

**OBESITY MANAGEMENT IN ADULTS
AMONG PRIMARY CARE DOCTORS:
A QUALITATIVE STUDY**

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by

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LIST OF ABBREVIATIONS

AACE	American Association of Clinical Endocrinology
AFPM	Academies of Family Physicians of Malaysia
APM	Airborne Particulate Matter
ATFM	Advanced Training in Family Medicine Programme
BMI	Body Mass Index
BP	Blood Pressure
CAC	COVID-19 Assessment Centres
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CI	Confidence Interval
CME	Continuing Medical Education
COVID-19	Coronavirus Disease
CPG	Clinical Practice Guideline
EOSS	Edmonton Obesity Staging System
FDA	Food & Drug Administration
FPS	Fat Phobia Scale
FRACGP	Fellow of Royal Australian College of General Practitioners
GCFM	Graduate Certificate in Family Medicine Programme
GDP	Gross Domestic Product
GLP	Glucagon-like Peptide
GP	General Practitioner
HDL	High-Density Lipoprotein
ICU	Intensive Care Unit
IDI	In-Depth Interviews
IF	Intermittent Fasting
JEPeM	Jawatankuasa Etika Penyelidikan Manusia USM
KK	Klinik Kesihatan
KL	Kuala Lumpur
LAGB	Laparoscopic Adjustable Gastric Band
LDL	Low-Density Lipoprotein
LEP	Leptin

LEPR	Leptin Receptor
LSG	Laparoscopic Sleeve Gastrectomy
MCH/KKIA	Maternal & Child Health / Klinik Kesihatan Ibu & Anak
MCO	Movement Control Order
MC4R	Melanocortin 4 Receptor
MDT	Multi-Disciplinary Team
MHP	Malaysian Healthy Plate
MInTFM	Malaysia-Ireland Training Programme for Family Medicine
MMA	Malaysian Medical Academies
MMed	Master of Medicine
MOH/KKM	Ministry Of Health / Kementerian Kesihatan Malaysia
MRCGP	Member of Royal College of General Practitioner, United Kingdom
MREC	Medical Research & Ethics Committee
NCD	Non-Communicable Diseases
NHMS	National Health and Morbidity Surveys
NRPM	Nutrition Research Priorities in Malaysia
PCD	Primary Care Doctor
PCP	Primary Care Physician
PIS	Participant Information Sheet
POMC	Pro-Opiomelanocortin
QOL	Quality of Life
QQH	Quarter Quarter Half
RYGB	Roux-en-Y Gastric Bypass
SSB	Sugar Sweetened Beverages
TDF	Theoretical Domains Framework
WHO	World Health Organization

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**PENGURUSAN OBESITI ORANG DEWASA DALAM KALANGAN
DOKTOR PERAWAT PRIMER: KAJIAN KUALITATIF**

ABSTRAK

Bilangan orang yang hidup dengan obesiti semakin meningkat di seluruh dunia. Malaysia juga tidak terlepas daripada wabak obesiti global dan telah dilabelkan sebagai negara paling gemuk di Asia Tenggara. Objektif yang disasarkan adalah (1) untuk meneroka faktor-faktor yang mempengaruhi pengurusan obesiti orang dewasa di kalangan doktor perawat primer, (2) untuk menyiasat pengalaman dan persepsi doktor perawat primer dalam pengurusan obesiti orang dewasa, (3) untuk menilai pengetahuan pengurusan obesiti orang dewasa dalam kalangan doktor perawat primer, dan (4) untuk menentukan pemboleh dan halangan dalam pengurusan obesiti orang dewasa di kalangan doktor perawat primer. Kajian ini menggunakan metodologi kualitatif dan temu bual mendalam (IDI) berpandukan soal selidik separa berstruktur. Sepuluh PCD telah dipilih secara bertujuan untuk mengambil bahagian dalam kajian ini. Temu bual telah dijalankan secara maya di mana kesemua rakaman audio telah ditranskripsikan secara verbatim sebelum dieksport ke perisian ATLAS.ti 8 untuk analisis data. Analisis tematik digunakan untuk mengenal pasti tema biasa apabila ketepuan data dicapai. Penemuan kajian mendedahkan bahawa doktor perawat primer mempunyai pengetahuan yang terhad, menerima latihan dan sokongan dalam kadar yang minimum dalam pengurusan obesiti di kalangan orang dewasa. Tidak dinafikan, penjagaan primer adalah tempat yang terbaik untuk pesakit mendapatkan rawatan obesiti untuk kebolehcapaian dan kesinambungan penjagaannya. Pengurusan obesiti akan berjaya apabila doktor perawat primer dilengkapi dengan pengetahuan dan latihan, mampu mengekalkan motivasi pesakit, dan menerima sokongan yang

mencukupi daripada sistem penjagaan kesihatan. Maklumat ini akan memberi pencerahan kepada pihak berkepentingan dalam menyusun strategi intervensi di masa hadapan, merangka belanjawan, membina dasar, dan dalam mengenal pasti hala tuju penyelidikan masa depan yang berpotensi untuk akhirnya meningkatkan kualiti penjagaan obesiti.

