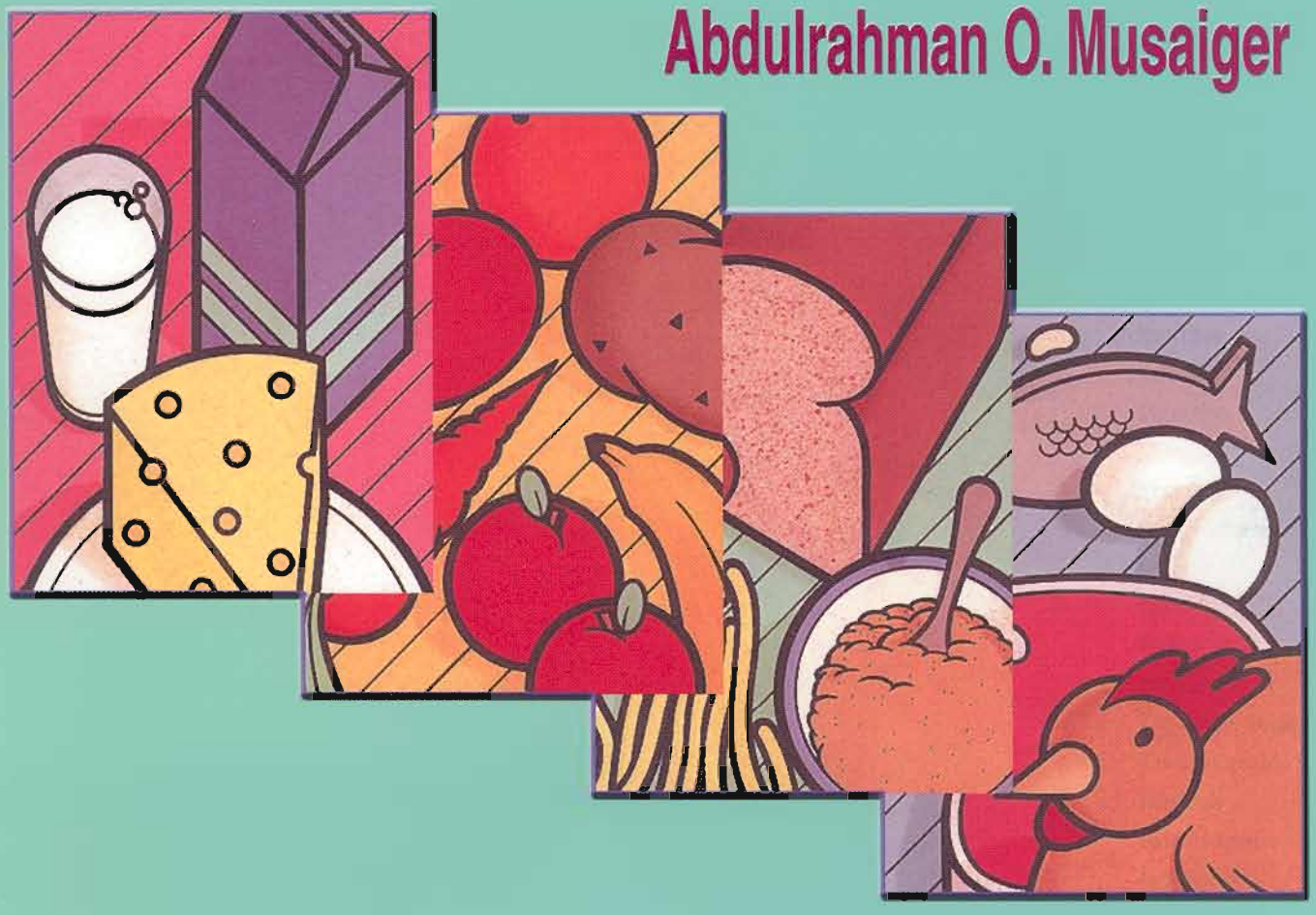
MICRONUTRIENT DEFICIENCIES AND DIET-RELATED CHRONIC DISEASES IN THE ARAB GULF COUNTRIES

Edited by
Abdulrahman O. Musaiger



MICRONUTRIENT DEFICIENCIES AND DIET-RELATED CHRONIC DISEASES IN THE ARAB GULF COUNTRIES

Edited by

Abdulrahman O. Musaiger
Head, Food and Nutrition Research
Director, Environmental and Biological Programme
Bahrain Center for Studies and Research
State of Bahrain

Bahrain Center for Studies and Research
First Edition, 2000

613.2
M 619 Micronutrient deficiencies and diet-related chronic diseases in the Arab Gulf countries/edited by Abdulrahman O. Musaiger . Bahrain: BCSR, 2000.

1. Chronic diseases - Nutritional asp. ects.
2. Micronutrient deficiencies.
3. Diet.
4. Health.
I. Bahrain Center for Studies and Research.
II. Abdulrahman O. Musaiger (editor).

Cataloging has been done by The Information, Publication and Translation Directorate.
Bahrain Center for Studies and Research.
P. O. Box 496.
Manama - Bahrain.
Fax: 973-754835

Bahrain Public Library No. 29727 L.D./2000.

ISBN 99901-09-12-5.

Printed with financial support from Kellogg's

PREFACE

Micronutrient deficiencies mainly iron deficiency anaemia and iodine deficiency disorders are now recognized as public health problems in the Arab Gulf countries. A few studies focused on the magnitude and causes of these deficiencies. However, unsound food habits have been blamed as the main factors contributing to these nutrition disorders.

On the other side diet-related chronic diseases have become the main causes of morbidity and mortality in these countries. Heart diseases are now the major cause of death in the Arab Gulf region, representing 25% to 37% of total annual deaths. The prevalence of hypertension has been reported to range from 10% to 30% of adult population. Obesity, which is considered a risk factor for several chronic illnesses, has reached an alarming level in these countries, especially among women. Diabetes is a serious health problem with a prevalence ranged between 10% to 25% among adult people. Cancer has become the third causes of death in the region.

The changes in dietary habits, life expectancy, socio-economic condition and lifestyle in the Arab Gulf countries have a great impact on the occurrence of these diseases. Information on prevalence and factors associated with micronutrient deficiencies and diet-related chronic diseases are the first step to establish programmes to prevent and control these diseases. This publication provides an important information on the current situation of micronutrient deficiencies, especially anaemia, as well as diet-related chronic diseases, with emphasis on cardiovascular diseases, diabetes, cancer and obesity.

CONTENTS

PREVALENCE AND CONTROL OF MICRONUTRIENT DEFICIENCIES IN THE ARAB COUNTRIES

SAMIR S. MILADI
Food and Agriculture Organization
Regional Office, Cairo, Egypt

INTRODUCTION

The ancient history of the Arab Region indicates that the symptoms of certain micronutrient deficiencies have been known since the Pharaonic time. References to night blindness (vitamin A deficiency) and its treatment with roasted ox liver or the liver of the black cock are to be found in ancient Egyptian medical literature such as Eber's Papyrus.

In 1840 maize was introduced in Egypt, and seven years later the appearance of pellagra was recorded. In 1898 the association of pellagra in Egypt with maize became clear. As of 1920 onward, several reports on micronutrient deficiencies were reported in the region. Attention to the occurrence of goiter in Egypt was first drawn in 1924 and on rickets in Yemen in 1939. In spite of the wealth of information from the studies and surveys on micronutrient deficiencies, only a few countries took action, especially as regards goiter control and its prevention through the iodization of salt. Very limited programmes on nutrition education and on the promotion of cultivation of certain traditional plants which are rich in micronutrients have been carried out in the region. Several countries through their primary health care have included the introduction of iron supplementation, especially for pregnant and lactating mothers. However, these programmes have reached only the limited numbers of beneficiaries who have access to health centres.

Micronutrient deficiencies have been long-standing public health problems in the Arab region. It is estimated that over 100 million people in the Arab region are suffering from one or more micronutrient deficiencies. These nutritional problems are widespread among both rich and poor Arab countries and among the rural and urban population. However, the prevalence of a particular deficiency can vary considerably between different geographic locations, socio-economic groups, age and sex. Most surveys previously conducted have been of a medical nature and have not been associated with either quantitative or qualitative food consumption data.

PREVALENCE AND CONTROL OF MICRONUTRIENT DEFECIENCIES

Anaemia

Anaemia, especially due to iron deficiency, is the most common micronutrient deficiency in the Arab region, especially among young children and women of reproductive age. Anaemia leads to learning disabilities, an increased risk of infection and diminished work capacity, and can lead to the death of women during pregnancy and at childbirth. Maternal anaemia also contributes to intrauterine growth retardation and low birth weight.

The causes of anaemia in the Arab region are mainly due to low dietary iron intake, poor iron absorption because of the lack of a sufficient intake of vitamin C, which is an enhancer for iron absorption, and iron losses associated with parasitic infections, especially in Egypt, Sudan and Iraq. Other causes of the deficiencies are due to the presence of phytic acid and polyphenols in some food which act as inhibitors to iron absorption. The endemicity of malaria in countries such as Sudan, Somalia and Mauritania is also another significant contributory factor.

Data from certain Arab countries have indicated that the phytic (iron-binding) content of wheat which is grown locally is higher than that of imported wheat. It should also be noted that the high consumption of tea (intake of tea in Egypt is more than in England) with its binding capacity reduces iron absorption, which is another common factor through the Arab countries. In Egypt, parasitic infection (bilharzia and ankylostoma) are considered important causes of the prevalence of anaemia, especially among the rural population and among urban low income groups. In most Arab countries anaemia ranges between 30% to 70% in preschool children and pregnant and lactating women. These findings were reported in several surveys which were carried out in Bahrain, Egypt, Jordan, Sudan, Tunisia, Morocco and Saudi Arabia. It is more prevalent among rural, low income groups and females. A study in Bahrain in 1980 indicated that 34% of pre-school children were anaemic. The prevalence in rural areas was double that in urban areas in children aged 6-11 years. It was more prevalent among adult females (42.8%) compared to only 21% in males. Later studies showed that anaemia decreased with the decrease in intestinal parastitic infections. A study in Oman indicated that 66% of pre-school children and 38% of school children suffered from anaemia. In Saudi Arabia it was found that 12-50% of the population were suffered from anaemia. In Yemen it is estimated that 90% of population were anaemic. Among Palestinian pregnant women, the rates were 41% in the West Bank and 67% in the Gaza Strip (Osman, 1992).

In Egypt, data on anaemia showed that it is most common among child-bearing women, nursing mothers and children between birth and two years of age. Anaemia is more common in Upper Egypt than in Lower Egypt. It is reported that 58-73% of school children aged 6-12 years suffered from anaemia. A study in Morocco indicated that 22% of children (0-2 years) admitted to hospitals had anaemia. It was also prevalent (10-14%) among pregnant women. Similarly the survey in Syria showed that anaemia is wide-spread (30%) among women of child bearing age (15-49) years.

Many of the reported studies on anaemia have been carried out on patients admitted to hospitals, those visiting health centers or schools. It is advisable that surveys should also be carried out on children who are not enrolled in schools and on populations who do not visit health centres.

Actions Needed

The intervention required for the prevention and treatment of anaemia is relatively inexpensive. Iron supplementation for vulnerable groups is essential, especially for pregnant and lactating women. Other groups that deserve high priority include premature and low birth-weight infants. For older preschool children and school children in areas where there is a high prevalence of anaemia, screening and supplementation should be considered. Fortification with iron could be undertaken with a variety of food vehicles such as processed cereals, salt, sugar, infant foods and milk products.

The selection of iron fortificant (iron sulphate, iron fumarate and sodium iron - EDTA) is dependent on the food vehicle. The colour of iron compounds is often a problem when fortifying light coloured foods. The use of more soluble iron compounds (e.g. iron sulphate) often leads to the development of off-colours and off-flavours due to reactions with other components of food material.

Attempts to modify dietary intake of iron is also important. There are three ways in which diet can improve iron absorption: by increasing intake of haem iron (primarily meat sources); by increasing intake of food rich in ascorbic acid (Vitamin C); by reducing inhibitors of iron absorption such as wheat and tea, and through the eradication of parasites.

Programmes for combating iron deficiency are usually cost-effective, since the expenditures are later offset by a better economic performance of the population.

Table 1.Micronutrient Deficiencies in the Arab Countries

Country	Anaemia	Goiter	A Vitaminosis
Algeria	19 - 42% c	23 - 71% b,c,d	NA
Bahrain	21 - 42% a,b	NA	NA
Djibouti	a,c	NA	8 - 14% c
Egypt	20 - 70% b,c,d	12 - 43% b	b,d
Iraq	d	30-80% d	d
Jordan	34% a	6 - 16% d	06 - 1.3% a,b
Lebanon	b	12 - 70%	NA
Morocco	10 - 40% a,b,c	18 - 80%	NA
Oman	38 -66% a,b	NA	NA
Saudi Arabia	21 -50% a,b	b	NA
Sudan	36% b,c	13 - 86% b,c,d	3 - 4 % b,d
Syria	30% c	69 - 77% b	NA
Tunisia	50% b,c	15 - 51% b,d	NA
U.A.E.	28 - 43% a,b,c	NA	NA
West	25 - 50% a,c	NA	NA
Bank/Gaza	NA	NA	NA
Yemen			

a. Pre-school children, b. school children, c. women of child bearing age,
d. whole population
NA: No available data.
Source: UNICEF / MENA Report 1992

Iodine Deficiency Disorders (IDD)

Iodine deficiency is a major risk factor for both the physical and mental development of a large number of the population in the Arab region who live in an iodine deficient environment. The surveys which were conducted in more than fifteen Arab countries indicated the prevalence of iodine deficiencies. Prevalence has been also reported in the mountainous areas in Morocco, Algeria, Tunisia, Syria, Lebanon, Yemen and in the Oasis in Egypt.

In pregnancy, iodine deficiency causes spontaneous abortions, stillbirths and infant death. It interferes with brain development, and can result in brain-damaged babies. In childhood, iodine deficiency can cause mental retardation, delayed motor development, growth failure or stunting, muscular disorders and paralysis, as well as speech and hearing defects. Data from Egypt indicate a

prevalence of 38% in the New Valley and 14% in Upper Egypt. It is also common among school children and females. Goiter has been reported to be endemic in Algeria since 1912. An epidemiological survey which included 4500 people, indicated a prevalence of 51.3% and endemic cretinism of 1.1%. In Lebanon, a study in 1961 indicated a prevalence of iodine deficiency of 49%, mainly among the population living in mountainous areas. IDD in Sudan was reported in 1952, mainly in Darfur areas and Western Sudan, reaching up to 86% of school children. It was also found that iodine content in foods and drinking water was low in most endemic goitre areas and the presence of a goitrogenic substance in millet which constitutes the staple cereal in Western Sudan. In Syria, surveys showed the prevalence of IDD among school children (6-14 years) was 73%. The rate was higher in high rainfall areas than in low rainfall areas.

Actions needed

The major control method for IDD is fortification of salt with iodine compounds, and distribution of iodized oil. The cost of iodized salt is about $ 0.05 per person per year. This method has been used successfully and safely for over 70 years in intervention programmes around the world. Two chemical forms of iodine which are currently used for iodization of salt, depending on its purity, are iodates and iodides. The Codex Alimentarious standard for food grade salt permits the use of the sodium and potassium salts of iodites and iodates at a level which ranges from 30 - 200 ppm. Alternative food vehicles for iodization are milk, bread, flour, sugar and condiments.

Another approach to be considered is the supplementation of the diet of domestic animals with iodine, so that those livestock products (e.g. milk, meat) contain the necessary nutrient. It is also suggested that it would be possible through agricultural research to select varieties of low goitrogenic substances such as sorghum and millet which constitute the staple diet in rural areas in Sudan and Somalia..

WHO and UNICEF are assisting several Arab countries such as Egypt, Syria, Tunisia, Jordan and Algeria. for the prevention and control of IDD through the fortification of salt with iodine.

Vitamin A Deficiency

The extent of vitamin A deficiency in the Arab countries is not clear, though a number of countries such as Djibouti, Sudan and Mauritania, have reported that vitamin A deficiency may be a significant public health problem. A recent study in Iraq indicated that vitamin A deficiency was prevalent as acute and chronic nutritional problems. Vitamin A deficiency, and its sad consequence of

blindness, poor growth, increased severity of infections, and death, is a public health problem especially among the low income groups in several Arab countries. The intake of food which is poor in Vitamin A, or its precursors (Beta-carotene), coupled with increased requirement due to infection, particularly measles, lead many children to xerophthalmia and blindness, particularly when the child is suffering from protein energy malnutrition. A survey in Sudan indicated that 14.8% of boys and 11.9% of girls showed signs of xerosis of the eye, while 2.3% of boys and 1.3% of girls showed Bitot's spots and xerosis.

In Egypt, the prevalence of vitamin A deficiency was reported to be 22% among preschool children who are suffering from PEM. In Saudi Arabia, isolated cases of vitamin A deficiency were observed in certain regions. The surveys conducted in Yemen indicated the prevalence of vitamin A deficiencies especially among school children. A study in Jordan on vitamin A deficiency in infants and young children revealed that 1.3% of children under six years of age suffered from night blindness and 0.6% suffered from Bitot's spots. The extent of vitamin A deficiency in the Arab region requires further investigation and special attention.

Actions needed

Vitamin A deficiency may be successfully attacked by relatively simple interventions. Short-term measures to prevent vitamin A deficiency among high-risk groups must be implemented because of the severe consequences of this deficiency. The fortification of commonly consumed foods, coupled with targeted distribution of high dose capsules every three to six months, may present the interim measures. The cost of fortification is estimated to be around $0.5 per person per year. Foods which have been successfully fortified with vitamin A include margarine, fats and oils, milk, sugar, cereals and spices. It should be noted that foods with a moisture content of over 8% are known to adversely affect the stability of vitamin A. Repeated heating also degrades vitamin A. Dried skimmed milk (DSM) is commonly fortified with vitamin A and D. In Tunisia, reconstituted DSM was fortified with vitamins A and D. This milk was sold at a subsidized price. Unfortunately, this programmes is no longer in operation.

There is greater coverage through fortification programmes which, however, require some investment and legislation. Health Services can be used for delivering vitamin A supplements, through immunization programmes. It has been estimated that the cost of a high dose of vitamin A supplement is around $0.4 per recipient per year. The long term solution lies in increasing the availability and consumption of vitamin A or Carotene-rich foods, including dark green leafy vegetables, and deep yellow fruits and vegetables. Agricultural planners and extension field workers must be aware of the extent and the severity

of vitamin A deficiency among the population, and how the agricultural sector can best address these problems. Nutrition education and social marketing techniques can be employed to improve dietary intakes of good sources of vitamin A.

Vitamin D Deficiency

Vitamin D deficiency has been reported in some countries. Studies in Yemen indicated that rickets is a major public health problem and osteomalacia was observed in adult women. In a study in Northern Yemen, it was found that the prevalence of rickets among children under five years of age was 27%. Rickets was common at the end of the first year and had disappeared by the fifth year. In some Arab countries such as Saudi Arabia, vitamin D deficiency was observed and was associated with wrapping infants for long periods, dietary factors and limited exposure to sunlight. Surveys in Morocco indicate vitamin D deficiency of 22% in children under four years of age. There has been a systematic preventive programmes initiated by the Ministry of Health which may reduce the incidence of rickets.

Actions needed

This particular deficiency is mainly associated with the cultural habit of wrapping the infants for long periods. The actions needed are: educating mothers not to wrap infants for long periods, a fortification programmes when required and the promotion of consumption of food rich in Vitamin D.

Other Micronutrient Deficiencies

Very limited studies and surveys were carried out in the Arab countries (Egypt and Morocco) on other micronutrient deficiencies such as zinc. The survey in Morocco indicates the prevalence of 29% of zinc deficiency among the examined adult population. However, this deficiency requires further investigation in several countries.

Vitamin C deficiency (Scurvy) has been reported among displaced populations in Sudan and Somalia. The food rations which are low in vitamin C and the new environment where wild plants are absent, have lead to the appearance of vitamin C deficiency.

CONCLUSION

The number of people affected by micronutrient deficiencies in the Arab Region is large. The consequences of these deficiencies on human health and

productivity are serious. The elimination and the control of micronutrient deficiencies in Arab countries require the establishment of a system for linking policy actions to human needs. Micronutrient deficiencies would not be solved by the Ministry of Health alone but require an integrated approach and the involvement of other Ministries such as Agriculture, Supply, Industry, Education and Information, as well as the private sector and NGOS. The World Declaration and Plan of Action on Nutrition which were adopted by the International Conference on Nutrition (ICN) and the Nutritional Goals for Children adopted by the World Summit for Children give guidelines for action needed by the international, national and local communities for the monitoring, control and elimination of these serious deficiencies which impair human development and nutritional well-being.

Three basic approaches for dealing with the problems of micronutrient deficiencies, which actually become macro-problems are as follows:

1. Diet diversification and quality improvement.
2. Fortification of food and other vehicles.
3. Direct and indirect targeted supplementation.

These interventions have been demonstrated to be feasible, effective and affordable in many countries.

REFERENCES

FAO (1996). *Technical Consultation Report on Food Fortification: Technology and Quality Control*, Rome, Italy.

FAO (1994). *Nutrition Country Profiles for Arab countries*, Rome, Italy.

FAO (1993). *Summary of the International Conference on Nutrition (ICN) Country Papers of selected countries in the Near East Region*, FAO/RNE, Cairo, Egypt.

FAO/WHO (1992). *Final Report of the International Conference on Nutrition*, - Rome, Italy.

Harfouch J. et al (1980). *The State of Child Health in the Eastern Mediterranean Region*. WHO/EMRO, Alexandria, Egypt.

Miladi, S (1992). *Food and Nutrition Problems in the Near East* . FAO/WHO Regional Meeting for the Preparation of the ICN, Cairo, Egypt.

Osman, A.K. (1992). *A Situation analysis of Micronutrient Deficiencies in MENA Countries*. UNICEF, Regional Office, Amman, Jordan.

Verster, A. (1992). *A Regional Nutrition Situation Analysis* . FAO/WHO Regional meeting for the preparation of the ICN-Cairo, April 1992.

MICRONUTRIENT DEFICIENCY IN SAUDI ARABIA

OMAR AL-ATTAS
College of Sciences, King Saud University, Riyadh, Saudi Arabia

INTRODUCTION

Nutrients are necessary for life and needed by the body to perform every single bodily function from blinking to thinking. No single substance alone can maintain the health of a human being; rather, it is a joint effort with a wide variety of nutrients working in harmonious concert with one another for the good of the whole the human host.

Nutrients can be categorized into two groups. Macronutrients are nutrients we need in large quantities to sustain us, and they consist of water, carbohydrates, protein and fats (lipids).

Micronutrients, on the other hand, are needed in much smaller quantities, but are nonetheless vital to our existence. These nutrients consist of vitamins and minerals. In Saudi Arabia, health, agriculture, education and social life have been improved remarkably in the last four decades. The purpose of this article is to highlight the micronutrients status in Saudi Arabia, basically from published data on the deficiencies of some micronutrients, minerals (iron and iodine) and vitamins D.

Iron Deficiency

The first study on iron deficiency was done by McNeil (1968) on the infants and children in Aramco Hospital in the Eastern region of Saudi Arabia. About 40% anaemic subjects were found in 500 studied cases. Another study (Al-Fawaz, 1993) was conducted in a well-baby clinic at King Khalid University Hospital in Riyadh. Out of 366 screened infants, 37.2% were anaemic (Hb<11g/dL). The screened infants were attending the clinic for routine vaccinations.

