



# Obesity-associated parameters in Baghdad city

Parámetros asociados a la obesidad en la ciudad de Bagdad

 Ali N. Hussein Department of Pharmacy, Oslo Aldeen University College, Iraq, Email: [ali\\_naim@ouc.edu.iq](mailto:ali_naim@ouc.edu.iq)

 Hadeel Delman Najim Department of Clinical Pharmacy, College of Pharmacy, Mustansiriyah University, Iraq, Email: [pharm.hadeelnajim2015@uomustansiriyah.edu.iq](mailto:pharm.hadeelnajim2015@uomustansiriyah.edu.iq)

 Zahraa Albasry\* Department of Clinical Pharmacy, College of Pharmacy, Mustansiriyah University, Iraq, Email: [zahraalbasy@uomustansiriyah.edu.iq](mailto:zahraalbasy@uomustansiriyah.edu.iq)

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113

## Abstract

**Background:** Excess body weight is a medical condition where excess body fat has accumulated to a level that may negatively affect health. Depending on the stage and duration of weight gain, obesity can gradually trigger and/or exacerbate a series of co-morbidities, mainly type 2 diabetes mellitus, cardiovascular disease, hypertension, dyslipidemia, musculoskeletal disorders, and certain types of cancer. Although many of these complications can be reduced or eliminated by weight loss, the life anticipation of a badly obese person is reduced.

**Objective:** This study aimed to estimate the prevalence trends of excess weight (overweight and obesity) in Iraqi people in Baghdad city and identify if we can relate the obesity to some socio-demographic parameters.

**Methods:** 398 participants were enrolled in our study randomly from attendants to specific private pharmacies in different regions in Baghdad city. We involved any person aged between (18-50) years old, and the data collected from a specific questionnaire were: age, sex, weight and height, marital, occupation, education, and disease status.

**Conclusion:** Obesity represents a severe health problem associated with a wide spectrum of comorbidities. It is the leading cause of death and disabilities worldwide, with burdens expected to increase in coming years. In Iraq, we need further attention to the risks posed by this hazardous disease to raise awareness of the necessity for appropriate weight regulation methods in the community.

**Keywords:** Overweight, Obesity, Co-Morbidities, Baghdad city

## Resumen

**Antecedentes:** El exceso de peso corporal es una afección médica en la que el exceso de grasa corporal se ha acumulado a un nivel que puede tener un resultado negativo para la salud. Según el estadio y la duración del aumento de peso, la obesidad puede desencadenar y/o exacerbar gradualmente una serie de comorbilidades, principalmente diabetes mellitus tipo 2, enfermedades cardiovasculares, hipertensión, dislipidemia, trastornos musculoesqueléticos y ciertos tipos de cáncer. Aunque muchas de estas complicaciones pueden reducirse o eliminarse mediante la pérdida de peso, la expectativa de vida de una persona muy obesa se reduce.

**Objetivo:** este estudio tuvo como objetivo estimar las tendencias de prevalencia del exceso de peso (sobrepeso y obesidad) en la población iraquí de la ciudad de Bagdad e identificar si podemos relacionar la obesidad con algunos parámetros sociodemográficos.

**Métodos:** 398 participantes se inscribieron en nuestro estudio de forma aleatoria, desde asistentes hasta farmacias privadas específicas en diferentes regiones de la ciudad de Bagdad. Se incluyó a cualquier persona con edades comprendidas entre (18-50) años y los datos recogidos de un cuestionario específico fueron: edad, sexo, peso y talla, conyugal, ocupación, educación y estado de enfermedad.

**Conclusión:** la obesidad representa un grave problema de salud asociado a un amplio espectro de comorbilidades. Es la principal causa de muerte y discapacidades en todo el mundo y se espera que las cargas aumenten en los próximos años. En Irak, necesitamos más atención sobre esta peligrosa enfermedad para aumentar la conciencia sobre la necesidad de un método apropiado de regulación del peso en la comunidad.