OBESITY MANAGEMENT IN ADULTS AMONG PRIMARY CARE DOCTORS: A QUALITATIVE STUDY

ABSTRACT

Number of people living with obesity are on the rise worldwide. Malaysia, too, is not spared from the global epidemic of obesity and has been labelled as the fattest nation in Southeast Asia. The objectives aimed are (1) to explore the factors influencing obesity management in adults among PCDs, (2) to investigate the experiences and perceptions of PCDs in obesity management in adults, (3) to evaluate the knowledge of obesity management in adults among PCDs, and (4) to determine the enablers and barriers in obesity management in adults among PCDs. This study adopted a qualitative methodology and in-depth interviews (IDIs) guided with semi-structured questionnaire. Ten PCDs were selected purposively to participate in the study. Interviews were conducted virtually where all the audio recordings were transcribed verbatim before being exported to the ATLAS.ti 8 software for data analysis. Thematic analyses were applied to identify common themes when data saturation was achieved. The findings revealed that PCDs have limited knowledge, received minimal training and support in managing obesity among adults. Undoubtedly, primary care is the best setting for patients to seek obesity treatment for its accessibility and continuity of care. Managing obesity would be successful when PCDs are well equipped with knowledge and training, able to sustain patients' motivation, and receive sufficient support from the healthcare system. This information will enlighten stakeholders in strategizing future interventions, drafting budget, building policies, and in identifying potential directions of future research to ultimately improve the quality of obesity care.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

People living with obesity are on the rise worldwide. This disease is a significant precursor to multiple complications such as stroke, heart disease, diabetes, and cancer, which are only a part of a long list (Kriaucioniene et al., 2019). Inevitably, these complications increase the mortality and morbidity in a person. Malaysia, too, is not spared from the global epidemic of obesity. There is a significantly increased in the prevalence of adult overweight and obesity in the country, and Malaysia has been dubbed as having the highest prevalence of obesity in Southeast Asia (Abu Bakar et al., 2015; Ghee, 2016). Malaysia's National Health and Morbidity Survey (NHMS) year 2011, 2015 found that the prevalence of adults' obesity and overweight had increased, from 15.1% to 17.7% and from 29.4% to 30.0%, respectively (Abu Bakar et al., 2015; Ghee, 2016). Recently, the NHMS reported that the prevalence of adults' obesity and overweight had a slight increase to 19.7 % and 30.4% respectively in 2019 (Sivam & Harith, 2022). The surplus of food per capita at the end of the 20th century possibly had promoted excessive food consumption. Increased food consumption, coupled with the sedentary lifestyle, results in an increased waistline among Malaysian adults (Ghee, 2016; Mohamad Nor et al., 2018).

The most prevailing effort to address this issue was the publication of the obesity management guidelines in 2004. It outlines the diagnosis, assessment, and treatment strategies for both adult and paediatric populations (Ministry of Health Malaysia, 2004). Lifestyle modification, e.g., low-calorie diet, exercise prescription, has been recommended as the mainstay of treatment (Ghee, 2016; Ministry of Health

Malaysia, 2004). Additionally, medication and bariatric surgery are also part of the treatment options (Del Re et al., 2014; Ministry of Health Malaysia, 2004). The treatment of choice depends on the effectiveness, patient's indication, cost, and side effect.

All levels in the healthcare system play a role, particularly primary care (Kriaucioniene et al., 2019). It is considered an ideal setting for weight management because of the continuity of care and accessibility it provides. Primary care offers regular medical check-ups to the public, thus increasing the chance of diagnosis and assessment of obesity for further interventions. are the key person in the overall treatment of patients (Blackburn et al., 2015). They are the providers who have long term direct contact with patients to come up with an agreeable treatment plan. Patients were reported to have the utmost trust in their PCDs for health information and recommendations as compared to other sources, e.g., family, friends, and social media (Kriaucioniene et al., 2019). Despite the availability of an evidence-based national guideline and accessible care to patients, the ever-increasing number of adults with obesity warrants an in-depth review to halt and reverse the trend.

Studies have reported a low proportion of body mass index (BMI) documentation during primary care consultations. According to a systematic review published in 2017, BMI documentation ranges from 28% to 79% in the United Kingdom (UK) (McLaughlin et al., 2017). The wide range is due to the different timeframe used for reporting the proportion of BMI records, which were between one to five years. However, most of the studies included found that only around 50% of primary care visits had a recorded BMI. The substandard assessment might result in a lackadaisical attitude towards the management of obesity. There is evidence to suggest

that this concern might have happened. Studies reported that only 15% to 42% of patients with obesity and overweight were offered interventions, and weight-loss counselling and discussion of treatment plan were usually forgone (Bramlage et al., 2004; Jay et al., 2010; McLaughlin et al., 2017).

Pharmacotherapy is one of the pillars for obesity management but commonly excluded from the patient's treatment plan. In an observational study conducted among 2.2 million United States (US) adults, only less than 2% of eligible adults with obesity were prescribed anti-obesity medication. Of note, nearly 90% of the prescriptions were from PCDs (Saxon et al., 2019). This data suggested that PCDs, indeed, are the leading care provider for obesity, albeit only a small proportion of them are prescribing pharmacotherapy.

