

CHANGES IN BODY MASS INDEX AND PREVALENCE OF OBESITY AMONG ADULT KUWAITI WOMEN ATTENDING HEALTH CLINICS

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This study was undertaken to compare changes in body mass index (BMI, kg/m²) and in prevalence of adiposity (BMI >25 and >30 kg/m²) between two cross-sections of previously studied samples of 1171 and 1705 adult (aged ≥18 years) Kuwaiti women drawn from primary health care (PHC) clinics and studied for nutritional assessment and for prevalence of obesity in 1980-1981 and 1993-1994, respectively. Mild and moderate obesity (BMI >25 and >30 kg/m²) were assessed based on the WHO criteria. The results of the study showed that BMI and prevalence of obesity (BMI >25 and >30 kg/m²) increased by 6.2% (1.7 kg/m²), 22.7% and 8.4%, respectively. After controlling for sociodemographic differences between the two study periods, including period of study, age, region, education, marital status and occupation, mean BMI was 1.6 kg/m² higher in 1993-1994 than in 1980-1981 and prevalence of obesity (BMI >25 and >30 kg/m²) also increased between the two periods (OR=2.2, 95% CI 1.6-3.0 and OR=1.4 95% CI 1.0-1.9, respectively). The rates of increase in BMI and in prevalence of obesity among Kuwaiti women were higher than in selected other countries. *Ann Saudi Med* 1997;17(3):307-311.

Obesity may result when energy intake exceeds energy expenditure. Obesity has been reported to be associated with higher mortality¹⁻³ and morbidity.⁴⁻⁸ In some modern-day societies, women are more likely to diet to lose weight for cosmetic than for health reasons.⁹ Women have been getting heavier over the past several decades, as judged from studies done on time trends in BMI and in prevalence of obesity.¹⁰⁻¹⁹

Data on BMI and prevalence of obesity are scarce among the population of most developing countries.²⁰⁻²¹ Data on temporal changes in BMI and prevalence of obesity are even more so.¹⁹ Kuwaiti women have been exposed to drastic physical and social changes in society in the past few decades, and no study of this nature has been done on them. The purpose of this study is to explore temporal changes in mean BMI and in prevalence of obesity between two independent samples of 1171 and 1705 Kuwaiti women aged 18 years and older studied in 1980-1981 and 1993-1994, respectively.

Methods

Kuwait is divided into five regions of governorates: 1) the capital, which is entirely urban; 2) Hawalli, which

is also entirely urban; 3) Farwaniya, which is mostly urban; 4) Ahmadi, which is about half rural; and 5) Jahra, which is mostly rural.

Two independent studies were used for analysis and comparison of temporal changes in BMI and in prevalence of obesity among Kuwaiti women. The first was a national study of 1171 women completed in 1980-1981 for the "Nutrition Status Assessment of Adults."²² The second was a cross-sectional study of 1705 women completed in 1993-1994 to assess the prevalence of obesity among Kuwaitis.²⁰

The 1980-1981 sample of 1171 women was drawn from 17 randomly selected primary health care (PHC) clinics located in all of the five regions (governorates) of Kuwait, using stratified random sampling according to the population sex ratio. The division of the sample among the clinics was proportionally defined by the catchment area served by each of the selected clinics. The sample size was determined through the application of the binomial theory.

The 1993-1994 sample of 1705 women aged 18 years and older was drawn from volunteer ambulatory patients attending six (10%) randomly selected primary health care (PHC) clinics for minor ailments such as cold or flu, as well as from those who accompanied them to the clinics. Potential participants were screened by a trained interviewer, who obtained their consent prior to participating in the study. The study extended over a year (April 1993-March 1994) and the required data were obtained through two rounds among the selected clinics in order to avoid seasonal fluctuations in clinic attendance. A sample of at least 200 volunteers in each age group was obtained, with the exception of the 60 years and above age

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TABLE 1. Mean (standard deviation, SD) body mass index (BMI, kg/m²) and prevalence of obesity (BMI>25 and >30 kg/m²) among Kuwaiti women by age group, region, education, marital status and occupation during two study periods, 1980-1981 and 1993-1994.