**Palabras clave:** sobrepeso, obesidad, comorbilidades, ciudad de Bagdad

The World Health Organization (WHO) describes obesity as an epidemic and global health problem. The worldwide prevalence of obesity nearly tripled in the last decade<sup>1</sup>. In 2016, 39% of adults aged 18 years and over were overweight, and about 13% of the world's adult population were obese. In Iraq, non-official records stated that male obesity prevalence had grown substantially from 13.8 to 23.4% from 1997 to 2016, rising at an increasing rate<sup>2</sup>.

Excess body weight is most commonly caused by a combination of high food intake, lack of physical activity, and genetic susceptibility; many cases are caused by endocrine disorders, medications, or mental disorders<sup>3</sup>. Sometimes, the rich sugar and carbohydrate diet is the main diet that causes obesity. People who consume a diet that consists mainly of fruits, vegetables, whole grains, and water are still at risk of gaining excess weight due to genetic factor<sup>4</sup>.

A sedentary lifestyle plays a significant role in obesity; working in an office rather than doing physical activities, going to places by car instead of walking, or cycling are examples of less physically demanding work. Several studies indicate that insulin level is stable when physical activities are enough, and unstable insulin level leads to weight gain<sup>5,6</sup>. Sleep disturbance is also considered one of the factors related to obesity; it can lead to a hormonal effect on appetite via a hormone known as ghrelin; often termed the hunger hormone; which stimulate appetite, and at the same time, a lack of sleep results in decrease the production of leptin; hormone that suppress appetite<sup>7</sup>.

It was also found that fat mass and obesity are associated with certain variants in the FTO gene, which is located on chromosome 16. The FTO gene is widely expressed in both fetal and adult tissues and is strongly associated with early-onset and severe obesity in adults and children<sup>8,9</sup>.

Endocrine disorders like Cushing syndrome, hypothyroidism, hypothalamic lesions, polycystic ovarian syndrome, and medications like steroids, anti-depressants, anti-psychotics, and anti-epileptics considered secondary causes of obesity<sup>10</sup>.

Depending on the stage and duration of weight gain, obesity can gradually trigger and/or exacerbate a series of co-morbidities, including type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), hypertension, dyslipidemia, and musculoskeletal disorders depending on the stage and duration of weight gain, sub-fertility, and certain types of cancer<sup>11,12</sup>. Although many of these complications can be reduced or eliminated by weight loss, obesity may increase the risk of co-morbid disease and mortality, mainly from CVD and cancer<sup>13</sup>, and a reduction in the life expectancy of a severely obese person recorded<sup>14</sup>.

This study aims to estimate the prevalence trends of excess weight (overweight and obesity) in Iraqi people in Baghdad city and identify if we can relate obesity to some socio-demographic parameters and chronic diseases.

## Methods

This study was conducted from August to October 2018 in Baghdad/Iraq. Three hundred ninety-eight participants were enrolled randomly from attendants to specific private pharmacies in different regions in Baghdad city. We involved any person; male and/or female; aged between (18-50) years old, and the data collected from a specific questionnaire involved weight and height, marital status (single, married, divorced, widow), occupation (employed, unemployed, student), education (college and higher, secondary, primary and less) and disease status. Body mass index (BMI) was calculated by dividing body weight (kg) by height (m<sup>2</sup>), then BMI classified according to the international classification of body weight in adults with risk of co-morbidities, table 1<sup>15</sup>.

Microsoft excel software 2010 and SPSS (version 21) was utilized for statistical analysis. The Chi-square test was used to compare percentages. Spearman correlations with BMI were obtained. p-value <0.05 was considered significant.

**Table 1. The international classification of body weight in adults.**

Classification	BMI (kg/m <sup>2</sup> )	Risk of co-morbidities
Underweight	<18.5	Low
Healthy weight	18.5–24.9	Average
Overweight	25–29.9	Increased
Obesity, class I	30–34.9	Moderate
Obesity, class II	35–39.9	Severe
Obesity, class III	≥40	Very severe

