



**OBESITY IN
THE ARAB GULF
COUNTRIES:
*AN ANNOTATED BIBLIOGRAPHY***

COMPILED BY

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and

NATASHA MISTRY



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Preface

Obesity has become one of the main public health problem in the Arabian Gulf countries. The prevalence of overweight and obesity among both children and adults has increased dramatically during the past two decades in these countries.

It is well documented that obesity is associated with several chronic illness such as diabetes mellitus, hypertension, heart disease and some forms of cancer. These diseases are the major causes of death in this region. Consequently programme to prevent and control these chronic diseases should include appropriate measures to prevent overweight and obesity in the community. A first step, therefore, is to collect enough information on prevalence and factors associated with obesity.

We hope that this publication provides useful information on studies on obesity in the Arab Gulf countries.

Abdulrahman O. Musaiger, Dr PHSc (Nutr)

BAHRAIN

Al-Ansari M, Al-Mannai M, Musaiger AO,
Body weight of university students in Bahrain.
Bahrain Med Bull 2000; 22(3): 135-36.

To estimate the percentage of overweight and obesity of university students in Bahrain, a sample of 238 males and 406 females were obtained. The findings showed that 17.6% and 18.5% of males and females respectively were overweight. The proportion of obesity was 11.8% in males and 7.6% in females. Physical activity should be encouraged in this group to prevent obesity.

Abdulkhalek N
Attitudes of Bahraini nursing students to obesity.
Bahrain Med Bull 2000; 22 (3): 133-34.

A sample of 200 students in the College of Health Sciences in Bahrain were interviewed to determine their knowledge and attitudes towards obesity. In general, the nursing students have better knowledge and attitudes than secondary students. However, some unsound attitudes towards obesity exist, suggesting more nutrition education programme in the mass media to correct unsound beliefs related to obesity.

Al-Madani KM
Obesity among medical practitioners and medical students in Bahrain.
Bahrain Med Bull 2000; 22(30): 138-39.

Data on weight and height (based on self-reporting) were obtained from 158 medical practitioners and 53 medical students

in 1999. Overweight and obesity was more observed in medical practitioners (44.3%) than medical students (22.6%).

Al-Mahroos F, McKeigue PM

High prevalence of diabetes in Bahrainis. Association with ethnicity and plasma cholesterol.

Diabetes Care. 1998; 21(6): 936-942.

The objective of this study was to determine the prevalence of diabetes and associated risk factors in the population of Bahrain. A cross-sectional study of 2,128 Bahrainis aged 40-69 years was conducted. Age-standardised prevalence of diabetes was 25% in Jaafari Arabs, 48% in Sunni Arabs, and 23% in Iranians. In multivariate analyses, positive family history of diabetes, low educational status, waist girth, plasma cholesterol, and, in women, postmenopausal status were independently associated with diabetes. Adjusting for these factors did not account for the difference in prevalence between Jaafari and Sunni Arabs. There was no association between diabetes and parental consanguinity. Mean plasma cholesterol was 0.5 mmol/l higher in diabetic than in normo-glycemic participants, 0.5 mmol/l higher in Sunni than in Jaafari Arabs and, excluding diabetic individuals, 0.2 mmol/l higher in those with a positive family history of diabetes than in those with a negative family history. Although 28% of participants had BMI \geq 30kg/m², only 42% of these obese individuals rated themselves as overweight. In men, obesity was inversely related to physical activity at work. In women, obesity was associated with high parity and inversely associated with employment outside the home. The high rates of diabetes in Bahrain and other Arabian Peninsula populations appear to be part of a familial syndrome that includes raised plasma cholesterol levels. Risk is related to ethnic origin but not to parental consanguinity. Despite the

high rates of diabetes, obesity is still perceived as a desirable attribute in this population.

Al-Mahroos F, McKeigue PM

Obesity, physical activity and prevalence of diabetes in Bahraini Arab native population.

Bahrain Med Bulletin. 1998; 20 (3): 119-122.

A cross-sectional population-based study of 2,128 residents aged 40-69 years was carried out in 1995 to determine the prevalence of diabetes and the association of obesity and physical activity with this disease. Subjects were invited to the clinic for interview, physical and laboratory examination. Venous blood samples were taken fasting and 2 hours after a 75g oral glucose load. Using the WHO criteria, the overall prevalence of diabetes and impaired glucose tolerance (IGT) were 30% and 18% respectively. In the age group 50-59 years the prevalence was 29% in men and 35% in women. Mean body mass index (BMI) was 27.3 kg/m² in men and 28 kg/m² in women. Only 13% of the men and 1% of the women walked at least 4km/day. BMI was positively related to education and inversely related to physical activity. On average the subjects with diabetes were older, had higher monthly incomes and a positive family history of diabetes. They also had higher mean BMI, waist to hip ratio (WHR), and waist to height ratio (WHTR). Mean multiple logistic regression analysis shows that age, BMI (or WHR, WHTR), and less physical activity are independent risk factors of NIDDM. The prevalence of diabetes in Bahrain is increasing with economic development and changes from a traditional to modernised lifestyle. Therefore Bahraini people should attempt to retain certain features of their traditional lifestyle (physical activity, healthy eating and moderate body weight).

Al-Mannai A, Dickerson JW, Morgan JB, Khalfan H

Obesity in Bahraini adults.

J R Soc. Health. 1996; 116(1): 30-32, 37-40.

In this study the prevalence of obesity and the demographic factors associated with it were analysed on 290 adult Bahraini individuals, of whom 137 were males and 153 were females. The overweight and obesity prevalence rates, using the Body Mass Index (BMI) as a criterion, were 26% and 16% in males and 29% and 31% in females, respectively. The prevalence of underweight (BMI < 20) was 16.8% and 11.8% in the males and females respectively. The mean body fat percentage of females, calculated from the skinfold measurements, was 35%; the fat percentage of males was 18.6%. Bahraini women had greater fat deposition in the sub-scapular region than the amount reported for American women. Females and males living in urban areas had a greater tendency to be obese than those residing in rural areas. Marriage, ownership of a car as well as a large family (> 7 members) were positively associated with obesity; unmarried women were more likely to be underweight than married women. The educational level was not associated with obesity in either the males or females. The age of adult females was not found to be associated with obesity, whereas in males the incidence of obesity was more frequent among those who were 50 years of age and above than under 50 years of age. Family monthly income was not associated with the incidence of obesity. The high prevalence of overweight and obesity in the women reported in this study and the difference in the distribution of body fat suggest that genetics may be a determinant factor of this disorder in Bahrainis but certainly social factors are also important.

Matter AM, Alekri S, Mahdi A, Musaiger AO

Growth patterns of Bahraini adolescents

J R Soc. Hlth. 1990; 110: 179-180.

Weight and height of adolescents in Bahrain (15.5-19.5 years) was measured to evaluate their growth patterns. A cross-sectional survey was done on 825 students that represented 5% of total secondary students. The results showed that median height and weight of Bahraini adolescents were below the 50th percentiles of the Western standard. However, when compared with earlier surveys in Bahrain, the growth pattern has improved. This is because of improvement in health and in the environment.

Musaiger AO, Al-Ansari M

Factors associated with obesity among women in Bahrain.

Int Quarterly Community Health Educ. 1992; 12: 129-136.

A sample of 420 women, who attended a physical fitness programme run by the General Organisation for Youth and Sport, was selected to study the association between obesity and some factors among adult females in Bahrain. Women were grouped into 2 categories, obese and non-obese, based on a Body Mass Index (wt/ht^2). The results revealed that age, education, employment, marital status, family size, and practising exercises before joining the fitness programme have a statistically significant association with obesity, while ownership of cars, availability of house maids, family history of obesity and meal patterns have no statistically significant association. There were no differences in the source of nutrition information between the obese and non-obese women. The study suggested that health education programmes should focus on both socio-

cultural factors and health factors for preventing obesity in the community.

Musaiger AO, Al-Awadi A, Al-Mannai MA

Lifestyle and social factors associated with obesity among the Bahraini adult population.

Eco Food Nut 2000; 39(2): 121-133.

A cross-sectional survey on 514 Bahraini natives aged 30-79 years was carried out to study the lifestyle and social factors associated with obesity. Body Mass Index (BMI; weight kg/height m²) was used to determine obesity among the study population. Obesity was considered when the subject had a BMI equal to or greater than 25. The overall prevalence of obesity was 56% in men and 79.6% in women. Age, sex, education, smoking and history of diabetes and hypertension, watching television and frequency of fruit intake had a significant association with obesity. When a multiple logistic regression was used to estimate the risk occurrence of obesity, it was found that the risk of obesity was greater in subjects who were females, educated, currently married, watching television daily, non-smokers, consuming fresh fruit more than 3 times a week and having a history of diabetes and hypertension. Lifestyle, dietary habits and social factors should be considered, therefore, in any health programme to prevent and control obesity in this community.

Musaiger AO, Al-Roomi KA

Prevalence of cardiovascular disease risk factors among Bahraini adults: a pilot study.

Emir J Agric Sci. 1994; 6: 175-187.

In Bahrain, circulatory diseases are the leading cause of death averaging 32% of all causes of death since 1982. An epidemiological survey comprising a random sample of 185

Bahraini adults (94 men and 91 women) aged 30-77 years was conducted as a first step to examine the current level of cardiovascular disease (CVD) risk factors. It was found that 15% and 10% of the subjects had a history of hypertension and diabetes, respectively. The prevalence of smoking was relatively high (31%) and more men were current smokers (39%) than women (23%). About 40% of the subjects did not practise physical exercise (walking). The prevalence of obesity (BMI>30) was high (32%) and women had a higher rate of obesity (49%) than men (29%). Of the subjects, 12% and 6.5% did not consume or rarely consumed fresh fruit and vegetables, respectively. It would appear that the prevalence of known risk factors of CVD among the adult Bahraini population is high. This is a source of great concern and indicates the need for a comprehensive community survey to confirm these findings.

Musaiger AO, Al-Roomi KA

Prevalence of risk factors for cardiovascular diseases among men and women in an Arab Gulf community.

Nutr Health. 1997; 11(3): 149-157.

A cross-sectional study was conducted to estimate the prevalence of major risk factors for cardiovascular diseases (CVD) among the adult population in Bahrain, an Arab Gulf country. A total sample of 516 subjects aged 30-79 years was selected proportionally from all geographical areas of Bahrain. Findings revealed that current smokers represented 32% of men and 20% of women ($P < 0.001$). However, a relatively high percentage of women were exposed to inhalation of other family member's tobacco smoking compared to men (29% and 44% among men and women, respectively). Obesity, hypertension and diabetes were highly prevalent and significantly more reported among women than men. Of women, 79.6% were overweight or obese compared to 56% of men. Sedentary lifestyle patterns (lack of physical exercise and daily watching of

television) were also highly reported. About 12.1% of men and 15.7% of women did not consume fresh fruit. The corresponding percentages for fresh vegetables were 8.4% and 5.5%, respectively. The prevalence of well established risk factors for CVD such as smoking, obesity, inactivity, diabetes and hypertension were high and indicate the need for a national health policy to prevent and control the CVD.

Musaiger AO, Al-Sayyed J

Nutritional Status of Mothers and Pre-school Children in Bahrain.

Bahrain Center for Studies and Research, 1999; Manama, Bahrain, 42p.

The aim of this report was to assess the nutritional status of Bahraini mothers and their children aged 1-6 years. A multistage sampling technique was used to select the households from all households in Bahrain. The total sample selected was 481 mothers and 569 children. In general, more than a quarter of the mothers (27.7%) were normal (having optimal weight for height), while a majority were overweight and obese (65%) and only 7.3% were underweight. The prevalence of obesity increases with age. About 53% of the mothers aged less than 25% were obese, and the percentage increased to 75% among mothers aged 35 years and more. The prevalence of underweight was almost double among young mothers (<25 years of age) when compared to other age groups.

Musaiger AO, Gregory WB

Height, weight, arm circumference and skinfold thickness of Bahraini children aged 6-18 years.

Arab Nutrition Society. 1997; Al-Ain, United Arab Emirates, 30p.

This report provides data on measurements of height, weight, arm circumference and skinfold thickness of Bahraini school

children. The anthropometric measurements were collected in 1986 as part of the National Nutritional Survey of school children in Bahrain. A cross-sectional growth survey was conducted in 1996 to select 2% of the total school children registered in the government schools (1,593 children aged 6-18 years), using a multistage stratified random sampling technique. Bahraini children are shorter and lighter than North American children for all age group studies. Although the NCHS growth charts may not be entirely appropriate for comparison with the growth of school age children in less developed countries, they permit valid comparison against other groups of children in other parts of the world. The small body size of Bahraini children in relation to U S children can be attributed to various genetic, health, socio economic and environmental factors. In both sexes, arm circumference increases with age. The mean tricep and bicep skinfolds of boys decreased slightly by age 16.5 and above, while in girls, these thicknesses continue to increase with age. At the sub-scapular and supra-iliac sites, girls have means which are greater than boys at every age. The differences in these sites between boys and girls are almost double. Girls begin to show significantly higher skinfold thickness than boys at age 6.5 years and this difference continues for every age group up to 18.5 years of age. In general, skinfold thickness of children in this study indicates substantial subcutaneous fat deposition. Considering the very small arm circumferences seen at all ages and for both sexes, the muscle area of these children appears to be under developed.

Musaiger AO, Gregory WB, Haas JD

Growth patterns of school children in Bahrain.

Ann Hum Biol. 1989; 16: 155-167.

The aim of this study was to assess physical growth of school children in Bahrain. Cross-sectional data on 1,593 children (818

boys and 775 girls), aged 6.5 to 18.5 years were collected in 1986. Anthropometric measures included height, weight, mid-arm circumference, triceps, biceps, sub-scapular and supra-iliac skinfold thickness. At all ages median (P50) heights and weights of Bahraini boys and girls are below the 50th percentiles of the North American reference standard (NCHS). Median heights of both Bahraini sexes fall between the 25th and 5th percentiles of the reference data. As for weight, the median of boys fluctuates between the 25th and 5th percentiles, while that of girls fluctuates between the 50th and 10th percentiles of the standard. When compared to the American standard, median triceps skinfold of Bahraini boys and girls falls between the 50th and 25th percentiles. The median arm circumference of both sexes is close to the 5th percentiles. In general, the skinfold measurements indicate a high subcutaneous fat store, suggesting a lack of muscle development. Health, genetic and other factors associated with growth patterns of Bahraini children are discussed.

Musaiger AO, Matter AM, Alekri SA, Mahdi AE
Obesity among secondary school students in Bahrain.
Nutr Health, 1993; 9: 25-32.

The aim of this study was to estimate the prevalence of obesity and factors associated with it in Bahraini secondary school students. A cross-sectional study involving a sample of 825 students (417 boys and 408 girls) aged 15 to 21 years was obtained from secondary schools. Obesity was determined using body mass index ($BMI = wt/ht^2$). The findings revealed that 15.6% of boys and 17.4% of girls were either overweight or obese ($BMI > \text{ or } = 25$). Family size, parent's education, and family history of obesity were significantly associated with obesity among boys, while family history was the only socio-economic factor statistically associated with obesity among girls. Meal patterns such as eating between meals, number of meals per

day, and method of eating were not associated with obesity in students. Boys who ate alone were 3 times more likely to be obese than those who ate with family members (odds ratio = 3.4). Measures to prevent and control obesity among children are suggested.

Musaiger AO, Matter AM, Alekri SA, Mahdi AE

Knowledge and attitudes of Bahraini adolescents towards obesity.

J Consumer Stud Home Economics. 1991; 15: 321-325.

The aim of this study was to evaluate the knowledge and attitudes of Bahraini secondary school students towards obesity. A multistage stratified sampling procedure was used to select 742 adolescents aged 14 to 19 years. The findings reveal that the knowledge of adolescents towards the causes and complications of obesity was quite sufficient. However, adolescents were more likely to believe many food fads related to reducing weight. Lack of physical exercise, excessive food intake and heredity were the main reasons given by the adolescents for obesity. Girls were more likely to depend on television (71.3%) and newspapers and magazines (55.6%) as sources of nutrition education than boys (66.7% and 44.8 respectively). It was concluded that the school curriculum should include more information about nutritional problems prevalent to the community.

