Obesity management in the Saudi population

Aljohrah Aldubikhi, PhD.

ABSTRACT

السمنة مصدر قلق يهدد الصحة العامة في المملكة العربية السعودية، ولذا يجب معالجتها على الفور. ساهم نمط الحياة الخامل، والتغيرات في الحصص والاختيارات الغذائية،والثقافة،والجنس،والظروف المناخية،ومؤخرا COVID-١٩في ظهورالسمنة في المملكة العربية السعودية. تشمل التدخلات التي تستهدف السمنة إدارة نمط الحياة والعلاج الدوائي والجراحة. تدخلات نمط الحياة تعتبر خط علاجي أولي. تشمل الأنظمة الغذائية نظامًا غذائيًا منخفض الدهون، ونظامًا غذائيًا منخفض السعرات الحرارية، ونظامًا غذائيًا منخفض الكربوهيدرات ،ونظامًاغذائيًا عالي البروتين، ونظامًاغذائيًا يحتوي على مؤشر جلايسيمي منخفض . يمكن أن يكون لتدخلات النظام الغذائي والتمارين الرياضية تأثير كبير على فقدان الوزن. يعتبر العلاج الدوائي خيارا علاجيا في مرحلة متقدمة. الجراحة هي فقط للأشخاص الذين يعانون من السمنة المفرطة. من خلال المراجعة تبين أنه على الحكومة التدخل وتطبيق اللوائح والسياسات التي يمكن أن تحد من الإصابة بالسمنة. تهدف هذه المراجعة إلى معالجة السمنة في المملكة العربية السعودية، والتدخلات للحد منها، وتأثير COVID-١٩ على السمنة.

Obesity is an alarming public health concern and needs to be addressed promptly in the Kingdom of Saudi Arabia. Sedentary lifestyle, changes in dietary intake and choice, culture, gender, climatic conditions and, lately, COVID-19 have contributed to obesity as a near epidemic in the Kingdom of Saudi Arabia. Interventions targeting obesity includes lifestyle management, pharmacotherapy, and surgery. Lifestyle interventions qualify as first-line therapies. Diets include a low-fat diet, low-calorie diet, low-carbohydrate diet, high-protein diet, and low-glycemic-index diet. Diet and exercise interventions can have a huge impact on weight loss. Pharmacotherapy is considered a treatment option at a later stage. Surgery is only for severely obese individuals. Above all, the government has to intervene and implement regulations and policies that can curb the incidence of obesity. This review aims to address obesity in the Kingdom of Saudi Arabia, interventions to curb it, and the impact of COVID-19 on obesity.

Keywords: obesity, Kingdom of Saudi Arabia, diet, exercise, COVID-19

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From the Department of Public Health, College of Health Sciences, Saudi Electronic University, Riyadh, Kingdom of Saudi Arabia.

Address correspondence and reprint request to: Dr. Aljohrah Aldubikhi, Department of Public Health, College of Health Sciences, Saudi Electronic University, Riyadh, Kingdom of Saudi Arabia.
E-mail: a.aldubikhi@gmail.com
ORCID ID: https://orcid.org/0000-0001-6795-5029

Obesity has been on the rise in epidemic proportions for the past 5 decades. It is defined as the "accumulation of adipose tissue to excess and to an extent that impairs both physical and psychosocial health and well-being".[1] The body mass index (BMI) is a tool used to evaluate obesity. As per the standards of the Centers for Disease Control and Prevention, a BMI of 25 to less than 30 is categorized as overweight, and a BMI of 30 and higher is classified as obese. Obesity is further subdivided into classes: I) Class 1 for people with a BMI of 30 to less than 35; II) Class 2 for people with a BMI of 35 to less than 40; and III) Class 3 for people with a BMI of 40 or higher.[2] Obesity poses a serious public health concern and predisposes individuals to lifelong illnesses and economic burdens. As per reports from the World Health Organization (WHO), obesity has tripled globally since 1975.[3]

