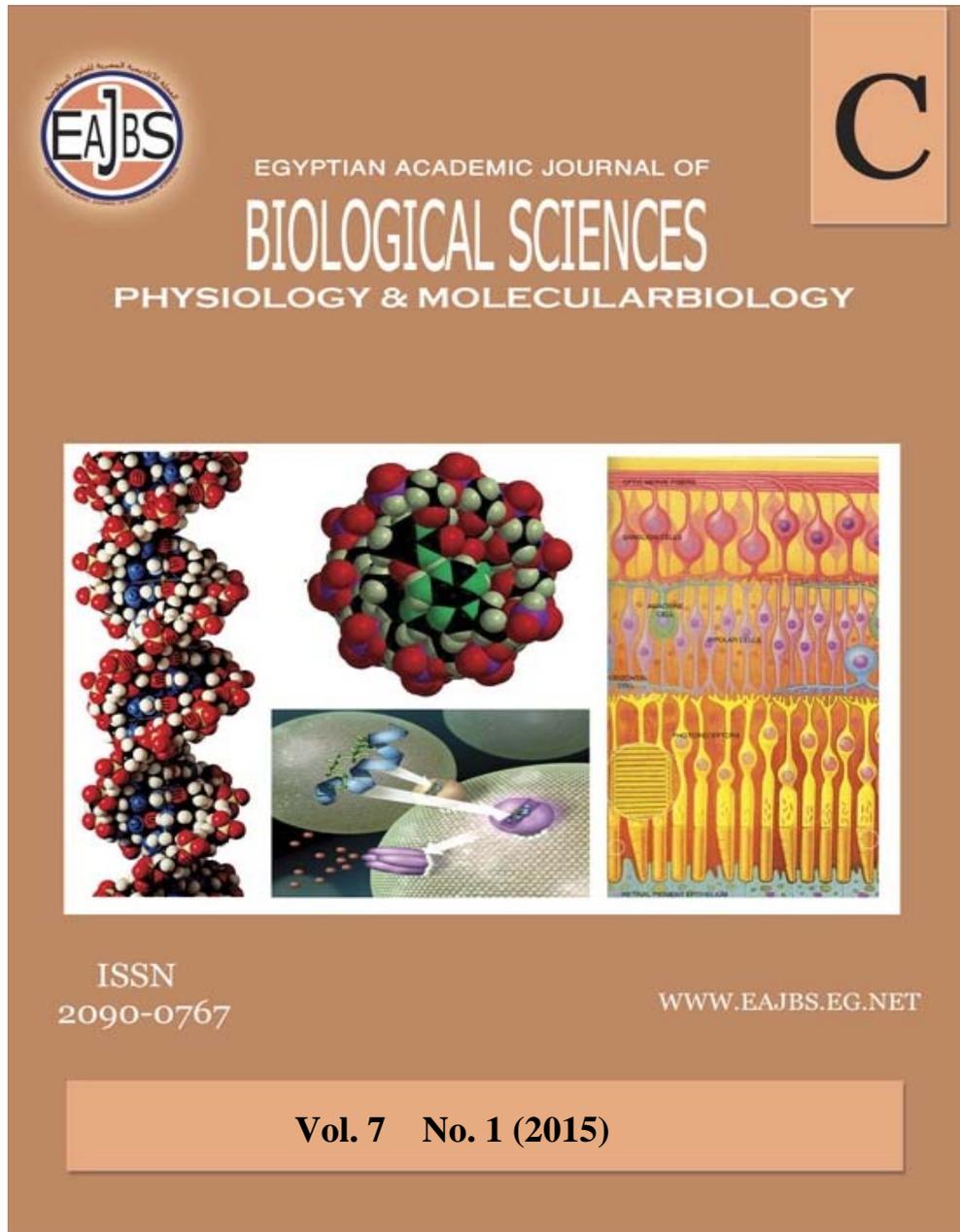


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**Obesity in Hai'l City, Kingdom of Saudi Arabia (KSA): is it a gender specific?**

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**ABSTRACT**

**Background:** Overweight and Obesity are not just a beautifying concern, but they increase the risk of several diseases. Being extremely obese or overweight is associated with several factors, including physical activity and gender; therefore, the objective of this study was to assess gender as a risk factor for overweight or obesity in the City of Hai'l in Northern KSA. **Methodology:** Data regarding height and weight and other demographical factors were collected from 1800 Saudi volunteers living at the city of Hail, KSA. **Results:** Of the 1800 included subjects, 1455/1800 (80.83%) have fully responded to all required parameters. Of the 1455 respondents, 699/1455 (48%) were males and 756/1455 (52%) were females. Of the 1455 subjects, 878/1455 (60.34%) were found overweight and obese, with females ratio more than males. **Conclusion:** Overweight and obesity are prevalent in Hail City with relatively higher females' susceptibility.