Musaiger AO, Ragheb MA, Al-Marzooq

Body composition of athletes in Bahrain.

British J Sport Med. 1994; 28: 157-159.

A total sample of 304 athletes was selected from first class clubs related to four common sports (football, handball, volleyball and basketball) and compared with 53 non-athlete adults. Weight,

height, mid-arm circumference and skinfold thickness were measured to assess their body composition. The findings revealed that there were differences in body composition among athletes according to the type of sport. Basketballers and volleyballers were the tallest athletes, while hand-ballers were the heaviest ones. Skinfold thickness measurements showed that basketball and handball players have more subcutaneous fat than other athletic groups. As compared with non-athletes, the Bahraini players had higher means for height, weight, subscapular, supra-iliac thickness and mid-arm circumference.

Musaiger AO, Al-Ansari M, Al-Mannai, M

Anthropometry of adolescent girls in Bahrain, including body fat distribution.

Annals Of Human Biology, 2000; 27 (5): 507-515.

The objective of this study was to determine anthropometric measurements of adolescent Bahraini girls, including obesity and fat composition. A cross-sectional sample of 584 Bahraini girls aged 12-19 years were selected from schools using multistage stratified sampling procedure. Fifteen anthropometric measurements were taken (weight, height, circumferences for upper chest, chest, waist, hip, thigh and medical calf, triceps, biceps, subscapular and suprailiac). Body mass index (BMI), waist/hip ratio, sum of skinfold thickness and % body fat were also computed. The findings revealed a significant increase in all anthropometric measurements with increase in age. The mean weights for girls was higher than those reported in 1986 for the same age group, but no difference was observed in the mean heights, indicating a trend toward overweight. Using the 85th and 95th centiles of the National Health and Nutrition Examination Survey I (NHANESI) BMI distribution to define respectively overweight and obesity, the prevalence of overweight was 38.5% and of obesity was 6.3%.

The means for BMI, waist/hip ratio, sum of skinfold thickness and % body fat were higher than those reported in many developed and developing countries. Bahraini adolescent girls have a higher proportion of body fat than their counterparts in many Western countries. This may contribute to some chronic diseases in adulthood. An intervention programme, therefore, is urgently needed to reduce overweight and obesity at childhood and adolescent stages.

Musaiger AO, Al-Mannai MA

Factors related to weight status of the adult Bahraini population (a community-based Study).

Bahrain Med Bull 2000, 22(3): 119-22.

Factors related to weight status of Bahraini adults were studied. A cross-sectional survey on 514 Bahraini adults aged 30-79 years was carried out using multistage sampling technique. Body mass index (BMI) was used as an indicator for measuring obesity. The subjects were classified into non-obese (BMI<25), overweight (BMI 25-29.9) and obese (BMI≥30). There was a significant difference in mean BMI between men and women in all factors studied. Younger people (30-49 years), with higher education, non-smokers, those with history of hypertension, and those who watched television daily had higher mean BMI. There was a significant difference between weight status and age ($p<0.001$), sex ($p<0.0001$), education ($p<0.04$), smoking ($p<0.0001$), hypertension ($p<0.002$), diabetes ($p<0.001$), and watching television ($p<0.04$). The results suggest that the health authority in the country should establish a programme to prevent and control obesity, taking into consideration several social, dietary and health factors.

Musaiger AO, Gregory WB

Profile of body composition of school children (6-18y) in Bahrain.

International Journal of Obesity 2000; 24: 1093-1096.

To study the body composition of Bahraini school children, a cross-sectional national school survey was undertaken, to include school children aged 6-18 years. The sample comprised 818 boys and 775 girls. Weight, height, arm circumference, and skinfold thicknesses were measured. Sum of skinfold thickness, body mass index (BMI), mid arm circumference, percentage body fat, fat weight and lean body weight were then calculated to determine body composition. A significant difference in the sum of skinfold thickness was observed between boys and girls. The girls have almost 50% extra skinfold thickness than boys at all ages. Similar trends were found in BMI, except at ages 9 and 18 years. The percentage of body fat was higher in girls than boys. The mean BMI for Bahraini girls aged 13 years and above exceeds that of their American counterparts, indicating a trend towards fat accumulation in the Bahraini girls. The data obtained are useful for monitoring obesity in school children in Bahrain as well as being usable as reference data for similar countries in the region. The high proportion of body fat among Bahraini school children, especially girls, urges an intervention program to prevent and control obesity in this age group.

Zaghloul NE

Assessment of the nutritional status of pre-school Bahraini children.

Bahrain Med Bulletin. 1984; 6 (3): 102-104.

Assessment of the nutritional status of the Bahraini pre-school children was studied using multistage random sampling technique to represent different geographic areas in Bahrain. Surveyed children showed that nearly one third suffered from

Protein Caloric Malnutrition (PCM) according to the Gomez classification, where moderate and severe cases were 4.6% and 0.2% respectively. Distribution of acute under nutrition by age groups indicated that children aged 6-24 months were mostly affected, with an overall percentage of 10%. Also, the data illustrated that 12.2% of the children were overweight. Stunting was most prevalent during the third year of life (23.5%) and continued through the fifth year. The data obtained documented that PCM represents a Public Health problem in Bahrain and needs detailed ecological study.

Zaghloul NE, Dodani T

A study of the growth pattern of Bahraini children.

Bulletin of High Institute of Public Health. 1984; 14; 147-156.

The growth pattern of Bahraini children under 5 years of age was studied using a multistage random sampling technique to represent different geographic areas of Bahrain. All anthropometric measurements, weight, height, head and chest circumferences were compared with American Standard of the National Health Centre of Health Statistics as well as other international standards. The growth pattern of the surveyed children resembled that which has been reported from many developing countries. Gains were excellent during the first 6 to 9 months of life followed by faltering until about the end of the fifth year. The data are consistent with view that physical development of growing children is greatly influenced by the environment.

Zaghloul NE, El-Sherbini AF, Al-Shayeb FA

Dietary factors and physical activity of obese and non-obese adolescents.

Bulletin of High Institute of Public Health. 1984; 14; 31-49.

Two groups of high nursing school girls, 40 obese, and 34 non-obese controls of matched age, height, grade, and socio-economic status, were compared with regard to dietary intake and physical activity. The anthropometric measurements showed a highly significant mean body weight, body mass index (BMI) and relative body weight. The skinfold thickness of the obese group in the following sites: biceps, triceps, subscapular, and abdominal were significantly higher than that of non-obese girls. The most clear cut findings in the present study is that the obese group consumed significantly more calories, protein, fat and carbohydrate than their non-obese peers. Also the results showed that the majority of the obese girls categorized as less active compared to the non-obese controls. It appears that overeating and physical inactivity are important factors in the occurrence of obesity among the girls of this community.

KUWAIT

Abdella NA, Khogali MM, Salman AD, Ghuneimi SA,
Bajaj JS

Pattern of non-insulin dependent diabetes mellitus in Kuwait.

Diabetes Res Clin Pract; 1995 Aug; 29(2): 129-36

The aim of this study was to examine distinctive clinical characteristics of non-insulin dependent diabetes mellitus (NIDDM) patients in Kuwait including mode of presentation at diagnosis, family history of diabetes, therapeutic management and response to treatment. We studied 3,299 Kuwaiti patients (1,454 male (M) and 1,845 female (F) subjects) registered in Salmiya diabetic clinic, a part of the national network of diabetes control and care programme, and located in the urban Hawally Governorate, Kuwait. The mean age of the patients was 53 years (+/- 13.9 years), and 73.8% were in the age group 45-64 years. The majority of patients (53.6%) were diagnosed as they were clinically symptomatic; in contrast, a significant minority (37.8%) were diagnosed by chance mainly during investigation for unrelated events. The 8.6% of the women diagnosed during pregnancy had a high parity index 6.5 +/- 2.9. A high percentage of the diabetic patients (63%) reported a positive family history in first degree relatives. The mean duration of diabetes mellitus was 7.8 years (range 2-28 years) and 70% of the patients had diabetes mellitus for 9 years or less. The mean body mass index (BMI) was 31.8 +/- 6.3 kg/m² and 28.5 +/- 6.3 kg/m² in women and men, respectively. Among the diabetic women 57.7% were obese (BM > 30 kg/m²) and 30.2% were overweight (BMI 25-30 kg/m²) as compared to 33.6% and 44.3% among diabetic men, respectively. High blood pressure (> or = 160/95 mmHg) was reported in 14.9%. The main therapeutic modality in the majority of patients, (63.2%), was the administration of oral hypoglycaemic agents (OHA), while

23.7% were on a diet regimen and only 13.1% were on insulin therapy. The study throws light on the pattern of NIDDM among Kuwaiti patients. Frequent association with obesity suggests that it may be a major risk factor. The strong familial aggregation reported paves the way for future research among these families for co-segregation of a defined genetic trait with NIDDM in the Arab population subset.

Al-Awadi F, Amine EK

Overweight and obesity in Kuwait.

J R Soc Health 1989 Oct; 109(5): 175-7

The aim of this study was to determine the prevalence of overweight and obesity among adult females. A multistage stratified sample of 2,999 adult females was examined. 52.5% were found to be overweight (10-20% above reference weight tables) and 42% obese (more than 20% above reference standards). The numbers increased with age. There were fewer obese and more overweight the higher the standard of education, with a similar pattern with the husbands' standard of education. Obesity was more prevalent (46.8%) in non-working women, 36.8% among those in management and 32.9% among those in technical work, while the corresponding figures for those overweight were 47.7%, 56.9% and 62.2%. The prevalence of obesity increased with family size while that of overweight fell. A similar pattern was found with the number of children. Family income was inversely related to the prevalence of obesity and positively related to overweight.

Al-Awadi F, Rahman KMM, Thomas M

Study of obesity with hyperlipidaemia in Kuwaiti adults.

J Kuwait Med Assoc. 1990; 24(2): 161-166.

This study of obesity with hyperlipidaemia was conducted on 124 patients in the outpatient (OP) clinic of the Administration of Food and Nutrition Department for a six-month period in 1987. 50% of all patients had excess body weight between 20-49% above their standard body weight and the rest had even more than that. In addition, all the patients had elevated serum cholesterol (CHL) of over 6.2 mmol/L. The occurrence of obesity was observed in both sexes from as early as 20 years of age, and a similar observation was made concerning the occurrence of CHL. The occurrence of high-risk coronary heart diseases due to elevated lipids was also observed equally from the same age. The dietary habits were of high calorie intake and particularly high cholesterol containing foods. The calorie intake was as high as 6,900 with about 53% of fats and 4,900 mg of cholesterol. Dietary intervention not only achieved the expected weight loss of one kg per week, but also corrected the abnormal biochemical values of CHL, low-density lipoprotein-CHL and triglycerides without the intervention of drug therapy. Further research on attributed risk related to different lipid variables and establishment of a lipid clinic is recommended.

Al-Isa AN

Prevalence of obesity among adult Kuwaitis: a cross-sectional study

Int J Obes Relat Metab Disord 1995 Jun; 19(6): 431-3

The objective of the study was to investigate the association between obesity and different diseases which is well documented, especially with non-insulin dependent diabetes, hypertension and heart disease. To prevent proliferation of these

and other obesity-related diseases, and to plan adequate health education programmes for the control of obesity, base-line data are required on the prevalence of this condition. The present study is concerned with this need and its purpose is the determination of the prevalence of obesity among adult Kuwaitis. A cross-section of 3,435 Kuwaiti adults forms the study sample. Corpulence was assessed from body mass index (BMI kg/m²) and the mean BMI (+/- standard deviation) was 28.3 (+/- 5.3). According to the WHO BMI criteria, the prevalence of obesity was found to be 70.2% (Grade 1) and 36.4% (Grade 2) with BMI as > 25 and > 30, respectively, and was significantly higher (P < 0.001) among women. Obesity among Kuwaitis was found to be higher than reported elsewhere in the world.

Al-Isa AN

Body mass index and prevalence of obesity changes among Kuwaitis.

Eur J Clin Nutr. 1997; 51(11): 743-49.

The objective of this study was to compare temporal changes in BMI, overweight (BMI > 25 kg/m²) and obesity (BMI > 30 kg/m²) between two periods, among adult Kuwaitis. Comparison was of two independent cross-sectional samples of Kuwaitis studied in 1980-81 and 1993-94. 2,067 (896 men and 1,171 women) and 3,435 (1,730 men and 1,705 women) adult Kuwaitis (aged > or = 18 y), were drawn from primary health care (PHC) clinics and studied for nutritional assessment and for prevalence of obesity in 1980-81 and 1993-94, respectively. Weight was measured in kilograms and height in meters to obtain the body mass index (BMI), which is the weight in kilograms divided by the height in meters squared (kg/m²). BMI > 25 and > 30 kg/m² were classified as overweight and obesity, respectively. RESULTS: Mean BMI (kg/m²) increased

significantly ($P < 0.001$) by 10.0 and 6.2% (2.5 and 1.7 kg/m²) among men and women, respectively. Prevalence of overweight and obesity (BMI > 25 and > 30 kg/m²) increased by 20.6 and 15.4% and by 13.7 and 8.4% among men and women, respectively. After controlling for socio-demographic differences between the two study periods, mean BMI was 2.0 and 1.6 kg/m² higher in 1993-94 than in 1980-81 among men and women, respectively. Prevalence of overweight and obesity (BMI > 25 and > 30 kg/m²) also increased among both genders between the two periods (OR = 2.1, 95% CI 1.7-2.7 and OR = 1.9, 95% CI 1.5-2.4, for men, and OR = 2.2, 95% CI 1.6-3.0 and OR = 1.4, 95% CI-1.0-1.9, for women). BMI, prevalence of overweight and obesity increased among Kuwaitis between 1980-81 and 1993-94, probably due to the effects of modernisation, affluence, increased food consumption and the concomitant changes to sedentary lifestyles. The rate of temporal changes in BMI and obesity were higher, by comparison, in Kuwait than in selected other countries.

Al-Isa AN

Changes in body mass index (BMI) and prevalence of obesity among Kuwaiti 1980-1994.

Int J Obes Relat Metab Disord. 1997; 21(12): 1093-9.

The objective of this study was to compare temporal changes in body mass index (BMI) (kg/m²) and prevalence of obesity (BMI > 25 and > 30 kg/m²) among adult Kuwaitis between two periods 14 y apart. Comparison was of two independent cross-sectional samples of Kuwaitis studied in 1980-1981 and 1993-1994. 2,067 (896 men and 1,171 women) and 3,435 (1,730 men and 1,705 women) adult Kuwaitis (aged > or = 18 y), were drawn from primary health care (PHC) clinics and studied for nutritional assessment and for prevalence of obesity in 1980-1981 and 1993-1994, respectively. BMI, which is the weight in

kilograms divided by the height in meters squared (kg/m^2), was based on measured weight and height. Obesity was defined as $\text{BMI} > 25 \text{ kg}/\text{m}^2$ (grade 1) and $\text{BMI} > 30 \text{ kg}/\text{m}^2$ (grade 2). Mean BMI increased significantly ($P < 0.001$) by 10.0% and 6.2% (2.5 and 1.7 kg/m^2) among men and women, respectively. Prevalence of obesity ($\text{BMI} > 25$ and $> 30 \text{ kg}/\text{m}^2$) increased by 20.6% and 15.4% and by 13.7% and 8.4% among men and women, respectively. After controlling for socio-demographic differences between the two study periods, BMI was 2.0 and 1.6 kg/m^2 higher in 1993-1994 than in 1980-1981 among men and women respectively. The risk of obesity ($\text{BMI} > 25$ and $> 30 \text{ kg}/\text{m}^2$) also increased among both genders between the two periods (OR = 2.1, 95% CI 1.7-2.7 and OR = 1.9, 95% CI 1.5-2.4, for men, and OR = 2.2, 95% CI 1.6-3.0 and OR = 1.4, 95% CI 1.0-1.9, for women). BMI and prevalence of obesity increased among Kuwaitis between 1980-1981 and 1993 and 1994 probably due to the effects of modernisation, affluence, increased food consumption and the concomitant changes to sedentary lifestyles. The rate of temporal changes in BMI and obesity were higher, by comparison, in Kuwait than in selected other countries.

