

Overweight and Obesity among Saudi Female Population

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Abstract: Background: During the last few decades, the Kingdom of Saudi Arabia (KSA) experienced rapid socio-cultural changes caused by the accelerating economy in the Arabian Gulf region. That was associated with major changes in the food choices and eating habits which, progressively, became more and more "Westernized". Such "a nutritional transition" has been claimed for the rising rates of overweight and obesity which were recently observed among Saudi population. **Objective:** to determine the prevalence of overweight and obesity in a sample of adults Saudi females. **Methods:** A total of 1500 female participants of age ≥ 19 from Makkah governorate, were included the study. A Self-reported questionnaire was conducted to collect the data. It composed of socio-economic data, disease history, food habits and anthropometric measurements. Overweight and obesity were defined according to internationally standardized criteria for classification of BMI. Data were analyzed using Statistical Package for Social Sciences (SPSS) software, version 16.0. **Results:** The data indicated that (23.9%) of Saudi female adults were overweight and (27.7%) were obese. The most common eating habits encountered were eating two main meals/day, consumed meals with family, drinking carbonated beverages, sweets, and the meals consist mostly of protein. Statistically significant direct correlations were found among these factors ($P < 0.005$). **Conclusion:** More than 50% of the adults Saudi females were obese or overweight. Additional monitoring of the prevalence of obesity is necessary.

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Key words: Female obesity, BMI, food habits, Body fat percentage, Body composition.

1. Introduction

Obesity has become one of the most important health problems throughout the world (**Malekzadeh et al., 2005**). Obesity is often defined as a condition of abnormal and excessive fat accumulation in adipose tissue to the extent that health may be adversely affected (**WHO, 2010**). Obesity is a killer in its own right, irrespective of other biological or social risk factors traditionally associated with coronary heart disease, increasing weight is associated with a higher prevalence of known risk factors for coronary artery disease, such as diabetes, high blood pressure and cholesterol. And it has been assumed that these have been responsible for the increased risk of heart disease seen in obesity (**Jennifer, 2011**). Obesity is a major cause of hypertension. Risk estimates suggest that approximately 78% of the hypertension cases in men and 65% in women can be directly attributed to obesity. Weight and blood pressure findings in a population hypertension screening of one million Americans demonstrated a linear relationship between blood pressure and BMI, in both normotensive and hypertensive subjects, even within the normal BMI range. Data from the NHANES show a strong linear relationship between BMI and systolic and diastolic blood pressures. This relationship remains consistent even in obese children and adolescent (**Framingham, 2012**).

Obesity is considered one of the most significant factors in the development of insulin resistance, and

insulin resistance can lead to type 2 diabetes. More than 90 percent of diabetes patients worldwide have type 2 diabetes. Being overweight or obese contributes to the development of diabetes by making cells more resistant to the effects of insulin. A weight loss of 15-20 pounds can help you decrease your risk of developing type 2 diabetes. Obesity results from a chronic disruption of the energy balance (**Terrence, 2010 and WHO, 2011**)

In 2007–2009, the prevalence of obesity in Canada was 24.1%, over 10 percentage points lower than in the United States (34.4%). Among men, the prevalence of obesity was over 8 percentage points lower in Canada than in the United States (24.3% compared with 32.6%) and among women, more than 12 percentage points lower (23.9% compared with 36.2%). Because the risk of adverse health effects increases at higher levels of body mass index (BMI), obesity is divided into three categories. In all three categories, prevalence was significantly lower in Canada than in the United States. In the highest BMI category the prevalence was twice as high in the United States (6.0%) compared with Canada (3.1%) (**Margot et al., 2011**).

The prevalence of obesity is significantly higher among U.S. adults than among their Canadian counterparts. U.S. estimates were higher for all three obesity classes for both men and women. When the population was limited to non-Hispanic white persons, the overall prevalence of obesity for both U.S. men

and women remained statistically higher than those for Canadian men and women, but the magnitude of the difference was reduced and there was no significant difference in the prevalence of class III obesity. Between the late 1980s and today, the prevalence of obesity increased significantly in both the United States and Canada. Increases followed a similar pattern in the two countries, particularly among men. Among women, increases have also occurred in both countries; however, in both the late 1980s and today the estimates of obesity prevalence for young and middle-aged U.S. women have been substantially higher than for their Canadian counterparts. In the United States the increases in the prevalence of obesity observed in the 1980s and 1990s did not appear to continue at the same rate during the current decade, particularly among women and possibly for men (Flegal *et al.*, 2010)

