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Obesity is a Major Health Problem Threatening the Iraqis- review article

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ABSTRACT

Obesity can be defined as an excessive or abnormal fat accumulation which may impair health. It is recognized as a top public health issue and it is ranked as the 5th foremost cause of death worldwide. The current review set out to summarize the studies which provide basic information about the obesity prevalence in Iraq (adults, children and adolescents); moreover, it set out to address the impact of obesity on multiple health conditions. It is now demonstrated that obesity (dependent upon the duration, distribution, and degree of the excess adipocytes/weight) may progressively exacerbate and/or cause a wide range of comorbidities. This review discusses the contributions of obesity toward the pathogenesis of type II diabetes, insulin resistance, metabolic syndrome, and COVID-19 in addition to other diseases.

Keywords: *Obesity, Iraq, BMI, Age, gender, type 2 diabetes mellitus, COVID-19*

BACKGROUND

Obesity is recognized as a top public health issue, it is the 5th leading cause of death worldwide. World Health Organization (WHO) projected that 30% of death worldwide will be due to lifestyle diseases in 2030, which may, possibly, be controlled by suitable identification of the related risk factors along with behavioural strategies. Therefore, discovering and identifying obesity, as early as possible, is important (1). The WHO defined obesity as an excessive or abnormal fat accumulation which may impair health, and stated that "the fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended" (2).

Obesity is frequently measured as a weight per height, considering gender, ethnicity and age; commonly, obesity is expressed by body mass index (BMI) for scientific purposes. The BMI is a well-defined and reliable marker to study obesity and its related diseases (3, 4). The obesity guidelines and classification systems defined healthy weight, overweight, and obesity as BMI 18.5 - 24.9 kg/m2, 25.0 - 29.9 kg/m2, and ≥ 30 kg/m2 respectively, in adult individuals; and for adolescents and children, the American Centers for Disease Control and Prevention body mass index-for-age percentile growth charts for girls and boys defined overweight as a body mass

index ≥90th percentile of standard weight, while the obesity is described as a body mass index >95th percentile of standard weight (5).

Obesity is the state of positive energy balance leading to the interaction between genetic, environmental and behavioural factors (6). Subsequent changes in lifestyle, economic growth, and urbanization are the most common and major factors leading to the rise of obesity epidemic prevalences globally. Moreover, the rapid economic development and westernization of lifestyle in the middle east and Arabian countries, especially the Gulf region, were additional factors which worsened the epidemic of obesity in this region (7).

Aetiology

Obesity is usually resulting from excess energy consumption (i.e., dietary intake) compare with energy expenditure (the energy loss through physical and metabolic activity). The aetiology of obesity is extremely complex and can include economic, genetic, environmental, social, psychological, physiologic, along with political aspects which interact at different levels to promote the development of obesity (8).

Prevalence of Obesity Among Adults: Iraq

The prevalence of obesity among Iraqi adults was listed in [Table 1]. The official reports indicated that the obesity prevalence among the Iraqi population is increasing, mostly since 2003. The 2005-2006 survey, conducted with the support of the WHO stepwise approach, was carried out in Iraq and revealed that the prevalence of overweight /obesity was 66.9% (9).

In Baghdad city, Al-Tawil and his coworkers (10) demonstrated that 37% were obese, and a further 39% were overweight among nonpregnant women attending the outpatient clinics. Whereas Mansour and his coworkers (11) carried out research in the southern Iraqi province of Basrah between 2003-2010, it reveal that 55.1% were obese and overweight. Additionally, in Baghdad, the obesity prevalence was 35.2% amongst female relatives of the primary care attendants (12). The 2015 survey, established the prevalence of obesity was 33.9%, overweight was 31.8%, whilst obesity and overweight were 65.7% (13). In 2017, in Erbil, a city in northern Iraq, the overall prevalence of obesity and overweight was 74,3% (40.9% obese and 33.4% overweight) (14).

Among samples of Iraqi college students at the University of Kerbala, AlGhabban et al. (15) revealed that the obesity and overweight prevalences were 5.6% and 22.9% respectively; While Sahib et al. (16) reported that the total prevalence of obesity and overweight among the university students at Kerbala University was 83% and 62% respectively. Moreover, Abdulkareem et al. (17) found that the obesity and overweight prevalence among university students was 6.6% and 27.9% respectively. Additionally, at Wasit University 15% of the students were overweight and only 3.1% of them were obese (18).

