

Original Article

Obesity and Cardiovascular Risk Factors in Kuwaiti Adults

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ABSTRACT

Objective: To assess the association between obesity [adult Body Mass Index (BMI) ≥ 30] and cardiovascular risk factors among adult Kuwaiti nationals

Design: A cross sectional study conducted among adult Kuwaiti nationals (20-44 years old)

Setting: Qurtoba Police Health Center and Abdulla Al Salem Health Center, Kuwait

Subjects: A sample of 296 subjects was selected

Intervention: Routine examination for those who have never been diagnosed with any chronic health problem.

Main Outcome Measure: Prevalence of obesity, levels of fasting blood sugar, blood pressure and blood lipid profile.

Results: Obesity was prevalent among 42% of the sample with male preponderance. Obese individuals were significantly

at higher risk of developing cardiovascular risk factors such as higher total cholesterol (OR=48, CI:9.8-235.9), LDL (OR=28, CI:9.3-81.3), impaired fasting blood sugar (OR=16, CI:6.2-43.2), prehypertensive systolic blood pressure (OR=5.4, CI:1.9-15.4) and prehypertensive diastolic blood pressure (OR=5.5, CI:1.2-25.9) than non-obese subjects after adjusting other confounders.

Conclusion: Obesity prevalence is an alarming health problem in the studied areas in Kuwait. It is associated with a wide range of cardiovascular risk factors that indicate a warning sign of probable future increase in CV diseases in this population. Further studies covering representative samples of all Kuwaitis are suggested. Obesity prevention programs related to community concerns are recommended.

KEY WORDS: obesity, cardiovascular risk factors, Kuwait

INTRODUCTION

Obesity and overweight are both labels for ranges of weight that are greater than what is normally considered healthy for a given height. Adult obesity (BMI ≥ 30) and its co-morbid disorders represent a significant public health concern and they are considered the leading causes of morbidity and premature mortality around the world^[1,2]. In the United States, about one third of the population was overweight and another third was obese^[2]. The prevalence of adult overweight (BMI range 25 - 29.9) and obesity is increasing regardless of age, socioeconomic, or ethnicity differences^[3].

Body weight is the result of a balance between energy taken in and energy expended. It is a condition in which natural energy stored in fat tissue is expanded far beyond usual levels to the point where it impairs health^[4]. Obesity is defined as too much body fat with an abnormal accumulation of fat in proportion to body size^[2,4].

Obesity is now recognized as a major risk factor for coronary heart disease. It also harms more than just the heart and blood vessels system; it is a major cause of gall stones and can worsen degenerative joint disease^[4]. Obesity is associated with significant morbidity including hypertension, type-2 diabetes mellitus and hyperlipidemia, as well as hyperuricemia and some forms of cancer especially cancer colon^[5].

Coronary heart disease (CHD) is an important and a prime cause of premature death; it remains the major killer of both men and women. Obesity is becoming a major concern worldwide due to its proven relation to CHD. Multiple risk factors contribute to the progression and primary development of CHD and that the risk of CHD can be significantly reduced through reduction of modifiable risk factors. Obesity is one of the major modifiable risk factors^[6]. Multiple cardiovascular disease (CVD) risk factors tend to cluster in individuals, thereby compounding the risk. Obesity and physical inactivity are associated with

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increased risk of heart disease, as well as elevated cholesterol levels, blood pressure and triglycerides^[7].

Epidemiologic studies have identified several environmental factors that contribute to the continued weight gain. The foremost among these are increasingly sedentary lifestyle and the availability of energy-dense (high fat content), low-fiber foods. Additional societal trends that are thought to have contributed included smoking and eating away from home particularly fast-food which is typically caloric-dense^[2].

Obesity is major health problem in Kuwait, more than half of adult females and almost one third of adult males are obese^[8]. The importance of detection and management of obesity to reduce the risk of correlated complications especially CVD prompted us to initiate this study to assess the association between obesity and cardiovascular risk factors among adult Kuwaiti nationals.

SUBJECTS AND METHODS

A cross-sectional study was carried out on individuals attending the Quortuba and Abdulla Al-Salem Primary Health Care Centers for routine examination. The inclusion criteria were individuals not suffering from or ever diagnosed with any chronic disease such as diabetes, hypertension, heart problems or dyslipidemia. All the subjects were adult Kuwaiti nationals aged between 20 - 44 years. Pregnant women were excluded. A convenience sample of 296 subjects was chosen for this study.