The rapid cultural and social changes that have occurred in the Arabian Gulf region, since the discovery of oil and the economic boom during the 1970's and 1980's, were associated with an alarming increase in obesity (Al-Kandari, 2006). One of the major causes of obesity is the changes in the diet, in terms of quantity and quality, which has become more "Westernized" (Antonio and Chiara, 2005). In the Kingdom of Saudi Arabia (KSA), recent studies revealed increasing consumption of animal products and refined foods in the diet at the expense of vegetables and fruits (Mahfouz, 2007 and Amin *et al.*, 2008). These dietary changes were accused for increasing the prevalence of both overweight and obesity observed among Saudi children, adolescences and adults in the last few decades (Al-Nozha *et al.*, 2005 and Al-Hazzaa, 2007). The aim of the study was to determine the prevalence of overweight and obesity in a sample of adults Saudi females.

2. Subjects and methods:

3.1. Design and subjects:

A cross-sectional study was conducted during the year of 2013. A convenience sample of (1500) participants was recruited for the study. Participants were grouped according to age into three groups, the first group was from 19- <30, the second group was from 30- <40 and the third group was ≥ 40 year. All participants were Saudi female adult and consent to participate in the study. Pregnant and lactating women in the year prior to the study were excluded.

3.2. Setting:

The study was conducted in Makkah governorate in Saudi Arabia. All of the participants were Saudi of the Arabian ethnicity.

3.3. Methods:

3.3.1. Questionnaire

Data were collected using self-administered questionnaire consisting of:

Demographic- Socio- Economic data

Include data about the general characteristics of the study sample such as age, education level, income level, etc.

Physical activities

The questionnaire used to collect the following data from each participant: how many times the participants performed exercise per week and the type of exercise.

Food habits

The questionnaire included questions about participants' food habits such as: how many times the participants ate breakfast per week, how many meals the participants ate daily, preferable methods of cooking, etc.

3.3.2. Anthropometric measurements

Weight

Measurements were taken in the morning where the participants remained without eating, drinking, bathing or exercising for at least two hours. After which participants were asked to wipe off the sole of their feet before stepping onto the measuring platform as unclean foot pads interfere with the device conductivity. Participants were asked to remove their heavy outer garments. Weight was measured by using Bioelectric Impedance Analysis.

Height

Height was measured where the participants were bare footed and head upright. The height was measured with the measuring tab in (cm).

Body mass index

Body mass index (BMI) provides a simple numeric measure of a person's thickness or thinness, allowing health professionals to discuss overweight and underweight problems more objectively with their patients (MacKay, 2010). BMI was measured by using Bioelectric Impedance Analysis.

Body Fat Percentage

Body Fat Percentage is a measure of the amount of body fat as a proportion of your total body weight. The researchers were measured body fat% by using Bioelectric Impedance Analysis.

Lean body mass

This is the muscle attached to the bones of the body to create movement. The researchers were measured lean body mass by using Bioelectric Impedance Analysis.

3.4. Statistical analysis

The Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 17 was used for data analysis. The Chi squared test was used to study the relationship between variables and the *t*-test was used to compare between means. Differences were considered statistically significant at *P* value < 0.05.

3.Results

Table 1 displays the descriptive characteristics of the studied sample according to levels of obesity. It shows that (10.6%) of none obese group were ≥ 40 years compared to (57.4%) of overweight or obese group, this result was statistically significant ($P < 0.05$). About (79.5%) of none obese group were Secondary or university compared to (61.8%) of

overweight or obese group, this result was statistically significant ($P < 0.05$). Around (46.6%) of none obese group had monthly income level > 6000 Saudi Riyal (SR) compared to (36.6%) of overweight or obese, this result was statistically significant ($P < 0.05$). Regarding the family number of the participants, the result was statistically non-significant ($P > 0.05$).

Table (1): Socio demographic characteristics of studied sample by levels of obesity.