The level of haemoglobin was studied in the Turaba in the Western region of Saudi Arabia (Sebai, 1985) and it was found that the level of haemoglobin of the children under five years of age ranged from 6 to 10 g/100 dl in 34% of these children. Another study, in the region of Tamnia, showed 36% of the pre-school children had haemoglobin levels below the normal level (Sebai et al, 1981). Another aspect of iron deficiency is the occurrence of such a deficiency during pregnancy. A group of studies were conducted (Hartely, 1980; Smart et

al, 1983; Ghazawi and Hussein, 1988; Khoja et al, 1994; Madani et al, 1995). From Table 1 it is clear that there is a wide range in the prevalence of anaemia among the studied subjects. It is expected that such a difference is due to the cut-off point used for haemoglobin.

Table 1. Iron deficiency anaemia in pregnant Saudi women

Study	Sample size	% Anaemia	Cut-off
Hartley (1980)	436	4.6	Hb<10g/dl
Smart et al. (1983)	217	6.5	Hb<10g/dl
Ghaznawi et al. (1988)	272	25.6	Hb<11g/dl
Khoja et al. (1994)	119	10.1	Hb<10.3g/dl
Madani et al. (1995)	952	22.9	Hb<11.3g/dl

Iodine Deficiency

About 90% of ingested iodine is excerted in urine; therefore, urinary iodine determination is an accurate means of assessing the iodine status (Dunn et al, 1993). Twenty-four hours urine collection is the best measure. However, it is not practical for epidemiological surveys and has been replaced by casual urine samples with the value expressed or as concentration (µg iodine/g createnine). Bourdoux (1988) recommended relying on the concentration of iodine in casual samples of urine in epidemiological surveys, since a large population sample will neutralize the factor of the difference on individual urinary dilution.

The International Council of Control of Iodine Deficiency Disorders (ICCIDD) has recommended using the median of urinary iodine concentration for assessment of iodine status (Bourdoux, 1988) using the following classification: severe iodine deficiency with a median <2 µg/dl. Forty to fifty samples from an area would be adequate to reflect the urinary iodine excretion of the population of that area.

School children are the most appropriate group for survey as they tend to be homogenous for any given district or region and reflect the current status of iodine deficiency and can be used in monitoring response for any intervention programme.

We have conducted a national cross-sectional epidemiological household survey among Saudi school children aged 8 to 10 years old for studying the iodine status in Saudi Arabia, through urinary iodine estimate and clinical assessment of the thyroid gland. They were randomly selected from different regions of the country. School children of this age category are a useful target group for IDD surveillance because of their combined high vulnerability, easy access and usefulness for a variety of surveillance activities (Al-Nuaim et al, 1995).

There were 4638 school children, 2365 (51%) male and 2273 (49%) female subjects. The national median and mean urinary iodine concentrations were 18 and 17 µg/dl, respectively. The frequency distribution of urinary iodine concentration was between 12- 26 µg/dl. The majority of subjects had a urinary iodine concentration of >10 µg/dl. About one quarter of the studied population (1043 students, i.e. 22%) had a urinary iodine concentration of <10µg/dl. The Southern province had the highest percentage (45%) of students with a low urinary iodine concentration (less than 10 µg/dl) followed by the Northern province (17%). The lowest such percentage was observed in the Central and Western provinces (8%).

The two separate analytical studies on iodine concentrations in water and staple food (Sulimani and Al-Attas, 1991; Al-Attas and Sulimani, 1993) consumed by the Saudi population revealed a low iodide content in the water. This applies to both the water obtained by desalinization (Riyadh for example) (mean $\pm$0.00075$\pm$0.0026) and to "mineral" bottled water (mean 0.0045$\pm$0.0011 mmol/l). These levels are low compared to the average concentration of iodine in ground water of 5 µg/L (0.039 mmol/L). On the other hand, data on the iodide content in Saudi staple foods confirmed adequate iodine concentrations in most foods consumed by Saudis. Low water iodide content in water reflects the reserve in soil and rocks in particular geographical regions.

Sedrani and his colleagues (1992) have studied the effect of regional and environmental locations on the vitamin D status of Saudis in 4078 subjects. The population was divided into five groups on the basis of their geographical location and lifestyle. The lowest 25-OHD plasma concentrations were observed in the population living in the Northern province. The highest levels were found in the Western province. Rural children have higher concentrations than rural adults. This study suggested several inter-regional, gender, and age differences, revealing that even in a country like Saudi Arabia, with an abundance of ultraviolet light, deficiency of vitamin D is frequently seen.

CONCLUSION

Mapping Saudi Arabia for some of the micronutrient deficiencies through regional and epidemiological surveys has revealed both inadequate and adequate micronutrient status. In establishing a recommended intake for a nutrient, the criteria should be scientific evidence of the nutrient's effectiveness and safety in supporting optimal biological performance, reducing disease risk, and preventing nutrient deficiencies. Such criteria do not assume that the recommended amounts can be met from dietary sources. At the same time, long-time nutrient consumption at levels beyond those found in usual diets cannot be assumed to be safe just because lower levels are present in the diet or because adverse effects have not been discerned in random public self-supplementation. Sound scientific evidence is essential before advising the public to change dietary and nutrient patterns.

REFERENCES

Al-Attas OS and Sulimani RA. (1993). Iodine concentration in Saudi Staple Foods. *Saudi Med. J.* 14 (4): 322-24.

Al Fawaz, I. (1993). Surveillance for iron deficiency anaemia at a well baby clinic in Riyadh, Saudi Arabia. *Saudi Med.J.*14, 27-31.

Bourodoux P.P. (1988). Measurement of iodine in the assessment of iodine deficiency. *Iodine Defic Disord Newl*, 4(1): 8-12.

Dunn J., T., Crutchfield HE, Gutekunst R. and Dunn A D. (1993). Two simple methods for measuring iodine iodine in urine. *Thyroid*; 3:119-123.

Ghazawi, H.I., E.E. and Hussein, M.M. (1988). Anaemia in pregnancy in Jeddah, Saudi Arabia. An epidemiological study. *Bull. High Inst. Publ. Hea*lth. 18, 541-553.

Hartley, D.R. (1980). One thousand obstetric deliveries in the air province, Kingdom of Saudi Arabia: A review. *Saudi Med. J.* 1, 87-196.

Khoja, S.M., Baroum, S.H., Salem, S.I. and Nasrat, H.A. (1994). Iron status in pregnant Saudi Arabian women in Jeddah area. *Saudi Med. J.* 15, 43-47.

Madani, K.A., Nasrat, H.A., AL-Nowaisser, A.A., Khashoggi, R.H. and Abalkhail, B.A. (1995). Low birth weight in Taif Region, Saudi Arabia. *East. Mediterranean. Health J.* April issue.

McNeil, J.R. (1968). Variations in the response of childhood iron-deficiency anaemia to oral iron. *Blood.* 31, 641-646.

Sedrani, S.H., Al Arabi. K., Abanmy, K., Al-Arabi. K. and Elidrissy, A. (1992). Vitamin D status of Saudi. Effect of regional and environmental location. *Saudi Med. J.* 13, 206-213.

Sebi, Z.A., El-Hazmi, M.A. and Serenius F. (1981). Health profile of pre-school children in Tamnia villages, Saudi Arabia. In: Priorities in childcare. *Saudi Med.J.* (Supp.1, 68-71).

Sebi, Z.A. (1985). Health in Saudi Arabia, Vol.I.Riyadh, Tihama Publications, 39-72.

Smart, I.S. Duncan, M.E. and Kalina, J.M. (1983). Haemoglobin levels and anaemia in pregnant Saudi women. *Saudi Med. J.* 4, 263-268.

Sulimani R.A., and Al-Attas O.S. (1991). Iodine concentration in Saudi water: a case for concern. *Annals of Saudi Med.* 1196: 655-57.

THE EPIDEMIOLOGY OF ANAEMIA IN KUWAIT

Zamzam Al-Mousa[1], Robert T. Jackson[2], Montaha Al-Raqua[1] And Prasanna Prakash[1].

[1]Community Nutrition Unit, Ministry of Health, The State of Kuwait,
[2]Department of Nutrition and Food Science, University of Maryland, USA

INTRODUCTION

Anaemia is the most prevalent nutritional problem in the world (DeMaeyer and Adiels-Tegman 1985). Iron (Fe) deficiency is the main cause of anaemia. The groups at highest risk for developing nutritional anaemia are infants, children, and reproductive age women, especially pregnant women (ACC/SCN, 1991). Deficiencies of other nutrients (including folic acid, protein, vitamin B12, vitamin A, and copper) may also contribute to the development of nutritional anaemia (Viteri 1998). Non-nutritional causes of anaemia include thalassemia, haemoglobin (Hb) variants, as well as infection and inflammation.

Compared to other areas of the world, relatively less has been done to ascertain the etiology of anaemias in the Gulf (WHO, 1996). It is important to know what factors are associated with anaemia in the Gulf region to augment our knowledge about anaemia in this important part of the world and as a basis for public health intervention. Previous Kuwaiti studies have focused solely on Hb concentrations in children or women, ignoring adolescents and adult males. Moreover, the contribution of haemoglobinopathies and other factors to anaemia have not been studied. Dawood et al. (1990) conducted a nationally representative study of 1582 pregnant Arab women between the ages of 14-45 years living in Kuwait and found that anaemia was prevalent in 36.8% of the Kuwaiti women. Al-Awadi et al. (1995) studied 980 Kuwaiti women between the ages of 14-45 years of age. Their results indicated that 23.2% of the women were anaemic (Hb < 120 g/L).

Studies of children confirm that anaemia is a public health problem in Kuwait. In 1986, Eid et al. (1986) examined 1,208 children between the ages of 6-17 years of age. Of the 593 males studied, 12.8% were anaemic; however, 26% of the 615 females were anaemic. Mostafa (1976) studied 1,611 girls and boys between the ages of 6 and 60 months. They found that nearly half of these children (46.9%) had haemoglobin values below 11 g/dl (i.e., were anaemic by WHO standards). Recently, Al-Awadi et al (1995) indicated that of 765 preschool children studied, 29.3% were anaemic (Hb < 11 g/dl).

None of these studies focused on adolescents or adult males, or examined etiological factors responsible for the low Hb concentrations. Public health measures instituted by the Kuwait government, coupled with a variety of environmental factors (including extremely high ambient temperatures, aridity, sparse vegetation and standing bodies of water) militate against the proliferation of the common anaemia-causing parasites (i.e., hookworms, round worms, whip worms, Schistosomes, malaria, etc) as significant contributors to anaemia.

The objective of the present study was to examine the prevalence of anaemia in healthy Kuwaitis at various stages of the life cycle. We also examined the geographical and age distribution of anaemia in children, adolescents, and adults and the roles of iron and haemoglobinopathies as etiological factors in anaemia in Kuwait.

Background on Kuwait

Kuwait is an oil-rich. Arab country with an area of 17,818 sq. km located at 30.27°N and 48.46°E. The country is bordered on the north and west by Iraq, on the south by Saudi Arabia and on the east by the Arabian Gulf. The estimated total population is 2 million, 38% of whom are Kuwaitis and 62% are non-Kuwaitis. (Ministry of Information, 1996).

Kuwait is divided into 5 administrative divisions (Capital, Hawalli, Farwania, Ahmadi, and Jahra), called Governorates. Citizens in all Governorates enjoy a high standard of living that includes free education and medical care among other social amenities. The discovery of oil in the 1950s has brought dramatic changes in living standards, including changes in lifestyle and diet. There have also been significant improvements in the physical environment.

METHODS AND SUBJECTS

Subjects

We investigated 9,877 individuals representing various age segments of the Kuwaiti population (from 2-6 year olds attending nursery and kindergarten to adult males and females (19-45 years) in the Kuwait work force). These data were compiled as a part of the on-going nutrition surveillance efforts of the Community Nutrition Unit of the Ministry of Health. All of the subjects studied were healthy.

Methods

Various background demographic and health data were obtained by interview from the subjects (adolescents and adults) or their parents (in the case of young children). The sick and those who had recently given or received blood were excluded from participation. Pregnant women were also not included in this study.

Both the Ministries of Health and Education reviewed the study and approved the research protocols. Written consent was obtained before children were studied. The purposes of the project were explained to the adults and their voluntary consent was obtained prior to admitting them to the study.

Nursery, kindergarten, primary, and secondary aged students were studied in their schools. Adults (18-45) years) were sampled from the Medical Council, which is located in the Capital Governorate. The Medical Council provides health assessments for newly employed workers. The purpose of the Medical Council assessment is to ascertain whether employees have any illness or physical handicap that may affect their ability to be productive workers.

Capillary blood was obtained from the finger of the subjects. Hb was assessed in g/L by the HemoCue method (von Schenck et al., 1986; Lu et al., 1987). HemoCue calibration was checked daily by using the control cuvette supplied with the photometer.

Adolescent sample

For this group, Fe deficient erythropoiesis was additionally assessed by measurement of erythrocyte protoporphyrin (EP) using the ZPP hematofluorometer (AVIV Biomedical, Incorporated, Lakewood, New Jersey). Additional blood was obtained into capillary tubes from 228 unrelated girls to determine Hb variation. Hemolysates were prepared and Hb variant quantitation was carried out with cation exchange HPLC (Waters LC Module 1, Milford, MA) to check for clinically significant Hb variants (Bisse and Wieland, 1988).

The WHO definitions of anaemia for children under 5 years (Hb < 11.0 g/dl), 5-11 years (Hb < 11.5 g/dl), and older children and adults (Hb < 12.0 g/dl) were used. For adult men a Hb < 13.0 g/dl was considered to indicate the presence of anaemia (WHO 1998). Normal EP values were below 5 μg/g Hb, a level suggested by AVIV Biomedical, the manufacturer of the ZPP hematofluorometer. Standards (high, medium, and low) for EP were obtained from the manufacturer (AVIV Biomedical, Lakewood, New Jersey) and tested daily with the samples.

Statistical Analysis

Means were tested using the Student's t test and/or by Analysis of Variance (for example, average Hb concentration among the 5 Kuwait Governorates). Correlations between variables were examined using the Pearson Product Moment Correlation test. Statistical significance was accepted when P values were < 0.05. The analysis was conducted on a personal computer using the Statistical Analysis System (SAS, 1990).

RESULTS

1. Nursery and Kindergarten Students (2-6 years)

The total number of preschool children was 1,225. The sample represented both nursery (n=510) and kindergarten (n=715) students. The nursery school children were 2 or 3 years of age, and the kindergarten students ranged between 4-6 years of age. There were a total of 560 girls and 665 boys. Table 1 shows the distribution of students by class level and Governorate.

Table 2 shows the number, mean Hb, and percent of anaemia of preschool children divided according to their ages. The percent of anaemia decreases from 39% in 2 year olds to about 25% in 5 and 6 year olds.

Table 3 presents the Hb concentrations of 2-5 year old students by Governorate. Students in Farwania and Ahmadi have the highest percents of anaemia while students in Capital have the lowest.

Table 1. Preschool students by school level and Governorate

Level	Capital	Hawalli	Farwania	Ahmadi	Jahra	Total
Kinder-garden	131	263	118	117	86	715
Nursery	93	130	108	117	62	510
Total	224	393	226	234	148	1225

Table 2. Number, mean Haemoglobin, and percent preschool anaemia by age category

Age Category	Number	Mean Hb (g/dl)	% Anaemic
2 year-olds	83	11.3 ± 1.3	38.6
3 year-olds	180	11.5 ± 1.2	28.3
4 year-olds	317	12.0 ± 1.3	20.8
5 year-olds	326	12.1 ± 1.1	25.1*
6 year-olds	291	12.1 ± 1.2	25.4*

* WHO Cut-off of 11.5 g/dl.(.)

Table 3. Haemoglobin values in 2-5 year old children by Governorate (n=934)

Governorate	No.	Mean ± SD	% Anaemic
Capital	207	11.9 ± 1.2	19.3
Hawalli	297	12.0 ± 1.2	22.8
Farwania	144	11.7 ± 1.3	27.8
Ahmadi	163	11.8 ± 1.3	23.3
Jahra	123	11.8 ± 1.1	22.8

2. Primary School System

The primary school sample included 4,850 children. Slightly more than one-half of this group (52.9%) were males and 47.1% were females. The students ranged between 6 and 9 years of age. The mean age of these children was 7.5 ± 1.1 years.

Table 4 displays the mean Hb distribution and prevalence of anaemia of school children by Governorate. The mean Hb for Governorate 4 was significantly higher ($P < 0.0001$) than that for Governorates 2 and 3. In three of the five Governorates the percent of anaemia was greater in males than females. The mean Hb concentrations for male (12.4 ± 1.25 g/dl) and female (12.4 ± 1.28 g/d) primary school children were not different. Table 5 shows the mean Hb of primary school children by age. The percent with anaemia decreases as the age of the subjects increases.

3. Adolescent Girls

The secondary school girls sampled ranged between 14 and 23 years of age. The mean age of all of the girls was 17.0 years. Adolescent girls were also drawn from all 5 Governorates of Kuwait (Table 6).

The average haemoglobin value for the entire sample was 12.7 g/dl ± 1.64 g/dl. The haemoglobin values ranged between 5.7 and 17.4 g/dl. Twenty-nine percent (29.7%) of the girls had Hb values below the WHO cut-off value of 12.0 g/dl. The highest mean Hb values were observed in Jahra (13.0 ± 1.3 g/dl) and the lowest mean Hb value was seen in Ahmadi (12.5 ± 1.6 g/dl).

Table 4. Mean Hb distribution and prevalence of anaemia of school children by Governorate

Governorate	No.	Mean Hb ± SD (g/dl)	% Anaemic by sex	
			Males	Females
Capital	986	12.4 ± 1.3	36.5	31.6
Hawalli	1100	12.3 ± 1.3	38.6	39.7
Farwania	1284	12.3 ± 1.2	31.7	38.8
Ahmadi	853	12.6 ± 1.3	27.9	34.4
Jahra	658	12.4 ± 1.3	29.4	27.0

Table 5. Haemoglobin distribution of primary school children by age

Age (yr)	No.	Mean Hb SD	% Anaemic
6	1214	12.3 ± 1.2	23.6
7	1088	12.4 ± 1.2	21.5
8	1362	12.5 ± 1.3	19.4
9	1186	12.5 ± 1.3	19.9

Table 6. Mean Hb and percent anaemic among adolescent girls by Governorate

Governorate	No.	Mean ± SD	% anaemic
Capital	148	12.8 ± 1.6	22.9
Hawalli	308	12.7 ± 1.8	29.9
Farwania	251	12.7 ± 1.7	32.0
Ahmadi	224	12.5 ± 1.6	34.4
Jahra	118	13.0 ± 1.3	23.7

Other hematologically related indices

The mean erythrocyte protoporphyrin, for which elevated values are a measure of impaired Fe metabolism, was 6.0 (SD ± 2.3 μg/g Hb). EP was in the normal range (i.e., < 5 μg/g Hb) for only 31.8% of all subjects. The overall correlation between the EP and Hb values was r = -0.4725, n=1051, P=0.0001. EP values were elevated (> 5.0 μg/g Hb) in 68.2% of the sample. EP was elevated in 81.1% of those with Hb values below 12.0 g/dl. Girls in the Capital Governorate had the highest percentage of abnormal EP values, while girls in Ahmadi had the lowest percentage of abnormal EP values.

Of the 228 unrelated individuals tested for Hb variants, 9 had clinically important Hb variants, and of those only 3 had Hb concentrations < 120 g/L. One subject had β-Thalassemia trait and two had Sickle Cell Trait.

4. Adults

We studied 2751 adults of whom 963 (35%) were males and 1788 were females (65%). The ages of the subjects ranged between 19 and 45 years. The average age of the subjects was 26.2 ± 5.4 years. The mean age of the females was 26.4 ± 5.4 years and that for males was 26.0 ± 5.4 years.

The mean Hb concentration of males and females was 14.9 ± 1.45 and 12.2 ± 1.45 g/dl, respectively. Nine percent (8.8%) of the males and 39.0% of the females had Hb values below the WHO cut-off values (13.0 g/dl and 12.0 g/dl), respectively, for males and females.

CONCLUSIONS

Anaemia and Lifecycle groups

These data show that the percent of anaemia varies widely among various groups during the lifecycle in Kuwait. For example, among 2 year-olds, the percent with anaemia is 39%. In 5 and 6-year-old children, the 25% are anaemic. In the 6-9 year-old age group the percent of anaemia ranges from 23.6% to 19.4%. Among adolescent girls attending secondary schools, the percent with anaemia was 29.7%. Among the adults in this sample there was a significant but expected gender difference in the percent anaemia. Nearly 40% of adult, non-pregnant women were anaemic, however only about 9% of adult males were anaemic.

Anaemia and Geographical area

Among 2-5 year olds and adolescent girls the prevalence of anaemia was lowest in Capital Governorate. However, there was no other discernible pattern. For example, the highest percent of anaemia among 2-5 year olds was 27.8% in Farwania, but for primary school children the highest percent was found among children in Hawalli. Among the adolescents the highest percent of anaemia was observed for residents of Ahmadi.

Causes of anaemia in Kuwait: some etiological explanations

Although these data show the epidemiology of anaemia in Kuwait among various age, gender, and geographical groups, it does not, in general, tell us definitively about the cause of the low haemoglobins found in Kuwait. The study of Jackson et al. (1999) however was designed to study etiological factors. That study found that in a sample of 228 unrelated individuals, only 9 persons had clinically important Hb variants, and of these 9, only 3 girls actually were anaemic. Thus these data demonstrate that in the Kuwaiti population, only a very small percent of the low Hb concentrations are due to haemoglobinopathies.

There are four known causes of elevated ZPP levels. They are elevated Pb burdens, a rare genetic disorder called erythropoietic protoporphyria, Fe deficiency, and chronic inflammatory diseases (Lamola et al. 1975). EP is not elevated in Thalassemia minor (Stockman et al. 1975). Previous studies investigated Pb levels in the tissues (blood and teeth) of Kuwaitis, but did not find them to be a public health problem (Bu-Olayan and Thomas 1999, Shaltout et al. 1989). In our study, less than 5% of adolescents had significantly elevated EP values (above 10 µg/g), a cut-off value that is thought to be diagnostic of significant blood Pb concentrations.

Our studies of erythrocyte protoporphyrin show that a large number of Kuwaiti adolescents have borderline or elevated erythrocyte protoporphyrin values. These results suggest that a large percent of the low Hb concentrations among this group, and most probably among other segments of the population, is the result of marginal to deficient intakes of iron. Another factor that supports this conclusion is that the percent of men with anaemia was low (8.8%), while that of adult women was relatively high (39%). If genetic causes were a plausible explanation then we would observe similar prevalences of anaemia among adult males and females. However, the elevated prevalence of anaemia among women is totally consistent with known biological and dietary differences observed between men and women. These differences are derived from two basic biological facts. First that reproductive age women sustain blood losses that need to be replaced. Second, that men as a group do not sustain these blood and nutrient losses and men usually have a higher energy (and therefore nutrient) intake than women. Thus the probability of meeting iron and other nutrient needs is higher in men than women. If these hypotheses are true, then what we would expect to see is that the prevalence of anaemia would be lower in men than women. Indeed this is what we observe in this study. The percent of anaemia among women is 5 times greater than the prevalence of anaemia in men.