Al-Isa AN

Temporal changes in body index and prevalence of obesity among Kuwaiti men.

Ann Nutr Metab. 1997; 41(5): 307-14.

The purpose of this study was to compare temporal changes in BMI (kg/m^2) and obesity among adult (aged ≥ 18 years) Kuwaiti men using 2 independent cross-sectional samples of 896 and 1,730 subjects, studied for nutritional assessment and for prevalence of obesity in 1980-81 and 1993-94, respectively. The samples were drawn from primary health care (PHC) clinics and measured for body mass index (BMI), and obesity, defined as

BMI > 25 (grade 1) and > 30 kg/m² (grade 2). The results of the study showed that mean BMI (kg/m²) and prevalence of grade 1 and 2 obesity (BMI > 25 and > 30 kg/m²) increased by 10, 20.6 and 15.4%, respectively. After controlling for socio-demographic differences between the two study periods, mean BMI was 2 kg/m² higher in 1993-94 than in 1980-81 and the prevalence of obesity (BMI > 25 and > 30 kg/m²) also increased between the two periods (OR = 2.1, 95% CI 1.7-2.7 and OR = 1.9, 95% CI 1.5-2.4, respectively). In conclusion, BMI and the prevalence of obesity increased among Kuwaiti men between 1980-81 and 1993-94, due to modernisation, affluence and the concomitant changes to sedentary lifestyles. The rates of temporal changes in BMI and in the prevalence of obesity were higher in Kuwait than in selected other countries.

Al-Isa AN

Factors associated with overweight and obesity among Kuwaiti college women.

Nutr Health. 1998; 12(4): 227-33.

A random sample of 585 Kuwaiti College women was studied in 1997 for factors associated with overweight and obesity. Weight and height were measured. The index of adiposity used was the body mass index (BMI), which is the weight in kilograms divided by the height squared (wt/ht²). The women were classified as overweight or obese (BMI \geq 25 or \geq 30 Kg/m²). The associated factors obtained through questionnaires included age, marital status, area of residence, number of siblings, (brothers, sisters, total), suffering from a chronic disease, obesity among parents, parents' education and occupation, number of major meals eaten, eating between meals, family income, number of servants, number of people living at home, exercising, last dental and physical check-up, dieting, year of study, highest desired degree, countries

preferred for visiting, and socio-economic status (SES). The results of the study revealed that 27.2 and 2% of the students were overweight (BMI > 25 Kg/m²) and obese (BMI > 30 Kg/m²), respectively. Factors that were found to be significantly associated with overweight and obesity among the women included number of brothers, having a chronic disease, obesity among parents, dieting and countries preferred for visiting. Logistic regression analysis of significant associated factors revealed that the same factors contributed to the development of overweight and obesity, except number of brothers and having a chronic disease.

Al-Isa AN

Dietary and socio-economic factors associated with obesity among Kuwaiti college men.

Br J Nutr. 1999; 82(5): 369-74.

Obesity has been on the increase among people of the Arabian Gulf countries. Overweight and obesity among 18-29-year-old Kuwaiti men increased by 23.4 and 14.8% respectively, between 1980 and 1993. The objective of the present study was to explore factors associated with overweight and obesity in a sample of 515 Kuwaiti College men studied in 1997. Weight and height were measured. The index of adiposity used was the BMI, which is the weight (kg) divided by the height (m) squared (kg/m²). The men were classified as overweight (BMI > 25 kg/m²) or obese (BMI > 30 kg/m²). The associated factors obtained through questionnaires included age, marital status, governorate, number of siblings, suffering from a chronic disease, subjects' parental obesity, education and occupation, number of major meals eaten, eating between meals, family income, number of servants, number of people living at home, exercising, last dental and physical check-up, dieting, year of study, highest desired degree after college, countries preferred

for visiting, and socio-economic status. The results of the study revealed that 38.5 and 11.1% of the students were overweight and obese respectively. Factors that were found to be significantly associated with overweight and obesity among the men included age, marital status, last dental check-up, exercising, subjects' parental obesity, dieting and year of study. Logistic regression analysis of significant associated factors revealed that the same factors contributed to the development of overweight and obesity.

Al-Isa AN

Obesity among Kuwait university students: an explorative study.
J R Soc Health. 1999 ;119(4):223-7.

University students' dietary habits have been criticised for their nutritional inadequacy and faddism. Kuwait University students may face the risk of obesity because of affluence and modernisation and the dynamic changes in their level of physical activity and caloric intake. This promoted a study of a random sample of 842 Kuwait University students for dietary and socio-economic factors associated with obesity. Weight and height were measured to calculate the body mass index (BMI), which is the weight in kilograms divided by the height in meters squared (kg/m^2). Obesity was classified into grade 1 and 2 ($\text{BMI} > 25$ and $> 30 \text{ kg}/\text{m}^2$). The associated factors studied and obtained through questionnaires included gender, age, marital status, parental obesity, education and occupation, dieting, last dental and health check-up, year of study, number of siblings (total, brothers and sisters), eating in between meals, high school and college GPA and major, exercising, number of regular meals eaten, obese relatives, those living at home, and servants, highest desired degree, birth order, having a chronic disease, countries preferred for visiting, family income, governorate, and socio-economic status (SES). Grade 1 and 2

obesity was found to be 32.0 and 8.9%, respectively. Factors that were found to be significantly associated with obesity included gender, age, marital status, obesity among parents, dieting, last physical check-up, year of study, number of brothers and sisters, regular meals eaten and high school GPA. Logistic regression analysis revealed that the same factors significantly contributed to the development of obesity, except the last four. The level of obesity among Kuwait University students is high. Obesity is a risk factor for a variety of chronic diseases. There is a need to address the challenge of instituting measures that would reduce the future ill effects of obesity on young adults. It is widely believed that during the young adult years many important health habits are formed and set. It is at this stage (or earlier) that wellness and self-care programming for college students is essential and worthy of being explored and its efficacy assessed.

Al-Isa AN

Changes in body mass index and prevalence of obesity among Kuwaiti women attending health clinics.

Annals Saudi Med 1997; 17(3): 307-311.

This study was undertaken to compare the changes in body mass index (BMI, kg/m²) and in prevalence of adiposity (BMI >25 and >30) between 2 cross sections of previously studied samples of 1,171 and 1,705 adult (age 18) Kuwaiti women drawn from primary health care (PHC) clinics and studied for nutritional assessment and for prevalence of obesity in 1980-81 and 1993-1994, respectively. Mild and moderate obesity (BMI >25 and >30) were assessed based on the WHO criteria. The results of the study showed that BMI and prevalence of obesity (BMI >25 and >30) increased by 6.2% (1.7), 22.7% and 8.4% respectively. After controlling for sociodemographic differences between the 2 study periods, including period of study, age, region, education, marital status and occupation, mean BMI

was 1.6 higher in 1993-94 than in 1980-81 and prevalence of obesity (BMI >25 and >30) 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.

Al-Isa AN, Bener A

The height and weight of Kuwaiti pre-school children.

Int J Anthro 1992; 5 (1): 5-11.

This paper considers the effect of age grouping on the distribution of two variables, namely, height and weight of pre-school children subject to growth. Ehrenberg's law like model was investigated assuming straight-line regression models for the dependence of expected values as well as variances and covariance of height and weight. Ehrenberg's law like relationship between height and weight, $\text{Log } w = bh + c$, was applied to Kuwaiti children under 7 years of age. It was found that the relationship $\text{log } w = 0.8h + c$ was a good fit for Kuwaiti boys and girls except for children under 1 year where the results were significantly different from the expected value.

Al-Isa AN, Moussa MA

Obesity among Kuwaiti pre-school children aged 0-5 years: prevalence and comparison with the NCHS/CDC references population.

Nutr Health. 1998; 12(4): 235-46.

The purpose of the study was to assess the level of obesity among Kuwaiti pre-school children aged 0-5 years, and compare their nutritional status with the NCHS/CDC reference population. A cross-sectional multistage stratified random sample of 7,419 Kuwaiti children (3,749 boys and 3,670 girls),

representing over 5% of the population at the studied age was used for the study. Children below 42 months were randomly selected from five maternal and child health clinics, one from each of the five local authority areas of Kuwait. Children 42 months and above were selected from 24 kindergartens, proportionally from the 5 local authority areas. Weights and heights of children were measured. Obesity was defined as weight-for-height (W/H) 2.00 to 5.00 standard deviation (SD) scores of the NCHS/CDC reference population. Underweight and short stature were defined as W/H and height-for-age (H/A) -4.00 to -2.00 SD scores, respectively. Obesity among Kuwaiti pre-school children was found to be 8.2% (7.5% in males and 9.0% in females). Underweight was found to be almost similarly distributed among both genders (4.2% in males and 4.1% in females). Short stature was found to be 5.8% (6.1% in males and 5.6% in females). Kuwaiti pre-school children aged 0-5 years were, for the most part, found to be slightly heavier and shorter than American children of the reference population. The children were also found to be heavier and taller than a decade ago. The nutritional status of the children improved during the last ten years.

Al-Isa AN, Moussa MA

Nutritional status of Kuwaiti elementary school children aged 6-10 years: comparison with the NCHS/CDC reference population.

Int J Food Sci Nut 2000; 51: 221-228.

The objective of this cross-sectional sampling survey was to assess the nutritional status of Kuwaiti elementary school children aged 6-10 years in comparison with the NCHS/CDC American reference population. The study was comprised of a multistage stratified random sample of 8,957 children (4,401 males and 4,556 females) which amounts to about 12% of the

target population. Weights and heights of children were measured. Obesity was defined as weight-for-height (W/H) 2.00 to 5.00 standard deviation (SD) scores of the reference population. Underweight and short statures were defined as W/H and height-for-age (H/A) -4.00 to -2.00 and -5.00 to -2.00 SD scores respectively. The results of this study showed that obesity was found to be significantly ($P < 0.01$) higher in males (15.7%) than in females (13.8%). Underweight was found to be almost equally prevalent among both genders (3.7% in males and 3.8% in females). Short stature (H/A, -5.00 to -2.00 SD scores) was found to be 7.1% (9.5% in males and 4.6% in females). When compared with an earlier study, changes in W/H were significant across most of the percentile categories. However, significant changes in H/A were noted with less frequency than W/H; mostly in the upper percentiles for both genders, More significant changes, however, were noted among males than females. In conclusion, Kuwaiti children were found to be heavier and shorter than American children. Moreover, the children were found to be fatter and slightly taller but nonetheless more nutritionally sound than a decade earlier.

Al-Isa AN, Moussa MA

Factors associated with overweight and obesity among Kuwaiti kindergarten children aged 3-5 years.

Nutr Health. 1999; 13(3): 125-39.

The purpose of the study was to investigate factors associated with overweight and obesity among Kuwaiti children aged 3-5 years. A cross-sectional sample of 3,473 pupils (1,748 boys and 1,725 girls) was selected for the study from kindergartens using a multistage random sampling technique. Overweight and obesity were defined as weight-for-height (W/H) $> OR = 90th - < 95th$ and $> OR = 95th$ percentiles of the NCHS/CDC reference population, respectively. Questionnaires were used to

obtain information about birth order, parents' education and occupation, family income, number of servants, eating habits, grandparents and number of persons living at home, number of siblings, socio-economic status (SES), which was based on parents' education and occupation, family income, area of residence and number of servants. Weight and height were measured and the pupils' dental status was assessed. Factors that were found to be significantly associated with overweight and obesity were gender, age, region (governorate), parents' education, birth order, dental status, eating regular meals and SES. Factors that were significantly associated with overweight and obesity in males were age, governorate, eating regular meals, number of persons living at home and SES. Among females these factors were governorate, dental status, number of servants and SES. The logistic regression analysis showed that the same factors shared by both genders significantly contributed to the development of overweight and obesity, except father's education. This study concludes that ecological factors play an important role in the development of overweight and obesity, especially those related to affluence; Kuwait has been undergoing modernisation and increasing affluence, and changes to sedentary lifestyle and increased food consumption may have contributed to changes in overweight and obesity among the children.

Al-Mousa Z

Trends in chronic diseases in Kuwait.

Emir J Agric Sci. 1994; 6: 113-127.

Kuwait has experienced a rapid change in economic and social status during the past 30 years, This change has brought an alteration in life style of the Kuwaiti population particularly in the food habits and dietary intake patterns. Increased food consumption, especially fat and protein, reflects on increased

caloric intake together with a decrease in physical activity. These lead to the emergence of diet related non-communicable disease such as obesity, diabetes, hypertension and heart disease. Changes in the eating patterns have also impacted the mortality patterns, resulting in the predominance of degenerative over infectious diseases. Studies showed that obesity is of a high prevalence among all age groups and more in females than males, and is now being considered as a major public health problem in Kuwait. There is a progressive increase in the number of newly diagnosed diabetic cases every year. Heart diseases are among the major causes of death in Kuwait. The incidence of cancer increases annually and breast cancer is the most common in females, while lung cancer is more common among males. Programmes to control these chronic diseases should be given a high priority.

Al-Mousa Z, Parkash P

Prevalence of overweight and obesity among Kuwaiti children and adolescents.

Bahrain Med Bull 2000; 22(3): 123-27.

The objective of this paper was to find out the prevalence of overweight and obesity in preschool and school children, as well as adolescents in Kuwait. Data were obtained from the national surveillance programme on anthropometric information of children, adolescent and adults. The sample included in this study was as follows: 15149 children aged 1-72 months, 10130 children aged 6-9 years, 10893 children aged 10-13 years and 10512 adolescents aged 14-17 years. Findings showed that the prevalence of obesity was higher among females at age group 1-72 months and 14-17 years, while the prevalence was almost equal in other age groups. As compared with previous studies, the prevalence of obesity is increasing and therefore a

programme to prevent overweight and obesity should be established.

Bayoumi A, Al-Hamadi A, Al-Jarallah A, Al-Shatti A, Khaja AK

Standards for growth in pre-pubertal primary school Kuwaiti children; a cross-sectional study.

Annals Trop Ped; 1984(4): 171-176.

In a cross-sectional study, anthropometric measurements were made in Kuwaiti primary school children aged 6 to 9 years. The sample included 6,765 children, of whom there were 3,534 boys and 3,231 girls. A minimum of 400 children were included in each of the 16 age-sex groups studied. Anthropometric data are presented as percentiles for weight-for-age, height-for-age and weight-for-height. The results were smoothed and figures were constructed for the three growth standards. A comparison between the locally constructed standards and a western reference growth standard (Tanner *et al*) revealed marked similarities in attainable growth. We think that the Western reference standards are suitable for use in Kuwait and probably in other similar developing countries, and the setting of lower targets for those countries is not recommended.

Bayoumi A, Moussa MA

Kuwait nutritional survey: comparison of the nutritional status of Kuwaiti children aged 0-5 years with the NCHS/CDC references population.

Bull World Hlth Org. 1985; 63(3): 521-526.

A national cross-sectional survey of the heights and weights of Kuwaiti pre-school age children of 0-5 years was conducted on a stratified multistage sample of 2,554 subjects from high and low socio-economic levels. The collected data were used to compare

the nutritional status of these children with their American counterparts using the NCHS/CDC reference population. The basic indices for comparison were height for age and weight for height, each considered in terms of percentiles and standard deviation (SD) scores and cross-classified using the SD scores. The results indicated that Kuwaiti children in the studied age groups were shorter than the American children, 47.7% falling below the 30th percentile of the reference population. Conversely the weights of the Kuwaiti children ages 0-5 years were much closer to their American counterparts, 51.8% falling above the 50th percentile of the reference population.

Eid N, Al-Hooti S, Bourisly N, Khalafawi M

Nutritional anthropometry of school children in Kuwait.

Nutrition Reports International 1986; 33(2): 253-260.

