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Relationship between Age and the Prevalence of Obesity and Overweight in Saudi Population

Mohsen AF El-Hazmi, PhD, FRCPath, FACB*, Arjumand S Warsy**

Objective: Obesity and overweight occur at a high prevalence in the adult population in different regions of Saudi Arabia. This study was aimed to determine the relationship between age and the prevalence of obesity and overweight in Saudi males and females.

Methods: The study group included 11208 individuals (males = 4628; females =6580) with age ranging from 20-70 years. Height and weight were measured and Body Mass Index (BMI) was calculated.

Results: The overall prevalence, in this adult Saudi community, of obesity and overweight was 15.12% and 32.82% in males and 23.97% and 29.09% in females, respectively. Further grouping was carried out according to age into 20-29, 30-39, 40-49 and ≥ 50 years age groups and the prevalence of obesity and overweight was determined in each age group. In the males the highest prevalence of obesity and overweight was 19.2% and 38.6% in the 40-49 years age group, while in the females overweight was most common in the > 50 years age group (34.8%) and obesity was highest in the 40-49 years age group (36%). A statistically significant increase was observed in the prevalence of both obesity and overweight with age. The correlation coefficient "r" was determined using General Linear Model Programme. The `r' between age and obesity was 0.9066 and 0.9593 and between age and overweight was 0.8864 and 0.8790 in the males and females, respectively, with a $p < 0.005$ in all groups.

In all age groups, obesity was significantly more in the females compared to males. Overweight was more prevalent in the females 20-29 years of age as compared to men, but the 30-49 years male had a higher prevalence of overweight. Male and female >50 years had almost an equal prevalence of overweight.

Conclusion: This study highlights the significant increase in the prevalence of obesity and overweight with age in both Saudi males and females. It stresses the need for extensive awareness programmes for the general public, highlighting the causes and complications of overweight and obesity. In addition, it is also necessary to make the Saudi public aware of the ways, means and significance of weight control.

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* Professsor
Department of Medical Biochemistry &
WHO Collaborating Centre
College of Medicine & King Khalid University Hospital

** Professor
Department of Biochemistry
College of Science
King Saud University
Riyadh, Kingdom of Saudi Arabia

Obesity, and overweight are both defined as "excessive" accumulation of fat in the body where the former is a more severe state[1,2]. Several methods are used to measure obesity[3,4]. On the basis of the Body Mass Index (BMI), normal weight is considered if the BMI is between 20-<25, overweight if BMI is between 25-<30 and obesity if BMI is $\geq$ 30[3]. Overweight and obesity are considered as a major health problem in several developed and developing countries[1,3]. As obesity is multifactorial, both genetic and environmental factors play a role in its development[5-7]. It is well established that obesity is associated with several complications including coronary artery disease, hypertension, diabetes mellitus, arteriosclerosis, hyperlipidaemias, and some types of cancer[8-16]. On the other hand, weight reduction, which is a possibility in most cases, is associated with significant reduction in the frequency of some of the major complications related directly to obesity[17-22].

The prevalence of obesity varies remarkably in various populations, sexes and age groups (Table 1)[23,24]. It was found that obesity increases with age and reaches its peaks at around 55-64 years and decreases afterwards. In Saudi Arabia, El-Hazmi and co-workers conducted an extensive study to determine the prevalence of overweight and obesity in Saudis in different regions of Saudi Arabia. The findings revealed a high prevalence of obesity in the overall adult population, with females having higher obesity prevalence than males[25].

Table 1.**Prevalence of obesity in different age groups in different populations**

Country	Age group (Years)	Prevalence (%) of obesity	
		Men	Women
Australia	25-34	4.0	5.7
	35-44	6.2	7.5
	45-54	10.2	22.0
	55-64	9.6	12.5
	25-64 (Total)	7.0	7.0
South Africa	15-24	3.6	4.6
	25-34	13.2	10.5
	35-44	14.3	15.6
	45-54	20.9	23.8
	55-64	19.8	31.7
	15-64 (Total)	14.7	18.0
U.S.A.	20-24	7	7
	25-34	10	12
	35-44	12	16
	45-54	16	18
	55-64	14	21
	20-64 (Total)	12	15
U.K.	20-24	3	5
	25-34	6	6
	35-44	8	8
	45-54	8	12
	55-64	9	14
	20-64 (Total)	8	9
Italy	15-44	4.8	3.9
	45-64	9.9	11.1

This study aims to highlight the relationship of age with the prevalence of overweight and obesity in the Saudi population.

METHODS

The study group comprised of 11208 adult Saudis (males =4628; females = 6580). The study was a part of a National Programme for the study of diabetes mellitus, which involved a house-hold screening protocol according to a well designed statistical plan. The methodology involved in the random household screening has been published elsewhere[25]. On a mutually agreed date the family was visited and physical details such as age, sex, height and weight were recorded for each member of the family. The height was recorded for each member of the family using a measuring tape fixed on the wall with the individual standing and without shoes. Each individual was asked to stand straight next to the wall, with the heads, buttocks, shoulders and occiput touching the wall. The head was kept erect and the measuring tape was stretched slightly to measure the height to the nearest 0.1 cm. Weight was recorded on a portable measuring scale calibrated regularly at the end of each day. The individuals were requested to be barefooted and to wear a light dress and the weight was recorded by taking two successive readings to the nearest 100 gm. The mean of the two reading were recorded. For each individual the Body Mass Index (BMI) ie. weight (kg)/height^2 (m^2) was calculated and used to classify each individual as normal, overweight and obese[1-3]. To compare the results in any two groups, Chi square analysis were calculated using 2 x 2 contingency tables. Regression analysis were conducted and correlation coefficients (r) were determined between age and prevalence of overweight and obesity, using the General Linear Model (GLM) Programme of Statistical Analysis System (SAS). P value < 0.05 was considered statistically significant.