Variable	1980-1981		1993-1994		% Obese			
	#	Mean BMI(SD)	#	Mean BMI(SD)	BMI>25 kg/m ²		BMI>30 kg/m ²	
					1980-81	1993-94	1980-81	1993-94
Age (years)								
18-19	89	22.5 (4.9)	200	24.8 (5.8)**	21.3	39.0**	9.0	20.0*
20-29	396	25.4 (5.9)	507	27.5 (5.0) [†]	44.4	66.7 [†]	21.2	29.2**
30-39	295	28.4 (6.4)	400	30.0 (5.5) [†]	68.1	81.8 [†]	37.6	45.3*
40-49	200	30.1 (5.8)	250	31.1 (5.2)*	80.0	88.8**	48.5	54.8
50-59	120	29.9 (6.5)	252	31.7 (6.5)*	79.2	84.5	45.0	57.1*
≥60	71	27.5 (6.0)	96	29.8 (7.6)*	59.2	67.7	32.4	43.8
Total	1171	27.3 (6.4)	1705	29.0 (6.0) [†]	59.2	72.9 [†]	32.2	40.6 [†]
Region (governorate)								
Capital	342	27.9 (6.5)	427	29.2 (6.1)**	64.0	76.8 [†]	34.8	38.0
Hawalli	166	27.2 (5.8)	307	28.4 (5.6)*	60.8	70.8*	31.3	34.5
Farwaniya	312	26.0 (6.4)	197	28.9 (6.7) [†]	46.8	67.0 [†]	25.0	43.7 [†]
Ahmadi	176	27.8 (6.1)	283	30.5 (6.6) [†]	65.3	76.0*	35.8	52.7 [†]
Jahra	175	28.2 (6.8)	491	28.5 (5.4)	64.0	71.5	37.1	38.5
Education								
Low (illiterate or elementary)	897	27.6 (6.4)	649	30.9 (6.2) [†]	61.3	81.2 [†]	33.9	54.1 [†]
Medium (intermediate or secondary)	252	26.6 (6.3)	559	29.3 (5.7) [†]	54.0	76.6 [†]	28.6	43.1 [†]
High (college or higher)	22	23.0 (4.6)	497	26.4 (5.1)**	31.8	57.9*	4.5	20.1
Marital status								
Single	163	24.2 (5.9)	382	25.7 (5.3)**	33.7	49.2 [†]	14.7	21.5
Married	802	27.7 (6.2)	1198	29.8 (5.8) [†]	62.1	79.0 [†]	34.5	45.2 [†]
Divorced or widowed	206	28.5 (6.9)	125	31.7 (6.4) [†]	68.0	87.2 [†]	36.9	55.2 [†]
Occupation								
Not working	997	27.4 (6.4)	82	27.2 (4.6)	60.1	68.3	32.4	22.0
Working	174	26.8 (6.5)	1623	29.1 (6.1) [†]	54.0	73.1 [†]	31.0	41.5**

T-test was used to compare changes between the two periods; *P<0.05; **P<0.01; [†]P<0.001.

group, since it constituted only 3.5% of the total Kuwaiti population. Refusal rate was less than 15% in the two samples.

The two samples were drawn from the five regions (governorates) of Kuwait, which include both urban and rural settings. The two samples were also characterized by similar sociodemographic factors. It was assumed that comparison between the two samples used in the study may represent a time trend in BMI and in prevalence of obesity between the two independent samples taken 13 years apart. The term "trend," therefore, should be used with the qualification that measurements of BMI were done for each of the two independent samples at two different times: more measurements in time on the same sample (longitudinal) may represent and better be called a trend.