Besides under prescription of weight-loss medication, adults with severe obesity, who did not respond to existing treatment were also under-referred to bariatric surgeons. Only 9% of PCDs who were affiliated to an academic medical centre in the US, referred their patients with severe obesity to a bariatric surgeon (Tork et al., 2015). A questionnaire-based study conducted among PCDs in France reported that a staggering 56.6% of them proposed bariatric surgery to their patients. Although there was a considerable difference between the two studies, only one-third of PCDs were the ones who initiated the discussion about surgical referrals (Martini et al., 2018). Contrary to the extensive data available in other countries, literature search regarding anti-obesity medication prescriptions and bariatric surgeon referrals in Malaysian primary care was scarce.

The passivity among PCDs to assess, diagnose and manage obesity is appalling. Multiple studies, both quantitative and qualitative, were conducted to

explore the reasons for such a predicament. Time constraint, perceived lack of knowledge and confidence were frequently cited roadblocks for PCDs to counsel and manage adults' obesity (Blackburn et al., 2015; Blane et al., 2017; Butt et al., 2019; Fogelman et al., 2002; Kriaucioniene et al., 2019; Martini et al., 2018; Mazza et al., 2019; Thomas et al., 2016; Tork et al., 2015). PCDs were also worried about the possible embarrassment and stress patients might feel when discussing weight management (Blackburn et al., 2015; Mazza et al., 2019). In agreement, a study conducted in the UK's primary care, among patients with obesity, also found that discussion about weight made patients feeling annoyed, stigmatized, and helpless (Brown et al., 2006).

The cost, success rate, and risks of treatment are common factors patients will weigh before deciding on their treatment. These factors were also found to be essential for PCDs in recommending obesity treatment (Gunther et al., 2012; Kriaucioniene et al., 2019; Mazza et al., 2019; Tork et al., 2015). They were concerned that discrepancies between the expectation and reality in these factors might cause patients to lose confidence in them and give up on their follow up (Blackburn et al., 2015; Mazza et al., 2019). In addition, some PCDs did not see obesity as a disease and downplayed the roles of pharmacological and surgical interventions (Epstein and Ogden, 2005; Kilpatrick et al., 2018; Saxon et al., 2019; Thomas et al., 2016). Such thought might prevent adequate assessment and management of adults living with obesity which they deserve.

Despite the barriers reported, several factors that empower PCDs in managing adult obesity were found. The continuity of care that primary care provides has built a conducive doctor-patient relationship to facilitate, both PCDs and patients, in

discussing weight issues (Blackburn et al., 2015; Gunther et al., 2012; Mazza et al., 2019). As a result of this relationship, PCDs also felt a sense of responsibility in treating their patients holistically, which includes obesity treatment (Mazza et al., 2019). Of note, a study conducted in Pakistan primary care found that PCD with normal BMI was associated with higher confidence in managing obesity (Butt et al., 2019). These findings provide an insight into the importance of PCDs' self-body image perception when handling patients with obesity.

Given the rising prevalence of obesity in Malaysia, multiple studies have been conducted locally for the past ten years to assess this problem and to find a solution. However, a recent scoping review revealed that there was a lacking in focus on the development and evaluation of obesity management (Mohamad Nor et al., 2018). Most of them were epidemiological studies, and only three out of 188 articles were qualitative research. A further literature search found that there has been little exploration of the experience and challenges the PCDs faced in managing obesity in adult. This information is essential to plan strategies in tackling the obesity epidemic base on the local context. Therefore, there is a need to explore PCDs' experience and the factors influencing them in managing adult obesity.

1.2 Objectives of the Study

1.2.1 General Objectives

The general objective of this study is to explore the factors influencing obesity management in adults among PCDs.

1.2.2 Specific Objectives

1. To investigate the experiences and perceptions of PCDs in obesity management in adults.
2. To evaluate the knowledge of obesity management in adults among PCDs.
3. To determine the enablers and barriers in obesity management in adults among PCDs.

1.2.3 Significance of the Study

It is anticipated that this study would provide some insights and benefit of obesity management for PCDs, patients, and the healthcare system.

Table 1.1 Significance of this study

PCDs	<ul style="list-style-type: none">• To increase knowledge of obesity and improve on ways to consult and treat patients
Patients	<ul style="list-style-type: none">• To increase awareness on obesity, healthy eating, regular physical activities, and quality of life
Healthcare System	<ul style="list-style-type: none">• To encourage policymaker on the importance of having updated clinical practice guidelines• To urge the policymaker to provide better facilities for patients with obesity• To increase research on obesity, its causes, treatments, barriers, and enablers

CHAPTER 2

LITERATURE REVIEW

This chapter reviews the literature from current and previous studies on management of adults with obesity among PCDs. The chapter explores the prevalence of obesity, the Clinical Practice Guideline (CPG) for obesity management, the fundamental of obesity management within primary care, PCDs experiences and perceptions towards obesity management, and PCDs challenges in obesity management within the primary care setting.

2.1 Prevalence of Obesity

Obesity is a major public health problem on a global scale, having tripled in prevalence since 1975 to over 1.9 billion patients who are overweight and 650 million patients with obesity issues. Once it was thought to be an issue only in high-income countries, obesity and overweight have now become endemic in low to middle income countries too (WHO, 2020).