Based on a cross-sectional study, height, weight, arm circumference and triceps skinfold measurements of 4,174 school children in Kuwait (6-17 years of age) were used to define growth patterns and to assess the nutritional status. Results showed that school children in Kuwait have a normal rate of growth, and the growth pattern in 1984 has improved since 1957. The current nutritional status assessment revealed that about 65% of the children were normally nourished, 13% were malnourished and 22% were overweight. The nutritional history assessment indicated that 22% of the children had growth retardation. Malnutrition in terms of muscle area was found in 31% of the children and the same percentage was found in terms of triceps skinfold thickness.

Emara M, Abdella N, Luqman W, Senthilselvan A, Salman A, Fenech FF

Excess body fat distribution and glucose homeostasis in obese Arab women.

Diabet Med 1988 May-Jun; 5(4): 369-71

The relationship of body fat distribution to glucose intolerance and non-insulin-dependent diabetes mellitus in Arab women was studied in 102 obese non-diabetic and 40 obese women with diabetes. The obese women underwent a glucose tolerance test. Linear regression analysis revealed a significant correlation between the waist/hip ratio and the plasma glucose concentration at 120 min. When divided into two groups according to the median of their waist/hip ratio (0.815), obese women without history of diabetes but with high waist/hip ratio (0.86 ± 0.07 , mean \pm SD) had significantly higher prevalence of glucose intolerance and of diabetes mellitus than those with the low ratio (0.78 ± 0.03 , $\chi^2 = 9.32$, p less than 0.001). The highest ratio (0.89 ± 0.06) was observed in the obese women with known diabetes mellitus.

Emara MK, Saadah A, Hassan M, Moussa MA, Hourani H

Pattern of obesity and insulin, glucagon, sex hormone binding globulin and lipids in obese Arab women.

Diabetes Res 1989 Apr;10(4):175-81

A standard oral glucose tolerance test was performed in 86 healthy premenopausal obese Arab women (BMI greater than or equal to 30). Glucose, insulin and glucagon were measured at 0, 30, 60, 90 and 120 min. Sex hormone binding globulin (SHBG), plasma lipids and uric acid were also estimated. Waist-hip circumference ratio (WHR) had significant positive correlation with age, triglycerides (TG), uric acid, fasting and 120 min glucose, and 120 min insulin and significant negative correlation

with SHBG. Body mass index (BMI) had significant correlation with uric acid, fasting and 120 min insulin, and significant negative correlation with high density lipoprotein cholesterol (HDL Chol). When separated in two subgroups, with WHR greater than 0.80 (41), and less than or equal to 0.80 (45 cases), plasma glucose was in the diabetic range in seven; and impaired glucose tolerance (IGT) in 11 women in the former subgroup. Only three with IGT but no diabetics were in lower WHR subgroup. WHR in diabetics (0.93), and in IGT cases (0.90) was significantly higher than in other women (0.80). Fasting insulin was not different, but at 90 and 120 min, insulin was higher in the high WHR subgroup that had also higher fasting, 90 and 120 min glucose. Glucagon level, though slightly higher in the higher (WHR) subgroup, may indicate relative hyperglucagonaemia because of the associated significantly higher glucose. Compared with age matched non-obese controls, obese women in both subgroups had significantly higher insulin, uric acid and significantly lower HDL Chol and lower glucagon (insignificant). Obese women in the higher WHR subgroup (greater than 0.80) also had significantly higher systolic blood pressure, TG and lower SHBG.

Malaviya AN, Shehab D, Bhargava S, Al-Jarallah K, Al-Awadi A, Sharma PN, Al-Ghuriear S, Al-Shugayer A

Characteristics of osteoarthritis among Kuwaitis: a hospital-based study.

Clin Rheumatol. 1998; 17(3): 210-3.

Sixty-nine Kuwaiti patients with osteoarthritis (OA) were studied. Primary knee OA was seen in 65 (94.2%) patients. The mean age of this group was 53.18 years with a range of 39-97 years. The female to male ratio was 2.82:1. OA was bilateral in 84.62% and predominantly involved the medial tibiofemoral joint. According to Kellgren's grading of knee OA, grade 1

changes were present in 40.0%, grade 2 in 32.5%, grade 3 in 22.5% and grade 4 in 5.0%. Grade I obesity was seen in 13%, grade II in 64% and grade III in 23% of patients. Generalised primary nodular OA was seen in only four patients, all of whom were women. Primary OA of the hip joint and chondrocalcinosis were conspicuous by their absence.

Moussa MA, Shaltout AS, Al-Sheikh N, Agha N.

Prevalence of obesity among 6 to 13 year-old Kuwaiti children.
Med Principles Pract. 1994; 4: 8-14.

The objective of this study was to determine the prevalence of obesity among 6-13 year old Kuwaiti children, and to investigate the familial and behavioural factors associated with obesity. A cross-sectional multistage stratified random sample of 2,400 school children (1,256 males and 1,144 females) of ages 6-13 years was selected from the five governorates in Kuwait, between September 1995 and June 1996. Obesity was defined as Body Mass Index (BMI weight in kilograms upon height in metres squared) >90th percentile of the age/sex specific value of the National Centre of Health Statistics reference population. Data on socio-demographic characteristics, children's behavioural factors, and family history of related diseases in parents were collected by questionnaire. Prevalence of obesity was 26.5% (95% CI 24.7-28.3%). Obesity was more prevalent among female children from urban areas. BMI was negatively correlated with the number of siblings and childbirth order, and positively correlated with blood pressure, after controlling for age and sex. Logistic regression analysis showed significant associations between obesity and family history of obesity (odds ratio=3.36, $p<0.0001$), family history of hypertension (odds ratio 1.37, $p=0.024$), family history of diabetes (odds ratio =1.57, $p=0.0004$) in parents, child birth order (odds ratio = 1.82, $p=0.0002$), and respiratory diseases in children (odds ratio

=2.08, $p < 0.0001$). The prevalence of obesity in Kuwaiti children is considered to be high. Obesity which is related to family, environment, and individual characteristics needs to be detected and corrected at a young age to prevent its consequences in adulthood.

Moussa MA, Shaltout AA, Nkansa-Dwamena D, Mourad M
Apolipoproteins A-I and B in Kuwaiti children.
Ann Nutr Metab. 1998; 42(4): 202-10

To assess the relation of apolipoproteins (Apos) A-I and B (the carrier proteins for high and low density lipoprotein cholesterol, respectively) with the degree of obesity, body fat distribution, serum lipids, glucose and insulin levels, a case-control study was carried out and included 460 Kuwaiti obese children, 6-13 years old, matched by age and sex to 460 normal-weight controls. Obese children were ascertained in a representative cross-sectional study of 2,400 school children. The Apo A-I levels were not different between obese and non-obese boys, while they were significantly lower in obese girls ($p < 0.01$). The Apo B mean concentrations were significantly higher in obese boys and girls ($p < 0.001$), while the Apo A-I:B ratio was significantly lower in obese children ($p < 0.001$). Apo A-I levels were positively correlated with total cholesterol, high- and low-density lipoprotein cholesterol, but were not correlated with very low-density lipoprotein cholesterol, triglycerides, insulin, glucose or insulin: glucose ratio. Apo B levels were negatively correlated with high-density lipoprotein cholesterol and positively correlated with insulin and insulin: glucose ratio ($p < 0.01$) in obese children. The study documented an adverse Apo profile in obese Kuwaiti children. Since Apo changes are correctable through management of obesity, their identification in childhood offers prospects for prevention of early onset atherogenesis in adulthood.

Moussa MA, Shaltout AA, Nkansa-Dwamena D, Mourad M, Alsheikh N, Agha N, Galal DO

Factors associated with obesity in Kuwaiti children.

Eur J Epidemiol. 1999; 15(1): 41-9.

The prevalence of adult obesity in Kuwait is among the highest in the Arab peninsula, and cardiovascular disease, for which obesity is a risk factor, is the leading cause of death. This study reports familial and environmental factors associated with childhood obesity; in addition to adverse effects of obesity on children's serum lipids, lipoproteins, apolipoproteins, insulin, and blood pressure profiles. The authors carried out a pair-matched case-control study including 460 obese (body mass index >90th percentile of the age/sex specific reference value of the National Center for Health Statistics), school children 6 to 13 years old matched by age and gender to 460 normal weight controls. We ascertained obese children in a cross-sectional survey of a representative sample of 2,400 school children selected from 20 schools by multistage stratified random sampling. Biochemical variables and blood pressure were adversely affected in obese children. The conditional logistic regression analysis showed that family history of obesity, and diabetes mellitus, respiratory and bone diseases in children were significant associated factors with obesity after adjusting for social and behavioural factors. Physical activity and parental social class were not significant. We recommend early preventive measures with emphasis on families in which one or both parents are overweight.

Saleh AK, Moussa MA, Al-Mehza A, Abdulla J

Maternal obesity: a risk factor.

Med Principles Pract. 1994; 95(4): 8-14.

A comparative study was conducted in Kuwait's Maternity Hospital to investigate the consequences of obesity on

pregnancy, labour and foetal outcome. Kuwaiti mothers were selected from the labour wards' registration every fifth day during the first three months of 1990. The 290 selected subjects were structurally interviewed on their first postnatal day. According to the skinfold method used, 55.5% of the subjects were found to be obese. Maternal age and parity were found to be significantly ($p < 0.01$) associated with fat percentage. After controlling for the effects of age and parity, pre-pregnancy hypertension was highly associated with fat percentage ($p < 0.001$). The rates of preeclampsia and multiple pregnancy among the obese women were higher. All known diabetic women in this series were obese. Gestational diabetes was significantly ($p < 0.05$) higher among obese patients. Prolonged labour was more likely in obese than non-obese primiparas ($p < 0.05$). Obese women were 1.6 times more liable to have induced labour and 5 times more likely to have larger for date babies than non-obese patients. It is recommended that public awareness about the hazards of obesity to both mother and foetus is promoted.

OMAN

Al-Asfoor DH, Al-Lawati JA, Mohammed AJ

Body fat distribution and the risk of non-insulin-dependent diabetes mellitus the Omani population.

East Mediterr Health. 1999; 5(1): 14-20.

Anthropometric measures of overall and central obesity as predictors of non-insulin-dependent diabetes mellitus (NIDDM) risk were studied. Data for 4,728 Omanis were taken from the 1991 National Diabetes Survey. Diabetes mellitus was assessed using a 2-hour post glucose load. After adjusting for age, sex, family history of diabetes, physical activity and blood pressure, body mass index (BMI) was positively associated with increased risk of diabetes mellitus. Controlling for BMI and other potential confounders, waist-to-hip ratio and waist circumference was positively associated with increased risk of diabetes mellitus. Waist measurement (alone or with hip circumference) is a simple and independent tool for assessing the risk of NIDDM.

Hasab AA, Jaffer A, Hallaj Z

Blood pressure patterns among the Omani population

East Mediterr Health J. 1999; 5(1): 46-54.

The National Blood Pressure Survey aimed to determine blood pressure levels among Omanis $>$ or $=$ 18 years, study the epidemiological factors most related to blood pressure and suggest a program for the management and control of hypertension in Oman. Of the 4,732 people screened, 1,278 (27.01%) had high blood pressure. Multiple regression analysis showed that blood pressure depended on age, body mass index and income per capita simultaneously. In a logistic regression model, adjusted risks associated with obesity and those aged $>$

or = 45 years were significantly increased compared with the relevant different categories. A national plan of action for hypertension control and management is recommended and discussed.

Musaiger AO

Nutritional status and iron deficiency anaemia among children 2-18 years in the Southern region of Oman.

Int Child Hlth. 1996; 7: 59-69.

The objective of this paper was to assess the nutritional status with regard to the growth pattern, prevalence of malnutrition and anaemia among children and adolescents (2-18 years) in the southern region of Oman. The data used in this paper were based on several rapid assessment surveys which were carried out during the period 1988-1991. At all ages except at age 17, the median BMI of girls was higher than that of boys. At age 18 years, the difference in median BMI between boys and girls reached its peak, indicating that adult females in Salalah city were more at risk of being overweight than adult males. When compared with NHANESI (USA) standards, the mean BMI values for Omani girls were below the reference in all age groups except at age 18 years, where the median became close to the 50th percentile for the same age, showing a trend to being overweight among Omani girls at the beginning of adulthood. Stunting was more prevalent among preschoolers (18.8%) than underweight (10.3%) and wasting (3.4%). Underweight was suddenly increased at age 4 and then declined by 7.5% at age 5. Stunting increased from 18.2% at age 2 to 25.8% at age 4 and then dropped to 8.8% at age 5. The prevalence of wasting fluctuated between 3.2% and 4.5% at ages 2 till 4 and then diminished at age 5.

Musaiger AO

Health and nutritional status of Omani families.

UNICEF Muscat Office. 1992; Muscat, Oman, 178p.

A national survey on health and nutritional status of Omani families was carried out between July and August 1991. The survey covered 1,024 families from 8 geographical areas in Oman. Based on body mass index (BMI), 12.7% of the mothers were underweight, 32.9% normal weight, 26.9% overweight and 27.6% obese. The highest prevalence of obesity was observed in the southern area where 57.3% were obese and 25% were overweight. The lowest percentage of obesity was seen in southern Batinah (9%). This area also has the highest percentage of underweight mothers. The prevalence of stunting and underweight among young children in Oman is still high. Using the cut-off point of WHO (-2 SD) it was found that the prevalence of under weight among boys ranged from 6.3% for infants to 42.4% for those at age 8.5 years. The prevalence of stunting (height for age) was relatively higher than that of underweight and it ranged from 10.4% to 47.5%.

Musaiger AO

Height, weight and menarcheal age of adolescent girls in Oman.

Ann Human Biol. 1991; 81: 71-74.

A cross-sectional survey was carried out on 683 schoolgirls aged 11.5-18.5 years in Oman, in order to assess their physical growth. Height, weight and age at menarche were measured. Results showed that median height and weight of Omani girls fluctuates between 25th and 5th percentiles and 25th and 10th percentiles of the North American reference standard (NCHS), respectively. The mean age at menarche was 13.3 +/- 0.09 years. In general Omani girls are shorter and lighter than girls of similar age in other Arabian Gulf countries (Bahrain and Kuwait).

Musaiger AO

Nutrition status and dietary habits of adolescent girls in Oman.
Ecol Food Nutr. 1994; 31: 227-237.

Weight, height and dietary patterns were obtained from 683 adolescent girls aged 11 to 18 years in 5 geographical regions of the Sultanate of Oman. Using body mass index (wt/ht²) of NHANESI as a reference for adolescence, the prevalence of under weight among these girls was relatively high (24%). However, nutritional status improved with age. About 12% of these girls were overweight or obese. Breakfast was frequently skipped (21%) by adolescent girls as compared to lunch (6%) and supper (9.5%). Older (15-18years) as well as overweight girls were more likely to skip breakfast than younger (11-14 years), normal and underweight girls. Nutritional status and age of girls were significantly associated with some foods consumed at main meals and snacking times. The pattern of skipping breakfast and snacking habits of Omani adolescents was similar to that of their counterparts in Western communities. This suggests a change in dietary habits toward those practised in Western communities, a change that may explain in part, a steady rise in diet related chronic diseases in this country. It is imperative that nutrition intervention programmes should therefore consider such alterations in food habits.

QATAR

Musaiger AO, Al-Khalaf FA, Shahbeek NE

Risk factors for cardiovascular diseases among women attending health centres in Qatar.

Emir J Agric Sci. 1994; 6: 188-200.

Diseases of the circulatory system are the major causes of death in Qatar, and represent 34% of the total causes of death in 1992. This study aimed to investigate some of the known risk factors for cardiovascular diseases (CVD) in Qatar. A cross-sectional survey was carried out in 1992 on 603 women aged 17-67 years who attended health centres in Doha, the capital. The prevalence of diabetes and hypertension was very similar; 12.9% and 12.3% respectively. However, the prevalence of these diseases increased steeply with age and reached 37.1% and 51.4% respectively for those aged over 44 years. Very few women were current smokers (3.2%) but 37.7% of married women have smoker husbands, making a high proportion of passive smokers among women. Using BMI (wt/ht²) as an indicator, 30% of women were overweight and 33.6% were obese. The association between obesity and age was highly statistically significant ($P < 0.001$). Only 16% of the women practised exercise regularly, with 27% exercising infrequently. A simple tool for coronary heart disease risk factors was implemented using a point scoring system for 9 known risk factors. It was found that 7% of women had generally average risk while 1% had moderate risk. In conclusion, the study showed that some of the known risk factors for CVD were highly prevalent among women in Qatar and this suggests the need for action to prevent and control these diseases.

