)** reported in their study that obesity interferes with RAAS system and plays a key role in causing obesity related hypertension.

Overweight and obesity not only increase the risk factors for these above discussed health issues. However, they add on to the risk of development of various types of cancer. Dysfunctioning in adipose tissue due to obesity seems to play a significant role in carcinogenesis by affecting insulin resistance and the production of several cytokines and adipokines **(Cowey & Hardy., 2006)**. However, the actual mechanism may differ in cancer progression, but it is believable that these mechanisms contribute to the enhanced cancer risk. **Renehan et al (2008)** reported that in their study reported that obesity and overweight is accountable for 14% of all deaths in men and 20% of all deaths in women in United States due to cancers. Excess body weight is not only accountable for the mortality, but it is associated with the increased incidence of several types of cancers. **Rob et al (2009)** documented in their report that alterations that takes place in the hormonal, physiological and metabolic functioning of the body leads to the manifestation and progression of cancers. Similar findings were reported by **Gottlieb (2009)** in their research report that obesity and overweight increases the prevalence of many malignancies and is held responsible for the mortality due to cancers. **Robert & Rourke (2014)** demonstrated in their study that obesity increases the risk aspects for cancers. In obese patients' cellular mechanism is uncoupled from nutrient availability in malignant cells and promotes tumour progression in obese individuals. Arnold and associates carried out a study to evaluate the role of obesity in causing cancers in France. They carried out a meta-analysis study for 10 years period and calculated population attributable fractions (PAFs) and were found that high BMI is associated with maximum numbers of cancer cases in France country **(Arnold et al., 2015).**

2.7 Multidisciplinary Strategies for Obesity Treatment and Management

Consumption of nutritious diet, having active mode of life and positive attitude all together forms the best remedy for healthy and happy life free from stress and diseases **(Muesing et al.,**

2006). Managing obesity is better option than treating obesity. Several lifestyle interventions can be used for managing obesity. Lifestyle interventions in managing obesity involve behavioural interventions, Dietary interventions, Physical activity, Pharmacological interventions. Major challenge in obesity is not its treatment but to manage weight and obesity after treatment. Several factors such as environmental, behavioural, biological and cognitive factors obstruct in managing obesity. Bhatnagar (2005) documented in their research evaluation that diet, exercise and proper medications are the major tools in treating and managing obesity. Team of professional doctors and therapists are involved in managing obesity. Since, obesity is caused by multiple risk factors so multiple professionals are involved in its treatment **(Montesi et al., 2016).** Obesity is also becoming a major reason for breast cancers and infertility in females. Many studies demonstrated that combining physical activity with lifestyle interventions helps in reducing obesity and it also helps in improving ovulation and helps them in achieving pregnancy **(Haqq et al., 2014). Cochrane et al (2017)** reported in their study that complications like obesity requires multi component and multidisciplinary approach for its treatment and it is based on four major components (patient, practitioner, process and environmental factors). Psychologists, dietitian, exercise physiologist and general practitioners were considered as key practitioners to be involved.

Nutritious diet, regular workout, active lifestyle and positive attitude altogether form the healthy and happy life free from stress and diseases **(Barte et al., 2010).** Reduction in weight by controlling dietary habits and improving sedentary lifestyle to more activated lifestyle helps in improving body metabolism and controls obesity and related health consequences. Major factors responsible for obesity treatment are diet, exercise and medication to keep the signs and symptoms in control **(Bruins *et al* 2014).** Successful management of lost weight is essential aspect to improve overall health status of individuals. This management of weight requires a long term commitment to healthy lifestyle habits focusing on healthy eating practice and regular physical activity.

2.7.1 Dietary Management: The major risk factors for obesity and other related health complications are lifestyle, inappropriate dietary habits, sedentary lifestyle and environment. Out of all these diet and physical exercise have direct impact on the health status and obesity management and progression **(Forouhi *et al*., 2018).** Comparable results were documented by

Lau et al (2007) that diet management along with suitable changes in lifestyle, holds an important position in disease prevention and control. Obesity and binge eating disorders are detrimental health conditions associated with lower quality of life. Obese people usually face societal discrimination **(Buskirk et al., 2010).** Changing eating habits and behaviour entails action against number of environmental, emotional and even familial obstacles (**Fismer et al., 2012)**. Poor education about eating habits is also one of the most important causative factors in obesity. Portion control in dietary intake is one of the strategies to minimize the energy intake. Healthy eating habits give our body nutrients it requires daily and provide enough calories for good health. Healthy eating diet is rich in green leafy vegetables, fruits with low carbohydrates content, legumes, whole grain, nuts and dairy products such as yoghurt with low carbohydrates. Adherence to calorie-controlled diet is one of the major barriers in the long-term management of weight loss **(Makris & Foster., 2011 & Wadden et al., 2012).** Successful loss in weight depends to larger extent on the management of energy balance. Enhancement in the expenditure of energy is significant aspect to maintain energy balance. **WHO (2012)** signified that some reduction in intake energy can be achieved through multiple ways. Reduction in intake of dietary food is not the only way to manage energy imbalance. Researchers reported in their study that fat intake of <20% of total calories are essential for optimal health. Diets with 10-20% fats are known as very low-fat diet. Low fat diets are basically plant based diets (e.g. fruits, vegetables, beans and soy) with reduced number of dairy products. To lose weight there should be cut down in the number of calories intake and there should be an enhancement in the exercise pattern. For losing 1-2 pounds of weight weekly, calorie intake should be minimized by 500-1000 calories **(Freedman et al., 2001).** In general pattern:

Dietary intake with 1000-1200 calories will help women to lose weight easily.

Dietary intake with 1200-1600 calories per day is suitable for men.

U.S department of health services (2005) recommended that food with low calories, having low content of cholesterol; sodium and trans fats should be eaten. Excess intake of high dietary fibre diet such as whole grains, bread and cereals, vegetables and fruits should be there. Meals should be taken in small portions. Olive or canola oils should be used for cooking purpose as these oils have low content of fats. The most vital aspect in weight loss is to minimize the intake

of energy dense foods (high starch, high fat and high sugar) and enhanced consumption of low energy dense food.

Systematic review studies conducted by researchers revealed great facts on the connection between intake of whole grains and legumes and weight loss. **Harland and Garton (2008)** in their systematic review in United Kingdom examined the connection between whole grains and body weight and they concluded that increased intake of whole grains (nearly 3 servings/day) is associated with lower BMI levels and central adiposity. Another systematic review conducted in Australia by **Williams et al (2008)** assessed accessible facts concerning the role of cereal grains and legumes in the maintenance of weight in obese people. Researchers revealed that diet with higher content in whole grains is associated with BMI at lower side. Moreover, this kind of diet pattern also curtails the risk of being overweight in people. Successful management of obesity can be achieved by sustaining a proper energy balance by maintaining the calorie intake to calorie expenditure with the help of physical activity. Alterations in dietary routine also help in cutting down the calorie intake. It is significant to understand that minimized energy intake can be achieved by using multiple strategies. Dietary intake alone cannot make out a major difference **(Nho et al., 2017).** Obesity is also becoming one of the major reasons for infertility and abortions in obese women. Lifestyle interventions are widely being used in obese women to prevent infertility. It involves the use of various nonpharmacological methods such as physical activity, stress management, nutritional changes and smoking cessation in obese women **(Dammen et al., 2017). Hadrevi et al (2017)** in their study reported that sociodemographic factors affect the choice of dietary fibre intake. In their study they examine the association between the fibre intakes in low economic, low education group of females compared to high income, high education group of females. Researchers reported from their study that in both the group's overall food intake was underreported. Moreover, intake of fibre food is low in working women. It was concluded from the study that it is significant for working women to have dietary advice on fibre intake to increase health and decrease weight.

Weight loss promoting diets are usually categorized into four different groups: low fat, low carbohydrate, low calorie and very low calorie. Sacks and associated researchers carried out a study on 811 overweight adults and subjected them to one of the four diets and were restricted to these diets for 2 years and after completion of two years of study period it was reported from

their study that all these diets resulted in the similar weight loss no matters type of micronutrients they were taking **(Sacks., 2009). Kim & Kim (2013)** in their study reported the benefits of green tea in obesity and type 2 diabetes. They documented that Taiwanese subjects who had habit of consuming green tea for more than 10 years showed lower fat composition and small waist circumference. Moreover, evidences from epidemiological studies suggest the possibility of green tea being a novel strategy for the treatment or prevention of obesity and type 2 diabetes.

Several researchers also argued on the concept of having extremely low calorie and protein diet. This diet pattern or starvation often leads to several health complications and adverse side effects such as lean muscle mass, increased problems of arthritis and gouts etc. People undertaking this kind of diet pattern should be monitored closely by health physician to avoid any sort of complications **(Strychar., 2006).** Similar findings were reported by **Rautiainen et al (2015**) that people having more consumption of fruits; vegetables and fibrous food have normal BMI and are at lower side of being overweight or obese.

2.7.2 Physical Activity: Physical workout is explained as any physical activity enhancing physical strength, robustness and maintains overall health and wellness of human body. Physical activity used to have a significant effect on health-related issues when compared with body weight. Enhanced and adequate levels of activity help in balancing the negative influence of body weight on health outcomes. It is to make use of intervention stratagem to assist the adoption of adequate physical activity for the maintenance of extra body weight **(Hainer et al., 2008).** Physical exercise pattern is usually grouped into three categories, depending on the overall effect they have on human body **(NHLBI., 2007):**

1. Stretchy Exercises such as stretching that improves the movement of joints and muscles.

2. Aerobic workout such as swimming, cross trainer, skipping, running, jogging or playing tennis or badminton etc helps in maintaining cardiovascular endurance.

3. Anaerobic workout such as weight training, functional training etc increases short term muscle strength.

Physical workout is essential and mandatory for sustaining proper body weight and maintaining physical fitness. Physical exercise is significant aspect for the maintenance of healthy bone

density, muscle potency and amplification of immune system **(Pedersen & Saltin., 2015).** Several researchers documented in their studies that habit of doing physical exercise before meals helps in lowering the blood glucose levels and lack of physical activity contributes to nearly 17% of heart diseases and diabetes incidence and more than 10% increased risk for cancers **(Chacko., 2016).** Similar findings were reported by **Bweir et al (2009).** In their study they reported that resistance exercise helps patients in having controlled glucose levels.

Physical inactivity and over nutrition have created havoc in the world. Obesity needs to be regulated by changing our lifestyle and dietary habits. Change in our behaviour aspect is a significant factor in improving major life-threatening disease. Physical exercise or any other physical activity helps body to maintain good health and wellness. Urbanization and ecological alterations and modifications such as amplified timings for desk work, car use has negatively impacted the duration and quantity of work out that populace execute due to reduced requirement for activity **(Fismer et al., 2012).** A usual walk of 40-45 minutes or a regular exercise or yoga for 30 minutes is advised to obese people for reducing excess body weight as well as in maintaining body weight (**Fabricatore & Waaden., 2003)**. **Sola et al (2010)** in their research report found that one year of physical activity intervention in obese children helps in improving cardiovascular capacity and also improved BMI in obese children. Wirth and associates in their study reported that low energy diet and diet with energy deficit of 500Kcal/day is instituted for obese patients. Moreover, physical activity promotes weight loss and improves risk factors for obesity and associated disease **(Wirth et al., 2014).** Regular physical exercise helps body to boost up the immune system which in turn helps to prevent obesity and other associated health issues **(Ma et al., 2017).** Physical activity appears to have an independent effect on health-related outcomes when judge against the body weight. **Yusop et al (2018)** concluded from his study that modified diet and physical activity behaviour are effective in weight management in obese children.

The fundamental key for the control and maintenance of body weight is the energy balance. It is the amount of energy consumption should be equal to the energy consumed. Practically, body weight should be sustained to the proper levels after the loss of extra body weight. It is mandatory to create an energy imbalance that creates energy deficit. Physical exercise helps in maintaining the initial weight attained after the weight loss and it also helps in the promotion of

further weight loss by preserving the weight loss strategies (**AIHW., 2006).** Health therapists and dietitians all around the world suggest that every individual should undertake physical activity regularly for half an hour. As per health therapists walking, running, cycling are the most effectual and successful ways for weight loss. Moderate exercise affects the macronutrient balance. American Heart Association proposed that exercise for minimum of half an hour for at least 5 days a week helps in the shedding out if extra body weight **(Sahlin et al., 2008).**

Exercise is important for good health in the same way food is important for good health. Exercise not only helps in the reduction of weight loss, but it also helps in increasing immune strength, muscle strength, artery function and minimizes the risk for heart attacks and chances for the development of other metabolic diseases. Exercise is the only best way to maintain good health and moreover it also helps in preventing the risk of developing diabetes and heart diseases in obese patients. Physical workout plays a mandatory role in improving the cardiovascular health in both average and overweight individuals. Regular aerobic output also helps in improving the blood pressure levels in obese patients and helps in minimizing the risk of developing hypertension in obese patients **(Leskinen et al., 2009).**

Life without health is a real trouble. Health is a real fortune of life. Now-a-days yoga is also one of the most emerging ways of exercise to lose and maintain body weight. However, almost all exercises are good for health, but meditation and yoga exercises give extra boost by stabilizing the endothelium. Meditation helps in lowering stress hormones; yoga helps in creating cascade of events that helps in reducing the risk of heart attacks or stroke. It helps in maintaining the blood pressure levels. Making yoga a daily habit helps a lot to the people who wish to lose and maintain their body weight **(Tundawala et al., 2012).** Similar findings were reported by Rani (2016) in her research study where she discussed about the significance of yoga asana in maintaining the health and well being of patients. **Lauche et al (2016)** documented in their study that yoga can be used as the safest, successful and efficient intervention to minimize the body mass index (BMI) in overweight or obese patients.

2.7.3 Behavioral Interventions: Changes in behaviour and lifestyle are two significant aspects for treating excess body weight**.** It is non-invasive and cost-efficient intervention focusing on changing and promoting lifestyle changes. It involves time and commitment both on the part of patients and health care provider (**Fabricatore & Waaden., 2003).** Behavioural treatments are

provided on weekly basis for starting period of 6 months and are then increased to biweekly sessions. Therapy is conducted in group of 10-15 individuals. Group therapy is more efficient and effective then individual therapy and significant improvement was seen in weight loss. Group therapy provides cost efficacy, empathy, social contact and healthy competition to participants. It is delivered to patients for the interval of 60-90 minutes **(Butryn et al., 2011). Jelalian & Evans (2016)** reported in their study that behavioural interventions are efficient in progressing weight status in obese children and adults. Moreover, authors also demonstrated that parental modelling of healthy eating habits is significantly essential for reduction in child weight. Several researchers documented in their studies that alcohol abuse and smoking are behavioural risk factors for several adverse health outcomes. Smoking and drinking both are two major reasons for obesity. **Yeomans (2010)** stated in their study that obesity and alcohol consumption is interrelated, and number of factors affects the association between the two. Factors that affects the connection are physical workout, body weight, genes, drinking level and pattern, amount of consumption etc. **Sturm et al (2013)** in their study reported that obesity and tobacco consumption significantly increase the health care expenditure. Some researchers reported and argued that alcohol consumption increases number of calories intake even after high and low carbohydrate meal. Behavioural interventions are essential for controlling and minimizing alcohol consumption **(Stautz et al., 2017).** Connection between alcohol and obesity is complex and it involves the interplay of number of factors such as body weight, diet, genes, physical activity and other lifestyle factors. All these lifestyle interventions help patients in losing excess body weight without any me. Self-medication and monitoring are cornerstone of all lifestyle interventions **(Kelly et al., 2016).**

2.7.4 Pharmacological Interventions: Ideally, obesity should be treated with diet and exercise. Patients failing in losing weight from these interventions make use of pharmacological intervention for losing weight. Drug therapy is also known as pharmacological treatment. The function of drug therapy in obesity treatment is always questionable. The reason behind this question is the growing concern about the efficiency, protection and scrutiny of the drugs used for weight loss therapy. It involves the use of medications for disease treatment**. Bray & Ryan (2012)** documented in their research reports that anti obesity drugs can be used as best option against diet and exercise for patients with BMI greater than 30kg/m^2. This therapy is also suitable for the individuals who fail to lose weight with the help of other interventions like diet

and exercise. Similar findings were reported by **Powell et al (2011)** in their report and stated that this new era of anti-obesity drugs has offered hope for the management and long-term treatment of obesity. Drugs interact with receptors or enzymes in cells to promote healthy functioning and try to cure obesity. Anti-obesity drugs affect different targets in central nervous system or peripheral tissues and these drugs aims to normalize the metabolic disturbance occurred in the obese patients due to excessive deposition of fatty tissue **(Gall et al., 2005).** The Food and Drug Administration (FDA) in United States has so far permitted five long term obesity drugs: Lorcaserin, Phentermine, Orlistat, Sibutramine and Bupropion. However, two of these drugs Phentermine and Lorcaserin got failure in getting approval in Europe **(Lemos., 2018).** Drugs are used for treating obesity only when there is failure in losing weight after 6 months of using lifestyle interventions. Medications lead to greater mean in weight loss as compared to lifestyle interventions. Sibutramine and Orlistat are two commonly used drugs for weight loss. Sibutramine is used for repressing diet and it works through mechanism occurring in brain. Drug is inhibited to use by patients suffering from HTN or stroke or cardiac patients. Orlistat is gastric lipase blocker and it hinders the absorption of fats consumed in meal. The main advantage of using pharmacological intervention is that it may helps in assisting the maintenance, rather than the induction, of weight loss.

2.7.5 Surgical Interventions: Large number of research papers documented in their reports that sustained use of bariatric surgery as suitable cure and management for the moderately to severe obese individuals having high risk of morbidity and mortality. This intervention was first made available in 1950s and it involves surgical treatment of gastrointestinal tract to induce long term weight loss in severely obese individuals. Surgical intervention is also beneficial for those who fail to achieve recommended targets with other lifestyle and medical interventions. These recommendations are made only after the success of bariatric surgery in losing extensive permanent weight than conventional form of treatments than diet and physical exercise **(Fobi., 2004, Richard & Health., 2009).** Bariatric surgery is the most demanding treatment of obesity. As per US guidelines patients with BMI greater than 35 and between 35-40 and those who failed to achieve weight loss from other interventions are eligible for bariatric surgery **(Kissler & Settmatcher., 2013)**. **Bult** and his colleagues also reported that bariatric surgery is long term treatment for obesity with greater chances for amelioration and for obesity related complications **(Bult et al., 2008).** Bariatric surgery helps in weight reduction by reducing the stomach size by

gastric band or removing a part of stomach. Two most common procedures are vertical banded gastroplasty (VBG) and gastric bypass (GB) Bariatric surgery helps in approximately 25-30% of starting weight loss and it also helps in significant improvement of HTN, sleep apnoea and diabetes. Numerous randomized trials showed that GB has better significant results than VBG. Researchers demonstrated that weight lost through surgical interventions remains in sustained form for more than 5 years in patients and these patients need to stay under medical monitoring for complications and lifestyle adjustments throughout their lives **(Grunchy & Eligar., 2017).**No doubt, surgical intervention is successful treatment but it is unrealistic to depend totally on bariatric surgery for obesity treatment as it is not handy to all patients and is quite costly. Moreover, patients of bariatric surgery suffer from post operative psychological challenges **(Picot et al., 2009 & Gulliford et al., 2017). Sjostorm et al (2004)** carried out a study on Swedish Obese Subjects who underwent gastric bariatric surgery and was found that bariatric surgery is the viable option available for the treatment of severe obesity and helps in long term weight loss and improved lifestyle.

2.8 Health Care Models: Policies and interventions to minimize obesity are informed by our understanding of its cause. There are two predominant models that are used to explain the occurrence of obesity is public health care model and medical health model. Both these models are based on different approaches, supposition, tradition and different implications for policy and interventions **(Sara et al., 2013).** Our traditional health care systems were based on systems that involves passive patient role and were not designed to meet the needs of chronic health diseases such as obesity which requires multidisciplinary treatments and self management approaches. Research reports by several researchers demonstrated that health care services need to have innovated and upgraded systems to improve health outcomes for people with complex chronic diseases. Major feature that differentiates public health model form medical health model is that medical health model aims on curing the disease while public health model aims to cure the disease **(Stephanie et al., 2016).**

2.8.1 Medical Health Model: Group of discussion of medical researchers and administrators explained that obesity epidemic is due to genetic makeup of individual and their poor choice of diet pattern. Medical health model centres on individual patients and his or her characteristics. Both these factors are based upon patient's behaviour pattern and lifestyle pattern. Agatha and his colleagues demonstrated that there is no way to change the genetic makeup of individual and

genetic result are proving hard to pin down even though few combinations of genes linked to obesity have been identified. However, obesity is complex interplay of genes and many more complex genes must be involved in disease manifestation. "*Each gene may make a little contribution to overweight"* **(Pagoto., 2011,Xia & Grant., 2013 & Agatha et al., 2015).** So this leaves lifestyle or behavioural habits as main target for intervention. Many researchers demonstrated in their reports that it is difficult or hard to maintain weight loss for longer duration using diet and exercise as interventions **(Montesi et al., 2016, Tomiyama et al., 2013 & Wing & Phelam., 2005).** Presently, the most effective and beneficial intervention for weight loss is through surgical intervention i.e. bariatric surgery. **Schiavon (2018) & Kubic et al ., (2013)** in their study ensures that bariatric surgery is one of the most effective treatments for weight loss in obese patients with hypertension. **Gulliford et al (2017)** reported in his study that the major limitation to this intervention is the cost effectiveness and availability. **Hruby (2015) & Sranali et al (2010)** argued in their reports that since obesity is majority a disease of lower class it's hard for every obese individual to undergo surgical intervention. Surgical interventions also involve certain risk factors and require patients to follow proper medical follow up after surgery. Patients need to intake restricted calorie rich diet and regular physical activity to maintain initial weight loss.

Limited Treatment: Despite of the fact, obesity needs to be regulated and treated in proper manner. More than one third of overweight individuals reported that they were never told by their health care professionals that they are overweight. Their BMI and WHR are not regularly monitored and were not given awareness about associated health risk factors (**Bish *et al.*, 2007).** Reports indicated that health care systems are not only failing to deliver outcomes, but it is also harming users. This quality chasm in care is attributed to the increasing complexity in health care system and its inefficiency to translate medical and technology advancement and research findings into practice. **Wyatt (2018)** in his research report stated that endocrinologists need to actively engage in the obesity diagnosis and should embrace an early treatment for their patients suffering from chronic disease. Research in this filed will help in improving our understanding of the disease physiology.

2.8.2 Public Health Model: This model differs from medical health model not only in its focus on disease avoidance but also on its contemplation in broader range of risk factors. The vital step in public health model is identifying and modifying disease vector. To pin out the major vector

for obesity is fundamental aspect of public health model. Public health model allocates accountability for obesity epidemic not only to individuals and their behaviour but also to the obesogenic environment. Increased prevalence of obesity is related to the social and economic conditions of the individuals. Globalization has modernized society outlook and minimized the physical output of the individuals in the society. Increased use of cars and other mode of transport have a greater impact on energy consumption and energy expenditure. Environmental pressure has made unhealthy way of living as default and easiest mode of living and has made strong affect on both environment and health of individuals. Gilmore and his associates in their study reported that as technology is developing rapidly the incidence of obesity is also growing at a disturbing speed. Advancement in technology is the major contributor for obesogenic environment. Technology encroachment has led to decline in manual labour **(Gilmore et al., 2014). Forman et al (2016) & Lakdawalla & Phillipson (2009)** also reported in their study that technology advancement is responsible for creating obesogenic environment. **Novak & Brownell (2012)** suggested in their report that there is a need for policy changes to improve the food and physical habits in overall American population and not just targeted obese individuals. It is a need of hour to develop and support the growth of policies that promote physical activity and ban the use of junk food. In Current urban environment people prefer to use transport use over walking, this habit has also minimized the physical activity among individuals **(Ewing et al., 2014).** Similar findings were reported by **Strasser (2013) & Wiklund (2016).** Public health model also focuses on the consumption of energy dense food. Cheap sources and easy availability of high calorie energy food has exploited the food preference of individuals. There is an alarming need to focus on providing health education regarding healthy eating habits and changing individual behaviour and providing health solutions to increasing obesogenic environment. For example, there should be authorized nutritional standards for school tiffins', ban of sale of junk food within school premises, ban of sweetened products in school, encouraged physical activity in school for kids. Similar findings were reported by lee & associates. In their report they suggested the fact that school-based weight management programme combined with the other health promoting policies will help in the betterment of health status of obese students **(Lee et al., 2013).** Other researchers stated that there is missing gap in awareness between the health policy sectors and non health policy sectors and management is also failing in creating awareness. To enhance this association to minimize the

childhood obesity it is suggested that public health therapists should reframe their goals and share them with non-public health sectors. Moreover, municipal management should work on creating awareness among people about obesity management and treatment **(Hendriks et al., 2013). Salas et al (2017)** reported in their research report that there are five major existing factors that may have suggestion for public health approaches and have accidental effects on health of people with obesity. These five factors are: 1.Prevention of childhood obesity as it menaces the health of future generation, 2. Physical activity and healthy eating can help in preventing obesity, 3. Obesity is a behavioural problem of every individual, 4.having a healthy body weight should be the major health target of society, 5. Obesity is a major risk factor for chronic diseases. Obesity itself is not a disease.

2.9 Ethical Issues Surrounding Weight Loss and Stigma in Health Care System

With the detection of obesity as a global outbreak there has been tremendous interest in the study of weight loss and stigmatization **(Ashmore, Friedman, Reichmann, & Musante, 2008; Puhl, Schwartz, & Brownell, 2005).** Ethical principles and guidelines are integrated into all medical health practices and are significant in providing quality health care to patients. These principles form the core of nurse patient therapeutic relationship and are involved in weight stigma **(Wren et al., 2012). Code of Ethics for Emergency Physicians (2009)** in their report explained that emergency physicians need to accept and follow specific ethical guidelines during their practice in emergency departments. Physicians while working should take into consideration that their services should be beneficial to mankind, certain ethical principles such as respect, privacy, confidentiality, justice, beneficence etc should be taken into consideration.

The fundamental and the primary goal of the quality care is to improve the prolonged existence, physical condition and superiority of patient's life by governing patient centred care. However, obesity is often seen as stigmatized condition in which one side of treatment process may acts as isolation and disgrace for patients. Stigmatized factors may lead patients to the practice of inequity and this feeling of being isolated and inequality can put the obese patients at risk factors for depression, low self esteem and lower quality of life **(Phelan et al., 2015).** Similar findings were reported by (**Hand et al., 2013**). **Fry et al (2012)** also reported a research document on the significance of implications of ethical aspects in the obesity intervention. Hurlimann and colleagues also reported in their research report that ethical guidelines provide a significant

framework of ethical dilemmas for treating obese patients while keeping in view the respect and dignity of obese patients **(Hurlimann et al., 2018).**The treatment procedure of obesity involves several ethical, moral and legal issues. Consequences and implications of Obesity are significant in western countries and it affects the self esteem of obese patients as body is the most important part of self representation of individuals. A thin or slim body is considered gorgeous and attractive and interprets as normal and healthy. Stereotypes and prejudices result in biasness towards obese patients and makes them feel disconnected in society. Peckham and Hann have recognized the fact that techniques focusing on the aspects for overweight and obesity management should be ethically justified and it should not add any kind of harm to individuals **(Peckham & Hann., 2010). Calman (2008)** stated in their research article that Nuffield Council on Bioethics is the potentially helpful framework has been developed to justify the ethical boundaries and limitations during obesity treatment and public health interventions. This model also involves an intervention hierarchy ranging from no intervention to eliminating choice. This model of public health focuses on the state duty and liability to address the demands of both individual and population but it is significant to know the limits of these responsibilities and it should not harm any individual **(Nuffield Council on Bioethics., 2011).**

However, medical treatments also have certain pitfalls that affect and risk ethical values of the patients. **Fry (2012)** also demonstrated the importance of ethics in obesity treatment. In their research article he emphasized the fact that health therapists should taken into consideration all ethical aspects while treating patients and they should make sure that their practice and guidelines should not harm any individual beliefs, respect and dignity. Implementation of ethical guidelines and considering all ethical drawbacks before the start up of health ventures for treating obesity patients **(Have *et al*., 2013 & Venkat., 2014). Venkat & Larkin (2014)** also stated in their research article that increased prevalence of obesity has created professional and organizational ethical problem for the patients admitted in emergency departments. Surgeons and hospital staff should take in consideration all the ethical aspects while treating patients. **Azevedo & Vartanian (2015)** documented in their research report that ethical implementation for any public health policy programme for obesity management needs to be evaluated in detail and these considerations should pose equilibrium on the basis of merits and demerits of proposed intervention. Authors also stated that those health programmes that are governed by public health system are best as they follow all ethical implications and have high potential to minimize

obesity rate and have enhanced improvement in public health globally. **Moreira (2017)** stated in their research study that aspects like autonomy, beneficence, non –malfeasance and justice are important factors taken into consideration while treating obese patients. Spasova and other researchers carried out a study to examine and analyse the ethical acceptability of obesity prevention interventions worldwide and it was found that these obesity prevention programmes, or interventions may lead to isolation of any particular group or disrespect to any ethical group or harm to public health. So, it was concluded that all these public health intervention programmes should be implemented while keeping ethical consideration in mind ensuring that it should not harm any human right **(Spasova et al., 2018).**

Creel and Tilman (2011) in their study stated that basic ethical principles that are required to be followed by any health intervention programme are beneficence, autonomy, non-malfeasance and justice.

Similar findings on ethical principles were reported by **Have et al (2012) & Wren et al (2012).**

Beneficence: Moreira (2017) & Caniano (2009) reported in their research reports that beneficence is one of the most significant ethical principles that establish the fact that physician or health professionals should act for the benefit of patients, seek ways to restore health and promote well being of obese patients. Beneficence is akin to caring in nursing. Hofmann and his associates demonstrated that there are three basic questions that ensure the beneficence in case of obese patients undergoing bariatric surgery: 1. does bariatric surgery benefits the adolescents and children. 2. Long term benefits of surgery. 3. Efficacy, efficiency and effectiveness of the surgery **(Hofmann et al., 2013 & Courcoulas et al., 2015).**

Autonomy: Patient respect is ethical and legal from medical point of view. It refers to individual right to self determination and their capability to take decisions about their medical treatment procedures based on their own beliefs and values. **Roux et al (2018) & Beauchamp (2013)** stated in their research report that there are basically three criteria that clearly defines the state of autonomy: intentionality, understanding and non control. Autonomy has become a significant factor of consideration in the last few decades. **Holm (2007)** stated that it is important to give patient complete and adequate information about their treatment procedure in order to preserve their autonomy. Similar findings were documented by **Ungar (2012).**

Justice: The final and the most significant principle of medical ethics is justice which reflects the need for fair and equal sharing and distribution of health resources in the society. **Craig et al (2018)** documented that there are three main fields of ethical justice. First field of justice is the recognition that all resources are fixed; secondly the right of individuals should be respected; lastly the laws need to be respected. **Beauchamp et al (2013)** also documented in their reports that justice and their laws are significant part of ethical aspects.