Along with the pre-existing public health conditions such as infectious diseases and starvation, low to middle income countries are also now confronting a dramatic increase in obesity and overweight. These conditions doubled the burden of sickness which cause a more serious economic risk and places a pressure on these countries' already overcrowded health systems. For example, in Asia-Pacific, the financial burden associated with obesity and its comorbidities, such as coronary heart disease, ranges between 1.5 % and 9.9 % of overall health-care costs (Lee et al., 2007). This quick shift in obesity and overweight trends can be related to changes in food and physical activity habits in relation to environmental and social changes.

In 2017, the National Health and Morbidity Survey (NHMS) in Malaysia reported a prevalence of 50.1% adults are overweight in which 30.4% and 19.7% adult population are classified as overweight and obese respectively. The trends of overweight and obesity continue to rise in comparison to NMHS 2011 (29.4%,15.1%), NMHS 2015 (30.0%,17.7%) and NHMS 2019 (30.4%, 19.7%) findings (Ministry of Health Malaysia, 2018; Sivam & Harith, 2022).

Malaysians have one of the highest obesity rates in Southeast Asia. According to the most current figures published in the (NHMS,2019), the prevalence of patients with overweight issues is at 30.4% and patients with obesity is at 19.7%, representing a fourfold rise in obesity prevalence rates since 2004 (Ministry of Health Malaysia, 2015; Sivam & Harith, 2022).

2.2 Malaysian Clinical Practice Guideline for Obesity Management

To help healthcare professionals, particularly PCDs, to treat obesity, many CPGs were published globally. For instance, the biannually updated Obesity Medicine Association's treatment algorithm, Obesity Canada's CPG published a couple of years ago and from other major endocrine and/or obesity care related societies (Bays et al., 2021; Obesity Canada, 2007; Wharton et al., 2020).

CPG sets a standard practice for PCDs in treating diseases. It is a handy document, easily accessible (mostly uploaded online), provides concise information adequate for clinical practice and supported by the latest evidence. In addition, CPG is also a good reference document to plan continuous medical education, and some used it as a study material for board/specialty examinations (Alexander et al., 2007; Zainudin et al., 2011).

The most recent CPG in Malaysia for obesity management was published in 2004 (Ministry of Health Malaysia, 2004). It is a 57 pages document. The introductory content includes background epidemiological data of obesity, its impact on health and economy, and the benefits of weight-loss. After that, there are chapters for obesity diagnosis and assessments, lifestyle interventions, pharmacotherapy, and surgical treatment. Of note, there is also a chapter on childhood and adolescent obesity. Though dated, the Malaysia CPG is a comprehensive document that provide obesity management guidance and as a reference source for many researchers conducted locally, be it clinical or basic science ones (Zainudin et al., 2011). In the Ministry of Health, Malaysia website, the CPG is shown to be under review for update (Ministry of Health Malaysia, 2004).

2.3 The Fundamental of Obesity Management within Primary Care

2.3.1 General Recommendation

According to most guidelines, (Alfadda et al., 2016; Garvey et al., 2016; Gonzalez-Campoy et al., 2013; Rust et al., 2020) a multidisciplinary team should be assigned to manage overweight and obesity as a chronic disease over the long term. Weight loss of 0.25 to 1.0 kg per week and a 5% to 10% reduction in body weight over 6 to 12 months is the suggested therapeutic objective for all patients who are living with obesity or overweight. The primary care management main objective should focus on improving patients' health by preventing or treating weight-related problems. Weight loss objectives ranged from a minimum of 5% to 40%, depending on the severity of weight-related comorbidities.

2.3.2 Role of Primary Care Providers in Malaysia for Obesity Management

Turner and colleagues (2015) provide an overview of the recommended roles of primary care doctors as listed below:

- I. Diagnose the stages of obesity and overweight.
- II. Recognize and address comorbidities associated with obesity.
- III. Identify therapies that are appropriate for a particular patient.
- IV. Weight loss management, includes:
 - a. Delivering lifestyle interventions effectively (diet, physical activity, and behaviour modification).
- V. Consideration of medication for obesity
 - a. Weight-centric prescribing: avoiding weight-promoting drugs in favour of those that are either weight-neutral or cause some weight reduction.
- VI. Appropriate prescription of drugs licenced for the treatment of obesity.
- VII. Referral to experts for speciality treatment (e.g., obesity medicine specialists and/or bariatric surgical procedures) and prevention of weight regain in individuals who have lost weight successfully.

The authors confidence in entrusting PCDs with these roles is justifiable because PCDs, both government and private sectors, have a good track record in treatment and prevention of chronic diseases (Mohamad Nor et al., 2018).

Moreover, primary care is the most visited facilities because of its accessibility and capability to provide continuity of care, especially in chronic diseases management like obesity.

2.3.3 Diagnosis Method

The World Health Organization (WHO) defines overweight as a body mass index (BMI) of 25kg/m², while obesity is defined as a BMI of 30kg/m² (WHO, 2020). Asians have lower obesity counts than Europeans, since Asians have more visceral adipose tissue (WHO Expert Consultation, 2004).