Musaiger AO, Al-Kalaf FA, Shahbeek NE

Factors associated with obesity among women attending health centres in Qatar.

Int J Food Sci Nutr. 1998; 49: 65-70. (supplement).

The aim of this study was to estimate the prevalence of obesity and factors associated with it among women in Qatar. A cross-sectional survey was carried out on 628 women aged 17-67 years who attended health centres in Doha, the capital. The findings revealed that 62.6% of the women were over weight or obese, based on a body mass index (BMI) ≥ 25 . Socio-economic factors such as age, marital status, education and age at marriage were significantly associated with obesity. There was no significant association between dietary habits and obesity. Chronic diseases such as diabetes and hypertension were significantly associated with obesity. However the association between obesity and heart disease was not statistically significant. A multi sectorial programme to prevent and control obesity is highly recommended.

Musaiger AO, Al-Mulla A A, Al-Manni M A

Social, lifestyle and health factors associated with obesity among out-patients in Qatar.

Bahrain Med Bull 2000; 22 (3): 128-32.

This study aimed to investigate factors associated with obesity in patients attending out-patient clinics in Qatar. Patients age 20 years and over who attended the out-patient clinics between 8 a.m. to 12 p.m. for the period of one week were interviewed (457 patients). Of these patients only 346 had their weight and height recorded, and therefore were included in the study. There was no significant association between factors studied and obesity. However, using logistic regression, it was found that the risk of obesity was higher among older people (odds

ratio, OR=1.56) female (OR=1.74), married (OR=1.20) and those who watched television more than two hours a day (OR=1.22). People with a history of hypertension and cardiovascular diseases were also prone to be obese. The findings revealed that obesity is caused by interaction between social and lifestyle factors.

SAUDI ARABIA

Abahussain NA, Musaiger AO, Nicholls PJ, Stevens R

Nutritional status of adolescent girls in the Eastern province of Saudi Arabia.

Nutr Health. 1999; 13(3): 171-7.

The aim of this study was to assess the nutritional status of Saudi adolescent girls using weight and height measurements. A cross-sectional sample of 676 girls aged 12 to 19 years was selected from Al-Khobar city, in the Eastern Province of Saudi Arabia. At all ages median (50th percentiles) heights of Saudi girls are below the 50th percentiles of the international standards. However, the median weight falls between the 75th and 50th of the standards, which may indicate a trend toward obesity. Using the body mass index for determining the nutritional status of the girls, it was found that 11% of girls were underweight, 61% were normal and 28% were overweight or obese. The findings revealed that adolescent girls in Saudi Arabia face two contrasting nutrition situations, underweight and overweight. Similar findings were reported in other Arabian Gulf countries, indicating the need for intervention programmes to promote better nutrition among school children and adolescents in Saudi Arabia.

Abdel-Aal RE, Mangoud M

Modelling obesity using abductive networks.

Comput Biomed Res. 1997; 30(6): 451-71.

This paper investigates the use of abductive network machine learning for modelling and predicting outcome parameters in terms of input parameters in medical survey data. Here we consider modelling obesity as represented by the waist-to-hip ratio (WHR) risk factor to investigate the influence of various

parameters. The same approach would be useful in predicting values of clinical parameters that are difficult or expensive to measure from others that are more readily available. The AIM abductive network machine learning tool was used to model the WHR from 13 other health parameters. Survey data were collected for a randomly selected sample of 1,100 people aged 20 years and over attending nine primary health care centres at Al-Khobar, Saudi Arabia. Models were synthesised by training on a randomly selected set of 800 cases, using both continuous and categorical representations of the parameters, and evaluated by predicting the WHR value for the remaining 300 cases. Models for WHR as a continuous variable predict the actual values within an error of 7.5% at the 90% confidence limits. Categorical models predict the correct logical value of WHR with an error in only 2 of the 300 evaluation cases. Analytical relationships derived from simple categorical models explain global observations on the total survey population to an accuracy as high as 99%. Simple continuous models represented as analytical functions highlight global relationships and trends. Results confirm the strong correlation between WHR and diastolic blood pressure, cholesterol level, and family history of obesity. Compared to other statistical and neural network approaches, AIM abductive networks provide faster and more automated model synthesis. A review is given of other areas where the proposed modelling approach can be useful in clinical practice.

Al-Abbad FA, Al-Sowielem LS

Prevalence of obesity

Saudi Med J; 1998; 19(5): 608-613.

The objective of this study was to determine the prevalence of obesity among intermediate and high school female students in Al-Khobar city, Saudi Arabia. A cross-sectional study was

carried out between May 28 and June 22,1994, in 700 female students randomly selected from 8,693 students in intermediate and high schools in Al-Khobar city. A two-stage stratified random sampling technique was used to obtain representative samples from both public and private schools. Standard procedures for measuring weight, height, waist, hip and triceps skinfold were conducted. The criteria for obesity and superobesity were body mass index (kg/m^2) of 85th - 95th and 95th percentile respectively as well as triceps skinfold thickness of 85th - 95th and 95th percentile respectively. The prevalence of obesity was 28.6% by BMI, but 39.3% by triceps skinfold thickness. However, when the 2 criteria were combined the prevalence decreased to 25.6%. Using BMI as a measure of adiposity, the prevalence of obesity and superobesity increased with age. In contrast, when triceps skinfold thickness was used there was no increase in the prevalence of obesity with age. This was, however, not true for superobesity which increased as students got older. In view of the high prevalence rate of obesity in this sample, national preventive programmes for weight control and healthy lifestyle are recommended for all ages including children and adolescents.

Al-Attas OS, Laajam MA, Khan MS, al-Dreez AZ

Obesity and major metabolic indices in newly diagnosed Saudi diabetic patients

Trop Geogr Med 1990 Apr; 42(2): 140-5

Metabolic indices were assessed in 217 Saudi diabetic patients and 57 control subjects in relation to Body Mass Index (BMI). Patients with BMI values greater than or equal to 27 in male and greater than or equal to 25 in female were considered obese. Obesity was found more frequent in females (82.7%) than in males (40.9%) (p less than 0.01). Basal glucose and HbA1C levels were lower in obese males than in females. C-peptide

levels were higher (p less than 0.01) in the obese subjects than in the non-obese. Within the obese group c-peptide levels were higher in males than in females. Triglycerides and total lipids were also higher in the obese group. Our result suggests that a varying degree of obesity influences the rate of both beta cell secretion, insulin resistance and impaired lipid metabolism.

Al-Attas OS, Laajam MA, Khan MS, al-Dress AZ

Endogenous insulin secretion in newly diagnosed diabetic patients in Saudi Arabia.

Diabetes Res Clin Pract 1990 Jan; 8(1): 51-9.

Diabetes mellitus is a major health problem in Saudi Arabia. The evaluation of endogenous insulin secretion at diagnosis has not yet been studied in this population. We have therefore studied fasting and post-glucagon stimulation levels of glucose, insulin and C-peptide in 216 newly diagnosed untreated diabetic patients. The mean +/- SD fasting insulin and C-peptide levels were 14.0 +/- 1.8 microU/ml and 1.8 +/- 0.4 ng/ml, while post-glucagon stimulation levels were 21.1 +/- 3 microU/ml and 2.4 +/- 0.4 ng/ml. There were significant post-stimulatory increment levels for insulin, from 4.9 to 13.7 microU/ml, and C-peptide from 0.2 to 1.3 ng/ml (P less than 0.001). Such increments did not affect specified age distribution. We found a significant correlation between the fasting levels and post-stimulation levels of C-peptide and insulin. Obesity correlated with higher basal and post-stimulation levels of both hormones ($r = 0.67$, P less than 0.001). The mean +/- SD fasting insulin and C-peptide levels were 18.5 +/- 9.1 microU/ml and 2.4 +/- 0.8 ng/ml for obese patients and 11.5 +/- 5.1 microU/ml and 1.9 +/- 1.1 ng/ml for non-obese patients. The type of diabetes among the Saudi adult diabetic patients studied is characterised by high basal C-peptide and insulin levels which increase

significantly with stimulation, suggesting diminished but present endogenous B-cell function.

Al-Hazzaa HM

Anthropometric measurements of Saudi boys aged 6-14 years.
Ann Hum Biol 1990 Jan-Feb; 17(1): 33-40.

Anthropometric measurements of 1,169 Saudi schoolboys between the ages of 6 and 14 years are reported. The boys were randomly selected from primary schools in the city of Riyadh, Saudi Arabia. Measurements of height, weight, grip strength, chest, triceps and subscapular skinfold thickness, as well as biacromial, chest, bi-iliac, knee, and elbow breadths were taken. Saudi boys have slightly lower values for body weight and height than American boys (NCHS standards). Values of skinfold measurements increased with age up to age 11 where they plateaued and took then a sharp increase by age 14. Means of triceps and subscapular skinfolds of the Saudi boys are also lower than some standards from the U.S.A. throughout age 13. At age 14, however, the Saudi boys have higher means than the U.S.A. boys.

Al-Nuaim AR

Effect of overweight and obesity on glucose intolerance and dyslipidemia, Saudi Arabia, epidemiological study.
Diabetes Res Clin Pract. 1997; 36(3): 181-91.

The aim of this study was to study the effect of overweight and obesity on glucose intolerance and dyslipidemia in Saudi Arabia. A cross-sectional national epidemiological randomised household survey of 2,059 Saudi subjects aged 30-64 years was carried out. The sample was representative and was in accordance with the national population distribution with respect to age, gender, regional and residency, urban versus rural population distribution. The subjects' height and weight

for the calculation of body mass index (BMI) was measured. Blood samples were drawn and assayed for glucose, total cholesterol, triglyceride and high density lipoprotein (HDL). Low density lipoprotein (LDL) was calculated. The oral glucose tolerance test was carried out for subjects with borderline random glucose concentration and the overall prevalence of diabetes mellitus was calculated. A high prevalence of obesity among the Saudi population was observed and mean serum glucose concentration was significantly higher among overweight and obese groups. The prevalence of diabetes mellitus was significantly higher among obese groups. The mean serum triglyceride concentration was only significantly higher among male obese groups. There was no significant difference in the mean of serum total cholesterol concentration between control and obese groups. Mean serum HDL concentration was lower among the obese group; however, the difference was not significant. There was no significant difference in the prevalence of hypercholesterolemia between control and obese groups. Prevalence of hypertriglyceridemia was higher among obese groups and was significantly higher among male subjects across all BMI groups. Prevalence of hypo HDL cholesterolemia exceeded 50% of the study population. Obesity, glucose intolerance, hypertriglyceridemia, hypo HDL cholesterolemia and features of insulin resistance syndrome (IRS) are widely prevalent among the Saudi population over the age of 40 years. IRS is probably a significant contributor to the pathologic process of cardiovascular (CVD) disease among the Saudi population, especially in view of the low prevalence of hypercholesterolemia.

Al-Nuaim AR

Population based epidemiological study of the prevalence of overweight and obesity in Saudi Arabia: Regional variation.
Saudi Med J; 1997; 17(2): 195-199.

This is a study of the pattern of distribution of body mass index and prevalence of overweight and obesity among the population of different regions of Saudi Arabia. It is a cross-sectional population based national epidemiological randomised household survey. There were 13,177 Saudi subjects over the age of 15. The sample was representative and in accordance with the national population distribution with respect to age, gender, regional and residency population distribution. Height and weight were measured for all the study population. BMI (body mass index) was calculated. WHO criteria were used for definition of overweight and obesity. The obesity/overweight (ob/ow) ratio was used to study the relation between the prevalence of overweight and obesity. Mean BMI values for female subjects were significantly higher than for male subjects across all regions. Mean BMI values were highest at the fifth decade for male and female subjects in all regions. Mean and 90th percentile of BMI values of male and female subjects of the Eastern region across all age groups was higher than for other regions. There was a progressive increase in prevalence of overweight with age among male subjects; the highest prevalence was achieved in the age group 51-60 years across all regions. The overall prevalence of overweight was higher among male subjects across all regions. There was a progressive increase in the prevalence of obesity with age among male and female subjects. The highest was achieved in the age group of 41-50 years across all regions. There was a regional variation with respect to the prevalence of overweight and obesity among Saudi subjects. The prevalence of overweight was higher among male subjects across all regions, while the prevalence of obesity

was higher among female subjects across all regions. A high prevalence of obesity was observed in most regions. Underlying factors such as lifestyle, nutritional habits, social and cultural beliefs and habits in different regions need to be studied. There is a need to establish a national control programme for combating obesity and related complications.

Al-Nuaim AR, Al-Rubeaan K, Al-Mazrou Y, Al-Attas O, Al-Daghari N, Khoja T

High prevalence of overweight and obesity in Saudi Arabia.
Int J Obes Relat Metab Disord. 1996; 20(6): 547-552.

The objective of this study was to examine the pattern of body weight distribution and the prevalence of overweight and obesity in Saudi Arabia. It was a cross-sectional national epidemiological household survey containing 13,177 Saudi subjects over the age of 15 years. The sample was adjusted for gender, age, regional and residency population distribution. The range and mean of age was similar for male and female subjects (15-95 years, 33 years). Measurements were taken by questionnaire, describing the social, educational and financial status. Measurement of height, weight and calculation of body mass index (BMI) were made. WHO classification was used for defining overweight (BMI 25-30) and obesity (BMI > 30). The mean BMI for female subjects was significantly higher than for male subjects, whether for all subjects or subjects of any given age group. There was a progressive increase of BMI for male and female subjects with age, reaching maximum at the 5th decade. The prevalence of overweight among male subjects was significantly higher than for female subjects (29% vs. 27%). The prevalence of obesity among female subjects was significantly higher than for male subjects (24% vs. 16%). There was a gender variation within each region with respect to the prevalence of overweight, with higher prevalence of overweight among male

subjects throughout all the regions, except the Southern region; none of the differences, however, reached significant levels. The prevalence of obesity was significantly higher among female subjects, throughout all the regions. Overweight and obesity were more prevalent among illiterate, high-income subjects who were residing in urban communities. In conclusion, this epidemiological household survey has shown a high prevalence of overweight and obesity among Saudi subjects. The prevalence of obesity among female Saudi subjects was among the highest reported, whether when using the WHO criteria or the 85th percentile of US subjects aged 20-29 years. The increase of prevalence of such conditions among high income subjects would reflect the perception of fatness as sign of affluence among those subjects. As the prevalence of obesity increases with age and considering that the majority of Saudi population is less than 30 years old at the present time, then one would expect the magnitude of obesity to be even greater in the near future. There is a need to establish programs for promoting awareness among the population of the health hazards and means of control of obesity.

Al-Nuaim AR, Bangboye EA, Al-Rubeaan KA, Al-Mazrou Y
Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables.
J Community Health. 1997; 22(3): 211-223.

The objectives of this community-based National Epidemiological Household Survey, conducted between 1990-1993, were to estimate the prevalence of overweight and obesity in Saudi Arabia and to examine its association with the socio-demographic characteristics of the adult population. A sample of Saudis 20 years and over was selected using a multistage stratified cluster sampling technique with probability proportionate to size. The selected subjects were requested to

visit primary health care centres in their localities. Physicians in these clinics took measurements of heights and weights and collected other relevant data. Obesity was measured by the Body Mass Index, using the Quetelet Index. The results showed the sample of 10,651 subjects, of which 50.8% were males, had a mean age of 35.8 years (SD = 14.27 years). The prevalence of overweight was 31.2% (95% confidence interval: 30.3%, 32.1%); 33.1% for males and 29.4% for females. For obesity, the overall prevalence was 22.1%; males 17.8% and females 26.6%. The study design suggested that these estimates could be closer to the true values. The multiple logistic regression analysis showed that age, residential area, region, income, gender, and education are statistically significant predictors of obesity. The prevalence of obesity was higher in females than males, lower in subjects living in rural areas with traditional lifestyles than those in more urbanised environments, and increased with increasing age. The observed prevalence and pattern of overweight and obesity with age and gender is similar to those observed in the Arab community and some Western nations. There is a need for increased physical activity and better nutrition education programs to reduce the extent of obesity and to prevent the serious health consequences, especially in the middle age group.