The FEP is one indicator of iron status. Most researchers recommend two or three indicators to assess iron status in population groups (Expert Scientific Working Group, 1985). A single indicator cannot unequivocally identify those with impaired iron status. However, we present strong presumptive evidence of iron deficiency, in addition to the high percent of Kuwaiti girls with elevated FEP values. First, iron is the main nutrient that is responsible for anaemia worldwide, so most low haemoglobin values in population level surveys can be reasonably assumed to be due to iron deficiency. Second, Kuwaiti men (residing in the same environment) have much less anaemia, as one would expect, given their higher caloric and nutrient intake. Blood loss is also less for males. Thus, we can conclude that iron deficiencies is the only likely cause of anaemia in these groups. The adolescent study (Jackson et al., 1999) is a major contribution to the understanding of anaemia and its epidemiology in Kuwait because it examined iron and haemoglobinopathies as etiological factors. Studies done prior to that study examined only Hb concentration. However, a low Hb concentration could be due to any number of factors, nutritional and non-nutritional, and is not specific to iron deficiency. Previous studies of haemoglobin variants, like Thalassemia and Sickle Cell Anaemia, based on hospital patients, are not representative of the general population.

Nutritional anaemia can be due to deficiencies other than iron. These may include deficiencies of any of the following nutrients: folic acid, vitamins B12

and vitamin A, copper, etc. We did not study these nutrients as etiological factors in the diets or blood of our subjects. Thus, we cannot definitively exclude or include them as causes of anaemia. Further research needs to be done to explicitly examine the role that nutrients other than iron may play in anaemia causation in Kuwait. Previous studies suggest that there is merit in this idea.

Kamel and Martinez (1983) studied 500 adult males and females to describe food preparation methods, dietary habits, and nutrient intakes of Kuwaitis. They found that cereals (wheat and rice) were important staples in the diet. Eighty-one percent of those studied consumed bread once or more daily. Ninety percent of the sample drank tea. Twenty-four percent of the women drank 3 or more cups of tea per day. That study also found that for women, the intakes of vitamin A, Fe, Ca, and Zn were below the RDA (USA) and that the food preparation methods employed involved prolonged boiling of meat and vegetable dishes. They surmised that prolonged boiling of vegetables may decrease the vitamin content (especially, folic acid) of foods consumed. With regard to the males in their study, they found that the calorie intake of males was 115% of the RDA (compared to 98% for females) and that males had intakes that exceeded the % RDA recommendations for all nutrients except vitamin A. Cereals provide a source of nonheme iron. The absorption of nonheme iron is low compared to heme iron. The amount of nonheme iron absorbed depends on the composition of the meal with which it is consumed. Certain substances in foods, such as fibers, phosphates and the phenolic compounds of tea, greatly decrease nonheme iron absorption. Thus the total amount of iron was not only below the RDA recommendation, but the amount of iron that was biologically available for absorption was likely to be inadequate.

In a more recent diet study of 203 female college students, Al-Shawi (1992) found, using a three-day diet record analysis, that the intakes of Fe, Zn, folacin, and vitamin D were below the RDA. The diets of these women were also high in caffeine. Thus two studies conducted nearly 10 years apart, both reveal inadequate total iron intake (as well as folate) in reproductive age women.

These data on 9,877 individuals demonstrate that anaemia is a public health problem in Kuwait. Further study of anaemia and its causes are needed. However, we strongly believe that public health authorities should not wait for all the data before initiating anaemia reduction programs.

ACKNOWLEDGEMENTS

Our sincere thanks go to the dedicated members of the Community Nutrition Unit research team. We would also like to thank Dr. Adekunle Adekile, at the Kuwait University, who performed the Hb screening tests. We also thank the

staff of the Medical Council, Preventive Health Center and the Schools for their help and assistance.

We appreciate and thank the Council for International Exchange of Scholars (Fulbright), the Kellogg Foundation, and The Kuwait Waqf Fund for Health Development for their funding of this research.

REFERENCES

ACC/SCN, (Administrative Committee on Coordination/Subcommittee on Nutrition) (1991). *Controlling Iron Deficiency*. State of the Art series. Nutr. Pol. Disc. Paper No. 9.

Adekile, A.D., Haider, M.Z. (1996). Morbidity, beta S haplotype and alpha-globin gene patterns among sickle cell anaemia patients in Kuwait. *Acta Haematol* 96(3): 150-4.

Al-Awadi, F., Amine, E., Goulam, Z. (1995). *Assessment of the Nutritional Status of Vulnerable Groups in Kuwait*. Ministry of Heath, Kuwait.

Al-Shawi, A.N. (1992) Nutrient intakes of University women in Kuwait. *J. R. Soc. Health* 112(3):114-118.

Bisse, E., Wieland, H. (1988). High-performance liquid chromatographic separation of human haemoglobins, simultaneous quantitation of foetal and glycated haemoglobins. *J. Chromatogr.* 434:95-110.

Bu-Olayan, A.H., Thomas, B.V. (1999). Dental lead levels in residents from industrial and suburban areas of Kuwait. *Sci. Total Environ.* 226(2-3): 133-137.

Dawood, J.S., Prakash, P., Shubber, K.M. (1990). Iron deficiency anaemia among pregnant Arab women. *J. Kuw. Med. Assoc.* 24(2): 167-1720.

DeMaeyer, E.M., Adiels-Tegman, M. (1985). The prevalence of anaemia in the world. *Rapp. Trimest. Stat. Snit. Mond.* 38:302-316.

Eid, N., Al-Hooti, S., Bourisly, N., Khalafawi, M. (1986). Anaemia in School Children: A Preliminary Study. *J. Kuw. Med. Assoc.* 20: 39-43.

Expert Scientific Working Group (1985). Summary of a report on assessment of the iron status of the United States population. *Am. J. Clin. Nutr.* 42:1318-1330.

Jackson RT, Al-Mousa Z, Adekile AD, Mughal HA, Nkansa-Dwamena DK (1999). The Prevalence and Etiology of Anaemia in Kuwaiti Preschoolers and Adolescents. *Kuw Med J* 31(1): 33-39.

Kamal, B.S., Martinez, O.B. (1983). Food Habits and nutrient intakes of Kuwaiti males and Females. *Ecol. Food Nutr.* 5: 261-272.

Lamola, A., Joselow, M., Yamane, T. (1975). Zinc protoporphyrin (ZPP): a simple, sensitive, fluorometric screening test for lead poisoning. *Clin Chem* 21: 93-97.

Lu, Y., Lynch, S.R., Cook, J.D., Madan, N., Bayer, W.L. (1987). Use of capillary blood for the evaluation of iron status. *Am. J. Hematol.* 224: 365-374.

Ministry of Information (1996), *Kuwait Facts and Figures*, International Media, Information Publication Administration, Kuwait.

Mostafa S. (1979). *Nutritional Status Assessment Among Pre-school Children*. Nutrition Unit, Ministry of Health, Kuwait.

Shaltout, A.A., Guthrie, R., Moussa, M., Kandil, H., Hassan, M.F., Dosari, L., Hunt, C.J., Fernando, N.P. (1989). Erythrocyte Protoporphyrin screening for Pb poisoning in Bedouin Children. A study from Kuwait *J. Trop. Ped.* 35: 87-91.

Statistical Analysis System (SAS) (1990). Version 6, North Carolina, Research Triangle.

Stockman, J.A., Weiner, L.B., Simon, G., Stuart, M.J., Oski, F.A. (1975). The measurement of free erythrocyte porphyrin (FEP) as a simple means of distinguishing iron deficiency from beta Thalassemia trait in subjects with microcytosis *J. Lab. Clin. Med.* 85: 113-119.

Viteri, F. (1998). A new concept in the control of iron deficiency: community-based preventive supplementation of at-risk groups by the weekly intake of iron supplements. Biomed. *Environ. Sci.* 11(1): 46-60.

von Schenck, H., Falkensson, M., Lundberg, B. (1986). Evaluation of "HemoCue", a new device for determining haemoglobin. *Clin. Chem.* 32: 526-529.

WHO (1996). *Guidelines for the Control of Iron Deficiency in Countries of the Eastern Mediterranean, Middle East and North Africa.* A report based on a joint WHO/UNICEF consultation on strategies for the control of Fe deficiency anaemia. Document WHO - EM/NUT/177, /G/11.96. 1996; WHO, Geneva.

WHO (1998). *Preventing Iron Deficiency in Women and Children: technical consensus on Key Issues.* A UNICEF/UNU/WHO/MI Technical workshop, UNICEF, New York, 7-9 October 1998.

WHO/UNICEF/UNU (1999). *Indicators for Assessing Iron Deficiency and Strategies for its Prevention,* Geneva.

CHANGES IN DIETARY HABITS, LIFESTYLE AND TREND IN DISEASES IN THE GCC COUNTRIES*

Abdulrahman O. Musaiger
Environment and Biological Programme, Bahrain Centre for Studies & Research, Bahrain

INTRODUCTION

The GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates have experienced a rapid change in socio-economic status, food consumption patterns, lifestyle and health status during the past three decades, mainly due to the oil boom and sharp increase in income. These changes have their impact on the nutritional and health situation of the Gulf community, with development of a paradoxical nutrition status, as both under- and over-nutrition exists. Under-nutrition is manifested as growth retardation among preschool children and anaemia in young children, adolescent girls and pregnant women, while over-nutrition is manifested as overweight and obesity and diet-related non-communicable diseases.

The improved standards of living and health services in these countries have lead to improvement in life expectancy, which increased from 50-59 years in the 1950s to more than 70 years in the 1990s. This situation has participated in the occurrence of several chronic diseases, especially cardiovascular disease, diabetes mellitus, hypertension and cancer. Additionally, the sedentary lifestyle and shifting from a traditional diet to a more westernized diet play an important role in changing the trends in diseases and the nutrition status of the population. The objective of this paper is to highlight the current changes in nutrition, health, lifestyle and food habits in the GCC countries (Musaiger, 1996).

Change in Dietary Habits

There has been a drastic change in food consumption patterns in the GCC states during the past three decades. The traditional diet which consisted of dates, milk, rice, brown bread, fish and vegetables has changed to a more diversified diet. The consumption of dates, fruit and vegetables has decreased gradually, especially among children and adolescents. Brown bread has been replaced by white bread and fast foods have become the most common foods preferred by young people (Musaiger, 1987). Cereal consumption seems to have reached a ceiling, with a contribution to overall dietary energy supply of 35-42%.

*Reprinted from Bahrain Medical Bulletin, vol 20, 1998.

The main cereals consumed are rice and wheat, and the rice consumed is polished and contains only 0.5% crude fiber (Musaiger and Sungpuag, 1985).

Wheat is mostly consumed as bread made from flour with an extraction rate of 70-75%. Sugar consumption is rising from an already relatively very high level of 80-110 g/head/day and contributes 10-15% of daily energy supply. The same trend is seen for oils and fats, with consumption around 80 g/head/day and contributing 30% of daily calorie supply. The consumption of animal products is high compared to most developing countries (160-190 g meat, 400-490 g milk, and 22-32 g eggs/head/day) (FAO, 1990).

Studies on the intake of complex carbohydrates in the Arab Gulf countries are at most scanty. This is mainly due to the lack of information on the fibre content of several foods consumed, as well as to a general neglect of the role of fibre in health and disease in nutritional surveys. However, since fiber is found only in the carbohydrate portion of the diet, it is widely accepted that the level of fiber in the Arab diet is decreasing. This can be assumed from the evidence for a decrease in the percentage of dietary intake from carbohydrates in most countries in the Arab region. Foods in the region are becoming increasingly processed with the result that grain products tend to be more refined and thus lose their fiber content. A further decrease in fiber intake takes place with a decrease in the consumption of whole grains. Fresh fruit and vegetables are considered rich sources of dietary fiber. The trend in consumption of these foods can be a good indicator for fiber intake in the Arab countries. Food frequency studies of fruit and vegetables intake in the Arab Gulf states indicate low intake (Musaiger, 1992, Musaiger and Radwan, 1995, Musaiger and Al-Roomi, 1996). Between 59% and 23% of adults did not consume fresh fruit daily, and between 50% and 19% did not consume vegetables daily Table 1.

According to Pender (Pender, 1994) using the four groups guide, an adult should consume at least two to four servings of fruit and a similar number of servings of vegetables per day. Thus a high proportion of adults in the Gulf community do not consume the amount of fruit and vegetables currently regarded desirable. The relationship between the intake of high-fiber foods, such as fruit and vegetables, and the occurrence of chronic non-communicable diseases is well documented (WHO, 1989). A recent study in Bahrain showed the patients with myocardial infarction tended to consume fruit and vegetables less frequently per week than community control subjects (Al-Roomi, 1994).The intake of fiber-rich foods by children and adolescents in most Arab Gulf countries is alarmingly low. The dietary habits of school children and adolescents in the region are characterized by low intake of fresh fruits, vegetables and milk and a high intake of carbonated beverages and foods. In general the food habits of the Arab Gulf adolescent, particularly in urban areas,

have become similar to that reported for Western communities in relation to snacking patterns and consumption of fast foods (Musaiger, 1994, Musaiger, 1995, WHO, 1994). These changes in food habits may in part explain the increase in diet-related chronic disease in the Gulf region.

Table 1. Frequency of intake of fresh vegetables and fruit in some GCC countries

Country	Age (years)	Sex	Sample size	Food	Daily	% Frequency intake[1] per week		
						4-6/w	1-3/w	Rarely or none
Bahrain	30-79	M	299	Veg[1]	78.9	2.3	10.4	8.4
Musaiger &				Fruit	63.5	4.7	19.1	12.7
Al-Roomi	30-79	F	217	Veg	81.1	3.7	9.7	5.5
(1996)				Fruit	65.4	6.5	12.4	15.7
Oman	15-50	F	900	Green Veg	50.3	3.1	31.3	15.4
Musaiger (1992)				Yellow Veg	33.2	3.9	11.1	51.8
				Citrus Fruit	76.5	2.0	2.6	18.0
UAE	18-30	F	215	Veg	59.1	20.0	7.9	13.0
Musaiger & Radwan (1995)				Fruit	40.9	32.1	9.3	17.7
Musaiger &	20-80	M	1090	Veg	59.6	22.8	15.4	2.2
Abuirmeileh				Fruit	46.2	24.6	25.7	4.7
(1998)	20-80	F	1122	Veg	64.7	17.2	15.3	2.8
				Fruit	52.5	21.4	22.0	4.1

[1] *Veg=Vegetables*

Changes in Lifestyle Patterns

In addition to the change in food consumption patterns, the other changes in lifestyle are an increase in smoking, decrease in practising exercise and sedentary lifestyle patterns. Smoking has repeatedly been found to be one of the risk factors for several chronic diseases. A secular trend of increasing cigarette smoking among both males and females in the GCC countries was

reported. In Bahrain, Hamadeh et al (1992) showed that 33% of men and 9% of women aged 15-80 years were smokers. In Kuwait, the prevalence of smoking was higher as 52% of men and 12% of women aged 20 years and above were smokers (WHO, 1996). Interestingly, smoking among physicians is higher in the region compared to the western region. Bener et al (1993) found that although 91% of physicians in the United Arab Emirates agreed that smoking is hazardous to health, 36% of them were current smokers and 31% were former smokers. The prevalence of smoking among university students in the Gulf is also high. Hamadeh (1994) reported that 27.5% of Gulf male medical students aged 18-31 years were smokers, compared to 2% of female students in the same age group.

Passive smoking, especially among women, seems to be a problem of concern in the Gulf region. Studies showed that women and other family members were regularly exposed to a smoking environment at home and at work. In the United Arab Emirates, 37% of married women were exposed to smoking, mostly from their husbands (Musaiger, 1998). In Qatar, about 38% of mothers reported that their husbands were current smokers (Musaiger et al, 1994). In Bahrain, 20% of men and 45% of women aged 30-49 years had one or more smokers in their families (Musaiger and Al-Roomi, 1996).

Studies on practising exercise in the Gulf region are very limited and mostly focused on exercise as a risk factor for heart disease, rather than studying the exercise habits in the community. In Bahrain, Musaiger and Al-Roomi (Musaiger and Al-Roomi, 1996) found that as age increased the practise of exercise among men decreased. The prevalence of exercise among men decreased from 20% to 7.5% at age 30-49 years and 50-79 years, respectively. The corresponding proportions for women at the same age were 10% and 6%, respectively. Additionally, television occupied most of leisure time of the people in the Gulf, especially adolescent girls and women. About 41% of mothers in Oman watched television for more than 4 hours a day (Musaiger, 1992). In Bahrain the majority of men (77%) and women (80%) reported watching television daily (Musaiger and Al-Roomi, 1996). This is consistent with a sedentary lifestyle pattern which may have a role in the aetiology of some chronic diseases.

Studies on risk factors associated with diet related chronic diseases in Bahrain are at most scanty. Al-Roomi et al (1994) carried out a population-based case-control study to explore the importance of lifestyle in the occurrence of acute myocardial infarction (AMI) among Bahrainis aged 30-79 years. The findings showed that the prevalence of tobacco smoking among the first- time AMI cases (64%) was higher than that among controls (44%), with current cigarette smokers being 2.1 times more likely to have an episode of myocardial infarction than those who had never smoked regularly. Walking regularly and

spending less time watching television at home also appeared to be associated with a reduced risk of developing AMI.

Because the AMI cases and community controls had different sex and age distributions, multiple logistic regression was used to estimate the risks of the occurrence of AMI in relation to hypertension, diabetes, lifestyle and dietary habits. The adjusted OR (adjusted for age, sex and several other confounding variables) for occurrence of an episode of first-time AMI in a subject with a history of hypertension was 5.04, and those with a history of diabetes 3.28. The risk of developing AMI, in line with many studies from western communities, was higher among men than women in those not currently married, and increased with older age. Although 22% of first-time AMI cases were obese subjects (BMI > 30), this proportion was lower than that among the community controls (33% were obese). Using weight as a single measurement, the mean weight of cases was slightly lower than that of controls (66.5 kg + 16.1, and 68.4 kg + 14.9, respectively) (Al-Roomi et al , 1994).

The same study showed people who did not walk regularly for exercise, who reported infrequent intake of fresh fruit and who infrequently consumed fresh vegetables were still at an increased risk of developing myocardial infarction, even after adjusting for the effects of all the other factors. Similar findings were obtained when the logistics regression analysis was repeated excluding those aged 60-79 years (30 cases and 130 controls).

Change in Disease Trends

The change in food habits, life expectancy and lifestyle in the GCC countries has led to a greater change in morbidity and mortality patterns. Infectious diseases have gradually disappeared and chronic non-communicable diseases are becoming apparent. Diseases of the circulatory system such as ischaemic heart disease, acute myocardial infarction, cerebrovascular disease and artherosclerosis are now the major cause of death in the Gulf, representing 25% to 37% of total annual deaths (Table 2).

Table 2. Deaths due to disease of circulatory system, neoplasms and accidents and injuries in the GCC countries

		% of total death		
Country	**Year**	**Circulatory system disease**	**Neoplasms**	**Accidents & Injuries**
Bahrain	1993	28.6	12.3	8.2
Kuwait	1994	36.7	12.4	10.6
Oman	1992	24.3	11.3	6.3
Qatar	1994	34.0	12.0	19.0
UAE	1992	25.0	8.0	---

Source: Musaiger and Miladi, 1997.

Hypertension has long been recognized as a risk factor for cardiovascular disease (CVD). Using the WHO blood pressure criteria of 165/95 mmHg, the prevalence rates have been reported to range from 10% to over 17% of the adult population. Obesity, which is considered a risk factor for several chronic illnesses, has reached an alarming level in many countries in the region, especially among women. Using the criterion of BMI (Body mass index: weight in kg divided by height^2 in m^2) of 25, the prevalence of overweight and obesity among women ranged from 50% to 70%, while the prevalence among men ranged from 15% to 54%. Non-insulin-dependent diabetes is a serious health problem in the region. The prevalence of this type of diabetes is about 5% in population samples in Saudi Arabia, Iraq and Egypt. In the age range 30-63 years, 10% of Tunisians and 14% of Omanis have been estimated to have diabetes. The survey from Oman which used the WHO diagnostic criteria revealed the highest prevalence in the Arab region; 9.8% of the population sample aged over 19 years. Cancer has become the third cause of death in these countries, behind the cardiovascular diseases and injuries and accidents. The percentage of deaths due to cancer ranged from 6% to 19%. The main sites for cancer are lung, gastrointestinal, breast, liver and prostate (WHO, 1989; Alwan, 1993; Musaiger, 1996; Musaiger and Miladi, 1996;).

Constraints on the control of diet-related chronic diseases in the Gulf (Musaiger, 1996).

Prevention and control of diet-related chronic diseases have received little attention in all Gulf countries. This can be attributed to the following factors:

1. Most health services focus on curative procedures for chronic diseases rather than preventive measures. The most sophisticated technology to treat these diseases, especially heart diseases, is employed and this places a heavy load on the budget of health services, affecting expenditure on preventive health.

2. Lack of epidemiological studies related to factors associated with chronic diseases. Although some of the risk factors are well established, it is believed that the magnitude of these factors may not be the same as those reported in Western countries. In addition there are some socio-cultural factors and behavioural changes which may differ from Western countries and play an important role in the prevalence of some chronic disease.

3. Inadequate health information systems. Although the reporting systems in health sectors in the Gulf have improved, the health information system is still ineffective for monitoring the health status of the community. This is mainly due to the lack of specialized staff rather than the lack of information technology.

4. Inadequate health and nutrition education. In general, health education programmes in the Gulf are far from being effective. This is mainly due to lack of specialized personnel in the mass media and incorrect selection of appropriate educational channels and target groups. Nutrition and health education in the region often pays little attention to preventing and managing diet-related chronic diseases. Even when this is done, it is usually based on foreign sources without taking into consideration the local circumstances.

5. Insufficient information on prevention and management of chronic diseases, especially in health and medical curricula. Nutrition is given a low priority in medical and paramedical education in all the Gulf countries. There is no central programme for prevention and control of local nutritional problems. In some health colleges, nutritional is either only taught in mother and child health curricula, or given at a rather elementary level.

6. Unclear food subsidy policies. In the 1970s the Gulf countries established food policies to keep the staple foods within the purchasing power of the majority of the population. The main foods subsidized are rice, wheat, sugar, oils, fats and meat. This policy may encourage an increase in the intake of foods rich in energy and animal fat. It is recommended that the governments in the Gulf should change their policies so as to promote the consumption of foods that provide protection for chronic diseases, such as vegetables, fruit and fish. These foods have become more expensive and are out of the reach of many low socio-economic families.

7. Absence of a Food and Nutrition policy. There is no food and nutrition policy in any of the Gulf countries. These countries carry out projects and programmes of various types in the fields of agriculture, health, social policy and education that are directly or indirectly related to control of nutritional problems. These programmes are often developed in isolation from other activities.

CONCLUSION

Although reliable data on the pathogenesis of chronic disease in the Gulf are lacking, it is widely thought that the causation of these diseases is not simply the high intake of foods rich in fat and free sugars, but rather results from a mixture of several factors such as sedentary life-style, high income, ignorance and low education, and sociocultural factors, as well as an increase in smoking (WHO, 1989).

A major challenge for the Gulf countries is therefore to adapt to the current health situation by developing new programmes and services related to prevention and control of chronic diseases. At the same time, these countries should maintain essential programmes to control infectious diseases.

REFERENCES

Al-Roomi K, Musaiger, A.O. and Al-Awadhi A (1994). Lifestyle patterns and risk of acute myocardial infarction in a Gulf Arab population. *Int J Epidemiol*; 23:931-9.

Alwan A (1993). Diseases of modern lifestyles; the need for action. *Health Services, J EMRO*; 7:24.

Bener A., Gomes. J. and Anderson, A.D. (1993). Smoking habits among physicians in two Gulf countries. *J Roy Soc Hlth*:113:298-301.

FAO (1990). *A Balanced Diet- A Way to Good Nutrition*. Report No. NERC/90/4 submitted to Twentieth FAO Regional Conference for the Near East. Tunisia, Italy: Rome.

Hamadeh R, McPherson, K and Doll, R. (1992). Prevalence of smoking in Bahrain. *Tobacco Control*; 1:102-6.