After a verbal consent from each individual to be included in the study, a relevant history, physical examination and laboratory investigations were performed as part of routine check up.

Data collected included personal data such as age, gender and lifestyle risk factors like current smoking status and level of regular aerobic physical activity (such as brisk walking at least 30 minutes per day, most days of the week according to the recommendation of lifestyle modification, Seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High blood Pressure)^[5]. Blood pressure (BP) was measured and divided to four categories according to the same Committee^[5] as follows: Category I (normal) was those whose systolic blood pressure (SBP) was < 120 mmHg and diastolic blood pressure (DBP) was < 80 mmHg. Category II (pre-hypertensive stage) was subjects with SBP between 120-139 mmHg and/or DBP 80-89 mmHg. Category III (stage I hypertension) were those with SBP between 140-159 mmHg and/or DBP 90-99 mmHg. Category IV (stage II hypertension) were individuals with SBP > 160 mmHg and/or DBP > 100 mmHg.

Subjects' weight and height were measured using the Detecto-Scale. Calibration was done

every morning before use. BMI was calculated. Subjects with BMI equal or greater than 30.0 kg/m² were classified as obese, and those with BMI less than 30.0 kg/m² were considered as non-obese^[4,9,10].

Blood samples were collected in the laboratory following the usual procedures. Fasting blood sugar (FBS) (after 6-8 hours of fasting) and lipids profile (after 12-14 hours of fasting) were measured.

FBS was classified according to the WHO criteria^[8] as normal (<6.1 mmol/l), impaired (6.1 - < 7.0 mmol/l) and diabetic (> 7.0 mmol/l).

The blood lipids total cholesterol (TC), high density lipoprotein cholesterol (HDL), and triglycerides (TG) were measured using the Timed Endpoint Method. Low density lipoprotein cholesterol (LDL) was calculated using the Friedewald formula from direct measurements of TC, HDL and TG. The risk classification of hypercholesterolemia in patients without coronary heart disease was considered. TC was categorized into desirable (< 5.15 mmol/l), borderline (5.15 - < 6.2 mmol/l) and high risk (> 6.2 mmol/l)^[11,12].

LDL was classified into desirable (< 3.35 mmol/l), borderline (3.35 - < 4.1 mmol/l) and high risk (> 4.1 mmol/l). Also HDL was classified into desirable (> 1.55 mmol/l), borderline (0.90 - < 1.55 mmol/l) and high risk (< 0.90 mmol/l). Finally TG levels were classified into desirable (< 4.0 mmol/l), borderline (4.0 - < 5.2 mmol/l) and high risk (> 5.2 mmol/l).

Data were analyzed using the Statistical Package for Social Sciences (SPSS), version 13. Student t-test, Chi-square test and binary logistic regression test were used to examine the association between obesity and different cardiovascular risk factors at level of significance of $p < 0.05$, and 95% confidence interval (CI).

RESULTS

The study was conducted among 296 Kuwaiti adults; most of them were males (60.1%). The mean age of non-obese individuals (29.5 ± 6 years) was significantly lower ($p < 0.05$) than that of obese subjects (31.2 ± 6.5 years). Obesity was detected among 124 subjects (41.9%); male gender dominated both groups of obese (59.7%) and non-obese (60.5%) individuals with no significant difference. Smoking was almost equally distributed in both groups (37% for each). In addition, about one third of the obese and non-obese subjects (33.7% and 35.5% respectively) were practicing exercise on a regular basis with no significant difference.

