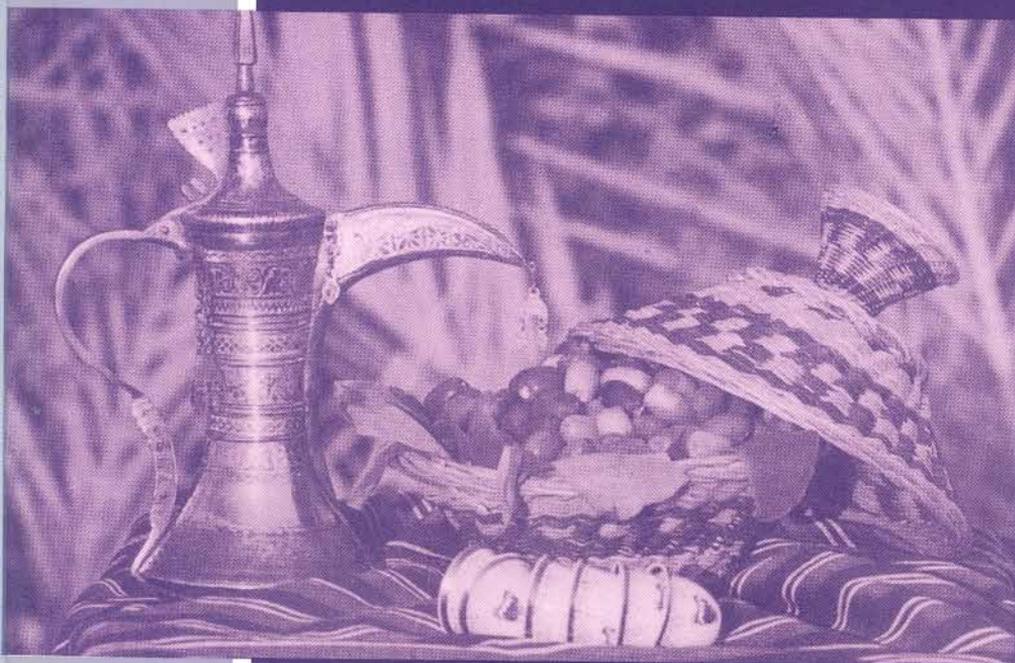


FOOD AND NUTRITION IN THE ARABIAN GULF COUNTRIES

AN ANNOTATED BIBLIOGRAPHY

Compiled by
ABDULRAHMAN O. MUSAIGER



MINISTRY OF HEALTH, BAHRAIN



**FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS, ROME**

Reviewed by E. Boutrif



***FOOD AND NUTRITION
IN THE
ARABIAN GULF COUNTRIES***
AN ANNOTATED BIBLIOGRAPHY

Compiled by
ABDULRAHMAN O. MUSAIGER
Head, Nutrition Unit
Public Health Directorate
Ministry of Health, Bahrain

First Edition, 1990
Ministry of Health, Bahrain



The author alone is responsible for the information provided in this document, which does not necessarily reflect the views of the Food and Agriculture Organization of the United Nations or the Ministry of Health, Bahrain.

First published by Ministry of Health, Bahrain
Printed by Awal Press, Bahrain
Copyright © by Musaiger, A.O., 1990
All rights reserved.

Bahrain Public Library L. D. 932/1990
Musaiger, Abdulrahman Obaid
Food and Nutrition in the Arabian Gulf Countries: An Annotated Bibliography.

Includes index:

1. Arabian Gulf
 2. Food and Nutrition
 3. Health
- I. Title
 - II. Musaiger, A.O.

**FOOD AND NUTRITION IN THE
ARABIAN GULF COUNTRIES**
AN ANNOTATED BIBLIOGRAPHY

CORRECTIONS

Page

- v second line add Qatar
- vii first paragraph, last line: ..20,000 US dollars....
- 9 third abstract: Alloush not Allowwh
- 56 second abstract: Al-Awadi, F. not Al-Awadi,
- 65 second abstract, third line: older children not order children
- 88 second abstract: J. Egyptian not J. Egyption
- 94 second abstract: J. Trop. Med. Hyg. not J. Trop. Ped. Hyg.
- 95 third abstract, direct microscopic not microscopie
hookworms not hookworks
E. histolytica not E. histolytics
T. trichiura not T. trichura

ACKNOWLEDGEMENTS

This work would not be done without the support from the Near East Regional Office of the Food and Agriculture Organization of the United Nations and the Ministry of Health, Bahrain.