TABLE 1: Prevalence of obesity among Iraqi adults.

Studies	Prevalence	City
In the 2005-2006 survey, WHO stepwise approach survey	overweight /obesity was 66.9%	-
Al-Tawil and his coworkers, 2007	37% were obese, and a further 39% were overweight	Baghdad
Mansour and his coworkers, Between 2003-2010.	55.1% are obese and overweight.	Basrah
Jasim and his coworkers, 2017.	obesity prevalence was 35.2%	Baghdad
The Pengpid and Peltzer 2021. From the 2015 survey.	prevalence of obesity was 33.9%, overweight was 31.8%, whilst obesity and overweight were 65.7%	-
Shabu, 2017.	Obesity and overweight total prevalence was 74,3% (40.9% obese and 33.4% overweight).	Erbil
AlGhabban et al., 2013	Obesity and overweight prevalence was 5.6% and 22.9%; (university students)	Kerbala

Sahib et al., 2020	Obesity and overweight prevalence was 83% and 62%.	Kerbala
Abdulkareem et al., 2017	Obesity and overweight prevalence was 6.6% and 27.9%. (university students)	-
Taher, 2019	15% of the students were overweight and only 3.1% of them were obese. (university students)	Wasit
The WHO, 2005 (19)	obesity prevalence was 8.3% for males and 19.1% for females	-
Al-Hilaly et al. in 2008	revealed that obesity affects nearly 30% of the adult population,	Baghdad

Obesity and gender

The worldwide data indicate that the prevalence of overweight and obesity is higher among men than women in some regions (20). Prior research has tended to either assess obesity regardless of gender or in females only; men's obesity has not been a common topic for research. Though the prevalence of obesity among men is increasing, also, males seem reluctant to contribute to weight-loss programs regardless of confirmed relationships between obesity with health-related disorders; Such attitude can reflect the general failure to identify gender issues regarding obesity (21). In general, males are less concerned about their body weight than females, moreover, they lack nutrition knowledge (22).

Worldwide data reveals that 34% of men and 35% of women had overweight, however, the prevalence of obesity in men was 10%, in women 14% and 12% in both sexes (23). Badran and Laher demonstrated that the obesity prevalence has risen at an alarming rate, in Arabic-speaking countries, and this seems more overwhelming in females (24).

In 2005, the WHO reported that the obesity prevalence for the Iraqi population was 8.3% for males and 19.1% for females (19). Globally, obesity prevalence in adults is increasing, specifically among reproductive-aged women. Based on the Iraqi Ministry of Health report, obesity prevalence was 38.2% in reproductive-aged women in 2006 (9). Additionally, in Baghdad between 1997 to 2007, the obesity prevalence among reproductive-aged women increased from 23.6% to 25% (10). In 2008, a report by Al-Hilaly et al revealed that obesity affects nearly 30 % of the adult population, with a higher rate in women (25). Another research was performed in Baghdad in 2009 on premenopausal and postmenopausal women to assess obesity prevalence. The research established that the obesity prevalence was 29.7% in premenopausal women and 36.5% in postmenopausal women (25).

Al-Ghabban demonstrated that overweight/obesity prevalence among Karbala University students was more common amongst male students (27.4%) in comparison with females (18.9 %) and there was no relationship between obesity and gender (15).

Prevalence of obesity among children and adolescents

Table 2 shows the prevalence of obesity among children and adolescents in Iraq. In the Gulf region countries, a systematic literature review revealed that the rate of obesity and overweight amongst adolescents aged 10–18 years, in this region was greater than their American counterparts (26).

In Duhok, Kurdistan Region, a study by AL-Dabbagh & Mohammed (27) demonstrated that the prevalence of overweight and obesity was 8.3% and 7.9% respectively. These rates have been higher than the 6% and 1.3% results found in Babil (28). The rate of childhood obesity alone has been higher than that of 3 other studies performed in Iraq (4.1% in Mosul, 4.1% in Baghdad and 4.5% in Duhok) (29, 30, 31). The high rate of childhood obesity found in AL-Dabbagh & Mohammed study compared with both studies could be, in part, a result of the better economic situation in the Kurdistan Region compared with the southern and middle parts of Iraq (27).