Table 1 shows the bi-variate analysis of different risk factors associated with obesity. Almost all the risk factors were significantly more prevalent among the obese subjects than the non-obese. The

Table 1: Prevalence and mean (SD) of risk factors associated with obesity in Kuwaiti adults

| | Non-obese n = 172 % | Obese n = 124 % | p-value |
|----------------------|---------------------------|-----------------------|-----------|
| Systolic BP(mmHg) | | | |
| Normal | 95.3 | 71.0 | < 0.001* |
| Pre-hypertensive | 4.7 | 29.0 | |
| Mean (SD) | 106.2 (13.5) | 115.97 (12.5) | < 0.001** |
| Diastolic BP(mmHg) | | | |
| Normal | 98.3 | 87.1 | < 0.001* |
| Pre-hypertensive | 1.7 | 12.9 | |
| Mean (SD) | 69.3 (7.4) | 74.1 (8.0) | < 0.001** |
| Fasting Blood Sugar | | | |
| Normal | 95.3 | 67.7 | < 0.001* |
| Impaired | 4.7 | 32.3 | |
| Mean (SD) | 5.4 (0.5) | 5.7 (0.6) | < 0.001** |
| Total Cholesterol | | | |
| Desirable | 84.9 | 35.5 | < 0.001* |
| Borderline high risk | 14.0 | 42.7 | |
| High risk | 1.2 | 21.8 | |
| Mean (SD) | 4.5 (0.8) | 5.5 (1.1) | < 0.001** |
| LDLCholesterol | | | |
| Desirable | 82.6 | 37.9 | < 0.001* |
| Borderline high risk | 14.5 | 30.6 | |
| High risk | 2.9 | 31.5 | |
| Mean (SD) | 2.8 (0.7) | 3.6 (0.97) | < 0.001** |
| HDLCholesterol | | | |
| Desirable | 13.4 | 7.3 | NS* |
| Borderline high risk | 75.0 | 73.4 | |
| High risk | 11.6 | 19.4 | |
| Mean (SD) | 1.2 (0.3) | 1.1 (0.3) | < 0.01** |
| Triglycerides | | | |
| Desirable | 99.4 | 93.5 | < 0.01* |
| Borderline high risk | 0.6 | 3.2 | |
| High risk | 0.0 | 3.2 | |
| Mean (SD) | 1.01 (0.697) | 1.7 (1.4) | < 0.001** |

*Chi-square test, ** Student-t test

table revealed that the mean SBP (115.97 Vs 106.2) and DBP (74.1 Vs 69.3) was significantly higher among obese individuals than the non-obese respectively. The same pattern applied to FBS, TC, LDL, and TG where the mean values were significantly higher in the obese subjects. None of the subjects was detected as diabetic, hypertensive stage I or II.

Multivariate binary logistic regression analysis was performed to eliminate the effect of all potential confounders. Crude and adjusted odds ratios were estimated for various cardiovascular risk factors as illustrated in Table 2. Obesity was the dependent variable (0 = non-obese individuals, 1 = obese individuals). The classification matrix overall prediction accuracy showed that 80.3% of the subjects were correctly identified by the model. Two models were examined for potential confounders and to avoid overlap between related variables (example SBP and DBP) and TC with LDL and HDL. Six risk factors stood for the independent variables that entered the first model as

Table 2: Binary logistic regression of some CV risk factors associated with obesity

| Variables | Crude ORs | | | Adjusted ORs | | |
|----------------------|-----------|-------|--------------|--------------|-------|-------------|
| | p | OR | CI | p | OR | CI |
| Age | < 0.05 | 1.04 | 1.01-1.08 | NS | 0.96 | 0.91-1.02 |
| Gender | | | | | | |
| Male (RG) | | | | | | |
| Female | NS | 0.97 | 0.60-1.55 | NS | 1.78 | 0.92-3.42 |
| FBS | | | | | | |
| Normal (RG) | | | | | | |
| Impaired | < 0.0001 | 9.76 | 4.37-21.80 | < 0.0001 | 16.39 | 6.23-43.16 |
| SBP | | | | | | |
| Normal (RG) | | | | | | |
| Pre-hypertensive | < 0.0001 | 8.39 | 3.74-18.83 | < 0.001 | 5.44 | 1.93-15.35 |
| TC | | | | | | |
| Desirable (RG) | | | | | | |
| Borderline high risk | < 0.0001 | 7.33 | 4.07-13.20 | < 0.0001 | 10.79 | 5.24-22.26 |
| High risk | < 0.0001 | 44.80 | 10.25-195.87 | < 0.0001 | 48.06 | 9.79-235.96 |
| TG | | | | | | |
| Desirable (RG) | | | | | | |
| Borderline high risk | NS | 5.86 | 0.65-53.116 | NS | 3.65 | 0.24-56.11 |