The author is grateful to Mr. Ezzeddine Boutrif, food science officer of the Food and Nutrition Policy Division, FAO, for reviewing the materials in this document and for his valuable comments.

PREFACE

This document is a first attempt to summarize the literature related to food and nutrition in the Arabian Gulf countries namely Bahrain, Kuwait, Oman, Saudi Arabia and United Arab Emirates.

The purpose of this bibliography is to provide nutritionists, food scientists and researchers interested in food and nutrition in the Gulf region with information which can be of assistance to them in their work. It contains the abstracts of published papers, books and reports during the period 1974 and 1989. Only publications directly related to human nutrition and food science in the Gulf are included.

Abstracts were directly reproduced, however, in many cases they were adapted and modified in order to be more informative. If the abstract was not provided, the abstract included was done by the author. Abstracts of materials written in Arabic were translated by the author to English.

The origin language of the articles, other than English, was mentioned at the end of their titles, as A for Arabic and G for German.

The present bibliography is far from being exhaustive as there are many other literature which were not accessible to the author. Therefore, researchers to whom their papers are missing in this edition of the bibliography can send their publications to the author so that it can be included in the future edition.

A.O. Musaiger

BACKGROUND*

Land and Population

The Arab Gulf countries namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates have similar social, economic, and geographical characteristics, with common food and nutrition problems. These countries are small in size varying from 678 Km² for Bahrain to 84000 Km² for UAE. The exception is Oman and Saudi Arabia which are 300,000 Km² and 2.15 million Km², respectively. The estimated total population of all these countries is about 17 millions, of whom Saudi Arabia alone represents 70% of the total. In general all Arab Gulf countries have a small population with a high percentage of expatriates. The percentage of non-national range from 28.4% in Saudi Arabia to 63.8% in UAE. Population growth rates are very high (4.5 – 13.4%), which is mainly due to an increase of immigrants and a rise in the national population. The Gulf countries enjoy a high percapita income which varies from 7,000 for Oman to 20,000 for the UAE.

Food Production

Despite efforts to increase food production in the Gulf countries, the contribution of agriculture to gross domestic product does not exceed 1% in all countries, except Saudi Arabia and Oman where it reaches 3%. The efforts to increase food production in this region are facing many difficulties; low quality of cultivated land, unfavourable environment for growing many crops and raising animals, salinity and soil deterioration, decline in arable land through urbanization, shortage of water resources and lack of quality and quantity of agricultural manpower. The severe shortage in food production has made the Gulf region highly dependent on food importation. Most of these countries have deficiencies in achieving self-sufficiency particularly in cereals, vegetables, fruits, and meat. Some progress has recently been achieved for self-sufficiency in fish, eggs and milk.

Food Consumption Patterns

There has been a drastic change in food consumption patterns with the increased incomes as a result of the oil boom. The traditional diet which consisted of dates, milk, rice, bread, and fish has changed to a more diversified diet. Red meat is consumed more frequently than fish or poultry. Rice is still the most staple cereal and it is eaten almost daily with other complements. Wheat is mainly consumed as bread. Milk and dairy products became essential items in meals. Nuts, seeds, soft drinks, corn puffs, potato chips and sweets are the main foods consumed in between meals and snacks. Fast foods such as beef-burgers, fried chicken, hot dogs and milkshake are widely consumed.

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

The high percentage of immigrants with various nationalities has also influenced food consumption patterns by introducing many food habits to the region. Many foods were introduced by immigrants and become popular among Gulf inhabitants. However, it is important to mention that the influence of immigrants differed from one country to another because of their nationalities and percentage in each country.

Health and Nutrition Situation

The rapid economic growth of the Gulf countries had led to a drastic change in the life-styles of people including their health and nutrition status. The picture of morbidity has changed dramatically. Infectious diseases such as malaria, bacillary dysentery, amoebiasis, whooping cough, tuberculosis, trachoma and poliomyelitis were considered the main health problems in the Gulf. Nowadays, cardiovascular diseases, diabetes mellitus, obesity and hypertension are the major public health problems.

Several nutritional surveys carried out during the 1980's in the Gulf region revealed that the main nutritional problems are: undernutrition particularly among infants and young children, iron-deficiency anaemia, vitamin D deficiency, diseases associated with excess in food intake such as obesity and its complications such as hypertension, diabetes and heart diseases.

In general health programmes in this region focus on improving the curative health services and little attention was given to preventive services. This makes difficulty to prevent and control many health and nutritional diseases, especially those associated with affluence.