In Saudi Arabia, obesity is expanding at an alarming rate. According to the WHO survey in Saudi Arabia, the prevalence of overweight was 38% and 20% of obesity in 2019, which indicates that there are 13 million overweight and 7 million obese individuals in the country.[4] Another survey carried out by the Saudi Ministry of Health in collaboration with the Institute for Health Metrics and Evaluation in 2013 found high rates of obesity among different strata of the Saudi population. Diabetes, hypercholesterolemia, and hypertension are the most common diseases that stem from obesity among the Saudis.[5] Obesity is preventable, and policies to combat it with targeted methods are essential.[6] Following the recommendations of the Saudi clinical practice guideline for the management of overweight and obesity in adults, lifestyle interventions are the mainstay of treatment, followed by pharmacological

and surgical measures. Lifestyle intervention is a multi-pronged approach that involves healthy lifestyle habits, dietary interventions, dietary counseling, and physical exercise training.[7] This review summarizes the population-specific causes and area-specific causes that could have led to obesity in Saudi Arabia and dietary interventions, exercise, pharmacotherapy, and surgical interventions to manage obesity. This study also throws light on the effect of COVID-19 on obesity and future actions for controlling it.

Review. A literature review was carried out to extract relevant information from databases, including PubMed, MedLine, and Google Scholar. The combination of keywords used for extracting the articles was obesity, obese, Saudi, Saudi Arabia, Kingdom of Saudi Arabia, fast food, sedentary, climate, low-calorie diet, low-fat diet, low-carbohydrate diet, high protein diet, exercise, physical inactivity, surgical interventions, pharmacotherapy, COVID-19, and policies. Titles, followed by abstracts, were screened for their relevance. All articles with required information in the abstract were further scrutinized and read for more information. Data were gathered, organized, and structured logically.

Nutritional transition and population-specific factors. Saudi Arabia is one of the top unprecedented growing economies in the world. Changes in the world food system have evolved developing countries like Saudi Arabia toward a nutritional transition characterized by a predominant westernized diet. Within the 4 walls of the house, a tremendous leap in household income was witnessed in Saudi Arabia at the beginning of the 21st century, which led to a shift in nutrition intake and increased saturated fatty acid consumption. With higher incomes, family members have relied on house helpers, thus contributing to a sedentary lifestyle; this presents with a greater deposition of calories.[8] The culmination of which was an escalating incidence of obese and overweight individuals.

Uncontrollable appetite and fast-food consumption, coupled with overeating when stressed, has given rise to unhealthy eating practices in the Saudi population. An evident reduction in the consumption of vegetables and fruits with the reported overconsumption of calorie-rich foods increased the availability of fast foods at affordable prices, and the consumption of soft drinks accelerated weight gain.[9,10] Overeating at social gatherings is yet a significant contributor to weight gain, and most social gatherings take place during the evening or nighttime. It is a custom to serve Arabic coffee with dates or other sweet foods at social gatherings. It was believed that eating calorie-dense foods during nighttime is associated with an increased risk of obesity and a negative influence on health and body composition. However, recent evidence suggests that bed-time supply of small, nutrient dense, low energy foods rather than mixed meals promotes positive physiological changes in the healthy populations. Furthermore, bed time eating coupled with exercise training is associated with lower adverse effects among the obese popultion.[11,12]

Among school children in Saudi Arabia, increased television time, consumption of energy-dense snacks, and sugar-sweetened beverages pose a significant threat to the younger population.[13] Following unhealthy practices can make children particularly vulnerable to dietary inadequacies, which can interfere with their physiological development and growth. College students are also frequent victims of unhealthy eating practices. They are more prone to midnight snacking, sleeping directly after dinner, consuming energy drinks, and having an increased duration of inactivity, such as time spent on laptops, mobile phones, television, and video games.[14] A study has also documented a high density of fast food outlets around educational facilities in Riyadh, Saudi Arabia. Exposure of school and college students to fast food outlets surrounding their educational setting has been found to provoke increased fast food consumption.[15] Therefore, obesity prevention programs targeting children and parents are a requisite.