**Results**

**S**ocio-demographic characteristics of the study sample are demonstrated in table 2. Of 398 participants, 120 (30.2%) were male with BMI mean (31.3±8.5) and 278 (69.8%) were female with BMI mean (29.8±8.4). The participants' age was between 18-60 years old, 284 (70.4%) were between 18-30 years old with BMI mean (27.6±7.2), 84 (21.1%) were between 31-45 years old with BMI mean (36.4±11.3), and 30 (7.5%) between 46-60 years old with BMI mean (38.1±7.3). The education status of participants was as follows: 9 (2.3%) were primarily educated with BMI mean (30.7±7.5), 65 (16.3%) were secondary educated with BMI mean (34±10.4), and 324 (81.4%) were college educated with BMI mean (29.3±9.0). About Marital status; 240 (60.3%) were single with BMI mean (27.6±8.3), 144 (36.2%) were married to BMI mean (34.6±9.2), 8 (2%) were divorced, and 6 (1.5%) were a widow. About occupation status, 178 (44.7%) were employed, 84 (21.1%) were unemployed, and 136 (34.2%) were students. Age showed a significant positive correlation with BMI (p<0.01).

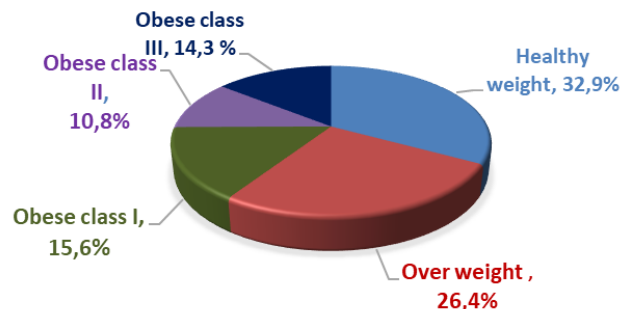
**Table 2. Socio-demographic characteristics of the study sample**

Variables	n (%)	mean±SD
Age **		
18-30	284 (70.4)	27.6±7.2
31-45	84 (21.1)	36.4±11.3
46-60	30 (7.5)	38.1±7.3
Gender		
Male	120 (30.2)	31.3±8.5
Female	278 (69.8)	29.8±8.4
Education		
Primary and less	9 (2.3)	30.7±7.5
Secondary	65 (16.3)	34±10.4
College and Higher	324 (81.4)	29.3±9.0
Marital		
Single	240 (60.3)	27.6±8.3
Married	144 (36.2)	34.6±9.2
Divorced	8 (2.0)	29.7±10.2
Widow	6 (1.5)	32.5±6.8
Occupation		
Employment	178 (44.7)	34±11
Unemployment	84 (21.1)	31.7±9.2
Student	136 (34.2)	26.2±6.2
Total	398	

Data present as number and percentage; SD standard deviation; \*\* Significant positive correlation with BMI p<0.01

According to BMI, distribution of the study sample showed that participants with healthy weight represent 32.9%, overweight represent 26.4%, obese class I represent 15.6%, obese class II represent 10.8, and obese class III represent 14.3%, as shown in figure 1.

**Figure 1. Distribution of the study sample according to body mass index**



Among hypertensive participants, obesity class II, III represent 22.4% and 38.8% which is significantly higher than obese class I, overweight and healthy weight patients (10.2%, 18.4%, 10.2%, respectively) (p<0.05). Among diabetic participants, obese class III represent 45.5% significantly higher than other classes, obese class II, III, overweight and healthy weight, 18.2%, 18.2%, 9.1%, 9.1%, respectively (p<0.05). Hypothyroid problems were more observed among obese class III 37.5% but with a non-significant result (p>0.05). Other reported diseases are shown in table 3.

Figure 2 show the distribution of BMI variations between male and female. 36% of females versus 25% of males have a healthy weight (p>0.05), and 27% of females versus 25% of males have overweight (p>0.05). While for obesity, 15.1% of females versus 16.7% of males have obesity class I, 10.8% of females versus 11.7% of males have obesity class II and 11.2% of females versus 21.7% of males have obesity class III, (p>0.05).