Variable	Non obese (727)		Overweight and obese (773)		X ²	P
	N	%	N	%		
Age						
19-<30	351	48.3	88	11.4	421.3	.000
30-<40	299	41.1	241	31.2		
≥ 40	77	10.6	444	57.4		
Total	727	100.0	773	100.0		
Education level						
Illiterate	5	0.7	66.0	8.5		
Elementary/intermediate	100	13.7	136	17.6	83.56	.000
Secondary/university	578	79.5	478	61.8		
Above university	44	6.1	93	12.1		
Total	727	100.0	773	100.0		
Income level						
Below 3000 SR*	173	23.8	213	27.6		
3000-6000 SR	215	29.6	277	35.8	15.60	.000
> 6000 SR	339	46.6	283	36.6		
Total	727	100.0	773	100.0		
Family number						
2-3	66	9.1	66	8.5		
$> 3-6$	343	47.2	358	46.3	0.35	.839
> 6	318	43.7	349	45.2		
Total	727	100.0	773.0	100.0		

*SR: Saudi Riyal.

Figure 1 shows BMI among studied female. It was found that more than quarter of the sample were obese (27.7%), whereas overweight participants represented (23.9%) of the sample.

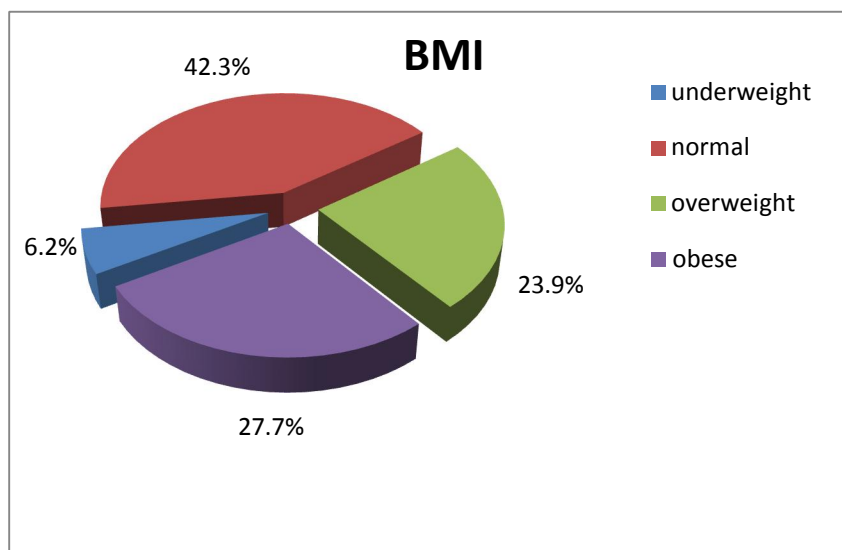


Figure 1: distribution of sample according to the BMI

Table 2 shows the concurrent disease among studied females. It was found that (18.2%) and (15.1%) of the overweight or obese group compared to (11.0%) and (5.4%) of none obese group were had hypertension and diabetes respectively. Also the study showed that (80.0%) of none obese group compared to (55.2%) of the overweight or obese group had no disease. This difference was statistically significant ($P < 0.05$).

Table (2): Distribution of the studied females according their concurrent disease.

Variable	None obese (727)		Overweight and obese (773)		X ²	P
	N	%	N	%		
Concurrent Disease						
Heart	18	2.5	57	7.4	1.53	.000
Diabetes	39	5.4	117	15.1		
Hypertension	80	11.0	141	18.2		
Kidney	9	1.1	20	2.6		
Liver	0	0.0	11	1.4		
None Disease	581	80.0	427	55.2		
Total	727	100.0	773	100.0		

Figure 2 shows that (85.20%) of more than or equal 40 year were overweight or obese versus (14.80%) were none obese, while (80%) from group of 19-<30 years were none obese compared to (20%) were overweight or obese.

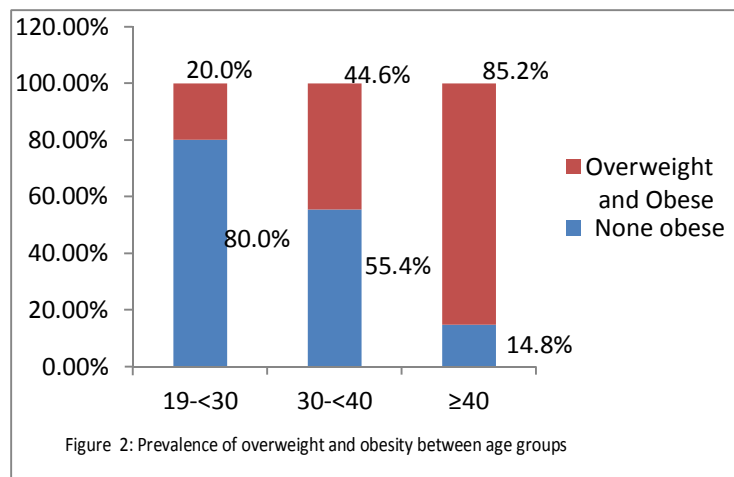


Figure 3 shows that (93%) of illiterate were overweight or obese compared to (45.30%) of the secondary or university education level.