Evidence suggests a preponderance of the female population regarding obesity prevalence in Saudi Arabia. A sedentary lifestyle, cultural beliefs, and multiple pregnancies can influence the occurrence of obesity among Saudi females. Multigravida is a specific female risk factor associated with gestational weight gain and increased food consumption. Restricted access to outdoor activities and increased use of smartphones, television shows, and internet services can make Saudi females disproportionately less active than males. Another culturally distinct factor is the avoidance of any physical activity for up to 40 days during the postpartum phase.[16] Climatic factors also condition the lifestyle of people and affect their BMI.[17] Extreme outdoor temperatures and a lack of forestation force people to remain indoors and relatively inactive. People

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also resort to riding vehicles for traveling short distances. Therefore, the environmental facet cannot be neglected while examining the causes of obesity in Saudi Arabia.[18]

There are a myriad of causes for the rise of obesity. Treatments have to be designed considering the difference in these parameters. A few globally used measures are described below.

Dietary approaches to the treatment of obesity. Although weight loss has triggered popular dietary interests among individuals, energy balance remains a key component to effectuate weight control. Dietary interventions proposed for weight loss focus on energy consumption and macronutrient composition. In the hospital setting, nutritional counseling must be provided under medication management to encourage weight control. Therefore, it is imperative to follow healthy dietary habits and proper food selection to tackle the soaring risk of obesity.[19] The dietary regimens popularly recommended for obese and overweight individuals are as follows:

Low-calorie diet (LCD). A restriction of a combination of carbohydrates, fats, or proteins. Following diets that have energy intake below energy expenditure are called reducing diets by physicians, and LCDs belong to this category. Low-calorie diets also advocate a high-carbohydrate (50-60%), high-fiber, low-fat (<30%), and low-glycemic index plan. This diet follows the concept of the "calories in calories out model." Obese and overweight individuals neglect their daily energy consumption, therefore employing pre-packaged and portion-controlled meals and avoiding energy-dense snacks, which can offer greater efficacy. Although an LCD aids sustained weight loss, optimizing a way to achieve it remains unclear.[20,21] A rigorous conformation of an LCD is a very-low-calorie diet. It mandates clinical supervision and advocates an intake of less than 800 calories per day. Severely obese individuals can choose this diet, but it is onerous to follow and may be unsuitable for many.[22]

Low-fat diet. The principal aim of a low-fat diet is the reduction in the fat intake to 20-25% of the total energy intake and to exert a cardioprotective action. A low-fat diet has been advocated by physicians since the 1950s. A single gram of fat contains (9 calories) more than twice the amount of calories found in proteins and carbohydrates. Reduction in fat intake by up to 20%, particularly saturated fats, can lower cholesterol levels by 15%.[21,23] A very-low-fat diet is defined as a diet in which less than or equal to 15% of energy is derived from fats. Fruits, vegetables, whole grains, and low-fat, or fat-free diet products can be covered in a very low-fat diet. The use of this diet in younger children is restricted with the risk of lowered essential fatty acids in their diet. There are numerous unanswered questions regarding a very low-fat diet, ranging from its long-term feasibility to its inadequacy in fat-soluble vitamin absorption and the associated malnutrition.[24] Although this diet has a favorable impact on cardiovascular outcomes, there is a lack of evidence on its long-term clinically meaningful weight loss outcomes.[25]