CONTENTS

	<i>Page</i>
Composition of foods	1
Food Consumption patterns	19
Infant feeding practices	31
Nutrition anthropometry	41
Nutrition related diseases	55
Nutrition education and communication	75
Food control	79
Others	85

Chapter 1

COMPOSITION OF FOODS

...

...

...

Abu-lehia, I.H. Composition of camel milk. *Milchwissenschaft* 42(6): 368-371. (1987)

Camel milk samples were taken biweekly for a period of approximately 3 months during the winter/spring season, from 5 shops located in Riyadh city. Samples were analysed in duplicate by standard methods for total solids, total protein, casein, non-casein nitrogen, non-protein nitrogen, fat, lactose, titratable acidity and ash. The averaged results, with \pm standard deviation were $11.29 \pm 0.57\%$, $2.78 \pm 0.12\%$, $1.90 \pm 0.13\%$, $0.77 \pm 0.01\%$, $0.17 \pm 0.01\%$, $3.13 \pm 0.15\%$, $4.67 \pm 0.11\%$, $0.15 \pm 0.01\%$, and $0.802 \pm 0.036\%$, respectively. The percentage of casein and titratable acidity in camel milk were substantially lower than those in cow milk while the percentages of whey protein and ash were significantly higher than those in cow milk. The levels in camel milk of K, Mg, Fe and Cu were higher and Ca, P and Zn were relatively lower than in cow milk.

Al-Jebrin, A. et al. Chemical and nutritional quality of some Saudi Arabian dishes based on cereals and legumes. 1. Proximate composition, amino acid contents and nutritive value. *Ecol.Food Nutr.* 17:157-164. (1985)

Chemical composition and nutritional quality of six popular Saudi Arabian dishes based on cereals and/or legumes were studied. The dishes contained 54-78.5% moisture, 2.6-7.5% protein, 0.5-4.9% fat, 0.1-1.8% crude fiber, 0.3-1.8% ash, 12.6-38.7% carbohydrates (by difference) and 92-193 Kcal per 100g dish. The most deficient essential amino acids were either tryptophan (in 4 dishes), or lysine (in one dish) or total sulphur amino acids (methionine + cystine, in one dish). The chemical scores ranged from 26 to 67. The in-vitro protein digestibility (IVPD) and calculated protein efficiency ratio (C-PER) values ranged from 77.9 to 88.9% and 0.45 to 2.01, respectively. Under identical conditions, the Animal Nutrition Research Council casein showed IVPD and C-PER values of 90.0% and 2.50, respectively. The nutrition significance of these results were discussed.

Al-Jebrin, A. et al. Chemical and nutritional quality of some cereal and legume based Saudi Arabian dishes. II. Mineral and vitamin contents. *Ecol.Food Nutr.* 17: 354-352. (1985)

Six Saudi Arabian dishes based on cereals or legumes were analyzed for nine mineral elements and vitamins. Results indicated the following concentrations (mg/100 g): sodium 14-590, potassium 24-215, calcium 21-37, phosphorus 61-123, magnesium 22-31, iron 0.25-2.22, zinc 0.26-0.94, copper 0.23-0.47, and manganese 0.36-1.14. The concentration of the vitamins were: vitamin A 5-16 Retinol Equivalents/100 g,

thiamine 0.031-0.106 mg/100 g, riboflavin 0.013-0.114 mg/100 g, pyridoxine 0.021-0.078 mg/100 g, niacin 0.667-1.749 mg/100 g, folacin 3-37 mg/100 g and pantothenic acid 0.100-0.366 mg/100 g. These results are discussed in relation to the Recommended Dietary Allowances for U.S.

Al-Mashhadi, A.S. et al. Traditional fermented dairy products in Saudi Arabia. Cultured Dairy Products 22(1): 24- 26, 28,33. (1987)

The chemical composition and microbiological quality of three traditional fermented foods namely cheese, laban (butter-milk) and madeer were studied. Composition of fresh and aged cheese ranged between 29.9-60.5% total solids (TS), 18-26.3% protein, 16.1-36% fat, and 2.0-3.2% ash. Average composition of laban was 7.7% TS, 3.4% protein, 0.5% fat, 2.1% lactose and 0.7% ash. Average composition of madeer was 91.8% TS, 36.4% protein, 13.4% fat, and 7.6% ash.