Hamadeh, R. (1994). Smoking habits of medical students in Bahrain. *Smoking-related Dis*; 5: 189-95.

Musaiger, A.O. and Abuirmeileh, N. (1998). Food consumption patterns of adult population in United Arab Emirates. *J Royal Soc Hlth* ;118:146-50.

Musaiger, A.O. and Sungpuag, P. (1985). Composition of mixed dishes commonly consumed in the Arabian Gulf States. *Ecol Food Nutr*; 16:153-60.

Musaiger, A.O. and Radwan, H. (1995). Food frequency intake of University female students in the Arab Emirates. In: Musaiger, A.O., Miladi, S., eds. *Food Consumption Patterns and Dietary Habits in the Arab Countries of the Gulf*. FAO Regional office for the Near East, Egypt, Cairo: 69-77.

Musaiger, A.O. and Al-Roomi, K. (1996). Prevalence of cardiovascular risk factors in Arab adult community. *Nutrition and Health*; 11:149-57.

Musaiger, A.O., Al-Khalaf, F.A., and Shahbeek, N.E. (1994). Risk factors for cardiovascular disease among women attending health centres in Qatar. *Emir J Agri Sci*; 6188-200.

Musaiger, A.O. (1996). Diet-related chronic diseases in the Arab Gulf countries: the need for action. *Ecol Food Nutr*; 32:91- 4.

Musaiger, A.O. (1995). Dietary habits of adolescent girls in Bahrain. In: Musaiger AO (1998). Dietary habits and chronic diseases among adult nationals in the United Arab Emirates. Bahrain Centre for Studies and Research.

Musaiger, A.O. and Miladi, S. (1996). *Diet-related Non-communicable Diseases in the Arab Countries of the Gulf*. FAO regional office for the Near East. Egypt: Cairo.

Musaiger, A.O. (1992). Health and nutritional status of Omani families UNICEF/Muscat Office Oman, Muscat, Oman.

Musaiger, A.O. and Miladi, S. (1997). *The State of Food and Nutrition in the Near East*. FAO regional office for the Near East. Egypt, Cairo.

Musaiger, A.O., Miladi, S. (1995). Food consumption patterns and dietary habits in the Arab countries of the Gulf, FAO regional office for the Near East. Egypt: Cairo:31-40.

Musaiger, A.O. (1987). The state of food and nutrition in the Arabian Gulf countries. *Wld Rev Nutr Diet*; 54:105-73.

Musaiger, A.O. (1994). Nutritional Status and dietary habits of adolescent girls in Oman. *Ecol Food Nutr*; 31:227-37.

Pender, F. (1994). Nutrition and dietetics. Edinburgh, UK, Camprion Press Ltd.

WHO. (1989). *Clinical Disorders Arising from Dietary Affluence in Countries of the Eastern Mediterranean*. WHO Regional Office, Alexandria, Egypt.

WHO (1994). Report of Intercountry Consultation on Health of Adolescents. WHO regional office for Eastern Mediterranean. Alexandria, Egypt.

World Health Organization, WHO (1996). Tobacco Alert, World No-Tobacco Day. Geneva, Swizeland.

PREVALENCE OF CARDIOVASCULAR DISEASE RISK FACTORS AMONG BAHRAINI ADULTS*
(A Preliminary Study)

Abdulrahman O. Musaiger[1], Khaldoon A. Al-Roomi[2]

[1] *Environmental and Biological Programme, Bahrain Center for Studies and Research,* [2] *College of Medicine and Medical Sciences, Arabian Gulf University, Bahrain*

INTRODUCTION

The rapid socio-economic, demographic and behavioural changes in Bahrain over the last three decades have had a marked influence on health patterns in the community. While the incidence of infectious diseases has decreased remarkably, the incidence of non-communicable diseases has increased and has become the main public health problem in the country. Circulatory system diseases are the leading cause of morbidity and mortality in Bahrain (MOH, 1992).

There is no specific programme to prevent and control cardiovascular diseases (CVD) in Bahrain. This is mainly due to the lack of information about risk factors affecting CVD in the country. Sharp contrasts among countries or among social groups within a country are often evident in the special or environmental conditions known to place population at risk for CVD (WHO, 1990). Investigation of such differences among populations or groups can provide important information for determination of risk factors in childhood and the adult population. Studies on risk factors for CVD are urgently needed to increase understanding of the known differences among various populations.

The aim of this preliminary study was to determine the prevalence of some of the risk factors known to be related to CVD in Bahrain. Such information would be valuable as baseline data for any further community-based study on CVD risk factors.

MATERIALS AND METHODS

The subjects studied were Bahraini residents aged 30-77 years. A simplified general method for cluster-sample survey of health was used to select these subjects (Benneett et al., 1991). Bahrain was divided into 100 blocks distributed in 10 geographical areas, and 15 blocks were selected for obtaining the subjects. Households were selected randomly from blocks taking

***Reprinted from Emirates Journel of Agricultural Sciences. vol 6, 1994.**

into consideration the proportional distribution of the population in the geographical areas. Selected households were those which housed persons aged 30-79 years old. Only one person, either male or female, was selected from each household. The population studied was 185, of whom 94 were men and 91 women.

Subjects were interviewed at home by two trained female assistant researchers, using a pretested questionnaire, which included information on socioeconomic background, lifestyle, smoking, history of diabetes and hypertension, food habits and anthropometric measurements.

Anthropometric measurements include weight and height. Weight was measured without shoes and with minimal clothing to the nearest 0.2 kg using portable digital scales with a 130 kg capacity. Height was measured without shoes to the nearest 0.1 cm using a portable stadiameter. Body mass index [weight (kg)/height(m)^2] was employed as a measure of obesity.

Data were first stored in Dbase files and analyzed using the EPI-INFO programme (CDC/WHO, 1990). Odds ratios for association, Chi-square and confidence intervals for the odd ratios were calculated using the same programme.

RESULTS

Socio-economic status

The mean age of subjects studied was 46.7 ± 13.7 years. The distribution of subjects by age and sex showed a higher prevalence of men aged 60 years and over compared to women (28.7% and 16.5% respectively). There were significant differences for age and sex in the sample studied ($p<0.01$); Table I.

The prevalence of illiteracy was high in subjects studied (40%); furthermore, 19% could only just read and write, making the overall low educational level (illiterate and those who only just read and write) about half of the sample. Illiteracy was higher among women than men. In contrast, higher education (secondary and above) was more observed among men. Winkleby et al, (1992) found that the relationship between socio-economic status measures and risk factors for CVD was strongest and most consistent for education, showing a higher risk associated with lower levels of education.

Table 1. Socio-demographic characteristics of sample studied

Factors	Male		Female		Total	
	No.	%	No.	%	No.	%
Age (year)						
30 – 39	35	37.2	33	36.3	68	36.8
40 – 49	15	16.0	26	28.6	41	22.2
50 – 59	17	18.1	17	18.7	34	18.4
≥60	27	28.7	15	16.5	42	22.7
Education						
Illiterate	30	31.9	45	49.5	75	40.5
Read & Write	10	10.6	10	11.0	20	10.3
Primary	15	16.0	14	15.4	29	15.7
Intermediate	6	6.4	5	5.5	11	5.9
Secondary	22	23.4	11	12.1	33	17.8
University	11	11.7	6	6.6	17	9.2
Employment						
Unemployed	22	23.4	24	26.4	46	24.8
Housewife	-	-	61	67.0	61	33.0
Employed	72	76.6	6	6.6	78	42.2
Marital Status						
Currently married	83	88.3	80	87.9	63	88.1
Not married	11	11.7	11	12.1	22	11.9
Total	94	100.0	91	100.0	185	100.0

As shown in many community studies in Bahrain, most women were not externally employed (93.4%), whereas employment status was 77% among men. The relatively high percentage of unemployment among men is due to the fact that 29% of men had passed the retirement age (60 years and over). The patterns of marital status of subjects were very similar among both sexes, and the Chi-square value showed no significant association between these two variables (sex and marital status).

Lifestyle

Four variables were measured to exhibit the lifestyle of subjects studied; walking, sedentary time spent at work, daily hours of watching television and smoking habits (Table 2). A significant association has been reported between

men and women in relation to daily practising of walking ($p<0.03$). Of men, 67% practised walking compared to 51.6% of women. The relatively high percentage of subjects who practise walking may be due to the increase of health awareness among the public regarding the role of exercise in reducing the risk of several chronic illnesses. In recent years, the mass media in Bahrain has intensively focused on the preventive measures to reduce the risk of heart diseases, and exercise has always been given as an easy and inexpensive measure to overcome these diseases.

Time spent sedentary at work and daily hours of watching television can provide a good picture about the sedentary lifestyle of the population. As expected, men were less likely to spend their time at work being sedentary than women (36% and 93%, respectively). This is obviously due to the low percentage of external employment among women. The recent population census in Bahrain (1992) showed that 93% of households has at least one television set. It has been showed that television occupied most of leisure time of the Bahraini population, especially females. Our result indicated that only 15.7% of subjects did not watch television, while the rest watched television between one to six hours daily. Women were more likely to watch television daily than men (27.5% of women and 17% of men watch television for more than four hours a day). Television viewing has been identified as a risk factor for childhood and adolescent obesity because spending a long time in watching television reduce physical activity, as well as encouraging the audience to eat snacks during watching (Gortmaker et al., 1990).

Obesity

Although the precise role of obesity in the aetiology of CVD remains controversial (Sharpnel et al., 1992), obesity was found to be highly correlated wih other risk factors for CVD, such as diabetes and hypertension (NDC, 1991). The prevalence of obesity in our subjects was alarming, as 33.7% were overweight (BMI 25-29.9) and 38.6% were obese (BMI>30). Obesity occurred more among women than men. About 10% of women had severe obesity (BMI>40) and the association between obesity and sex was highly statistically significant ($p<0.0001$) (Table 3).

History of diabetes and hypertension

Diabetes and hypertension have repeatedly been shown to predict the development of CVD in adults. Our findings showed that the prevalence of diabetes was almost 3 times greater among women than among men (14.3% and 5.3%, respectively). The association between sex and diabetes was statistically significant ($p<0.04$) (Table 4). Taking age into consideration, the prevalence of diabetes increased steeply with age and the trend was similar in both men and women. At age 30-39 none of the subjects reported a history of

diabetes, but at age 40-49 years, the prevalence of diabetes was 6.7% and 15.8% among men and women respectively. At age 50-59 years, the prevalence of diabetes in men decreased slightly to 5.9%, while that for women continued to increase to 29.4%. At age 60 years and over, the prevalence of diabetes in men increased (11.1%), but slightly decreased in women (26.7%).

Table 2. Distribution of Bahraini subjects by walking, time spent sedentary at work, hours of watching television and smoking

	Male		Female		Total	
	No.	%	No.	%	No.	%
Practising walking						
Yes	63	67.0	47	51.6	110	59.6
No	31	33.0	44	48.4	75	40.5
Time spent sedentary at work						
All the time	34	36.2	85	93.4	119	64.3
More than half the time	4	4.3	-	0.0	4	2.2
Half the time	11	11.7	-	0.0	11	5.9
Less than half the time	13	13.8	3	3.3	16	8.6
Rarely	32	34.0	3	3.3	35	18.9
Daily hours of watching TV						
None	15	16.0	14	15.4	29	15.7
<2 hours	35	37.2	27	29.6	62	33.5
2-3 hours	28	29.8	25	27.5	53	28.6
≥ 4 hours	16	17.0	25	27.5	41	22.2
Smoking						
Current smoker	37	39.4	21	23.1	58	31.4
Non-smoker	57	60.6	70	76.9	127	68.6

P<0.02 (OR=2.2, 1.08 – 4.35)

Table 3. Prevalence of obesity among Bahraini subjects by sex

Grade of obesity	Male		Female		Total	
	No.	%	No.	%	No.	%
Underweight (BMI<20)	7	7.5	4	4.4	11	6.0
Normal (BMI 20-24.9)	32	34.4	8	8.8	40	21.7
Overweight (BMI 25-29.9)	28	30.1	34	37.4	62	33.7
Obese (BMI 30-39.9)	25	26.9	34	37.4	59	32.1
Severe obesity (BMI 40+)	1	1.1	11	12.1	12	6.5
Total	93	100.0	91	100.0	184	100.0

Table 4. Distribution of Bahraini subjects by history of diabetes and hypertension

	Male		Female		Total	
	No.	%	No.	%	No.	%
History of diabetes						
Yes	5	5.3	13	14.3	18	9.7
No	89	94.7	78	84.7	167	90.3
	P<0.04 (OR=0.34, 0.10 – 1.08)					
History of diabetes						
Yes	13	13.8	15	16.5	28	15.1
No	81	86.2	76	83.5	157	94.9
	P<0.06 (OR=0.81, 0.34 – 1.95)					

Frequency intake of fruit and vegetables

A high intake of fruit and vegetables is thought to reduce the risk of CVD through several mechanisms, including lowering serum cholesterol and blood pressure levels (Sharpnel et al., 1992). The weekly intake of fresh fruit and vegetables by subjects studied is given in Table 5. The daily intake of these foods was higher in women than in men. A significant association between intake of vegetables and sex was found (p<0.02).

Table 5. Distribution of Bahraini subjects by frequency of intake of fresh fruit and vegetables

	Male		Female		Total	
	No.	%	No.	%	No.	%
Frequency of intake of fruit*						
None	16	17.0	6	6.6	22	11.9
Daily	51	54.3	61	67.0	112	60.5
4-6 per week	22	23.4	20	22.0	42	22.0
1-3 per week	5	5.3	4	4.4	9	4.9
Frequency of intake of vegetables **						
None	10	10.6	2	2.2	12	6.5
Daily	55	58.5	71	78.0	126	68.1
4-6 per week	24	25.5	16	17.6	40	21.6
1-3 per week	5	5.4	2	2.2	7	3.8

*Not significant
**P<0.02

DISCUSSION

Many factors that are known to contribute to the risk of developing CVD in western populations are prevalent among the Bahraini adult population; however, the prevalence estimates for most risk factors were not similar for men and women. The importance of age and sex as cardiovascular risk factors should not be underestimated, even though they cannot be modified. Several studies showed that the incidence of CVD increases significantly with age, and men have higher rates than women (Isles and Hole, 1992). These findings have been confirmed in Bahrain by recent statistics of the Ministry of Health. The death ratio of CVD is 3 to 1 for men and women respectively, and the death rate increased remarkably with age (MOH, 1992). The longer life expectancy of the Bahraini population has increased the risk of developing certain chronic illnesses such as CVD, diabetes and hypertension.

Physical activity and exercise have profound effects on the cardiovascular system, most of which are beneficial. Our findings revealed that more than half of subjects studied practised walking, and the rate was significantly higher among men and women. Nevertheless, we did not ask about the frequency of walking per day, and the duration of daily walking in general and walking for exercise purposes. We suggest that in further studies, the question of walking as well as for exercise should be more elaborated in order to get precise data about exercise habits in the community. However, we strongly believe that the

phenomenon of exercise, especially walking, has increased among the adult population in Bahrain due to the increase in awareness and availability of places for practising such activity.

As in many other Arabian Gulf countries, the type of work of Bahraini inhabitants is mostly sedentary. Moderate and heavy work which need more muscular efforts are mostly practised by expatriate workers (Musaiger, 1987). The availability of cars, housemaids, and electronic household appliances, in addition to long exposure to television, all played an important role in diminishing the physical activity of Bahraini adults. This study showed that most of the population studied spent their time sedentary at work and watched television for at least two hours a day. This lifestyle will increase the risk of CVD, especially for those who have additional risk factors such as diabetes and hypertension.

The sedentary lifestyle and intake of high density foods may be the main causes of obesity in this part of the world. However, despite the fact that there is a well-established association between obesity and an increased cardiovascular risk profile, epidemiological studies relating obesity and CVD yield inconsistent results (Sharpnel et al., 1992). Obesity is however, highly associated with two major risk factors for CVD; diabetes and hypertension (NDC, 1991). Our data showed a high association between obesity on one side and diabetes and hypertension on the other side (not shown in tables).

Hypertension and diabetes are amongst the most common public health problems managed by physicians in Bahrain. It is well documented that hypertension and diabetes continue to be major risk factors for CVD. The prevalence of these two diseases in our subjects was relatively high creating an urgent need for prevention strategies to control them. Diabetics develop long term complications such as CVD in this region at a rate similar to that reported in developed countries (Alwan, 1993).

In most countries where the incidence of CVD is high, cigarette smoking appears to be the most important risk factor for CVD. Recent evidence suggests that passive smokers may also be at risk (Isles and Hole, 1992). Hamadeh and McPherson (1993) found that smoking is one of the main factors that contribute to acute myocardial infarction (AMI) in Bahrain. The risk for AMI is doubled for smokers when compared to non-smokers.

It can be concluded that most risk factors that are known to be associated with CVD are highly prevalent among the adult population in Bahrain. An epidemiological community-based survey is highly recommended to confirm the findings of this pilot study, as well as to provide baseline data for any intervention programme to prevent and control CVD diseases in the country.

REFERENCES

Alwan, A.A.S. (1993). Diseases of modern lifestyle: the need for action. *Hlth. Serv. J. EMRO/WHO* 7:24-23.

Benneette, S.T. Woods, W.M. Liyanage and Smith D.L. (1991). A simplified general method for cluster–sample surveys of health in developing countries. *Wld. Hlth. Statist, Quart*,44: 98-105.

CDC/WHO. (1990). Epi-Info Programme. World Health Organization, Geneva.

Gortmaker, S.L., W.H. Dietz and L.W.Y. Cheung. (1990). Inactivity, diet and the fattening of America. *J. Am. Diet, Ass*. 90, 1247-1525.

Hamadeh R.R. and K. McPherson. (1993). Smoking and acute infarction in Bahrain. A case control study. *J. Smoking – Related Dis*. 4: 109-116.

Hamadeh R.R., K. McPherson and R.C. Doll. (1992). Prevalence of smoking in Bahrain. *Tobacco Control*, 1: 102-106.

Isles C.G. and D.J. Hole. (1992). Changing trend in vascular disease: Coronary risk factors today. In Lorimer, A.R. and J. Schepherd (editors). *Preventive Cardiology*. Oxford, U.K. 1-29.

Ministry of Health (1992). *Annual Report*, 1990. Bahrain.

Musaiger, A.O. (1987). The state of food and nutrition in the Arabian Gulf countries. *Wld. Rev. Nutr. Diet*. 54: 105-173.

Musaiger, A.O. (1990). Nutritional disorders associated with affluence in Bahrain. Family Practice, 7: 9-13.

National Dairy Council (NDC) (1991). *Coronary Heart Disease* – I. London, U.K.

Sharpnel W.S., G.D. Clavert, P.J. Nestel and A.S. Truswell. (1992). Diet and coronary heart disease. *Med. J. Australia*, 156 (supplement).

WHO. (1990). *Diet, Nutrition and the Prevention of Chronic Diseases*. Technical Report Series 797, Geneva.

Winkleby M.A., D.E. Jatulis, E. Frank and S.P. Fortmann. (1992). Socio-economic status and health: how education, income, and occupation contribute to risk factors for cardiovascular disease. *Am. J. Public Health*, 82, 816-820.

DIET-RELATED CHRONIC DISEASES IN KUWAIT: A REVIEW

Abdulwahab N. Al-Isa
Department of Community Medicine, Faculty of Medicine, University of Kuwait

INTRODUCTION

Kuwait is one of six Gulf Cooperative Council (GCC) countries. It is a country that suffers from affluence and diet-related chronic diseases such as obesity, diabetes, hypertension, heart disease, and cancer. Most Kuwaitis lead a sedentary lifestyle and overeat. These two factors contribute to the high prevalence of most of the aforementioned chronic diseases. Obesity increases at a rate of 0.5-1.7% annually, depending on age group. In adults, obesity has been reported to be 67.5 and 72.9% among males and females, respectively. Hypertension was found to be 10% among Kuwaiti males and 11.1% among females. The overall prevalence of non-insulin-dependent diabetes mellitus (NIDDM) was found to be 14.7% and 14.8% in men and women, respectively. Age specific incidence rate (per 100,000) of acute myocardial infarction was reported to be 14.0 for males and 3.9 for females. The crude rate (per 10,000) of cancer was reported to be 49.4 for males and 55.4 for females. It is unfortunate that current programs to prevent and control diet-related chronic diseases are not known to exist in Kuwait. In fact studies on lifestyle and eating habits of Kuwaitis have so far not been undertaken. It may be that they are more difficult to do than studies on the simple prevalence of certain syndromes or diseases. They are also difficult to standardize, with answers mostly of a subjective nature. Studies that describe the lifestyle, eating habits, food preferences and physical activities of Kuwaitis should be undertaken, using methods available in the literature. The results of these studies should form the bases for preventive programs aimed at modifying lifestyles, eating habits and preferences and increasing the level of physical activity among various sectors of the population to reduce the risk of future confrontations with morbidity and mortality from a variety of chronic diseases.

Obesity

Obesity has been shown to be associated with higher rates of mortality (Lew et al, 1979; Waaler, 1984; Fitzgerald et al, 1992) and morbidity (Chiang et al, 1969; Hubert et al, 1983; Kannel et al, 1991; Carrison et al, 1980; Noppa et al, 1978). Obesity in Kuwait (BMI >25kg/m2) is high; it is 67.5% and 72.9% among ≥18 years of age males and females, respectively. It is highest among

the 40-49 year age group. Pathological or grade 3 obesity (BMI>40 kg/m2) is twenty times higher in women than in men (Al-Isa, 1995).

Obesity is higher in Kuwait than in any other country in which similar studies were conducted. High standards of living since the forties (Shehab, 1964), sedentary lifestyle, overeating (Al-Isa, 1997; Al-Isa, 1997, Al-Isa, 1989), and modernization (Bindon et al, 1985; Kamel and Martinez, 1984B) have all been implicated as contributing factors to the development of the syndromes. Although no studies are available to document the prevalence of obesity in Kuwait earlier than the eighties, Kuwaitis of the lean pre-oil and sea-faring era were known for their leanness and physical activity. Since the eighties, there has been an annual increase of 1.7% in the prevalence of obesity among adult Kuwaitis. Children are no exception. Obesity among children aged 0-5 years increased by 38% in the last decade; it increased 46% among boys and 31% among girls (Al-Isa and Moussa, 1998). Obesity among children aged 6-12 years, also increased in the last decade by about 21.5%; it increased by 22% among boys and 21% among girls (Al-Isa, unpublished manuscript). The prevalence of obesity among 10 to 13 year old children is 17%; it is 16.6% among boys and 23% among girls (Moussa, et al, 1999). The average prevalence of obesity among Kuwaiti College students is 29.5%; it is 27% in men and 32% in women. This is the only age group of adults when obesity among men is greater than among women (Al-Isa, 1998).

Barring the availability of any scientific data confirming the assumed changes in eating behavior, caloric intake and physical inactivity in Kuwait or at least from other countries in the region, high levels of obesity among Kuwaitis may be attributed to a sedentary lifestyle coupled with energy intake exceeding expenditure, resulting in the conversion of excess energy into fat. Modernization and affluence may have led Kuwaitis to abandon their traditional habits of frugal food consumption and increased physical activity.

Kuwaitis of today often celebrate social and religious occasions with ample amounts of food served. Although Arabs are known for their hospitality, this quality has become more exaggerated in recent years. Men who attend their social club, the already existing unique (to Kuwait) institution of diwaniyah in which they gather, are often served by ample amounts of food, buffet-style. In the pre-oil era, often only dates and coffee were served. The women also gather at homes during their mid-morning tea when a great deal of food is served. The women may rotate in hosting the occasion.