Equality: Gardnier., (2003) & Beauchamp et al (2013) documented in their report that the chief aspect of health care interventions is to make people life healthier and happier. However, it is difficult to treat people of all religion groups equally without any discrimination. People from low ethic groups with lower standards of education are more prone to obesity related health complications. **Puhl & Brownell (2001)** stated that the major drawback is that these interventions are not much available to lower class groups. Moreover, due to lower educational background the information provided by the intervention groups is hard to understand by patients belonging to lower economic groups. Furthermore, cost effectiveness of these interventions makes it impossible for the lower economic groups to afford these health interventions. Several others authors also reported the same findings in their study that ethical perspective play significant role in protecting respect and dignity of obese patients during their medical treatment **(Venkatapuram et al., 2010 & Rossen & Schoendorf., 2012).**

CHAPTER 3 METHODOLOGY

3.1 Introduction

In Middle East region, the obesity outbreak has attained drastic heights and there is an alarming and escalating burden of disease in many parts of the region. Finucane and colleagues documented in their research report that both USA and Middle East has highest BMI as compared to other countries and Middle East is ranked to have second highest body mass index ratio (BMI) and also marked at second position in world for having highest mean waist hip ratio (WHR) **(Finucane *et al.,* 2011).** Remarkable transition in lifestyle and diet pattern along with the collaboration of genetic factors and unfavourable environmental conditions has created a perfect storm that has made Gulf Countries and Jordan population extremely susceptible to Obesity and associated health problems such as Diabetes (DM) and Hypertension (HTN). Transition in the levels of physical activity has enhanced the complexity of the disease. Levels of this dreadful disease are rising all over the world and Jordan is one of the most affected countries and is rank as fifth among the fattest countries in the world **(Nsour et al., 2014)**. The obesity problem has achieved predominantly heights and getting severe in the states of the Gulf Co-operation (GCC)—most notably in Bahrain, Kuwait, Qatar, Saudi Arabia and the UAE—where dramatic improvements in standards of living have aggravated the problem. Rapid growth in wealth and successive development in the Gulf countries lead to the dramatic change in the living style of its population. Dietary habits of population have a great bend towards fast food, processed food and sedentary mode of living. World Health Organization postulated in their report that Gulf countries positioned with the higher rates of obesity and is marked in top ten leading countries in obesity. Nohair and his colleagues reported in their study that women and children are likely to be highly influenced in these countries. The reason behind this is the lack of knowledge and awareness about the disease and its risk factors among the affected group **(Nohair et al., 2014).** Government health reports indicate that about 40% of Jordanian adults are overweight and child obesity stands at more than 50%. International Diabetes Federation stated that there is an increment in the cases of obesity every year. In Jordan twice a woman, considered obese as men **(Musaiger et al., 2013).** Despite, this alarming increase in the obesity incidence in Gulf countries and Jordan not much literature reported. Therefore, we intended to plan a research study to evaluate several aspects related to obesity manifestation, treatment and management

among obese patients. There is a need of hard-hitting approach for treating and managing obesity. Government based health care and obesity management policies are running all around the world but are not direct in proper way. In some countries, obesity management programme is still in budding state. Moreover, most of countries in the world do not cover intensive interventions such as programmed weight loss programme and surgical interventions. It is a need of hour to implement multidisciplinary approach all around the world for managing obesity. Apart from this lack of knowledge on risk factors contributing to obesity in region and lack of efficacy of existing measures to minimize obesity are also hampering the process of obesity management **(Blaz &Svab., 2015).**

Bariatric surgery has emerged as standard treatment for obese patients as it helps in having significant effect on body weight, obesity related co morbidities and health related life quality. Several research studies recommend that to sustain post operative health benefits patient needs to sustain balanced diet and physically active lifestyle **(Schiavon., 2018).** In the recent years, Jordan has become a centre for the bariatric surgery and cached attention from the patients of Middle East.

3.2 Ethical Status of Middle East Countries

Ethics is defined as a discipline or a approach to understand, analyse and differentiate between the concepts of good or bad, right and wrong, with moral duty and obligation. Ethics in public health and diseases deals with the welfare of public health based on ethical principles, values and beliefs of stakeholders and respect for their autonomy, confidentiality and justice. Right to health is a basic fundamental right of every individual. Largely recovery of health depends upon how health care providers are extending care and treatment to patients. Basic set of ethical principles are involved in providing medical care to patients. However, beyond proper medical care and facility, patients still find themselves in vulnerable condition and this cause the breaching of ethical acts. Moreover, patient's helplessness reduces the efficacy of treatment. Patient vulnerability or weakness holds a central position in health care ethics. In bioethics, respect for person dignity is highly significant at all the three levels of treatment and care: human experiment, medical care and biomedical research interventions and it also improves the efficiency of treatment (**Roche et al., 2017 & Toader et al., 2013**). Violation of human respect and dignity in medical ethics calls for a serious action against health care team and interventions.

Ethics involved in health care and professional practice ensures patients right and involvement in decision-making process of treatment; their right for justice, treatments designed should not have any negative impact on patient's health and there should not be any biasness or disrespect to any religion or belief. Patients have their right to understand completely the treatment procedure before the commencement of treatment. Furthermore, Bio medical ethics calls for the involvement of multidisciplinary teams in the treatment and weight management programme for obese patients. There should be a core team of physicians, surgeons, nurses, counsellors, dietitians and nutritionists for pre and post counselling sessions **(Africano et al., 2015).**

Ethics underpins the values that vary from culture to culture. Culture has a great impact on the thinking of society. Middle East society has been in a state of change for over a century. The society has been searching for identity and direction and its population has faced a great deal of tension. Language and religion are the two important markers of ethnic and cultural identity for any society and country. The most distinct tension existing was between modernity and tradition. Muslim Population occupies the Middle East region perceived dominantly by Islamic religion as majority of region, but some population of non- Muslims and other ethnic groups also resides in the region. Since, Middle East is largely under Islamic religion, a struggle is going between Islam and modernity. People of Islamic religion not only see Islam as their religion, but they consider it as their heritage and identity. Inequality between men and women is high in this region. Status of women population in Middle East is quite different from those in West. Under traditional Islamic law, women are more prone to cultural restrictions, limited or no access to education, sports or professional opportunities. Women of this area are supposed to stay inside the homes. Women are supposed to marry once whereas men can marry number of times. All these factors have led to the increase of obesity in women population in Middle East.

Biology also plays a role, including genetic susceptibility and a complex gene-environment interaction caused by the desert location. Lifestyle and genetic factors also act as reasons for the increased prevalence of obesity in Middle Eastern population. Furthermore, urbanization in Middle East has led to dramatic alterations in the lifestyle, food habits and thinking of people. Traditional mode of food habits altered with fast food consumption. Furthermore, acceptance of modernity has led to the enhanced use of technology and transportation.

The luxurious lifestyle of people in Middle East country contributes to their increased prevalence of obesity among the inhabitants. There is a great transition in the basic lifestyle and mode of transportation among people. They are more engage into deskwork and no physical activity is there. The present reliance on mode of transportation and increased use of technology for work and entertainment has decreased physical activity and increased sedentary mode of living among people of Middle East region **(Musaiger et al., 2011).** Moreover, eating culture among Arabic people is very rich. Food is always on the table among this culture. Therefore, their calorie intake is on higher side as compared to calorie out take. Government in Jordan identified obesity as one of the most targeted area of research and assumed that there is a lack of understanding among public about the true causes behind the disease. People consider obesity more as a side effect of diabetes and hypertension rather than a disease. This research report is designed in a retrospective manner so that it can assess and examine the burden of obesity, economic impact, associated risk factors, and incidence of associated diseases among recruited patients from Gulf countries and Middle East. The research report will also consider the role of health policies, knowledge and awareness of patient and its family members about surgical interventions.

3.3 Comparison of European practices in managing overweight and obesity with practices in Jordan & Middle East.

Tsigos et al (2011) & Yumuk et al (2015) demonstrated in their research reports about the European guidelines for obesity treatment and management. European Association for the Study of Obesity (EASO) opens centres for managing obesity. However, obesity management issues remain unresolved in European countries due to several issues such as patient's stigmatization, poor knowledge about medical consequences of obesity, unawareness about treatments available for disease treatment and management, lack of ease of use to interventions, inexperienced team for multidisciplinary treatments, lack of coordination between surgeons and physicians. To overcome all these pitfalls EASO started up with the development of EASO-Collaborating Centres Specialized in Obesity Management (EASO-COMs) explains the requirement of developing uniform state-of-the-art standards for specialized obesity care across Europe country that are authorized by the health authorities. These management centres will be equipped with general physicians, health-care policy makers, and health-care providers with authoritative criteria for the development of obesity management centre's across Europe. This set of criteria

will also assist the establishment of a pan-European network of EASO collaborating centres specialized in obesity management. These management centres will further include university, public and private clinics, which will fulfil the requirements of EASO and will work together in strong association for the better management of all obese patients. Researchers explained BMI vs. waist circumference in men and women and the level of co morbidities as first level of intervention. Moreover, the guide also explained the role of clinical pathways in determining the overweight and obesity levels. These guidelines are extremely significant in explaining the clinical and non-clinical management of obese adults and the guide helps in providing stepwise management of obesity in adults. The aim of these guidelines is weight reduction is not the central aim, but the main aim is the risk reduction, weight reduction, improvement in the health and quality of life and management of co morbidities (**Uerlich et al., 2016).**

Behavioural intervention is of key importance in weight management along with the involvement of allied team of health professionals. This intervention helps in promoting and maintaining lifestyle and dietary changes. Patients involved in behavioural intervention involve face-to-face contact with the dietitians and it includes 6 to 14 sessions to achieve best results. This therapy needs long term commitment and patience from the patients. Self-control and monitorial is core aspect of this intervention. Patients need to cut off their diet plan as per dietitians (**Kelley et al., 2016).** *The present study is designed to evaluate the role of multidisciplinary team in weight loss using bariatric surgery and role of behavioural interventions in weight management after surgery. Our study covers around all fundamental ethical principles like autonomy, informed consent, maintaining confidentiality, respect for patient's dignity, and respect for cultural and social beliefs. Ethical principles form the core aspect of any research related to humans.*

Jordanian society for obesity management also works on the same guidelines of providing quality and safe clinical care for weight management in obese patients. In Jordan concept of Bariatric surgery become more active in last three to four years only. These guidelines explain that interventions should be provided based on patients need. Healthy authorities in Jordan ensures that bariatric surgery should be provided only to the patients have undertaken all other clinical interventions, patient BMI should be 40-50kg/m2with evidence of failed non-invasive interventions, six months of lifestyle modification using a comprehensive, structured program

has not resulted in an average weight loss **(Khadeer et al., 2008).** Bariatric surgery assists in losing weight and improving medical health issues in obese people. Surgical intervention has a great impact on patient's diet and patients need to undertake follow up programme and after care **(Kane et al., 2016)**. Furthermore, patients must receive counselling sessions after surgical intervention from a specialized multi-disciplinary team including as a minimum a physician specializing in weight management or nurse, certified dietitian and psychologist, who should perform a risk-benefit analysis and are ready to commit long-term follow-up by an obesity management provider. Moreover, obesity management centres providing bariatric surgery should have to follow up post-surgery with a multidisciplinary team including as a minimum a specialist bariatric surgeon, a nurse, a dietician and a support group, all with specialization in bariatric procedures and interventions **(Jakobsen & Småstuen., 2018).**

3.4 Obesity Rates in Women in Middle East

Obesity in the Middle East., (2014) documented in their research report that obesity crisis is at peak in almost much of Middle East regions. However, this crisis levels seems to be even worse in women of these areas particularly in GCC countries. Researchers in their studies reported several different factors that are held responsible for this dramatic increase in obesity levels among women population. Partly, this increased phenomenon in obesity trends is due to cultural factors, far less role of women in public, which leads to sedentary mode of lifestyle. Obesity risk in women doubles after pregnancy. In Jordan, women gain lot of weight during pregnancy and fail to lose weight after delivery. Moreover, women with high weight problems are far less likely to have opportunities to become more active in public owing to cultural restrictions, with just 2-6% exercising in the Gulf countries. Prospects for getting involved in sports are also limited, although this is gradually changing **(Nsour et al., 2013).** However, in a recent study conducted by **Thaher (2018)** reported in their study that female adolescents in Jordan have high prevalence of overweight and obesity. Moreover, women of the area have a very poor knowledge about the risk factors of the disease.

3.5 Government Policies to Combat Obesity in Middle East and Jordan

Several areas of action are planned and projected for the prevention and management of disease. Government to combat obesity among the people of Middle East region put policies and

strategies forward. These strategies mainly focus on population wide approach to address major public health challenges with strong focus on food systems. Government has decided to reduce the burden of obesity by promoting awareness about the significance of healthy food, physical activity and knowledge about other complications of obesity to inhabitants of the region. Mass media platform is used for acceptance and implementation of physically active lifestyle. Health professionals are looking out for the ways for observing and evaluating obesity levels among people. Strategies are planned to link up government, private and civil sector together for promoting awareness about healthy eating and lifestyle in region for better health of people. World Health Organization (WHO) recommendations should be implemented for the check and control on marketing of foods and beverages high in fats, sugar and salt to children. Counselling sessions on healthy dietary nutrition and physical activity by health care professionals should be available to pregnant females **(Poston et al., 2011).** More and more research should be conducted on health, nutrition, social and economic factors associated with the occurrence of obesity, so that people should have ample knowledge about this deadly spreading disease. Implementation of healthy food procurement and regular regime of physical exercise will be the most significant step in minimizing the increasing burden of obesity. Policy makers have right to make use of various policies to enhance the quality and standards of food nutritive value. International and national trade policies are significant drivers of food supply, neighbouring policy makers to control food systems at regional levels **(Sdralevich et al., 2014).** More attention is being given for the development of interventions for obesity management. Likewise, bariatric surgery has come up in Jordan few years back. Ministries of health should own the responsibility for coordinating and implementing the plans and strategies for weight loss in an organized way. Moreover, government has targeted school and colleges to promote awareness about healthy eating among children and youngsters, implementation of physical activities for at least 30 minutes a day in school and colleges to make children aware about the importance of physical activity in day-to-day life. School and college premises should ban the supply of fast foods and aerated drinks within and surrounding of premises **(Velazquez et al., 2017).**

In this chapter, we aimed to plan the outline of present study along with the discussion on the aspects that are considered around methodology. *Preceding literature review revealed that there is a need of further research and survey into relationship between obesity and multidisciplinary approaches for the treatment and management of the disease. Due to the lack of sufficient*

literature and research, finding it seems appropriate to investigate the associated health risk factors associated with obese patients and the multidisciplinary approaches available to manage obesity. Following this, the selection of participants and sample size sections will precede the method of data collection and an outline of the associated ethical issues. A detailed description on the methodology of research study will be presented. This chapter will end with a short description of the quality checks put in place prior to starting the study, in order to ensure validity, and a reflexive statement. Several researchers reported that most of research literature on obesity treatment and management is available for male population. However, recent researchers are now focusing on the impact of obesity in female population. Apart from these traditional findings on obesity impact in male and female population there is a need to carry out more upfront investigations on the multidisciplinary approaches available for treating and managing obesity in our population.

The present study was design keeping in view all ethical aspects that involves around while working with human population. Basic ethical principles involved in our study are respect for autonomy. Both patients and health care practitioners should equally endorse it. Informed choice, respect for social and cultural beliefs, maintaining confidentiality and liberty are the basic fundamental principles that are in mind while designing this study. After critical perusal of literature, a two -tier, self-assessed questionnaire and a consent form was designed. The first part of questionnaire was designed in a pattern that it covers all the questions regarding patient's sociodemographic characters, lifestyle pattern, family history, interventions undertaken for obesity management, patient's knowledge and awareness about the disease, role of family in undertaking the surgical intervention, patient's knowledge about the bariatric surgery etc. Second part of questionnaire addresses the questions that need to be answer by the health professionals.

Consent form was designed in English and native language so that enrolled participants can give their agreement for study participation. Participants will sign the form or give their approval on phone only after they completely understand the terms of study.

The quantitative approach of research study using triangulation of data sources were used to evaluate the risk factors associated with obese patients, treatment and management strategies available for patients in Dubai population. Moreover, two-phase approach was used to survey and investigate about the awareness, outlook and opinion of obese individuals about the disease.

The methodological procedure delineate under this section of thesis will be using both qualitative and quantitative approaches. This section will underline the outlook and plan of research, estimated population size to be undertaken for research, procedure for sample collection, research instruments and the pilot study. The last section will provide an overview of the information about the compilation of anthropometric measurements, group interviews, the data analysis, ethical considerations and a summary of the chapter.

3.2 RATIONALE OF THE STUDY

- To rule out the association between obesity and associated risk factors.
- To explore participants knowledge about obesity and associated risk factors
- To explore participants knowledge on available obesity treatment.
- To determine the role of Bariatric Surgery in long term management of Obesity
- To assess the issues faced by patients in postoperative care and treatment.
- To assess the ethical implications, involve in obesity management.
- Role of health policies in obesity management
- To evaluate the participation of patient and its family before and after the implementation of bariatric surgery
- To highlight the most relevant ethical questions associated with bariatric surgery treatment.
- To evaluate whether bariatric surgery is safe and effective method to treat obesity.
- To highlight the significance of informed consent in bariatric surgery.

3.3 RESEARCH SETTING

In the present study, recruitment of patients was done from the Dr. Mohammad Al-Zitawi Obesity Management Centre. We have taken study approval from the hospital administration for

sample collection and research. Those patients who attended Dr. Mohammad Obesity Management Centre in last three years were recruited, as bariatric surgery in Jordan was not much common from long. The intervention had gained its popularity and become more active from last 3 to 4 years i:e started from the year 2015.We visited the centre in September 2018 and surgeon explained not to include the year 2018 as it is not yet completed. The data analysis year was from 2015-2018. Since, population in that area was homogenous so we used systematic sampling approach for sample collection and 10% of population was randomly selected from last three consecutive years. In the year 2015, nearly 241 obese patients were being managed out of which 10% were randomly selected for study purpose i.e. 24 patients were enrolled and interviewed from the year 2015. In the next consecutive year 2016, almost 761 obese patients were administered and 10% (76 patients) of overall administered patients were enrolled for further enquiries. The last year (2017) of patient recruitment had managed 540 obese patients and only 54 of them were further interview. Total patients enrolled for the study were 154 from the period of 2015-2017.Most of the participants enrolled for the present study were from Jordan, Iraq and Gulf countries. The selected age group of patients was between the age of 20 to 50s and all the patients had a keen desire to lose weight. Since, enrolled patients were from Gulf and Jordan. Patients were informed about the study over phone and if they agree to participate in the study. Patients were given detailed explanation of questionnaire in their native language and knowledge about consent form was given to patients before participating in the study. Study is designed in a retrospective manner, consent from enrolled patients was taken on phone, patients were also explained in detail about the ethical aspects, and they have full freedom to leave the interview in between if they feel at any point that they are treated biased. The questionnaire designed in our study was approved by research ethical committee and surgeons involved in bariatric surgery. Pinho and associates in their study explained that questionnaires are convincing, reliable and appropriate instruments that are use as promising tool in gathering information from patients (**Pinho et al., 2013).** In our study, we focused in detail on all the ethical features while taking patients interview.

3.5 RESEARCH METHODOLOGY

A quantitative method approach was employed in the study. Data was gathered from the participants attended obesity management centre Mohammad Al-Zitawi Obesity Management Centre attached to Al-Esraa Hospital located in Jordan from the year 2015 (prior to the implementation of guidelines) to the year 2017 (post to the implementation of guidelines). Participants were selected randomly, and selected participants were 10% of patients attended obesity management centre in that particular year. Below is the year wise and gender wise distribution of participants.

Enrolment Year	Male	Female	Total Patients Recruited (10%)	Total Population Managed
2015	4	20	24	241
2016	17	59	76	761
2017	24	31	55	540

Table 1. Illustrating Gender Wise and Year Wise Distribution of Participants

The methodology involves the distribution of questionnaire among the participants. Since, it is a retrospective study and participants are not in the city. Questionnaire forms and patients' consent was obtained on phone from the participants. Filling up of questionnaire form was on phone. Questions were explained to participants on phone in English and Islamic language and consent was obtained. In the present study, we used mixed method approach to improve the quality of our research study.

Mixed method approach refers to growing methodology of research that progress the systematic mixing of both qualitative and quantitative datum within a single investigation or constant programme of investigation. Mixed up approach allows complete and synergic use of data. Furthermore, this method gives voice to study participants and make sure that enrolled participants are part of study and results are base on participant's experience. This kind of approach provides space to multidisciplinary team by research by promoting the contact of quantitative, qualitative, and mixed methods scholars (**Creswell et al., 2011).**

The explanation of using quantitative approach is that it is beneficial to increase the reliability of our findings by taking detailed information from the patients and this helps in gaining depth in the understanding of the problem under research findings. Quantitative approach in the present research study was used to enable data to be gathered using methods such as self-reported health survey questionnaires. **Turner and Haboubi (2015)** conducted qualitative and quantitative study. In their study they carried out a semi structured interview-based study on 180 patients and concluded that multidisciplinary approaches help in weight loss. Research questions are tested empirically to recognize risk factors that contribute to overweight and obesity, interventions that can be used for the treatment and management of obesity, role of family in patient's decision for undertaking interventions, knowledge of patient's and its family about bariatric surgery. Further crude datum from questionnaires was summarized in excel sheet and raw results were processed with the help of statistical analysis. Moreover, qualitative approach was used in the underlined research study to gather detailed information and determine knowledge of and attitudes towards obesity utilizing methods such as interviews and questionnaire filling and it makes better understanding and explanation of participants perception. Similarly, Cochrane and associates did a qualitative study on multi component and multidisciplinary approach to obesity management. In their study, they make use of qualitative research actions such as interviews, questionnaires and observations to facilitate the process of research enquiry and was reported in their study that the approach should be well developed between four main components (patients, practitioners, dietitians and exercise physiologists) (**Cochrane et al., 2017**). However, use of only one approach will not be sufficient to address the research questions. Therefore, both qualitative and quantitative approaches are considered significantly important for the present study to obtain data in more comprehensive form from participants and this adds on to the worth of the study. Moreover, many authors argued in their studies that use of mixed method approach generates more confirmation and verification about research data when compared to the use of single approaches and researchers can use all the research tools for data collection and examination rather than sticking to one method of data collection **(Creswell., 2013).**

3.6 SAMPLING

Sampling is one of the most important and core part of research study. Guo and his associates proposed in their study that selection of right study participants and sample size is a significant aspect in conducting research. Research studies conducted with inadequately low sample size often creates unreliability in terms of answers to focused aims & objectives of study which leads to the results with low strength **(Guo et al., 2013)**. Hence, the sample was selected to enhance the applicability of findings to the broader population. It is uncommon for an entire population to be included in a study due to the time-consuming nature of doing so in cases where there is a large population **(Stern al., 2014).** Participants attending obesity management centre for weight loss therapy were included for the study. Follow up study was carried out from prior to surgical intervention to the post surgical intervention. Both male and female participants were selected depending upon the number and gender of patients attended management centre in that particular year. Complete details of patients were taken starting from their daily life routine to their work life, social life, their mode of transport, their dietary habits, undertaken of any weight loss interventions, surgeries etc. Participant's anthropometric measurements such as body mass index (BMI), waist hip ratio (WHR), waist circumference (WC) etc were also taken into consideration. The participant survey elicited information on the perception of participants and role of their family in helping patient to lose weight and undertake interventions and their attitudes toward overweight and obesity in general.

3.6.1 Inclusion and Exclusion Criteria: Participants were clearly informed about the duration and aspects of study before the start of the research programme. Inclusion criteria highlight three main aspects that should be undertaken while including patients for study purpose. Sample size, sampling approach and stability of included population overtime are significant factors in methodology section. Those individuals were included in the data source and ultimately in the analyses that were ready to give their detailed personal information to the questions contained in the questionnaire and they were willing to sign the consent form. Exclusion criteria were applied to the patients who denied giving the complete details and were not ready to sign the patients consent form. Those patients were best suited and included in the study that were happier to share their personal information and understands the fact their information will be recorded only for research purpose and their identity will not be revealed.

3.6.2 Sample Size: Sample size of a study largely determines statistical tests that can be successfully and meaningfully performed. Estimates of obesity trends and prevalence are more stable in large sample size population. Study with accurate sample size gives more authenticate and valid results in study population.

3.6.3 Stability of Population Overtime: The extent to which the undertaken study population remains stable is of key importance. Alterations or modifications in the distribution of exposures and sociodemographic characteristics within subgroups of the population over time can affect the interpretation of obesity prevalence data. These modifications should be calculated and undertaken at the time of data analysis **(Assessing prevalence and trends in obesity: Navigating the evidence. 2016).**

3.7 RESEARCH INSTRUMENTS

3.7.1 Participant Health Questionnaire. Patient's behaviour, attitude and knowledge questionnaire (ABAKQ) were adapted to elicit information on the eating habits, physical activities and sedentary behaviour of youth **(Powell., 1998).** The patient's questionnaire was pilot to draw information from 155 obese patients on telephone. All questionnaires were completed manually; patients were around the Middle East not only from Jordan. We have actually contacted each single patient except for few who could come over to the centre. Dietitian of the research centre helped me out in reaching to the patients. Patients were from different parts of Middle East such as Jordan, Kuwait, Saudi Arabia, Yemen etc, so telephonic approach was the only way to reach patients. It could not be done in another way. Actually, it was tough because we had to explain each question, and make them all understand it the same, they didn't have fax machines and many of them were not using emails actively, therefore the most convenient was to ensure having it done properly is to have them on the phone. We spend an average of 45 minutes on each call. Patients were asked questions in sequence order, they replied, and then answers were subsequently filled up in the questionnaires. The copy of questionnaire contains questions under the following sections such as:

First section contains set of questions about patient's general information such as name, age, sex, date of birth, height, weight, occupation, phone number, email address.

Second section focuses on social history of patient such as consumption of alcohol and tobacco, quantity and duration of consumption, active or passive users.

Third section relates to the dietary habits of the participants and it includes questions like consumption of carbonated drinks / day, calorie intake/day, number of meals, frequency of eating in restaurant and junk food, consumption of water/day, consumption of tea/coffee /day and snack intake in middle of night. After that there are some questions on patients' self-esteem, sex life, willingness towards physical activity, duration of physical activity and walk.

Fourth section patients were reported about their weight history like how long they have been overweight, obesity history, family history of being obese, heaviest weight, health issues caused by obesity. Family health history includes questions such as whether there was any disease in family due to obesity such as arthritis, diabetes, CVDs, high cholesterol levels and high BP levels were also reported from the participants.

Fifth section elicited information on patient's knowledge about lifestyle interventions and surgical interventions like what kind of knowledge and education patient and its family have about weight loss intervention, source of awareness about the use of intervention, source of awareness about the interventions such as health directive, internet, nurses and physicians. Questions about the use of any intervention for weight loss, duration of intervention used, any progression in weight loss, how many kg, use of any medication for weight loss, duration, name and dosage of drug if consumed were also reported under this section.

Sixth section gathered information about participant's reasons for undertaking bariatric surgery for weight loss, did they faced failure in weight loss from other interventions, how long they were thinking about undertaking bariatric surgery, do they gathered information from other patients who underwent surgery their knowledge about different surgical procedure, does their family supported them in this decision, spouse contentment in undertaking surgery, living status of patient and role of family in patient weight management after surgery, , was their surgery successful.

Last seventh section of questionnaire enquired participants if they have undergone any surgery other than bariatric surgery and details about their medical health directives.

Annexure 1: Questionnaire for Patients.

3.7.2 QUESTIONNAIRE FOR OBESITY MANAGEMENT TEAM: Since this research study involved two tier questionnaire forms one for patients and another one for obesity management team. This set of questionnaire forms contains questions that need to be answered by the obesity management team. Following are the questions incorporated in this form.

Questions 1 - 4 were related to the general information of the management centre and the doctors involved in the treatment. Data was gathered about doctor's highest attained degree, their professional years of practice in treating and managing obesity and their present professional status.

Questions 5-10 gathered information about the doctor's practice and their associations with societies of nutrition education, weight management or any other groups. This set of questions also enquired whether the centre follows particular protocol, guidelines for nutrition management in preoperative and post-operative bariatric patients.

Questions 11-15 elicited information that whether the centre provides post operative care and counselling to the patients or not. Last but not the least is the obesity management centre is following proper ethical aspects while treating and managing patients.

Annexure 2: Questionnaire Obesity Management Centre.

After the completion of questionnaire round on phone participants were requested to give their approval for filling up of consent form.

Annexure 3: Consent Form.

3.7.3 QUESTIONNAIRE ADAPTATION PROCESS: Process to adapt questionnaire involves certain steps that guides the method of designing of questionnaire. Firstly, the data required in the designed questionnaire was highlighted depending upon the research questions and rationale of the research study. Secondly, the language of the study was kept in English and the native language so that it will be easy for participants to understand the questions and purpose of the study completely. Wording of questionnaire were focused to ensure clarity and to avoid ambiguity. The questionnaire was translated to study participants on phone either in English or in

their native language depending upon their feasibility. Questionnaire translation is a significant aspect of research survey. Research surveys performed in diverse ethnoliguistic languages fist develops the questionnaire in English language before translating the questionnaire into the language of target population. Researchers proposed that several methods are used for the language translation such as back translation, forward translation and committee approach **(Furukawa et al., 2014.)**

3.8 DATA ANALYSIS

After data collection the most important step was the analysis of raw data. The first and foremost step in analysing data was to engross myself in the data produced by the participants. This includes understanding my written information, field notes and literature in detail. Second step was to code the data collected from both the questionnaires and the details were entered in Microsoft excel sheet. Proper code was assigned to every patient and in the excel sheet codes were used instead of patient name. Crude datum from excel sheet was transferred to Statistical software for Social Sciences (SPSS) software version 20.0. The data analyses were executed by using two significant ways: descriptive statistical analysis and inferential statistical analysis. Both the approaches were used to generate fine results from crude data. Statistical tests such as t test, chi square test, analysis of variance (ANOVA) were performed to calculate the variances.