Al-Mohizea, I.S., El-Behery, M.M. & Hablass, M.A. Physico-Chemical characteristics of jujube fruits grown in the Central Region of Saudi Arabia. J.Coll.Agric.King Saud Univ. 8(2):337-344. (1986)

The physico-chemical characteristics of Jujube (*Zizyphus spina christi*) fruit grown in the central region of Saudi Arabia were investigated. The fruit is of a relatively small size and low pulp content. The chemical analysis showed that the ripe fruit pulp contained, on dry matter basis, 10.09% protein, 1.89% fat, 38.12% carbohydrates and 4.42% ash. Ascorbic acid content in the ripe stage was 50.44 mg/100g pulp while it was highest in the pre-ripe stage (80.93 mg/100g pulp). Among nine minerals determined in the ripe stage, potassium was present in a relatively appreciable amount (380 mg/100g pulp). The amino acid profile of jujube protein indicated that threonine was found in a high concentration compared to the resembling fruits.

Ba-angood, S.A., & Ahmed,M.S. Chemical composition of major date cultivars grown in the United Arab Emirates. Date Palm J. 3(2):381-394. (1984)

This study was conducted to determine the chemical composition of 64 cultivars of dates grown in the UAE. The contents of ash, crude protein and reducing sugars were 1.5 - 4.8%, 2.0-5.7% and 27.8 - 88.2%, respectively. Macro-element analysis showed that these dates contained high level of K (400-1960 mg/100g dry wt). The concentration of other elements were 25-220 mg/100g for Na, 11-182 mg/100g for Ca, 45-171 mg/100g for Mg, and 42-121 mg for P per 100g of dry weight. The micro-element levels were relatively low ranging from 1.0 to 8.7 mg for Fe, 0.40 1.2 mg for Mn, 0.10-2.15 mg for Zn and 0.10-1.0 mg for Cu per 100g of dry weight.

Eid, N. & Bourisly, N. Suggested level for fortification of flour and bread in Kuwait. Nutr. Rep.Int. 33(1): 241-245. (1986)

The effect of milling practices on the micronutrients in white flour commercially produced in Kuwait was studied to suggest a premixture for fortification and to evaluate the fortified bread. For enrichment, a pre-mixture having the following composition: thiamin, 0.5 mg; riboflavin, 0.2 mg; niacin, 6.0 mg; and iron, 1.7 mg per 100 g flour was suggested for fortifying white flour of 78% extraction. The fortified Arabic and Iranian types of bread were acceptable to taste panels. The added vitamins showed good stability in the fortified Arabic bread; less stability of the vitamins was found in the fortified Iranian bread.

Eid, N. et al. Fortification of Flour and Bread in Kuwait. Kuwait Institute for Scientific Research. Kuwait. 65p. (1983)

This study was aimed at surveying the different types of bread consumed, methods of baking and the effect of the milling process on the nutrient content of flour produced in order to suggest recommendations for the fortification of flour and bread in Kuwait. A bread consumption survey among 1420 subjects revealed that the overall average bread consumption was 277 g/capita/day. Sex, age, nationality and work activity significantly affected bread consumption. Arabic bread was found to be the major bread type consumed, followed by Iranian bread. Conversion of wheat to flour according to the commercial milling practised in Kuwait resulted in downgrading of Mg, Fe, Zn, vit B1, vit B2 and niacin, in a descending order, in the flour produced. A premixture of vitamins and minerals having the following composition: thiamin, 0.54 mg; riboflavin, 0.23 mg; niacin, 6.6 mg; and iron 1.9 mg per 100 g flour was suggested for fortification of white flour of 78% extraction. The fortified Arabic and Iranian bread types were acceptable since no significant difference was detected either in taste or flavour compared to the respective unfortified types. The added vitamins showed good stability in fortified Arabic bread; less stability of the vitamins was found in fortified Iranian bread. The cost of fortification is reasonable and effectively increased the contribution of the bread to the fulfillment of the daily requirements by 80% of niacin, 50% of both iron and thiamin and 23% of riboflavin.

El-Karim, H.A.A. & Bamheer, A.M.S. Vitamin C content of vegetables and fruits available in Saudi Arabia. Zeitschrift fur Ernährungswissenschaft. 18(3): 213-216(G). (1979)

Mean values of vitamin C in the edible portion of 27 vegetables and fruits obtained from Jeddah, Saudi Arabia were reported. The mean values ranged from 6.5 to 216 mg/100 g. In general the vitamin C values in these vegetables and fruits were found to be lower than those reported in other countries.