**INTRODUCTION**

Obesity is a term used to indicate excessive deposition of fat in the body. It is the most common nutritional disorder in the developed countries and is assuming a significant proportion in the developing countries (Ellen 2015). It has long been observed that obesity is associated with an increased prevalence of morbidity and reduced life expectancy (Wang *et al.* 2011). The etiology of obesity is complex and multifactorial and both genetic and environmental factors play an important role in its development (Guh *et al.* 2009).

The prevalence of obesity worldwide has nearly doubled since 1980 with current estimates of 2.1 billion in 2013. Overweight and obesity lead to numerous adverse conditions including type 2 diabetes, cardiovascular disease, stroke, and certain cancers.

Particularly concerning is the increasing prevalence of pediatric obesity which has been linked not only to metabolic disorders and cardiovascular risk factors but also to psychiatric illness, early pubertal onset, and orthopedic disorders (Weiss *et al.* 2004, de Groot *et al.* 2011).

The worldwide spread of obesity and associated co morbidities not only threatens quality of life but also presents a significant economic burden. It has been projected that by 2030, costs associated with overweight and obesity will comprise 16%–18% of total health care expenses in the US (Gettys *et al.* 2011, Wang *et al.* 2008)

Obesity is a major risk factor for illness and death. It is associated with diabetes, hypertension, hyperlipidemia, obstructive sleep apnea, and osteoarthritis (Haslam and James, 2005). With the increase in life expectancy, obesity is causing more years of disability (Kelsey *et al.* 2014). Hence, the increased cost of obesity and its consequence will put a burden on the resources of governments and individuals (Withrow and Alter. 2011).

In many developing cultures, the embracing of Western lifestyle, characterized by decreased physical activity and high caloric intake, is donating to an worrying epidemiological transition, marked by the shift in the primary causes of death from communicable to non-communicable diseases (Boutayeb and Boutayeb 2005; Amuna and Zotor 2008). The identification of the role of elevated body mass index (BMI) in these changes has made obesity a high priority for health authorities around the world (Malik *et al.* 2013). Socially, the awareness of obesity has changed over time. Whereas it once was related with wealth and prosperity for men and with health and reproduction abilities for women, it is now perceived as a health problem and a risk factor for

many diseases (Nocito and Balke 2013). Women, the poor, and older people are at higher risk of obesity worldwide (Kanter and Caballero 2012; McLaren 2007).

In Global Burden of Disease 2010 study, it was found that raised BMI is the leading risk factor for disability-adjusted life years in the Kingdom of Saudi Arabia (KSA) (Institute for Health Metrics and Evaluation 2014). Previous studies in KSA show an increasing drift in the occurrence of obesity. Data from the late 1980s through mid-1990s show a frequency of obesity averaging about 20%, ranging from as low as 13.1% among men to as high as 26.6% among women. However, all frequency estimates from 1995 and beyond are above 35% (Al-Othaimen *et al.* 2007, Warsy and El-Hazmi 1999). The last national survey on obesity in the KSA and its associated risk factors was accompanied in 2005 in collaboration with the World Health Organization (Al-Nozha *et al.* 2005). Since then, no such surveys have been accompanied, making it impossible to control whether the efforts of the Saudi Ministry of Health (SMOH) are affecting obesity trends. To control current rates of obesity and associated risk factors and chronic conditions, the SMOH, in cooperation with the Institute for Health Metrics and Evaluation, accompanied a large household survey in 2013. Therefore, the objective of this study was to estimate the prevalence rates of Obesity in Hail city.