Al-Nuaim AR, Bamgboye EA, Al-Herbish A

The pattern of growth and obesity in Saudi Arabian male school children.

Int J Obes Relat Metab Disord. 1996; 20(11): 1000-5.

The objective of this study was determine the prevalence of overweight and obesity among male school children in Saudi Arabia and provide a growth chart for males 6-18 y old. A three stage stratified cluster sampling procedure was used. The study population was 9,061 male school children attending public

schools in Saudi Arabia. Their ages ranged from 6-18 y and covered all the 12 grade levels of school. Children with evidence of chronic or acute diseases were excluded from the study. Measurements were taken by a structured questionnaire, including location of school, socio-demographic characteristics and age of the student. Anthropometric measurements of weight and height were taken for all the study sample. Growth charts were designed through fitting the polynomial regression model of degree three. The percentage of body mass index (BMI) of expected BMI at the 50th percentile for each age group was computed. The 50th percentile of The National Center for Health Statistics/Center for Disease Control reference population was used as the expected standard population values for defining childhood overweight and obesity. The results show that the overall prevalence of overweight was 11.7% and obesity 15.8%. There was a statistically significant variation in the regional distribution of overweight and obesity ($P < 0.01$). The highest prevalence (18.0%) was recorded in Riyadh, capital of Saudi Arabia, and the lowest was in Sabea (11.1%) located in the Southern region. In conclusion it can be said that these findings of a high prevalence of childhood obesity when compared with the NCHS/CDC calls for an early health education program on the appropriate choice of diets for growth, health and longevity. However, because of the possible ethnic differences between the Saudi and American populations, the growth charts presented could serve as a better reference for future comparisons.

Al-Rehaimi AA, Bjorntorp P

Obesity and fat distribution in women from Saudi Arabia.

Int J Obes Relat Metab Disord; 1992 Dec; 16(12): 1017-9

Anthropometric measurements were carried out on 100 women selected randomly from the population of two cities in the eastern province of Saudi Arabia. The data obtained in this

study were then compared to those reported earlier for European countries. This comparison indicates that Saudi women are on average more obese than their European counterparts, with a preponderance of abdominal obesity. This is discussed in terms of socio-economic changes that this area has undergone in the last 50 years.

Al- Shagrawi RA, Albadar A, El-Hag EA

Factors affecting the prevalence of obesity among Saudi female college students.

Emir J. Agric Sci. 1994; 6: 227-236.

This study was conducted to evaluate the factors affecting the prevalence of obesity among Saudi female college students. Data was collected through personal interviews using a questionnaire. A sample of 460 Saudi female students representing 21.2% of the total students were selected using a systematic random procedure. The results showed that the average height and weight of the female students were 156.2cm and 55 kg respectively. Obesity and underweight were present among 12.2% and 58% of the students respectively using Body Mass Index (wt/ht^2) as a criterion. There was a significant relationship between age, social status, daily dietary intakes of energy, fat and carbohydrate as independent variables with obesity as the dependent variable. It is recommended that more attention should be given to nutritional education for university students regarding the selection of a balanced diet.

Al-Shammari SA, Khoja TA, Kremli M and Al-Balla SR

Obesity and clinical osteo-arthritis of the knee in primary health care, Riyadh, Saudi Arabia

Med Sci Res 1995; 23: 255-256.

The recent remarkable and rapid economic development in Saudi Arabia has been associated with an increased prevalence

of some diseases previously associated with more economically developed countries. Of these conditions, obesity is the most obvious and important in view of the increased risk of morbidity and mortality associated with it. An increased number of health problems, such as diabetes mellitus, hypertension, gout and gall bladder disease, are associated with obesity. In addition, cross-sectional epidemiological studies have consistently shown a relationship between obesity and osteoarthritis (OA) of the knee. Due to the lack of any scientific studies examining obesity and joint pains in the Riyadh community or primary care centres, the present study was conducted in order to determine whether there is an association between knee joint pains and obesity in Arab patients attending primary health care centres in Riyadh. This was a cross-sectional study conducted over 2 months (Feb - March 1993) that included primary health care centres in rural and urban regions in Riyadh. 759 patients (male and female) complaining of joint pains and 1,971 free of joint pains were selected. The patients with knee pain were classified as having clinical OA according to the criterion proposed by the American Rheumatism Association (ARA). The body mass index (BMI) was calculated for each patient. Of the 759 patients with joint pain, clinical OA of the knee was diagnosed in 434 patients (57.2%) while the remaining 325 (42.8%) had both knee and other joints affected but did not fulfil the ARA criteria. The mean age of the cases was 33y. The mean BMI was 30.5 ± 6.2 while that of the non-cases was 26.5 ± 5.9 ($p < 0.01$). Only 13.9% of the cases were at their ideal body weight compared to 39.9% of the non-cases. Bivariate analysis showed that cases increased with age, among female patients, married and divorced, widows, housewives and those with low education. Logistic regression analysis showed that only BMI, age, gender and education had significant effects on the presence of knee joint pains. Though obesity was the most strongly associated factor with the development of the disease, weight loss does not lead to

amelioration of the disease but can provide improvement of the symptoms. Thus, strategies aiming at weight control not only impair the development of other diseases associated with obesity, but also decrease the risk of OA of the knee.

Al-Shammari SA, Khoja TA, Kremli M and Al-Balla SR

Low back pain and obesity in primary health care, Riyadh, Saudi Arabia.

Saudi Medical Journal. 1994; 15(3): 223-226.

The objective of this study was to assess the prevalence of obesity and its association with low back pain in patients attending health care centres. A case control study of 2,460 Arab patients attending urban and rural health centres in the Riyadh region was conducted during Jan-Feb 1993. 12 health centres participated in the study. All patients attending the health centres with low back pain (cases) were compared to patients free from back pain (non cases). The mean ages were 34 years for males and 32 for females. Only 17.6% cases can be considered as non-obese as compared to 42.6% non-obese among non cases. The mean body mass index (BMI) of cases was 30.6 ± 6.1 compared with 26.7 ± 5.8 of non cases ($p < 0.01$). Body mass indices were higher among females, those of low education, housewives, non-Saudis and the divorced or widowed than other groups ($p < 0.01$). Patients living in rural areas had higher BMI than those residing in urban areas ($p < 0.01$). In conclusion it can be said that low back pain is associated with obesity. The prevalence of obesity is higher among females, those of low education, housewives, non-Saudis, the divorced, widowed and those living in rural areas.

Al-Shammari SA, Khoja TA, Al-Maatouq MA,

The prevalence of obesity among Saudi males in the Riyadh region.

Annals Saudi Med. 1996; 16 (3): 269-273.

Attendees of 15 health centres in urban and rural areas in the Riyadh region were screened for obesity during May and June 1994. Systematic selection yielded 1,580 Saudi males for analysis. The mean age was 33.6 ± 13.5 years and body mass index (BMI) was 26.9 ± 5.7 . Only 36.6% of subjects were their ideal weight (BMI <25), while 34.8% were overweight (BMI 25-29.9), 26.9% were moderately obese (BMI 30-40) and 1.7% were morbidly obese (BMI >40). Middle age, lower education and joblessness predicted a higher risk of obesity. Patients living in rural areas had greater BMI's than those living in urban areas ($P < 0.01$). 40% of overweight participants did not think they were so. The high prevalence of obesity and the lack of awareness among those afflicted emphasises the need for community based programmes for preventing and reducing obesity, since weight control is effective in ameliorating most of the disorders associated with obesity, such as type II non-insulindependent diabetes mellitus, hypertension, stroke, heart disease, sleep apnoea syndrome and osteo-arthritis of the knees. Young parents who are at risk of developing obesity and who play a central role in perpetuating it in their offspring should be the target of obesity prevention programmes.

Al-Shammari SA, Khoja TA, Al-Subaie AS

Trans-cultural attitude towards being overweight in patients attending health centres, Riyadh, Saudi Arabia.

Fam Pract Res J 1994 Jun; 14(2): 149-56.

The objective of this study was to assess differences in body weights among various nationalities living in Riyadh and find

out the effect of socio-demographic characteristics of participants on their attitudes towards body weight. In May and June of 1992, 4,144 health centre patients of various nationalities in Riyadh were surveyed about their attitudes towards overweight. A survey of attitudes of 4,144 health centre participants of various nationalities in Riyadh towards overweight was conducted during May-June 1992. Fifteen health centres representing the five arbitrarily divided sections of Riyadh (North, South, East, West, and Central) participated in the study. Every third patient was included if he or she satisfied the criteria. Participants were asked to complete a questionnaire and to have their height and weight recorded. The body mass index (BMI) was calculated for all patients and their opinions about their weights were compared with the BMI. Obesity was more common among other Arabs (43.8%) and Saudis (36.4%) than Indians (27.6%) and Westerners (30.1%). Female subjects were more obese than their male counterparts in all nationalities. The body weights increased with age, fewer physical activities, low levels of education, and marital status. All these differences were statistically significant. When comparing positive predictive value of the opinion of the participants with their BMI, it was found that the Indians (87.2%) were less likely to be correct when they judge their degree of overweight than Saudis (92.2%), Westerners (92.8%), and other Arabs (95.4%). However, positive predictive values varied with the participant's socio-demographic characteristics. The findings in the present study of a higher proportion of patients with obesity in the study group stresses the importance of promoting programs aimed at preventing or reducing obesity in the community.

Al-Shammari SA, Khoja TA, Al-Maatouq MA, Al-Nuaim AR
High prevalence of clinical obesity among Saudi females: a prospective, cross-sectional study in the Riyadh region.
J Trop Med Hyg; 1994 Jun; 97(3): 183-8.

A cross-sectional study of 1,385 Saudi females attending 15 health centres in urban and rural areas in the Riyadh region was conducted during September and October 1992 to determine the prevalence of obesity and its associated factors. The mean age was 32.2 +/- 11.7 years and body mass index (BMI) 29.2 +/- 7.0 kg m⁻². Only 26.1% of subjects were their ideal weight (BMI < 25 kg m⁻²), while 26.8% were overweight (BMI 25-29.9 kg m⁻²), 41.9% were moderately obese (BMI 30-40 kg m⁻²) and 5.1% were morbidly obese (BMI > 40 kg m⁻²). High-risk groups for obesity were mostly middle aged, multiparous housewives. Patients living in rural areas had greater BMIs than those living in urban areas (P < 0.01). Thirty per cent of overweight participants did not think they were overweight. The study emphasises the need for community based programmes for preventing and reducing obesity since weight control is effective in ameliorating most of the disorders associated with obesity such as Type 2 non-insulin dependent diabetes mellitus, hypertension, stroke, heart disease, sleep apnoea syndrome and osteoarthritis of the knees. The focus of efforts should be directed towards young mothers who are at risk of developing obesity and who play a central role in perpetuating it in their offspring.

Al-Turki YA

The prevalence of overweight and obesity amongst hypertensive and diabetic adult patients in primary health care.

Saudi Med J; 2000; 21(4): 340-343.

The objective of this study was to estimate the prevalence of overweight and obesity amongst hypertensive and diabetic adult patients in primary health care centres in Riyadh, Saudi Arabia. A retrospective review of the medical records of 3,186 adult hypertensive and diabetic patients in 10 primary health care centres in Riyadh, from August to October 1999 was carried out. 19% of the patients were their ideal weight (BMI<25) while 35% were overweight (BMI 25-29.9). 41% were moderately obese (BMI 30-40) and 5% were morbidly obese (BMI >40). Overweight and obesity are co-existing risk factors amongst hypertensive and diabetic adult patients and are an important focus for treatment and prevention of high blood pressure and diabetes.

Ashy AR, Merdad AA

A prospective study comparing vertical banded gastroplasty versus laparoscopic adjustable gastric banding in the treatment of morbid and super-obesity.

Int Surg 1998 Apr-Jun; 83(2): 108-10

We present our prospective comparative study on 60 patients subjected to two types of gastric restrictive procedures, i.e. Vertical Banded Gastroplasty (VBG) and Laparoscopic Adjustable Gastric Banding (LAGB) at King Abdul Aziz University Hospital, Jeddah, Saudi Arabia. The aim of our study was to compare weight reduction after both procedures. Thirty patients had VBG and thirty had LAGB based upon informed consents. The age, sex and preoperative weight and BMI were comparable in both groups.

Excess weight loss of 87% was achieved in the VBG group while only 50% was noticed in the LAGB group at 6 months postoperatively.

Ashy AA, Gareer WY, Omayr AS, Meccawy AA

Laparoscopic adjustable silicone gastric banding in the treatment of super obesity in the Jeddah area, Saudi Arabia. A preliminary report.

Int Surg 1996 Jul-Sep; 81(3): 289-91.

Eighteen morbid and super-obese patients were subjected to laparoscopic adjustable silicone gastric banding (LASGB) of the new prototype, which is currently used in Europe. This prospective study was done during a short period of time between October 26, 1995 and January 29, 1996 by one team and in the same hospital. Eleven patients were males, while seven were females. The mean age was 32 years (range 19-55 years), while the mean weight was 138 kg (range 98-191 kg), and the mean Body Mass Index (BMI) was 49.8 kg/m² (range 36.3-65 kg/m²). Although most of the patients were super obese, no major operative difficulties were encountered and the patients made a good postoperative recovery after this technique. The weight loss during this short period was encouraging. The literatures are reviewed.

Binhemd T, Larbi EB and Absood G

Obesity in a primary health care center: A retrospective study

Annals Saudi Med. 1991; 11(2): 163-166.

In a retrospective study, the heights and weights of 1,072 Saudis (477 men and 595 women), aged 18 to 74 years, were studied to determine the prevalence of obesity in Saudi patients attending

the primary health care centre of King Fahd Hospital of the University, Al-Khobar, in the Eastern Province of Saudi Arabia. Of the trial group, 51.5% (95% CI, 46.5 to 56.0) of the men and 65.4% (95% CI, 61.5 to 69.2) of the women were considered obese, using as the criterion a body mass index (wt/ht^2) of greater than 25. Significantly more women were obese than men. An active detection programme and campaign against obesity must be mounted in the community, and this should include advice on diet and the better education of patients with regard to obesity and its complications.

Chiedozi LC, Al Hadi FH, Salem M, Desouky MM

Cholelithiasis in young Saudi women.

East Afr Med J. 1998; 75(3): 184-7.

We studied some of the factors associated with gallstones in a sub population of Saudi women who presented with cholelithiasis at a rather young age, 17-30 years. We determined the weight, height, ideal weight, overweight, Quetelet index, ideal Quetelet index, and parity in 152 such women designated the study group and in another aged matched group of 152 women without biliary disease designated the control group. Although the mean weights of both groups were greater than ideal, the mean weight, level of overweight, and mean Quetelet index in the study group were greater than those of the controls at virtually all age groups ($p > 0.001$). In the study group, comparison of the 17-25 year olds with the 26-30 year olds showed close similarity in weight, Q index, and level of overweight ($p = 0.50$). There was no significant difference in parity between the study group and the controls. We conclude that obesity is a significant factor in the development of cholelithiasis in Saudi women who develop symptomatic gallstones in the age group 17-30 years.

El-Hazmi MA, Warsy AS

Prevalence of obesity in the Saudi population.

Annals Saudi Med. 1997; 17: 302-306.