El-Shaarawy, M.I. & Mesallam, A.S. Feasibility of Saudi wheat flour enriched with cottonseed flour for bread making. Z Ernährungswiss. 26:100-106. (1987)

Three samples of edible grade cottonseed flour (cosf) were utilized each in 5%, 10%

and 15% mixtures with Saudi wheat flour for bread making. Addition of cosf increased water absorption of the dough. Times of dough mixing, stability and break-down were slightly increased at the low addition level, but adversely shortened at the higher levels, where mixing tolerance was doubled or tripled. Up to 5-10% of cosf could be tolerated without deleterious effect on dough properties or bread quality, depending on the source of the additive and method of preparation. An increase of 25-50% in protein content of bread was expected.

Hussein, M.A. & Eid, N.M. Nutrient components of truffles. *Nahrung*. 24(8):811-812. (1980)

Nutrient composition of truffles (*Terfexia* sp) obtained from Kuwait and Saudi Arabia were determined. The level of nutrients in Kuwait and Saudi truffles were found respectively as follows (% dry weight basis): N, 6.3 and 2.7; fat, 7.2 and 6.8. Values for the vitamin concentration were only given for Kuwaiti truffles (mg/100 g fresh wt.): L-ascorbic acid, 24.20; thiamin, 0.02, and riboflavin, 0.19. Corresponding data for level of minerals in Kuwaiti truffles were (mg/100 g dry wt.): K, 1456; Ca, 512; Mg, 904; Zn, 107; Cu, 93; Fe, 66; and Mn, 8. Comparison with the FAO amino acid reference pattern showed that Kuwaiti truffles were rich in phenylalanine, tyrosine and S-amino acids, but very low in isoleucine, leucine and lysine.

Kamel, B. Proximate, macro and micro elements analysis of Arabian Gulf fish. *Lebensum.Wiss.U.Technol*. 15:22-25. (1982)

This study investigated the proximate composition, macro and micro elements content of 28 species of the commonly consumed fish and shrimp in the Arabian Gulf. The average proximate composition was found to be 76.25% for moisture, 19.63% for protein, 2.85% for fat, 1.45% for ash. The average mineral contents were 53.5, 264.7, 387.7, 33.6, 109.2, 0.98 and 0.93 mg/100g of Ca, P, K, Mg, Na, Fe and Zn, respectively. In relation to the Recommended Dietary Allowances (RDA), 100 grams of fish supply 35, 6.7, 33, 9.6, 9.8 and 6.2% of the requirements for an adult male of protein, Ca, P, Mg, Fe and Zn, respectively. Micro elements such as Cu, Mn, Ni, and V were found in all fish species investigated with an average concentration of 92.1, 62.7, 29.8 and 4.4 U_g/100g, respectively. Certain species were found to contain Pb, Cd and Hg.

Kamel, B.S. & Allam, M. Composition of Foods Consumed in Kuwait, Phase I. *Kuwait Institute for Scientific Research, Kuwait*. 28p. (1979)

Proximate and mineral (P, Na, Ca, Mg, Fe, and K) compositions of 191 foods and 36 composite dishes commonly consumed in Kuwait were obtained through chemical analysis. The food items analysed were categorized into ten groups; cereals and cereals products, dairy and dairy products, sweets, fruits, vegetables, nuts and seeds,

meat, poultry, fish and seafood, spices and condiments, beverages, and composite dishes.

Kamel, B.S. & Allam, M. Composition and Protein Quality of Foods Consumed in Kuwait. Phase II. Kuwait Institute for Scientific Research, Kuwait. 43p. (1980)

The food composition tables recorded here include data on 232 foods in the form of menu items, snacks and market products. Some of the food items are ready to eat, some require preparation in varying degrees and some are used as ingredients in preparing other products. The data reported include water, food energy, protein, fat, ash and carbohydrates. The content of minerals (zinc, potassium, iron, magnesium, calcium, sodium and phosphorus), vitamin C, and percent refuse are included. The values refer to the amount supplied by the edible part of the designated food items.

Kamel, B., Bond, C. & Allam, M. Composition and Protein Quality of Foods Consumed in Kuwait; Protein Quality and Amino Acid Analysis of Food. Kuwait Institute for Scientific Research, Kuwait. 21p. (1980)

Protein quality assay and amino acid analysis are two different methods of assessing nutritional quality of foods. Nineteen Kuwaiti and Arabic sweets and twenty-six Kuwaiti dishes were analysed in this study in order to determine their protein digestibility and their amino acid content. The data show a direct relationship between the two methods. The food items with low essential amino acid content have a lower protein quality. The average protein content of Arabic and Kuwaiti sweets were 12.5 g/100 g on dry weight basis and their average Relative Nutritive Value (RNV) was 42%, which is relatively low. Such low value in sweets was due to low lysine and sulfur containing amino acids in flour which was the main ingredients in such products. On the other hand, Kuwaiti composite dishes were found to have an average protein content of 34.4 g/100 g and RNV of 75.8%. Although most of the composite Kuwaiti dishes used rice as a basic ingredient, their RNV was relatively high due to their content of meat and fish.