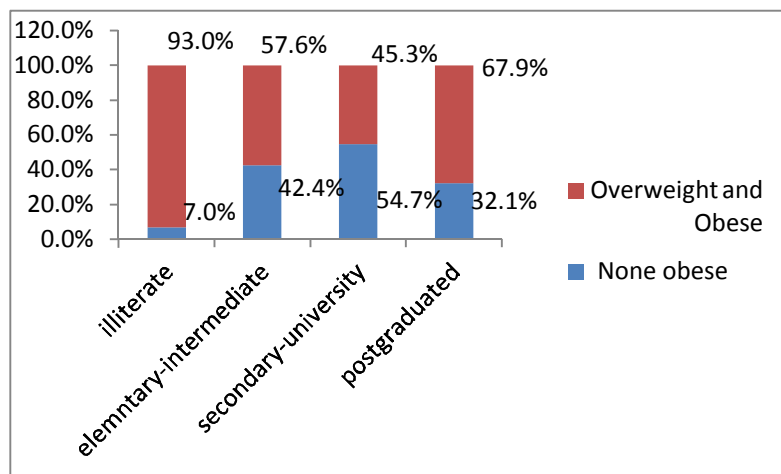


Figure 3: Prevalence of overweight and obesity among deferent educational levels.

Figure 4 shows that obesity represents (55.20%), (56.30%), and (45.50%) of the studied females with monthly income levels below 3000 SR, from 3000-6000 SR, and more than 6000 SR respectively

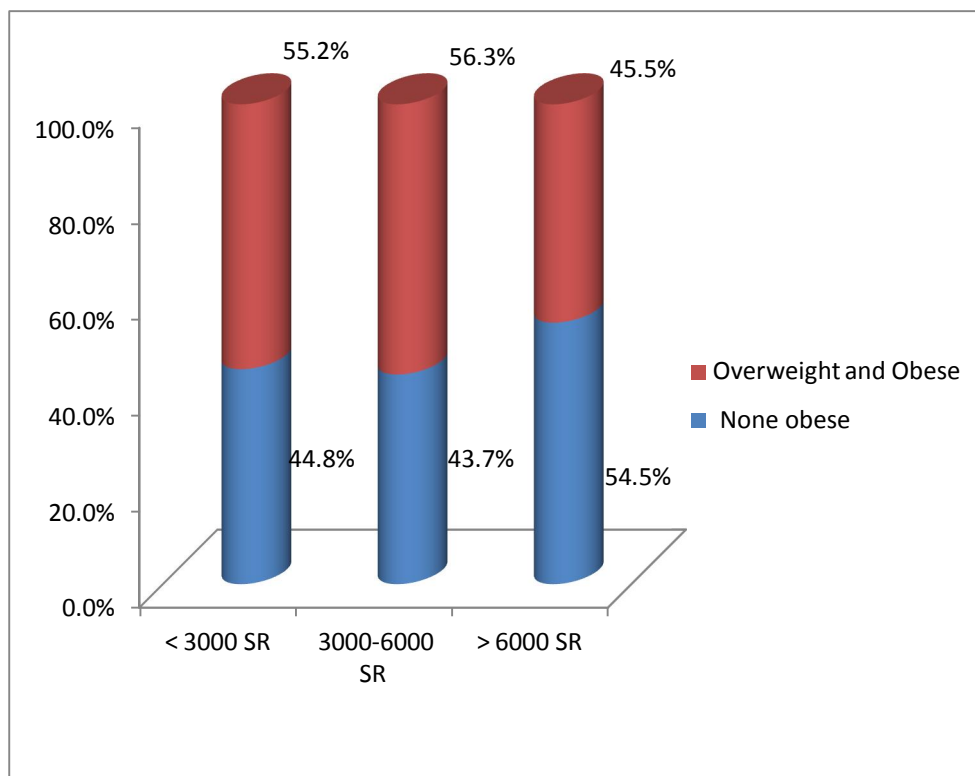


Figure 4: Prevalence of overweight and obesity among different levels of monthly income.