## MATERIALS AND METHODS

Data regarding obesity were collected 1800 Saudi civilians living in Hail City, Northern region of Kingdom of Saudi Arabia (KSA). The purpose of the survey was to estimate the prevalence rates of for obesity related categories in the area. During the survey participants were interviewed at different public gathering sectors and Primary Health

Centers (PHC). Data were collected by the doctors of the team utilizing a standard questionnaire, which included demographic information.

BMI was calculated from measured height and weight and classified as normal weight (<25 kg/m<sup>2</sup>); overweight (25 -30 kg/m<sup>2</sup>); and obese (30-35 kg/m<sup>2</sup>), morbid obesity (>36 kg/m<sup>2</sup>).

**Statistical Analysis:** Data management was done using Statistical Package for Social Sciences (SPSS version 16). SPSS was used for analysis and to perform Pearson Chi-square test for statistical significance (P value).

**Ethical Consent:** Each participant was asked to sign a written ethical consent during the interview in addition to informed ethical form was designed and passed the ethical committee of the College of Applied Medical Science, at university of hail.

**RESULTS**

This cross sectional study have investigated 1455 apparently healthy Saudi volunteers, their ages ranging from

13 to 80 with a mean age of 43 years. Of the 1455 respondents, 699/1455 (48%) were males and 756/1455 (52%) were females. The males' females' ratio was 1.08: 1.00. Of the 1455 subjects, 878/1455 (60.34%) were found overweight and obese. Of the 878 overweight, 368/878 (41.9%) were males and 510/878 (58.1%) were females, giving males' females' ratio of 1.00:1.39.

In regard to the relationship between over overweight and age, the great majority of over overweight were found among the age range 41-54 years, representing 292/878 (33.3%) followed by age ranges 26-40, 55-70, < 25 and 71+ constituting, 271/878(30.9%), 159/878 (18%), 131/878 (15%) and 25/878 (2.8%), respectively, as indicated in Table 1. However, when over overweight percentages were calculated within the entire age ranges, the highest proportion was presented by age range 41-54, constituting 77.5% followed by 55-70, 26-40, 71+ and > 25 years, representing 72%, 64.7%,54.3% and 33.4%, in this order as indicated in Fig.1.

Table 1: Distribution of the study population by age and body weight status

Age group	overweight	Normal	Total
< 25 years	131	261	392
26-40	271	148	419
41-54	292	85	377
55-70	159	62	221
71+	25	21	46
Total	878	577	1455



Fig. 1: Description of the study population by overweight within an entire age group.

The distribution of the study subject by sex and weight status according to BMI was summarized in Table 2. Since 878 of the study population were over overweight or obese, in this context, 267/878 (30.4%) of the males were found over overweight compared to 252/878 (28.7%) in this category. Furthermore, 159/878 (18.1%) of the females were found obese compared to 62/878 (7%) of the males.

Moreover, 99/878 (11.3%) of the females were found with morbid obesity compared to 39/878 (4.4%) of the males. However, even when, the percentage of each category of the over overweight was calculated within the entire group, it was noticed that females have the highest proportions in obese and morbid obesity categories and males were higher at over overweight category as indicated in Fig. 2.

Table 2: Distribution of the study population by sex and weight status according to BMI

Weight (BMI)	Males	Females	Total
Low weight	41	2	43
Normal weight	290	244	534
Over weight	267	252	519
Obese	62	159	221
Morbid obesity	39	99	138
Total	699	756	1455