Khalil, J.K. et al. Chemical composition and nutritional quality of sorghum flour and bread. Qual.plant Foods Hum. Nutr. 34:141-150. (1984)

This study was undertaken to investigate the chemical composition and nutritional quality of two abundant sorghum cultivars, white and reddish-white, and the effect of baking on the sorghum bread. The two cultivars were found to be similar in proximate composition, mineral profile, fatty acid composition, vitamin content (except vit-B12 which was higher in reddish-white sorghum), in protein digestibility (IVPD), and calculated protein efficiency ratio (C-PER). Tannins level was higher in reddish-white (0.27 catechin equivalent) compared to white sorghum (0.09% catechin equivalent). Lysine was the first limiting amino acids in both cultivars with

chemical scores of 45 and 47 for the protein of white and reddish-white cultivars, respectively. Baking had no effect on proximate, fatty acid and amino acid composition. Na and Ca contents increased with baking, while K, P and pantothenic acid levels decreased. Tannins were not detected in the breads. Fermented breads (for 18 hours) had higher vitamin-B12 and pantothenic acid levels, but lower P content than unfermented breads. A slight increase in tyrosine, lysine, methionine contents as well as C-PER was also observed in fermented breads.

Khalil, J.K. et al. Fortification of date bars with yeast proteins and dry skim milk. Can. Inst. Food Sci. Technol. J. 17(3): 131-136. (1984)

In an attempt to produce palatable high protein and high energy date bars, plain and chocolate-coated bars were fortified with yeast proteins (Toruway (T) or Z yeast (Z) and dry skim milk (DSM) in different proportions (9% T + 6.5% DSM; 12% T + 3.5% DSM; 20% Z + 11.5% DSM and 4% Z + 9% DSM). The fortified bars showed higher amounts of protein, fat, fiber, ash, Na, K, Ca, Mg and P, compared to the unfortified date bar. Fortification also improved the amino acid profile resulting in an approximately two-fold increase in the chemical score. The in-vitro protein digestibility (IVPD) value (77.8%) increased only slightly but the calculated protein efficiency ration (C-PER) increased significantly ($P < 0.05$) from 1.36 to 2.35-2.43 as a result of fortification. In comparison, IVPD and C-PER values for ANRC-Casein were 90.0% and 2.50, respectively. Milk chocolate bars C-PER values were equal to that of casein. Sensory evaluation data showed that all the bars were equally acceptable and could be stored for six months at ambient temperature without significant loss of quality attributes. 9% T + 6.5% DSM or 2% Z + 11.5% DSM were the optimum economic levels of supplementation in terms of nutritive benefit.

Khalil, J.K. & Sawaya, W.N. Mineral and vitamin contents of Saudi Arabian pearl millet flour and bread. Cereal Chem 61(4): 301-304

Flour and bread made from pearl millet obtained from Saudi Arabia were analyzed for their mineral and vitamin composition. The level of minerals (mg/100g) in the flour and bread were, respectively: Na, 17 and 102; K, 420 and 239; Ca 22 and 23; P, 338 and 250; Mg, 44 and 37; Fe, 3.35 and 3.09; Zn, 1.88 and 0.96; Cu, 0.68 and 0.55, and Mn, 3.09 and 1.89. The concentration of B-carotene was low in both flour and bread (< 0.01 mg/100g). The levels of vitamins (mg/100g) in the flour and bread were, respectively: thiamine, 0.27 and 0.17; riboflavin, 0.15 and 0.11; pyridoxine, 0.27 and 0.24; niacin, 0.89 and 0.87; pantothenic acid, 1.40 and 0.71; folic acid (μ g/100g), 34.9 and 18.3; and vitamin B12 (mg/100g), 0.07 and 0.05. In relation with US RDA it was found that for both male and female adults, 100g of fresh millet bread provide approximately 3% of Ca, 6% of Zn, 11-12% of Mg, 31% of P, 17-31% of Fe, 2% of vitamin B12, 5% of folic acid, 5-6% of niacin, 6-8% of riboflavin, 11-12% of pyridoxine, and 11-15% of thiamine.