Obesity, i.e. excessive deposition of fat in the body, is the most common nutritional disorder in the developed countries. The aim of this study was to determine the prevalence of overweight and obesity in the population of Saudi Arabia living in different regions of the country. A total of 14,660 adult Saudi males and females (>14 years of age) in 35 areas were screened and information on height (m) and weight (kg) was recorded during a National Project to study various aspects of diabetes mellitus in Saudi Arabia. The Body Mass Index (BMI) was calculated and the data were used to group the males and females as overweight (BMI= 25-29.9) and obese (BMI \geq 30). In the total Saudi Population, the prevalence of overweight was 27.23% and 25.2% in the males and females respectively, while the prevalence of obesity was 13.05% and 20.26% in the males and females respectively. When separated on the basis of each region, the prevalence of obesity was highest in females in the Central Province and in males in the Western Province, while overweight was more prevalent in males and females of the Central Province. The data were further analysed depending on each area within each province and significant differences were encountered. In general, overweight was more common in males and obesity in females. The high prevalence of obesity is cause for concern, since obesity is associated with several complications, which increase morbidity and mortality. Awareness programs must be initiated and nation-wide control and prevention programmes need to be adopted to decrease the prevalence of obesity in the Saudi population.

El-Hazmi MA, Warsy AS

Obesity and overweight in Type II diabetes mellitus patients in Saudi Arabia.

Saudi Med J; 1999; 20(2): 167-172.

Non-insulin dependent diabetes mellitus (Type II) and obesity, occur at a high prevalence in the Saudi population. Since obesity is one of the factors contributing to insulin resistance and hence predisposition to hyperglycaemia, this study was designed to investigate the prevalence of obesity in Saudi Type II diabetes mellitus and non-diabetic populations. The study was conducted on 1,419 adult individuals (age > 14 years) suffering from Type II diabetes mellitus (men=711 and women =708) and 13,241 non-diabetic individuals (men=5,451 and women=7,790) to determine the prevalence of overweight and obesity using the BMI level. The study group belonged to different parts of the country and were volunteers in a well designed screening protocol to screen for diabetes mellitus in Saudi nationals. Household screening was conducted. Fasting and 2 hr post glucose load blood glucose levels were measured and WHO criteria were applied to classify the population as diabetic and non-diabetic. Height and weight were recorded and used to calculate body mass index (BMI). Considering BMI values of 25-29.9 as overweight and 30 or over as obesity, the prevalence of overweight and obesity were calculated separately in the male and female diabetic and non-diabetic populations. In the total population, the prevalence of Type II diabetes mellitus was 9.7% and 7.1%, obesity was 13.1% and 20.3% and overweight was 27.2% and 25.2% in the total men and women. When the Type II diabetes mellitus population was separated from the non-diabetics, the prevalence of obesity was 39.3% among diabetic women ($p<0.0001$). The prevalence of obesity was lower among men compared to women and diabetic men had a higher prevalence compared to non-diabetic males (20.7%

and 12.1% respectively) ($p < 0.001$). On the other hand, overweight men (37%) were more prevalent than women (29.7%) in the diabetic group and men and women in the non diabetic group (25.9% and 24.8% respectively) ($p < 0.001$). The population was stratified on the basis of the different provinces to which they belonged and the prevalence of both overweight and obesity showed significant differences in the different provinces where the highest prevalence of obesity was in diabetic females in the Eastern province, while the lowest prevalence was in the South-Western province. The results of this study suggest that obesity may be considered as a major etiological factor in the development of Type II diabetes mellitus in Saudis.

El-Hazmi MA, Warsy AS

Relationship between obesity, overweight and plasma lipids in Saudis.

Saudi Med J; 1999; 20(7): 521-525.

Overweight and obesity occur at a high prevalence in the Saudi population. This study was conducted with the aim of determining plasma lipid levels in Saudi overweight and obese individuals and to compare them to values obtained in normal weight groups. A total of 2035 adult Saudis (927 males and 1,108 females) was included in the study. Height and weight were recorded and BMI was calculated. Fasting Blood glucose, Hb Alc, cholesterol and triglyceride levels were measured. The males and females were grouped into 3 groups (i) normal weight BMI < 25 , (ii) overweight BMI 25-29.9 and (iii) obese BMI > 30 . The cholesterol and triglyceride levels were compared among the groups. The results showed that the cholesterol and triglyceride were significantly higher in the overweight and obese groups compared to the normal weight groups. The correlation between the BMI and lipids was positively and

statistically significant. We conclude that since the prevalence of overweight and obesity is high in Saudis and since overweight and obesity are associated with hyperlipidemias, it is essential to initiate control and prevention programmes in an attempt to reduce the prevalence of overweight and obesity and hence morbidity and mortality associated with hyperlipidemic states.

Hamilton CJ, Jarondi KA and Sieck UV

High prevalence of obesity in a Saudi infertility clinic population.

Annals Saudi Med. 1995; 15: 344-346.

A menstrual history was taken from the female partners of new infertility couples seen in our clinic between 1988-1990. The body mass index (kg/m²) was measured in all females, The ovulatory status was studied using a combination of serial transvaginal ultra sound investigations and progesterone measurements in the second half of the cycle in females with regular menstrual cycles, or progesterone measurements one week before the expected onset of menstruation in females with oligomenorrhea. Amenorrheic patients were considered anovulatory if no anatomical abnormality was found. Out of the 1,755 patients, only 17% were in the normal weight category (BMI 19-24), 42% were overweight (BMI 25-29) and 38% were obese (BMI 30 or more), while the remaining 3% were underweight. With increasing BMI the percentage of oligomenorrhea increased from 18% to 32%. and the percentage of amenorrhea increased from 2% to 13%. The overall percentage of anovulation increased from 32% to 55%.

Khalid ME

The association between strenuous physical activity and obesity in a high and low altitude populations in southern Saudi Arabia.

Int J Obes Relat Metab Disord 1995 Nov; 19(11): 776-80

The objective of this study was to assess the relationship between obesity and strenuous physical activity in Saudi nationals living at high and low altitude. A cross-sectional randomised study was conducted on a total of 437 healthy adult Saudi national born and living permanently at high altitude (3,150 m) and 468 healthy adult Saudi nationals born and living permanently at relatively low altitude 500 m). Body Mass Index (Weight (kg)/height (m²)) strenuous activity scores were obtained using the Lipid Research Clinic Questionnaire and resting radial pulse rate (beats/min). Strenuous physical activity was significantly and inversely associated with obesity in men at both high ($\chi^2 = 7.13, P < 0.05$) and low ($\chi^2 = 6.14, P < 0.05$) altitude but there was no clear trend for women at either altitude. The lack of association between strenuous physical activity and obesity in women was attributed to the low and homogeneous levels of strenuous physical activity. Strenuous physical activity should be encouraged as a strategy directed towards weight reduction in the obese as well as prevention of obesity in Saudi high and lowlanders.

Khashoggi RH, Madani KA, Ghaznawy HI, Ali MA

Socio-economic factors affecting the prevalence of obesity among female patients attending primary health centres in Jeddah, Saudi Arabia.

Ecol Food Nutr. 1994; 31: 277-283.

A sample of 852 Saudi women who attended the primary health care centres in Jeddah seeking medical care were examined. Obesity was defined as a value for the body mass index

(kg/m²) > 25.0. The prevalence of obesity in the examined sample was high (64.3%). Obesity was significantly related to age, marital status, parity, level of education, level of work, women's income levels, who is the householder and the number of servants. There was no significant association between obesity and the following factors: being the only or youngest daughter, number of inhabitants, number of cars, time spent watching television, eating while watching television, number of times per week inviting or being invited to meals, householder's income and his education or work. Multiple regression analysis indicated that five variables were significant predictors: age, marital status, number of servants, and parity. Knowledge of social factors associated with obesity will help to identify high-risk groups. Those most vulnerable to the development of obesity, should then be the focus of a vigorous preventive programme.

Khwaja SS, Al-Sebai H

The relationship of age and parity to obesity in Saudi female patients.

Saudi Med J. 1987; 8: 35-39.

This study demonstrated the distribution of Quetelet's body mass index (i.e. weight/height²) among 467 married non-pregnant female patients. The overall prevalence of obesity was 27%. Statistical analysis of our data showed that age was a significant contributor to obesity rather than parity. A higher proportion of multiparous women was found to be obese due to the confounding effect of age on obesity.

Kordy MN, El-Gamal FM

A study of pattern of body mass index (BMI) and prevalence of obesity in a Saudi population.

Asia-Pacific J Public Health. 1995; 8 (2): 59-65.

The present study was conducted to assess the pattern of body mass index (BMI) prevalence of obesity, and the association between obesity and other health-related problems in a Saudi population. The study was conducted in Queza district of Jeddah, Saudi Arabia. A systematic random sample of Saudi nationals aged 16 years and above was selected (total number 1,037; 611 males and 426 females). The study population was clinically examined and a specially designed questionnaire was administered to obtain the information. Anthropometric measurements, blood pressure and urine analysis was carried out. The collected data were analysed using simple as well as multivariate statistical methods. It was observed that BMI significantly increased with age. The crude mean BMI was significantly greater in females compared to males. Prevalence of Grade I obesity among different age groups in males ranged from 15.7% to 43.0%, while in females the range was from 22.8% to 45.7%. Similar patterns for both genders were found for Grade II obesity (5.2%-18.9%; and 11.1%-47.8% respectively). Obesity was significantly associated with an increase in both systolic and diastolic blood pressure, where increase in BMI by one unit increased systolic blood pressure by 0.617 mm Hg, and diastolic blood pressure by 0.484 mm Hg. This relationship held true even after allowing for other confounding factors. The present study concluded that obesity is a problem prevalent in the community of Queza district. It is recommended that health education programs be implemented through primary health care services in the community to prevent this problem.

Madani K A

Obesity in Saudi Arabia: A Review.

Bahrain Med Bull 2000; 22(3): 113-18.

This paper highlights the current situation of obesity in Saudi Arabia. The prevalence of obesity ranged from 14% in children less than 6 years to about 83% in adults. Women were more prone to be overweight or obese than men. Several factors were reported to be associated with obesity in this country such as age, sex, socio-economic status, employment, education, and parity. More studies are needed to determine cultural influences in developing obesity. Strategy to prevent obesity in Saudi Arabia should include encouragement of physical activity, reduce intake of high fat foods and behaviour modification.

Madani KA, Khashoggi RH

Obesity in Saudi Arabia: an overview.

Emir J Agric Sci. 1994; 6: 209-217.

It is well documented that obesity is associated with several chronic illnesses. Therefore, the prevalence of obesity in a population can be considered as a rough indicator for health status. This paper reviews the current state of knowledge related to obesity in Saudi Arabia. The prevalence of obesity ranges from 14% to 66%. The wide variation can be attributed to the difference in criterion used to define obesity and also differences in age and sex structures of the samples studied. In a study on Saudis aged 18-74 years, the prevalence of obesity was found to be 51% among men and 65% among women. Several studies showed that obesity is more prevalent in diabetic patients. Factors contributing to obesity have not been well studied. Some studies suggest that a lack of physical exercise, excessive intake of high energy foods and attitudes of the community to overweight are the important factors for the occurrence of

obesity in this country. A recent study using multiple regression analysis indicated that five variables were significant predictors of obesity among women: age, marital status, number of servants, having children and parity. The paper calls for urgent action to prevent and manage obesity. Studies on the factors contributing to the high prevalence of obesity in Saudi Arabia are highly recommended.

Magbool GM

Body mass index of Saudi children aged 6-16 years from the Eastern Province.

Ann Saudi Med; 1994; 14(6): 495-198.

Body mass index (BMI is generally accepted as a useful index of various clinical situations related to obesity. However, there are no reference BMI charts for Saudi children; this paper is an attempt to establish these. A total of 21,638 Saudi schoolchildren between ages 6 to 16 (49.6% males) were studied. Curves for BMI, and seven percentiles- 5th 10th 25th 50th 75th 90th and 95th were constructed. As reference material, BMI data for American children were modified into Hegira years. It was found that, in agreement with others, the BMI for the Saudi children studied were age and gender dependent. Comparison between Saudi data and international references showed the expected genetic influence. These results remain to be compared with those from other regions in the Kingdom.

Ogbeide DO, Bamgboye EA, Karim A, Al-Khalifa I

The prevalence of overweight and obesity and its correlation with chronic diseases in Al-Kharj adult out patients, Saudi Arabia.

Saudi Med J; 1996; 17(3): 327-332.

The purpose of the study was to determine the prevalence of overweight and obesity among males and females in a suburban

area of Saudi Arabia and correlate BMI with observed chronic diseases. A period prevalence study of all adult out patients meeting the inclusion criteria was conducted between July 1993 and January 1994. The study was set at the outpatient department of the Al Kharj Military Industry Corporation Hospital, in a suburban area of Riyadh, capital of Saudi Arabia. Collection of demographic data, anthropometric measurements and chronic disease diagnoses of all adult male and female patients attending the clinic over an 18 months period was carried out. BMI was derived from weight and height². Overweight and obesity were defined as BMI >25, BMI >30 respectively. The prevalence of overweight and obesity among the study sample of 1,485 patients (685 males and 800 females) was found to be 31.5% and 40.5% for females and 40.2% and 21% for males respectively. These values were however lower when BMI greater than 85th and 95th percentile of the American population 20-29 year age group was used to define overweight and obesity respectively. There was a significant sex differential and patients with chronic diseases such as diabetes mellitus, hypertension and gallstones have a significantly higher proportion of obesity. A high prevalence of obesity is observed particularly in females. Outpatient departments and primary health care centers should include nutritionists in their team to educate subjects on good nutritional habits and weight control.

Rasheed P

Perception of body weight and self-reported eating and exercise behaviour among obese and non-obese women in Saudi Arabia.

Public Health. 1998 ; 112(6): 409-14.

A case control study was conducted to examine the theorised differences for eating and exercise behaviour among the obese and non-obese women from an urban health centre in Saudi Arabia. Perceptions regarding actual and ideal body size were

also determined. The obese were significantly more likely to eat under emotional conditions of stress and anger, in secrecy, and indulge in binge eating ($P < 0.05$). Frequent snacking and drinking of regular soda drinks was also more common in this group compared to the controls ($P < 0.05$). A weak association was observed for nibbling at food without being aware and preference of sweet foods compared to savoury ones by the obese ($P < 0.1$). A large group of the study population (75%) were either not exercising at all or doing so infrequently--a feature expected in the middle and lower social class group of women in this region. A sizeable proportion of women either overestimated (28.6%) or underestimated (28.9%) their actual body weight with increasing education significantly related to overestimation of weight and vice versa ($P < 0.05$). A change in the concept of an ideal body image from the overweight female to that of the slim figure was also observed with advancing education. To control and prevent obesity in this region, it is suggested that health education related to an awareness of a healthy body size and appropriate eating and exercise behaviour should be given through primary health centres, other health facilities and schools.

Rasheed P, Abou-Hozafa BM, Khan A

Obesity among young Saudi female adults: a prevalence study on medical and nursing students

Public Health. 1994 Jul; 108(4): 289-94

The prevalence of obesity was examined among Saudi female medical and nursing students. The analysis was made on 222 students whose ages ranged from 18-25 years. Standard procedures for measuring weight, height and triceps skinfold measurements were conducted. The criteria for obesity used in the present study were: (i) body mass index (W/H^2) in kg/m^2 $> \text{ or } = 25$ and (ii) triceps skinfold measurement of $> \text{ or } = 25$ mm

(> or = 85th percentile for ages 18-24 years). The prevalence rate of obesity by body mass index was found to be 30.6% with more girls falling in the Grade I (26.1%) than the Grade II (4.5%) category. Using the skinfold measurement as a standard, a smaller proportion (16.8%) of students was observed to be obese indicating variation in the sensitivity of the two indices as measures of body fatness. Irrespective of the method used for estimation, the prevalence of obesity in these young Saudi women was notably high and supports findings of earlier studies for a common occurrence of female obesity in this region. Preventive programmes for weight control and a healthy lifestyle among Saudi females should be emphasised from young adulthood or perhaps earlier.

Serenius F, Swailem AR

Growth and nutritional status of less privileged urban children in Saudi Arabia.