The adjusted variables are: age, gender, FBG, SBP, TC and TG.
NS = not significant, RG = reference group**Table 3:** Binary logistic regression of other CV risk factors associated with obesity

| Variables | Crude ORs | | | Adjusted ORs | | |
|----------------------|-----------|-------|-------------|--------------|-------|------------|
| | p | OR | CI | p | OR | CI |
| Age | < 0.05 | 1.04 | 1.01-1.08 | NS | 0.99 | 0.94-1.04 |
| Gender | | | | | | |
| Male (RG) | | | | | | |
| Female | NS | 0.97 | 0.60-1.55 | < 0.05 | 2.35 | 1.19-4.62 |
| FBS | | | | | | |
| Normal (RG) | | | | | | |
| Impaired | < 0.0001 | 9.76 | 4.37-21.80 | < 0.0001 | 13.30 | 5.33-33.19 |
| DBP | | | | | | |
| Normal (RG) | | | | | | |
| Pre-hypertensive | < 0.001 | 8.35 | 2.38-29.32 | < 0.05 | 5.48 | 1.16-25.88 |
| LDL | | | | | | |
| Desirable (RG) | | | | | | |
| Borderline high risk | < 0.0001 | 4.95 | 2.51-8.39 | < 0.0001 | 5.42 | 2.68-10.95 |
| High risk | < 0.0001 | 23.57 | 8.78-63.28 | < 0.0001 | 27.56 | 9.35-81.28 |
| HDL | | | | | | |
| Desirable (RG) | | | | | | |
| Borderline high risk | NS | 1.80 | 0.80-4.08 | NS | 2.49 | 0.83-7.50 |
| High risk | < 0.05 | 3.07 | 1.16-8.11 | < 0.05 | 5.15 | 1.28-20.63 |
| TG | | | | | | |
| Desirable (RG) | | | | | | |
| Borderline high risk | NS | 5.86 | 0.65-53.116 | NS | 3.95 | 0.33-46.77 |

The adjusted variables are: age, gender, FBG, DBP, LDL, HDL and TG
NS = not significant, RG = reference group

demonstrated in Table 2. The table revealed that three factors (adjusted odds) represented the risk factors of obesity (TC especially the high risk levels ranked the highest risk factor followed by FBS and SBP).

Increased levels of TC showed significant very high risk aspect (OR=45, CI: 10.3 - 195.9) among the

obese adults as an individual factor. Its risk reinforced (OR = 48, CI: 9.8 - 235.9) when adjusted to other factors and towered the odds. The crude risk of impaired FBS was almost 10 times in obese individuals compared to non-obese and its risk boosted to rank the second odds (OR = 16, CI: 6.2 - 43.2) when adjusted for other risk factors.

Pre-hypertensive SBP was significantly eight times crude odds among the obese individuals and shrank to five odds (CI: 1.9 - 15.4) when adjusted compared to non-obese subjects. SBP ranked the third major risk factor among obese persons.

The second model included seven independent variables as shown in Table 3. Although the crude analysis demonstrated that the older the age, the higher risk to be obese, its effect disappeared when adjusted for confounding. The gender showed a reverse picture. It did not show individual odds but its effect came to light when adjusted for other risk factors. Females significantly showed two odds to be obese than males.

High value of LDL illustrated highly significant crude odds (OR = 24, CI: 8.8 - 63.3) in the obese individuals and its risk was reinforced to rank as the first risk factor in the second model when adjusted to other risk factors (OR = 28, CI: 9.3 - 81.3). The protective effect of HDL was obvious in both the crude and the adjusted analysis, while the risk of its high levels increased from three odds (CI: 1.2 - 8.1) as an individual factor to five odds after adjustment (CI: 1.3 - 20.6) in obese subjects more than the non-obese group.

Pre-hypertensive DBP showed significant high crude odds (OR = 8, CI: 2.4 - 29.3) for the obese subjects but its risk diluted (OR = 5, CI: 1.2 - 25.9) when other factors were adjusted.