Tables 3 and 4 show the distribution of studied sample according to their food habits. The results showed that (43.1%) of overweight and obese individuals were eating two meals per day compared to (38.7%) of none obese group, this result was statistically significant ($P < 0.05$). About (42.0%) of none obese group were consuming fast foods from 2-4 times/week compared to (38.2%) of overweight or obese participants. This result was statistically non-significant ($P > 0.05$). About (41.4%) of overweight and obese group were prefer to drink Carbonated beverages compared to (33.3%) of none obese group. This result was statistically significant ($P < 0.05$). About (40.6%) of overweight and obese group were prefer to eat Chips and desserts for snack compared to (45.9%) of none obese individuals, this result was statistically non-significant ($P > 0.05$). About (34.7%) of none obese group were eating meals consist mostly of protein compared to (48.3%) of overweight or obese individuals, this result was statistically significant ($P < 0.05$).

Figure (5) shows that 43.1%, and 33.2% of the group was consumed 2 meals per day and group was consumed 3 meals per day, respectively were obese.

Figure (6) represents the exercise behavior of the participants. They show that the majority of studied samples were performing the exercise (60.1%), while (39.9%) from the sample weren't exercising.

Table (5) shows the anthropometric measures of the females participants. There were highly statistically significant difference between none obese and overweight or obese group regarding their weight, and BMI ($P < 0.001$). Also regarding body fat percentage and lean body mass, it was found statistically highly significant difference between the two groups ($P < 0.001$), where the mean body fat percentage of the none obese group was 31.12 ± 6.89 , while the overweight or obese group was $44.54 \pm 6.41\%$, and the mean lean body mass was $23.00 \pm 2.98\%$ of the overweight and obese group versus $25.15 \pm 3.48\%$ for none obese group.

Table (3): Distribution of studied sample according to their food habits.

Variable	None obese(727)		Overweight and obese (773)		X ²	P
	No	%	No	%		
Number of meals / day					23.96	.000
One	63	8.7	43	5.6		
Two	281	38.7	333	43.1		
Three	299	41.7	257	33.2		
More than three	84	11.6	140	18.1		
Total	727	100.0	773	100.0		
Number of breakfast intake/ week					13.77	.003
Daily	290	39.9	327	42.3		
3-4 times	215	29.6	217	28.1		
1-2 times	81	11.1	122	15.8		
Rarely	141	19.4	107	13.8		
Total	727	100.0	773	100.0		
Consumption of fast food/ week					5.14	.162
Daily	55	7.6	72	9.3		
2-4 times	305	42.0	295	38.2		
Once	286	39.3	298	38.6		
None	81	11.1	108	14.0		
Total	727	100.0	773	100.0		
Number of eating times with the family					13.15	.004
Daily	478	67%	455	58.9		
3-4 times /week	165	22.7	201	26		
1-2 times /week	46	6.3	79	10.2		
Rarely	29	4	38	4.9		
Total	727	100.0	773	100.0		
Preferred method of cooking					3.08	.379
Grilling	360	49.5	367	47.5		
Boiling	130	17.9	142	18.4		
Frying	205	28.2	240	31.0		
Total	727	100.0	773	100.0		
Favorite drink					10.51	.001
Carbonated beverages	242	33.3	320	41.4		
Fresh juices	485	66.7	453	58.6		
Total	727	100.0	773	100.0		

Table (4): Distribution of studied sample according to their food habits (cont...)