Acta Paediatr Scand Suppl 1988; 3 46: 93-103

The attained growth was assessed in a cross-sectional study of Saudi children 1-71 months of age, growing up in a less privileged area of Riyadh. Individual data on weight, height and weight for height were expressed in SD scores of the NCHS reference and those of triceps skinfold thickness in percentage of the reference median. The mean (SD) weight, height and weight for height of the entire sample were -0.9 (1.0), -0.8 (1.0), and -0.5 (0.9), respectively and the median triceps skinfold was 90 percent of the reference median. When stratified by age groups the means were nearly identical with those of the reference populations in the 1-5 month age group. The mean weight and height were significantly below the reference means at 6-11 months, however. There was a similar decline in the mean weight for height and the median triceps skinfold during the second year of life. The growth deficits of

early life remained unchanged or increased slightly up to 6 years. According to WHO criteria, 14 percent of the children were classified as chronically and 3 percent as acutely undernourished. The faltering growth was different from that of privileged Saudi children whose growth pattern was found to resemble that of Western reference populations.

Soyannwo MA, Kurashi NY, Gadallah M, Hams J, El-Essawi O, Khan NA.

Body mass index (BMI) in the Saudi population of Gassim.

Afr J Med Sci. 1998; 27(1-2): 117-21.

In a total cross-sectional population survey of the Faizia East Primary Health District of Buraidah, Gassim region of Saudi Arabia, 6,044 (2,727 male and 3,317 females) subjects out of a de facto population of 7,695 had their BMI computed, because infants and restless or bedridden subjects could not be examined. Mean (\pm SD) and percentiles (25th & 75th) were calculated in the conventional 5-year age cohorts as well as in functional age groups, namely, 0-5, 6-12, 13-49, 50-69 and 70+ years. 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles were computed only for the functional age groups. In general, the trend was for BMI to increase with age in both genders but the curve pattern showed some plateauing from about the age of 50 with slight decline in later life. Females had significantly higher indices than males, this becoming quite prominent from the 10-14 year age cohort. This difference persisted irrespective of the types of age grouping or residential location. Overall means (\pm SD) were 20.14 \pm 5.98 vs. 22.22 \pm 7.21 for males and females respectively; df: 5771; $p = 0.0000$; 95% CI: -2.43, -1.735. Subjects in the urban living environment had significantly higher indices than their rural counterparts: (21.666.92 vs. 20.446.33: df: 5771; $P = 0.0000$; 95% CI: 1.595, -0.840). From the age of 15 about one quarter of females are overweight (BMI at

the 75th percentile > 25) and from 30 years the same proportion are frankly obese (BMI > 30). Both systolic and diastolic blood pressure were significantly positively correlated with BMI in both genders: male SBP: $r = 0.22$, $P < 0.0001$; male DBP: $r = 0.21$, $P < 0.00001$; female DBP: $r = 0.18$, $P < 0.00001$.

UNITED ARAB EMIRATES

Al-Mukhtar RA, Musaiger AO

Obesity in female students in the United Arab Emirates university.

Bahrain Med Bull 2000; 22(3): 136-37.

A study on 200 female university students was carried out to determine their weight status. Using body mass index (BMI), 24% and 7.5% of students were overweight and obese, respectively. There was no significant association between BMI and age of students.

Al-Tajar SS, Hossain MM, Pugh RN

Abdominal obesity and glucose intolerance in middle-aged women in the United Arab Emirates.

J Public Health Med. 1995; 17(3): 362-363. (Letter)

Non insulin dependent diabetes mellitus (NIDDM) has emerged as a leading chronic disease in the United Arab Emirates (UAE) and in many developing countries world-wide. Adult obesity has been associated with this emergence but has lacked attention in the early diagnosis of NIDDM. In particular, the simple determination of waist to hip ratio (WHR) as an indicator of body fat distribution has been neglected as a medical screening approach in predicting glucose intolerance. Abdominal obesity, detected by a high WHR, is associated with hyperinsulinemia and independently of BMI predicts the development of NIDDM. A preliminary case control study was carried out to determine if the WHR would provide any advantage over BMI in assessing risk of NIDDM. The sample comprised of 100 subjects aged 40-59 years (49 cases of NIDDM and 51 controls.) of national (47), other Arab (36) and South

Asian (17) origin living in the city of Al-Ain. A higher proportion of cases exercised more, were on a weight reduction diet or had a family history of NIDDM, compared with controls, but these differences were not significant ($p=0.07,0.239,0.232$ respectively). The WHR can be used routinely to assess risk of NIDDM in primary health care centres.

Amine EK, Samy M

Obesity among female university students in the United Arab Emirates.

J R Soc Health. 1996; 116(2): 91-6.

The aim of the study was to determine the prevalence of obesity among female students from the United Arab Emirates University. A sample of 566 students was taken. Body weight and height were measured. The students were interviewed to collect data on age, home Emirate, obesity in childhood, obesity among parents, food intake between meals, the consumption of fast foods and physical activity. A student was considered overweight when the body weight was 110-120% of the reference weight of height and was considered obese when the body weight exceeded 120% of the reference value. The results show that 10.8% of the students were overweight and 30.6% were obese. While the prevalence of obesity increased with age, obesity among students was associated with obesity during childhood, the presence of obesity among one or both parent and food intake between meals, in particular fast foods. Limited physical exercise and long afternoon napping were important contributors to the development of obesity.

Baba N, Shaar K, Faour D, Musaiger AO, Al-Housani H, Adra N

Nutritional status of school children aged 6-10 years in the United Arab Emirates: Comparison with children from different ethnic origins.

Eco Food Nutr. 1996 36; 367-384.

A field survey was conducted to study the nutritional status of UAE children in selected Emirates in the United Arab Emirates as compared to others of different ethnic groups and from different countries. Anthropometric data (weight and height) were collected on 1,447 children aged 6-10 years from the UAE national population and from Egyptian, Jordanian, Sudanese and Omani children living in the same country. The indices studied were weight for age, height for age and weight for height. The cut off points used to indicate mild and moderate malnutrition were taken as values below -1 SD and -2 SD respectively of a reference population. The United States National Centre for Health Statistics (NCHS) was used. Results showed that children of UAE nationals suffered from both stunting and wasting in the four Emirates studied with the highest prevalence in the Emirate of Ajman. Comparisons of anthropometric data for UAE children with those from other nationalities living in the UAE, showed that ethnic origin affected the percentile and z score distribution of anthropometric indices. A higher percentage of Omani and UAE Nationals fell in the lower percentile and z score ranges as compared to children from other ethnic backgrounds. Within the UAE the observed overall levels of malnutrition could be attributed to non economic socio cultural factors which may also constitute important determinants explaining differences in nutritional status between UAE nationals and other ethnic groups studied. Further studies are needed in order to identify the

underlying nutritional and health factors, which led to the observed pattern of growth.

El Mugamer IT, Ali Zayat AS, Hossain MM, Pugh RN

Diabetes, obesity and hypertension in urban and rural people of Bedouin origin in the United Arab Emirates.

J Trop Med Hyg. 1995; 98(6): 407-15.

In the United Arab Emirates, coronary heart disease has emerged as the leading cause of mortality over a 20-year period of rapid socio-economic development. CHD risk factors of non-insulin dependent diabetes mellitus (NIDDM), obesity and hypertension were investigated by a community based survey among a Bedouin-derived Emirati population sample of 322 subjects ($> \text{ or } = 20$ years). Diagnosis of diabetes was based on a random capillary blood glucose level $> \text{ or } = 11.1$ mmol l-1. Overall diabetes prevalence was 6% (11% in male and 7% in female subjects aged 30-64 years). Urban residence was associated with higher blood glucose levels ($P = 0.000$), and with higher Body Mass Index (BMI) values ($P = 0.002$): 27% of all urban residents were obese (BMI $> \text{ or } = 30$). The Shamsi were positively associated with higher blood glucose levels compared with other tribal groups ($P = 0.000$). Female gender was associated with higher BMI values ($P = 0.000$). Between 19 and 25% of all subjects (male or female; urban or rural residents) have systolic hypertension (> 140 mm Hg). Male gender was associated with raised diastolic BP ($P = 0.023$). Diabetes was associated with higher mean systolic ($P = 0.0274$) and diastolic ($P = 0.0132$) BP levels. Differences in lifestyle between urban and rural residents are becoming blurred with further socio-economic development and it is expected that the incidence of these CHD risk factors will continue to rise. Further studies are needed to specify changes associated with urbanisation. Tribal influence also merits further study given the tradition of consanguinity in the UAE and the genetic basis to NIDDM.

Hossain MM, Pugh RN, Malik M

Prevalence and correlates of diabetes, obesity and hyperlipidemia in the United Arab Emirates (UAE)

Bahrain Med Bull 1998; 20(3): 119-122.

Associated with the rapid socio-economic development in the last three decades, coronary heart disease (CHD) has emerged as the major cause of mortality in the UAE. Yet the prevalence and correlates of CHD risk factors including diabetes, obesity and hyperlipidemia have not been studied in depth in any UAE population. We examined 358 apparently healthy office-based male employees of the Abu Dhabi oil industry for these three conditions. These men, aged 35-49 years, belonged to one of six ethnic groups: South Asian, Peninsular Arab, Shawam, Egyptian, Afro-Arab and European. Of all studied men, 10% had diabetes and 18% had glucose intolerance, 51% of the men were grade 1 overweight (body mass index BMI: 25.00-29.99) and 18% were grade 2 (BMI: 30.00-39.99) or grade 3 (BMI >40) overweight. 31% of the men had waist to hip ratio of 1:0. Borderline high levels (200-239 mg/dL) and high level (>240mg/dL) of total blood cholesterol were detected in 35% and 39% of the men respectively. The prevalence of the three studied CHD risk factors were associated with selected socio-demographic (age, ethnicity, level of education and professional status) and lifestyle (current cigarette smoking and leisure time physical activity) variables. The high prevalence of diabetes, obesity and hyperlipidemia in this group of apparently healthy men emphasises the urgent need for effective interventions and further depth research in this population and other comparable populations in the UAE.

Moussa MA, Shaik MB, Selwanes SB, Yaghy OY, Bin-Othman SA

Contribution of body fat and fat pattern to blood pressure level in school children.

Eur J Clin Nutr.1994; 48(8): 587-90.

The study aims to investigate the effect of body fat and fat localisation on blood pressure. The case control study was carried out in the school health primary care. The case-control study included 220 obese and 220 non-obese children aged 7-18 years from Al Ain City, United Arab Emirates between September 1992 and May 1993 inclusive. Each group consisted of 120 males and 100 females. Two schools were randomly selected from each of the three educational stages: primary, junior and secondary. The inclusion criterion for cases comprised children with body mass index (BMI; Quetelet index), > 90th percentile of age and sex-specific reference data of the French population. Non-obese healthy controls were randomly selected from the same classes from where obese children were identified in order to ascertain that cases and controls were matched by age and sex. Anthropometric measures (weight, height, waist and hip circumferences), systolic and diastolic blood pressures were measured. To minimise inter-observer error, blood pressure was measured by one physician. We also collected information about other confounding social variables (family history of obesity and mother's education) and behavioural variables (preferred diet and physical activity). There was a significant difference of systolic and diastolic blood pressure means between obese and non-obese children ($P < 0.001$) in both males and females. Applying the multiple linear regression analysis to fix the confounding effect of age, sex, social and behavioural factors, the fatness index, BMI, was significantly related to systolic BP ($P < 0.0004$) and diastolic ($P < 0.0001$); while waist-to-hip

circumference ratio (WHR) was not significant ($P = 0.803$ in systolic and $P = 0.648$ in diastolic blood pressure respectively). Systolic and diastolic blood pressure showed a positive relationship with the fatness index BMI, but not with WHR, in both boys and girls. This is evidence that WHR may not be a reliable indicator of body fat distribution in children.

Moussa MA, Shaik MB, Selwanes SB, Yaghy OY, Bin-Othman SA

Factors associated with obesity in school children.

Int J Obes Relat Metab Disord. 1994; 18(7): 513-5.

To investigate factors associated with the development of obesity in school children, the authors undertook a case-control study of 220 obese and 220 non-obese children aged 6 to 18 years from Al Ain, United Arab Emirates between September 1992 and May 1993 inclusive. The inclusion criterion for cases comprised children with body mass (Quetelet index) > 90 th percentile of age-sex reference data of the French population. Questionnaires were used to obtain information about socio-economic status (SES), family history of obesity, related diseases and behavioural factors (smoking, physical activity and preferred diet). Anthropometric measures (weight, height, waist and hip circumferences), systolic and diastolic blood pressure were measured. The waist/hip circumference ratio was used as an index for body fat distribution. The logistic regression analysis showed that family history of obesity, diet, physical activity and mother's education were significant factors for development of obesity after adjusting for other confounding covariates. Neither smoking nor SES showed an apparent relation to obesity. Both systolic and diastolic blood pressure showed stronger correlation with the fatness index, BMI, than with the fat distribution index, waist/hip ratio.

Musaiger AO

Knowledge and attitudes of university female students toward obesity.

Int Quartly Community Health Educ. 1994; 14: 337-343.

A cross-sectional study on 203 female university students aged 18-30 years was carried out to determine their knowledge and attitudes towards obesity. The findings revealed that most of the girls believed that over eating (53%) or over eating in addition to inactivity (26.1) are the main causes of obesity. However, 50% of the girls reported that they did not know the health complications of obesity. In general, attitudes towards certain food fads related to obesity were found to be unsatisfactory. Only 50% of the girls knew their height compared to 76% who knew their weight. Body weight perception was found to be inaccurate in 30% of the girls with acceptable weight, while 80% of the overweight girls considered themselves to be obese. Magazines and television are the main sources of nutrition information for these girls. Intervention programmes to correct the food fads and change the food habits of adolescent girls are highly recommended.

Musaiger AO, Radwan HM

Social and dietary factors associated with obesity in female university students in United Arab Emirates.

J R Soc Health. 1995; 115(2): 96-9.

A cross-sectional study on 215 female university students aged 18-30 years was undertaken in 1993 to examine some factors associated with obesity among this group of females. Based on Body Mass Index (BMI), (wt/ht^2), 19% of females were overweight and 9.8% were obese. The proportion of obesity was the highest in females aged 18 years (31%) compared to those aged 19 and 20 years and above (23.8% and 27.6%, respectively).

Although there was no significant association between obesity and social factors studied, the prevalence of obesity was higher in non-nationals, those with educated mothers, having no housemaid, and having a family history of obesity. Skipping meals and snacks had no significant association with obesity; however, obesity was more prevalent among females who did not skip lunch. In contrast, females who ate afternoon snacks and supper were more likely to be obese than females who skipped these events. Median BMI for university females was higher than that reported in the USA for the same age group, while median values for weight and mid-arm circumference for females studied were similar to that reported in their counterparts in Western countries.

Musaiger Ao, Abu-Aladeeb N, Qazaq H

Nutritional status of Emirati women in Al-Ain City, United Arab Emirates

Bahrain Med Bull 2000; 22(3): 140-41.

The aim of this study was to determine the proportion of obesity among national Emirati women who were attending out-patient clinics in Al-Ain City, United Arab Emirates. Of women studied, 9.2%, 29.8% and 38.4% respectively were underweight, overweight and obese. The findings of this study are consistent with other studies in UAE, that obesity is a problem of concern among women.

overweight and obese. On the other hand, underweight is prevalent among 3-13% of the women. Gestational Diabetes occurred in 5-10% of pregnant women, which may be associated with significant pregnancy complications. Early age at marriage, multiple pregnancies, unsound food habits, traditional beliefs and attitudes, social change and lifestyle are the main factors associated with the nutritional status of pregnant women in the GCC countries. Recommendations to improve the nutritional status of pregnant women in the region are suggested.

Musaiger AO

Health and nutritional profile for adolescent girls in the GCC countries.

Bahrain Med Bulletin. 1998; 20(3): 102-105.

Studies of adolescent girls in this region demonstrate a number of health and nutritional problems. Iron deficiency anaemia is the main problem among adolescents in all socio-economic groups. Also, a major concern is inadequate energy intake leading to underweight among a relatively high percentage of these girls. At the same time the prevalence of obesity in adolescent girls has increased, suggesting a predisposing factor for chronic diseases, such as heart disease, diabetes and hypertension. Some of the main reasons for the increasing prevalence of overweight and obesity among teenage girls are intake of foods high in energy and fat and lack of physical exercise and sedentary lifestyle. Such chronic diseases are the main causes of death in the region, and thus any programme to prevent and control these diseases should start with children and adolescents.