In the Asian context, the BMI cut-off values have been changed such that a BMI of 23kg/m² indicates a little increase in risk, while a BMI of 27kg/m² indicates a significant increase in risk for cardiovascular disease and diabetes (Barba et al., 2004; WHO Expert Consultation, 2004). At least five large-scale studies in Malaysia, including a series of NHMS, have reported the prevalence of obesity using these diagnostic criteria (Abd Kadir Abu Bakar et al., 2015; Ministry of Health Malaysia, 2015; Nor et al., 2008).

It has been reported that BMI greater than or equal to 25 kg/m² but less than 30 kg/m² was deemed to be related with an increased risk of cardiovascular disease, whereas a BMI of greater than or equal to 30 kg/m² was assessed to be associated with an increased risk of cardiovascular disease and mortality (Alfadda et al., 2016; Faruqi et al., 2015; Fernández et al., 2012; Fried et al., 2017; Itani et al., 2020; Rust et al., 2020).

While some guidelines indicated that BMI cut offs and associated cardiovascular risk may vary by demographic group, only one guideline advocated a precise BMI cut off greater than or equal to 23 kg/m² for overweight Asian people (Amirthalingam, 2020). The study also mentioned that waist circumference should not be used routinely to diagnose overweight and obesity, it does provide important information about the risk of developing long-term health problems associated with

obesity. Adults with overweight or obesity should undergo a targeted assessment that includes information about possible causes such as current weight history, personal lifestyle, psychosocial stress, other psychological issues, prior attempts to lose weight, social background, and motivation and willingness to lose weight (Amirthalingam, 2020).

There are other methods of diagnosing obesity besides than using BMI which includes the American Association of Clinical Endocrinology (AACE) obesity guidelines or the person-centred obesity care such as the Edmonton Obesity Staging System (EOSS) and '4M' approach.

The anthropometric component of diagnosing obesity according to the AACE obesity guidelines are yearly BMI screening, to use waist-hip ratio if the patient's BMI is <35 , and to consider using body composition techniques. the guideline acts as a guidance in diagnosing, assessing, and in treating obesity (Garvey et al., 2016; Zhu and Wang, 2017). AACE is an example of complications-centric approach to management of obesity. The care model comprises of 4 parts which are the contextualization such as the health care system, an equipped obesity practice, an "activated" patient, and result of the assessment. AACE prioritize on preventing and treating the complications which eventually resulting in a better health (Garvey, 2022; Garvey et al., 2016; Mechanick et al., 2017).

The EOSS is a four-stage system which consist of physical, metabolic, social, and psychological parameters to classify obesity and to figure out the most favourable treatment obesity for patients. Studies have described EOSS to have better outcome of treatment when compared with BMI. EOSS treatment covers mainly the physical, mental, and occupational health impacts, and it is reported that patients with obesity

in a higher stage of EOSS will need longer treatment times than patients in lower EOSS stages to achieve similar weight (Canning et al., 2015).

Meanwhile, the '4M' approach which stands for metabolic, mental, mechanical, and monetary factors are meant to distinguish the musculoskeletal and metabolic dysfunction, and to bring out the effect of weight has on fiscal health (Kalra et al., 2020).

Utilizing guidelines such as EOSS and AACE on top of BMI and waist-hip ratio when diagnosing obesity will allow PCDs to gather a thorough history from the patient and facilitate a better treatment plan (Wharton et al., 2020).

2.4 Management Approaches to Obesity

2.4.1 PCDs Recommendations for Adults with Weight Related Complications or Comorbidities

Weight-related complication and other comorbidities and/or risk factors were listed in five guidelines (Amirthalingam, 2020; Faruqi et al., 2015; Fernández et al., 2012; Fried et al., 2017) and are regarded as an integral element of a patient's medical history. Weight-related problems and other coexisting conditions, on the other hand, should be handled independently of any weight-loss therapy. Additionally, a medication review of drugs that may contribute to weight increase should be adjusted or substituted, whilst weight neutral medications, or medications that have weight loss effect, should be utilised to treat weight-related complications and other comorbidities.

As we know, the whole world has been affected by COVID-19 and it has been reported that individuals with obesity and its comorbidities are at a higher risk with poor outcomes, higher risk of hospitalization. Higher risk of Intensive Care Unit (ICU)

admission and has the highest numbers of death per million people (Haase et al., 2021). In addition, circumstances such as the movement restrictions, quarantine period at home, and financial limitation for some during the COVID-19 pandemic increases the risk of obesity (Goryakin et al., 2018).

2.4.2 Lifestyle Modification

Dietary and physical exercise suggestions, as well as behavioural interventions, were all suggested in these guidelines (Alfadda et al., 2016; Amirthalingam, 2020; Faruqi et al., 2015; Fried et al., 2017; Garvey et al., 2016; Gonzalez-Campoy et al., 2013; Itani et al., 2020). Weight loss is suggested for those with a BMI more than or equal to 30 kg/m², or with a BMI greater than or equal to 25 kg/m² and weight related problems (for example diabetes, hypertension). A comprehensive lifestyle programme includes medical nutrition therapy, physical activity routine, and strategies to foster behavioural change. Treatment should last at least six to twelve months and it can be individually or in group sessions with a skilled health provide such as nurse, dietitians, psychologist, or doctors.