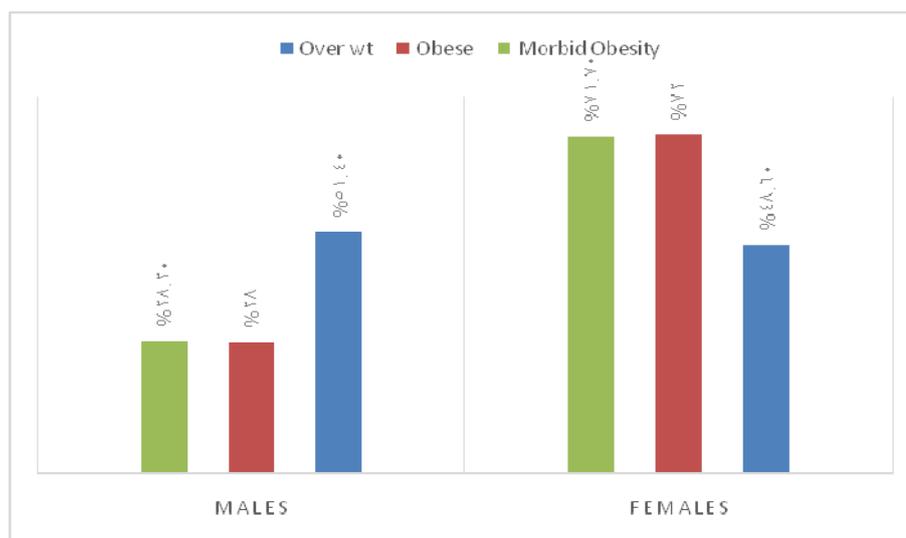


Fig. 2: Description of the study population by overweight degree and sex

As summarized in Table 3, in males the great majority of persons with overweight were identified among age group 41-55 years constituting 77/267 (28.8%), followed by age ranges, 26-40, 56-70, >25 and 71+, representing 72/267(27%), 60/267(22.5%), 42/267(15.7%), 16/267(6%), respectively. For obese category, elevated number of obese individuals were seen among the age range 41-55

years, representing 20/62 (32.3%) followed by age groups 56-70, 26-40, <25 and 71+ constituting, 18/62 (29%), 11/62 (17.8%), 10/62(16.1%) and 3/62 (4.8%), in this order. High number of individuals with morbid obesity were observed at age range 41-55 years representing 14/39(35.9%) followed by age ranges 26-40, <25, 56-70 and 71+ constituting 13/39 (33.3%), 7/39(18%), 4/39(10.3%) and 1/39(2.5%), per capita.

In regard to the females the great majority of persons with overweight were identified among age group 41-55 years constituting 80/252(31.7%), followed by age ranges, 26-40, 56-70, >25 and 71+, representing 79/252(31.3%), 46/252(18.3%), 46/252(18.3%), 1/252(0.4 %), respectively.

In general it was observed that obesity categories were more frequent among females than males. Moreover, when calculating the percentages of obesity within the entire age groups, elevated numbers of obese individuals were observed at age range 41-55 years for both sex as indicated in Fig. 3. Otherwise other groups were similarly proportionate for both sex.

Table 3: Distribution of the study population by age, BMI and gender.

Category	Variable	Age group					Total
		<25 years	26-40	41-55	56-70	71+	
Males	BMI						
	Normal	154	72	47	40	18	331
	overweight	42	72	77	60	16	267
	Obese	10	11	20	18	3	62
	Morbid obesity	7	13	14	4	1	39
Total		213	168	158	122	38	699
Females	BMI						
	Normal	105	83	32	23	3	246
	overweight	46	79	80	46	1	252
	Obese	11	64	55	26	3	159
	Morbid obesity	15	33	45	5	1	99
Total		177	259	212	100	8	756

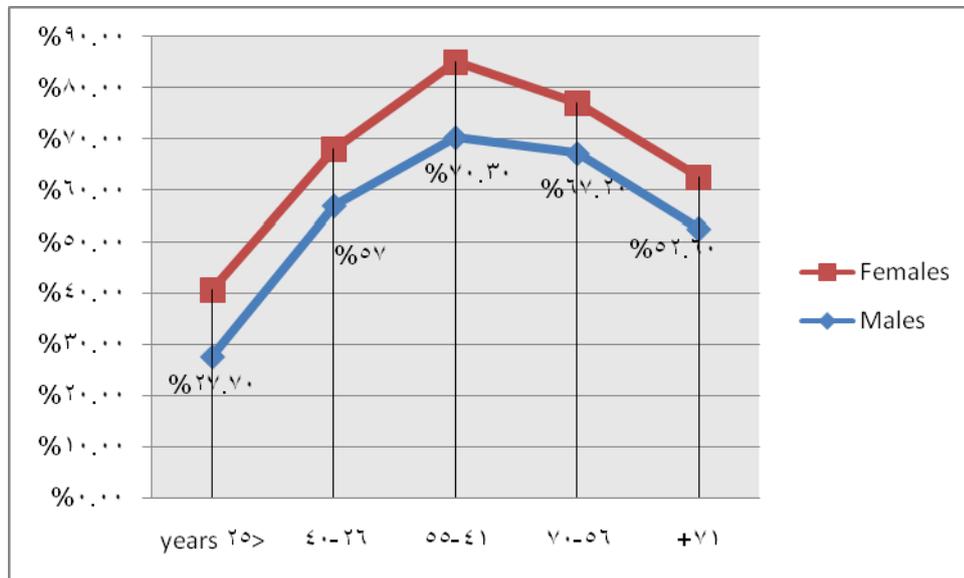


Fig. 3: Description of the study population by Obesity and age among males and females.