3.4 EXECUTION OF ETHICAL ASPECTS

Ethics or moral philosophy is a branch of philosophy that involves systematizing, defending and recommending concept of right and wrong conduct. Ethics seeks to resolve questions of human morality by defining concepts such as good and evil, right and wrong, virtue and vice, justice and crime **(Mandal., 2011).** Ethical concern is significant while working with humans because research takes place in real world situations with the humans involved in every single step of research. Therefore, it becomes mandatory to execute all ethical aspects while working with humans **(Kapp., 2006).** Researchers and patients are basic ethical elements that are involved in complete ethical procedure. Moreover, its efficacy and adequacy depends upon patient's decision. Several social and legal issues are involved while working with humans. Factually, ethical conduct means doing things in right way and in actuality; it means more than doing things in right way. It involves that actions should be done in right way and spirit, concern and respect

for other persons feelings. Human research revolving around humans involves research conducted with or about people or it involves their data or tissue specimen to conduct research. The core intention of using humans or their samples or data is to do well to them. “Do not harm” is the first and basic ethical principle that needs to be followed by the researchers while taking information from the patients **(Kapp., 2006).** The centralized role of humans in our research study is to provide data that can be used as a source for analysing patient’s knowledge and awareness about disease and its treatment interventions. The NHMRC (2007) ethical guidelines state that quality and reliability of data collection and analysis is a significant aspect of research studies. The most salient ethical values that should be undertaken in research studies involving human participants are beneficence (doing good), non malfeasance (not justifying patients), fidelity, trust, respect, unbiased treatment, cultural respect, right to justice, maintenance of confidentiality, right to decision making and voluntary decision. During the filling up of questionnaire, forms from patients following ethical aspects were taken into key consideration:

- ✓ **Informed Consent**: The committee of ethics in 1980 proposed a statement on “consent form”. Informed consent is an ethical concept that has become a significant part of medical ethics and medical practice. Obtaining consent from patients for participation in medical research is an ethical requirement that reflects in legal documents and requirements. Seeking consent from patients expresses the respect for the patient as person. Consent form not only ensures protection for patients to participate in research activity but also makes possible patients’ active involvement in her medical care and treatment **(Ethical decision making in obstetrics and gynaecology. 2007).**When any personal information is taken from person and the acquired information will be further used for the research study purpose. It is significant that participant should be inform completely and clearly about the study pattern and how their information will be used further. Study participants given the opportunity to read and clearly understand the aims and objectives of the study before giving their approval. Participants consent is an integral part of study and without their consent; it is illegal to use participant’s personal information. Informed consent should look upon as a significant process rather than a simple signature on form. Study approval was from Al-Esraa Hospital Ethical Committee. After getting approval from hospital ethical committee, patients’ consent was obtained on phone. Most of patients were contact on phone and questions explained to

them in English as well as Arabic language. Patients are ask to repeat the questions to ensure the clear understanding. Once, the patients understand the nature of study, they gave their consent of participating in the study on phone. On the other hand, some patients met in clinic and the whole process of questionnaire round and consent form done face to face. Voluntary consent of human subjects is significant it makes clear and outweighs the risks involved in working with humans **(Mandal et al., 2011).**

- ✓ **Maintaining confidentiality/Privacy:** Being the main investigator of study, I assured patients that their personal data and information will be used only for research purpose and their names and identity will not be revealed in any circumstances. To maintain the identities and to protect patient's confidentiality pseudonyms were allocated to each study participant.
- ✓ **Numbering Code**: Numbering code is also a significant aspect to be involved while working with humans. It involves the use of number code on the data questionnaire or samples taken from participants. Numbering code was established in 1948 and it is used to hide the identity of patients. Instead of their names numbering codes are used on their data and samples **(Beauchamp et al., 2009)**.

- ✓ **Right to Withdraw:** Before the start of filling up of questionnaire forms, participants were assured that they are free to leave the study at any point of question round if they feel uncomfortable in answering questions or if they feel that these questions are hitting their privacy.
- ✓ **Counselling:** Recommendations on the use of proper weight loss approaches was also given to the patients based on proper medical recommendations. Physicians involved in the study also provide counselling to the patients in an unbiased manner respecting their dignity and self respect **(Brown et al., 2012).**
- ✓ **Patient/Physician Relationship:** Investigator and physicians should maintain a strong therapeutic connection and participants should be treated with equality; they should not be disrespected at any point of question round. Ethical aspects of beneficence and nonmaleficence are given consideration in this aspect **(Violato., 2013).**

ANNEXURE 1

QUESTIONNAIRE FORM FOR PATIENTS

➢ GENERAL QUESTIONS

1. Name: _____
2. Date of Birth:_____Age: _____
3. Adress:_____
4. Phone/ Mobile Number: Home:_____Cell: _____
5. Work Number: _____
6. E-Mail: _____
7. Occupation _____
8. Weight (Kg) _____
9. Height (m) _____
10. BMI _____

➢ SOCIAL HISTORY

Alcohol Consumption: Yes/ No

If Yes, Glasses per Day or Week: ____/ml

Glasses of Wine:_____/ml

Can of Beer:_____/ml

Duration of Alcohol Consumption**:** _____**Months or**____**Years**

Tobacco Consumption: Yes/No

Current Smoker: _____

Passive Smoker: _____

Never Smoker: _____

Duration of Smoking: _____Months or____Years

- **ASSOCIATION WITH ANY SORT OF DISEASE:**

  Hypertension: Yes_____ No _____Duration_____Years

  Diabetes Yes _____No_____ Duration_____ Years

  Asthma Yes _____No_____Duration_____Years

  Sleep Apnea Yes _____No_____Duration_____ Years

  Dyslipidemia Yes _____No_____Duration_____Years

  Heart Disease Yes _____No_____Duration_____Years

- **CURRENT DIETARY HABITS**

  How many carbonated beverages do you drink a day?_ ❑ Diet _____Regular _

  How many meals a day do you eat _____

  Do you snack? If yes, describe_____how often: _____

  Do you eat in the middle of the night? _____

  How many calories do you think you eat in a typical day? _____

  How many times a week do you eat out in a restaurant? _____

  How many times a week do you bring home take-out food? _____

  How many glasses of water do you drink a day? _____

  How many cups of coffee do you drink a day?_____ ❑ Decaffeinated ❑

- **QUESTIONS ABOUT ASPECTS OF LIFE TO CLASSIFY PATIENTS INTO FIVE GROUPS (Good, Very good, Excellent, Poor, Acceptable)**

  Self Esteem _____

  Willingness to physical activity _____

  Willingness to work _____

  Sociability _____

Sex life _____

- **LIFESTYLE HABITS**

  Do you Exercise: Yes _____ No_____If Yes Duration_____

  Walk Yes_____No_____If Yes Duration _____

- **FAMILY HISTORY FOR ANY DISEASE:**

  _____

  _____

- **<u>WEIGHT HISTORY</u>**

How long have you been overweight (years) _____

What is your Heaviest weight (Kg)? _____

What problems is it causing? _____

BMI if Known: _____

Obesity history Yes_____No _____

Have you been obese for greater than 5 years? _____

Have you been obese since childhood? No_____Yes _____

- **<u>EDUCATION ABOUT LIFESTYLE INTERVENTIONS AND BARIATRIC SURGERY</u>**

What Kind of knowledge you or your families have about weight loss interventions?

_____

Main source of awareness about the use of interventions?

Health Directive _____

General Physician _____

Nurses' _____

Internet _____

- **USE OF INTERVENTIONS FOR WEIGHT LOSS**

Have you tried any interventions for weight loss?

Name and duration of intervention used?

Any progression in weight loss? If Yes up to how many Kg?

_____

Weight loss medications if any use? _____

Duration of Use _____

Name of drug used _____

Dosage Consumed _____

- **CONSIDERING WEIGHT LOSS BARIATRIC SURGERY**
- How much weight you have been able to lose before?

  _____
- What are the reasons to get surgery done?

  _____
- How long have you been considering weight loss surgery?

  _____
- What have been your main sources of information about weight loss surgery?

  _____
- Do you know other people that have had an operation for obesity? ❑ Yes ❑ No
- Have those operations been successful? ❑ Yes ❑ No
- Do you have family and friends supportive of your decision to undergo an operation to help you lose weight?

  _____

- What are your main reasons for considering an operation to help you lose weight?

  _____

- Which of the following operations are you aware of?

  Laparoscopic Adjustable Gastric Band (Lap Band) _____

  Gastric Bypass (Open Laparoscopic and the (Fobi operation) _____

  Sleeve Gastrectomy _____

  Other _____

- **ROLE OF PATIENTS FAMILY IN DECISSION PROCESS**

Living Status: Alone _____

With Spouse _____

With Family _____

- Have you discussed with your spouse or family about surgery _____
- Is your family ready to undertake surgery or have doubts about surgery?

  _____

- If married, is your spouse willing to undertake you for surgery _____
- Spouse Contentment for surgery (essential) _____
- Parents contentment for surgery (if living in joint family) _____
- Who will pick up you from hospital:

  Name_____Relationship_____Phone_____
- Alternate Contact number and name of family member _____

DETAILS ABOUT PREVIOUS SURGERIES

- Details of health care directive (if any)? They can help in selecting mode of intervention for patients?

  _____

  _____

- Please mention if you have any allergies to medication

  _____

- Have you been hospitalized for more than 24 hours or spent more than 24 hours in an Emergency Department in the past 6 months?

  _____

  _____

- Details of Previous Surgeries and hospitalizations?

  _____

- INFORMED CONSENT

  Patients are requested to read and sign the informed consent after filling the questionnaire form?_____

  Patients have right to withdraw from the study at any point and can return the questionnaire form to health care team?

  _____

Thanks for completing Questionnaire. This will help your doctor to understand your health better.

Signature of Patient _____ **Signature of Researcher** _____

Print Name of Patient _____ **Print Name of Researcher** _____

Date _____ **Date** _____

Email ID _____ **Email ID** _____

Annexure 2

QUESTIONNNAIRE FOR OBESITY MANAGEMENT TEAM

CLINIC NAME _____

DETAILS ABOUT MANAGING TEAM

I am General Physician _____

Registered Nurse _____

Nurse Practitioner _____

Medical Director _____

Other _____

Question 1 Highest Attained Degree in Field of Specialization? _____

Question 2 How many years you have been practicing as Registered/ Licensed Dietitian?

_____

Question 3 How many years you have been practicing as Registered/ Licensed Bariatric Dietitian?

_____

Question 4 what is your current professional status?

1. Inpatient Clinical Bariatric Dietitian _____
2. Outpatient Clinical Bariatric Dietitian _____
3. Both _____

Question5 Please indicate if you are a member of these societies.

Academy of Nutrition and Dietetics _____

The American Society for Metabolic and Bariatric Surgery _____

Obesity Action Coalition _____

Weight Management Dietetic Practice Group _____

Society for Nutrition Education and Behaviour _____

American Diabetes Association _____

Other, please specify _____

Question 6 On average, how many bariatric patients do you personally see per month (include both office and hospital encounters)?

Less than 1 _____

1-100 _____

101-200 _____

201-300 _____

301-400 _____

>400 _____

Question 7 Does your institution have a written guideline, policy, or protocol concerning preoperative nutritional management of the bariatric surgical patient?

Yes_____

No _____

Don't Know _____

Question 8 Does your program's postoperative bariatric diet incorporate texture progression: from clear liquids to full liquids to purees to soft solids and finally to solid foods?

Yes_____

No _____

Question 9 Do you discharge bariatric patients on a full liquid diet?

Yes _____

No _____

Question 10 Who evaluate the patient's tolerance to the postoperative diet?

Physician_____

Bariatric Surgeon _____

RD/RDN _____

Other, please specify _____

Question 11Who decides when a patient is ready to advance to the next phase of the postoperative diet?

Physician_____

Bariatric Surgeon _____

RD/RDN _____

Other, please specify _____

Question 12 Are following health professionals are involved in educating about dietary guidelines, meal progression in your institution?

	Never	Often	Always
Physician (MD or DO)			
Bariatric Surgeon			
Board-certified Physician Assistant			
Nurse Practitioner			
Surgical Assistant-Certified			
Registered Nurse			

Question 13How long after the bariatric surgery procedure do initial outpatient follow-ups commence in your department?

1 week post surgery

2 weeks post surgery

3 weeks post surgery

4 weeks post surgery

5 weeks post surgery

6 weeks post surgery

Other, please specify

Question 14 Do you personally carry out long-term follow-up of your bariatric surgery patients?

Yes

No

Question 15 Ethics Involved in Treatment and follow up?

Confidentiality will be maintained: Yes_____No _____

Details about Personal data will not be shared. It should be used only for research purpose.

Only investigator will have access to patient information.

Unbiased treatment will be given by health professionals?

Name will not be revealed under any circumstances.

Injustice in behaviour will not be tolerated by any medical staff. _____

Patient will have right to speak and have right to have involvement in management of weight? _____

Names and signature of Therapists Involved in Managing Patients

---------- Signature _____

_____ Signature _____

---------- Signature _____

---------- Signature _____

Annexure 3

INTERVIEW CONSENT FORM

Thank you for agreeing to take part in health survey

If you have any queries, please ask the researcher **before filling** this consent form.

Consent

I have cleared all my doubts regarding the study.

I understand that I may ask for interview to be terminated at any point.

I understand that my identity and my personal data will not be revealed.

I agree to the fact that my information will be further used for research purpose.

I_____(name) with my consent take part in this research study.

Patient Email _____

Sign of Participant _____

Sign of Researcher _____

Date _____

4. DATA PRESENTATION AND ANALYSIS

4.1 Introduction

When undertaking the current study, the researcher was to survey 154 patients that had undertook a bariatric surgery in 2015, 2016 or 2017 and interview five members of the obesity management team in one hospital in Jordan. At the end of the data collection period, all the 154 surveys of the patients had been conducted. The researcher however managed to interview four individuals involved in obesity management in the investigated hospital. This chapter of the thesis provides a presentation and analysis of the data that had been collected. In particular, the chapter provides a presentation and analysis of general information about the study participants obtained from the surveys and the interviews and the information obtained in relation to each of the research questions of interest.

4.2 Presentation and Analysis of Survey Data

4.2.1 General Information of the Patients

When undertaking the current study, 24 patients that had undergone bariatric surgery in 2015, 76 that had undergone it in 2016 and 54 that had undergone it in 2017 were surveyed. This was not different from what the research intended to achieve, which was to survey 10% of the patients that had undergone bariatric surgery since it became common in Jordan. The number of patients that had visited the obesity management centre for bariatric surgery as indicated by the medical records of the hospital were 241 in 2015, 761 in 2016 and 540 in 2017. The researcher failed to include 2018 in the analysis because it was not yet complete by the time when data was collected for the study.

Among the patients surveyed in the current study, women were as many as 83.3% (*n*=20) in 2015 and 77.6% (*n*=59) in 2016, but were only 55.6% (*n*=30) in 2017 (Figure 1).

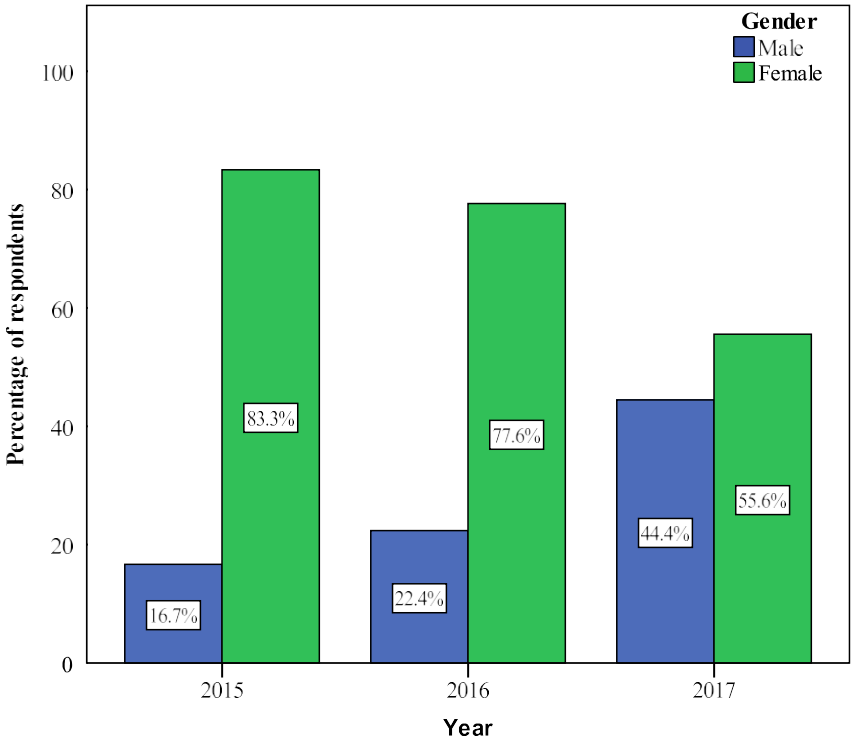


Figure 1: *Gender of the Patients Surveyed in Each of the Three Years*

In the Middle East countries that include Jordan, it has been indicated that women are more likely to be affected by obesity than men due to lack of knowledge and awareness about the disease and its risk factors **(Nohair et al., 2014).**The researcher therefore expected the patients visiting the obesity management centre of the investigated hospital to be more women than men during the three years that were investigated. Medical records of the investigated hospital however indicated that women visiting the obesity management centre for bariatric surgery were far much more than men in 2015 and 2016 but were almost equal to men in 2017. This is the reason why the researcher had selected almost as many male patients as female patients for the study in 2017, but only selected a small number of male patients for the study in 2015 and 2016.

Patients included in the study were aged between 20 and 60 years (*M*=35.5, *SD*=8.85) with the average age of the patients being almost the same in each of the three years (*F (2, 151)* = 0.02, *p*=.98) and for both male and female patients (*t (152)* = -0.765, *p*=.445, 2-tailed). In Jordan and

other GCC countries, obesity has been indicated to be as high as 40% among adults of various different ages, which makes Jordan the fifth fattest country in the world **(Nsour et al., 2014).** Patients of various aged between 20 and 60 years had therefore been represented in the study regardless of their gender and the year when they had received the bariatric surgery.

Among the patients interviewed in the current study, 72 (47%) were from Jordan, 34 (22%) were from Kuwait and 29 (19%) were from Saudi Arabia with the remaining being from other GCC countries such as Iraq (*n*=6), Palestine (*n*=3), Qatar (*n*=7) and UAE (*n*=3) (Figure 2).

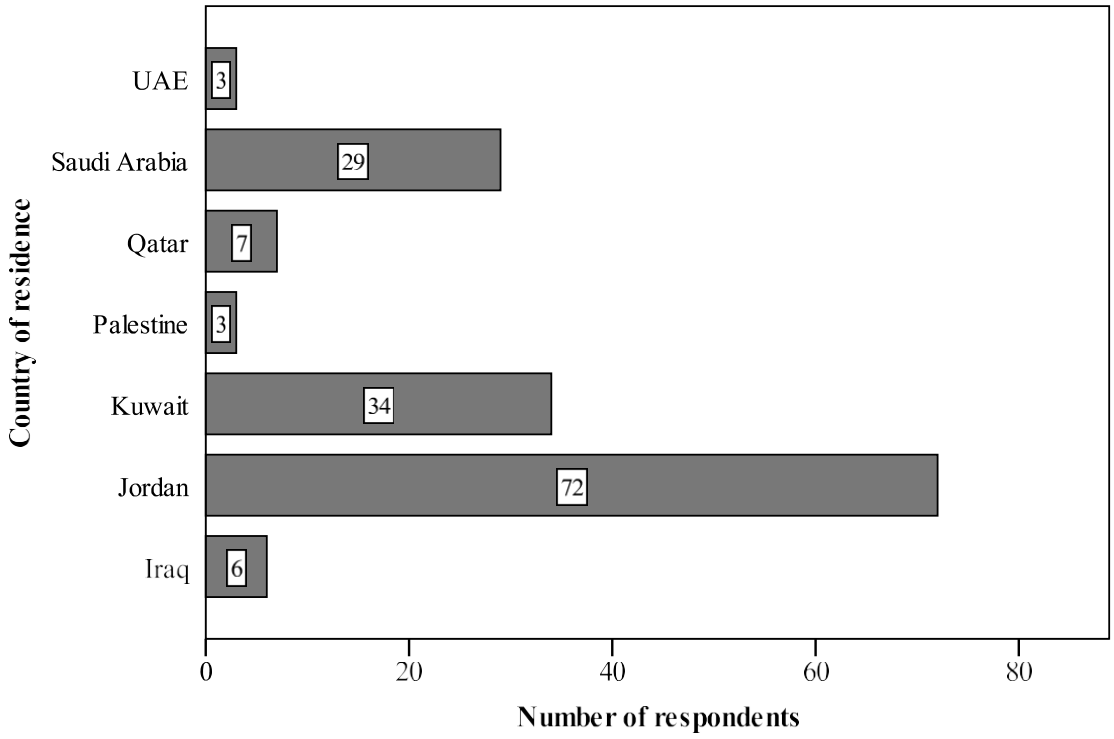


Figure 2: *Country of Residence of the Survey Respondents*

Patients from Saudi Arabia were mostly men while patients from the other GCC countries represented in the study were mostly women (Figure 3) with the association between country of residence and gender among the patients being statistically significant (χ^2 (3) = 13.592, p=.004), but the one between country of residence and year when they had received bariatric surgery not being statistically significant (χ^2 (6) = 7.637, p=.266).

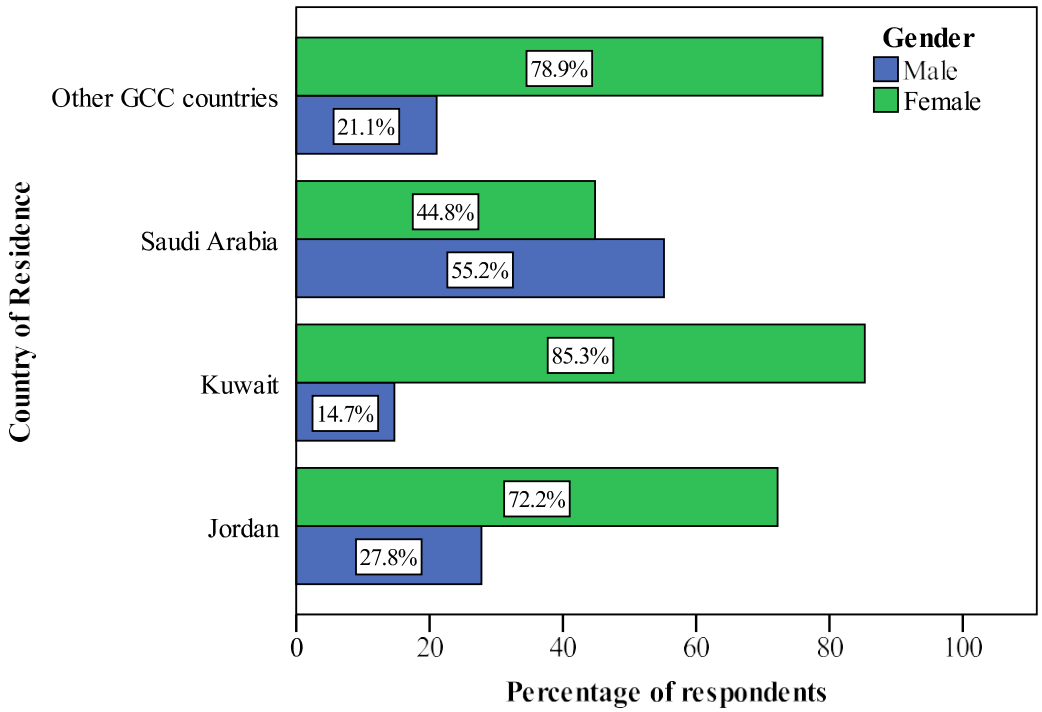


Figure 3: *Gender of the Patients from GCC Countries Represented in the Study*

Participants enrolled in the current study were therefore mostly from Jordan and other GCC countries like Kuwait and Saudi Arabia with Saudi Arabia having more male patients than female patients unlike Jordan, Kuwait and other GCC countries.

Patients interviewed in the current study had various different occupations such as administrative clerk (*n*=14), pharmacists (*n*=11) and secretaries (*n*=11), but included also individuals that had retired from their respective jobs (*n*=12), house wives (*n*=47) and students (*n*=13) (Table 3).

Table 1: *Occupations of the Survey Respondents*

	Freq	
Accountant	3	1.9
Administrative clerk	14	9.1
Beautician	8	5.2
Business man/woman	5	3.2
Division director	3	1.9
Driver	3	1.9
House wife	47	30.5
Legal specialist	4	2.6
Pharmacist	13	8.4
Physician assistant	3	1.9
Project manager	3	1.9
Retired	12	7.8
Sales manager	9	5.8
Secretary	11	7.1
Shift manager	3	1.9
Student	13	8.4

Investigated patients weighed between 58Kgs and 159Kgs (M=82.3, SD=21.93) and had a height of between 1.50m and 1.83m (M=1.64, SD=0.0817). On average, the investigated patients had a BMI of about 30.3 Kg/m^2 (SD=6.36), but there were patients with a BMI that was as low as 22.5 Kg/m^2 and those with a BMI that was as high as 49.8 Kg/m^2.Patients that had received bariatric surgery in different years were not significantly different in terms of their weight ($F\ (2, 151)$ = 1.238, p=.293), height ($F\ (2, 151)$ = 0.006, p=.994) and BMI ($F\ (2, 151)$ = 1.811, p=.167).

Male patients interviewed in the current study however had a higher weight (M=95.1, SD=29.27) than their female counterparts (M=77.0, SD=15.36) with the difference being statistically significant ($t\ (152)$ = 5.007, p< .001). Also, the male patients interviewed were taller on average (M=1.699, SD=0.0907) than their female counterparts (M=1.617, SD=0.0641) with the difference being statistically significant ($t\ (152)$ = 6.37, p< .001). Moreover, the male patients interviewed in the current study had a higher BMI on average (M=32.5, SD=7.75) than their female counterparts (M=29.4, SD=5.48) with the difference being statistically significant ($t\ (152)$ = 2.783, p=.006). This is not different from what could be expected, given that men are mostly not

only taller than the women, but also heavier than the women in most parts of the world, which make them likely to have a higher BMI.

Among the patients investigated, 32 (20.8%) were normal, 61 (39.6%) were overweight and another 61 (39.6%) were obese with the BMI group of a patient not being significantly associated with the year that the patient had received bariatric surgery (χ (4) = 6.734, p=.151) and the gender of a patient (χ (2) = 5.351, p=.069).However, the association between a patient's country of residence and his or her BMI group was statistically significant (χ (6) = 25.914, p< .001, 1-tailed) with overweight individuals being mostly the individuals from other GCC countries and obese individuals being mostly those from Saudi Arabia (Figure 4).

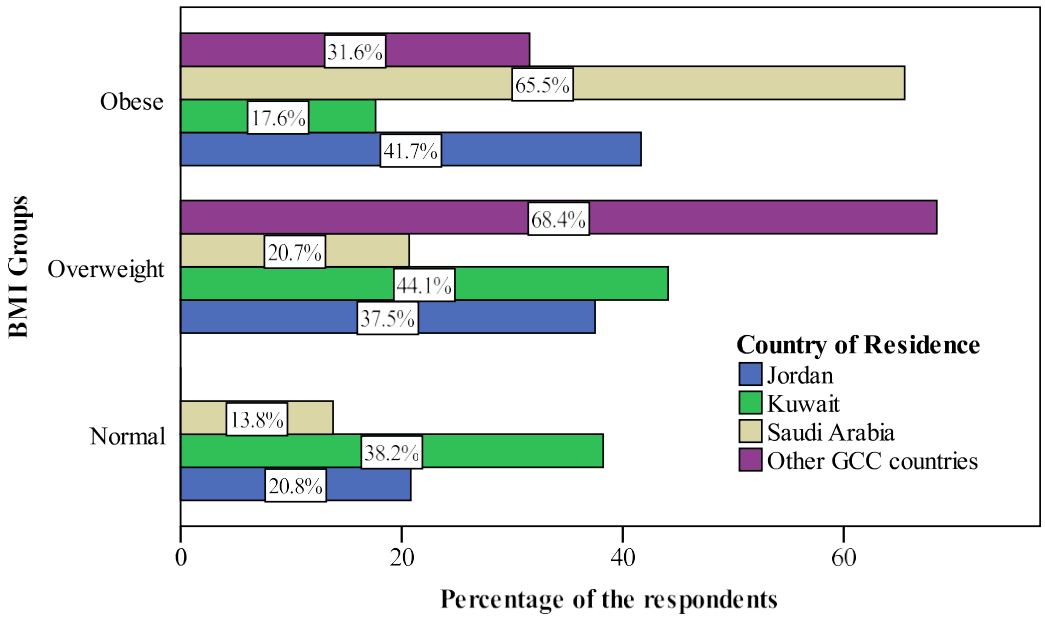


Figure 4: *Normal, Overweight and Obese Patients from Countries Represented in the Study*

4.2.2 Risk factors and their association with obesity

4.2.2.1 Social History

Only three of the individuals investigated in the current study (1.9%) agreed that they used to consume alcohol of which all were men while as many as 66 out of the 154 respondents (42.9%) agreed that they used to consume tobacco (Figure 4).

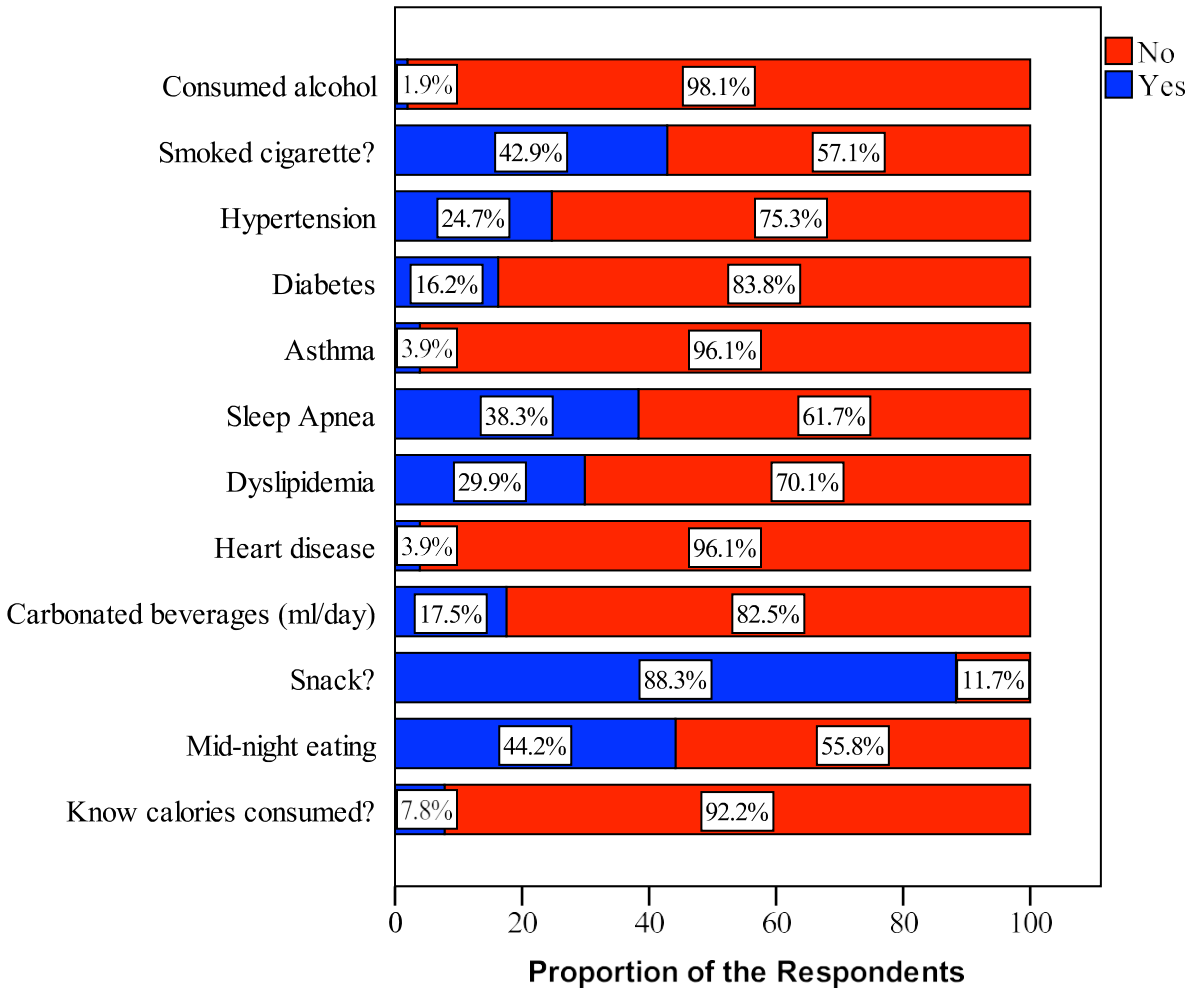


Figure 5: *Responses on Questions of Social History and Disease Factors*

As many as 91% (*n*=60) of the patients that agreed to having smoked tobacco were current smokers while the remaining 9% (*n*=6) indicated that they were passive smokers (Figure 6).