The variables used in the two studies were height, measured without shoes to the nearest 0.5 cm; weight, measured to the nearest 0.1 kg with the subject in light indoor clothes, with emptied pockets and without shoes, using a precalibrated SECA scale; body mass index (BMI), which is the weight in kilograms divided by the height in meters squared (kg/m²); age (18-19, 20-29, 30-39, 40-49, 50-59, ≥60); region, which included the five regions in Kuwait; education, which included low (illiterate or elementary), medium (intermediate or secondary), high

(college or higher); marital status (single, married, divorced or widowed); and occupation (working and not working).

The index of adiposity used in this study was the BMI, which is the weight in kilograms divided by the height in meters squared (kg/m²). The criteria attributed to WHO²³ were adopted for the classification of the BMI categories, as follows: <18.5, below normal; 18.5-25, normal; and >25 and >30, obese.

The percentages of obesity were calculated as the proportion of women in each of the two samples whose BMI exceeded 25 and 30 kg/m². The percent increase in BMI was calculated by subtracting the earlier (1980-1981) BMI value (27.3 kg/m²) from the latter (1993-1994) value (29.0 kg/m²). The product was then divided by the earlier BMI value and multiplied by 100 (29.0-27.3/27.3x100).

The SPSS package (Statistical Programme for the Social Sciences, Version 6.0.1, PC Windows) was used for data analysis. In addition to descriptive statistics, the chi-squared test was used to assess the association between categorical variables. The t-test was used to compare

TABLE 2. Changes in body mass index and in prevalence of obesity among Kuwaiti women, with respect to each selected variable, after adjustment for the effect of the other variables.

Mean BMI ¹ (kg/m ²)	Prevalence of obesity ²
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Variable	Regression coefficient (SE)	BMI>25 kg/m ²		BMI>30 kg/m ²	
		OR (95%-CI)	BMI>25 kg/m ² OR (95%-CI)	BMI>30 kg/m ² OR (95%-CI)	BMI>30 kg/m ² OR (95%-CI)
Study period 1980-81		1.0	1.0		
Study period 1993-94	1.6 (0.4) [†]	2.2 (1.6-3.0)	1.4 (1.0-1.9)		
Age (years)					
18-19	-	1.0	1.0		
20-29	1.6 (0.4) [†]	2.0 (1.5-2.8)	1.3 (0.9-1.9)		
30-39	4.1 (0.5) [†]	4.8 (3.3-6.9)	2.5 (1.7-3.8)		
40-49	5.4 (0.5) [†]	8.7 (5.7-13.4)	3.6 (2.3-5.5)		
50-59	5.3 (0.6) [†]	6.4 (4.1-10.1)	3.1 (1.9-4.9)		
≥60	3.0 (0.7) [†]	2.2 (1.3-3.7)	1.7 (1.0-3.0)		
Region (governorate)					
Capital	-	1.0	1.0		
Hawalli	-0.7 (0.3)*	0.8 (0.6-1.0)	0.9 (0.7-1.1)		
Farwaniya	-1.1 (0.3)**	0.5 (0.4-0.7)	0.8 (0.6-1.1)		
Ahmadi	0.9 (0.3)*	1.1 (0.8-1.4)	1.5 (1.2-1.9)		
Jahra	-0.8 (0.3)*	0.8 (0.6-1.0)	0.8 (0.7-1.1)		
Education					
Low (illiterate or elementary)	-	1.0			
Medium (intermediate or secondary)	0.5 (0.3) [†]	1.5 (1.1-2.0)	1.0 (0.8-1.3)		
High (college or higher)	-1.6 (0.4)*	0.8 (0.6-1.1)	0.4 (0.3-0.5)		
Marital status					
Single	-	1.0	1.0		
Married	1.1 (0.4)**	1.7 (1.3-2.2)	1.4 (1.0-1.9)		
Divorced or widowed	2.0 (0.5) [†]	2.5 (1.7-3.7)	1.6 (1.1-2.4)		
Occupation					
Not working	-	1.0	1.0		
Working	0.8 (0.4)*	1.1 (0.8-1.4)	1.5 (1.1-2.1)		

*P<0.05; **P<0.01; †P<0.001; SE=standard error; CI=confidence interval; ¹based on multiple linear and ²logistic regression.

between the mean BMIs and percent prevalence of obesity of the two samples from the two study periods.