Since obesity among Kuwaitis has been shown to be on the increase, the trend may produce future health problems, especially those related to diabetes, hypertension, heart disease, and cancer. To reduce the ill effects of such a trend, changes in lifestyle among Kuwaitis are warranted, perhaps indirectly,

through the institution of changes in the community rather than changes in individuals. One way of doing this may be through the creation of physical activity centers that are easily accessible and weather-controlled, the weather being hot most of the year. Another way may be through changing nutritional habits by using the mass media to portray unhealthy eating habits as deviant behavior and healthy ones as desirable. Other means of intervention should be directed at the provision of low-caloric food, and influencing personal choices as they relate to nutritional habits, body image and physical activity. Children in school should be afforded more time for physical activity sessions, nutrition education and nutritious meals. They should also be taught the negative aspects of excess body fat.

Non-insulin-dependent diabetes Mellitus (NIDDM)

Since the late 1940s, and after the first shipment of oil in 1946, Kuwait has been undergoing drastic socioeconomic, lifestyle, dietary and physical changes. In the lean pre-oil era, Kuwaitis ate frugally and were physically active. Today, there is a high consumption of abundantly available food, and the once physically active Kuwaitis have become sedentary. This has led to increased levels of obesity and other associated chronic diseases, chief among which is non-insulin-dependent diabetes mellitus (NIDDM) which has been reported to have a highly significant ($p<0.001$) association with obesity. Those with BMI >30 kg/m^2 have a 4:1 chance of getting NIDDM. In fact, 44.3% of diabetic men and 57.7% of diabetic women were obese (and 15% of both genders were hypertensive). The overall prevalence of NIDDM was found to be 14.8% (14.7% in men and 14.8 in women), being highest at the age group 40-59 (18.3%). A female preponderance (F:M 1.6:1) was found is some areas of Kuwait among certain age groups. A strong association was found between a family history of the disease and NIDDM, suggesting a genetic predisposition. Familial aggregation of the disease has been attributed to the 37.8% consanguinity in Kuwait. Those with a parental history of NIDDM have a 30% higher chance of harboring this noncommunicable disease than those with no known history of the disease. The majority (87.6%) of the diabetic patients were physically inactive (vs 82.9% of the non-diabetic). NIDDM was also found to be significantly associated with cholesterol; a high cholesterol level increased the risk of NIDDM by 20%. A similar association between NIDDM and triglycerides was found, but an increased level of these lipids increased the risk of NIDDM by 260%. (Abdella, et al, 1995; Abdella et al, 1996; Abdella et al, 1998).

The high ratio of NIDDM in Kuwait confirms the strong association between NIDDM and obesity among Kuwaitis, since most Kuwaitis are obese. Hypertension has a strong association with NIDDM, which suggests a sizable

proportion of NIDDM patients being hypertensive and obsess. Since NIDDM, hypertension and obesity are strongly interrelated, it seems unlikely that a patient who suffers from these conditions would not face the danger of suffering from heart disease. It has been noted that obesity predisposes a person to cancer (Van Itallie, 1979). It seems then that the five conditions discussed here are interrelated either directly or indirectly. For example, obesity has been shown to have an association with some types of cancer, but the latter may not have a direct association with NIDDM or hypertension. Nonetheless, these conditions are highly prevalent in Kuwait and with the limited available published data on the interrelationships between these conditions, it is presently difficult to state categorically which one gave rise to which. The incidence or the prevalence of these conditions present a challenging public health problem that may require concerted effort on the part of public health officials to control, reduce or eradicate some or all of these conditions. This may require a huge investment in preventive measures and health education, starting from looking at the roots of the problem and working upward toward devising means of dealing with it. The upward trend of NIDDM, for example, may be related to changes in dietary, lifestyle, and physical activity habits of Kuwaitis. These changes were drastic when Kuwaitis moved in time from the lean pre-oil, sea-faring days of the forties and earlier, to the post-oil days of abundance. The latter period has witnessed increased consumption of high-caloric foods and decreased level of physical activity; less than 2% of Kuwaitis practise high form of sport (tennis, jogging), and less than 10% practice light forms of sport (walking) on a weekly basis (Al-Isa, 1998).

Hypertension

Hypertension is defined as a sustained increase in the arterial blood pressure, either diastolic, systolic or both. Hypertension among Kuwaitis, using the diastolic blood pressure as an index, was found to be 10.6%. It was found to be highly prevalent among obese people (Unit of Nutrition, 1980). Dietary factors have been reported to increase the likelihood of such noncommunicable diseases as hypertension, diabetes, and heart disease (Davidson, 1975). The mean systolic blood pressure increased with age by 22% from 18-19 to ≥60 year age group. This increase was found to be 17% in males and 27% in females. At ≤29 years of age, men had higher systolic values than females. Thereafter, females recorded higher systolic pressure than males. The mean diastolic blood pressure also increased with age, reaching its highest values at 40-49 year age group. Hypertension among pregnant Kuwaiti women was associated with diabetes (Omu et al, 1996). Diabetes was associated with higher mean systolic and diastolic blood pressure level (el Mugamer IT et al, 1995).

The association between hypertension and diabetes has been demonstrated (Nielsen, 1998). The strong association of hypertension with obesity, diabetes, and heart disease reflect perhaps higher rates than previously reported in the early eighties. This is because obesity, diabetes, and heart disease are all highly prevalent in Kuwait. It is unfortunate that studies on the prevalence of hypertension in Kuwait could not recently have been carried out and reported in international journals. Studies about chronic diseases in Kuwait often considered hypertension as a secondary factor. For example, a study on diabetes would also look on the level of hypertension in the studied sample. There is currently no known comprehensive study on hypertension in Kuwait.

Cardiovascular disease

In industrialized countries, cardiovascular disease (CVD) is the leading cause of death (WHO, 1993; National Health Statistics, 1983-1994). The CVD incidence has been associated with lifestyle and dietary habits, SES (socioeconomic status) and environmental conditions (WHO, 1994).

Cardiovascular disease was the first cause of death in Kuwait in 1993 (MDH, 1993). However, mortality rates from ischaemic heart disease (IHD) increased by 26% during the eighties but decreased by 17% during the nineties. Carotid-territory infarction represented 46.5% in all strokes, followed by intracerebral hemorrhage in 19.9%, lacunar infarction in 17%, basilar infarction in 8.3%, and subarachnoid hemorrhage in 1.7%. In general, case fatality rate from stroke was 10%. Case fatality in Kuwait was low due to the young average age of the Kuwaiti population (Abdul-Ghaffar, et al, 1997).

The age specific incidence rate (per 100,00) of acute myocardial infarction was reported to be 14.0 for males and 3.9 for females (Al-Owaish, 1983). Acute myocardial infarction (AMI) represented 37% of total IHD (ischaemic heart disease) mortality in 1994 and has been implicated as the main cause of mortality from CVD death in Kuwait. From 1989 to 1993 (except 1990, the year of the Iraqi invasion) CVD was the first cause of death in Kuwait (Al-Owaish et al., 1996). Mortality from AMI among Kuwaitis $\geq$20 years declined by 26 from 59 to 33 per 100,000. In the age group $\geq$35 years, the age-specific mortality rate increased substantially. The overall mortality (and morbidity) rate continues to be high. Although AMI decreased from 40% in 1989 to 37% in 1994, it is considered to be the main cause of mortality from CVD in Kuwait, (Dawood et al, 1993).

It is unfortunate that the system of registry of AMI has not yet been developed in Kuwait (Al-Owaish, et al, 1996). This may provide a basis for health planning and prevention purposes. In addition, such a registry would allow for a centralized database system that is essential for understanding the underlying

causes and other affecting factors in the development of AMI, which in turn may strengthen the country's resolve in reducing AMI morbidity and mortality through the development of prophylactic programs in this area. The development of the registry may provide information regarding the contribution of some other risk factors like obesity, diabetes and hypertension to the development of AMI other than hereditary predisposition (Al-Owaish et al, 1996). To achieve a more efficient system of prevention, several factors are to be recognized as having important input and are to be coordinated in a positive way to reach that goal. Coordination between agencies working for the same purpose is essential. Moreover, uniform standards of data management and an accurate notification system are also essential to estimate incidence and death rates. At present, for example, private hospitals do not provide input in AMI mortality and morbidity. In short, there should be a uniform national system of diagnosing and reporting the incidence of AMI. A national "Kuwait CCU (coronary care unit) Registry" form has been put together (Zubaid and Rashed, 1997) in collaboration with the Cardiology Division of McMaster University in Hamilton, Ontario, Canada. This form would provide a means for adhering to a uniform protocol in the assessment of CVD. It was started in Kuwait at Mubarak Hospital on 2nd August, 1997. Furthermore, this form would allow for future comparison between Middle Eastern and other countries.

Cancer

Neoplasm is the second cause of death in Kuwait (Al-Owaish et al, 1996). The crude rate for cancer is 49.9 for males and 55.4 for females. For males, with a rate of 7.9, bronchial cancer ranks at the top of the crude rates, followed by non-Hodgkin lymphoma (3.3), Hodgkin disease and liver (2.9), bladder (2.8), and stomach and pancreas (1.8). For females, breast cancer ranks at the top of neoplasm rates, followed by thyroid (3.5), cervix uteri and non-Hodgkin's lymphoma (3.1), bronchial cancer (2.9), and the brain/nervous system (2.0). There are 48 classifications of cancer and the incidence is reported annually per 100,000 for both genders. The crude rates, of course, vary with age and the crude rates from all sites are provided periodically by the Ministry of Health's Kuwait Cancer Registry (KCR), which was established in 1971. The registry maintains separate alphabetical and numeric indices, which include such information as case note number, nationality, name, sex, age, year of diagnosis and site. Notification of cancer was made compulsory through a Ministry of Health decree. This made possible a comprehensive registration system which follows international recommendations for reporting data obtained. The crude rates of various age groups are provided for males and females (Anjum & Al-Muhanna, 1997).

Cancer has been known to be associated with dietary life habits as well as with environmental conditions. Food coloring, preservatives, chemical protective

agents for plants, level of freshness in food, amount of fiber and consumption of certain foods over others have all been known to increase the likelihood of infliction with neoplasms. Cancer has been associated with excessive energy intake and obesity (Van Itallie, 1979). Lifestyle is also a factor in the pathogenesis of cancer. Smoking, sedentary lifestyle and depression are some of the daily life habits that increase the chances of exposure to the disease. Environmental conditions like air pollution, working in asbestos-contaminated conditions, working in chemical plants, exposure to radiation and sun rays play a major role in the pathogenesis of the disease. Modifying lifestyles and eating habits, as well as improving environmental conditions, may lessen the danger of infliction with the disease.

CONCLUSION

Obesity, diabetes (NIDDM), hypertension, heart disease and cancer are all interrelated conditions, either directly or indirectly. They are all highly prevalent in Kuwait. It may be difficult to decide which prevailed first, second and last. However, one thing remains certain: obesity has been known to be directly associated with these conditions. Another thing that remains certain is that Kuwaiti society and its Kuwaiti inhabitants have undergone, since the first shipment of oil in 1946, drastic physical, social, dietary, physical activity, and economic changes. Since the chronic conditions dealt with in this study are increasing, there is an urgent need to intervene prophalactically to arrest, or reduce this trend. Interventions should be aimed at changing the lifestyle, modifying eating habits and increasing the physical activity of Kuwaitis. Men usually attend the already existing institution of diwaniyah, the men's social club, in which they gather to discuss social and political issues and exchange favours. A great deal of food is served in most of over 2200 diwaniyahs in Kuwait. Women on their part, gather at home for the social occasion of the mid-morning tea, in which an ample amount of food is served, often buffet-style.

During the sea-faring days, Kuwait men worked mostly as sailors and/or divers (for pearls). Women tended house, often without domestic help or gadgets, and walked to and from markets. Today, most Kuwaitis drive around in luxury cars and rarely exercise. The hot weather most of the year precludes most Kuwaitis from engaging in public sports. Engaging in indoor sports, however, seems to be confining and incongruent with their domestic responsibilities or individual status. Their favourite pastime is often sitting by the sea in chalets, at the seafront surrounding the city, or at restaurants at night overlooking the beaches. Another favourite pastime is shopping for food with their children at the many huge supermarkets, where they often let themselves and their children loose in buying food items which are not nutritionally sound. In the summer, many Kuwaitis travel abroad to cooler climates. They tend to be more physically

active during their travels because of the cooler climate there than at home. However, they tend to increase the frequency and the quantity of their meals.

Kuwaiti adults are at present poor role-models for their children for dietary and physical activity habits. Kuwaiti children shop at supermarkets with their parents for their favourite sweets and candies. One in two children suffers from dental caries (Petersen et al, 1990). Their consumption of fast-food has been drastically on the increase since the liberation. Domestic help, home-delivery services, and satellite-beamed television programmes of numerous stations promote the children to overeat and sit around watching television. Even the occasion of going out with their parents almost always ends up at a fast-food restaurant, where carbonated drinks are offered in unlimited amounts with the meals. Physical activity sessions at schools have also declined. Camping out, a favourite pastime before the invasion, declined after liberation because of land-mines that were left in the desert by the Iraqis.

Research in the area of obesity, diabetes, hypertension, heart disease and cancer is essential to enable interested groups to learn about the causes of these conditions. Interventions aimed at changing lifestyles (FAO/WHO, 1992), modifying eating habits and increasing the level of physical activity, are to be instituted. Environmental restrictions on pollutants are to be implemented. Worrying about improving their fiscal standing may subject Kuwaitis to stress-related conditions such as obesity, diabetes, hypertension, heart disease and cancer. They must eat well, eat less and be more physically active. Kuwaitis in general should be taught to relax and enjoy life more.

REFERENCES

Abdella, N. Khogali, M., Al-Ali, S., Gumaa, K., Bajaj, J. (1996). Known type 2 diabetes mellitus among the Kuwaiti population: A prevalence study. *Acta Diabetol*, 33, 145-49.

Abdella, N.A., Al-Arouj, M., Al-Nakhi, A., Al-Assousi, A., Moussa. M. (1998). Non insulin-dependent diabetes in Kuwait: Prevalence rates and associated risk factors. *Diab. Res. Clin. Pract.*, 42, 187-196.

Abdella, N.A., Khogali, M.M., Salman, A.D., Ghuneimi, S.A., and Bajaj, J.S. (1995). Pattern of non-insulin dependent diabetes mellitus in Kuwait. *Diab Res Clin Prac* 29: 129-136.

Abdul-Ghaffar, N.U., el-Sonbaty, M.R., el-Din, Abdul-baky, M.S., Marafie, A.A., al-Said, A.M. (1997). Stroke in Kuwait a three year prospective study. *Neuroepidemiology*, 16, 40-7.

Al-Isa, A.N. (1989). Obesity among Kuwaiti women: an explorative study. Ph.D. Thesis. Manchester Medical School, Manchester, U.K.

Al-Isa, A.N. (1995). Prevalence of obesity among Kuwaitis: a cross-sectional study. *Int. J. Obes.*, 19, 431-433.

Al-Isa, A.N. (1997a). Changes in body mass index and prevalence of obesity among adult Kuwaiti women attending health clinics. *Ann Saudi Med*, 17, 307-11.

Al-Isa, A.N. (1997b). Temporal changes in body mass index and prevalence of obesity among Kuwaiti men. *Ann Nutr Metab*, 41, 307, 14.

Al-Isa, A.N. (1998). Factors associated with obesity among Kuwaiti college women. *Nutr and Health*, 12, 227-233.

Al-Isa, A.N. and Moussa, M.A.A. (1998). Obesity among Kuwaiti pre-school children aged 0-5 years: prevalence and comparison with the NCHS/CDC reference population. *Nutr. and Health*, 12, 235-246.

Al-Isa, A.N. (1998). Nutritional status of elementary school children aged 6-10 years: Comparison with the NCHS/CDC reference population. Unpublished manuscript.

Al-Owaish. R., Moussa, M.A., Shakil, A., and Sharma, P. (1996). Acute myocardial infarction in Kuwait: Current status and recommendations for prevention. *J Kuwait Med Assoc*, 28, 294-99.

Al-Owaish, R.A. (1983). Descriptive epidemiology of acute myocardial infarction in Kuwait, 1978. *Bull WHO*, 61, 509-516.

Anjum, M., and Al-Muhanna, A.N. (1997). In Cancer incidence in five continents. Volume VII. Edited by Parkin DM, Whelan SL, Ferlay J, Raymond L, and Young J. IARC Scientific Publications No. 143, Lyon. International Agency for Research on Cancer, WHO. International Association of Cancer Registries.

Bindon, J.R. and Baker, P.T. (1985). Modernization, migration and obesity among Samoan adults, *Ann Hum Biol*, 12, 67-76.

Carrison, R.J., Wilson, P.W., Castelli, W.P., Feinleib, M., Kannel, W.B., McNamar, P.M. (1980). Obesity and lipoprotein cholesterol in the Framingham offspring study. *Metabolism*, 29, 1053-60.

Chiang, B.N., Perlman, L.V., Epstein, F.H. (1969). Overweight and hypertension. A review. *Circulation*, 39, 403-21.

Davidson, D.L., Passmore, J.R., Brock, J.F., Truswell, A.S. (1975). Textbook of human nutrition and dietetics, 6th edition. Churchill Livingstone, Edinburgh.

Dawood, J.S., Shah, N.M., Al-Owaish, R.A., and Karadamam, M.W. (1993). Physician's definition and management of hypertension in Kuwait. *J Kuwait Med Assoc*, 25, 58-66.

el Mugamer, I.T., Ali Zayat, A.S., Hossain, M.M., and Pugh, R.N. (1995). Diabetes, obesity and hypertension in urban and rural people of Bedouin origin in the United Arab Emirates. *J Trop Med Hyg*, 98, 407-15.

FAO/WHO (1992). Major issues for nutrition strategies, summary, Rome,Italy.

Fitzgerald, A.P., Jarrett, R.J. (1992). Body weight and coronary heart disease mortality: an analysis in relation to age and smoking. 15 years follow-up data from the Whitehall Study. *Int. J. Obes.*, 16, 119-23.

Hubert, H.B., Feinleib, M., McNamara, O.M., Castelli, W.P. (1983). Obesity as an independent risk factor for cardiovascular disease: a 26-year follow-up of participants in the Framingham Heart Study. *Circulation*, 67, 968-77.

HVSD (1993-1994). *Health and Vital Statistics*, Department of Statistics and Medical Records, Ministry of Health, Kuwait.

Kamel, B.S. and Martinez, O.B. (1984B). Food habits and nutrient intake of Kuwaiti males and females. *Ecology Food Nutr*, 15, 261-272.

Kannel, W.B., Cupples, L.A., Ramaswami, R., Strokes, J., Kreger, B.E., Higgins, M. (1991). Regional obesity and risk of cardiovascular disease. The Framingham Study. *J. Clin. Epidemiol*, 44, 183-90.

Lew, E.A., Garfinkel, L. (1979). Variations in mortality by weight among 750,000 men and women. *J. Chron Dis*, 32, 563-76.

Ministry of Health (1994). Vital and Health Statistics Reports, 1983-1994, Ministry of Health, Kuwait.

Ministry of Health (1993). *Health and Vital Statistics*, Department of Statistics and Medical Records, Ministry of Health, Kuwait.

Moussa, M.A.A., Shaltout, A.A., AL-Sheikh, N., Al-Agha, N. (1999). Prevalence of obesity among 6 to 13 years old Kuwaiti children. *Med Principles and Pract*, (in press).

Nielsen, J.V. (1998). Periphera neuropathy, hypertension, foot ulcers and amputations among Saudi Arabian patients with type 2 diabetes. *Diab Res and Clin Prac*, 41, 63-9.

Noppa, H., Bengstsson, C., Bjortorp, P., Smith, U., and Tibblin, E. (1978). Over-weight in women: Metabolic aspects. The population study of women in Goteberg 1968-1969. *Acta Med. Scand*, 201, 135-41.

Omu, A.E., Al-Othman, S., Al-Qattan, F., Al-Falah, F.Z., and Sharma, P. (1996). A comparative study of obstetric outcome of patients with pregnancy induced hypertension: economic considerations. *Acta Obstet Gynecol Scand.*,75, 443-8.

Peterson, P.E., Skouguard, M., Vigild, M. (1990). A cross-cultural perspective of the dental health behaviour situation among Kuwaiti school children and mothers. *Thanlaegebladet*, 94, 83-86.

Shehab, F. (1964). Kuwait: A super-affluent society. *Foreign Affairs*, 3, 461-474.

Unit of Nutrition (1980). Nutrition status assessment of adults. Preventive Health Section, Department of Public Health Planning, Ministry of Public Health, Kuwait.

Van Itallie, T.B. (1979). Obesity: adverse effects on health and longevity. *Am J Clin Nutr*, 32, 2733-33.

Waaler, H.T. (1984). Height, weight and mortality. The Norwegian experience. *Acta Medica Scand*, 679 (Suppl), 1-56.

WHO (1994). Cardiovascular diseases risk factors: New areas of research. WHO Technical Report Series 841, Geneva.

WHO/EMRO (1993). Health Statistics and trends report. National Health Statistics (1994). Vital and Health Statistics Reports 1983-1994. Ministry of Health, Kuwait.

Zubaid, M. and Rashed, A. (1997). Towards a National Registry of Coronary Artery Disease in Kuwait. *J Kuwait Med Assoc*, 29, 454-457.

RISK FACTORS FOR CARDIOVASCULAR DISEASE AMONG WOMEN ATTENDING HEALTH CENTERS IN QATAR

[1]Abdulrahman.O Musaiger, [2]Fawzia.A. Al-Khalaf, [3]Nora. E. Shahbeek

[1]Biological and Environmental Programme, Bahrain Center for Studies and Research, Bahrain, [2]Hamad Medical Corporation, Doha, Qatar

INTRODUCTION

Qatar, like other Arabian Gulf countries, has faced a drastic change in its socio-economic situation and dietary patterns during the past three decades which have affected the way of living and pattern of diseases. These changes, in addition to the increase in life expectancy, have led to an increase in the incidence of non-communicable diseases – the so called diseases of affluence such as cardiovascular disease, cancer, diabetes mellitus, and accident injuries. Recent statistics showed that diseases of the circulatory system are the major cause of death in Qatar and represented 34% of total deaths. Qataris are more likely to be susceptible to this group of diseases than non-Qatari group (37% and 30%, respectively). Neoplasms are the third major cause of death (12.1%) after injury and poisoning (20%). In general, the non-communicable diseases, including accidents and injuries, constitute more than 70% of total deaths in this country (Preventive Health Department, 1993).

There have been no studies on factors determining the non-communicable diseases in the population of Qatar. The aim of this paper is, therefore, to study some of the known risk factors associated with cardiovascular disease in adult females in Qatar as a first attempt to provide baseline data on factors associated with diseases of affluence in this country.

MATERIALS AND METHODS

The target population was adult females aged 18 years and over who attended the health centers in Doha, the capital, during 1-15 July, 1992. Pregnant women were excluded to avoid disorders due to pregnancy, such as gestational diabetes, hypertension and increase in weight. The total number of target women attending health centers during the study period were 671. However, 48 women refused to participate and 20 women were excluded because of incomplete information, making a drop out of 68 women (10% of total). The total sample population was thus 603 women.

Reprinted from Emirates Journal of Agriculture Scinces, vol 6, 1994.

Women were interviewed by female medical students using a pretested questionnaire. Information obtained included socio-economic background, practising exercise, history of diabetes and hypertension, weight and height measurements. Weight was measured using a Deteco scale having a capacity of 140 kg. The weight was measured to the nearest 0.05 kg with women wearing minimum clothes and no shoes. The height was measured without shoes to the nearest 0.1 cm by using the stadiometer attached to the scale.