Adults who are overweight but do not have any weight-related issues should be given information and counselling on how to adjust their behaviours as a mean to have a healthier lifestyle via nutritional modification and by being active physically. It was emphasised that in addition to weight loss, long term efforts to maintain weight loss are equally important. These should include a low-calorie, well-balanced diet, increased physical activity, and psychological support. Patients should be contacted at least monthly for at least a year for this purpose, either in person or by phone (Alfadda et al., 2016; Amirthalingam, 2020; Faruqi et al., 2015; Fried et al., 2017; Garvey et al., 2016; Gonzalez-Campoy et al., 2013; Itani et al., 2020).

There were also guidelines that included specific recommendations on nutritional changes (Amirthalingam, 2020; Faruqi et al., 2015; Fernández et al., 2012; Rust et al., 2020). To help patients to lose weight, nutritionists should use dietary interventions that result in a daily calorie deficit of 500 to 750 kcal. The composition of nutritional therapy was irrelevant if the food was balanced and healthful, according to the standards.

Additionally, to maximise adherence, nutritional interventions should be tailored to the individual's and culture's preferences. As viable interventions, structured meal plans, quantity management, and meal substitutes are advised. Diets that are excessively restricted and nutritionally deficient, or fad diets, are most discouraged. Very low-calorie diets (calorie intake 800 kcal/day) should not be advised consistently to manage obesity, but rather for specific causes and medical situations, such as weight-related complications or circumstances necessitating rapid weight loss such as pre-operative preparation in bariatric surgery. In addition, a very low-calorie strategy should always be monitored by a doctor (Ryan and Kahan, 2018).

Calorie restriction is paired with suggestions to exercise for at least 30 minutes most days of the week (i.e., 180 minutes/week) such as brisk walking. Behavioural therapy is often offered in weekly group or individual sessions supervised by certified dietitians, psychologists, exercise experts, and other counselling professionals in academic medical facilities. Over the course of 16 to 26 weeks, a weekly group lifestyle intervention results in a mean weight loss of around 7 to 10% of beginning weight (Ryan and Kahan, 2018).

The importance of physical activity was also emphasised in most guidelines. Physical activity interventions should be tailored to each patient's capabilities and preferences, with a particular emphasis on activities of daily living (e.g., walking, cycling, and gardening). Individuals with a BMI greater than 35 kg/m² should avoid activities that place a strain on the musculoskeletal system. Most of the guidelines advocated for at least 30 minutes of moderate-intensity endurance activity five or more days a week, in addition to strength training, twice a week. Resistance training alone is ineffective for weight loss. In general, it is advisable to limit sedentary activities (e.g., watching television or working on a computer) (Ryan and Kahan, 2018).

Obesity is the result of a combination of environmental and genetic factors, including but not limited to differences in appetite regulation, food consumption, metabolism, body-fat distribution, and BMI, as well as differences in dietary preferences, physical activity tolerance, and sleep-wake rhythms. There is evidence linking a chronotype to an increased likelihood of being overweight (Golden & Kessler, 2020).

The links between obesity and both genetics and lifestyle are well established. Heritability studies show that genes play a significant role in obesity, although their full extent has only recently begun to be understood. However, Western societies facilitate the spread of obesity by normalising both high-calorie food sources and inactive lifestyles. The importance of living a healthy life is being increasingly recognised, though. Although stress and alcohol consumption as well as exposure to a wide range of industrial chemicals were not covered in this review, it is possible that they contribute to obesity via epigenetic mechanisms. The underlying reasons of obesity are thus significantly more complicated, encompassing social and cultural

issues, and at a more biological context, incorporating epigenetics mechanisms, regulation of food intake, and even the participation of the gut bacteria (Albuquerque et al., 2017).

Exposure to obesogenic (weight-promoting) environmental factors has been shown to have a significant impact on obesity gene expression, both in utero and in adulthood. Obesity research is challenging because of the widespread presence of obesogenic environments and the large number of genetic variants and polymorphisms that are linked to the condition (Golden & Kessler, 2020).

2.4.3 Pharmacology Intervention

Pharmacotherapies approved for long term weight management is only indicated as a supplement to lifestyle changes. This recommendation is specifically only for adults with a BMI greater than or equal to 30 kg/m², adults with a BMI greater than or equal to 27 kg/m² and weight-related complications, and adults who could not lose enough weight through lifestyle interventions alone. Pharmacological weight loss should be continued only if a person has dropped at least 5% of their starting body weight or 2 kg over the first 4 weeks of treatment. Patients with obesity should be prescribed weight reducing medicine for chronic weight management if the possible advantages exceed the hazards. It is not suggested to use weight-loss medications while pregnant, lactating, or breastfeeding, and pharmacological weight loss should be used with caution in the elderly. Additionally, most guidelines discourage the use of off-label medications (e.g., amphetamines, diuretics, and thyroxine) for weight loss, as well as the use of other dietary supplements and medical products (Saunders et al., 2018; Srivastava et al., 2019).

Examples of medications that are prescribed to individuals with obesity are phentermine, orlistat, liraglutide, combination of phentermine and topiramate, combination of naltrexone and bupropion, and semaglutide (Golden, 2017). These medications are approved by the Food and Drug Administration (FDA) and are licensed in Malaysia. However, only liraglutide, phentermine and orlistat are licensed in Malaysia.