Other methods of statistical analysis were also used. The multiple linear regression model was used with the BMI as a dependent variable and a number of other variables, such as period of study, age, region, education, marital status and occupation, were used as independent variables. The various categorical variables were converted to dummy variables prior to their inclusion in regression. This multivariate approach had the merit of fixing the confounding effects between independent variables giving rise to the pure influence of each of those variables on BMI. It explains the effect that two or more independent variables have on a dependent variable. Logistic regression was also done, using a binary variable as a dependent variable and a number of other variables as independent variables. The merit of the logistic regression approach is that it leads to the odds ratios (estimated relative risk or RR) of the independent variable in relation to a reference group. A P-value of P<0.05 was used as the criterion of statistical significance.

Results

Temporal Changes in Mean BMI

A significant (P<0.001) average increase in mean BMI of 6.2% (1.7 kg/m²) was noted between 1980-1981 and 1993-1994; the only non-significant changes in BMI were noted in Jahra region and among those who were not working (Table 1).

Table 2 shows the influence of different variables on mean BMI of Kuwaiti women, after adjustment for the effects of the other variables, such as period, age, region, education, marital status and occupation, using the multiple linear regression model. This model estimates the magnitude of change in relation to a reference group for each factor independent of the other variables.

In 1993-1994, a significant increase of 1.6 kg/m² in mean BMI over 1980-1981 (1.6, P<0.001) was noted. Significant (P<0.001) increases in BMI were noted in all age groups in comparison to the reference group (18-19 years of age). Only Ahmadi region showed a significant (P<0.05) increase in BMI. A significant increase was noted among those with medium education (P<0.001), the widowed or divorced (P<0.01), and among those who are working (P<0.05).

Table 3 shows temporal changes in mean BMI among Kuwaiti women compared with changes in BMI in selected other countries, such as the USA,¹⁴ Italy,¹⁵ Finland,¹⁶ the Netherlands,¹⁷ and Sweden,¹⁹ all with intervening BMI measurements between the shown first and second periods, except for Italy and Sweden. Among Kuwaiti women, mean BMI increased by 7.4% between 1980-1981 and 1993-1994. The rate of change per year was higher, by comparison, in Kuwait than in any of the selected countries, including between intervening years.

Temporal Changes in Prevalence of Obesity

A significant (P<0.001) average increase of 13.7% in obesity, defined as BMI>25 kg/m², was noted between 1980-1981 and 1993-1994; it increased significantly across all variables with few exceptions. Obesity, defined as BMI>30 in kg/m², in the interim, significantly (P<0.001) increased by an average of 8.4%; it also increased significantly across all variables, with few exceptions (Table 1).

Table 2 shows the prevalence of obesity (BMI>25 and >30 kg/m²) in a sample in Kuwaiti women by year of study, age, region, education, marital status, and education, after adjustment for the effects of the other variables (odds ratios, OR) with 95% confidence intervals (CI), using the

TABLE 3. Changes in body mass index among Kuwaiti women compared to women in selected other countries.

Country	Year	BMI (kg/m ²)	Year	BMI (kg/m ²)
Kuwait	1980-81	27.0	1993-94	29.0
USA ¹⁴	1973	23.9	1985-87	25.6

Finland ¹⁶	1972	26.9	1982	26.4
Italy ¹⁵	1978-79	25.3	1983-84	24.6
The Netherlands ¹⁷	1974	24.7	1980	24.4
Sweden ¹⁹	1980-81	23.4	1988-89	23.4

TABLE 4. Changes in prevalence of obesity among adult Kuwaiti women compared to women in selected other countries.