Obesity was determined using Body Mass Index (BMI) which is defined as the weight in kilograms divided by height in meters squared. Women with a BMI equal to or more than 25 were considered overweight while those with BMI>30 were considered obese (Bray, 1978).

Data were stored in a Dbase file and analysed using the EPI-INFO programme (WHO/CDC, 1990). Chi-square and odd ratios were used to test the statistical significancy.

RESULTS

The distribution of women by socio-demographic characteristics is given in Table 1. Most women studied were Qatari (66%) while the rest were non-Qatari, mainly from other Arab countries, such as Egypt, Lebanon, Palestine and Sudan. The mean age of women was 31.1 + 10 years and ranged from 18 to 67 years. The majority of women (69.4%) were less than 35 years, while those aged more than 44 years represented 12% of the total.

About half of women (53%) had a high educational level (secondary schools and above). This relatively high percentage of education among the women was mainly due to non-Qatari women who had a higher education level than Qatari women (Central Statistics Organization, 1994). The same explanation can be given for the relatively high proportion of empolyment in the women studied (26%), as in general, employment among national women in the Gulf does not exceed 10% (Musaiger, 1987). The percentage of women who were currently married was 72%.

History of Chronic Illnesses

Three main chronic diseases were investigated in this study, namely diabetes, hypertension and heart diseases. The women were asked whether or not they currently had any of these chronic diseases. The prevalence of diabetes and hypertension among women studied was very similar (12.9% and 12.3%, respectively). These figures compared favourably with that reported in Bahrain among women aged 29 to 79 years (Al-Roomi et al, 1994). The prevalence of

heart disease was 3.8%. Actually, this category includes a group of diseases such as myocardial infarction, angina, and stroke. However, since the women generally could not differentiate among these diseases, they were asked about whether or not they had any diseases related to the heart.

Table 1. Socio-demographic characteristics of women in Qatar

Characteristics	No.	%
Age (years)		
<25	167	27.8
25-34	251	41.6
35-44	115	19.0
>45	70	11.6
Nationality		
Qatari	398	66.0
Non-Qatari	205	34.0
Educational level		
Low	120	19.9
Middle	164	27.2
High	319	52.9
Employment status		
Employed	156	25.9
Housewives	447	74.1
Marital status		
Married	432	71.6
Single	131	21.7
Divorced	22	3.7
Widowed	18	3.0
Total	603	100.0

*Low education = Illiterate + read and write
Middle education = Primary + intermediate
High education = Secondary and above

A high statistically significant association was found between these diseases and the age of women (Table 2). The prevalence of diabetes was 0.6% among those aged less than 25 years and then increased by 10% for every ten years to reach 37% among those aged over 44 years. The situation for hypertension was different as the proportion tripled after age 34 years, and then tripled again in those aged over 44 years to reach 51% among this age group. Surprisingly, 1.2% of women aged less than 25 years reported a history of heart disease. This relatively high prevalence may be due to congenital heart disease.

The relationships between the prevalence of diabetes and heart disease to a family history of these diseases were found to be statistically significant

($p<0.001$ and $p<0.02$, respectively). Of women who had diabetes, 70% had a family history of diabetes, compared to 44% of those who had no diabetes. The percentages for heart diseases were 43% and 23% among those who had heart diseases and those who had not respectively (Table 3).

Table 2. Prevalence of some chronic diseases in women by age group in Qatar

Age (years)	Diabetes %	Hypertension %	Heart diseases %
< 25	0.6	4.7	1.2
25 – 34	10.4	14.9	3.6
35 – 44	21.9	51.4	3.5
> 45	37.1	51.4	11.4
P value	< 0.001	< 0.001	<0.004

Smoking

Smoking has repeatedly been found to be one of the main risk factors for cardiovascular disease (Lakier, 1992). The prevalence of smoking among women in Qatar is very low (3.2%) compared to that reported in other Gulf countries (Hamadeh et al., 1993). However, a high prevalence of smoking was found among husbands (38%) of women who are currently married. Thus a high proportion of women could be defined as passive smokers.

Table 3. The relationship between the prevalence of diabetes and heart disease with family history of these diseases among women in Qatar

History of the Disease	Prevalence of the Disease					
	Yes		No		Total	
	N	%	N	%	N	%
Family history of diabetes						
Yes	55	70.5	233	44.4	288	47.8
No	23	29.5	292	55.6	315	52.2
	P< 0.001, O.R. = 3.0 (95% C.I., 1.73-5.22)					
Family history of heart diseases						
Yes	10	43.5	135	23.3	145	24.0
No	13	56.5	445	76.7	458	76.0
	P< 0.02, O.R. = 2.5 (95% C.I., 1.00 – 6.4)					

Physical Exercise and Obesity

It is believed that a sedentary lifestyle and high intake of food rich in fats are the main factors determining obesity in the Gulf, including Qatar (Musaiger, 1987). Our study showed that more than half of the women (56.5%) did not practise any type of exercise; 27.5% practised exercise, while only 16.5% of the women practised exercise. Most of these were non-Qatari. The common exercises practised were walking and swimming. The low percentage of women who practise exercise could be attributed to several reasons, such as lack of health awareness, lack of places for women to practise exercise, and cultural barriers.

Typically, as reported in all Gulf countries, overweight was highly prevalent among women in Qatar (63.7% had BMI > 25). About one-third of women were overweight and a similar proportion were obese (BMI>30). The association between overweight (based on BMI) and the age of the women was highly statistically significant ($p<0.001$). The prevalence of overweight and obesity among older women (35 years and over) was about 80% (Table 4). This percentage is higher than that reported in women in other countries in the region (WHO/EMRO, 1989).

Table 4. Prevalence of obesity in women in Qatar by age group

Obesity	Age (years)								Total	
	<25		25-34		35-44		>45			
	N	%	N	%	N	%	N	%	N	%
Underweight (BMI< 20)	36	21.6	20	8.0	4	3.5	-	0.0	60	10.0
Normal (BMI 20-24.9)	69	41.3	58	23.2	20	17.5	11	15.7	158	26.3
Overweight (BMI 25-29.9)	40	24.0	86	34.4	32	28.1	23	32.8	181	30.1
Obese (BMI 30+)	22	13.2	86	34.4	58	50.9	36	51.5	202	33.6
Total	167	100.0	250	100.0	114	100.0	70	100.0	601	100.0

* weight and height were not taken for two women.

Heart Disease Risk Appraisal

A simple tool to assist health workers in evaluation of coronary heart disease risk was implemented. This tool is based on nine known risk factors for coronary heart disease, namely smoking, blood pressure, diet, stress, exercise, weight, age, gender and heredity. Detailed information on how these risk

factors were scored is available elsewhere (Delugolecka and King, 1989). The results showed that, using a combination of risk factors, 7% of women had generally average risk, and 1% had moderate risk. However, when risk was associated with age, it was found that the proportion of women who had generally average risk increased slightly with age till age 35-44 years. None of the women had a moderate risk at age less than 25 years, and then the risk increased gradually to reach 4.3% in those aged over 44 years (Table 5).

Table 5. Heart disease risk appraisal for women in Qatar by age (%)

Level of risk	Age (years)			
	<25	25-34	35-44	>45
Well below average risk	55.6	27.2	14.9	8.6
Below average risk	43.8	68.0	73.7	57.1
Generally average risk	0.6	4.4	9.6	30.0
Moderate risk	0.0	0.4	1.8	4.3

DISCUSSION

This is the first study which has investigated risk factors for CVD in the adult population in Qatar. Women generally have a lower incidence rate for CVD than men. However, by age 65, the number of deaths due CVD was becoming higher for women than for men (Eaker et al., 1993). Some studies have shown that an increase in the incidence of atherosclerosis and coronary heart diseases occurs in post menopausal women (Isles and Holes, 1992). Statistics of the Ministry of the Public Health showed that the rate of deaths due to diseases of the circulatory system was 37% among men compared to 28% among women. There is a difference between sex and nationality, as deaths due to these diseases occurred more among Qataris than non-Qatari. The non-Qatari women have a higher incidence rate of these disorders than Qatari women (Preventive Health Department, 1993). These differences in mortality between the Qatari and non-Qatari women may be attributed to differences in lifestyle and dietary habits, in addition to age distribution. Most Qatari women are housewives and depend mainly on housemaids in home management. In addition, they rarely practise physical exercise, compared to non-Qatari women. The foods commonly consumed by Qatari families are high in fat and carbohydrates (Musaiger, 1987). These factors may play an important role in increasing risk of CVD among Qatari women compared to non-Qatari women.

The prevalence rate of diabetes, hypertension and heart diseases among women in Qatar are high compared to their counterparts in some developing countries (WHO/EMRO, 1989; INCLEN, 1992). This prevalence reaches alarming levels

after age 44 years, as almost one-third and about half of women at this age had a history of diabetes and hypertension respectively. Heart diseases occurred in about one-tenth of women at the same age group. This finding is in good agreement with that reported by the Preventive Health Department (1993), as 94% of deaths owed to circulatory system diseases in women occurred at 45 years of age or over. However, it is worth mentioning that our study is of the women who attended health centers, and some of these women may visit the health centers for treatment of chronic diseases. Therefore, the prevalence of diabetes, hypertension and heart diseases in this study do not necessary reflect the prevalence of these diseases in the community.

The role of heredity factors as a cardiovascular disease risk should be taken into consideration. It was found that with a family history of premature death from CVD, there was a much greater risk of cardiovascular deaths (National Dairy Council, 1991). Our study showed that family history of diabetes was highly associated with the prevalence of diabetes among women studied, while the association was only barely statistically significant in relation to heart diseases in general. This may be due to the small number of women who reported occurrence of heart diseases.

The prevalence of obesity among women in Qatar is a source of concern, and more attention should be given to the prevention and control of obesity in both children and adults. Factors determining obesity in Qatar have not been studied. Studies in other Gulf countries (Musaiger and Al-Ansari, 1992; Khashoggi et al., 1994) showed that several social and dietary factors were associated with obesity in women. Musaiger and Al-Ansari (1992) found that age, education, employment, marital status, family size and practicing exercise have a statistically significant association with obesity among women in Bahrain, while ownership of cars, availability of housemaids and meal patterns have no statistically significant association with obesity among women in Bahrain.

Smoking may be one of the most significant risk factors for CVD in countries where the incidence of CVD is high (Isles and Holes, 1992). Although the prevalence of smoking in women in Qatar is very low (3.6%), it seems that a high percentage of these women are exposed to a smoking environment because of smoking by one or more male members of the family. This study revealed that more than one third of married women have husbands who smoke. Recent evidence suggests that passive smokers may also be at risk of health hazards due to smoking, such as CVD (Isles and Holes, 1992).

In conclusion, this study showed that women in Qatar, especially those aged over 44 years, are highly susceptible to some of the known risk factors for CVD such as diabetes and hypertension. In addition, obesity is highly

prevalent among these women. There is, in consequence, an urgent need for action to be taken to prevent and control CVD in this country. However, since this study involved women who attended health centers, it is difficult to generalize the findings. Community-based studies among both men and women in Qatar are recommended to determine the true prevalence of risk factors for CVD and other chronic diseases. It is important in future studies to distinguish between nationals and non-nationals because socio-economic status, dietary habits, age and sex structure are different, and these factors can affect the prevalence of chronic diseases.

REFERENCES

Al-Roomi, K., Musaiger, A.O. and Al-Awadi, A. (1994). Lifestyle Patterns and the risk of acute myocardial infarction in a Gulf Arab population: A community-based case control study. *Int. J.Epidemiol.* 23, 931-939.

Bray, G.A. (1978). Definition, measurement, and classification of the syndrome of obesity. *Int.J. Obesity*, 2: 99-112.

Central Statistics Organization. (1994). Statistical Abstract, 1993, Presidency of Council of Ministers, Qatar.

Delugolecka M.J.and King, S.A. (1989). A simple tool for heart disease risk appraisal in general practice. *J.Roy.Soc.Hlth.* 109: 98-99.

Eaker, E.D., J. Chesebro, J.H Sacks, F.M. Wenger, N.K. Whisnant, J.P and Winston, K. (1993). Cardiovascular Disease in Women. Circulation 88: 1999-2009.

Hamadeh R.R., K. McPherson and R.C. Doll. (1993). Prevalence of smoking in Bahrain. *Tobacco Control* 1: 102 – 106.

INCLEN Multicentre Collaboration Group (1992). Risk factors for cardiovascular disease in the developing world. A multicentre collaborative study in the international Clinical Epidemiology Network (INCLEN). *J.Clin.Epidemiol.* 45: 891-847.

Isles C.G.and D.J. Holes. (1992). Changing trend in vascular disease: Coronary risk factors today. In Lorimer A.R. and Schepher J. (editors). Preventive Cardiology, Oxford, U.K., 1-29.

Khashoggi R., Madani, K. Ghaznawi, H. and Ali, M. (1994). Socio-economic factors affecting prevalence of obesity among adult females in Saudi Arabia. Ecol, *Food Nutr.* 31: 277-284.

Lakier, J.B.(1992). Smoking and cardiovascular disease. Am.J. Med. 93 (1A): 85-125.

Musaiger, A.O.(1987). The state of food and nutrition in the Arabian Gulf countries. *Wld. Rev. Nutr.* Diet. 54: 105-173.

Musaiger, A.O. and Al-Ansari, M. (1992). Factors associated with obesity among women in Bahrain. Int. Quart Comm. *Hlth Ed.*, 12:129-135.

National Dairy Council (1991). Coronary Heart Disease – I. London, U.K.

Prevention Health Department. (1993). *Vital Statistics, Annual Report*, 1993, Ministry of Public Health, Qatar.

WHO/CDC. (1990). *Epi-Info. Versions*. Centers for Disease Control, Atlanta and World Health Organization, Geneva.

WHO/EMRO. (1989). *Clinical Disorders Arising from Dietary Affluence in Countries of the Eastern Mediterranean Region*. World Health Organization, Regional Office for the Eastern Mediterranean, Publication No. 14, Alexandria, Egypt.

DIET-RELATED CHRONIC DISEASES IN SAUDI ARABIA

Khalid A. Madani [1], *Taha A. Kumosani* [2] *and Nadia S. Al-Amoudi* [3]

[1]Ministry of Health, [2]King Abdulaziz University, [3]General Presidency of Girls' Education, Jeddah, Saudi Arabia

INTRODUCTION

Chronic non-communicable diseases are now the major health problems in Saudi Arabia. Heart diseases, cancer, diabetes and hypertension are the main causes of death. Obesity has become endemic and contributes to the risk for many chronic diseases. This paper highlights the current situation of main non-communicable diseases in Saudi Arabia.

Obesity

The prevalence of obesity in Saudi Arabia ranges from fourteen percent to about eighty-three percent (WHO, 1989; Hamilton et al., 1995). This wide variation could be due to the differences in criteria used to define obesity and also to differences in age, sex and health status.

The risk of childhood obesity and its continuation to adulthood is well established (Rimm and Rimm, 1976). A survey utilizing the National Centre for Health Statistics Standards carried out in the kingdom (WHO, 1989) revealed 14% childhood obesity among newborn children to six years of age. The tracking of body mass and obesity from childhood through adulthood implies that the genetic, behavioural, and culture involved in obesity operate early in life, can be identified in youth, and can be intervened upon (Harlan, 1993). The challenge for early identification and intervention has important public health implications.

Madani et al. (1996) gathered preliminary data about the health and nutritional profile of adolescent girls in the Taif Region of Saudi Arabia. Weight, height, and dietary patterns were obtained from 540 adolescent girls aged 12 to 18 years, using the body mass index (Wt/Ht^2) of NHANESI as a reference for adolescents. The prevalence of under-weight among these girls was 14.7% ($<15^{th}$ percentiles), and 16.3% were over-weight or obese ($>85^{th}$ percentiles). However, the majority (69.0%) were in the normal weight (15^{th} – 85^{th} percentiles).

In another study, using the same criteria of obesity as the previous investigation, Al-Abbad (1995) determined the prevalence of obesity and some of its association risk factors using a cross sectional study. Several hundred students in Al-Khobar City were randomly selected. The prevalence of under-weight, normal and over-weight were 11.3%, 60.1%, and 28.6%, respectively. In view of the high prevalence of obesity, the author recommended national preventive programs for weight control and healthy life-style for all ages including children and adolescents. Families, schools and school teachers should be involved in the implementation of such programs (Al-Abbad, 1995).

Al-Nuaim et al. (1996a) investigated the prevalence of overweight and obesity among 9,061 male school children aged 6-18 years old in Saudi Arabia. Children with evidence of chronic or acute diseases were excluded from the study. 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 Centre for Health Statistics / Centre for Disease Control (NCHS/CDC) reference population was used as the expected standard population value. Childhood obesity was defined as children who weighed more than 120% of the expected median percentile of the reference population, and overweight as 110-120%. The results showed that the overall prevalence of overweight was 11.7% and obesity was 15.8%. The authors concluded that 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.

El-Hazmi and Warsy (1997) determined the prevalence of overweight (BMI=25-29.9) and obesity (BMI 30) in a total of 14,660 adult Saudi males and females (>14 years of age) in different regions of the kingdom. The prevalence of overweight in the total population was 27.23% and 25.20% in males and females, respectively, while the prevalence of obesity was 13.05% and 20.26% in males and females, respectively.

Al-Nuaim et al. (1997a) conducted a community based national epidemiological household survey to estimate the prevalence of overweight and obesity and to examine its association with the socio-demographic characteristics for 10,657 Saudi subjects aged 20 years and over. The mean age was 35.8 $\pm$ 14.27 and 50.8% of the sample were males. The overall prevalence of overweight was 31.2%, 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 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 with traditional lifestyles living in rural areas than those in more urbanized environments, and in increased age. The observed prevalence and

pattern of overweight and obesity with age and gender are 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 et al., 1997a).

Recently, El-Hazmi and Warsy (1999) investigated the relationship between the prevalence of obesity in type 2 diabetes mellitus and non-diabetic subjects in the Saudi population. The study was conducted on 1,419 adult individuals (age > 14 years) suffering from type 2 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 screening was carried out as a household-screening programme using the World Health Organization (WHO) criteria to classify the population as diabetic or non-diabetic. Using BMI values of 25 – 29 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. The prevalence of type 2 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 2 diabetes mellitus population was separated from the non-diabetics, the prevalence of obesity was 39.3% among diabetic women compared to 18.5% among non-diabetic women ($p < 0.0001$). The prevalence of obesity was lower among men compared to women, and diabetic men had a higher prevalence than 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 the men and women in the non-diabetic group were 25.9% and 24.8%, respectively ($p < 0.001$). The results of this study suggest that obesity may be considered to be major etiological factor in development of type 2 diabetes mellitus in Saudi Arabia (El-Hazmi and Warsy, 1999).

Diabetes Mellitus

Diabetes has become the most challenging public health problem in Saudi Arabia. The prevalence rates range from 1.5% to as high as 40%, based on age, with rates increasing with age (Fatani et al., 1989; Sebai, 1987; Bacchus et al., 1982; El-Hazmi, 1990; El-Hazmi and Warsy, 1989; Al-Nuaim et al., 1995a). Many researchers (Fatani et al., 1987; Sebai, 1987; Al-Nuaim, 1997b) suggest that the rapid socio-economic changes in the country over the last thirty years have contributed to the high prevalence rate of diabetes. All the acute and chronic complications of diabetes are prevalent in Saudi Arabia from a developing to a rapidly industrialized nation (Famuyiwa et al., 1992). Health education for the dietary management of diabetes is urgently needed. These education efforts should be provided through the public media, by radio,

Table 1.Comparison of studies on obesity among the Saudi female population in the Kingdom of Saudi Arabia

Study	Mean age (year) (±SD)	Percentage ideal weight BMI 20-24.9	Percentage over-weight BMI 25-29.9	Percentage moderate obese BMI 30-40	Percentage morbid obese BMI>40
Khwaja and Sebai (1987) n=467	(1) 15-49	35.1	27.0	(2) 18.8	(3) 8.2
Binhemd et al. (1991) n=595	(1) 18-74	(4) 34.6	34.1	27.9	3.4
Al-Shammari et al. (1994a) n=1,385	32.3 (±11.7)	(4) 26	26.8	41.9	5.1
Al-Shagrawi et al. (1994) n=460	(1) 16-26	21.3	8.7	12.2	*
Hamilton et al. (1995) n=1,755	28.9 (±5.8)	17.0	(5) 42.0	(6) 25.0	(7) 13.0
Al-Nuaim et al. (1995) n=6,340	(1) 15-95	(8) 32.5	(5) 27.0	24.0	2.2
Ogbeide et al. (1996) n=6,325	(1) 18-91	(4) 28.0	31.5	(9) 40.5)	*
Al-Nuaim et al. (1996b)	(1) 15-95	(4) 49.0	(5) 27.0	(9) 24.0	*
Al-Nuaim (1997e) n=1,016	(1) 30-64	(4) 32.0	(5) 34.0	(9) 34.0	*
El-Hazmi and Warsy (1999) n=708 Diabetic	Over 14	(4) 31.0	29.7	(9) 39.3	*
n=7,790 Non-diabetic		(4) 56.7	24.8	(9) 18.5	

(1) Range of age in years, (2) BMI from 30 to 34.9, (3) BMI equal to or greater than 35, (4) BMI less than 25, (5) BMI from 25 to 30 (6) BMI from 30 to 35, (7) BMI greater than 35, (8) BMI from 19 to 24.9, (9) BMI equal to or greater than 30, *=Data is not available.

television and newspapers. Dietary recommendations for diabetics should be simple, easy to understand, acceptable in practice, and of proven effectiveness if they are to have an appreciable influence on the quality of diabetic management (Al-Rowais et al., 1993).

The national chronic metabolic diseases survey (Al-Nuaim et al., 1995a) showed that 11.8% and 12.8% for male and female subjects aged 15 years and over were diabetic, while 10% and 9% of male and female subjects had impaired glucose tolerance.

El-Hazmi et al. (1995, 1996 and 1998) conducted several studies on the prevalence of diabetes in Saudi Arabia. A household study in 34 different areas to determine the prevalence of insulin-dependent diabetes mellitus (IDDM), NIDDM, DM and IGT was carried out by El-Hazmi et al (1996a). Samples of blood were collected from 23,493 Saudi males and females, ages ranging from two to seventy years. The overall prevalence of IDDM, NIDDM and IGT was 0.19%, 5.50% and 0.50% in the Saudi males and 0.24%, 4.56% and 0.90% in Saudi females respectively. When grouped on the basis of age, there were 8,767 children (<14 years), and of these 15 (0.17%) had IDDM and 13 (0.15%) had maturity onset diabetes of the young. The prevalence of IGT in this group was 2.25%. In the 14-70 year age group, the prevalence of IDDM, NIDDM and IGT was 0.24%, 9.50% and 0.72% in the males and 0.25%, 6.82% and 1.35% in the females, respectively. These results place Saudi Arabia among the countries that have a high prevalence for DM and a moderate risk for IGT. This overall increase of DM in Saudis could be related to several factors, the foremost being the changing conditions and the general life pattern that favours a sedentary lifestyle which contributes to lack of exercise. In the light of these findings, based on a large number of Saudi individuals from different regions of the country, it is clear that carefully planned programs are needed to achieve control and prevention of diabetes mellitus in Saudi Arabia.

Table (2) shows the summary of the results of the studies of El-Hazmi et al. (1995, 1996 a,b, 1998) in different areas of Saudi Arabia.