Phentermine is a sympathomimetic amine and works by releasing catecholamines in the hypothalamus which will reduce one's appetite and eventually decreasing food consumption. Phentermine is the most common prescribed medications in the USA and other countries and its reported side effect are dry mouth, dizziness, nausea, vomiting, diarrhoea, constipation, and difficulty sleeping (Srivastava and Apovian, 2018).

Another medication is orlistat where it works by inhibiting the pancreatic and gastric lipases, which leads to a 30% reduction of fat absorption. The common side effect for orlistat includes oily spotting, faecal incontinency, oily defecation, and vitamin A, D, E, K, and β -carotene deficiencies (Srivastava and Apovian, 2018). Orlistat is the only medicine that can be found over the counter and its effectiveness in losing weight has been reported in many studies. Orlistat works better when coupled with a balanced and mildly low-calorie diet (Qi, 2018).

Liraglutide is a glucagon-like peptide (GLP1) receptor agonist of an incretin-derived acting on the central and peripheral receptor pathways which lead to reducing appetite and calorie intake. Liraglutide is effective to be taken for patients with or without Type-2 diabetes mellitus and is taken through subcutaneous injection and its reported side effects include nausea, vomiting, constipation, diarrhoea, and abdominal

pain (Lin et al., 2020; Srivastava and Apovian, 2018). In a 56 weeks SCALE Diabetes participated by 846 individuals with BMI of 27 or greater proved that those who are on 3.0mg doses of liraglutide had more than 6% weight reduction compared to those on 1.8mg doses of liraglutide which had 5% weight reduction compared to the individuals in placebo (Alruwaili et al., 2021).

The combination of phentermine/topiramate has proven to have better weight loss effects with reduced side effects than taking the medicine on its own. Topiramate is known as an epileptic drug and is prescribed for migraine headaches (Wilding, 2017). Some of the side effects are headache, dizziness, insomnia, constipation, anxiety, depression, and blurred vision (Srivastava and Apovian, 2018). In a meta-analysis study by (Lei et al., 2021) to investigate the combination of phentermine and topiramate in losing weight and its side effects, it has been reported that the combination of phentermine/topiramate has shown a successful weight loss with a risk of side effects to the nervous system.

Another combination of medicines are the naltrexone and bupropion where they work by blocking the opioid receptor-mediated pro-opiomelanocortin auto inhibition and inhibits the reuptake of noradrenalin and dopamine resulting in decreasing food intake and satiety. The side effects of this medication include nausea, vomiting, headaches, and constipation (Srivastava and Apovian, 2018; Wilding, 2017).

On the other hand, semaglutide works similar to liraglutide, but have shown greater results in increasing weight loss compared to liraglutide. Semaglutide is also given by subcutaneous injection with a dose of 2.4mg once weekly (Chao et al., 2021; O'Neil et al., 2018). In a 12-week study comparing the effectiveness of semaglutide

and liraglutide, semaglutide has shown to reduce their weight by doubled compared to those who are on liraglutide (Phillips and Clements, 2022).

2.4.4 Surgery Intervention

Eleven guidelines support bariatric surgery as a treatment option for patients with a BMI larger than or equal to 40 kg/m² or a BMI greater than or equal to 35 kg/m² with weight-related problems when all nonsurgical weight loss methods fail. Adults with BMI more than 50 kg/m² are considered suitable candidates for bariatric surgery regardless of whether they have previously used conservative weight loss methods. Surgery should be offered only after a thorough multidisciplinary assessment. Bariatric surgery may also be explored in patients with diabetes and a BMI of 30–34.9 kg/m², while the available evidence is limited, and long-term data are inadequate. According to the standards', advanced age does not preclude bariatric surgery. However, because to a lack of evidence, it is currently hard to estimate the advantages and harmful effects of bariatric surgery in individuals aged 65 years or older (Patel et al., 2019).

Currently, there are two common bariatric surgeries that have been proven to produce result of weight loss, reduced risk of obesity related complications and eventually increase patient's quality of life (Mechanick et al., 2020). The two bariatric surgeries are Laparoscopic Sleeve Gastrectomy (LSG) or and the Roux-en-Y Gastric Bypass (RYGB). Adults who go through LSG will go through the removal of almost 70% stomach and the fundus. Removal of these parts will result in reducing food intake by supressing the hunger hormone called the ghrelin which can be found in the stomach. In RYGB, a small pouch is created from the stomach and connected to the jejunum which limits the food storage and reduces the level of nutrients absorption in

small intestine (Tchang et al., 2021). Gagnon and Schafer (2018) said that hormonal changes able to influence the surgical procedures such as RYGB and LSG by reducing appetite and improving glucose homeostasis.

2.5 PCDs Experiences & Perceptions towards Obesity Management

The majority of PCDs believe it is the responsibility of both the patient and the PCD to ensure that the patient is counselled about obesity in a study conducted by (Petrin et al., 2017). Obesity, obesity-related disorders, and obesity-related risk factors are the most counselled topics among PCDs that offer obesity counselling. The most common issues in counselling are high blood pressure (89%) and the risk of heart disease (90%). In a comparison between PCDs and other clinicians, "exercise" is mentioned more frequently than "physical activity" (85% vs. 81%), "diet" is mentioned more frequently than "eating habits" (77% vs. 75%), and "obesity" is mentioned more frequently than "unhealthy weight" (60% vs 45 %). PCDs mentioned that they need more time (70%), training in obesity management (53%), better reimbursement (53%), and better tools to help patients recognise obesity concerns to improve their obesity counselling (50%). Majority of PCDs believe that better weight management training and tools to help patients recognise obesity risks appear to be crucial aspects in helping patients assess the risks of invasive therapy against the risks of continuing to be obese.