**DISCUSSION**

Obesity has received substantial consideration as a major health threat worldwide. The worldwide prevalence of obesity has virtually doubled between 1980 and 2008. In 2008, 10% of men and

14% of women in the world were obese (BMI ≥30 kg/m<sup>2</sup>), compared with 5% for men and 8% for women in 1980 (WHO. Global Health Observatory 2015).

However, the prevalence rates of obesity differ from a country to another;

raised body mass index increases with income level of countries up to upper middle income levels. The prevalence of overweight in high income and upper middle income countries was more than double that of low and lower middle income countries (Dinsa *et al.* 2012). Saudi Arabia has a fast growing economy that rapidly pulled the country to be one of the high income countries.

In the present study the overall prevalence of obesity is very high constituting 60.34%, which relatively similar to that of the corresponding high income countries. The prevalence of overweight and obesity were highest in the WHO Regions of the Americas (62% for overweight in both sexes, and 26% for obesity) and lowest in the WHO Region for South East Asia (14% overweight in both sexes and 3% for obesity) (WHO. Global Health Observatory 2015). In Saudi Arabia, there were some studies conducted in this context with relatively varying findings. In a recent study from Hail Region, KSA which collected data from 5000 Saudi civilian, they found that the overall prevalence of obesity in Hail was 63.6%. Moreover, the prevalence of males was 56.2% and the prevalence of females was 71% (Ahmed *et al.* 2014). This survey involved both urban and rural population, but our survey involved only urban population within Hail city. Another study from the same region has showed that, the prevalence rates of DM and obesity in Hail, Baqaa, Ash Shinan and Ghazala were (27% and 64%), (35% and 70%), (18.6% and 69%), (35% and 55%), respectively (Ginawiet *et al.* 2014)

In the present study, obesity were frequently more observed among females (58.1%) than males (41.9%). In all WHO regions women were more likely to be obese than men. In the WHO regions for Africa, Eastern Mediterranean and South East Asia, women had roughly double the obesity prevalence of men. For obesity, the difference more than triples

from 7% obesity in both sexes in lower middle income countries to 24% in upper middle income countries. Women's obesity was significantly higher than men's, with the exception of high income countries where it was similar. In low and lower middle income countries, obesity among women was approximately double that among men (WHO. Global Health Observatory 2015). Moreover, studies from the region has similar findings (Ahmed *et al.* 2014, Ginawiet *et al.* 2014).

In this study and in regard to the association between obesity and age, the great majority of overweight were found among the age range 41-54 years, representing 33.3%. Similar findings were previously reported showing that, men aged 40-59 had a higher prevalence of obesity (39.4%) than did men aged 20-39 (29.0%) and men aged 60 and over (32.0%). However, there was no difference in the prevalence of obesity between men aged 20-39 and those aged 60 and over. Among women, the prevalence of obesity did not differ between those aged 40-59 and 60 and over (39.5% compared with 38.1%) (Ogden *et al.* 2013).

On the other hand 18.1% of the females were found obese compared to 7% of the males and 11.3% of the females were found with morbid obesity compared to 4.4% of the males. However, even when, the percentage of each category of the overweight was calculated within the entire group, it was noticed that females have the highest proportions in obese and morbid obesity categories. Such findings has been previously reported (Ahmed *et al.* 2014).

In conclusion: Obesity is prevalent in Saudi Arabia with females more likely to be affected than males, particularly with advance stages of obesity. Obesity is caused by a complex interaction between the environment, genetic predisposition, and human behavior. Although, obesity develops when there is

a positive imbalance between energy intake and energy expenditure, but the relative contribution of these factors is poorly understood. Therefore, control of obesity involves the contribution of several factors, which might not be touched in the present study but remain future stimulus for further research.

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