Variable	None obese (727)		Overweight and obese(773)		X ²	P
	No	%	No	%		
Amount of water / day					11.022	.004
Less than 8 cups	282	38.3	318	41.1		
8 cups or more	132	18.2	181	23.4		
When I feel thirsty	313	43.1	274	35.4		
Total	727	100.0	773	100.0		
Favorite snack					4.525	.104
Fruits and vegetables	309	42.5	355	45.9		
Chips and desserts	334	45.9	314	40.6		
Nuts	84	11.6	104	13.5		
Total	727	100.0	773	100.0		
Number times of eating dates/day					17.212	.001
1 - 2	300	41.3	400	51.7		
3 - 4	73	10.0	57	7.4		
More than 4	28	3.9	28	3.6		
None	326	44.8	288	37.3		
Total	727	100.0	773	100.0		
Number times of eating fruits and vegetables/day					1.592	.661
1 - 2	471	64.8	478	61.8		
3 - 4	110	15.1	127	16.4		
More than 4	45	6.2	48	6.2		
None	101	13.9	120	15.5		
Total	727	100.0	773	100.0		
Number times of eating sweets / day					31.987	.000
1 - 2	398	54.7	527	68.2		
3 - 4	148	20.4	110	14.2		
More than 4	54	7.4	28	3.6		
None	127	17.5	108	14.0		
Total	727	100.0	773	100.0		
The meals consist mostly of...					41.792	.000
Protein	252	34.7	373	48.3		
Carbohydrates	304	41.8	238	30.8		
Fats	76	10.5	102	13.2		
Vitamins and minerals	95	13.1	60	7.8		
Total	727	100.0	773	100.0		

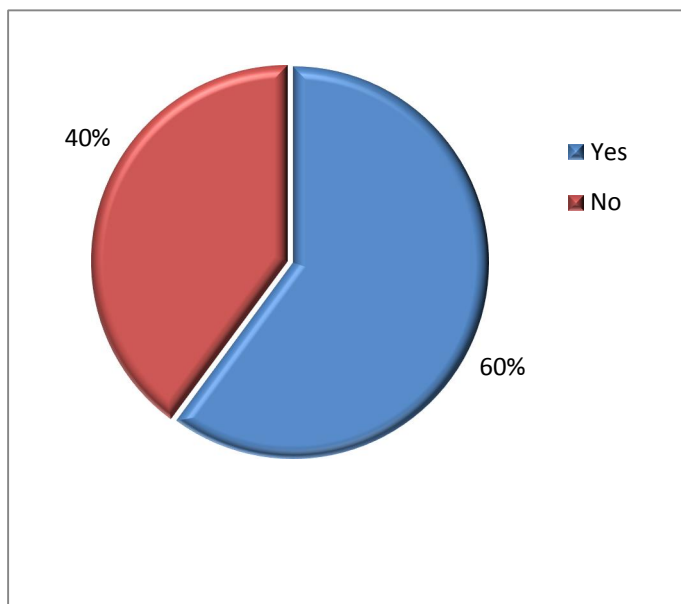
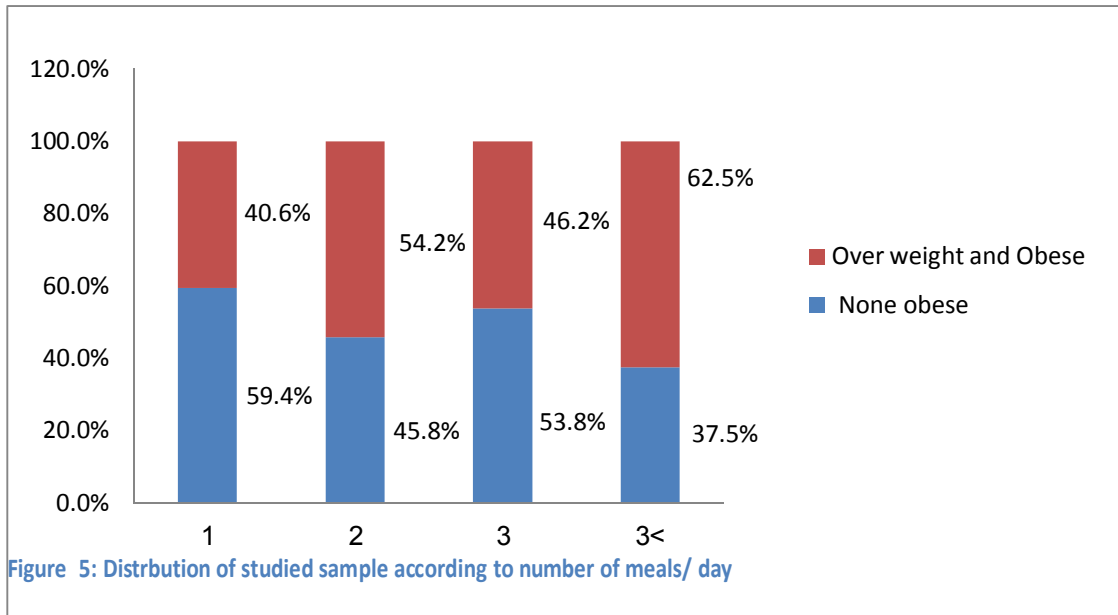


Figure (6): Distribution of participants according performing exercise.