DISCUSSION

This study showed a high prevalence of obesity among Kuwaiti adults of both sexes. Although the results cannot be generalized to the whole population as it was a convenience sample rather than a random sample, it can reflect an ingredient of the overall picture of obesity problem in this community. Considering that this convenience sample that attended the clinic for routine examination may exhibit a healthy volunteer effect as documented in the epidemiological literature, an inherited potential bias cannot be neglected. The present results also revealed significant associations between obesity and CVD risk factors. The association between obesity and increased chance for developing impaired FBS, hypertension, and hypercholesterolemia was supported by the study. Obesity (mainly visceral obesity) increases insulin resistance and lead to development of type II diabetes. In turn insulin resistance results in

specific abnormalities of lipid metabolism characterized by elevated levels of plasma triglycerides and low levels of HDL cholesterol^[13,14].

Obesity is a modifiable condition that can prevent the occurrence of associated risk factors such as adverse lipid, blood pressure, and insulin levels^[15]. The high prevalence of obesity in the present study is in concordance of a previous study which found that one third of adult Kuwaitis are obese^[16]. Moreover, the Kuwait Annual Nutrition Surveillance (2005) found that 41.7% and 33.9% of adult males were overweight and obese respectively. Among adult females the prevalence was 32.7% and 41.0% respectively^[17]. A recent study has shown an increased prevalence of obesity^[18].

This study revealed a high level of TC and LDL in the obese individuals compared to the non-obese group. This finding is of crucial importance as it represents the first alarming risk for CVDs. This definitely is the result of unhealthy eating habits and increased intake of fast foods and other high fat content food practiced by the Kuwaiti community in all age groups. This finding also necessitates the urgent interference of health programmers to plan intervention programs that aim at modifying the lifestyle and eating habits.

Impaired FBS ranked as the second risk for obese individuals. Studies have shown that modest weight loss significantly reduces the prospective risk for diabetes; also weight loss accompanying intensive lifestyle interventions (e.g. low-fat diet and regular exercise) in patients with known heart disease has been shown to reduce progression and even promote improvement of cardiovascular disease^[2]. There is an increased risk of developing type 2 diabetes mellitus (CVD risk equivalent) in those who have impaired FBS^[11]. This is in accordance with the finding of the present study. Also, studies showed that among persons with a BMI > 30 who already have an impaired FBS and are at risk for developing type 2 diabetes, adopting lifestyle changes that decrease weight will reduce risk by over 50 to 60%^[19]. This emphasizes the crucial need for urgent intervention to control and reduce the incidence of this current increasing health problem in Kuwait among all ages.

Hypertension in obese patients, together with its concomitant metabolic findings appears to be driven primarily by the obesity itself whereas the hypertension in lean individuals appears to be driven primarily by heightened reactivity of the rennin-angiotensin and sympathetic systems^[6]. This is in accordance with the prehypertensive stage of SBP and DBP found in the obese subjects in the current study that may progress to the disease stage with its subsequent CV risk effect.

Data from observational studies involving more

than one million individuals have indicated that death from both ischemic heart disease (IHD) and stroke increases from levels as low as 115 mmHg SBP and 75 mmHg DBP upwards. For every 20 mmHg systolic or 10 mmHg diastolic increase in BP there is a doubling of mortality from both IHD and stroke^[9].

The initial treatment of overweight and obese patients should include dietary fat restriction and increased activity, simply to eat less and exercise more^[2]. Nutritional counseling, behavior therapy, drugs and surgery are other available ways for weight reduction. With most forms of treatment, weight can be lost, but most persons return to their pretreatment weight within five years^[20]. This emphasizes the importance of encouraging more exercise and the importance of its maintenance among adults that will help them to avoid indulging in risks leading to CVD. Many ways for weight reduction are known that help in weight loss such as diet and nutritional counselling.

Achieving significant weight loss and reaching ideal body weight for age and sex has to be a mandatory intention among all obese and overweight individuals. Awareness campaigns and health education programs should be at the top of the agenda of health authorities and programmers.

CONCLUSION

Prevalence of obesity in Kuwaiti adults in the referred areas of the study is alarming. It has a significant association with different cardiovascular risk factors especially high total cholesterol and LDL, impaired FBG and hypertension. Immediate intervention is highly recommended to reduce the risk of coronary heart problems among these Kuwaitis. Further studies on large scale representative of the whole Kuwaiti population are necessary to determine the extent of the problem. Early appropriate intervention programs and management regimens are highly recommended.

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