RESULTS

The value of BMI was used to classify each individual as normal (BMI < 25), overweight (BMI 25-29) or obese (BMI $\geq$ 30). The prevalence of overweight and obesity in the total males and females are presented in Table 2, and show that males have significantly higher prevalence of overweight while females have significantly higher prevalence of obesity.

Table 2. **Prevalence of obesity and overweight in the Saudi population**

Sex	Age Group	No. investigated	Obese		Overweight	
			No.	%	No.	%
Males*	20-70	4628	700	15.12	1519	32.82
Females*	20-70	6580	1577	23.97	1914	29.09
Total:	20-70	11208	2277	20.31	3433	30.63

*The difference in the prevalence of obesity in the males and females is statistically significant ($p<0.001$).

The study population was grouped into four age categories, 20-29, 30-39, 40-49 and ≥ 50 years. The results are presented in Table 3. In general, the prevalence of overweight was higher than obesity in each age group except at age group 40-49 years in females where the prevalence of obesity exceeded that of overweight . In the males, the overweight increased from 21.4% at age 20-29 years to 38.6% at age 40-49 years and then reduced to 35.2% in those ≥50 years old. In the females overweight increased from 24.3% at age group 20-29 years to 34.8% at age group 50 years and above. The results in males and females in different age groups are compared and presented as Figures 1 & 2. The correlation coefficient (r) between age and obesity in the males and females was 0.9066 and 0.9593, respectively, with $p < 0.005$, while between age and overweight was 0.8864 and 0.8790 in the males and females, respectively with $p < 0.001$.

Table 3. **Prevalence of obesity and overweight in adult male and female Saudis of different age groups**

Age (years)	Prevalence (%) in males					Prevalence (%) in females					P#
	No. Investigated	Obese		Overweight		No. investigated	Obese		Overweight		
		No.	(%)	No.	(%)		No.	%	No.	%	
20-29	1073	98	9.13*	230	21.4*	2325	306	13.2**	565	24.3**	$\pi^2 = 11.37$ <0.001
30-39	923	147	15.9*	334	36.2*	1787	481	26.9**	547	30.6**	$\pi^2 = 41.3$ < 0.0001
40-49	816	157	19.2	315	38.6	111	400	36**	330	29.7	$\pi^2 = 66.3$ < 0.0001
≥ 50	1816	298	16.4	640	35.2	1357	390	28.7**	472	34.8	$\pi^2 = 69.53$ < 0.0001

**Increase in prevalence of obesity and overweight in males is statistically significant between20-29 years and 30-39 years age group, but not in 30-39 to 40-49 years and ≥ 50 years.*

***Increase in the prevalence of obesity and overweight in females is statistically significant between all age groups.*

 # Statistical significance of the difference in the prevalence of obesity in the male and female in the same age group.

DISCUSSION

Obesity and overweight are risk factors for several chronic disorders that may lead to life threatening and debilitating complications.

Earlier studies in Saudi population reported a high prevalence of obesity in adult Saudi males and females[26,27]. The results of this study also show a high prevalence of obesity in adult Saudi male and female population where the prevalence is 15.12% and 23.97%, respectively. This prevalence is close to that reported for males and females in South Africans and USA. population[24], while other population including the British, Australians and Italians have considerably lower prevalence compared to Saudis[24]. With increase in age a dramatic increase in overweight and obesity was observed. In those above 40 years, two in three Saudi females are either obese or overweight. The correlation coefficient (r) between age and obesity and overweight are 0.9593 and 0.8790, respectively, with $p < 0.001$ in both groups.

Figure 1. Correlation between age and prevalence of obesity in Saudi males and females

In the Saudis the prevalence of diabetes mellitus is high[28-31] and the diabetic patients have higher prevalence of obesity and overweight compared to the non-diabetics[32]. In addition, prevalence of diabetes mellitus shows a significant increase with age and those over 30 years of age almost one in four Saudis is diabetic (Fig 1& 2) . Other chronic diseases have also been reported in obese Saudis[15]. Further studies may highlight further complications of obesity.

Figure 2. Correlation between age and prevalence of overweight in Saudi males and females

This study shows the seriousness of the situation in relation to age and stresses the need for effective awareness programmes.

Obesity and overweight are clinical states that can be corrected by proper dietary habits and increase in physical activity. Reducing carbohydrates and fats plays an important role in weight reduction and hence can result in considerable weight loss. It is the lack of awareness and careless approach towards physical activities that is resulting in increase in obesity and overweight prevalence in Saudis [El-Hazmi et al, in preparation]. Intake of carbohydrates and sugars are high and life is fairly sedentary largely due to the availability of home help, and the climatic conditions [El-Hazmi et al, in preparation]. Afternoon siesta after a heavy meal is a norm and is considered necessary by majority of the population, particularly during the hot summer days. Thus, the awareness programmes in Saudi Arabia have to be specially designed in order to (i) first convince the population of the harmful effects of obesity and overweight, and (ii) followed by awareness of the correct diets and proper physical activities.

CONCLUSION

This study highlights the significant increase in prevalence of obesity and overweight with age in both Saudi males and females. It stresses the need for extensive awareness programs for the general public, highlighting the causes and complications of

overweight and obesity. In addition, it is also necessary to make the Saudi public aware of the ways and means and significance of weight control.

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