Khatchadourisan, H.A., Sawaya, W.N. & Bayoumi, M.I. The chemical composition and rheological properties of flours milled from two major wheat varieties grown in Saudi Arabia. Cereal Chem. 62(5): 416-418. (1985)

The chemical composition, mineral contents, and rheological properties of flour samples obtained from two major wheat varieties grown in the Kingdom of Saudi Arabia, Yecora Rojo and Probred, were studied. Results indicated that these flours contained relatively high levels of protein, when compared to other flours, but similar levels of crude fiber, ash, and fat. Probred was higher in protein (16.03%) than Yecora Rojo (14.19%). Other constituents such as crude fat, crude fiber, ash, and nitrogen-free extract were present in comparable amounts in both flours. The mineral profiles of the two flours were comparable except for a slightly higher iron content in Probred. The sodium level in both flours was relatively high. Data on the rheological properties indicated desirable physical characteristics for breadmaking.

Kordy, M.T. & Fonseka, C. Fluoride concentration in drinking water in the City of Riyadh. Saudi Med.J. 5(3): 336-338. (1984)

The fluoride concentration in drinking water in Riyadh was estimated spectrophotometrically in samples of tap water, well water, bottled table-water and water obtained from treatment works in the city. The fluoride concentration in tap water was within the optimum range of dental health, but its concentration in 11 of 13 samples from the other sources was well below the optimum. It is concluded that a large number of people in Riyadh who do not use tap water for drinking and cooking purposes are being deprived from a beneficial factor whose effect on reducing the incidence of dental caries has been well established.

Matter, A.A. Investigation Into Fluorides in Bahrain. Bahrain Centre for Studies and Research, Bahrain. 22p. (1986)

Investigation on fluoride contents of various sources of drinking water in Bahrain (desalinated, blended, imported natural mineral waters and soft drinks) was carried out. A 24 hour urinary fluoride excretion of 9 subjects living in Bahrain was also determined. The results showed a high fluoride content in ground water. Fluoride content of the other drinking waters, with few exceptions, was low. Analysis of the 24-hour urinary fluoride excretion showed that Bahraini residents excrete more fluoride than do others living in cooler climates. Recommendations concerning optimum fluoride content and fluoride supplements are included in the appendix.

Mesallam, A.S. & El-Shaarawy, M.I. Quality attributes of honey in Saudi Arabia. Food Chem. 25:1-11. (1987)

The properties of locally produced and imported honeys on Saudi market are compared to evaluate their native qualities and compliance with specifications set by the Saudi Arabia Standard Organization (SASO). Samples of locally produced honey complied with almost all SASO requirements. Only two samples had higher sucrose content than that set by SASO. This may be attributable to lack of ripening. Samples of imported honey had lower soluble solids, reducing sugars, fructose to glucose ratio and diastatic activity, but higher moisture content, insoluble solids and hydroxymethylfurfural (HMF) than the local samples, indicating better qualities of the latter. No differences were encountered in pH values or protein content between local and imported samples. The high HMF content of some of the imported samples indicated their adulteration with invert sugar.

Musaiger, A.O. Traditional Dishes of Bahrain, Methods of Preparation and Its Nutritive Value. Al-Yamani Commercial and Management Services Bureau, Bahrain, 52p. (1988)

This booklet provides information on the method of preparation of 41 traditional dishes in Bahrain and their nutritive values. Data on nutrients composition of the dishes provided were extracted from direct chemical analysis and calculation from ingredients of the dishes. Information on moisture, protein, fat, fiber, carbohydrates, energy, calcium, iron, and vitamin C contents for each dish is included. The booklet is divided into three parts, main dishes, snacks and sweets.

Musaiger, A.O., Abu-Dagga, F. & Allowh, S. Nutrients composition of flours used in preparation of various breads in Bahrain. Food Chem. 27:107-113. (1988)

This paper attempted to determine the chemical and amino acid composition of various flour mixtures used in preparation of breads commercially produced in Bahrain. Proximate composition was found to be comparable in the four flour mixtures studied. All flour mixtures had low levels of fiber (0.3-0.5 g/100g), indicating low extraction rates of flours used in preparing bread. Mineral analysis was also comparable, except for K and P. The sodium value (7.7mg/100g) of flour mixture used in tanoor bread, the local bread, was higher than that of other flour mixtures (3.1-4.0 mg/100g), possibly due to contamination of flour with salt during the blending process. No major differences were observed between the amino acid profiles of the flour mixtures studied. All flour mixtures contained low levels of lysine, isoleucine, valine and threonine when compared with the FAO/WHO reference protein.