Heart Disease

Heart disease is the main killer of adults in Saudi Arabia, representing about 30% of total causes of death. High blood cholesterol, diabetes mellitus, hypertension, obesity, and inactivity seem to be the major risk factors for the high prevalence of heart disease in this country. Al-Nuaim et al. (1997b) studied the characteristics of risk factors for hypercholesterolemia (HC) among the Saudi population. Household surveys of 4,548 Saudi subjects, aged 15 years and above were conducted. Hypercholesterolemia Criteria used was defined as follows:

Table 2. Prevalence of IDDM, NIDDM and IGT in Saudis by sex

Study	Males				Females			
	No.	IDDM (%)	NIDDM (%)	IGT (%)	No.	IDDM (%)	NIDDM (%)	IGT (%)
El-Hazmi et al. (1995)	1,925	0.26	4.47	0.57	2,070	0.24	3.86	1.69
El-Hazmi et al. (1996a)	10,829	0.19	5.50	0.50	12,664	0.24	4.56	0.90
El-Hazmi et al. (1996b)	1,000	0.10	5.90	0.50	1,060	0.28	7.87	1.04
El-Hazmi et al. (1998)	11,713	0.23	5.63	0.50	13,624	0.30	4.53	0.72

borderline high HC (5.2-6.2 mmol/L) and high HC (>6.2 mmol/L). The risk of developing HC was increased with age by 2% and 1% (for each year increase in age) for borderline high HC. The risk of developing HC was significantly higher among female subjects. There was no significant relation between the spectrum of BMI group, underweight to obesity, with risk of developing HC among residents of urban communities. There was no significant regional variation for risk of borderline high HC. However, there was a significant increase in risk of developing high HC among residents of Central and Eastern regions, compared with other regions. The author concluded that characteristics of risk factors for HC among the Saudi population differ in many respects from other populations. Overweight and obesity are not significant risk factors for HC. Rural communities are more at risk of HC than urban communities. The population of the Eastern and Central regions were at a significantly higher risk of developing HC. The relatively recent urbanization may account for the low prevalence of HC. It may partially explain the disassociation between obesity and HC. Food habits, both in quantity and quality in rural communities in genetically predisposed homogeneous populations may account for the increase in the prevalence of HC in rural communities. There is a need to propagate information about the potential health hazard of obesity and HC among Saudi communities generaly, and specifically in the Eastern and Central regions. There is a need to study the food patterns of rural communities, which may partially explain the relative increase in the prevalence of HC in rural communities.

Al-Shammari et al. (1994b) determined the prevalence of hyperlipidemia in 1,005 family practice attenders at King Fahad National Guard Hospital in Riyadh. The percentage of patients with a total serum cholesterol concentration (TSCC) of 5.2-6.8 mmol/l was 39.3%, while those with TSCC exceeding 6.8 mmol/l was 9.5%. Hypertriglyceridemia (TG 2.5 mmol/l) was found in 5%. TSCC increased progressively with age up to the seventh decade.

TSCC was higher among obese and diabetic patients than among others. There is an urgent need to equip primary health care teams with training and resources to help them give proper dietary advice, modify the local lifestyle and screen at least high-risk groups for hyperlipidemia and other coronary risk factors.

Al-Shagrawi (1998) studied selected risk factors for cardiovascular disease among 690 Saudi men. The Saudi faculty members of King Saud University were screened for blood parameters (total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol, blood triglycerides, blood sugar, and for systolic and diastolic blood pressure, SBP, DBP) in order to investigate the coronary heart disease risk factors in a fairly sedentary affluent segment of the society. Mean values of these parameters were within normal ranges. However, calculated mean body mass index have indicated prevalence of overweight among the group. High blood pressure of SBP > 160 mm Hg was not prevalent among younger participants aged <35, nor among normal weight participant with BMI > 25. About 4.3% of the total population studied showed this elevation. However, 14.5% of the group had a raised DBP (>90 mm Hg). Similar percentages of those with elevations in blood lipids and glucose were observed. The importance of public awareness, at all socio-economic levels, in regard to cardiovascular risk factors, related lifestyle, and food consumption patterns are therefore recommended.

Table 3. Comparison of studies on plasma total cholesterol level in the healthy Saudi population

Study	Age (years)	Number		Plasma total cholesterol	
		Males	Females	Males	Females
El-Hazmi et al. (1982)	20-29	578	226	115-231 mg/dl	132-209 mg/dl
Khoja et al. (1993)	20-60	1,613	886	184.0±0.8 (1) mg/dl	177.8±1.1 mg/dl
Sair et al. (1995)	18-34	128	32	183.6±1.4 mg/dl	172.3±2.5 mg/dl
Al-Nuaim et al. (1996c and 1997c)	<15	2,294	2,254	4.0±1.5 mmol/L	4.24±1.5 mmol/L
Al-Nuaim (1997d)	25-64	1,476	1,448	4.3±1.5 mmol/L	4.4±1.5 mmol/L
Al-Nuaim (1997e)	30-64	1,034	1,000	4.3±1.5 mmol/L	4.4±1.5 mmol/L

(1) Means ± standard error of means

Taha and Bella (1998) studied prevalence and knowledge of coronary heart disease risk factors among people attending Southwest Thogbah primary health care centre. A random sample of 227 male and female Saudi attendees aged >18 years was assessed. The prevalent risk factors were diabetes mellitus (28.2%), obesity (37.9%) and lack of physical exercise (68.3%). Diabetes mellitus was the most prevalent risk factor among males (55.6%), while obesity was the main one among females (42.3%). Less than half of the sample knew about risk factors and preventive measures. Knowledge of risk factors and prevention was significantly associated with educational level (Taha and Bella, 1998).

Hypertension

Hypertension has long been recognized as a risk factor for cardiovascular disease. A few studies have reported the prevalence of hypertension, mostly in urban areas of the kingdom, with rates ranging from 2.4% to 15.4% (Al-Bella et al., 1993; Al-Nozha et al., 1993, 1997; Al-Nozha and Osman, 1998; Khalid et al., 1994; Wahid et al 996; El-Hazmi et al. 1998). These differences are due to the selection of target study groups in relation to sex and age, and other criteria used for the definitions of hypertension.

Wahid et al. (1996) estimated the prevalence of hypertension in adults residing in Riyadh City and studied the sociodemographic characteristics of the hypertensive population. The sample was selected by stratified random sampling from their records in the primary health care centres catchment areas. A total of 1,394 people aged 15 years and over were interviewed and examined. Subjects are considered hypertensive if the average BP reading is 160/95 mm Hg or more, or they are currently under treatment. The total hypertensive subjects were 214 giving an overall prevalence of hypertension of 15.4%. Of these, 157 subjects were known hypertensives and were under some form of treatment. On the other hand, 57 (4.1%) other subjects were newly detected by the study. Hypertension was significantly related to age, marriage, education, occupation and employment status and consanguinity. Male subjects had a higher prevalence of hypertension but the differences were not significant. Nationality and income were not related to high BP. The authors concluded that hypertension is a problem among adults in Riyadh City. It is significantly related to some sociodemographic and family factors. About 27% of all hypertensives are not aware of their disease and more than 31% of known hypertensives are apparently not well controlled. There is a need for a programme to prevent and control hypertension in Riyadh City. Similar studies need to be done in other areas of the country to estimate the prevalence of hypertension and associated factors as prerequisites for any programme to control the disease (Wahid et al., 1996).

Al-Nozha et al. (1997) gathered data about the prevalence of hypertension in the kingdom among 13,700 individuals of both sexes in all age groups. The data of this study came from a major national survey entitled "Evaluation of the Nutritional Status of the People of Saudi Arabia", conducted during 1989-1994. The WHO definition of hypertension of 160/95 mm Hg was used; it was found that 9.1% and 8.7% of the total sample investigated were systolic and diastolic hypertensives, respectively. However, 12.4% and 7.9% of children younger than 18 years were systolic and diastolic hypertensives. Among adults aged 18 years and older, 5.3% were systolic and 7.3% were diastolic hypertensives; 87.5% of systolic and 79.4% of diastolic hypertensives were aged 40 years and over. Females had statistically elevated systolic hypertension compared with males ($P < 0.01$). However, if blood pressure of 140/90 mm Hg is used as a criterion for hypertension definition, the prevalence among the latter age groups would be 20.4% for systolic and 25.9% for diastolic hypertension. The prevalence of Isolated Systolic Hypertension (ISH), Isolated Diastolic Hypertension (IDH) and Systolic Diastolic Hypertension (SDH) among adults above 18 years was 1.8%, 3.8% and 3.5%, respectively. ISH was higher among females compared with males (2% vs 1.4%), while IDH was higher among males than among females (4.4% vs 3.4%). There is a need for tracking childhood hypertension, which could provide long-term analysis for risk of adult hypertension.

Cancer

The prevalence of cancer in Saudi Arabia has increased steeply in recent years, which may be attributed to advances in diagnosis. Breast cancer is the most common female malignancy (Rabani, 1987; Stirling et al., 1989; Koerich and Al-Kuhaymi, 1984; Mahboubi, 1987). It is the most common cancer referred to the King Faisal Specialist Hospital and Research centre in Riyadh (Ezzat et al., 1997). The development and implementation of a comprehensive breast cancer prevention program is an important first step towards raising the national awareness about this disease and directing additional resources towards its solution.

According to the recent National Cancer Registry 1994-1996 report (1996), the total number of cases reported among Saudis through this period was 16,294. Cancer occurs more frequently in men (8,791) than women (7,503). The report indicated also that the highest incident cases for males were liver cancer (906) followed by cancer of the hematological and the reticuloendothelial system (870) and the lymph nodes (8,005), while for females, the highest was breast cancer (1,430), followed by cancer of the thyroid gland (658) and cancer of the hematological and reticuloendothelial system (585).

The National Cancer Registry will enable health care providers, through government support, to provide concurrent cancer screening, detection and prevention programs, as well as conducting cancer epidemiological and biostatistical studies. It has been estimated that about 80% of all cancers could be avoided if preventive measures involved primarily lifestyle modifications, early detection and treatment (Ajarim, 1992; Madani, 1995).

REFERENCE

Ajarim, D.S. (1992). Cancer at King Khalid University Hospital, Riyadh. *Ann. Saudi Med.* 12:76-82.

Al-Abbad, F.A. (1995). Prevalence of obesity & risk factors among single female intermediate & high school students in Al-Khobar Eastern Province, Saudi Arabia. College of Medicine and Medical Sciences, King Faisal University, Dammam, Kingdom of Saudi Arabia, unpublished fellowship dissertation.

Al-Balla, S.R. Bamgboye, E.A., Al-Sekat, M; Al-Balla, M. (1993). Causes of morbidity in the elderly population of Saudi Arabia. *Trop. Med Hyg.* 96:151-162.

Al-Nozha, M.M.; Osman, A.K. (1998). The prevalence of hypertension in different geographical regions of Saudi Arabia. Ann, *Saudi med.* 18:401-407.

Al-Nozha, M.M.; El-Shabrawy, M.; Karrar, A.A. (1993). Communtiy based epidemiological study of hypertension in Riyadh Region. *Journal Saudi Heart Association.* 5:25-30

Al-Nozha, M.M.; Osman, A.K. (1997). Arterial hypertension in Saudi Arabia. Ann. Saudi Med. 17:170-174.

Al-Nuaim, A. (1997a). Population – based epidemiological study of the prevalence of overweight and obesity in Saudi Arabia, regional variation. *Ann. Saudi Med.* 17: 195-199.

Al-Nuaim, A. (1997b). Prevalence of glucose intolerance in urban and rural communities in Saudi Arabia. *Diabetic Med.* 14:595-602.

Al-Nuaim, A. (1997d). Serum total and fractionated cholesterol distribution and prevalence of hypercholestrolemia in urban and rural communities in Saudi Arabia Inter. *J. cardio.* 58:141-149.

Al-Nuaim, A. (1997e). High prevalence of metabolic risk factors for cardiovascular disease among Saudi population, age 30-64 year. *Int. J. Cardiol.* 62:227-235.

Al-Nuaim, A.; Al-Rubeaan, K., Al-Mazrou, Y., Al-Attas, O., Al-Daghari, N. (1997c). Serum total fractionated cholesterol concentration distribution and prevalence of hypercholesterolemia in Saudi Arabia, regional variation. *Ann. Saudi Med.* 17:179-184.

Al-Nuaim, A.; Al-Rubeaan, K., Al-Mazrou Y., Al-Attas, O.; Al-Daghari, N. Y.; Khoja. T. (1996b). High prevalence of overweight and obesity in Saudi Arabia, *Inter. J. Obesity.* 20:547-552.

Al-Nuaim, A. Al-Rubeaan, K., Al-Mazrou. Y., Al-Attas, O.; Al-Daghari, N. (1995). *National chronic metabolic diseases survey*, part I. Ministry of Health and King Saud University, Riyadh, Saudi Arabia.

Al-Nuaim. A.; Al-Rubeaan, K., Al-Mazrou Y.; Khoja, T.; Al-Attas, O.; Al-Daghari N. (1996c). Prevalence of hypercholesterolemia in Saudi Arabia, epidemiological study. *Inte. J. Cardio.* 54:41-49.

Al-Nuaim, A; E.; Al-Herbish, A. (1996a). The pattern of growth and obesity in Saudi Arabian male school children. *Int. J. Obese.* 20:1000-1005.

Al-Nuaim, A; Bamigboye, E.; Al-Rubeaan, K., Al-Mazrou Y.; (1997a). Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables. *J. Community Health.* 22:211-223.

Al-Nuaim, A.; Mirdad, S.; Al-Rubeaan, K.; Al-Mazrou, Y. Y.; Al-Attas, O.; Al-Daghari, N.; Khoja, T. (1997b). Population-based epidemiological study on characteristics of risk factors of hypercholesterolemia in Saudi Arabia . *Int. J. Cardiol.* 31-47-54.

Al-Rowais, N.A.; Alhaider, A.A.; Al-Hassan, M.I.; Abou-Auda, H.S.; Jarallahm, J.S. (1993). A look at the diabetic patient compliance in Riyadh district. *Saudi pharmaceutical Journal.* 1:50-55.

Al-Shagrawi, R.A. (1998). Selected risk factors for cardiovascular disease among Saudi men. *Bahrain Med. Bull.* 20:106-110.

Al-Shagrawi, R.A.; Al-Bader, A.; El-Hag, E.A. (1994). Factors affecting the prevalence of obesity among Saudi college female students. *Emir. J. Agri. Sc.* 6:227-236.

Al-Shammari, S.A; Ali, M; .Al-Shammari, A; Al-Maatouq, M.; Tennier, A; Armstrong K. (1994b). Blood lipid concentrations and other cardiovascular risk factors among Saudis. *Fem. Pract.* 11:153-158.

Al-Shammari, S.A.; Khoja, T.A., Al-Maatouq, M.A.; Al-Nuaim, L. (1994a). High prevalence of clinical obesity among Saudi females: a prospective cross-sectional study in the Riyadh region. *J. Trop. Med.* Hygiene . 97:183-188.

Bacchus, R.A; Bell, J.L.; Madkour, M.M.; Kilshaws, B. (1982). The prevalence of diabetes mellitus in male Saudi Arabs. *Diabetologia.* 23:330-332.

Binhemd, T.; Larbi, E.B.; Absood, G. (1991). Obesity in primary health care centres: a retrospective study. *Ann. Saudi Med.* 11:163-166.

El-Hazmi, M.A.; Al-Falah, F.Z.; Al-Mofleh, I.A.; Warsy, A.S. (1982). Establishment of normal (References) ranges from biochemical parameters for healthy Saudi Arabs. Tropical and Geographical Med. 34: 323-332.

El-Hazmi, M.A. (1990). Diabetes mellitus – present state of the art. *Saudi Med. J.* 11:10-17.

El-Hazmi, M.A.; Al-Swailem, A.R.; Warsy, A.S.; Al-Sudiary, F.; Sulimani, R.; Al-Swailem, A.M.; Al-Meshari, A. (1995). The prevalence of diabetes mellitus and impaired glucose tolerance in the population of Riyadh. *Ann. Saudi Med.* 15:598-601.

El-Hazmi, M.A.; and Warsy, A.S. (1989). A comparative study of hyperglycemia in different regions of Saudi Arabia. *Ann. Saudi Med.* 19:434-437.

El-Hazmi, M.A.; and Warsy, A.S. (1997). Prevalence of obesity in the Saudi population. *Ann. Saudi Med.* 17:302-306.

El-Hazmi, M.A.; and Warsy, A.S. (1999). Obesity and overweight in Type II diabetes mellitus patients in Saudi Arabia. *Saudi Med. J.* 20:167-172.

El-Hazmi, M.A.; Warsy, A.S. Al-Swailem, A.R; Al-Swailem, A.M.; Sulimani, R. (1998). Diabetes mellitus as a health problem in Saudi Arabia. *Eastern Mediterranean Health J.* 4:58-67.

El-Hazmi, M.A.; Warsy, A.S.; Al-Swailem, A.R.; Al-Al-Swailem, A.M.; Sulimani, R.; Al-Meshari, A. (1996a). Diabetes mellitus and glucose tolerance in Saudi Arabia. Ann. Saudi Med. 16:381-385.

El-Hazmi, M.A.; Warsy, A.S.; Bairmah, N.A.; Al-Swailem, A.R.; Al-Swailem, A.M.; Sulaimani, R.; Al-Meshari, A. (1996b). The prevalence of diabetes mellitus and impaired glucose tolerance in the population of Al-Baha, Saudi Arabia. *Saudi Med. J.* 17:591-597.

Ezzat, A.; Raja, M.; Rostom, A.; Zwaan, F.; Akhtar, M.; Bazarbashi, S. Ingemansson, S.; Al-Abdulkareem, A. (1997). An overview of breast cancer. *Ann. Saudi med.* 17:10-15.

Famuyiwa, O.O.; Sulimani, R.A., Laajam, M.A.; Al-Jaseer, S.J.; Mekki, M.O. (1992). Diabetes mellitus in Saudi Arabia: The clinical pattern and complications in 1,000 patients. *Ann. Saudi Med.* 12:140-151.

Fatani, H.H.; Mira, S.A; El-Zubeir, A.G. (1987). Prevalence of diabetes mellitus in rural Saudi Arabia. Diabetes Care. 10:180-187.

Fatani, H.H.; Mira, S.A.; El-Zubeir, A.G. (1989). The pattern of complications in Saudi Arabian Diabetics. *Ann. Saudi Med.* 9:44-47.

Hamilton, C.J.; Jaroudi, K.A.; Sieck, U.V. (1995). High prevalence of obesity in a Saudi infertility population. *Ann.Saudi Med.* 15:344-346.

Harlan, W.R. (1993). Epidemiology of childhood obesity. A national perspective. *Ann. New York Acad. Sciences*. 699:1-5.

Khalid, M.E.; Ali, M.E.; Ahmed, E.K.; El-Karib, A.O. (1994). Pattern of blood pressures among high and low altitude residents of Southern Saudi Arabia, *J. Hum. Hypertens*., 8:765-769.

Khoja, S.M.; Salem, A.M.; Taha, A.M.; Hakim, N.A. (1993). Plasma lipid levels of a selected Saudi Arabian population in the Western Region. *Saudi Med J.* 143:315-321.

Khwaja, S.S; Al-Sebai, H. (1987). The relationship of age and parity to obesity in Saudi female patients. *Saudi Med J.* 8:35-39.

Koerich, O.M.; Al-Kuhaymi, R. (1984). Cancer in Saudi Arabia. Riyadh, Al-Kharji (1984). Hospital Programme experience. *Saudi Med. J.* 5:217-23.

Madani, K.A. (1995). Mechanisms for vitamin A in cancer prevention and possible therapy. *Malaysian Oil Science and Technology* 4:102:106.

Madani, K.A.; Khashoggi, R.H.; Al-Nowaisser, A.A.; Nasrat, H.A.; Khalil, M.H.; Abalkhail, B. (1996). An abstract entitled "Nutritional status and dietary habits of adolescent girls in Taif, Saudi Arabia", *presented at the 12th Annual Meeting of the American Public Health Association*, New York, USA, November 17-12.

Mahboubi, E. (1987). Epidemiology of cancer in Saudi Arabia. *Ann, Saudi Med.* 7:265-267.
National Cancer Registry, 1994 –1996 Report (1996). Ministry of Health, Riyadh, Saudi Arabia.

Ogbeide, D.O.; Bamigbeoy, E.A.; Karim A.; Al-Khalifa, I. (1996). The prevalence of overweight and obesity and its correlation with chronic diseases in Al-Kharj adult outpatients, Saudi Arabia. *Saudi Med. J.* 17:327-332.

Rabani, S.J. (1987). Cancer at Dahran health center, Saudi Arabia. Ann. Saudi Med. 7: 288-293.

Rimm, I.J.; Rimm, A.A. (1976). Association between juvenile obesity and severe adult obesity in 73,532 women. *Am. J. Public Health*. 66:479-481.

Sair, M.M.; Al-Zahrani, H.A.I.; Omer, M.N. (1995). Plasma lipid profile of healthy Saudi population in Makkah Region. *Saudi Heart J.* 6:41-47.

Sebai, Z.A. (1987). Diabetes mellitus in Saudi Arabia. *Post Grad. Doc.* 10:582-586.
Stirling, G., Khalil, A.M.; Nada, G.N. (1989). Malignant neoplasms in Saudi Arabia. Cancer. 1: 89:94.

Taha, A.Z.; Bella, H. (1998). Heart disease risk factors: prevalence and knowledge in a primary care setting, Saudi Arabia. Eastern Mediterranean Health J. 2:293-300.

Wahid, S.A.; Al-Shammary, F.J.; Khoja, T.A.; Hashim, T.J.; Anokute, C.C.; Khan, S.B. (1996). Prevalence of hypertension and sociodemographic characteristics of adult hypertensives in Riyadh City, Saudi Arabia, J. Hum. Hypertens. 10:583-587.

WHO, (1989). Clinical disorders arising dietary affluence in countries of the Eastern Mediterranean Region. Situation analysis and guidelines for control. EMRO. Tech. Pub. No. 14, Alexandria, Egypt.

LIFESTYLE – RELATED CHRONIC DISEASES IN THE UNITED ARAB EMIRATES

Musaddaqe M.Hossain [1] And Hussain S. Qazag[23]
[1] Faculty of Medicine and Health Sciences, UAE University, [2] Nutrition Department, Ministry of Health, Al- Ain, United Arab Emirates

INTRODUCTION

Lifestyle-related chronic diseases, particularly cardiovascular diseases (CVDs) diabetes, obesity, elevated blood total cholesterol and cancer, have emerged during the past 3 decades as major causes of morbidity and mortality in the United Arab Emirates (UAE) (MOH, 1996) and in other countries of the Gulf Area and the Eastern Mediterranean Region (EMR) of the World Health Organization (Alwan, 1997). This emergence has been linked to the aging of the population and lifestyle changes associated with the rapid socioeconomic development during the period (Alwan, 1997; Musaiger, 1998).

In the UAE, national-level mortality data on lifestyle-related chronic diseases are published regularly by the Ministry of Health (MOH, 1996). However, national-level descriptive and analytic epidemiologic data on morbidity associated with these diseases in the UAE are quite limited. While extensive information about the epidemiology, prevention, and control of lifestyle-related chronic diseases in developed countries is already available (Brownson and Remington,1998), direct application of this information to populations in rapidly developing countries such as the UAE may not be appropriate for at least some of these diseases (Markovitx JH, 1998). Therefore, it is necessary to review all available epidemiologic information, though limited in scope and quality, before planning programs for prevention and control of these diseases in the UAE. Such a review should also be helpful in guiding future research.

The aims of this review were to: a) summarize available descriptive and analytic epidemiologic data on coronary heart disease, hypertension, obesity, elevated blood total cholesterol, diabetes mellitus, and cancer in the UAE; (b) identify the current national programs for the prevention and control of these diseases; and (c) make general recommendations as to the future course of action related to the prevention and control of these diseases.