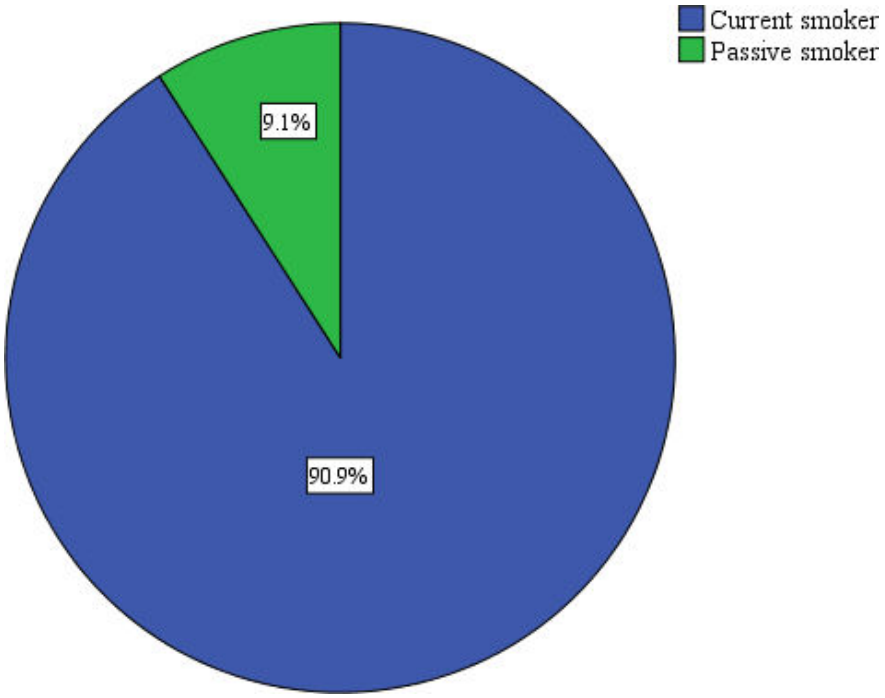


Figure 6: *Current Smoking Status of the respondents*

The association between tobacco consumption and the BMI group of the patients was statistically significant (χ (2) = 8.584, p=.014) with normal individuals being mostly the smokers and overweight and obese individuals being mostly the non-smokers, but this was not the case between BMI group and both consumption of alcohol and current smoking status (Table 2).Three individuals that used to consume alcohol were consuming only three glasses per week and were all obese.

Table 2: *Association between BMI Group of a Patient and Various Different Risk Factos*

		BMI Groups			χ^2 (2)	p
		Normal	Overweight	Obese		
		n(%)	n(%)	n(%)		
Consumed alcohol	No	32(21.2%)	61(40.4%)	58(38.4%)	4.665	.097
	Yes	0	0	3(100%)		
Smoked cigarette	No	11(12.5%)	39(44.3%)	38(43.2%)	8.584	.014
	Yes	21(31.8%)	22(33.3%)	23(34.8%)		
Smoking status	Current smoker	21(35.0%)	19(31.7%)	20(33.3%)	3.085	.214
	Passive smoker	0(0.0%)	3(50.0%)	3(50.0%)		
Hypertension	No	20(17.2%)	49(42.2%)	47(40.5%)	3.751	.153
	Yes	12(31.6%)	12(31.6%)	14(36.8%)		
Diabetes	No	26(20.2%)	52(40.3%)	51(39.5%)	0.248	.883
	Yes	6(24.0%)	9(36.0%)	10(40.0%)		
Asthma	No	32(21.6%)	58(39.2%)	58(39.2%)	1.638	.441
	Yes	0(0.0%)	3(50.0%)	3(50.0%)		
Sleep apnoea	No	16(16.8%)	39(41.1%)	40(42.1%)	2.370	.306
	Yes	16(27.1%)	22(37.3%)	21(35.6%)		
Dyslipidaemia	No	23(21.3%)	43(39.8%)	42(38.9%)	0.098	.952
	Yes	9(19.6%)	18(39.1%)	19(41.3%)		
Heart disease	No	32(21.6%)	60(40.5%)	56(37.8%)	5.14	.077
	Yes	0(0.0%)	1(16.7%)	5(83.3%)		
Takes carbonated beverages?	No	26(20.5%)	55(43.3%)	46(36.2%)	4.633	.099
	Yes	6(22.2%)	6(22.2%)	15(55.6%)		
Beverage type	Diet	3(50.0%)	0(0.0%)	3(50.0%)	4.436	.109
	Regular	3(14.3%)	6(28.6%)	12(57.1%)		
Snack?	No	6(33.3%)	9(50.0%)	3(16.7%)	4.810	.090
	Yes	26(19.1%)	52(38.2%)	58(42.6%)		
Eating at the middle of the night	No	19(22.1%)	40(46.5%)	27(31.4%)	5.822	.054
	Yes	13(19.1%)	21(30.9%)	34(50.0%)		
Know calories consumed?	No	32(22.5%)	58(40.8%)	52(36.6%)	7.520	.023
	Yes	0(0.0%)	3(25.0%)	9(75.0%)		
Coffee type	Caffeinated	20(17.4%)	45(39.1%)	50(43.5%)	15.074	.001
	Decaffeinated	9(60.0%)	1(6.7%)	5(33.3%)		

On average, the tobacco smokers had smoked it for 84 months (*SD*=89.96) with the person that had smoked tobacco for the most number of months having smoked it for about 360 months and the one that had smoked for the least number of months having smoked for only two months.

Among the participants, the ones that were overweight had smoked tobacco for the most number of months on average (*M*=127, *SD*=115.3), followed by those that were normal (*M*=67, *SD*=82.2) and then those that were obese (*M*=59, *SD*=48.5) with analysis of variance indicated that patients in at least two of the BMI groups differed significantly in terms of the average number of months that they had been smoking tobacco at the 5% level of significance (*F (2, 63)* = 4.053, *p*=.022) (Table 3).

Table 3: *Variation of Durations of Risk Factors Investigated across BMI Groups*

	BMI Groups			F	p
	Normal	Overweight	Obese		
	M(SD)	M(SD)	M(SD)		
Months of smoking	66.9(82.24)	126.5(115.26)	59.3(48.54)	4.053	.022
Duration of hypertension (in years)	3.7(2.26)	2.0(0.85)	7.6(7.79)	4.498	.018
Duration of diabetes (in years)	4.0(3.29)	2.2(0.67)	9.1(7.96)	4.193	.029
Duration of sleep apnoea (in years)	2.2(1.53)	3.4(1.18)	5.7(4.96)	5.751	.005
Duration of dyslipidaemia (in years)	7.7(3.50)	4.8(4.90)	7.8(6.96)	1.519	.230
Meals/day	2.8(0.97)	2.9(1.24)	3.4(1.63)	2.472	.088
Times taken snack in a day	2.1(0.92)	2.6(1.14)	2.4(2.03)	0.758	.470
Times dined in a restaurant in a week	1.4(1.88)	1.8(1.66)	2.4(2.51)	2.914	.057
Times brought takeout food at home	0.0(0.00)	0.5(0.92)	1.3(2.04)	10.622	<.001
Grasses of water drank in a day	5.1(2.03)	5.1(2.72)	4.4(2.13)	1.458	.236
Cups of coffee/tea drunk in a day	2.0(1.40)	1.7(1.49)	2.2(1.53)	1.786	.171
Exercise duration in minutes/day	52.5(8.22)	58.1(33.71)	46.4(15.67)	0.684	.512
Walking duration in minutes/day	28.7(13.96)	48.7(75.33)	81.2(151.16)	1.397	.254
Years overweight	14.6(12.53)	11.5(9.51)	14.3(8.83)	1.546	.216
Heaviest weight	117.0(30.04)	115.3(32.29)	139.7(32.58)	9.606	<.001
Heaviest BMI if known	43.4(1.71)	46.8(15.21)	45.4(13.19)	0.204	.816

Multiple comparisons undertaken using the Tukey's HSD method however indicated that individuals that different significantly in terms of the average number of months that they had been smoking tobacco were only those that were overweight and those that were obese (*p*=.029) (Table 4).

Table 4: *Specific BMI Groups that Differed Significantly in Terms of Duration of Smoking*

(I) BMI Groups	(J) BMI Groups		
	Normal	Overweight	Obese
Normal		.067	.955
Overweight			.029
Obese			

4.2.2.2 Associated Diseases

Patients agreeing to having the disease were 38 (24.7%) for hypertension, 25 (16.2%) for diabetes, six (3.9%) for asthma, 59 (38.3%) for sleep apnoea, 46 (29.9%) for dyslipidaemia and six (3.9%) for heart disease (Figure 5) with having or not any of these diseases not being significantly associated with the BMI group of a patient (Table 2).On average, the respondents that had been having hypertension had been having it for 4.6 years (*SD*=5.385) with the respondent that had been having hypertension for most number of years having been having it for 20 years and the one that had been having it for least number of years having it for as little as only one year. Among the participants, the ones that were obese had been having hypertension for the most number of years on average (*M*=7.6, *SD*=7.79), followed by those that were normal (*M*=3.7, *SD*=2.26) and then those that were overweight (*M*=2.0, *SD*=0.85) with analysis of variance indicating that patients average number of years that one had been having hypertension differed significantly in at least two of the BMI groups at the 5% level of significance (*F (2, 35)* = 4.498, *p*=.018) (Table 3). Multiple comparisons undertaken using the Tukey's HSD method however indicated that individuals that differed significantly in terms of the average number of years that they had been having hypertension at the 5% level of significance were only those that were overweight and those that were obese (*p*=.017) (Table 5).

Table 5: *Specific BMI Groups that Differed Significantly in Terms of Duration of Hypertension*

(I) BMI Groups	(J) BMI Groups		
	Normal	Overweight	Obese
Normal		.664	.126
Overweight			.017
Obese			

On average, the respondents that had been having diabetes had been having it for 5.4 years (*SD*=6.01) with the respondent that had been having diabetes for most number of years having been having it for 20 years and the one that had been having it for least number of years having the disease for as little as only one year. Among the participants, the ones that were obese had been having diabetes for the most number of years on average (*M*=9.1, *SD*=7.96), followed by those that were normal (*M*=4.0, *SD*=3.29) and then those that were overweight (*M*=2.2, *SD*=0.67) with patients in at least two of the BMI groups differing significantly in terms of the average years they had been having diabetes at the 5% level of significance (*F (2, 22)* = 4.193, *p*=.029) (Table 3).Multiple comparisons undertaken using the Tukey's HSD method however indicated that individuals that differed significantly in terms of the average number of years that they had been having diabetes at the 5% level of significance were only those that were overweight and those that were obese (*p*=.027) (Table 6).

Table 6: *Specific BMI Groups that Differed Significantly in Terms of Duration of Diabetes*

(I) BMI Groups	(J) BMI Groups		
	Normal	Overweight	Obese
Normal		.805	.178
Overweight			.027
Obese			

On average, the respondents that had been having sleep apnoea had been having it for 3.9 years (*SD*=3.40) with the respondent that had been having the disease for most number of years having it for 13 years and the one that had been having the disease for least number of years having it for as little as only one year. Among the participants, the ones that were obese had been having sleep apnoea for the most number of years on average (*M*=5.7, *SD*=4.96), followed by those that were overweight (*M*=3.4, *SD*=1.18) and then those that were normal (*M*=2.2, *SD*=1.53) with analysis of variance indicating that average number of years that one had been having sleep apnoea differed significantly in at least two of the BMI groups at the 5% level of significance (*F (2, 56)* = 5.751, *p*=.005) (Table 3).Multiple comparisons undertaken using the Tukey's HSD method however indicated that individuals that differed significantly in terms of the average

number of years that they had been having sleep apnoea at the 5% level of significance were only those that were normal and those that were obese (p=.005) (Table 7).

Table 7: *Specific BMI Groups that Differed Significantly in Terms of Duration of Sleep Apnoea*

(I) BMI Groups	(J) BMI Groups		
	Normal	Overweight	Obese
Normal		.507	.005
Overweight			.058
Obese			

On average, the respondents that had been having dyslipidaemia had been having it for 6.6 years (SD=5.73) with the respondent the disease for most number of years having it for 20 years and the one having the disease for least number of years having it for as little as only one year. The average number of years that the individuals had been having dyslipidaemia was however not significantly different among individuals in any of the two BMI groups at the 5% level of significance ($F\ (2, 43)$ = 1.519, p=.230) (Table 3).

In the current study, obesity cannot therefore be associated with any of the diseases investigated, but it could be associated with the duration that one had been having sleep apnoea, diabetes and hypertension.

4.2.2.3 Dietary Habits

Patients agreeing to dietary habits were 27 (17.5%) for taking carbonated beverages, 136 (88.3%) for eating snacks, 68 (44.2%) for eating at the middle of the night and 12 (7.8%) for knew the amount of calories consumed in a typical day (Figure 5).However, only agreeing or disagreeing to knowing the calories that one consumed in a typical day was significantly associated with the BMI group of a patient at the 5% level of significance ($\chi^2\ (2)$ = 7.520, p=.023) where the people that knew the calories that they consumed in a typical day were mostly those that were obese (Table 2). As many as 21 (77.8%) of the patients that used to take carbonated beverages were taking beverages that were regular rather than dietary (Figure 7), but the type of carbonated beverage consumed was not significantly associated with the BMI group of a patient (Table 2).

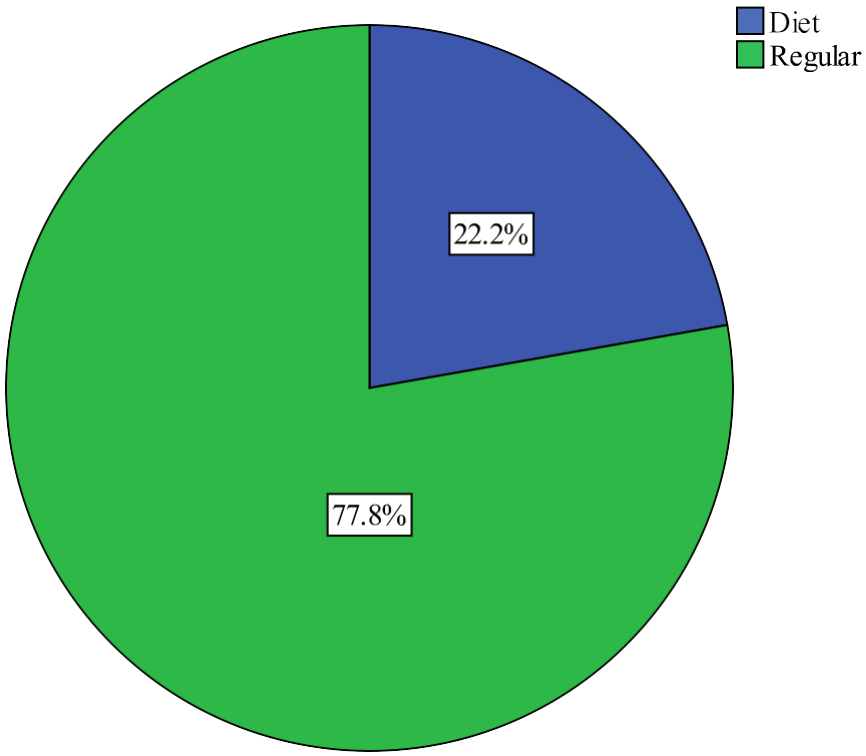


Figure 7: *Type of Carbonated Beverages Consumed by Respondents*

On average, study participants in the current study used to consume three meals in a day (*SD*=1.38) with the person consuming most meals consuming six and the person consuming least meals consuming zero with average number of meals consumed in a day not differing significantly between patients in different BMI groups (Table 3). On average, study participants in the study used to take about 2 snacks in a day (*M*=2.4, *SD*=1.54) with the person consuming most snacks in a day consuming 10 snacks and person consuming the least snacks consuming one snack in a day. Also, average number of snacks consumed in a day did not vary significantly between the patients in different BMI groups (Table 3). Figure 8 shows that the snacks consumed by most of the study participants were biscuits/popcorn/sweets (52.2%), fruits/salad/nuts (42.6%) and chocolate/ice cream/yoghurt (37.5%).

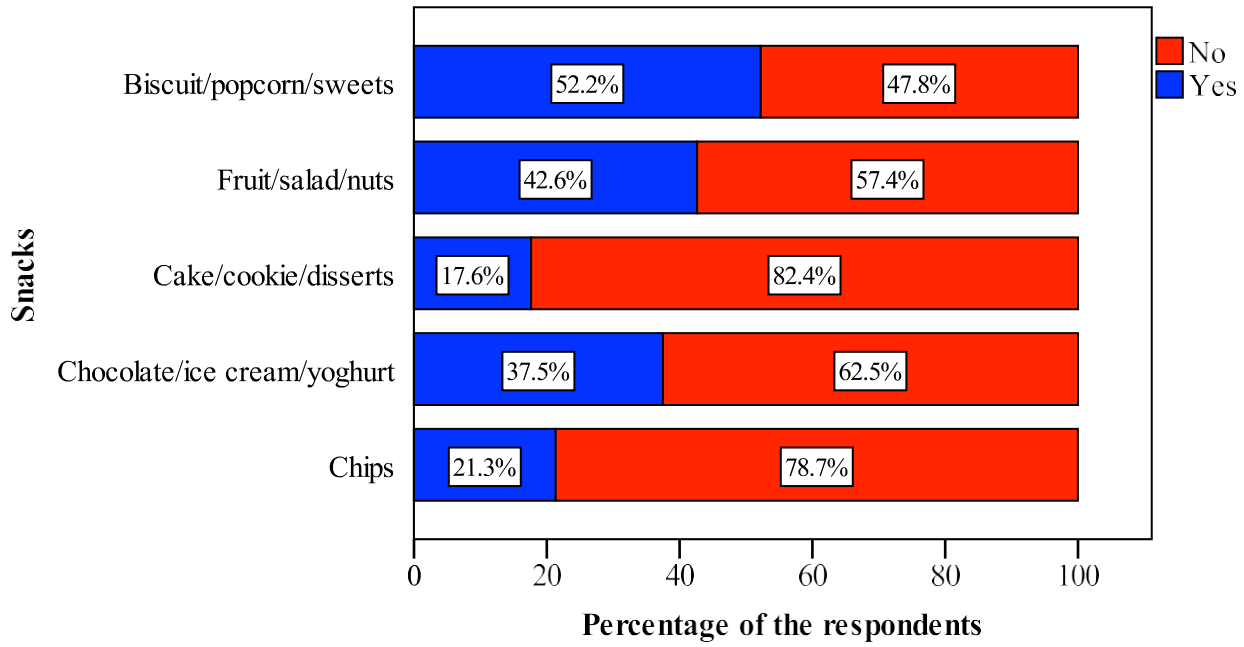


Figure 8: *Snacks Commonly Eaten by the Surveyed Patients*

On average, the individuals investigated in the current study dined in a restaurant twice a weak (*SD*=2.1) with the individual dining in a restaurant for the most times dining for seven times and the one dining the least dining for zero times. Average number of times that the patients dined in a restaurant did not however differ significantly between patients in different BMI groups at the 5% level of significance for any of the two groups (Table 3). However, the individuals investigated in the current study brought takeout food at home only about ones in a week on average (*M*=0.7, *SD*=1.497) with individual bring takeout food at home for the most times bringing it seven times and the one bringing the food for least times bringing it zero times. Obese individuals brought takeout food at home for the most times in a week on average (*M*=1.3, *SD*=2.04) followed by the overweight individuals (*M*=0.5, *SD*=0.92) while normal individuals did not bring takeout food at home at all (*M*=0.0, *SD*=0.00) with the difference being statistically significant at the 5% level of significance for at least two of the BMI groups (*F (2, 151)* = 10.622, *p*< .001) (Table 3). Multiple comparisons undertaken using the Tukey's HSD method however indicated that the individuals that differed significantly in terms of the number of times they brought takeout food at home were the obese individuals when compared to those that were overweight (*p*=.004) and those that were normal (*p*< .001) (Table 7).

Table 8: *Specific BMI Groups that Differed Significantly in Terms of Times Brought Takeout Food at Home*

(I) BMI Groups	(J) BMI Groups		
	Normal	Overweight	Obese
Normal		.250	<.001
Overweight			.004
Obese			

Individuals investigated in the current study however used to take about five glasses of water in a day on average (*M*=4.8, *SD*=2.37) with the individual that used to take most glasses taking nine and the one that used to take least glasses not drinking any water at all in a day. Average glasses of water taken in a day was however not significantly different between any two of the BMI groups (Table 3).

On average, the individuals investigated in the current study took about two cups of coffee in a day (*M*=1.95, *SD*=1.49) with the individual that used to take most cups taking five and the one that used to take the least cups taking no coffee at all in a day. Average cups of coffee taken in a day on average was however not different between any two of BMI groups (Table 3). Among the individuals who used to take at least some coffee in a day, as many as 115 (88.5%) used to take caffeinated coffee (Figure 9).

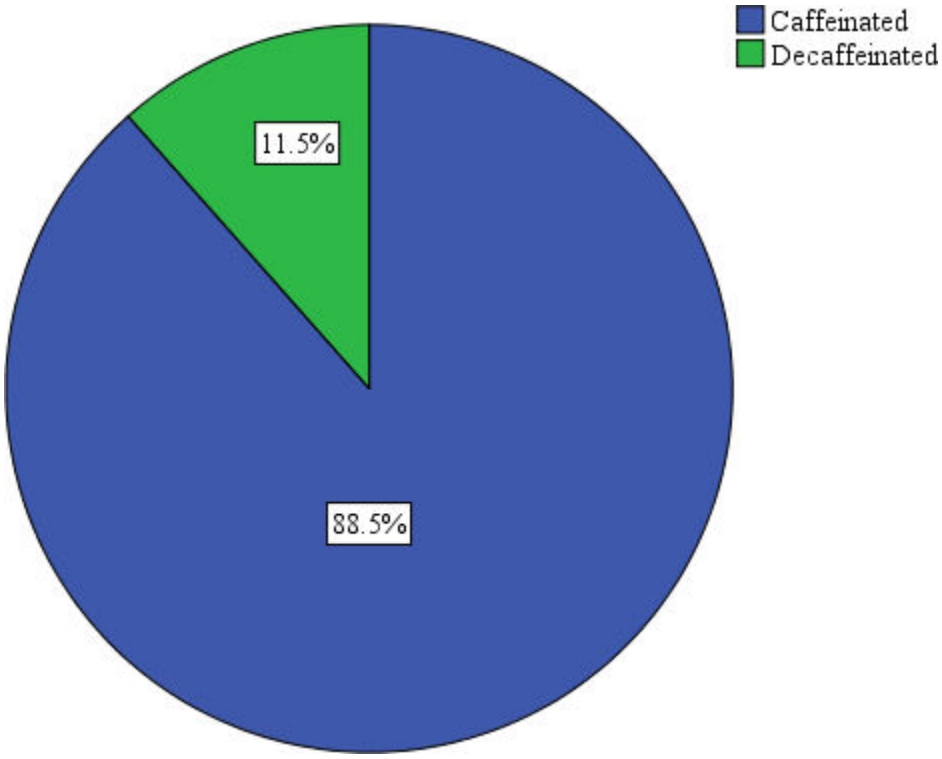


Figure 9: Type of Coffee/Tea Taken by Respondents

Individuals taking caffeinated coffee were however mostly obese (43.5%) while the ones taking decaffeinated coffee were mostly normal (60%)with the association between taking caffeinated or decaffeination coffee and being normal, overweight or obese being statistically significant at the 5% level of significance (χ (2) = 15.074, p=.001) (Table 2).

4.2.2.4 Aspects of Life

Majority of the individuals surveyed in the current study (62.3%) rated their self-esteem as excellent while only 9.7% rated it as poor (Figure 10). The association between the way the patients rated their self-esteem and whether they were normal, overweight or obese was statistically significant at the 5% level of significance (χ (8) = 29.230, p< .001) with individuals that rated their self-esteem as poor, acceptable or good being mostly those that were obese and the ones that rated it as very good or excellent being those that were overweight (Table 9).As many as 47 of the patients surveyed in the current study (30.5%) however rated their willingness to physical activity as poor while only 34 patients (22.1%) rated their willingness to work as

excellent (Figure 10). The rating of one's willingness to physical activity was significantly associated with being normal, overweight or obese at the 5% level of significance (χ (8) = 17.434, p=.026), but with individuals that rated their willingness to physical activity as excellent being mostly those that were obese and the ones that rated it as good being mostly those that were overweight (Table 9).

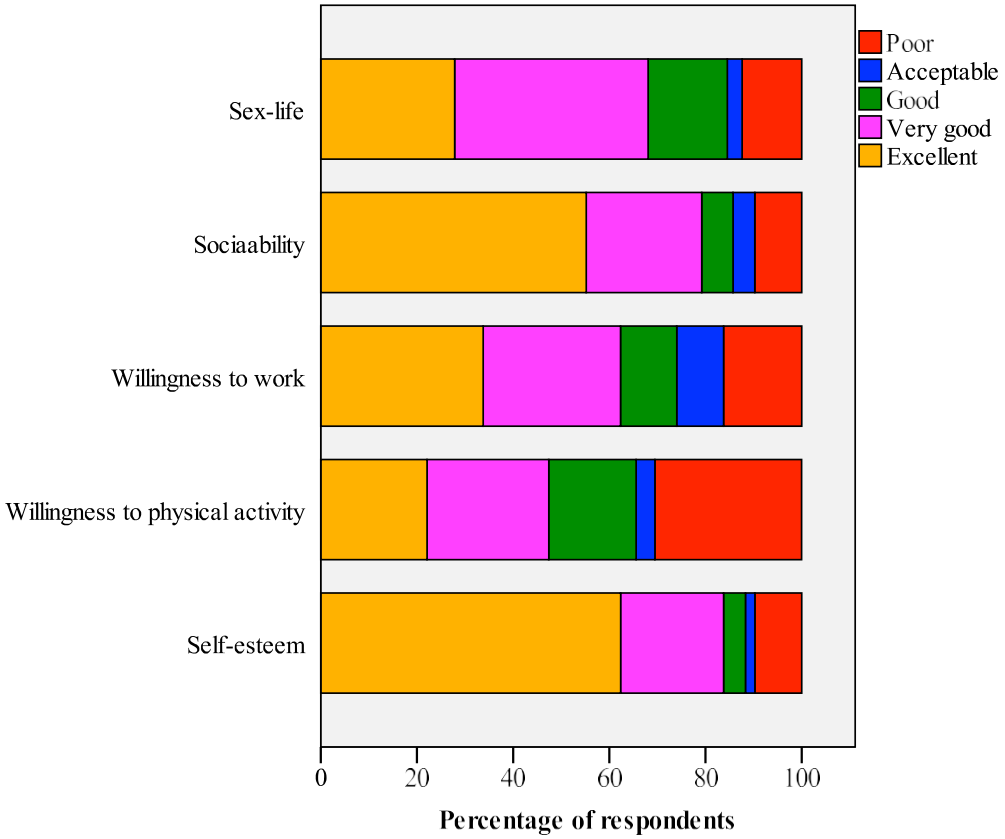


Figure 10: *Aspects of Life of the Respondents*

However, as many of 52 patients (33.8%) rated their willingness to work as excellent while 16.2% rated it as poor (Figure 10). Although the patients that rated their willingness to work as acceptable were mostly those that were obese while the ones that rated it as very good were mostly those that were overweight, but the association between the way the patients rated their willingness to work and their BMI group was not statistically significant at the 5% level of significance (χ (8) = 15.401, p=.052) (Table 9).Among the patients surveyed in the current study, 55.2% rated their sociability as excellent while only 9.7% it as poor (Figure 6). Most of the patients that rated their sociability as poor or acceptable were those that were obese while most

of those that rated it as either good or very good were the ones that were overweight with the association between the way the patient had rated his or her sociability being significantly associated with whether the patient was normal, overweight or obese at the 5% level of significance (χ (8) = 22.763, p=.004) (Table 9).

Table 9: *Association between Aspects of Life and BMI Group of the Patients*

		BMI Groups			$\chi^2(8)$	p
		Normal	Overweight	Obese		
Self-esteem	Poor	3(20.0%)	3(20.0%)	9(60.0%)	29.230	<.001
	Acceptable	0(0.0%)	0(0.0%)	3(100.0%)		
	Good	0(0.0%)	0(0.0%)	7(100.0%)		
	Very good	11(33.3%)	18(54.5%)	4(12.1%)		
	Excellent	18(18.8%)	40(41.7%)	38(39.6%)		
Willingness to physical activity	Poor	10(21.3%)	16(34.0%)	21(44.7%)	17.434	.026
	Acceptable	0(0.0%)	3(50.0%)	3(50.0%)		
	Good	10(35.7%)	15(53.6%)	3(10.7%)		
	Very good	6(15.4%)	18(46.2%)	15(38.5%)		
	Excellent	6(17.6%)	9(26.5%)	19(55.9%)		
Willingness to work	Poor	6(24.0%)	9(36.0%)	10(40.0%)	15.401	.052
	Acceptable	0(0.0%)	6(40.0%)	9(60.0%)		
	Good	3(16.7%)	9(50.0%)	6(33.3%)		
	Very good	7(15.9%)	24(54.5%)	13(29.5%)		
	Excellent	16(30.8%)	13(25.0%)	23(44.2%)		
Sociability	Poor	3(20.0%)	3(20.0%)	9(60.0%)	22.763	.004
	Acceptable	0(0.0%)	0(0.0%)	7(100.0%)		
	Good	4(40.0%)	6(60.0%)	0(0.0%)		
	Very good	6(16.2%)	19(51.4%)	12(32.4%)		
	Excellent	19(22.4%)	33(38.8%)	33(38.8%)		
Sex-life	Poor	3(25.0%)	3(25.0%)	6(50.0%)	23.357	.003
	Acceptable	0(0.0%)	3(100.0%)	0(0.0%)		
	Good	10(62.5%)	6(37.5%)	0(0.0%)		
	Very good	7(17.9%)	15(38.5%)	17(43.6%)		
	Excellent	12(44.4%)	6(22.2%)	9(33.3%)		

However, only 27 patients (17.5%) rated their sex-life as excellent, but as many as 39 patients (25.3%) rated their sex-life as very good with only 12 patients (7.8%) rating it as poor (Figure 10). The way the patients rated their sex-life was significantly associated with being normal,

overweight or obese at the 5% level of significance (χ (8) = 23.357, p=.003) with the patients that rated their sex-life as poor being mostly the ones that were obese, the ones that rated it as acceptable being mostly those that were overweight and the ones that rated it as good being mostly those that were normal (Table 9).