**Table 3. Distribution of chronic diseases among the participants according to BMI**

BMI Disease	Healthy weight	Over weight	Obese class I	Obese class II	Obese class III	Total
Hypertension	5 (10.2)	9 (18.4)	5 (10.2)	11 (22.4) <sup>a</sup>	19 (38.8) <sup>a</sup>	49
Diabetes	2 (9.1%)	2 (9.1)	4 (18.2)	4 (18.2)	10 (45.4) <sup>a</sup>	22
Hypothyroid	1 (12.5)	2 (25.0)	1 (12.5)	1 (12.5)	3 (37.5)	8
Asthma	0	2 (33.3)	3 (50.0)	0	1 (16.7)	6
Arthritis	1 (25.0)	1 (25.0)	0	0	3 (75.0)	4
IBS	3 (75.0)	0	0	1 (25.0)	0	4
PCOS	1 (25.0)	1 (25.0)	1	2 (50.0)	0	4

Data present as mean and percentage, n (%). <sup>a</sup> significant difference horizontally.

**Figure 2. Distribution of BMI variations between male and female**

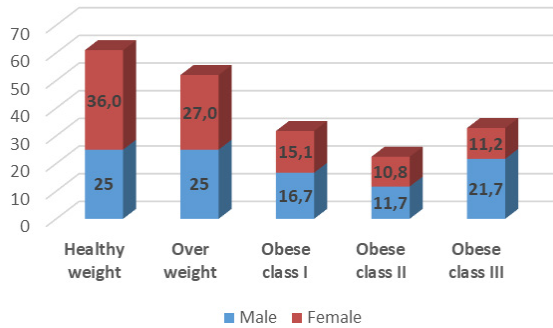


Table 4 shows the distribution of BMI variations among participants according to some socio-demographic characteristics. For the effect of marital, 61.7% of married participants were obese ( $p < 0.01$ ), 24.5% were overweight ( $p < 0.05$ ), and 13.7% were a healthy weight. Among single people, 45.4% were healthy weight ( $p < 0.05$ ), 29% were overweight, and 25.6% were obese. Marriage status showed a significant positive correlation with BMI ( $p < 0.01$ ). For education, 41.3% of college-educated people were obese ( $p < 0.05$ ), 31.2% were healthy, and 27.5% were overweight. 41.5% of secondary educated people were healthy weight ( $p < 0.05$ ), 36.9% were obese, and 21.5% were overweight. 44.4% of primary educated people were obese, 33.3% were healthy, and 22.2% were overweight. College education showed a significant negative correlation with BMI ( $p < 0.01$ ). About occupation status, 45.9% of employed people were obese ( $p < 0.05$ ), 28.2% were overweight, and 26% were a healthy weight. 51.2% of unemployed people were obese ( $p < 0.05$ ), 30.9% were overweight, and 17.9% were healthy. 50.7% of students were healthy weight ( $p < 0.05$ ), 28.7% were obese, and 20.6% were overweight.

**Table 4. Effect of some socio-demographic characteristics on BMI**

Socio-demographic characteristics		BMI		
		Healthy Weight	Over Weight	Obese Classes
Marital	Single	108 (45.4) <sup>a</sup>	69 (29.0)	61 (25.6)
	Married**	20 (13.7) <sup>c</sup>	36 (24.5) <sup>b</sup>	90 (61.7) <sup>a</sup>
	Divorced	2 (25.0)	4 (50.0)	2 (25)
	Widow	1 (16.7)	1 (16.7)	4 (66.7)
Education	Collegett	101 (31.2)	89 (27.5)	134 (41.3) <sup>a</sup>
	Secondary	27 (41.5) <sup>a</sup>	14 (21.5)	24 (36.9)
	Primary	3 (33.3)	2 (22.2)	4 (44.4)
Occupation	Employed	47 (26.0)	51 (28.2)	83 (45.9) <sup>a</sup>
	Unemployed	15 (17.9)	26 (30.9)	43 (51.2) <sup>a</sup>
	Student	69 (50.7) <sup>a</sup>	28 (20.6)	39 (28.7)

\*\* Significant positive correlation with BMI  $p < 0.01$

†† Significant negative correlation with BMI  $p < 0.01$

## Discussion

In Iraq, obesity prevalence has risen substantially in the past years, as in the Arab countries<sup>16</sup>. This epidemic draws attention to the extent of the risks of this serious health problem. The complications of obesity emerge from the larger mass of fat tissue and the products produced by the modified adipocytes in obese person<sup>17</sup>. Regarding the study of Flegal et al.<sup>18</sup> and Prospective Studies Collaboration of 900,000 adults<sup>19</sup>, the observed rise in mortality in obesity predominantly reported at higher BMI levels. The study found that class II and III were associated with significantly higher mortality than a healthy weight, while class I obesity was not associated with higher mortality.