Table (5): Anthropometric measurements and body composition among the studied females.

Variable	None obese	Overweight and obese	t-test	P
	Mean ±SD	Mean ±SD		
Wt. (kg)	52.95±6.31	79.44±14.00	47.7	.000
Ht. (cm)	1.58±6.18	1.59±7.22	1.56	.12
BMI kg/m ²	20.99±2.32	31.25±5.15	50.21	.000
BF %	31.12±6.89	44.54±6.41	39.03	.000
LBM %	25.15±3.48	23.00±2.98	12.87	.000

4. Discussion

Obesity is a health problem in the majority of the developed countries and is emerging as a serious problem in the developing countries of the world (Bouchard, 1992). Also along with the economic growth of the Gulf region, there has been an increase in nutritional health problems and related diseases. This is often referred to as the nutrition transition, which was first noted in developed countries, but has quickly spread to emerging economies and developing nations in the past two decades (Ng, *et al.*, 2011).

Obesity is a major public health issue in the Kingdom of Saudi Arabia (KSA) the increasing problem of obesity has been reported in several studies from Saudi Arabia. A clinic-based study in Al Khobar showed an obesity rate of 65.4% (BMI > 25 kg/m²) among females aged 18-74 years. (Binhemd, *et al.*, 1991) Similar findings have been reported from Jeddah and Riyadh. (Kashoggi *et al.*, 1994). Moreover, obesity among young age groups 6-13 years and 18-25 years reached high levels among females in the eastern province. (Rasheed *et al.*, 1994). So, the present study was conducted in Makkah, Saudi Arabia with the main aim to determine the prevalence of overweight and obesity in a sample of Saudi adults females by using the international standards of body mass index (BMI), and to determine the relationship between the obesity and factors associated.

Based on the classification of BMI, data indicated that (23.9%) of Saudi female adults were overweight and (27.7%) were obese as shown in Table 2. These findings were close to data from a national survey in 1997 encompassed 10,651 subjects from Riyadh region where overweight was 31.7% and obesity was 22.1% (Al-Nuaim *et al.*, 1997). Also, Binhemd *et al.*, 1991 reported a point prevalence of overweight of 34.1%. In Eastern region, Al-Shammari *et al.*, 1993 recorded a slightly lower rate of overweight among non-pregnant adult Saudi females (26.8%). The data of the present study also confirms earlier reports of high prevalence of obesity in females in Riyadh = 44.1% (Al-Shammari *et al.*, 1993), Eastern Province = 27% (Khwaja and Al-Sibai, 1987), Central Province = 29.7% (Binhemd, *et al.*, 1991), and highlanders in the Western Province of Saudi Arabia = 67.6%. (Khalid and Ali, 1994) Similarly, males have also been shown to have a high prevalence, i.e., 28% (Al-Rehaimi and BJORNTORP, 1992) 21% (Ogbeide, 1996) and 18% (Binhemd, *et al.*, 1991) in Riyadh and 45% in the highlanders (Khalid and Ali, 1994). Overall, the percentage of overweight or obesity of the present study was higher than that in USA, whereas 35% of the College students were reported to be overweight or obese. Contrary to the present study and in spite of the high rate of economic growth in China, overweight

and obesity among university students was 2.9% only (Sakamaki, *et al.*, 2005).

Obesity usually occurs by high intake of energy and its less expenditure, The present study proves that the subjects whose life style was inactive were prone to obesity more as compare to those whose life style was active. They show that the majority of subjects were regular in the exercise (60.1%), while (39.9%) from the sample weren't exercising. Table (5) shows **Anthropometric measurements and body composition of females**. There was highly statistically significant difference between none obese and overweight or obese group regarding their mean weight, BMI, BF%, and lean body mass ($P < 0.001$).

Regarding the age, the middle-age spread is still a problem. The prevalence of obesity is higher among middle-aged adults (39.5%) than younger (30.3%) or older (35.4%) adults (Nanci, 2013). Versus the result of present study which showed that the higher prevalence of obesity among ≥ 40 year (57.4%) than middle-aged adults 30-<40 year (32.1%) or younger 19-<30 year (10.6%).