4.2.2.5 Lifestyle Habits

Among the patients surveyed in the current study, only 36 (23.4%) indicated that they exercised regularly, but as many as 79 patients (51.3%) agreed that they walk regularly (Figure 11). On average, the patients that used to exercise regularly exercised for about 53 minutes in a day (M=53.2, SD=25.46) with the patient that used to exercise the most exercising for 120 minutes in a day and the one that used to exercise the least exercising for 30 minutes. The average minutes exercised in a day did not vary significantly between normal, overweight and obese patients (F *(2, 30)* = 0.684, p=.512) (Table 3). Exercising or not exercising regularly was also not significantly associated with being normal, overweight or obese (χ^2(2) = 0.666, p=.717) (Table 10).

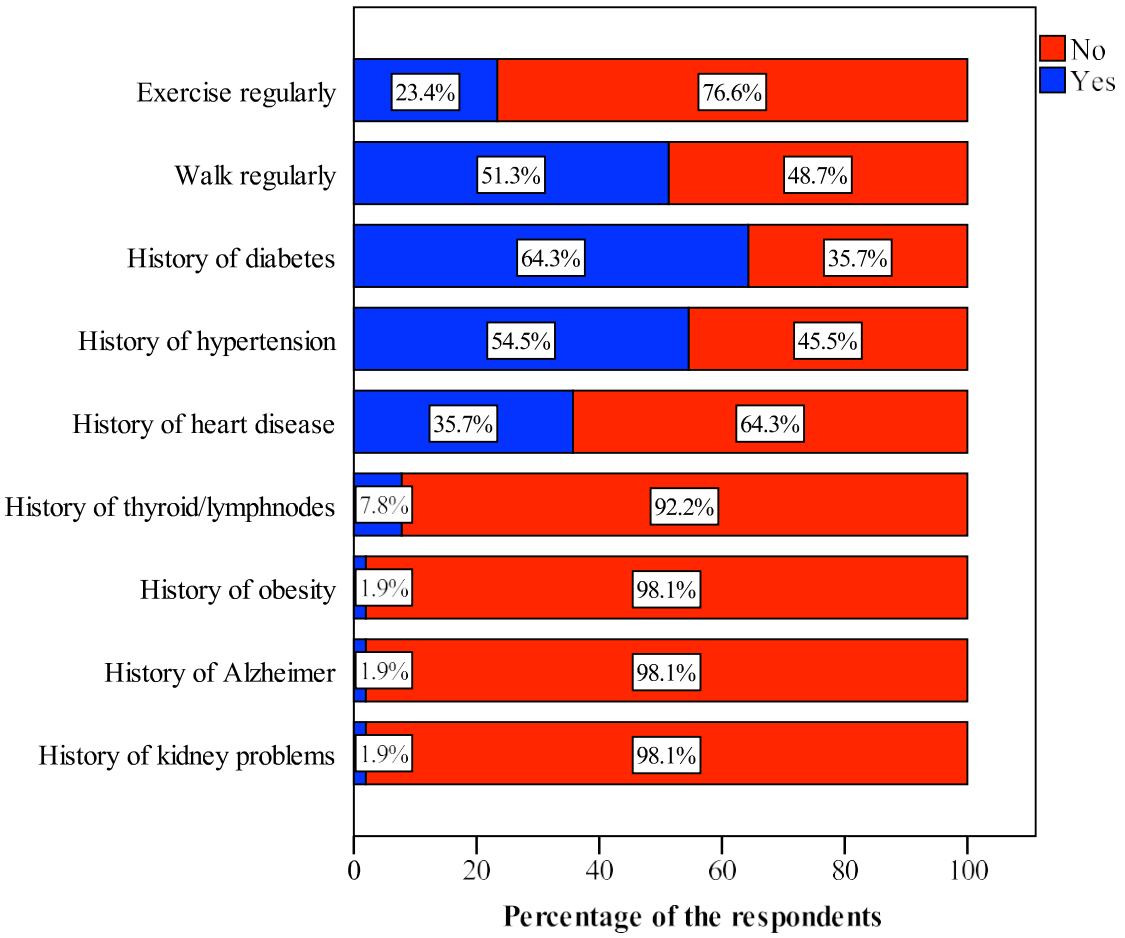


Figure 11: *Lifestyle Habits and Family History of Diseases of the Respondents*

On average, the patients that used to walk regularly walked for about 52 minutes in a day (M=51.9, SD=92.30) with the patient that used to walk the most walking for 480 minutes in a day and the one that used to walk the least walking for 10 minutes. The average minutes walked in a day did not vary significantly between normal, overweight and obese patients ($F\ (2,\ 70)$ = 1.397, p=.254) (Table 3). However, walking or not walking regularly was significantly associated with being normal, overweight or obese ($\chi^2(2)$ = 14.178, p=.001) with most patients that used to walk regularly being overweight and those that are not used to walking regularly being obese (Table 10).

Table 10: *Association between BMI Group of a Patient and Lifestyle habits and History of Diseases*

		BMI Groups			χ^2 (2)	p
		Normal	Overweight	Obese		
Exercise regularly	No	26(22.0%)	45(38.1%)	47(39.8%)	0.666	.717
	Yes	6(16.7%)	16(44.4%)	14(38.9%)		
Walk regularly	No	13(17.3%)	21(28.0%)	41(54.7%)	14.178	.001
	Yes	19(24.1%)	40(50.6%)	20(25.3%)		
History of diabetes	No	3(5.5%)	34(61.8%)	18(32.7%)	21.345	<.001
	Yes	29(29.3%)	27(27.3%)	43(43.4%)		
History of hypertension	No	9(12.9%)	31(44.3%)	30(42.9%)	4.926	.085
	Yes	23(27.4%)	30(35.7%)	31(36.9%)		
History of heart disease	No	17(17.2%)	48(48.5%)	34(34.3%)	9.189	.010
	Yes	15(27.3%)	13(23.6%)	27(49.1%)		
History of thyroid/lymphnodes	No	26(18.3%)	55(38.7%)	61(43.0%)	10.857	.004
	Yes	6(50.0%)	6(50.0%)	0(0.0%)		
History of obesity	No	32(21.2%)	61(40.4%)	58(38.4%)	4.665	.097
	Yes	0(0.0%)	0(0.0%)	3(100.0%)		
History of Alzheimer	No	29(19.2%)	61(40.4%)	61(40.4%)	11.665	.003
	Yes	3(100.0%)	0(0.0%)	0(0.0%)		
History of kidney problems	No	32(21.2%)	61(40.4%)	58(38.4%)	4.665	.097
	Yes	0(0.0%)	0(0.0%)	3(100.0%)		

4.2.2.6 Family History for any Disease

Patients with a family history of the disease were 99 (64.3%) for diabetes, 84 (54.5%) for hypertension, 55 (35.7%) for heart disease, 12 (7.8%) for thyroid/lymph nodes, three (1.9%) for obesity, three (1.9%) for Alzheimer and three (1.9%) for kidney problems (Figure 11). Having or not having diabetes was significantly associated with the BMI group of a patient ($\chi^2(2) = 21.345$, $p < .001$) with individuals with history of diabetes being mostly the ones that were obese and those without the history of the disease being mostly the ones that were overweight (Table 10). Also, having or not having heart disease was significantly associated with the BMI group of a patient ($\chi^2(2) = 9.189$, $p = .010$) with patient that had a history of the disease being mostly those that were obese and individuals without history of the disease being mostly those that were overweight (Table 10).

4.2.2.7 Weight History

On average, the patients surveyed in the current study had been obese for about 13 years (*M*=13.3, *SD*=10.02) with the patient that had obese for most years having been obese for 47 years and the one that had been obese for the least years having been obese for only a year. The average number of years that one had been obese did not vary significantly across patients in different BMI groups currently (*F (2, 148)* = 1.546, *p*=.216) (Table 3). Patients investigated in the current study however had about 125 Kg (*M*=124.7, *SD*=33.75) on average as their heaviest weight with some of the patients being as heavy as 220 Kg once in their lifetime. The average heaviest weight differed significantly between at least two of the BMI groups (*F (2, 145)* = 9.606, *p*< .001) with patients that were currently obese being the ones that had attained the highest heaviest weight (*M*=139.7, *SD*=32.58) and individuals that were currently overweight being the ones that had attained the lowest heaviest weight (*M*=115.3, *SD*=32.29) (Table 3). Multiple comparisons undertaken using the Tukey's HSD method indicated that the individuals that differed significantly in terms of the average heaviest weight were those that were obese when compared to those that were normal (*p*=.005) and those that were overweight (*p*< .001) (Table 11).

Table 11: *Specific BMI Groups that Differed Significantly in Terms of Average Heaviest Weight*

(I) BMI Groups	(J) BMI Groups		
	Normal	Overweight	Obese
Normal		.970	.005
Overweight			<.001
Obese			

Figure 12 shows that problems caused by obesity that were common among the patients were sleep apnoea/disorder (42.2%), joint pain/difficulty in walking (46.8%), back pain/fatigue (29.2%), social isolation/stigma (14.3%) and low self-esteem/confidence (18.2%).

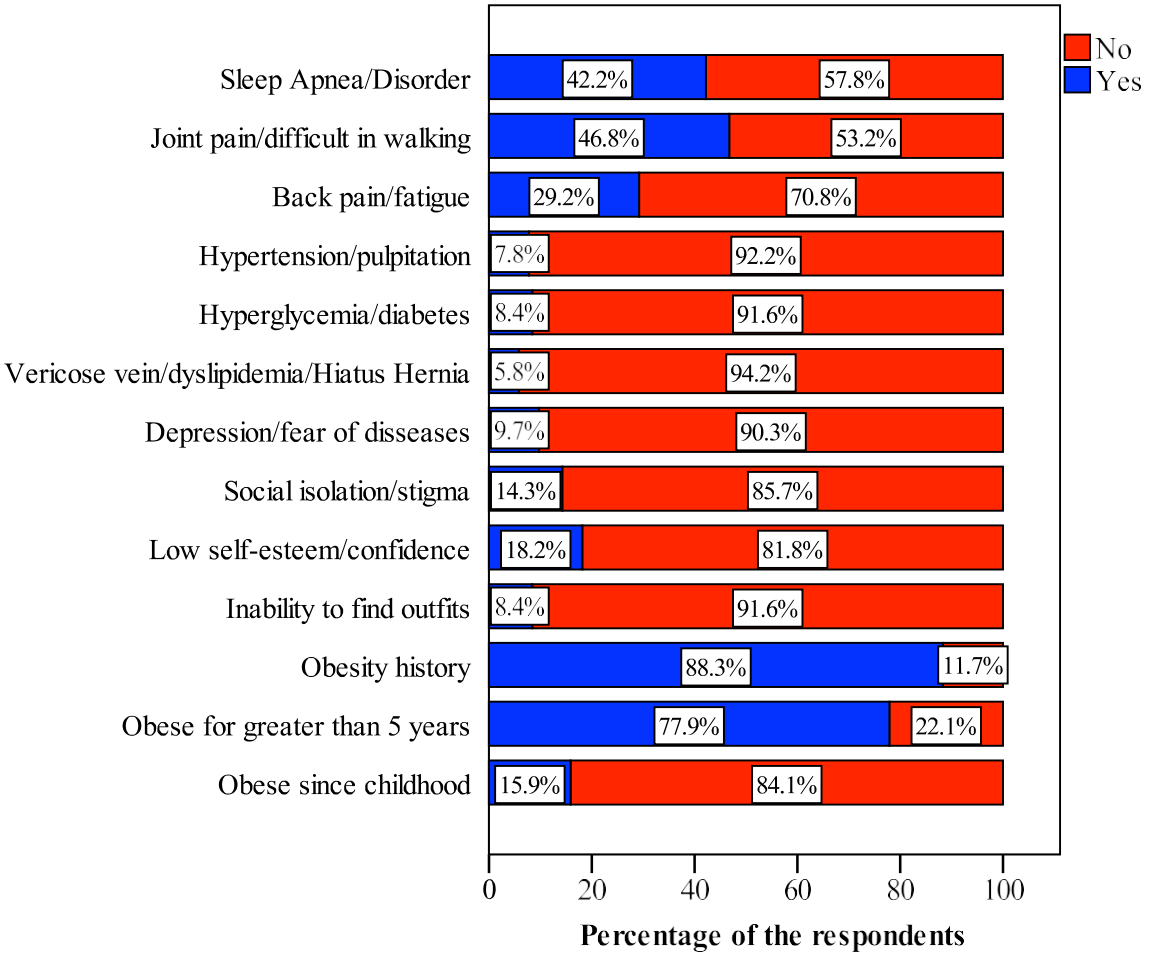


Figure 12: *Problems Caused by Obesity and History of Obesity of the Respondents*

The problems that were significantly associated with the BMI group of the patients were hypertension/palpitation ($\chi^2(2) = 10.857$, $p=.004$), social isolation/stigma ($\chi^2(2) = 7.000$, $p=.030$), low self-esteem/confidence ($\chi^2(2) = 27.490$, $p< .001$) and inability to find outfits ($\chi^2(2) = 9.451$, $p=.009$) (Table 12). However, patients with self-esteem/confidence problems were mostly those that were normal while the ones that did not have the problem were mostly those that were overweight or obese.

Table 12: *Association between BMI Group of a Patient and Problems Caused by Obesity and Obesity History*

		BMI Groups			χ^2 (2)	p
		Normal	Overweight	Obese		
Sleep apnoea/disorder	No	22(24.7%)	30(33.7%)	37(41.6%)	3.635	.162
	Yes	10(15.4%)	31(47.7%)	24(36.9%)		
Joint pain/difficult walking	No	17(20.7%)	30(36.6%)	35(42.7%)	0.823	.663
	Yes	15(20.8%)	31(43.1%)	26(36.1%)		
Back pain/fatigue	No	23(21.1%)	45(41.3%)	41(37.6%)	0.658	.720
	Yes	9(20.0%)	16(35.6%)	20(44.4%)		
Hypertension/palpitation	No	26(18.3%)	55(38.7%)	61(43.0%)	10.857	.004
	Yes	6(50.0%)	6(50.0%)	0(0.0%)		
Hyperglycaemia/diabetes	No	29(20.6%)	58(41.1%)	54(38.3%)	1.742	.418
	Yes	3(23.1%	3(23.1%)	7(53.8%)		
Vericose vein/dyslipidaemia /Hiatus Hernia	No	29(20.0%)	60(41.4%)	56(38.6%)	3.299	.192
	Yes	3(33.3%)	1(11.1%)	5(55.6%)		
Depression/fear of diseases	No	29(20.9%)	55(39.6%)	55(39.6%)	0.006	.997
	Yes	3(20.0%)	6(40.0%)	6(40.0%)		
Social isolation/stigma	No	32(24.2%)	49(37.1%)	51(38.6%)	7.000	.030
	Yes	0(0.0%)	12(54.5%)	10(45.5%)		
Low self-esteem/confidence	No	16(12.7%)	55(43.7%)	55(43.7%)	27.490	<.001
	Yes	16(57.1%)	6(21.4%)	6(21.4%)		
Inability to find outfits	No	28(19.9%)	52(36.9%)	61(43.3%)	9.451	.009
	Yes	4(30.8%)	9(69.2%)	0(0.0%)		
Obesity history	No	3(16.7%)	3(16.7%)	12(66.7%)	6.642	.036
	Yes	29(21.3%)	58(42.6%)	49(36.0%)		
Obese for greater than 5 years	No	9(26.5%)	12(35.3%)	13(38.2%)	0.906	.636
	Yes	23(19.2%)	49(40.8%)	48(40.0%)		
Obese since childhood	No	29(22.8%)	52(40.9%)	46(36.2%)	2.074	.354
	Yes	3(12.5%)	9(37.5%)	12(50.0%)		

On average, the patients that knew their highest BMI had a BMI of about 45.8 (*SD*=13.40) with the person having the least BMI having a BMI of 26.4 and the one having the largest BMI having a BMI of 86. The average highest BMI did not however differ significantly between any of the BMI groups (*F (2, 75)* = 0.204, *p*=.816) (Table 3).Among the patients, 136 (88.3%) were the ones that agreed to having a history of obesity in their family while as many as 120 (77.9%) agreed that they had experienced obesity for greater than 5 years during their lifetime (Figure

12). Figure 12 however shows that only 24 of the patients (15.6%) agreed to having been obese since childhood. However, only agreeing or disagreeing to having a history of obesity was significantly associated with the BMI group of the patient ($\chi^2(2) = 6.642$, p=.036), but with patients agreeing that they had a history of obesity being mostly those that were overweight and the patients that indicated otherwise being mostly those that were obese (Table 12).

4.2.3 Knowledge about Obesity Management Interventions

The patients that had knowledge about the intervention were 127 (82.5%) for diet, 80 (51.9%) for exercise, 15 (9.7%) for medication and 24 (15.6%) for the surgeries (Figure 13). Having or not having knowledge about an intervention was however not significantly association with the BMI group of a patient for all the four types of interventions (Table 13).

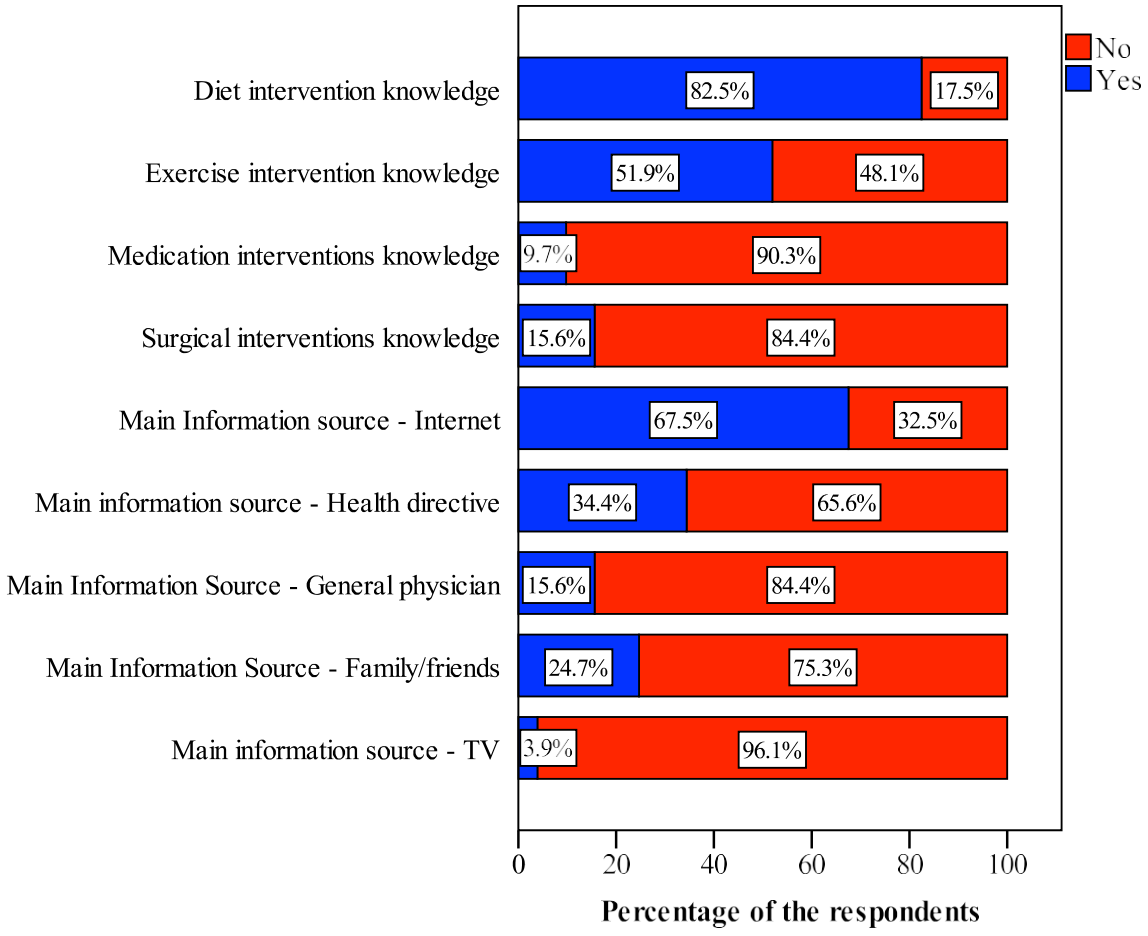


Figure 13: *Knowledge about Interventions and Its Main Sources of the Respondents*

Figure 13 shows that the main sources of information about weight less interventions mentioned by the patients surveyed in the study were internet (67.5%), health directives (34.4%), family/friends (24.7%), general physicians (15.6%) and TV (3.9%). Having or not having any of these as a main source of information about weight loss interventions was however not significantly association with the year that the patient had undergone the bariatric surgery (Table 13).

Table 13: *Association between BMI Group of a Patient and Knowledge about Interventions and its Main Sources*

		Year			χ^2 (2)	p
		2015	2016	2017		
Diet intervention knowledge	No	3(11.1%)	15(55.6%)	9(33.3%)	0.704	.703
	Yes	21(16.5%)	61(48.0%)	45(35.4%)		
Exercise intervention knowledge	No	12(16.2%)	36(48.6%)	26(35.1%)	0.051	.975
	Yes	12(15.0%)	40(50.0%)	28(35.0%)		
Medication intervention knowledge	No	21(15.1%)	69(49.6%)	49(35.3%)	0.246	.884
	Yes	3(20.0%)	7(46.7%)	5(33.3%)		
Surgical interventions knowledge	No	18(13.8%)	66(50.8%)	46(35.4%)	1.982	.371
	Yes	6(25.0%)	10(41.7%)	8(33.3%)		
Internet as a main source of information	No	8(16.0%)	24(48.0%)	18(36.0%)	0.054	.973
	Yes	16(15.4%)	52(50.0%)	36(34.6%)		
Health directive as main source of information	No	15(14.9%)	51(50.5%)	35(34.7%)	0.193	.908
	Yes	9(17.0%)	25(47.2%)	19(35.8%)		
General physician as main source of information	No	19(14.6%)	65(50.0%)	46(35.4%)	0.598	.741
	Yes	5(20.8%)	11(45.8%)	8(33.3%)		
Family/friends as main source of information	No	19(16.4%)	57(49.1%)	40(34.5%)	0.240	.887
	Yes	5(13.2%)	19(50.0%)	14(36.8%)		
TV as main source of information	No	23(15.5%)	73(49.3%)	52(35.1%)	0.011	.995
	Yes	1(16.7%)	3(50.0%)	2(33.3%)		

4.2.4 Use of Interventions for Weight Loss

The patients that had used the interventions prior to the bariatric surgery were 132 (85.7%) for diet, 86 (55.8%) for exercise and 15 (9.7%) for the medication (Figure 14). Having or not having an intervention before undergoing bariatric surgery was however not significantly associated

with the year when the patient had undergone the bariatric surgery for diet, exercise and weight loss medication (Table 15).

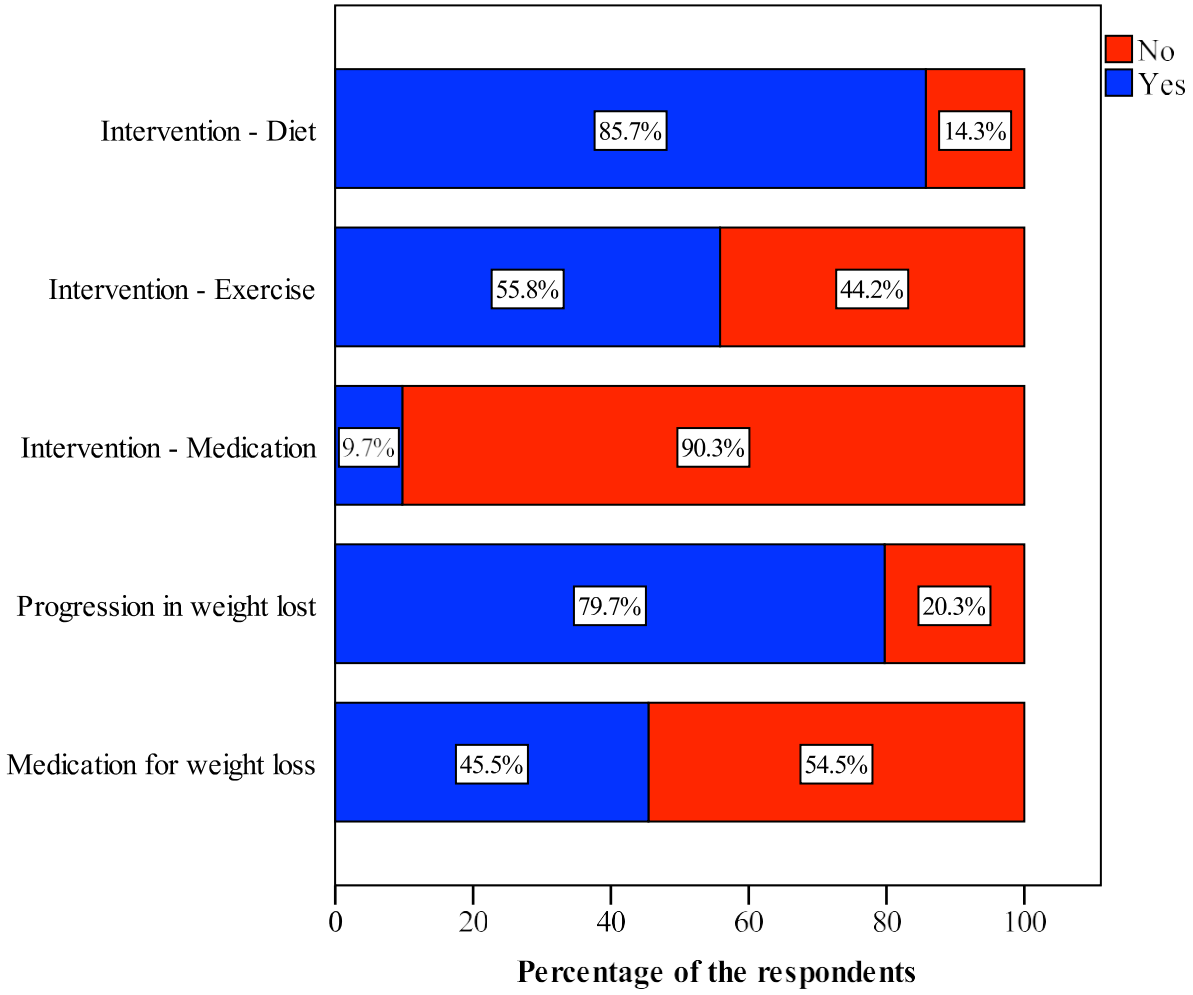


Figure 14: *Interventions Tried and Progress in Weight Loss of the Respondents*

The patients that had used diet intervention had used it for about 59 months on average (M=59.1, SD=66.6) with the patient that had used it for the shortest period having used it for only a month and the one that had used it for the longest period having used it for 276 months. The patients that had used exercise intervention, on the other hand, had used it for about 54 months on average (M=54.3, SD=67.45) with the patient that had used it for the shortest period having used it for only a month and the one that had used it for the longest period having used it for 276 months. At the 5% level of significance, the duration that the patients had used the intervention did not differ significantly between patients that had undergone bariatric surgery in any two of

the years for both the diet intervention (*F (2, 115)* = 0.026, *p*=.974) and the exercise intervention (*F (2, 84)* = 0.353, *p*=.704) (Table 14).

Table 14: *Durations of Interventions and Considering Surgery and Kgs Lost by Year Operated*

	Year			F	P
	2015	2016	2017		
	M(SD)	M(SD)	M(SD)		
Duration of diet intervention	61.7(52.37)	59.4(72.46)	57.6(65.41)	0.026	.974
Duration of exercise intervention	41.2(33.03)	59.2(75.30)	52.3(66.36)	0.353	.704
Kgs lost with diet, exercise or both	11.2(9.34)	10.9(8.92)	10.7(8.68)	0.016	.984
Medication intervention duration	3.5(3.24)	4.0(5.43)	3.8(4.95)	0.045	.956
Weight lost before bariatric surgery	9.1(9.49)	9.0(9.12)	9.1(9.03)	0.004	.996
Duration of considering surgery	9.3(9.63)	9.4(11.55)	9.4(11.04)	0.001	.999

Among the patients surveyed in the study, 118 (76.6%) had lost at least some weight through the interventions that they had used (Figure 14). On average, the patients that had lost at least some weight had lost about 11 Kg (*M*=10.9, *SD*=8.82) with the patient that had lost most weight having lost 40 Kg and the one that had lost least weight having lost only 1.5 Kg. Having or not having lost at least some weight was however not significantly associated with the year that a patient had undergone the bariatric surgery (Table 15). Also, patients that had received bariatric surgery in any of the three years were not necessarily the ones that had lost most weight through diet or exercise interventions (*F (2, 115)* = 0.108, *p*=.898) (Table 14).

Table 15: *Association between BMI Group of a Patient and Intervention Tried and Weight Loss Progress*

		Year			χ^2 (2)	p
		2015	2015	2017		
Diet intervention	No	2(9.1%)	12(54.5%)	8(36.4%)	0.847	.655
	Yes	22(16.7%)	64(48.5%)	46(34.8%)		
Exercise intervention	No	10(14.7%)	34(50.0%)	24(35.3%)	0.073	.964
	Yes	14(16.3%)	42(48.8%)	30(34.9%)		
Medication intervention	No	22(15.8%)	68(48.9%)	49(35.3%)	0.122	.941
	Yes	2(13.3%)	8(53.3%)	5(33.3%)		
Progression in weight loss	No	4(13.3%)	16(53.3%)	10(33.3%)	0.178	.915
	Yes	18(15.3%)	58(49.2%)	42(35.6%)		
Medication for weight loss	No	14(16.7%)	40(47.6%)	30(35.7%)	0.273	.872
	Yes	10(14.3%)	36(51.4%)	24(34.3%)		

Although most of the patients were not highly knowledgeable about weight loss medication, as many as 70 of the patients (45.5%) had used it at some point in their attempts to lose weight before undergoing bariatric surgery (Figure 14). However, having or not having used medication for weight loss was not significantly associated with the year that the patient had undergone the bariatric surgery (Table 14). On average, the patients included in the study had however used the medication for weight loss for only about four months (M=3.9, SD=4.94) with the patient that used weight loss medication for the longest period having used it for 24 months and the one that had used it for the shortest period having used it for only a month. The patients that had received bariatric surgery in any of the three years investigated were however not necessarily the ones that had used medication for weight loss for longer periods on average before undergoing the bariatric surgery $F\ (2,\ 64)$ = 0.045, p=.956) (Table 3). Among the patients that could recall the drug that they had taken, 13 (19%) had taken appetite suppressant, 12 (18%) had taken Xenical, 9 (13%) had taken Via Ananas (Table 16).