Age group (yr)	Kuwait		Sweden ¹⁹		Czechoslovakia ¹⁸	
	BMI >30 kg/m ²		BMI ≥28.6 kg/m ²		BMI ≥29 kg/m ²	
	1980-81	1993-94	1980-81	1988-89	1985	1988
25-34	28.1	39.7	2.2	4.7	10.9	11.6
35-44	47.1	49.7	4.2	5.6	23.9	27.5
45-54	41.8	58.0	10.9	11.6	36.8	42.5
55-64	43.8	54.7	17.6	16.9	52.2	40.7

multiple logistic regression model. This model presents, as a ratio, the magnitude of change in relation to a reference group.

In 1993-1994, there was a significant increase in the prevalence of obesity, defined as BMI >25 kg/m², in comparison to 1980-1981 (odds ratio 2.2, $P < 0.001$). Significant changes were noted in all age groups in relation to the reference group. Significant changes were noted in Farwaniya region ($P < 0.001$), among those with medium education ($P < 0.01$), and among the married, divorced or widowed ($P < 0.001$).

In 1993-1994, there was a significant increase in the prevalence of obesity, defined as BMI >30 kg/m², in comparison to 1980-1981 (odds ratio 1.4, $P < 0.05$). Significant changes were noted in all except the youngest age group. Significant changes were noted in Ahmadi region ($P < 0.01$), among the highly educated ($P < 0.001$), the married, divorced or widowed, and among those who are working ($P < 0.05$).

Table 4 compares temporal changes in the prevalence of obesity in Kuwait (BMI >30 kg/m²) with Sweden¹⁹ (BMI >28.6 kg/m²) and Czechoslovakia¹⁸ (BMI ≥29 kg/m²) among selected age groups of women between two periods. It shows that Kuwait has higher levels of obesity in both periods than the other two periods of each country with respect to the selected age groups, except for the oldest age group (55-64) of Czechoslovakia. Moreover, the average change in obesity, defined as BMI >30 kg/m², in Kuwait was higher than the average change in each of the two selected countries, even though each country used a lower BMI criteria, >28.6 and ≥29 kg/m², respectively.

Discussion

Even though the two independent samples used in the study came from the five regions (governorates) of Kuwait and included both urban and rural settings, as well as different socioeconomic situations, they do not necessarily

represent the whole population of Kuwaiti women. Future studies should be planned in a way that will ensure representativeness and, perhaps, longitudinality of sample and the ability to measure BMI more frequently over an extended period to establish a time trend and to provide a detailed description of changes in BMI;¹⁶ it has been found that obesity is an independent predictor of disease where there was a long-term observation.⁷ Moreover, studies extending over long periods may allow for the influence of environmental factors on weight changes to be identified and for the more subtle differences in sociodemographic factors to become apparent.²⁴

The purpose of this study was to assess temporal changes in BMI and in obesity among Kuwaiti women. Each of the two studies comparing these changes also showed a high proportion of women who are obese. An assumption was made that these changes, having been subject to the influences of affluence and modernization would increase in time. This was found to be true. Other similar studies from the USA and Europe also found, in most cases, that mean BMI and prevalence of obesity increased over time.

Temporal changes in BMI and prevalence of obesity among Kuwaiti women which were noted between 1980-1981 and 1993-1994 seem, in most cases, to be unfavorable and difficult to fully explain. It is possible that wealth and modernization have brought about a change to a more sedentary lifestyle among Kuwaiti women which, coupled with energy intake exceeding expenditure, results in the conversion of excess energy into fat.

Temporal changes in BMI and obesity should be controlled through increasing the level of physical activity, improving dietary habits and increasing nutritional knowledge to pass on to the next generation.

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