Modernization and adoption of the Western lifestyle for countries in transition are key factors affecting nutritional habits and obesity levels (Sibai *et al.*, 2003). The data of the current study shows that the most common eating habits encountered were eating two main meals/day, consumed meals with family, drinking fresh juices, sweets, and the meals consist mostly of protein. Statistically significant direct co-relationship was found among these factors ($P < 0.005$). The importance of regular eating was emphasized by several studies. Skipping of breakfast has been associated with lower nutritional status and increased the risk of cardio-vascular disease (Sakarata *et al.*, 2001). In addition, less adequate breakfast habits may contribute to the development of obesity (Ortega *et al.*, 1996). The importance of eating at fixed times during the day should be highlighted in health education programs. It was reported that obese in general were less likely to eat at selected times (Rasheed, 1998).

The results of the present study showed that most of the obese and overweight participants had eaten two main meals per day (43.0%), the majority of the obese and overweight participants eat vegetables and fruits twice a day (61.8%) and (13.8%) of them were rarely eating breakfast. Moreover, most of the females studied were eating. With the comparison of these results with equivalent study from Chinese, was found that the majority of participants ate 3 regular meals per day, 80% of students consumed vegetables and fruit twice per day and snacking was reported by 31% of females (Sakamaki *et al.*, 2005). Also our results are relative to other study among Saudi female in Riyadh was found that 41.2% of participants skipped their

breakfast. Snacking was reported by most of the students (98.9%). Moreover, **Norah, 2010** demonstrated high consumption of protein, rice and bread. Those who reported eating these items once daily were, 49.4%, 47.3% and 30.4% respectively. Minority of subjects consumed fruits and vegetables 2 to 3 times a day being 7.4% and 9.8% respectively. More than fifth of subjects reported daily eating of potato chips (24.5%) and pastry (22.1%). The importance of food habits during the day should be highlighted in health education programs in KSA.

Obesity and high BMI values are major risk factors for several diseases, most notably diabetes. Studies have shown that for every 1-kg increase in weight, the prevalence of diabetes rises by 9% (**Mokdad et al., 2000**). The WHO specifies a BMI value of 21 kg/m² as optimal for the adult population mean, allowing almost all individuals to fall within the healthy weight range of 18.5 to 24.9 kg/m² (**WHO, 2002**). Also the study proved that overweight and obesity is one of the major risk factors for many chronic diseases as shown in Table (2). It was found that 18.2% and 15.1% of the overweight and obese group versus 11.0% and 5.4% of none obese group had hypertension and diabetes respectively. Also regarding concurrent disease the study shows 80.0% of none obese group, and 55.2% of the overweight and obese group had no disease. This difference was statistically significant ($p < 0.05$).

SES plays an important role in the development of obesity. In this study it was observed that low socio-economic background is a contributing factor, Figure (4) shows that (55.2%) of the females with monthly income level below 3000 SR were overweight or obese. compared to (56.3%) and (45.5%) of the females with monthly income level from 3000-6000 SR and more than 6000 SR. were. overweight or obese individuals. SES is an important individual characteristic that influences an individual's access to resources, knowledge of nutrition and health, food choices, and physical activity at work and in leisure time (**Sobal, 1991**). Moreover, ubiquitous advertisements for energy-dense foods, low prices of unhealthy foods, large portion sizes, and food preparation practices at home can affect all SES groups and, thus, promote weight gain (**French et al., 2001**). Over the past 2 to 3 decades, many social, economic, and environmental changes probably have contributed to the decline of people's physical activity and energy expenditure (**Hill et al., 2003**). The prevalence of obesity and overweight has increased in all SES groups. The disproportionate increase in the prevalence of obesity and overweight in high-SES groups indicates that even if people are aware of the importance of maintaining a healthy body weight, having a healthy diet, and engaging in regular physical activity, they are still gaining weight. It is societal

changes that have contributed to the increase in obesity (**Qi, 2004**).

Conclusion and Recommendations

This study was revealed the high prevalence of obesity (27.7%) and overweight (23.9%) among adult females in Makkah, Saudi Arabia. Factors associated with overweight and obesity among studied subjects were increasing age, high monthly income, skipping breakfast, drinking carbonated beverages. Irregular eating habits significantly associated with obesity. The study findings about dietary behaviors and food habits indicated the need for a national strategy both at institutional and community levels aiming at modifying the unhealthy lifestyle among Saudis.

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