Table 16: *Weight Loss Medication Drugs as Taken By the Respondents*

	Frequency	Percentage
Appetite suppressant	13	19%
Xenical	12	18%
V-Ananas	9	13%
Slimming advanced	6	9%
Victoza injection	6	9%
Slim down tablet	3	4%
Chitocal	3	4%
DN and Actifat	3	4%
Herbal life (USA)	3	4%
Reduct	3	4%
Liposix	3	4%
Fat burners	3	4%

The drugs were taken mostly as a dose of two tablets or capsules per day, but there were cases where the drugs had been taken as a dose of three capsules per day or as a dose of one tablet per day (Table 17).

Table 17: *Dosage of the Drugs*

	Frequency	Percentage
2 capsules/tablets per day	37	58%
One tablet per day	9	14%
3 capsules per day	9	14%
One injection only	6	9%
One course	3	5%

4.2.5 Considering Bariatric Surgery

On average, the patients surveyed in the current study had lost about 9 Kg before undertaking bariatric surgery (M=9.1, SD=9.08), but there were those that had lost as many as 40 Kg and those that had lost no weight at all. Patients that had undergone bariatric surgery in any of the three years were not necessarily the ones that had lost more weight than others before undergoing the surgery ($F\ (2, 145)$ = 0.004, p=.996) (Table 14).As shown by Figure 15, reasons

for considering bariatric surgery mentioned widely by the study participants were everything else failing/doctor's advice (27.9%), regaining self-esteem/confidence (31.8%) and improving one's health (27.3%).

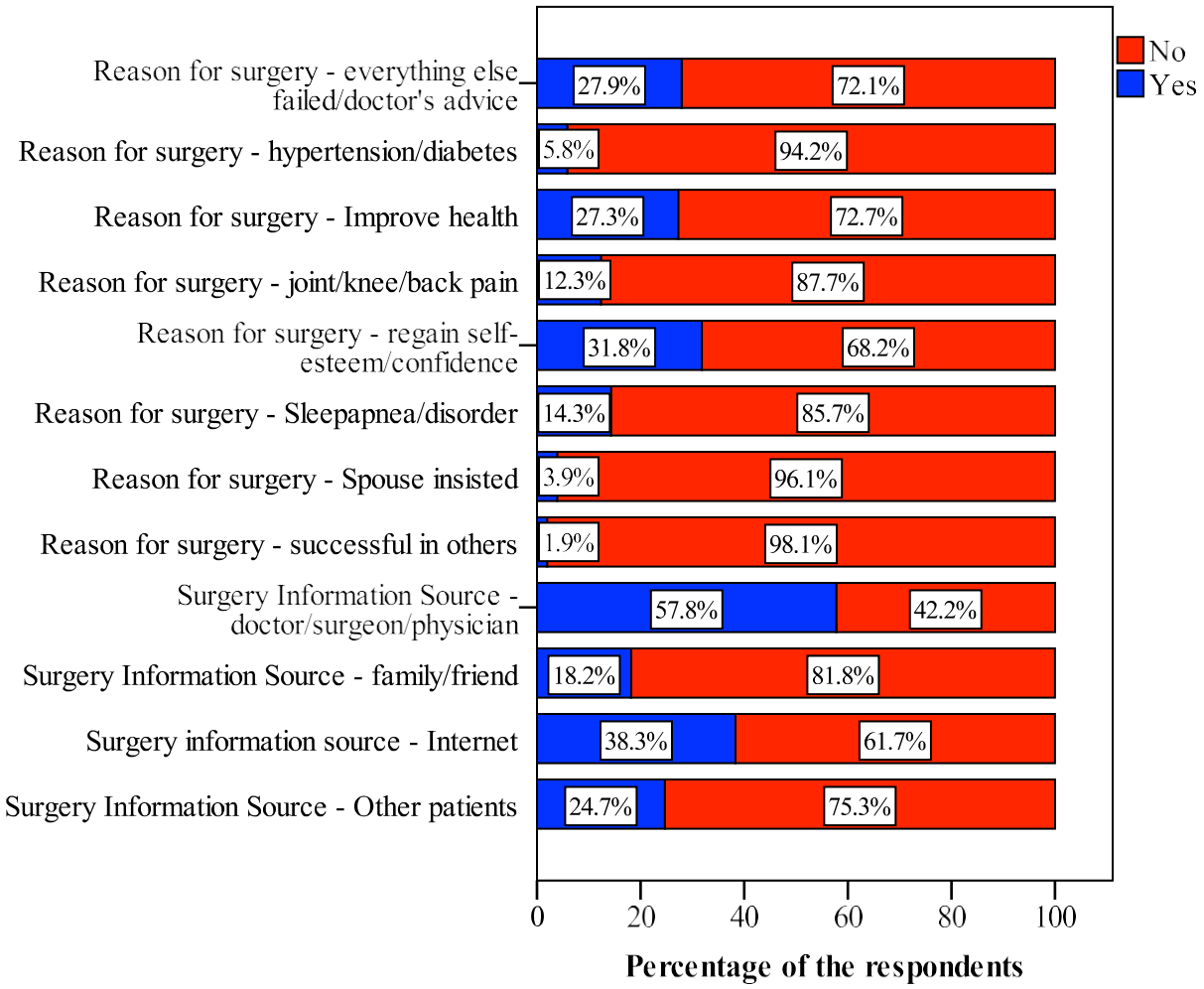


Figure 15: *Reasons for Surgery and Sources of Information about Surgery*

Reasons for surgery were however not significantly associated with the year that a patient had undergone the bariatric surgery (Table 18).

Table 18: *Association between Year Operated and Reasons for Surgery and Source of Information about Surgery*

		Year			χ^2 (2)	p
		2015	2016	2017		
Everything else failed/doctor's advice	No	18(16.2%)	54(48.6%)	39(35.1%)	0.142	.931
	Yes	6(14.0%)	22(51.2%)	15(34.9%)		
Regain self-esteem/confidence	No	14(13.3%)	54(51.4%)	37(35.2%)	1.365	.505
	Yes	10(20.4%)	22(44.9%)	17(34.7%)		
Hypertension/diabetes	No	21(14.5%)	73(50.3%)	51(35.2%)	2.437	.296
	Yes	3(33.3%)	3(33.3%)	3(33.3%)		
Sleep apnoea/disorder	No	20(15.2%)	66(50.0%)	46(34.8%)	0.202	.904
	Yes	4(18.2%)	10(45.5%)	8(36.4%)		
Joint/knee/back pain	No	23(17.0%)	65(48.1%)	47(34.8%)	1.822	.402
	Yes	1(5.3%)	11(57.9%)	7(36.8%)		
Improve health	No	18(16.1%)	54(48.2%)	40(35.7%)	0.219	.896
	Yes	6(14.3%)	22(52.4%)	14(33.3%)		
Spouse insisted	No	23(15.5%)	73(49.3%)	52(35.1%)	0.011	.995
	Yes	1(16.7%)	3(50.0%)	2(33.3%)		
Successful in others	No	24(15.9%)	74(49.0%)	53(35.1%)	0.665	.717
	Yes	0(0.0%)	2(66.7%)	1(33.3%)		
Internet as information source	No	16(16.8%)	46(48.4%)	33(34.7%)	0.303	.860
	Yes	8(13.6%)	30(50.8%)	21(35.6%)		
Doctor/surgeon/physician as information source	No	9(13.8%)	33(50.8%)	23(35.4%)	0.267	.875
	Yes	15(16.9%)	43(48.3%)	31(34.8%)		
Other patients as information source	No	22(19.0%)	54(46.6%)	40(34.5%)	4.240	.120
	Yes	2(5.3%)	22(57.9%)	14(36.8%)		
Family/friends as information source	No	18(14.3%)	64(50.8%)	44(34.9%)	1.047	.593
	Yes	6(21.4%)	12(42.9%)	10(35.7%)		

On average, the patients had taken about nine months considering whether to undergo a bariatric surgery or not (M=9.4, SD=11.03) with the patient that took the longest taking about 49 months and the one that took the shortest period not taking even a month. Figure 15 shows that the main sources of information about weight loss surgery widely mentioned by the survey respondents were internet (38.3%), doctor/surgeon/physician (57.8%), other patients (24.7%) and family/friends (18.2%). Having any of these sources as one's main source of information about

bariatric surgery was however not significantly associated with the year that a patient had undergone the bariatric surgery (Table 18).

Also, as many as 127 (85.8%) knew other people that had already received a bariatric surgery of which 95.3% (n=121) indicated that the previous bariatric surgeries they knew about were successful with as many as 88 patients (62.4%) had friends and relatives supporting their decision to undergo an operation for weight loss (Figure 16). Knowing or not knowing another person that had received the surgery previously and whether the surgery had known had been successful or not was however not significantly associated with the year that one had undergone the bariatric surgery (Table 19). This was the case for having or not having friends and relatives supporting one's decision to undergo a bariatric surgery (Table 19).

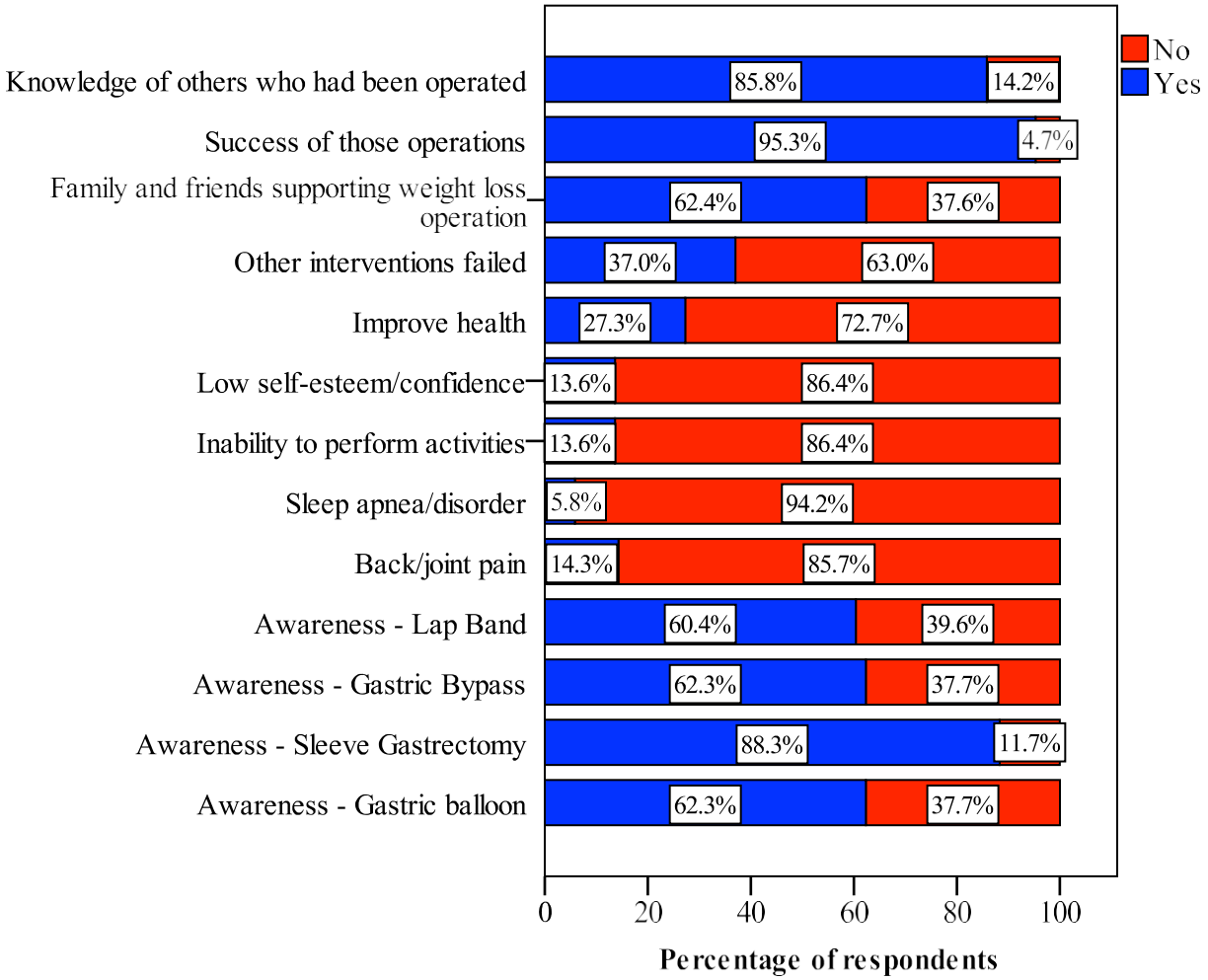


Figure 16: *Bariatric Surgeries Awareness and Reasons for Having Been Considered*

As shown by Figure 16, the reasons for considering bariatric surgery that were common among the patients surveyed in the current study were failure in other interventions (37%), improve health (27.3%), low self-esteem/confidence (13.6%), inability to perform life activities (13.6%), sleep apnea/disorder (5.8%) and back/joint pain (14.3%). Reasons for considering bariatric surgery were however not significantly associated with the specific year that one had undergone the surgery (Table 19).

Table 19: *Association between Year Operated and Reasons for Considering and Awareness of the Surgeries*

		Year			χ^2 (2)	p
		2015	2016	2017		
Knowledge of people that had undergone the surgery	No	5(23.8%)	9(42.9%)	7(33.3%)	1.590	.452
	Yes	17(13.4%)	65(51.2%)	45(35.4%)		
Success of known previous operations for surgery	No	2(33.3%)	2(33.3%)	2(33.3%)	2.272	.321
	Yes	15(12.4%)	63(52.1%)	43(35.5%)		
Family/friends supporting the surgery	No	9(17.0%)	25(47.2%)	19(35.8%)	0.238	.888
	Yes	13(14.8%)	45(51.1%)	30(34.1%)		
Considering operation because other interventions failed	No	15(15.5%)	49(50.5%)	33(34.0%)	0.156	.925
	Yes	9(15.8%)	27(47.4%)	21(36.8%)		
Improve health as reason for considering surgery	No	18(16.1%)	54(48.2%)	40(35.7%)	0.219	.896
	Yes	6(14.3%)	22(52.4%)	14(33.3%)		
Low self-esteem/confidence as reason for considering surgery	No	21(15.8%)	65(48.9%)	47(35.3%)	0.092	.955
	Yes	3(14.3%)	11(52.4%)	7(33.3%)		
Inability to perform activities as reason for considering surgery	No	21(15.8%)	65(48.9%)	47(35.3%)	0.092	.995
	Yes	3(14.3%)	11(52.4%)	7(33.3%)		
Sleep apnoea/disorder as reason for considering surgery	No	22(15.2%)	72(49.7%)	51(35.2%)	0.325	.850
	Yes	2(22.2%)	4(44.4%)	3(33.3%)		
Back/joint pain as reason for considering bariatric surgery	No	24(18.2%)	62(47.0%)	46(34.8%)	5.074	.079
	Yes	0(0.0%)	14(63.6%)	8(36.4%)		
Awareness – Laparoscopic Adjustable Gastric Band	No	12(19.7%)	28(45.9%)	21(34.4%)	1.338	.512
	Yes	12(12.9%)	48(51.6%)	33(35.5%)		
Awareness – Gastric Bypass	No	11(19.0%)	27(46.6%)	20(34.5%)	0.839	.657
	Yes	13(13.5%)	49(51.0%)	34(35.4%)		
Awareness – Sleeve Gastrostomy	No	4(22.2%)	8(44.4%)	6(33.3%)	0.693	.707
	Yes	20(14.7%)	68(50.0%)	48(35.3%)		
Awareness – Gastric Balloon	No	11(19.0%)	27(46.6%)	20(34.5%)	0.839	.657
	Yes	13(13.5%)	49(51.0%)	34(35.4%)		

Figure 16 shows that sleeve Gastrectomy was the bariatric surgery intervention that was most widely known by the patients surveyed in the study (88.3%), followed by gastric bypass (62.3%) and gastric balloon (62.3%) and then the laparoscopic adjustable gastric band (60.4%). Awareness of these types of bariatric surgery was however not significantly associated with the year when the patient has received the surgery (Table 19).

4.2.6 Role of Family in Decision Process

Among the survey respondents, only nine (5.8%) were living alone with 88 (57.1%) living with a spouse and 57 (37.0) living with family (Figure 17) with the living status of the patient not being significantly associated with the year when the patient had undergone the bariatric surgery.

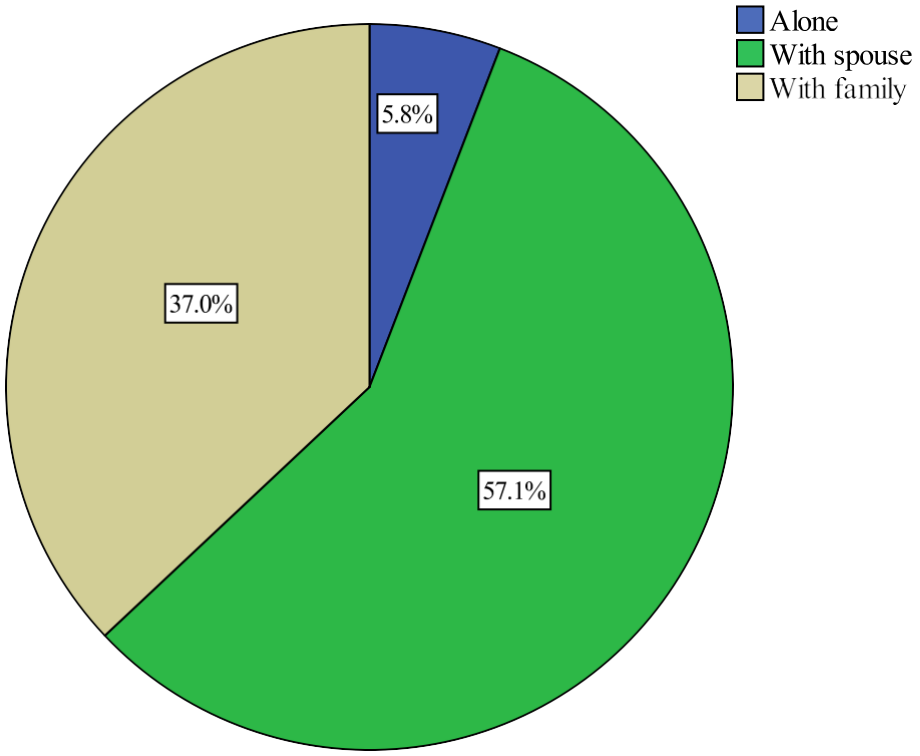


Figure 17: *Living Status of the Respondents*

As many as 100 patients (84.7%) had discussed with spouse or family about the surgery while 83 patients (61.0%) had a family that was ready to take them for the surgery, but only 44 (55.7%) had a spouse that was willing to take them for the surgery (Figure 19). However, as many as 67

of the patients that had involved their spouses in their decision to undergo bariatric surgery (84.8%) had spouses that were contented with the surgery while 84 of those that had involved their parents (77.1%) had the parents contented with the surgery (Figure 19). Patients that had discussed with spouse or family about the surgery and those with family or spouse willing to take them for the surgery were not necessarily those that had undergone bariatric surgery in a particular year (Table 20). Also, patients that had parents contented with the decision to undergo the surgery were not necessarily those that had undergone bariatric surgery in a particular year (Table 20). The association between having spouse contented with decision to undergo surgery and the year of surgery was however statistically significant at the 5% level of significant (χ^2 *(2)* = 6.963, *p*=.031) with the patients that had spouse contented with their decision to undergo the surgery being mostly those that had undergone the surgery in 2016 (Table 20).

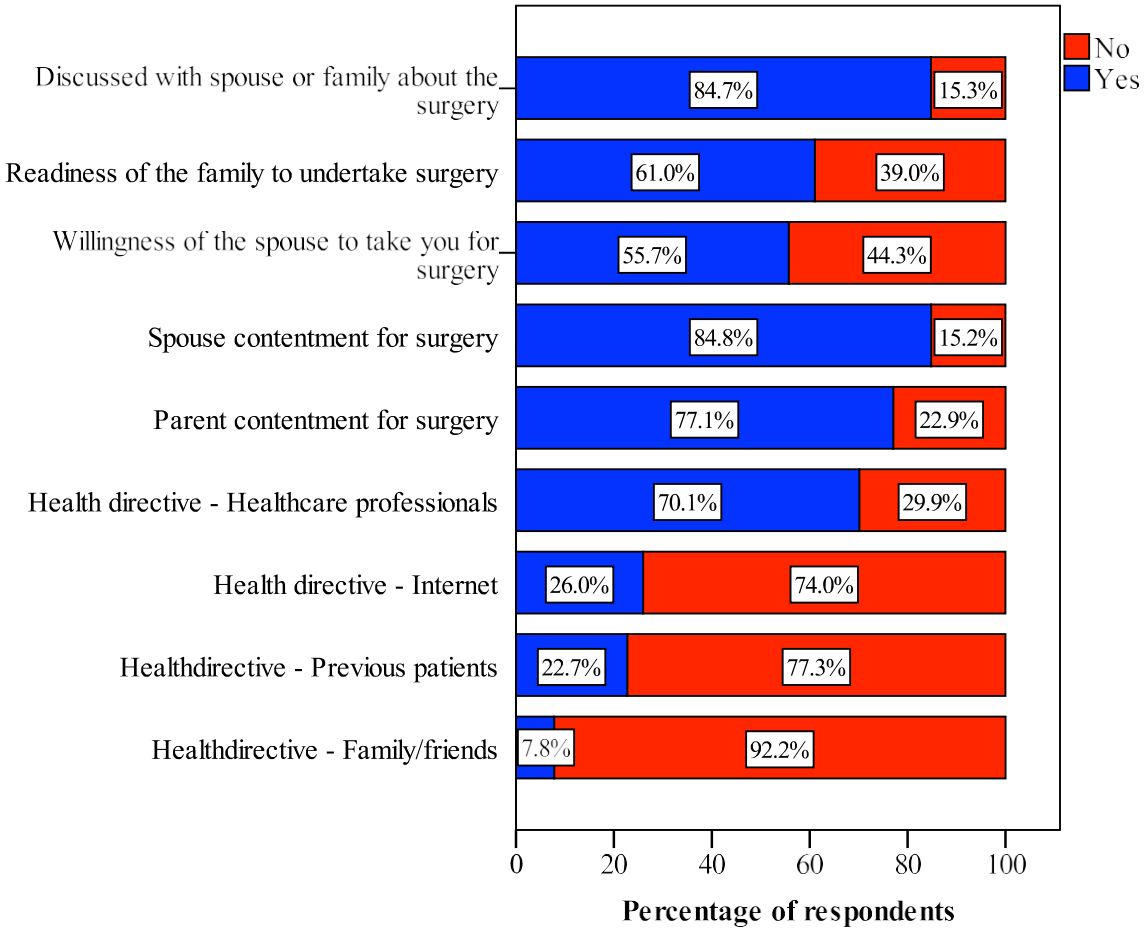


Figure 18: *Family and Friends Involvement in Decision Process, Health Directives and Medication Allergies*

4.2.7 Details about Previous Surgeries

Figure 19 shows that healthcare directives that could help in selecting mode of intervention for patient that were popular among the investigated patients were healthcare professionals (70.1%), internet (26%), other patients that had already received an intervention (22.7%) and family/friends (7.8%). Having or not having any of these healthcare directives as helpful when selecting mode of intervention was however not significantly associated with the year when the patient had undergone the bariatric surgery (Table 20).

Table 20: *Association between Year of the Surgery and Family Involvement and Contentment*

		Year			χ^2 (2)	p
		2015	2016	2017		
Discussed with spouse/family about the surgery	No	4(22.2%)	8(44.4%)	6(33.3%)	1.062	.588
	Yes	13(13.0%)	51(51.0%)	36(36.0%)		
Readiness of the family to undertake the surgery	No	9(17.0%)	25(47.2%)	19(35.8%)	0.452	.798
	Yes	11(13.3%)	43(51.8%)	29(34.9%)		
Willingness of spouse to take you for the surgery	No	6(17.1%)	16(45.7%)	13(37.1%)	2.290	.318
	Yes	3(6.8%)	25(56.8%)	16(36.4%)		
Spouse contented with the surgery	No	4(33.3%)	4(33.3%)	4(33.3%)	6.963	.031
	Yes	5(7.5%)	37(55.2%)	25(37.3%)		
Parent contented with the surgery	No	3(12.0%)	13(52.0%)	9(36.0%)	0.346	.841
	Yes	14(16.7%)	40(47.6%)	30(35.7%)		
Health directive – Healthcare professionals	No	9(19.6%)	21(45.7%)	16(34.8%)	0.850	.654
	Yes	15(13.9%)	55(50.9%)	38(35.2%)		
Health directive – Internet	No	19(16.7%)	55(48.2%)	40(35.1%)	0.439	.803
	Yes	5(12.5%)	21(52.5%)	14(35.0%)		
Health directive – Previous patients	No	22(18.5%)	56(47.1%)	41(34.5%)	3.444	.179
	Yes	2(5.7%)	20(57.1%)	13(37.1%)		
Health directive – Family/friends	No	20(14.1%)	72(50.7%)	50(35.2%)	3.318	.190
	Yes	4(33.3%)	4(33.3%)	4(33.3%)		

Figure 19, on the other hand, shows that patients that did not have any allergy to medication were as many as 142 (92.2%) while those that had never been hospitalized for more than 24 hours or spent more than 24 hours in an emergency department in the previous six months were as many as 138 (89.6%). As shown by Figure 19, the surgeries that the investigated patients had undergone before the bariatric surgery included caesarean section (22.1%), lap chole (10.4%),

appendectomy (3.9%), breast reduction/augmentation (8.4%), liposection (4.5%), thyroidectomy (8.4%), haemorrhoidectomy/tonsillectomy (5.8%), Inguinal Hernia/heap surgery (3.9%) and uterine removal (5.8%).

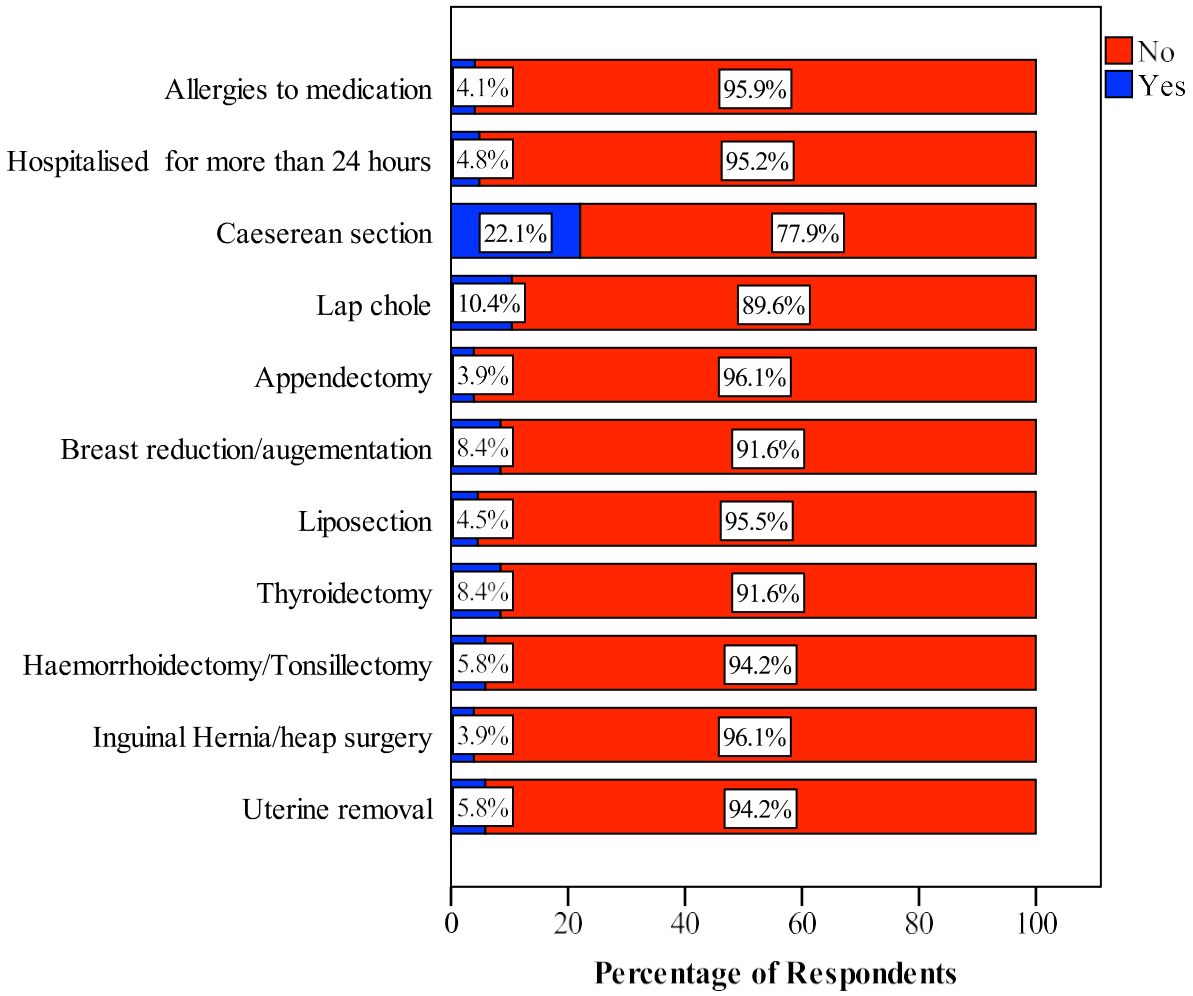


Figure 19: *Medication Allergies, Hospitalisation and Other Surgeries History*

Patients that had undergone any of the identified previous surgeries, had medication allergies or had been hospitalized for more than 24 hours or spent more than 24 hours in an emergency department in the previous six months were not necessarily those that had received bariatric surgery in a particular year (Table 21).