In 2014, in the Sulaimani governorate, the obesity prevalence was 11.3% and overweight

was 20.6% (32). In 2016, 12.1% of school-aged children were obese, and a further 15.2% were overweight (33). In Iraq, between 2010 and 2011, the obesity and overweight prevalence were similar to Jordanian adolescents, with 24.1 % of Iraqi children being obese or overweight. Nonetheless, there were no significant gender differences regarding the prevalence of obesity or overweight for Iraqi children (34). Moreover, Subhi observed that 7.3 % of school students in Baghdad, aged between 6–12 years were obese (35).

Various studies were conducted to measure the prevalence of childhood obesity among primary schoolchildren which reported a rapid increase in the prevalence of obesity and overweight in the Iraqi community. In 2019, obesity prevalence was 25.6% in Khalid et al. (36) study. Similar findings were reported previously in 2014 by Alredainy & Lami study, wherein obesity prevalence was 30.3 % (37). Differently, in 2005 Lafta and his team revealed that the prevalence of overweight was 12.4% and obesity was 4.1% (29). Between (2006-2007), the prevalence of obesity and overweight in Fawzi & Yassen's study was 9.8% and 11.3% respectively; the factors that determine these differences are physical inactivity, snacking, and consumption of fast foods (38).

In addition, the estimated prevalence of obesity in Khalid et al 2020 study, increased significantly in boys, in contrast to Fawzi & Yassen 2008, as well as Alredainy & Lami 2016 studies, which revealed that the prevalence of overweight/obesity is greater among girls than boys (29, 37, 38) . This could be related to males participating in sports more likely than females who tend towards a more sedentary lifestyle (39). Whereas in Al-Nasiriya between 2015-2016 the percentages of obesity and overweight among children aged 6-60 months were almost equal for both females and males (40).

Between 2018-2019, a cross-sectional study in Ramadi city reported that the prevalence of childhood obesity was 13.3%and of overweight was 15.4% (41) Another study by Kahtan et al., targeting primary schoolchildren in Baquba city demonstrated that the prevalence of overweight was 14.3% whereas obesity was 9.4% (42).

TABLE 2: Prevalence of obesity in Iraqi children and adolescents.

Studies	**Prevalence**	**City**
AL-Dabbagh & Mohammed, 2009	overweight & obesity was 8.3% & 7.9% respectively.	Duhok, Kurdistan Region,
Lafta & Kadhim, 2005	overweight & obesity was 6% & 1.3%	Babil
Lafta and his team, 2007	overweight was 12.4% & of obesity was 4.1%	Mosul
Al-Assaf, 2006	childhood obesity was 4.1%	Baghdad
Yahya, 2008	The rate of childhood obesity was 4.5%	Duhok
Qadir et al., 2014	obesity was 11.3% & of overweight was 20.6%	Sulaimani governorate
Haleem & Al-Rabaty, 2016	12.1% of school-aged children were obese, & a further 15.2% were overweight	-
Salman & Ajeel, 2013	obesity & overweight was 24.1 % of children being obese or overweight.	-
Subhi, 2006	7.3%of school students were obese	Baghdad
Khalid et al., 2019	obesity was 25.6%	-
Alredainy & Lami, 2014	obesity was 30.3 %.	-
Fawzi & Yassen, 2008	obesity & overweight were 9.8% and 11.3% respectively	-
Al-Delaimy et al., 2020	childhood obesity was 13.3% & of overweight was 15.4%	Ramadi
Kahtan et al., 2019	overweight was 14.3% whereas obesity was 9.4%.	Baquba

Obesity and other diseases

Obesity (dependent upon the duration, distribution, and excess of weight) may progressively exacerbate and/or cause a wide range of comorbidities, involving cardiovascular disease, hypertension, type 2 Diabetes Mellitus (T2DM), psychiatric conditions, respiratory abnormalities, dyslipidemia, reproductive dysfunction, liver disease, and increase the risk for particular types of cancer (43).

Obesity is primarily an independent risk factor for the development of T2DM (44). More important, T2DM is strongly related to obesity in both genders and all ethnicities. About 80 % of T2DM individuals are obese, this explains the tight association of insulin resistance (IR) with adiposity, and justifies "the term Diabesity" (45). Obesity causes insulin resistance along with increased circulating insulin levels over time, consequently reducing insulin sensitivity as well as impairing pancreatic beta cell function (46). The adverse metabolic changes of obesity, mainly visceral obesity, on several metabolic mechanisms proposed to involve the excessive lipid supply by lipotoxicity (47).