The present study agrees with many others; most hypertension cases have been noticed in obese people (class II and III) rather than healthy weight alarming the potential risk based on the study of Olshansky et al., which is stated that the progression of this epidemic problem, concurrently with CVD, portends to slow or invert the decline in mortality that has been noted in most western countries over the past thirty years<sup>20</sup>. Having a heavy bodyweight for a long time may negatively affect cardiac function by increasing the ventricular mass and left atrial dilatation with atrial fibrillation and systolic dysfunction<sup>21-23</sup>. Kotchen et al. found that obese persons are 3.5 times more vulnerable to have hypertension, while 60–70% of hypertension cases in adults may be relevant to adiposity<sup>24</sup>.

Obesity is a major risk factor for T2DM; this study found that the percentage of people with overweight and obesity have T2DM more than healthy-weight people, and the incidence of DM seems to be increased with increased BMI. The link between obesity and diabetes lies through increased circulating free fatty acids<sup>25</sup>, which promote the overproduction of reactive oxygen species (ROS), thus inducing oxidative stress and triggering insulin resistance<sup>26,27</sup>. Therefore, "diabesity" is a perfect term to describe the overlap between T2DM and obesity because actually, about 50% of diagnosed diabetic patients are obese<sup>28</sup>. Hartemink et al. stated that the risk of developing T2DM increases by 20% for each 1 kg/m<sup>2</sup> increase in BMI, and the risk of the disease would rise by 100% for BMI 27.2 to 29.4 kg/m<sup>2</sup> and increases by about 300% for BMI >29.4 kg/m<sup>2,29,30</sup>.

The present study showed a significantly high percentage of obesity among married individuals compared to single individuals who showed a significant percentage of healthy weight; in addition, our result is in line with early literature found that marriage is positively associated with bodyweight<sup>31</sup>. Authors attributed such correlation to some reasons: married persons are more likely to be stable with whom to eat and may therefore eat more regularly, leading to weight gain. They are also less likely

to be careful about their body weight because they are not actively seeking a mate<sup>32,33</sup>. Smoking seems to suppress appetite, and married persons are less likely to smoke compared to non-married, which may also induce weight gain<sup>34</sup>. Consequently, married individuals are more likely to increase body weight than non-married.

Exploring the relationship between education and obesity identified by survey of Devaux Marion et al., finding a better education seems to be associated with a lower incidence of obesity compatible with our study. We found a negative correlation between years of schooling and BMI<sup>35</sup>. Webbink et al. also confirm the negative relationship between education and the probability of being overweight<sup>36</sup>. This may be because educated people are less likely to smoke, drink, be overweight or obese, or to use illegal drugs<sup>37</sup>. A similar result was found in local studies from Baghdad and Basra<sup>38,39</sup>.

By looking at differences between the genders within a study, men showed higher BMI than women. However, the prevalence of overweight and obesity among men and women varies greatly within and between countries<sup>40</sup>. Such variation indicates the multiplicity of causes, Yoon et al. found that, in men, income had a greater effect on body weight and BMI rather than education, whereas, for women, higher education level resulted in lower body weight and BMI<sup>41</sup>.

We found a significant correlation between age and BMI, and more obesity cases were observed in people aged 45 years and above, consistent with other studies<sup>42-44</sup>. It has been reported that atherosclerosis is associated with facial hyperpigmentation<sup>45</sup> that can be rectified and treated<sup>46-50</sup>. We also found elevated BMI in both employees and non-employees, which might, unfortunately, refer to the sedentary lifestyle even with work; this confirms that most jobs nowadays rely on mental effort instead of physical effort, providing a serious outlet for overweight and obesity.

## Conclusions

**O**besity represents a serious health problem associated with a broad spectrum of comorbidities. It is one of the leading causes of death and disabilities worldwide, with burdens expected to increase in coming years. In Iraq, we need further attention to this hazardous disease to increase awareness of the necessity for appropriate weight regulation methods in the community.

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