Low-carbohydrate diet. It has claimed benefits for weight loss in a short period. There is a historical transition and paradigm shift in the dietary patterns of modern humans. Their diet is inclined to energy-dense sources. Although ancestral carbohydrate consumption was thought to be 35%, they primarily came from fruits and vegetables, and 2-3% came from honey. A low-carbohydrate diet favors glycogen utilization, decreases insulin secretion, and promotes lipolysis.[26-28] Very low-carbohydrate diets have energy contents between 200-800 kcal/day. They are generally not recommended, as they are associated with undesirable events and are only recommended under the guidance of trained medical personnel. Donnelly et al[29] found that in countries under the Gulf Cooperative Council, a traditional diet comprising of wheat, dates, and vegetables is being actively replaced with fast foods dominated largely by refined and processed meals loaded with carbohydrates and sugar. White bread, pasta (such as spaghetti, macaroni, noodles, and grit), snack foods (such as potato chips, popcorn, and chocolates), cakes, pastries, and sweet pies were their sources of carbohydrate intake.[29] High mortality rates and increased risk of cardiovascular events have been insinuated in individuals consuming a high-carbohydrate diet. Therefore, a reduction in carbohydrate intake (such as white bread and white rice) can benefit these individuals.[30]

High-protein diet (HPD). An HPD promotes body weight and fat mass reduction while maintaining fat-free mass. This diet also prevents weight regain after weight loss. High protein consumption elevates energy expenditure through diet-induced thermogenesis and increased resting metabolism. An HPD stimulates the release of anorexigenic hormones, including glucagon-like peptide-1 (GLP-1), cholecystokinin, and peptide tyrosine-tyrosine, which results in increased satiety. It also suppresses the release of ghrelin, an orexigenic hormone. This diet induces ketogenesis and gluconeogenesis. Thus, various mechanisms have been proposed to operate behind HPD-induced weight loss in obese individuals.[31] High-protein diet in an ad libitum design/energy-controlled design increases fat loss. The replacement of carbohydrate-rich food with proteins

has documented evidence for controlling glucose and HbA1c levels and can be beneficial for individuals with type 2 diabetes.[32]

Low glycemic index (GI) diet. It is a tool to determine the postprandial elevations in blood glucose. Foods rich in high GI starches induce weight gain, visceral adiposity, and lipogenic enzymes. For instance, lentils are a reliable source of low GI. They provide a sustained release of glucose into the bloodstream, which prompts a consistent and slower release of insulin, therefore improving insulin sensitivity and minimizing glucose fluctuations. Low GI foods also induce satiety and reduce hunger. Therefore, obese individuals can lose more weight on low GI diets compared to high GI diets. Compliance will be higher in a low-GI diet compared to all other diets, as there is less need for food restriction, provided that low-GI carbohydrates are consumed.[33-35]

There is a wealth of scientific evidence regarding effective dietary interventions and weight loss. A structured focused and systematic dietary intervention with inter-sectoral contribution is highly needed to reverse the current trends of obesity in Saudi Arabia.

Exercise-based interventions for obesity. Energy expenditure modification for weight loss can be attained through exercise. When carried out regularly, it exerts a strong protective action on obesity-related comorbidities. Dietary approaches integrated with exercise interventions have a more pronounced impact on weight reduction than physical activity alone. A total of 150 minutes of moderate-intensity exercise or 75 minutes of vigorous-intensity exercise each week and muscle/resistance training of the major muscle groups for 2 days a week are the current recommended standards for weight loss. Exercise is often overestimated, and weight loss can be expected only when the major muscles are used for exercise. The benefits of exercise in overweight and obese individuals are an increase in peripheral blood flow and basal metabolic rate; improvement in cardiovascular performance and lipid profile; reduction in truncal obesity and blood pressure; slowing down of atherosclerosis; decreased risk of type 2 diabetes mellitus, cancer, and osteoarthritis; improvement in self-image; decreased anxiety; and improvement in patients with depression. Therefore, exercise has immeasurable health benefits and must be explained to patients.[20,36]

Pharmacotherapy for obesity. Pharmacological therapies for weight loss maintenance are fairly limited. They are only approved for use in individuals with a BMI of ≥30 kg/m^2, those with a BMI of 27 kg/m^2, and those with associated risk factors. Few drugs used for managing obesity are described below.