Table 21: *Association between Year of the Surgery and Previous Surgeries, Hospitalisation History and Medication Allergies*

		Year			χ^2 (2)	p
		2015	2016	2017		
Allergies to medication	No	21(14.8%)	71(50.0%)	50(35.2%)	0.019	.990
	Yes	1(16.7%)	3(50.0%)	2(33.3%)		
Hospitalised for more than 24 hours in the last 6 months	No	20(14.5%)	70(50.7%)	48(34.8%)	0.206	.902
	Yes	1(14.3%)	3(42.9%)	3(42.9%)		
Caesarean section	No	19(15.8%)	59(49.2%)	42(35.0%)	0.026	.987
	Yes	5(14.7%)	17(50.0%)	13(35.3%)		
Lap Chole	No	23(16.7%)	67(48.6%)	48(34.8%)	1.201	.549
	Yes	1(6.2%)	9(56.2%)	6(37.5%)		
Appendectomy	No	22(14.9%)	74(50.0%)	52(35.1%)	1.592	.451
	Yes	2(33.3%)	2(33.3%)	2(33.3%)		
Breast reduction/augmentation	No	22(15.6%)	70(49.6%)	49(34.8%)	0.076	.962
	Yes	2(15.4%)	6(46.2%)	5(38.5%)		
Liposuction	No	23(15.6%)	73(49.7%)	51(34.7%)	0.198	.906
	Yes	1(14.3%)	3(42.9%)	3(42.9%)		
Thyroidectomy	No	24(17.0%)	68(48.2%)	49(34.8%)	2.687	.261
	Yes	0(0.0%)	8(61.5%)	5(38.5%)		
Haemorrhoidectomy/Tonsillectomy	No	23(15.9%)	71(49.0%)	51(35.2%)	0.205	.902
	Yes	1(11.1%)	5(55.6%)	3(33.3%)		
Inguinal Hernia/Hip surgery	No	24(16.2%)	72(48.6%)	52(35.1%)	1.358	.507
	Yes	0(0.0%)	4(66.7%)	2(33.3%)		
Uterine removal	No	23(15.9%)	71(49.0%)	51(35.2%)	0.205	.902
	Yes	1(11.1%)	5(55.6%)	3(33.3%)		

4.3 Presentation and Analysis of Interview Data

4.3.1 Characteristics of the Respondents

Table 22 shows the characteristics of the four members of the obesity management team of the investigated hospital interviewed in the current study. The four individuals included two general physicians, a general bariatric surgeon and a dietician. Three of the respondents had a bachelor's degree as their highest attained degree in their field of specialisation of which two had been practicing as registered/licensed dieticians or registered/licensed bariatric dietician for threes while one had been practicing for a year. The other one respondent, the general bariatric surgeon,

had a Fellowship of American College of Surgeons as the highest attained degree in field of specialisation and was a member of the American Society for Metabolic and Bariatric Surgery and American Diabetes Association. Dietician interviewed in the study, on the other hand, was a member of the Association of Jordanian Nutrition Specialists. All the four members of obesity management team of the investigated hospital interviewed in the study were personally seeing 101-200 patients per month in both office and hospital encounters.

Table 22: *Characteristics of Members of Obesity Management Team Interviewed in the Study*

Characteristic	Respondent 1	Respondent 2	Respondent 3	Respondent 4
Profession	General bariatric surgeon	Dietician	General physician	General physician
Highest attained degree	Fellowship of American College of Surgeons	Bachelor's degree	Bachelor's degree	Medicine and general surgery
Years practicing as dietician		3 years	3 years	1 year
Years practicing as bariatric dietician		3 years	3 years	1 year
Professional status		Both inpatient and outpatient clinical bariatric dietician	Inpatient clinical bariatric dietician	Both inpatient and outpatient clinical bariatric dietician
Membership	The American Society for Metabolic and Bariatric Surgery and American Diabetes Association	Association of Jordanian Nutrition Specialists		
Average bariatric patients seen in a month	101-200	101-200	101-200	101-200

4.3.2 Guideline, Policy or Protocol Concerning Bariatric Surgery

Table 23 shows how the respondents responded to questions on guideline, policy or protocol of the management of bariatric surgery in the investigated hospital. All the four respondents agreed that the hospital has a written guideline, policy or protocol concerning pre-operative nutritional management of the bariatric surgical patients. Also, all the four respondents agreed that their program's postoperative bariatric diet incorporates texture progression from clear liquids to full liquids to purees to soft solids and finally to solid foods. However, the dietician interviewed in the study indicated that they discharge bariatric patients on a full liquid diet while the other three respondents indicated otherwise. The four respondents mentioned bariatric surgeon as the person who evaluates the patient's tolerance to the postoperative diet with three of the four respondents indicating that bariatric surgeon is also the one who decides when a patient is ready to advance to the next phase of postoperative diet. The dietician interviewed in the study

however indicated that it is the dietician who decides when a patient is ready to advance to the next phase of postoperative diet.

Table 23: *Bariatric Surgery Guidelines, Policy or Protocol in the Investigated Hospital*

Questions	Respondent 1	Respondent 2	Respondent 3	Respondent 4
Presence of guideline, policy or protocol	Yes	Yes	Yes	Yes
Who evaluates tolerance to postoperative diet	Bariatric surgeon	Bariatric surgeon	Bariatric surgeon	Bariatric surgeon and physician
Years practicing as dietician	Bariatric surgeon	Dietician	Bariatric surgeon	Bariatric surgeon and physician
Physician involvement in educating about guidelines and meal progression			Often	Always
Bariatric surgeon involvement in educating about guidelines and meal progression	Always		Always	
Physician assistant involvement in educating about guidelines and meal progression			Often	
Nurse practitioner involvement in educating about guidelines and meal progression			Never	
Surgical assistant involvement in educating about guidelines and meal progression			Never	
Registered nurse involvement in educating about guidelines and meal progression			Never	
Bariatric RD/RDN involvement in educating about guidelines and meal progression		Often	Always	
Period after bariatric surgery procedure when initial outpatient follow-up commences	1 week	1 week	1 week	1 week
Personally carries out long-term follow-up of bariatric surgery patients	Yes	Yes	Yes	Yes

All the four respondents interviewed in the current study indicated that they are at least often involved in educating about dietary guidelines and meal progression in the investigated hospital. One of the general physicians interviewed in the study however indicated that bariatric surgeons and bariatric RD/RDN are always involved in educating about dietary guidelines and meal progression in the hospital while physicians and board-certified physician assistants are often involved, but nurse practitioners, certified surgical assistants and registered nurses are never involved. However, all the four respondents indicated that in their respective departments, initial outpatient follow-up commences one week after the bariatric surgery. Also, all the four respondents agreed that they personally carry out long-term follow-up of patients that undergo the bariatric surgery.

4.3.3 Ethical Considerations

Table 24 shows how the members of the obesity management team of the investigated hospital responded to questions on ethical issues related to the management of patients of bariatric

surgery. Members of the obesity management team of the investigated hospital interviewed agreed that confidentiality will be maintain, details about personal data not shared and will be used only for research purpose during the management of bariatric surgery patients. The respondents also agreed that only the investigator will have access to patient information and names will not be revealed under any circumstances in the management of patients of bariatric surgery. Moreover, the respondents agreed that treatment will be given by health professionals in an unbiased manner with injustice in behaviour not being tolerated by any medical staff when managing patients before and after the bariatric surgery. Also, the members of the obesity management team of the investigated hospital interviewed in the study agreed that patients will have right to speak and to get involved in the management of weight before and after undergoing the bariatric surgery.

Table 24: *Ethical Issues Considered in Management of Patients before and after Bariatric Surgery*

Questions	Respondent 1	Respondent 2	Respondent 3	Respondent 4
Confidentiality will be maintained	Yes		Yes	Yes
Details about personal data will not be shared	Yes		Yes	Yes
Details about personal data should be used only for research purpose	Yes		Yes	Yes
Only investigator will have access to patient information	Yes		Yes	Yes
Unbiased treatment will be given by health professionals	Yes		Yes	Yes
Names will not be revealed under any circumstances	Yes		Yes	Yes
Injustice behaviour will not be tolerated by any medical staff	Yes		Yes	Yes
Patient will have right to speak and get involved in management of their weight	Yes		Yes	Yes

4.4 Summary of the Findings

4.4.1 Obesity and Associated Risk Factors

Tobacco consumption was significantly associated with the BMI group of the patients, but this was not the case for alcohol consumption and current smoking status of the patients. However, overweight patients had smoked for significantly more number of months when compared to the

obese patients. In the current study, obesity cannot therefore be associated with social history risk factors of tobacco and alcohol consumption.

Having or not having diseases like hypertension, diabetes, asthma, sleep apnoea, dyslipidaemia or heart disease was not significantly associated with the BMI of a patient. However, obese patients with hypertension and those with diabetes had been having the diseases for significantly more years on average when compared to those that were overweight. Obese patients with sleep apnoea, on the other hand, have been having the disease for significantly more years on average when compared to those that were normal. In the current study, obesity cannot therefore be associated with any of these diseases, but it could be associated with the duration that one had been having hypertension, diabetes or sleep apnoea.

In relation to dietary habits, only knowing or not knowing the amount of calories consumed in a typical day was significantly associated with the BMI group of a patient, but the people that know the amount of calories consumed in a typical day were mostly those that were obese. However, obese patients used to bring takeout food at home significantly more frequently when compared to the overweight and the normal patients. Whether a patient was taking caffeinated or decaffeinated tea/coffee was also significantly associated with a patient's BMI group with normal patients being mostly the ones that were taking decaffeinated tea/coffee. In the current study, obesity can therefore be associated with only bringing takeout food at home and taking caffeinated coffee rather than taking decaffeinated coffee when it comes to dietary habits.

BMI of a patient was however significantly associated with the way the patient had rated his or her self-esteem, willingness to physical activity, sociability and sex life, but it was not associated with the way the patient had rated his or her willingness to work. Patients that had rated their self-esteem and sociability lowly and their willingness to physical activity very highly were mostly those that were obese. Patients that rated their sex-life poorly were however mostly those that were obese. In the current study, obesity can therefore be associated with the extent to which the patient was comfortable or uncomfortable with his or her self-esteem, willingness to physical activity, sociability and sex-life, but it cannot be associated with the extent to which they are comfortable or uncomfortable with their willingness to work.

Although many of the patients surveyed in the study were not used to exercising regularly, whether a patient was exercising regularly or not was not significantly associated with their BMI group. Also, the number of minutes exercised in a day on average did not differ significantly between patients in different BMI groups. The number of minutes walked in a day on average did not also vary significantly between patients in different BMI groups, but walking or not walking regularly in a day was significantly associated with the BMI group of a patient with most of the patients not used to walking regularly being obese. In the current study, obesity can therefore be associated with walking or not walking regularly, but it cannot be associated with exercising or not exercising regularly.

Among the diseases mentioned by the patients, only the history of diabetes and the history of heart disease were associated with the BMI group of a patient with patient that had a history of these two diseases being mostly those that were obese. Patients that had been obese for many years on average were not necessarily the ones that were obese, but average heaviest weight was significantly higher for the obese patients that for the normal and overweight patients. Highest BMI attained was however not significantly higher between any of the BMI groups. Hypertension/palpitation, social isolation/stigma, low self-esteem/confidence and inability to find outfits were the only problems caused by obesity that were significantly associated with the BMI group of a patient. Having or not having a history of obesity was significantly associated with the BMI group of a patient, but this was not the case for having or not having been obese since childhood having or not having been obese for greater than 5 years.

4.4.2 Knowledge on Available Obesity Treatments

Patients that had knowledge about interventions were 82.5% for the diet intervention, 51.9% for exercise intervention, 15.6% for surgical interventions and 9.7% for medication interventions with having or not having knowledge about the interventions not being significantly associated with the year when the patient had undergone the bariatric surgery. However, as many as 67.5% of the patients mentioned internet as their main source of information about the interventions with only 34.4% mentioning health directives and 15.6% mentioning general physician as their main source of information about the intervention.

The patients that had used interventions before undergoing the bariatric surgery were as many as 85.7% for diet and 55.8% for exercise, but only 9.7% medications for weight loss with having or not having used any of these obesity interventions before undergoing bariatric surgery not being significantly associated with the year when one had undergone the bariatric surgery. Patients that had used diet intervention before undergoing bariatric surgery had used it for as many as 59 months on average regardless of the year when they had undergone the bariatric surgery. On the other hand, patients that had used exercise interventions had used it for as many as 54 months on average regardless of the year before undergoing bariatric surgery regardless of the year when they had undergone the surgery. Most of the patients surveyed in the current study could therefore be said to have knowledge about diet and exercise interventions because they not only know about them but had also used them for several months before undergoing bariatric surgery.

However, only a few patients among the ones surveyed in the current study could be said to have knowledge about the surgical interventions despite having undergone a bariatric surgery. The patients with knowledge about the medication for weight loss management were even fewer although some of the patients had used them in the management of their weight. This was not dependent on the year when the patient had undergone the bariatric surgery.

4.4.3 Role of Bariatric Surgery in Long-Term Management of Obesity

On average, the patient had lost only about 9 Kg on average before undergoing bariatric surgery, with some having lost as little as no weight at all. As many as 27.9% of the patients surveyed in the study indicated that they had undergone bariatric surgery as an advice from a doctor or all the other interventions having failed to achieve a substantial weight loss. Hypertension and diabetes, to improve health, joint, knee or back pain, regain self-confidence, sleep apnoea or disorder and pressure from a spouse came out as other reasons that had made the patients to undergo the bariatric surgery. Other interventions having failed and improving one's health also came out as the most popular reasons that had made the patients to consider undergoing bariatric surgery. The other reasons that had made the patients to consider undergoing bariatric surgery were low self-esteem or self-confidence, inability to perform activities, sleep apnoea or sleep disorder and joint or back pain. In the long-term management of obesity, bariatric surgery could therefore be said to play a role in helping patients to achieve substantial loss in their weight when all the other interventions fail or when other health problems prevent the patients from other weight loss

interventions. Such health problems could be comorbidities such as diabetes, hypertension, or joint, back or knee pain. Bariatric surgery could also be said to play a role helping patients regain self-esteem and self-confidence and improve their health in general.

4.4.4 Postoperative Care and Treatment Issues Faced By Patients

As indicated by the healthcare professionals interviewed in the current study, postoperative care and treatment of bariatric patients could be grouped as inpatient or outpatient. Issues faced by patient during both inpatient and outpatient care and treatment are mainly diet progression whereby dietary and meal progression guidelines are provided by a team of health professionals that include general physician, bariatric surgeon, certified physician assistant and bariatric RD/RDN. The same health professionals are the ones who personally carry out long-term follow-up of the bariatric patients, which starts a week after the patient is discharged from the hospital.

4.4.5 Ethical Implications in Obesity Management

Majority of the patients indicated that they did not have knowledge about surgical and medication interventions in general with the internet as the most common source of information about the interventions among the patients. It is therefore unlikely that the patient had been adequately bariatric surgery by the healthcare professionals involved regardless of the year when they had undergone bariatric surgery. Moreover, most of the patients had not used the medication intervention for bariatric surgery before undergoing bariatric surgery with only few patients that had undergone bariatric surgery because of comorbidities like hypertension, diabetes and joint or back pain. This could be said to be unethical since patients should undergo bariatric surgery only when other weight loss interventions fail or because of presence of co-morbidities and should be adequately informed about all the interventions available for weight loss.

Some patients had not been given even a month to consider whether to undergo bariatric surgery or not while others had been given as many as 49 months. Moreover, almost a half of the patients indicated that they did not have doctor, surgeon or physician as their main source of information about bariatric surgery. Treatment of the patients could have therefore been biased with some patients being given very long duration to consider undergoing bariatric surgery and others not being given adequate period to consider undergoing the surgery and only some patients being adequately informed about the bariatric surgery by the healthcare professionals involved.

However, most of the patients did not have medication allergies and had not been previously hospitalised for more than 24 hours six months before undergoing bariatric surgery and had not previously undergone surgeries that could have hindered them from undergoing bariatric surgery.

However, health professionals interviewed in the current study indicated that confidentiality will be maintained and details about personal data used only for research purpose and not shared with the investigator being the only person that will have access to patient information during pre and post-operative management of bariatric patients. The health professionals also indicated that treatment will be given in unbiased manner with names of the patients not revealed under any circumstances and injustice behaviour not tolerated by any medical staff. Also, the health professionals indicated that patients will have right to speak and get involved in the management of their weight.

4.4.6 Role of Health Policy in Obesity Management

As indicated by the healthcare professionals interviewed in the current study, the investigated healthcare facility had guideline, policy and protocol for obesity management pre and post operation. The guideline, policy and protocol indicate criteria for a patient to undergo bariatric surgery, progression in the diet of the patients after undergoing bariatric surgery, whether or not bariatric patients should be discharged on a full liquid diet and who should evaluate the patient's tolerance to post-operative diet and decide when the patient is ready to advance to the next phase of the diet. However, this is unlikely to have played an important role in the obesity management of the patients. The reason for this is that the patients that had undergone bariatric surgery in 2015 prior to the implementation of obesity management guidelines were not different from those that had undergone bariatric surgery in 2016 and 2017 after the implementation of obesity management guidelines in terms of their pre and post-operative treatment and care.

4.4.7 Involvement of Patients and their Family before and After Surgery

The patients were the ones that had made the decision to undergo bariatric surgery because of various reasons with the role of the health professional involved being only advisory. This is indicated by the various reasons mentioned by the patients for either considering or undergoing bariatric surgery. It is also evident that the patients had taken as many as nine months on average to consider whether to undergo bariatric surgery or not with some patients taking as many as 49

months to make the decision. The patients could therefore be said to have been involved before the surgery. Majority of the patients surveyed in the current study were either living with family or living with a spouse with most of them having involved their spouse or family in their decision to undergo bariatric surgery. Most of the patients also had spouses or family willing to undertake them through the surgery and had parents or spouses contented with their decision to undergo the bariatric surgery. The patient's families could therefore be said to have been involved before the surgery, but in an indirect rather than direct manner. After the bariatric surgery, patients were involved in deciding their diet after being given guidelines by the healthcare professional, especially after being discharged from the hospital.

5. DISCUSSION AND IMPLICATIONS

5.1 Obesity and Associated Risk Factors

In this particular study, some patients were obese even after having undergone bariatric surgery while others were either normal or overweight. Being obese, overweight or normal was however not significantly associated with whether an individual had ever consumed alcohol or cigarette or not. This particular finding by the current study was consistent with those obtained by previous studies by **Swinburn et al. (2004), Nakeeb et al. (2015), Livia (2016) and Rosiek et al. (2015)**, which failed to identify alcohol and tobacco consumption as behavioural factors causing obesity in individuals. Together, these findings could mean that tobacco and alcohol consumption might not be important risk factors for obesity in the patients of bariatric surgery. However, this particular finding obtained in the current study failed to be consisted with those of **Kolb & Martin (2017)**, which indicated that alcohol and tobacco consumption could contribute to a person becoming obese. According to **Kolb & Martin (2017)**, smoking and consumption of alcohol contribute to obesity in a person by increasing intake of calories because stimulants such as nicotine increase a person's appetite with alcohol consumption hindering a person's capacity to choose between healthy and unhealthy food as well as choosing the required amount of food.

Based on the findings obtained in this particular study, obesity could not be associated with hypertension in the patients of bariatric surgery, but it could be associated with the duration that the patient had been having the disease. This particular finding by the current study fail to be consistent with those of **Cabandugama et al. (2017), Segula (2014), Thethi et al (2012), Kotsis et al. (2010), Hall et al. (2010), Manrique et al (2009), Theodore et al (2008), Vogt et al (2007), Sjostorm et al (2004), Wilson et al (2002) and Huang et al. (1998)** indicating a strong association between obesity and hypertension. According to **Kotsis et al. (2010) and Hall et al. (2010)**, excess weight gain resulting to obesity alters the sympathetic nervous system to cause imbalance in blood pressure levels of the obese individuals. **Cabandugama et al. (2017), Manrique et al (2009) and Vogt et al (2007)**, on the other hand, indicated that obesity leads to hypertension and other renal diseases by interfering with renin-angiotensin-aldosterone system. However, findings by the current study indicated that hypertension/palpitation was among the

problems caused by obesity that was significantly associated with the BMI group of a patient. Together with the findings of previous studies, these particular findings by the current study could indicate that the duration that one has been having hypertension could be a problem associated with obesity among patients of bariatric surgery in the investigated hospital unlike whether a patient has such a comorbidity or not.

Also, the findings obtained in the current study indicated that obesity could not be associated with having or not having diabetes, but it could be associated with duration of diabetes among those having the disease. This particular finding by the current study was consistent to that of previous study by **Bambrick (2005)** indicating that there is no interconnection between obesity and the risk of type 2 diabetes. The finding is also consistent with WHO reports indicating that only 10% of obese individuals are diabetic across the world **(WHO, 2004)**. Together, these findings imply that diabetes is not an important risk factor for obesity in the patients of bariatric surgery. The finding however failed to be consistent with those of previous studies by **Banjare & Bhalerao (2016), Arner & Ryden (2014) and Webber et al. (2012)** indicating that obesity is an important risk factor for diabetes. According to **Arner & Ryden (2014)**, anomalous fatty acids cause insulin resistance in obese patients, which leads to lack of glycaemic control and dysfunctioning of the pancreatic cell to cause type 2 diabetes. **Eckel et al. (2011)** however noted that more investigations were required to fully understand the pathogenic of both obesity and diabetes.

The findings obtained in the current study indicated that obesity could not be associated with having or not having asthma but failed to indicate whether obesity could be associated with duration of the disease because of the few individuals that agreed to having had the disease. This particular finding by the current study was consistent to that of previous study by **Pelegrino et al. (2007) and Vazque-Nava (2010)** indicating that obesity is not associated with the asthma hospitalisations and severity. Together, these findings could mean that obesity is not an important risk factor for asthma for the patients of bariatric surgery. The finding however failed to be consistent with that of previous studies by **Kim, Sutherland &Gelfand (2014), Brashier&Salvi (2013), Ross & Hart (2013), Mosen et al. (2008) and Sutherland et al. (2008)** indicating existence of a link between obesity and asthma severity or hospitalisation. According to **Sutherland et al. (2008),** mechanisms possibly related to innate immunity might

explain the relationship between obesity and asthma, but enhancement of the "classical" forms of airway inflammation resulting from the systemic inflammatory effects of obesity itself might fail to do so. **Kim, Sutherland &Gelfand (2014)**, on the other hand, indicated that adipokines play a central role in the association between obesity and asthma and maintenance of asthma phenotype.

Moreover, the findings obtained in the current study indicated that obesity could not be associated with having or not having sleep apnoea, but it could be associated with duration of the disease, especially with respect to patients of bariatric surgery. This particular finding by the current study was consistent to those of previous studies by **Tan et al. (2017) and Hargens et al. (2013)** indicating existence of a relationship between duration and quality of sleep increase in body weight and adiposity. Together, these findings could mean that decrease in sleep quality and duration caused by sleep apnoea could increase the risk of developing obesity in an individual. The finding however failed to be consistent with those of previous studies by **Jehan et al. (2017), Khan (2017) and Patel (2014)** indicating that obesity is an important risk factor for sleep apnoea. According to **Patel (2014)**, 41% of adults obstructive sleep apnoea cases are attributed to overweight or obesity. **Jehan et al. (2017)**, on the other hand, indicated that obesity and diabetes mellitus type 2 are the main components contributing to sleep apnoea.

For dyslipidaemia, the findings obtained in the current study indicated having or not having the disease and duration of having the disease were not associated with obesity among patients of bariatric surgery in the investigated hospital. This particular finding by the study however fails to be consistent with those of previous studies by **Deeb et al. (2018), Sun et al. (2018), Shakiba et al. (2017) and Maria-del-Mar et al. (2016)** indicating existence of association between obesity and overweight and increased risk of dyslipidaemia. According to **Klop, Elte&Cabezas (2013)**, obesity seems to contribute to dyslipidaemia through development of insulin resistance in peripheral tissues leading to enhanced hepatic influx of fatty acids from dietary sources, intravascular lipolysis and from adipose tissue resistance to the antilipolytic effects of insulin. **Sun et al. (2018)** however indicated that age weakens the relationship between dyslipidaemia and both overweight and obesity for both male and female individuals. **Deep et al. (2018)**, on the other hand, used weight circumference to measure obesity and overweight among individuals

rather than the body mass index as is the case in the current study while **Maria-del-Mar et al. (2016)** investigated only the individuals aged between 11 and 16 years.

As for the heart disease, the findings obtained in the current study indicated having or not having the disease and duration of having the disease were not associated with obesity among patients of bariatric surgery in the investigated hospital. This particular finding was not consistent with those of previous studies by **Ortega, Lavie and Blair (2016), Jiang et al. (2013), Chen et al. (2013), Akil& Ahmed (2012)**indicating existence of association between obesity and overweight and increased risk of cardiovascular diseases. Also, the finding was not consistent with those of **Riaz et al. (2018)** indicating existing of association between obesity and increased risk of coronary artery disease. The finding was however consistent with those of **Kim, Despres& Kon-Koh (2016)** indicating existence of a subset of overweight and moderately obese individuals with a high level of fitness that do not have a higher risk of developing cardiovascular diseases when compared to individuals with a normal body weight. **Ortega, Lavie& Blair (2016)** also indicated existence of fat-but-fit and metabolically healthy but obese individuals that do not have a higher risk of cardiovascular diseases when compared to individuals with normal body weight. **Chen et al. (2013)**, on the other hand, indicated that higher BMI is not that strong as a risk factor for mortality from cardiovascular disease in south Asians.

In the findings obtained in the current study, BMI of the patients of bariatric surgery in the investigated hospital was associated with only knowing or not knowing calories consumed in a typical day, frequency of bringing takeout food at home and consumption of either caffeinated or decaffeinated coffee. However, the patients that knew the number of calories consumed in a typical day were mostly the ones that were obese. A characteristic that distinguishes caffeinated coffee or tea from the one that is decaffeinated is nicotine content. The finding by the current study on association between obesity and the taking of caffeinated coffee is therefore consistent with that of **Kolb & Martin (2017)** indicating that stimulants such as nicotine increase a person's appetite to cause overweight or obesity. **Kolb & Martin (2017)** however indicated that intake of high calorie food, junk food and soft drinks increase the risk of developing excess fat in the body, which is contrary to what was indicated by the findings obtained in the current study. Also, this particular finding by the current study failed to be consisted with those of **Rosiek et al.**

(2015) and Swinburn et al. (2004) indicating that eating habits characterised by intake of dense calorie food, junk food and soft drinks are a major cause of obesity in individuals.

According to **Khabazkhoob (2017)**, obesity rates are higher in women than in men, which is an indication that gender could be an important risk factor for obesity. **Kerrigan *et al*. (2010)**, on the other hand, indicated that obesity rates increase with age, especially among women, which a possibility of age being an important risk factor for obesity. Similarly, to what has been indicated by these findings by previous studies, the current study found that BMI for the male patients was higher than the one for the female patients. However, the current study found that the BMI group of the patient was not associated with the patient's gender, which was contrary to what had been indicated by previous studies. Also, study found that patients with a normal body weight were the ones that were older on average when compared to those that were obese, which is contrary to what had been indicated by previous studies.

In the current study, the BMI group of a patient could be associated with his or her self-esteem, willingness to physical activity, sociability and sex-life, but it cannot be associated with the patient's willingness to work. This particular finding by the current study was consistent with those of previous studies indicating a significant association between body weight status and a person's self-esteem **(Alvani, Hosseini& Kimura, 2016; Griffiths, Parsons, & Hill, 2010; Habib et al., 2015)**. According to **Habib et al. (2015) and Griffiths, Parsons,& Hill (2010)**, a person's BMI status is also significantly associated with a person's quality of life, which could be significantly dependent on the individual's willingness to physical activity and work, sociability and sex-life. **Rao& Kishore (2014)**, on the other hand, indicated that obese adolescents differ significantly from their counterparts who are not obese with respect to behaviour problems. However, the finding by the current study failed to be consistent with those of **Rao& Kishore (2014)** indicating that obese adolescents do not differ significantly from their counterparts in terms of self-esteem. The findings by the current study also agreed with those of previous studies by indicating that social isolation/stigma and low self-esteem/confidence were problems caused by obesity that were associated with the BMI group of a patient.

Previous studies indicate existence of association between BMI of an individual and amount of physical activities undertaken by a person, which makes physical activities to be a recommended intervention for the prevention of obesity **(Britton et al., 2012; Oliveira et al., 2017; Rosenberg**

et al., 2013). According to **Oliveira et al. (2017)**, moderate to vigorous physical activities are negatively associated with the BMI of boys regardless of race, family income, education of parents, screen time, diet patterns and sedentary time. **Rosenberg et al. (2013)**, on the other hand, indicated that incidences of obesity decrease with increase in vigorous exercise. The findings obtained in the current study failed to be consistent with those of previous studies by indicating that BMI group of the patient was associated with walking or not walking regularly regardless of number of minutes walked in a day but was not associated with exercising or not exercising regularly. However, the finding by the current study agreed with those of previous studies by suggesting that sedentary lifestyle characterised by not walking regularly is an important risk factor for obesity among the patient of bariatric surgery in the investigated hospital. As argued by **Melam et al. (2016)**, brisk walking with diet therapy is not as effective as aerobics with diet in controlling and reducing BMI, especially among North Indian women.

In the current study, only the family history of diabetes and heart disease were associated with the BMI group of a patient with patients that had family history of these two diseases being mostly those that were obese. Therefore, only the patients of bariatric surgery genetically exposed to diabetes and heart disease were likely to be obese. This particular finding by the current study was consistent with those of **Corica et al. (2018), Geetha, Gopalakrishnan&Umadevi (2017), Cederberg et al. (2014) and Basit et al. (2004)** indicating existence of a relationship between obesity and family history of both diabetes and heart disease. According to **Basit et al. (2004)**, diabetes and cardiovascular diseases risk from positive family history are mediated by increase in the percentage of body fats in an individual's body. **Geetha, Gopalakrishnan&Umadevi (2017) and Cederberg et al. (2014)**, on the other hand, indicated that persons with a positive family history of diabetes are more prone to early onsets of diabetes and its related complication such as excessive gain in weight when compared to individuals without such a history. Together, these findings could mean family history of diseases such as diabetes and heart disease is an important risk factor that could be associated with obesity among the patients of bariatric surgery.

Having or not having a history of obesity was significantly associated with the BMI group of a patient. This particular finding by the current study was consistent with that of **Corica et al. (2018), Behreynian et al. (2017) and Hou et al. (2008)**indicating an association between

obesity in young people and their family history of the disease. According to **Corica et al. (2018)**, family history of obesity and cardiometabolic diseases are important risk factors for onset and severity of obesity in individuals. **Hou et al. (2008)**, on the other hand, indicated that family history of obesity increases the risk of overweight and obesity by about 1.2-fold for both men and women. Together, these findings could mean that family history of obesity is an important risk factor that could be associated with obesity among patients of bariatric surgery. However, BMI group of a patient was not associated with having or not having been obese since childhood and having or not having been obese for greater than 5 years. This particular finding by the current study failed to be consistent with that of **Herman et al. (2009)**, which indicated that the people that were obese as children were highly likely to remain obese during their adult life. **Herman et al. (2009)** also indicated that individuals that have been obese for at least five years in the past were highly likely to be obese later in their life. Together, these findings indicate that patient of bariatric surgery might be different from other individuals in that their current obesity status is not dependent on their past obesity levels.

The findings obtained in the current study however indicated that average heaviest weight attained by a patient was higher among obese patients than among the normal and overweight patients, but this was not the case for the highest BMI attained. However, as indicated by **Haregu et al. (2016)**, weight alone as a measure of overweight and obesity is not as good as BMI or WC because of its likelihood to increase with a person's height. In the current study, most of the patients of bariatric surgery investigated in the current study were not aware of the highest BMI they had attained prior to undergoing the bariatric surgery.

5.2 Knowledge and Usage of Obesity Management Interventions

According to **Lemistra et al. (2019)**, modification in diet and physical activities are the two most common interventions for weight loss management. Most of the individuals are therefore expected to be knowledgeable about these two interventions for weight loss management. Findings obtained in the current study agree with those of **Lemistra et al. (2019)** by indicating that dietary modification intervention was a highly popular weight loss management intervention among the patients of bariatric surgery investigated. The reason for this is that the patients of bariatric surgery investigated in the current study indicated to not only know about this particular intervention, but also to have used the intervention in their attempts to lose weight. However,

finding obtained in the current study failed to agree with those of **Lemistra et al. (2019)** by indicating that exercise intervention was not as popular as dietary intervention among the investigated patients of bariatric surgery. In the current study, the patients of bariatric surgery that agreed that they knew about exercise weight loss intervention were far much less than those that indicated that they knew about dietary intervention. This could however be attributed to the fact that the current study had included more women than men because women were the majority among the individuals that had visited the investigated hospital for the bariatric surgery. According to **Attlee et al. (2017)**, as weight management interventions, physical activities are popular in men while dietary modifications are popular in women.