METHODS

For this review, information about lifestyle-related chronic diseases in the UAE and their risk factors was traced through electronic search of the 'Medline' computerized publication database and through manual search of important

local and regional publications and reports not included in the 'Medline' database. All accessible published papers and reports were reviewed. Relevant information was also obtained from informed personnel in the Ministry of Health.

FINDINGS

The major findings derived from the literature reviewed and discussions with Ministry of Health personnel are presented below.

Mortality

CVDs are currently the leading cause of death in the UAE (MOH, 1996), as in many other countries of the Gulf area and the EMR. (Alwan, 1997) In 1996, of 4,747 registered deaths in the UAE, 23.8% were attributed to CVDs, 7.9% to cancer, and 2.1% to diabetes mellitus. Of all CVD deaths, acute myocardial infarction accounted for 26.4%, cerebrovascular disease for 20.7%, ischemic heart disease for 14.3%, hypertensive disease for 9.1%, atherosclerosis for 2.5%, and other CVDs for the remaining 27.0%. The number of CVD deaths in males was almost twice that in females, an observation explained at least in part by the preponderance of male expatriate workers in the population (MOH, 1996).

Cancer is currently the third leading cause of death in the UAE (MOH, 1996). Indeed, during the last 2-3 decades cancer has emerged as one of the 3 leading causes of death in other countries in the Gulf area (Hamadeh, 1998) and the EMR (Alwan, 1997) as well. In 1996, the sites of cancer among those dying of the disease in the UAE were: trachea, bronchus, and lungs: 14.9%; digestive organs and peritoneum: 13.5%; female breast: 7.4%; cervix uteri: 2.4; and others: 61.8% (MOH, 1996).

Morbidity

In the UAE, national-level data on morbidity associated with lifestyle-related chronic diseases are quite limited both in scope and quality. Available data are mostly from epidemiological studies done in selected population groups.

Hypertension

In a study of Bedouin-derived UAE citizens ≥20 years from both urban and rural communities in Al Ain, the prevalence of systolic hypertension (>140 mm Hg) and diastolic hypertension (>90 mm Hg), was found to be 23.9% and 17.9% among men (n=123) and 19.7% and 12.8% among women (n=199) (El Mugamer et al, 1995). Both systolic and diastolic hypertension were more

prevalent among urban subjects than in their rural counterparts (systolic: 24.9% v. 19.2%; diastolic: 18.3% v. 12.1%). Another study of 358 apparently healthy men aged 35-49 years selected from a multiethnic office-based employee group in Abu Dhabi revealed that 14.2% had previously undiagnosed hypertension (systolic > 140 mm Hg or diastolic >90 mm Hg) with notable differences in the prevalence among different ethnic groups. These prevalence figures from the UAE, although from selected population groups, are comparable to those reported from other Gulf and EMR countries (Alwan A., 1997).

Diabetes mellitus

Among Bedouin-derived UAE citizens aged ≥20 years from both urban and rural communities in Al Ain, the prevalence of diabetes mellitus (random capillary blood glucose level of ≥11.1 mmol/l) has been found to be 5.8% in men and 6.1% in women (El Mugamer et al, 1995). In both men and women the prevalence was higher among those aged 40-59 years (men 15.8%, women 11.3%) than among those aged 20-39 years (1.9% in both men and women) or ≥60 years (men 3.1%, women 7.7%). In members of one tribe the prevalence was noted to be 18.7%, whereas the prevalence in members of all the remaining tribes combined was 4.2%. Diabetes mellitus was also more common among urban subjects (9.2%) than in their rural counterparts (4.0%).

A study of 358 apparently healthy men aged 35-49 years selected from a multiethnic office-based employee group in Abu Dhabi revealed that 10.1% had previously undiagnosed diabetes mellitus (blood glucose: fasting >7.8 mmol/l or 2-hour >11.1 mmol/l) (Pugh et al, 1998), and 18% had impaired glucose tolerance (Hossain et al, 1998). The prevalence of abnormal glucose tolerance (diabetes plus impaired glucose tolerance) was highest (38%) among peninsular Arabs (Emiratis, Omanis) and was quite similar to the prevalence (36%) in South Asians (Indians, Pakistanis) (Pugh RN., 1998). Relative to their European counterparts, South Asian and peninsular Arab subjects in the study shared the tendency to significantly higher 2-hour blood glucose and insulin levels.

In population samples aged >20 years in the EMR, around 10% have been found to be diabetic using WHO criteria (Alwan, 1997). Available UAE data, although based on selected population groups, indicate that the prevalence of diabetes in the UAE is comparable to the regional figures. It is quite disturbing to note, however, that these regional prevalence figures are higher than those reported from Western Europe and north America (Alwan and King, 1995).

Overweight and obesity

Overweight and obesity are important modifiable risk factors for coronary heart disease, hypertension, and diabetes (Brownson and Remington, 1998). Several studies have been done to estimate the prevalence of overweight and obesity in the UAE population. The National Nutrition Survey in 1992 (799 married men aged ≥20 years; 927 married women aged ≥17 years), revealed that the overall prevalence of overweight (body mass index (BMI): 25.0-29.9) was 40.3% in men and 32.8% in women, and the overall prevalence of obesity (BMI≥30) was 15.8% in men and 38.3% in women (Musaiger et al, 1994).

A cross-sectional study of 215 female university students aged 18-30 years revealed that, based on BMI, 19.0% were overweight and 9.8% were obese (Musaiger and Radwan, 1995). The median BMI of these female university students was higher than that reported in the USA for the same age group.

In a study of Bedouin-derived UAE citizens aged ≥20 years from both urban and rural communities in Al-Ain, the prevalence of obesity (BMI ≥30 kg/m^2) was found to be 10.7% in men and 27.4% in women (El Mugamer, 1995). In both men and women the prevalence was higher among those aged 40-59 years (men 13.2%, women 37.7%) than among those aged 20-39 years (men 11.3% women 28.0%) or ≥60 years (men 6.3%, women 12.8%). Also, obesity was more prevalent among urban subjects (26.7%) than in their rural counterparts (17.9%).

A study of 358 apparently healthy men aged 35-49 years selected from a multiethnic office-based employee group in Abu Dhabi revealed that 51% were grade 1 overweight (BMI: 25.00-29.99) and 18% were grade 2 (BMI 30.00-39.99) or grade 3 overweight (BMI >40.00) (El Mugamer, 1995). Among peninsular Arabs (Emiratis, Omanis) the prevalence of overweight of any grade was 78%. In multivariate logistic regression analysis, overweight of any grade was found to be significantly associated with ethnicity and waist-to hip circumference ratio (WHR). Also, of all subjects in this study, 31% had a WHR of >1.0. In multivariate logistic regression analysis, significant correlates of a WHR >1.0 were ethnicity, physical activity, and BMI.

In a case-control study of 220 obese and 220 non-obese school children aged 6-18 years in Al-Ain, after multivariate adjustment, family history of obesity, physical inactivity, preference of high calorie food, and maternal education were found to be significant correlates of obesity (Moussa et al, 1994).

The prevalence of overweight and obesity in the UAE, although quite high, is generally comparable to prevalence figures reported from other Gulf countries (Kordy et al, 1995; Al-Isa AN, 1995; Musaiger and Al-Ansari, 1992).

Elevated blood total cholesterol

Several longitudinal studies have convincingly shown that the risk of atherosclerosis and cardiovascular diseases, particularly coronary heart disease, is positively associated with blood (Brownson and Remington, 1998). In a preliminary study of 834 volunteers selected at busy urban public sites such as shopping centers and mosques, the age-specific prevalence of elevated blood total cholesterol (≥200 mg/d1) was found to range from 47.2% to 53.0% Arabs and from 22.7% to 44.5% in non-Arabs (Agarwal, et al, 1995). The overall prevalence of elevated blood total cholesterol among the study subjects was nearly 50%. Among UAE citizens the mean blood total cholesterol level was 207.9 mg/d1. Of all UAE citizens studied, 33.3% had borderline high (200-239 mg/d1) and 19.8 had high (≥240 ,g/d1) blood total cholesterol levels. These prevalence figures among UAE citizens are quite similar to those observed among adults in the USA (Brownson and Remington , 1998).

A study of 358 apparently healthy men aged 35-49 years selected from a multiethnic office-based employee group in Abu Dhabi revealed that 35% and 39% had borderline high (200-239 mg/dl) and high (≥240 mg/d1) levels of blood total cholesterol, respectively (Hossain, et al , 1998). In multivariate logistic regression analysis, older age was the only significant correlate of elevated blood cholesterol (≥200 mg/d1).

ASSOCIATED LIFESTYLE FACTORS

Food consumption pattern

A cross-sectional study of 215 female university students revealed that their diet had become westernized, that their intake of fresh fruit and vegetable was low, and that a high proportion of them skipped morning and afternoon snacks (Musaiger and Radwan, 1995).

In a country-wide cross-sectional dietary survey of a population-proportionate sample of Emirati men (1,122) and women (1,090) aged >20 years, significant differences were seen between the intakes of males and females and between the intakes of younger (20-49 years) and older (≥50 years) subjects (Musaiger and Abuirmeileh, 1998). Older men tended to consume greater amounts of fish, milk, laban, fruit, rice, bread, and tea on a daily basis than younger men. In contrast, eggs, cheese, and chicken were consumed more frequently by younger men. Among women, the older groups reported significantly higher preference for milk and laban than their younger counterparts. In general, among the study subjects, the intake of fresh fruit and vegetables and milk was found to be low. Daily intake of fresh fruit and vegetables was reported by 46% and 60% of men and 52% and 65% of women, respectively.

Habitual intake of diets low in fruit, vegetables, complex carbohydrates, and fibers, and high in saturated fats and cholesterol is a known modifiable risk factor for many chronic diseases (Brownson and Remington, 1998). In this context, the progressive shift from the traditional diet to a modern diet rich in calories, saturated fats, and cholesterol observed during the last 3 decades in the UAE and other Gulf countries is a matter of great concern (Miladi, 1998).

Physical activity

Regular physical activity performed on most days of the week is known to reduce the risk of premature death, death from coronary heart disease, development of diabetes, and colon cancer (Brownson and Remington, 1998). Yet, during the last 3 decades, associated with socioeconomic development and modernization, many men and women in the UAE have adopted a progressively sedentary lifestyle. However, very little quantitative data on physical activity in the UAE population is available. In a cross-sectional study of 358 apparently healthy men aged 35-49 years selected from a multiethnic office-based employee group in Abu Ahabi, between 17.9% and 44.8% in different ethnic groups were classified as 'inactive' based on self-reported leisure-time physical activity levels (Pugh et al, 1998). 'Heavy' physical activity was reported by between 6.0% and 28.6% of the subjects in different ethnic groups. Of the peninsular Arab (Emirati, Omani) subjects in the study. 35.8%, 32.8%, 25.4%, and 6.0% reported 'inactive', 'light', 'moderate', and 'heavy' leisure-time physical activity.

Smoking

Cigarette smoking is an important modifiable risk factor for many respiratory and cardiovascular diseases and cancer. Epidemiologic data on cigarette smoking in the UAE are limited to some professional groups. In a cross-sectional survey of 275 physicians in the UAE, 43.9% of the males and 8.2% of the females were classified as current smokers (Bener et al, 1993). In another cross-sectional survey of 268 health professionals (doctors, clinical and non-clinical specialists, pharmacists, dentists) from hospitals and primary health care centers in Al Ain, 43.7% of the males and 5.6% of the females were found to be current smokers (Bener et al, 1994), a cross-sectional study of 304 randomly selected workers in 4 cement factories in 4 Emirates in the UAE showed that 27% were current smokers (Abou-Taleb et al, 1995). These findings, although limited to selected professional groups, suggest that cigarette smoking is highly prevalent in the UAE. Furthermore, the finding that prevalence of current smoking was higher among health professionals than in cement factory workers in quite worrisome, as health professionals, particularly physicians, are expected to be lifestyle role models for the general public.

Prevention and Control Programs

The UAE Ministry of Health has taken various measures to prevent and control lifestyle-related chronic diseases including CVDs, diabetes mellitus, and cancer. But national-level programs for the prevention and control of these diseases are not yet in place. However, preparations for launching such programs are in progress, particularly for CVDs and diabetes mellitus.

CONCLUSION

In the UAE, both descriptive and analytic epidemiologic data on lifestyle-related chronic diseases are scanty. National level morbidity and risk factor data on these diseases are virtually nonexistent. However, available data, despite the limitations, strongly suggest that lifestyle-related chronic diseases constitute a major public health problem in the UAE, as in other countries in the Gulf and the EMR. The UAE Ministry of Health has taken measures to prevent and control these diseases, but national-level programs are not yet in place. The magnitude of the morbidity, mortality, and direct and indirect economic losses caused by these chronic diseases in the UAE demands that national-level prevention and control programs be initiated without delay. Collection of accurate, baseline and surveillance data on the distribution and determinants of the major lifestyle-related chronic diseases should be given top priority among the activities in these programs. Such data are indispensable for sound planning, effective implementation, proper monitoring, and rigorous evaluation of prevention and control programs.

REFERENCES

Abou-Taleb, A.N., Musaiger, A.O., Abdelmoneim, R.B. (1995). Health status of cement workers in the United Arab Emirates. *J R Soc Health*, 115:378-81.

Agarwal, M.M., Hughes, P.F., Haliga, A.A., Newman, P., Sheekh-Hussen, M.M., Shalabi, A.G. (1995). Relevance of cholesterol screening in the United Arab Emirates. A preliminary study. *Eur j Epidemiol*, 11:581-5.

Al-Isa, A.N. (1995). Prevalence of obesity among adult Kuwaitis: a cross-sectional study. *Int J Obes Relat Metab Disord*, 19:431-1.

Alwan, A. (1997). Noncommunicable diseases: a major challenge to public health in the Region. *Eastern Mediterranean Health journal*, 3:6-16.

Alwan, A.S., King, H. (1995). Diabetes in the Eastern Mediterranean (Middle East) Region: the World Health Organization responds to a major challenge. *Diabetic Medicine*, 12:1057-8.

Bener, A., Gomes, J., Anderson, J.A., Abdullah, S. (1994). Somking among health professionals. *Med Educ*. 28:1057-8.

Bener, A., Gomes, J., Anderson, J.A. (1993). Smoking habits among physicians in two Gulf countries. *J R Soc Health*, 113:298-301.

Brownson, R.C., Remington, P.L., Davis, J.R. (eds) (1998). Chronic disease epidemology and control. American Public Health Association, Washington, DC.

El Mugamer, I.T., Ali Zayat, A.S., Hossain, M.M. and Pugh, R.N. (1995). Diabetes, obesity and hypertension in urban and rural people of Bedouin origin in the United Arab Emirates. J Trop Med Hyg, 98:407-15.

Hamadeh, R.R., Khalifa, F. (1998). Avoidable risk factors for cancer in Bahrain. *Intl J Food Sci Nutr*, 49:S59:S64.

Hossain, M.M., Pugh, R.N.H., Malik, M. (1998). Prevalence and correlates of diabetes, obesity, and hyperlipidemia in the United Arab Emirates (UAE). *Bahrain Medical Bulletin*, 20:119-22.

Kordy, M.N., el-Gamal, F.M. (1995). A study of pattern of body mass index (BMI) prevalence of obesity in a Saudi population. *Asis Pac J Public Health*, 8:59:65.

Markovitx, J.H. (1998). Cardiovascular risk factors in rapidly developing countries. *Ann Epidemiol*, 8:1-2.

Miladi, S.S. (1998). Changes in food consumption pattern in the Arab countries. *Int J Food Sci Nutr*, 49:S23-S30.

Ministry of Health (MOH) (1996), *Annual Report*. Department of Preventive Medicine, Ministry of Health, Abu Dhabi, United Arab Emirates.

Moussa, M.A., Skaik, M.B., Selwanes, S.B., Yaghy, O.Y., Bin-Othman, S.A. (1994). Factors associated with obesity in school children. *Int J Obes Relat Metab Discord*, 18: 513-5.

Musaiger, A.O., Abuirmeileh, N.M. (1998). Food consumption patterns of adults in the United Arab Emirates. *J R Soc Health*, 118:146-50.

Musaiger, A.O., Al-Ansari, M. (1992). Factors associated with obesity among women in Bahrain. *Int Quart Comm Health Ed*, 12:129-136.

Musaiger, A.O., Bener, A., Bin Ishaq, S.A., Al-Hosani, H. (1994). Cardiovascular disease in UAE: An overview. Emirates Journal of Agricultural Sciences, 6:86:99.

Musaiger, A.O., Radwan, H.M. (1995). Social and dietary factors associated with obesity in university female students in United Arab Emirates. *J R Soc Health*, 115:96-9.

Musaiger, A.O. (1998). Change in dietary habits, lifestyle and trend in diseases in the GCC Countries. *Bahrain Medical Bulletin*, 20:87-90.

Pugh, R.N., Hossain, M.M., Malik, M., El Mugamer, I.T., White, M.A. (1998). Arabian Peninsula men tend to insulin resistance and cardiovascular risk seen in South Asians. *Trop Med Int Health*, 3:89-49.

ACTIONS NEEDED TO PREVENT AND CONTROL MICRONUTRIENT DEFICIENCIES
(In the Arab Countries of the Gulf)

1. The GCC countries are aware of the deleterious health impact of micronutrient deficiencies, especially nutritional anaemia in women and children caused by iron/folate deficiency and iodine deficiency disorders. The effect of vitamin A deficiency on children is being increasingly realized. The awareness has not yet produced any political commitment with high priority.

   It is suggested that a properly designed problem-definition study be conducted to ascertain the extent and magnitude of these micronutrient deficiencies, and at the same time to identify the underlying determinants of each of these deficiencies. Efforts should be made to design and undertake such studies in all the GCC countries in a cross-country manner using a standardized uniform method and using comparable data from all the GCC countries.

2. It is suggested that a micronutrient surveillance system be established along with this problem definition, to monitor on a continuing basis the extent of these deficiencies over time and the impact of the ameliorative measures. The indicators of such surveillance should be simple and reliable, and those which could easily collected by health workers in the peripheral health infrastructure. Such a surveillance system will be useful to conduct evaluation of the ameliorative measures at periodic intervals, focusing on both process and impact evaluation.

3. It is recommended that the measures for the control of these deficiencies, when appropriately implemented nation-wide, will need additional financial resources and in-service training of medical and health workers at all operational levels of the health care system.

4. Education for nutrition promotion is a major responsibility of the health ministry. Special attention should be given to the following approaches:

- through the ante-natal care of pregnant women through the MCH centres.
- through health education as a component of school-health services.

School health education is now receiving increasing attention in view of its great potential in establishing health-related behaviours including good dietary habits at the impressionable age of school children.

5. Mass-awareness campaigns should be systematically designed for nutrition promotion with special focus on micronutrient deficiencies and the means to overcome them through proper diet. Mass-media, including audio-visual and printed materials, should be widely used for this purpose. However, a person-to-person approach and group discussion should also be mobilised whenever and where ever possible.

6. Measures for oral supplementation of iron/folate and vitamin A should be carefully designed after reviewing the results of the nation-wide situation analysis of the problem, and especially the underlying determinants.

7. Control of IDD through salt-iodization should be started as soon as reliable evidence of the problem is available, based on clinical and laboratory data. In case the government policy is to adopt universal iodization of salt, uniodised salt should not be made available to the consumers, for which appropriate legislation will have to be adopted.

8. In order to provide high priority to the control of micronutrient deficiencies, all steps should be taken to obtain political commitment of the highest level decision makers, for which advocacy measures have to be taken. Since micronutrient deficiencies are basically public health problems, the health ministry will have to spearhead such advocacy measures.

9. However, control and prevention of micronutrient deficiencies cannot be done only by the health sector, since the problem is of a multi-faceted nature. A comprehensive strategy will have to be designed in collaboration with other concerned government sectors, non-governmental organizations and others.

An intersectoral Committee or Council charged with the responsibility of implementing the strategy, should be established by the government in which the following should be represented:

- Ministry of Health
- Ministry of Education
- Ministry of Social Welfare
- Ministry of Agriculture
- Ministry of Commerce and Industry
- University and Research Institutions
- Municipality
- Food Industry
- Non-governmental Organizations
- Others concerned

10. There are numerous determinants of nutritional anaemia, VAD and IDD, which could be controlled by a number of health measures of which the following are important:

- Immunization of children
- Control of diarrhoeal disorders
- Malaria control in endemic areas
- Promotion and protection of breast-feeding and appropriate complementary feeding
- Promotion of environmental sanitation and provision of safe water
- Birth spacing advice and services

Steps should be taken to implement these measures to get full benefit of specific measures for the control of micronutrient malnutrition.

11. Food fortification is one of the important measures to combat micronutrient deficiencies. It is recommended that the GCC countries which have adequate and reliable information on prevalence and causes of one or more of micronutrient deficiencies, should establish a food fortification programme, after careful cost-benefit study.

12. Food fortification programmes in some GCC countries should be evaluated to find out whether or not these programmes achieved their objectives and participated in the reduction of micronutrient deficiencies.

ACTIONS NEEDED TO PREVENT AND CONTROL DIET-RELATED CHRONIC DISEASES
(In the Arab countries of the Gulf)

A. Actions needed to establish Food-Based Dietary Guidelines (FBDG)

1. The first step is to determine the purpose and goals for establishing FBDG.

2. Determine the critical health and nutrition problems in the region. This can be done through collecting and compiling the available data.

3. Collecting information on food consumption patterns in the region. This can be obtained from household budget surveys and other studies on food habits. Data on dietary intake by age and sex are more valuable to establish FBDG.

4. Establishing a committee consisting of members from governmental and non-governmental organizations as well as private sectors, to review and assess the available data on food, nutrition and health in the region.

5. The target groups and the message should be clearly defined.

6. A workshop on establishing FBDG should then be organized. The participants should be from all GCC countries, international organizations and private sectors.

7. Comprehensive and in-depth studies on food composition tables and dietary intake in the GCC countries are highly recommended.

B. Actions needed to promote healthy lifestyles

1. Some problems facing the establishment of programmes to promote healthy lifestyles in the region

- Representatives on the committees are not always multisectoral.
- Co-chairmanship of committees is lacking.
- Committee members are not always highly motivated.

2. ***Responsibility for promoting healthy lifestyles:***

A supreme board of committee on healthy lifestyles should be established. Such a structure should:

- Have political commitment and support at the highest level.
- Be multisectorial.
- Have an executive office with secretariat for implementation and follow up.
- Include representatives of Government Ministries of health, education, higher education, information, agriculture, industry, religious affairs, and sports as well as NGO's, the private sector and the community.

The Ministry of Health should lead the initiative to attain the political support and commitment necessary to establish the committee or the board, in each country.

3. ***Steps needed to establish the programme:***

- Expand the responsibilities of the existing health education department to become those of health promotion and protection.
- Reliable and accurate situation analysis including epidemiological data on risk factors, chronic diseases and health behaviour, available services and economic impact of these diseases.
- Dissemination of epidemiological information to policy makers.
- Developing a national policy on healthy lifestyles and a national action plan based on policy. This plan should have measurable targets set for achievements within the time frame and an evaluation component.

4. ***Main issues needed to be included in the programme:***

- Developing a national plan for food and nutrition with special emphasis on healthy eating.
- Developing a national plan on control of tobacco and substance abuse.
- Developing a national plan on physical activity.
- Developing a national plan on injury prevention.
- Developing a national plan on sexual behaviour.
- Revision of school health curricula.
- Mobilizing the community to support healthy lifestyles.

AWAL PRESS