Orlistat is an irreversible pancreatic lipase inhibitor. Pancreatic lipases promote the breakdown of dietary fat into components that can easily be absorbed. Orlistat inhibits this process, and gastrointestinal side effects, such as oily stool, fecal urgency, fecal incontinence, fat-soluble vitamin deficiencies, and flatulence with discharge, may occur as a consequence. Therefore, it is advocated to adhere to a low-fat diet while on this medication.[37] Liraglutide is a glucagon-like peptide 1 (GLP-1) analogue. glucagon-like peptide 1 is an incretin hormone released from the intestines in response to meals. It slows down gastrointestinal transit, enhances endogenous secretion of insulin in response to meals, alters glucose homeostasis, and suppresses appetite. Clinically relevant doses of GLP-1 agonists for 20 weeks can lead to weight loss. This intervention can result in beneficial effects for obese and overweight patients.[20,38-40]

Other agents recommended for weight loss include lorcaserin and phenteramine/topiramate. Lorcaserin is a serotonin agonist that acts by centrally suppressing the appetite.[41] Phenteramine is a sympathomimetic agent that induces weight loss through increased energy utilization. Given its cardiovascular effects, phenteramine should be used cautiously in patients with hypertension.[42,43] Table 1 summarizes a list of drugs used for obesity management.

Although multiple drug options are available for the treatment of obesity, lifestyle management remains the fundamental pillar in achieving the desired weight loss.

Surgical interventions. They are considered in morbidly obese individuals, in whom exercise and diet are found to be largely ineffective. Bariatric procedures employed to treat obesity include laparoscopic sleeve gastrectomy, laparoscopic adjustable gastric banding, and laparoscopic Roux-en-Y gastric bypass, and the least carried out is a biliopancreatic diversion and duodenal switch. Before carrying out a surgery, it is advised to assess the metabolic, cardiovascular, psychosocial, and dietary details.[44,45] Surgery is not a miracle cure for obesity, but rather a last resort for severely obese patients.

Impact of COVID-19 on obesity. The spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) resulted in thousands of deaths worldwide. The WHO declared it a pandemic on 12th March 2020.[46] Because of the high transmissibility

of SARS-CoV-2, partial curfews and full 24-hour lockdowns were imposed in Saudi Arabia from mid-March to mid-June.[47] There was a restriction regarding the suspension of sport competitions and the closure of stadiums, sports centers, and gyms.[48] The undesirable consequences of lockdown and "stay at home" instructions include physical inactivity, weight gain, and social isolation. Weight gain is associated with an increased risk of chronic diseases and unhealthy aging.[49] Evidence suggests that there is an increase in weight gain from the pre-2020 period to the post-2020 period in Saudi Arabia, attributable to the negative effects of lockdown.[50]

A study carried out in Jeddah, has observed that during the pandemic, the number of people who did not engage in any physical activity increased from 31.6 to 35.2%, and people with higher body weight increased from 33 to 38.8%. Boredom affects dietary patterns, and constantly hearing and knowing about the pandemic during quarantine is stressful. As a result, in response to emotional triggers, individuals tend to eat foods and beverages loaded with sugar, also known as "comfort foods." As per the findings of the study, the overall prevalence of poor eating habits has increased from 17.6 to 27.3% during the pandemic. The number of people spending more than 6 hours daily on screen-based activities increased from 12.5 to 36.2%, which increased body weights due to increased sedentary activities.[51] Coronavirus disease-19 has imposed severe restrictions on physical activities and has escalated mental burden, all of which could have contributed to the increase in the number of obese and overweight individuals in Saudi Arabia.