In the current study, only a few patients among the ones investigated agreed that they were knowledgeable about medication and surgeries for weight loss management regardless of the year when the patient had undergone the bariatric surgery. This was consistent with the findings of **Lemistra et al. (2019)**, which indicated that medication weight loss interventions and bariatric surgeries are not very common, especially in the developing counties. However, the finding fails to be consistent with those of **Manning, Finer &Pucci (2014) and Sharpe et al. (2006) cited in Attlee et al. (2017)** indicating that dietary supplements that come in various forms such as capsules, tablets, liquid, powder and bar are common weight loss management intervention, especially in countries with developed economies such as the USA and the UK. Together, these findings could mean that medication for weight loss management commonly known as pharmacotherapy are popular in countries with developed economy such as UK and USA, but unpopular in countries with developing economies such as those in the Middle East.

In the findings obtained in the current study, internet was the most popular main source of information about the interventions among the patients of bariatric surgery investigated. This is not different from what could have been expected because of the popularity of the internet as a source of information across the world **(Tan & Goonawardene, 2017)**. According to **Chang, Abouassaly & Lawrentschuk (2016) and Fahyet al. (2014)**, more than three quarters of the people across the world use the internet to get the information they required about their day-to-day lives, but the information they get is not always accurate and reliable. With respect to weight loss management interventions, information obtained from health directives given various different health professionals is the one is likely to be highly accurate and reliable. In the current

study, the patients that indicated health directives or general physicians as their main source of information about weight loss management interventions were not that many. It is therefore likely that the information that most of the patients of bariatric surgery investigated in the current study had about weight loss interventions could be inaccurate and unreliable regardless of the time when they had undergone bariatric surgery.

Based on the findings obtained in the current study, dietary modification and physical exercise could not be said to be fully ineffective in enabling individuals to lose weight. The reason for this is that most of the patients of bariatric surgery investigated in the current study agreed to have lost at least some weight prior to undergoing bariatric surgery through such interventions. However, such weight loss interventions cannot be said to be fully effective in the sustainable weight loss management among individuals. The reason for this is that most of the investigated patients had been forced to undergo bariatric surgery even after having tried these other interventions either because the weight they has lost was not as much as what they wanted to loss or because they has regained the weight later. This particular finding by the current study was consistent with those of **Manning, Finer &Pucci (2014)**, which indicated that individuals are sometimes forced to turn to pharmacological interventions or even the surgery interventions because of the failure in the lifestyle interventions to achieve required outcomes.

5.3 Bariatric Surgery and Its Role in Obesity Management

The main focus of the current study was bariatric surgery as one of the interventions in multi-disciplinary weight loss management among individuals suffering from obesity. From the findings obtained in the current study, many of the individuals failed to indicate that they were knowledgeable about the surgical interventions for weight loss management. In another finding by the current study, most of the patients of bariatric surgery indicated that they were aware of bariatric surgical interventions such as lap band, gastric bypass, sleeve gastrostomy and gastric balloon. As mentioned by **Jane at al. (2018)**, knowledge about weight loss interventions could imply awareness, but awareness cannot imply knowledge. This particular finding by the current study is consistent with those of **Taube-Schiff et al. (2016), Sarwer et al. (2013) and Guler et al. (2018)** indicating a limited knowledge about bariatric surgeries among obesity patients even in the developed countries. Together, these findings could mean that patients of bariatric surgery in the Middle East do not have much understanding about surgical interventions for weight loss

management. **Luck-Sikorski et al. (2012)** however argued that bariatric surgeries could be regarded as more of obesity treatment intervention rather than obesity management intervention. This could be the reason why most patient of bariatric surgery investigated in the current study failed to indicate surgical interventions as some of the interventions for weight loss management that they knew about.

According to **Bhatnager (2005) and Bruins et al. (2014)**, surgical interventions such as bariatric surgeries are not among the major tools for treating and managing obesity with such tools being diet, exercise and medication. **Westerveld& Yang (2016)**, on the other hand, argued that ideally, obesity should be treated and managed through exercise and diet with individuals being advised to use pharmacological intervention only when these two interventions fail to achieve a substantial weight loss. **Bray & Ryan (2012) and Powell et al (2011)** however indicated that pharmacological interventions are not only useful when individuals fail to achieve substantial weight loss through diet and exercise, but also when the patient has a very large BMI and wants to lower it significantly within a short period. This could be the reason why the current study failed to identify bariatric surgery as an intervention for weight loss management and treatment that is popular among obesity patients.

From the findings obtained in the current study, the patients of bariatric surgery investigated had either not lost as much weight as what they wanted to lose using other intervention or had regained the weight after losing. This is not contrary with what could have been expected because other interventions for weight loss management and treatment have been found not to be as effective as bariatric surgery, especially when it comes to the long-term treatment of individuals with severe obesity or moderate obesity complicated by comorbidities such as hypertension, diabetes or sleep apnoea **(Belle et al., 2007; Kushner, 2014;Grunchy&Eliger, 2017).** According to **Grunchy&Eligar (2017)**, only the weight lost through surgical interventions remain in sustained form for more than five years, but the patients need to stay under medical monitoring for complications and lifestyle adjustments.`

Reasons for undergoing bariatric surgery mentioned by most of the patients of bariatric surgery investigated in the study were advice from the doctor or other interventions having failed, hypertension and diabetes, improve health in general, back and joint pain and sleep apnoea. The same reasons had been mentioned as the ones that had made the patients to consider undergoing

bariatric surgery. This is consistent with the findings of **Fobi (2004), Richard & Health (2009) and Bult et al. (2008)**, which indicated that bariatric surgery is the suitable intervention only when obesity is very severe or moderate accompanied by risk of co-morbidity and mortality. According to **Picot et al. (2009) and Gulliford et al. (2017)**, bariatric surgery is always accompanied by serious post-operative psychological challenges, which makes to be recommended only when other interventions have failed, or they cannot be used due to comorbidities such as hypertension or diabetes. For example, US guidelines for obesity management requires that obesity patients should not be allowed to undergo bariatric surgery unless they have a BMI of at least 35 and have evidence of failing to loss as much weight as required through the use of the other available interventions (**Kissler&Settmatcher, 2013)**.

However, bariatric surgery does not make other interventions for weight loss management and treatment to stop being important, especially when it comes to long-term treatment and management of obesity. Most of the patients of bariatric surgery investigated in the current study agreed to having used dietary intervention in their attempts to sustain weight lost through the bariatric surgery. Moreover, the health professionals interviewed in the current study indicated that diet progression guided by a team of health professionals is an important part of both inpatient and outpatient care and treatment of obesity patients after undergoing bariatric surgery. These particular findings by the current study were consistent with those of **Schiavon (2018)**, which indicated that obesity patients need lifestyle and behaviour intervention after undergoing bariatric surgery to sustain the lost body weight. Together, these findings could mean that lifestyle, behavioural and pharmacological interventions are important in the multidisciplinary management of obesity after patients have undergone bariatric surgery.

5.4 Involvement in Obesity Management before and after Bariatric Surgery

The patients of bariatric surgery included in the current study had mentioned various reasons for considering undergoing bariatric surgery and the period they took to consider undergoing the surgery. This is an indication that they had been involved in the decision of undergoing bariatric surgery. Moreover, the patient of bariatric surgery included in the current study indicated that they were the ones that made the decision of the obesity management interventions used prior to undergoing bariatric surgery with healthcare professionals playing only an advisory role. This could be indicated by the fact that most of the patients included in the current study that had used

other interventions prior to undergoing bariatric surgery chosen the interventions themselves based on what they knew about the intervention from information obtained from the internet or from health professionals. In the current study, the patients of bariatric surgery investigated could therefore be said to have been involved in the management of their weight before undergoing bariatric surgery.

Such a finding is not contrary to what has been found by previous studies. According to **Beamish &Reinehr (2017)**, patients must be educated about benefits and risks, potential side effects, expected changes in eating behaviour and lifelong requirement for regular medical follow-up before undergoing bariatric surgery. The patients also need to be evaluated for suitability to undergo the surgery by being required to provide their medical and medication history **(Beamish &Reinehr, 2017)**. In the current study, involvement of the patients before undergoing bariatric surgery was not significantly associated with the year when they had undergone the surgery. Together, these findings could mean that involvement of the patients before undergoing bariatric surgery is a common practice even in Jordan just like in Europe.

From the findings obtained in the current study, it was evident that the investigated patients had involved their family or carers in their decision to undergo bariatric surgery. However, the findings do not provide evidence of involvement of the patient's family or carers in the treatment and management of bariatric surgery before and after the patient had undergone bariatric surgery. This particular finding by the current study is consistent with those of **Beamish &Reinehr (2017) and Lent et al. (2016)**, which indicated that involvement of a patient's family or carers in the treatment and management of patients before undergoing bariatric surgery is a common practice. According to **Beamish &Reinehr (2017)**, patient's family or carers must be educated about benefits and risks, potential side effects, expected changes in eating behaviour and lifelong requirement for regular medical follow-up before the patient is allowed to undergo bariatric surgery. **Lent et al. (2016)**, on the other hand, found that patients of bariatric surgery are given high levels of support by family and carers including support in following a healthy diet and engaging in physical activity.

According to **Kostecka&Bojanowska (2017)**, patients of bariatric surgery should receive professional preoperative, intraoperative and post-operative care from a multidisciplinary team of specialists, including a bariatric surgeon, a general practitioner, a dietician and a health

psychologist. From the findings obtained in the current study, it is evident that the patients of bariatric surgery in the investigated hospital receive pre and postoperative care from a multi-disciplinary team of specialist. The reason for this is that the healthcare professionals interviewed in the current study indicated that specialists like general physician, bariatric surgeon, physician assistants and bariatric RD/RDN are at least often involved in educating patients and their family or carers about guidelines and meal progression. A good number of patients in the current study had also indicated that health directives from professionals such as general physicians, bariatric surgeons and dieticians was among their main sources of information about weight management interventions including bariatric surgery before undergoing the surgery.

5.5 Ethical Implications in Obesity Management

Based on the findings obtained in the current study, it is unlikely that the patients of bariatric surgery investigated had adequately informed about bariatric surgery before being allowed to undergo the surgery. Moreover, some of the patients had not been given adequate time to consider whether to undergo the surgery. As a result, the fundamental right of the patients to be involved in the making of decision with respect to the treatment and care received from health care professionals cannot be said to have been always observed in the obesity treatment and management in the investigated hospital. Moreover, some of the obesity patients in the current study had neither undergone bariatric surgery because other interventions had failed not because of comorbidities such as hypertension or diabetes, which was not ethical. Also, there was evidence of biasness in the treatment and care that had been given to the patients of bariatric surgery investigated in the current study where only some patients had been adequately informed about the study or had been given adequate time to consider undergoing the bariatric surgery. It is possible that some ethical issues might be violated by healthcare professionals in the management and treatment of obesity as is the case in the current study. According to **Venkat& Larkin (2014)**, the increased prevalence of obesity has created professional and organisational ethical problems for the patients admitted in emergency departments. **Spasova et al. (2018)**, on the other hand, found that obesity prevention programmes and interventions may lead to isolation or disrespect of particular groups of individuals or harm to public health, which could be unethical.

According to **Roche et al. (2017) and Toader et al. (2013)**, respect for the person's dignity is highly important when a healthcare professional is delivering treatment and care to patients of various different diseases and when going research and experiments involving human research subjects. Based on the findings obtained in the current study, respect for the person's dignity is observed in the management and treatment of obesity in the investigated hospital. This is because the healthcare professionals interviewed in the current study indicated that confidentiality is always maintained and details about personal data used only for research purposes and not shared with others with investigators being the only people allowed to access personal information about the patients. Also, the healthcare professionals interviewed in the current study indicated that names of the patients are not revealed under any circumstances, which could ensure respect for person's dignity and fundamental right to privacy and confidentiality.

Healthcare professionals interviewed in the current study also indicated that is always given in unbiased manner with injustice behaviour not being tolerated by any medical staff and patients having the right to speak and get involved in the management of their weight. However, this might not always be the case in the investigated hospital because of evidence of patients of bariatric surgery that had not been adequately informed about the surgical interventions by the healthcare professionals and patients that had not been given adequate time to consider undergoing bariatric surgery. According to **Africano et al. (2015) and Homer et al. (2016)**, a multi-disciplinary team consisting of physicians, surgeons, nurses, counsellors, dieticians and nutritionists is recommended for the treatment and management of obesity before and after bariatric surgery. In the current study, it is however unlikely that such a team of health professionals had been involved in the treatment and management of obesity in the investigated patients prior to undergoing bariatric surgery. This is because most of the patients of bariatric surgery investigated in the current study did not have such healthcare professionals as their main source of information about other interventions available for the treatment and management of obesity. Moreover, it is unlikely that counsellors were involved in the management and treatment of obesity after bariatric surgery in the investigated hospital because such individuals had not been indicated to play a role in post-operative treatment and management of patients of bariatric surgery. As argued by **Picot et al. (2009) and Gulliford et al. (2017)**, bariatric surgery is always accompanied by serious post-operative psychological challenges, which results to a need to

involve counsellors in post-operative treatment and management of obesity patients after undergoing bariatric surgery.

5.6 Health Policy and Its Role in Obesity Management

As indicated by the patients of bariatric surgery investigated in the current study, the investigated hospital has a guideline, policy and protocol for obesity management. This is not contrary to what could be expected because guidelines, policies and protocols for obesity management are highly common across the world. **Tsogos et al. (2011) and Yumuk et al. (2015)** demonstrated about the European guidelines for obesity treatment and management. There is also the American Guideline for obesity and overweight management and treatment **(Ryan &Kahan, 2018)** and the guidelines for bariatric surgery in Jordan developed by the Jordanian Society for Obesity Surgery **(JSOS, 2016)**. Together, these findings indicate that guidelines, policies and protocols for obesity management are not new in Jordan just like in America and the Europe. From the findings obtained in the current study, the guideline, policy and protocol for obesity management in Jordan plays the role of indicating the criteria for a patient to undergo bariatric surgery and post-operative treatment and care of patients after undergoing bariatric surgery. This is not different from what could be expected since the guidelines for bariatric surgery in Jordan include duties for healthcare providers, bariatric surgery patient eligibility criteria and healthcare provider requirements (**JSOS, 2016)**. Together, these findings could mean that the guideline for bariatric surgery in Jordan plays the role of indicating how overweight and obesity should be management and treated in a sustainable manner before and after a patient is allowed to undergo bariatric surgery.

However, the findings obtained in the current study indicated that the guidelines, policies and protocol for obesity management are unlikely to have been that important in the sustainable management and treatment of obesity in the Jordanian hospitals. This is because the patients that had received bariatric surgery in 2015 before the implementation of the guidelines and policies for obesity treatment and management in Jordan were not that different when compared to others in terms of awareness, engagement and usage of interventions for weight loss management. This is not contrary to what could be expected given what is the case in other parts of the world. According to **Tsigos et al. (2011) and Yumuk et al. (2015)**, European guidelines for obesity treatment and management also provides guideline on how obesity should be management before

and after bariatric surgery, but management and treatment of obesity patients continue to be a problem in European countries as characterised by patient's stigmatisation, poor knowledge about medical consequences of obesity and treatments available for its management and treatment, inexperienced team for multi-disciplinary treatment of obesity and lack of coordination between surgeons and physicians. However, **Uerlich et al (2016)** indicated that European guidelines for obesity management and treatment not only focus on weight reduction, but also risk reduction, improvement in a patient's health and quality of life and management of comorbidities.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

According to **Schiavon (2018)**, it is a need of the hour to implement multi-disciplinary approach for the treatment and management of obesity across the world because lack of knowledge on obesity and ineffectiveness of existing measures for minimising obesity is hindering the process of obesity management in many parts around the world. Bariatric surgery has emerged as the ultimate treatment for obesity in many places across the world, but it does not make other interventions for weight loss management to be irrelevant **(Grunchy & Eligar, 2017)**. As required by most of the policy guidelines for obesity management across the world, bariatric surgery should be performed only when other weight lose interventions have failed or they cannot be implemented because of presence of comorbidities such as hypertension and diabetes **(Kissler & Settmatcher, 2013)**. After the bariatric surgery, other weight loss interventions are recommended for preventing weight gain after undergoing bariatric surgery **(Grunchy & Eligar, 2017)**. Recently, Jordan has become a centre for bariatric surgery serving patients from across the Middle East. The current study was intended to evaluate the multi-disciplinary approach to obesity treatment and management and bariatric surgery as undertake in Jordan using the views of patients and the views of healthcare professionals involved.

In order for this to be achieved, the study explored knowledge about obesity and risk factors associated with obesity and rule out any association between obesity and the risk factors of obesity. Also, the study explored participants' knowledge on available obesity treatments, the role played by bariatric surgery in long-term treatment and management of obesity and assessed issues faced by patients in post-operative care and treatment of obesity patients and the ethical implications involved. The study also identified the role of health policies in obesity management and evaluated involvement of patients and their family before and after bariatric surgery, ethical questions that could be raised in relation to bariatric surgery treatment and whether bariatric surgery is safe and effective with respect to how it is undertaken in Jordan.

From the findings obtained, obesity was not significantly associated with most of its risk factors that included social behaviour such as tobacco and alcohol consumption, diseases such as hypertension and diabetes and dietary and lifestyle behaviours. However, most of the patients were not highly knowledgeable about obesity and most of the associated risk factors and were not knowledgeable about medication and surgical interventions for the treatment and management of obesity, but wee knowledgeable about the diet and exercise interventions. The role of bariatric surgery, on the other hand, was identified to be treatment and management of obesity when other interventions fail or when it is not possible to use other interventions because of comorbidities such as diabetes and hypertension. Based on what was found by the study, bariatric surgery has been generally successful as undertaken in Jordan with a policy guideline being in place for determining when and how bariatric surgery should be undertaken in Jordan and who should be involved before and after the bariatric surgery. Several ethical questions are however evident in relation to how obesity management is undertaken in Jordan before and after the bariatric surgery.

The current study had achieved most of what it had been intended to achieve. Based on the findings obtained, the researcher concludes that in Jordan treatment and management of obesity is undertaken using a multidisciplinary approach, especially after the patient has undergone bariatric surgery. In the current study, professionals such as bariatric surgeons, physicians, physician assistants and bariatric RD/RDS were at least often involved in treatment and management of obesity after a patient had undergone bariatric surgery. Involvement of such a team of professionals when treating and managing obesity before a patient was allowed to undergo bariatric surgery was also evident as indicated by the patient's main source of information about interventions for obesity management including the bariatric surgery. However, patients are not adequately informed about obesity and its associated risk factors and medication and surgical interventions for the treatment and management of obesity, especially before undergoing bariatric surgery, which raises ethical concerns.

From the findings obtained in the current study, obesity was not significantly associated with most of its risk factors among the patients of bariatric surgery in Jordan. This is an indication that most of the patients that were obese after undergoing bariatric surgery were not necessarily the ones exposed to the risk factors associated with obesity. Having an inactive life as indicated by

not walking regularly on a daily basis however came out as a factor that could have made some of the patients investigated in the study to be obese even after undergoing bariatric surgery. The findings obtained also indicated existence of a policy guideline in Jordan that plays the role of determining how treatment and management of obesity should be done before and after bariatric surgery and indicating who should do what when several professionals are involved. However, the policy guideline is unlikely to have done much on the improvement of treatment and management of obesity in the country because the knowledge and understanding of obesity and its risk factors and that of interventions for treatment and management of obesity was not different before and after the implementation of the policy guideline.

Knowledge about medication interventions and the usage of such interventions before a patient had undergone bariatric surgery was not common among the study participants. Also, most of the patients investigated in the current study did not have co morbidities like diabetes or hypertension that could have prevented them from using an obesity treatment and management intervention such as medication. The patients also appear not to have been given adequate time to consider undergoing bariatric surgery with the treatment and care given to patients before undergoing bariatric surgery appearing to have been done in a biased manner with some patients being given adequate time to consider about the bariatric surgery and adequate information about available interventions unlike others. However, respect for a person's dignity is observed by ensuring privacy and confidentiality of a patient. The current study therefore concludes that several ethical issues arise in the treatment and management of obesity in Jordan despite existence of a policy guideline explaining how this should be done before and after a patient undergoes bariatric surgery.

6.2 Ethics Involved in our study

Implementation of ethical guidelines must be a key aspect before the start-up of any venture related to humans. Health policies both at private and government levels involved in the treatment of obesity have certain ethical drawbacks. It is significant to take in consideration all ethical pitfalls that threaten human values and beliefs. Overweight prevention programmes may have unintentional harmful consequences that may risk ethical values. "Do not harm" is the first and basic ethical principle. Proper knowledge and awareness about ethical principles is essential for those who are involved in scheming, executing and publicly justifying these weight loss and

management programmes. American ethical committee designed ethical framework that offers following recommendations and guidelines **(Have *et al*., 2013 & Venkat., 2014).**

1. **Unbiased Treatment**: Dieticians, physicians, surgeons and other health professionals involved in the treatment of obese patients should carry out their treatment in non-judgmental manner, being aware about medical, social and ethical implications of obesity.
2. **Health Consideration**: Programmes designed and implemented for weight loss therapy should essentially take into consideration the physical health of a patient. They should not have intended negative impact on the health of an individual. The World Health Organization calls for the control on the approval and encouragement of dangerous and deliberately unreliable programmes to weight loss or control, such as special weight loss aids, 'miracle-cures' and certain drugs and treatments often offered through unlicensed weight loss centres.
3. **Equality**: Helping people to live a healthier and happier is a chief goal of health care interventions. However, there are some odds in treating all groups equally. Groups with lower educational level and members of low ethnicity are more prone to obesity related health issues but weight loss programmes and therapies are less effective in these groups. Moreover, groups with lower educational status are also not much benefitted by these health care interventions, as the information provided by them are hard to understand and may increase existing health issues. Furthermore, interventions involving high budget also hit hard to people with low social income.
4. **Informed Choice**: Providing clear and adequate information about healthy choices is the main aim of health care interventions to prevent overweight and obesity. However, most of the times these interventions fail to provide clear and adequate information about the strategies involved in the weight loss. Providing unclear and inadequate information is ethically wrong.
5. **Social and cultural beliefs**: Health care providers should respect the social and cultural beliefs of their patients. Some interventions tend to interfere with the social and cultural value of food. Disregarding cultural belief of patients also bias the ethical implications.
6. **Privacy**: Maintaining confidentiality and privacy of patients is the chief aspect of ethical guidelines. Personal information taken by health care providers should be kept classified and it should not be shared with anyone and these interventions should be sensitive to privacy.

7. **Liberty**: Autonomy and liberty are the two main features that need to be provided by the therapists involved in the weight loss programmes.
8. **Therapist-Patient relationship:** It is essential for healthy output if both patient and therapist maintain a healthy relationship. Empathy and compassion are essential aspects for sustaining a therapeutic connection between the two.

Ethical approval for the study was granted by the Sheikh Khalifa Medical City/UAE and Al-Esraa Hospital/ Jordan. During my course of study, I will adhere to all the ethical guidelines.

The significant ethical considerations are detailed below:
Informed Consent: All the patients registered for the study were given a detailed overview about the study. They were asked to sign the consent form before filling up of questionnaire. My direct contact number will be on the consent form and participants can contact me in case of any query.
Anonymity: As main study investigator, I am the only person to have access to participant's number, name and address. Anonymity maintained by replacing names with patient codes.
Confidentiality: All the questionnaires and consent form were kept in data sheets with the lock codes to maintain the patient's confidentiality.
Right to Withdraw: Individuals who did not wish to participate in the study are allowed to drop back. Interviewed participants also had a right to withdraw from the study if they did not wish to answer any question in the study.

6.3 Recommendations

From the findings obtained in the current study, treatment and management of obesity and bariatric surgery in Jordan is undertaken using a multi-disciplinary approach with individuals involved being physicians, bariatric surgeons, physician assistants and bariatric RD/RDS. However, these are not the only individuals that should be involved in the treatment and management of obesity and bariatric surgery when it is undertaken using a multi-disciplinary approach. According to **Africano et al. (2015)**, the individuals that should be involved in the treatment and management of obesity in patients after undergoing bariatric surgery are

physicians, surgeons, nurses, dieticians and psychologists that have specialisation in bariatric procedures and interventions. This is necessary because of the complexity of the issues faced by patients after undergoing bariatric surgery. The researcher therefore recommends inclusion of nurses and psychologists with specialisation in bariatric procedures and interventions in the multi-disciplinary teams involved in treating and managing obesity among the patients of bariatric surgery in an obesity management centres across Jordan.

Obesity management appear not to be effectively undertaken before a patient undergoes bariatric surgery despite existence of a policy guideline indicating how it should be done. Patients need to have adequate understanding of not only the bariatric surgery, but also the other interventions available to the treatment and management of obesity before undergoing the bariatric surgery **(Kissler&Settmatcher, 2013)**. However, this is not the case among the patients of bariatric surgery investigated in the study. Therefore, the current study recommends that the management and treatment of obesity before a patient undergoes bariatric surgery be improved in relation to process that is followed and professionals involved. This could be achieved through modifying the existing policy guideline for the treatment and management of obesity and bariatric surgery in Jordan or improving the way the policy is being implemented.

As argued by **Africano et al. (2015)**, treatment and management of obesity need to be undertaken using a multi-disciplinary approach before and after bariatric surgery. This is not the case in Jordan given the little evidence of involvement of individuals other than physicians and bariatric surgeons in providing information on interventions available for treatment and management of obesity or even providing care and treatment to the patients. In the current study, only very few patients had used medication interventions before undergoing bariatric surgery, which could have been prescribed by a physician if such a person was involved in the treatment and management of obesity before a patient undergo bariatric surgery. The researcher in the current study therefore recommends that the treatment and management of obesity in Jordan be undertaken by a multi-disciplinary team of professionals not only after an individual undergoes bariatric surgery, but also before the patient undergoes bariatric surgery. Such an approach would not only enhance the treatment and management of obesity before the patient undergoes bariatric surgery, but also ensure that bariatric surgery is undertaken as the last option used when other interventions fail.

Policy guideline for obesity treatment and management in Jordan and bariatric surgery plays the role of indicating the criteria for an individual to undergo bariatric surgery and pre and post-operative treatment and care of patients after undergoing bariatric surgery. This is not enough for a policy guideline for the treatment and management of obesity in any particular country across the world, which could be the reason why management and treatment of the patients appeared not to have improved significantly after the introduction of the policy guideline for the treatment and management of obesity and bariatric surgery in Jordan. According to **Yumuk et al (2015)**, a policy guideline for the treatment and management of obesity need to be effectively implemented and holistically followed by healthcare professionals involved for it to enhance treatment and management of obesity patients in a country. The researcher in the current study therefore recommends that measures be taken to ensure that policy guideline for bariatric surgery as one of the interventions for obesity treatment and management is effectively implemented and holistically followed by healthcare professionals providing obesity care and treatment in Jordan.

6.3 Limitations of the Study

Recruitment of respondents for the current study was undertaken in only one particular obesity management centre in Jordan. The reason for this is the choice by the research to undertake the study as a case study of the Mohammad Al-Zatawi Obesity Management Centre at Al-Esraa Hospital because of limitation in time and resources available. Findings obtained in the current study were therefore highly likely not to be generalizable for drawing inferences and conclusions about treatment and management of obesity in Jordan. However, selection of patients for the study had been undertaken randomly using the systematic sampling method with the selected sample being about 10% of the study population of the research, which was likely to enable inferences and conclusions to be made about patients of bariatric surgery in the investigated hospital based on the findings that had been obtained in the study.

In the current study, only the individuals that had undergone bariatric surgery in the investigated hospital in 2015, 2016 or 2017 were recruited. Information obtained in the current study therefore only contains opinion of patients that had undergone bariatric surgery in the investigated hospital during this period. However, bariatric surgery became popular in Jordan only in 2015 with a policy guideline for bariatric surgery being introduced in the country later in 2016. It is therefore likely that the current study had captured the opinions of most of the

individuals that had undergone bariatric surgery in Jordan by the time the current study was undertaken despite having recruited only the patients that had undergone bariatric surgery in 2015, 2016 and 2017.

The current study had been designed in a retrospective manner with individuals being expected to recall information about obesity, its associated risk factors and its treatment interventions. This was likely to cause recall bias because individuals can differ systematically in terms of their ability to recall past information. Findings obtained in the current study were also likely to be affected by social desirability bias because the patients and healthcare professionals investigated in the study had been asked to provide their own opinions in relation to obesity, risk factors associated with obesity and obesity interventions including bariatric surgery. Some of the individuals investigated in the current study might have provided information that they thought was desirable rather than accurate information about what was investigated resulting to what is known as social desirability bias. As a result, validity and reliability of the findings that had been obtained in the current study could be questioned.

Although the current study had used both patients and healthcare professionals as sources of evidence about multi-disciplinary treatment and management of obesity and bariatric surgery in Jordan, information obtained from the healthcare professionals interviewed in the study was not as much detailed as could have been required. In the study, the healthcare professionals had used single statements to respond to questions asked in the interviews, which made the reasons for their responses not to be clear. Moreover, the researcher managed to interview just four of the five healthcare professionals that were to be interviewed. This is an indication that some of the information that was to be collected for addressing the research question might have failed to be collected by the study.

Information obtained from the data collected from the patients investigated in the study is also unlikely to be optimal given how it had been analysed. Method used to analyse the data collected in the study were descriptive statistics such as frequencies and relative frequencies and means and standard deviations and inferential statistics such as chi-square tests and ANOVAs. Statistical models such as logistic, ordinal or multinomial regressions had not been used. The analysis undertaken in the study was not therefore able to show relationships between variables when other variables were controlled. For example, the analysis undertaken was not able to show

the association between obesity and any of the investigated risk factor associated with obesity when other risk factors associated with obesity are controlled.

6.4 Suggestion for Further Research

The current study has provided useful insights in relation to multidisciplinary treatment and management of obesity and bariatric surgery in Jordan despite its limitations. Further research could however be required on the issue to verify the findings obtained in the current study. Suggested further research should be undertaken in several obesity management centres in Jordan to determine the extent to which the findings obtained in the current study could be generalised to the treatment and management of obesity and bariatric surgery across Jordan. Moreover, suggested further research should have a control group consisting of patients of bariatric surgery and healthcare professionals from obesity management centres in a country with ideal multi-disciplinary approach for treatment and management of obesity before and after bariatric surgery. Data collected from healthcare professionals interviewed in the suggested further research should also be made to be as much detailed as possible through modifying the questions asked in the interviews and undertaking probing when conducting the interviews. Analysis of data obtained from the patients, on the other hand, should be undertaken not only using descriptive and inferential statistics used in the current study, but also using statistical models such as logistic, ordinal or multinomial regressions.

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