Metabolic Syndrome (MetS), is a set of escalating health problems, which occur in children, adolescents and adults due to obesity. When those people are suffering from multiple collectively risks like cardiovascular disease, hypertension, T2DM and dyslipidemia (48). The IR is a link between inflammation and obesity, and the impairment of the insulin signalling pathway along with IR is an important factor in the development of MetS (49). Furthermore, mitochondrial dysfunction in adipose tissue may be an important cause of adipose tissue inflammation along with IR. Defective mitochondrial function along with reduced fatty-acid oxidation in adipose tissue increase triglyceride accumulation, and adipocyte enlargement as well as subsequent adipose tissue hypoxia; which causes the accumulation of the hypoxia-inducible factor, that promotes adipose tissue inflammation as well as fibrosis (50). The continuous inflammatory cycle as well contributes to neuro-immuno-endocrine dysregulation of MetS (51). The inflammatory state which affects obese subjects is called metainflammation or metabolic inflammation, additionally, there is an increased number of M1 macrophages occurring, along with a decreased number of M2 macrophages, coupled with Treg cells in visceral adipose tissue, via chemotactic signalling, through monocyte chemoattractant protein-1 and interleukin-8 released by the adipocytes (52, 53).

Dyslipidemia is well linked to obesity, and dyslipidemia may induce cardiovascular diseases, like myocardial infarction, stroke, and hypertension (54). Also, excess weight causes musculoskeletal disorders and osteoarthritis, for instance, sleep apnea (55). Elevated concentrations of tumorigenic molecules, for example, insulin-like growth factor-ı, are linked to various types of cancer, like liver, prostate, breast, renal, gastrointestinal, and ovarian cancer (56). Obesity is additionally a chief cause of Alzheimer's disease (57), reduced life expectancy (58), early retirement, social disadvantages, decrease productivity, and lowered quality of life (55). Moreover, obesity is strongly connected with some mental health disorders, for example, anxiety (59), depression (60), as well as other types of brain diseases (61). But, it is wise to mention that, some overweight and obese subjects have no associated risk factors, which is a phenomenon known as "healthy obese" (62).

Obesity and COVID-19

Obesity is the most common health problem among patients diagnosed with COVID-19 and "has a high proportion of deaths to cases". Likewise, Onorato and his team reviewed the research on the impact of obesity on mortality in patients with COVID-19 in the United Kingdom and the USA, and all of these researches established that obesity is associated with the risk of death (63).

Numerous researches performed in various countries, involving China (64), Morocco (65), United Arab Emirates (UAE) (66), India (67), United States of America (USA) (68, 69), Lithuania (70), Croatia (71), United Kingdom (72), Italy (73), Belgium (74), Poland (75), Spain (76), Portugal (77), and Iraq (78) have established that the social isolation has caused body weight gain across different population

groups, with rates ranging from 22% to 98.05%. Moreover, the forwarded research found that isolation strategies during the pandemic of COVID-19 result in a growing tendency towards unhealthy eating habits and decreased physical activity. A study of 765 participants in the Kurdistan Region, demonstrated a body weight gain during quarantine of <2 kg in almost every Covid-19 patient 98.05%, whereas the majority of those who did gain >3 kg were females or from the centre of big cities (78).

Indeed, a metanalysis of fifty researchers reported a positive association between obesity with SARS-CoV-2 infection as well as severe COVID-19 symptoms (79). Given that adipocytes express high levels of angiotensin-converting enzyme-2 (80), a receptor which plays a crucial role in the entry of the SARS-CoV-2 into the target cell (81). Also, there is very strong evidence demonstrating the negative influence of obesity on the immune response to COVID-19 infections (82). Moreover, elevated inflammatory cytokines linked with obesity can contribute to the elevated morbidity linked with obesity in COVID-19 infections (83).

CONCLUSION

The current review has summarized the studies which provide basic information about the prevalence of obesity among the Iraqi community (adults, children and adolescents). Prior reports have designated that the obesity prevalence among the Iraqi population is increasing, particularly since 2003.

The current review has described the contributions, for instance, the association, of obesity toward the pathogenesis of various diseases like type 2 diabetes mellitus, insulin resistance, metabolic syndrome, and COVID-19 in addition to other diseases.

Multiple studies report the strong relationship between obesity and COVID-19 infection, the negative influence of obesity on the immune response to infections, and the elevated morbidity linked with obesity in COVID-19 infections.

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