This above finding is a contrast to finding by Falvo et al. (2018), PCDs believed that managing obesity was the patient's duty (97.6%), and not on the shoulder of the PCD's (100%). 93% of respondents indicated that obesity is a prevalent diagnosis in their practise and exhibited an appropriate level of awareness about the medical effects of obesity. The majority of PCDs (88.9%) out of 160 reported "always" calculating patient BMI, but only 13.3% reported "always" discussing body mass index data.

Respondents most frequently prescribed diet and exercise to patients with obesity and rarely prescribed medications, with referrals for bariatric surgery. Many respondents (97%) were able to determine the proper bariatric surgery eligibility criteria, including a particular medical condition that can be improved or avoided post-operatively. 30% of PCDs reported prior unpleasant experiences with patients who had undergone bariatric surgery and were thus unwilling to refer more patients. Most PCDs (56%) reported on discussing obesity diagnosis with patients but are not always applying BMI in that discussion. They frequently suggest lifestyle change as a therapy option for patients, believing it to be the most effective way to combat obesity.

A survey conducted by Özgüç and colleagues (2021) which included 1044 doctors revealed that 743 doctors strongly agreed that a primary care practice should be involved in the treatment of obesity (71.1%). The most often cited reason for not pursuing treatment by primary care was the requirement for a multidisciplinary approach to obesity management. 72.3% from 573 participants believed that patients with a BMI greater than 40 kg/m² should be referred for surgery, 53.3% believed that patients with a BMI of 35-40 kg/m² and comorbidities should be referred for surgery, and 35.9% believed that patients with a BMI of 35-40 kg/m² and uncontrolled diabetes should be referred for surgery. doctors who were fresh to the profession were found to have a more favourable attitude toward surgical indications.

This study also discovered that PCDs in Turkey possessed a basic understanding of obesity therapy and were willing to treat and monitor these patients. However, it was determined that they were unable to appropriately focus on this issue due to the provider's multidisciplinary nature and the workload. Although young

doctors had a greater level of awareness about bariatric surgery, their views about patient referral were similar (Özgüç et al., 2021).

The finding of this study is similar to a study by Granara and Laurent (2017) which PCDs were surveyed to determine practice patterns, attitudes, barriers, and facilitators for prescribing weight loss medications. 76% of the primary care doctors did not prescribe weight loss medications for long-term, and 58% of PCDs had a negative attitude about pharmacotherapy. There were differences between advanced practise clinicians' and doctors' prescription habits and attitudes. The main barrier was safety concerns. Having two or more comorbid conditions and extreme obesity were predictors of weight loss medication prescription. Pharmacotherapy underutilization shows that PCDs may lack adequate understanding of medication safety and efficacy profiles. Delaying treatment until a high level of morbidity has been attained may be less effective than initiating treatment sooner.

In contrast to a survey of PCDs at an institute in the United States was done (Tork et al., 2015) to assess their attitudes, knowledge, and practises regarding the treatment of morbidly patients with obesity, with a particular emphasis on factors influencing referral patterns for bariatric surgery. The study found that the only 12% responders were satisfied with recommending nonsurgical therapies, even though 39% thought diet and exercise were useful for long-term weight loss. In the long run, 63% of the PCD's believe bariatric surgery is generally successful option. All of the responders were aware of the well-known benefits of bariatric surgery, such as the reduction of diabetes, hypertension, and hyperlipidaemia. In addition, 65% were familiar with the indications for bariatric surgery, and 70% felt comfortable discussing it as a treatment option with patients. Fewer than half of the respondents were

confidence in their ability to provide post-operative care. Cost was also cited as a barrier to refer their patients for surgical options, with 53% claiming that majority of their patients could not afford bariatric surgery.

2.6 PCDs Challenges in Obesity Management

2.6.1 Imbalances Level of Education and Training Among PCDs

The most significant impediment to discussing diet or exercise with patients was lack of exposure to evidence-based obesity management methods during medical school and residency training programmes. It has been reported that PCDs without adequate training on weight management and its treatment method, feel restricted and sometimes lack confidence to treat patients with weight related problems (Khan and Teoh, 2020). Hence, PCDs who acquired effective obesity management methods in medical school were more likely to address diet and exercise with patients with obesity than those who did not. Similarly, doctors who received training in excellent weight management practises were more likely to always address diet or exercise with patients with obesity than those who did not get training in good weight management practises (Antognoli et al., 2017).

In a study by (Hite et al., 2019) concerning provider-level setbacks to obesity care, only few doctors (23.6%) and residency training programs reported learnt the effective obesity management methods (30.9%). Only 32.7% felt that most patients with obesity are unwilling to make changes to their weight, and only 5.5% agreed that there are few effective therapies for obesity.

Among the system-level deterrent to obesity care were doctors' need for further education regarding weight management services (94.4%), as well as acknowledgment