Current strategies and future perspectives. The estimated annual direct medical cost of overweight and obesity combined is $3.8 billion US dollars, which represents 4.3% of health expenditures in Saudi Arabia. Overweight and obesity are expected to increase Saudi Arabia's annual health expenditures by 12.7% between the years 2020-2050. This depicts a far-reaching economic burden on Saudi Arabia.[52] Studies on the cost of obesity in this direction should not be neglected, as they serve as a high evidence source to elaborate on the economic consequences of obesity. They will help in formulating healthcare policies and promote the planned allocation of resources.[53] As a part of the Saudi vision 2030, Saudi Arabia introduced policies such as an excise tax on sugar-sweetened beverages, with substantial improvement in health and cost savings.[54] Saudi's regulations of the healthy food strategy include a display of caloric information, regulation of nutrient composition, display of nutrition labels, ban of all partially hydrogenated oil, enforcement of a flat tax of 50% on all sugar-sweetened beverages, and recommendation of sodium limits. These strategies aim to empower individuals to make healthy decisions and thus, curb the incidence of obesity.[55]

The adoption of a customized plant-based diet to fit Saudi cultural preferences can mitigate the growing

Table 1 - Pharmacotherapy used in obesity management.

Drugs	Starting doses	Available doses	Side effects	Contraindications
Orlistat	120mg TDS	120 mg	Steatorrhea, oil spots, faecal incontinence, fat-soluble vitamin malabsorption, and flatulence with discharge	Pregnancy
Liraglutide	0.6 mg	0.6-3mg	Nausea, vomiting, diarrhoea, constipation, pancreatitis (rare), and cholecystitis (rare)	Severe renal or hepatic insufficiency, pregnancy, history of pancreatitis, and psychiatric disorder
Lorcaserin	10 mg BID	10 mg	Dry mouth, dizziness, somnolence, headache, and gastrointestinal disturbances	Severe renal insufficiency or severe hepatic impairment, pregnant
Phenteramine/ topiramate	15 mg/12.5 mg	Phe-15 mg Topi-12.5, 25, 50, 100 mg	Dry mouth, insomnia, agitation, constipation, and tachycardia	Severe hypertension, cardiovascular disease, glaucoma, history of drug or alcohol abuse, monoamine oxidase inhibitors, selective serotonin reuptake inhibitor use, and pregnancy
Natrexone/ bupropion	8 mg/90 mg	Nal-8 mg Bup-90 mg	Constipation, diarrhoea, nausea, vomiting, dizziness, and anxiety	Acute opiate withdrawal, allergy to bupropion, bulimia, anorexia nervosa, history of seizure disorder, and uncontrolled hypertension
Semaglutide	0.25 mg SQ once weekly then titrate	2.4 mg	Hypoglycaemia, abdominal pain, constipation, and nausea	Personal or family history of medullary thyroid carcinoma, known hypersensitivity to semaglutide

TDS: once 3 times a day, BID: twice a day, Phe: phenteramine, Topi: topiramate, Nal: naltrexone, Bup: bupropion, SQ: subcutaneous

incidence of obesity in this population.[56] Children can benefit from nutrition-based curriculum programs that will promote more fruit and vegetable intake, thus, enhancing their diet.[57] Strategies need to be adopted to improve the nutritional status of teenagers. Improving their understanding of healthy nutrition, improving their diet, and increasing their levels of physical activity throughout the week are a few steps that can combat growing obesity. Families and schools have a profound impact on teenagers, as they tend to resist advice. However, such effective strategies need to be discussed openly, and corrective measures are to be tailored.[58]

In conclusion, the impending threat of obesity is concerning. Lack of measures to address obesity can lead to amplifying public health concerns in the coming years. With the increasing upward trend of childhood obesity, Saudi Arabia is expected to face an increased economic burden with an insurmountable effect on the health system. The basic treatment modalities for obesity are lifestyle management, pharmacotherapy, and surgical interventions. However, lifestyle interventions play a significant role in preventing obesity and should be encouraged not only by the health department but all the government departments. Pharmacotherapy and surgical interventions are other treatment options but should only be considered in the face of moderate to severe obesity. The recommendations in this review can be modeled for preventing obesity in Saudi Arabia.

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