Musaiger, A.O. & Al Dallal, Z. Food Composition Tables for Use in Bahrain. Nutrition Unit, Ministry of Health Bahrain. 75p. (1985)

This booklet provides information on the nutrient composition of foods and dishes commonly consumed in Bahrain. Information includes proximate analysis, mineral

and vitamin contents. Data were extracted from literatures, direct chemical analysis and calculations from the ingredients of the composite dishes. The book is divided into three parts, Composition of foods, Composition of dishes and ready-made foods, and appendices on chemical composition of tap water, cholesterol content of certain foods and index of scientific names of foods included.

Musaiger, A.O., Alloush, S. & Abu-Dagga, F. Chemical and amino acid composition of various breads consumed in Bahrain. *Ecol. Food Nutr.* 21:211-217. (1988)

Four kinds of bread commonly consumed in Bahrain, namely Tanoor, Chapati, Arabic and European breads were analyzed for their chemical and amino acid composition. No major variations were observed in the ash, fiber and protein levels. The moisture content of Arabic bread (25.5%) was lower than that of other breads (29.5-31.8%). Fat was highest in European bread (4.8%), and lowest in both Arabic and Tanoor breads (1.2%). No significant differences in the levels of iron, copper, zinc and magnesium were found. All breads showed high content values of sodium (277-534 mg/100g). The amino acid profile was comparable in all breads. Lysine and threonine were the first and second limiting amino acids when compared with the FAO/WHO provisional pattern. The nutritional and health significance of the findings were discussed.

Rizk, A.K. Hammouda, F.M. & Hussein, L. Constituents of plants growing in Qatar. III. Nutritive Constituents of garawah (*Glossonema edule*). *Qual.Plant Foods Hum. Nutr.* 33(1):71-76. (1983)

Proximate, mineral, amino acids and fatty acids compositions of the pericarp and the seeds of unripe garawah fruit (*Glossonema edule*) were determined. Values for composition of pericarp and seeds were respectively as follows (on dry matter basis): Protein 11.05 and 19.45%; lipid 3.67 and 1.44%; crude fibre 16.60 and 4.29%; soluble carbohydrate 59.70 and 67.92%; ash 7.80 and 6.40% ; Fe 3.72 and 3.66 mg/100 g; Zn 1.15 and 2.70 mg/100 g. Essential amino acids/total amino acid ratio was 34.35 for pericarp and 34.1 for seeds. Palmitic acid predominated in both pericarp and seeds followed by oleic, stearic and linoleic acids.

Sawaya, W.N. et al. Fruit growth and composition of Khudari, Sillaj and Sifri date cultivars grown in Saudi Arabia. In proceedings of The First Symposium on Date Palm. King Faisal University, Saudi Arabia. 202-210. (1982)

Date cultivars, Khudari, Sillaj and Sifri were studied for physical characteristics and chemical composition at four stages of fruit maturity. Higher values of fruit and seed weight as well as length and diameter were observed during the early stages of development and minimum in the Tamre stage. The content of all three cultivars in moisture, crude protein, crude fat, crude fiber, ash, vitamin-A, vitamin-C, tannins and

mineral elements were at maximum at the Kimri stage and at minimum at the Tamre stage. Total sugars and reducing sugars contents increased, from the Kimri to the Tamre stage while non-reducing sugars (comprised only of sucrose) increased in the Khalal stage and then dropped sharply to low level in the Tamre stage. The dominance of the reducing sugars and the low sucrose levels at the Tamre stage, indicate that the cultivars belong to the group of soft-dates. Among the mineral elements, potassium was the highest and sodium the lowest. Of the micro-elements, manganese was present in traces while fluoride was completely absent. Iron was present in higher concentration than copper and zinc. The amount of iron and copper present in 100 g dates on dry weight basis represented 20-30% of the U.S. Recommended Dietary Allowances.

Sawaya, W.N. et al. Growth and compositional changes during the various developmental stages of some Saudi Arabian date cultivars. J. Food Sci. 47(5): 1489-1492. (1982)

Compositional changes during fruit maturation were studied in two important date cultivars grown in Saudi Arabia. Physical analyses showed that the fruit weight, length, diameter and weight of seed were highest at the mature color stage. Chemical analyses including moisture, total nitrogen, fat, fiber, ash, tannins, vitamin C, B-carotene, and 10 nutritionally essential minerals showed that all were highest at the early stages of development and decreased during maturation. Reducing sugars were dominant in both cultivars and showed progressive increase during ripening with fructose and glucose as the only detected constituents. Sucrose content reached its maximum in both cultivars at the mature color stage then dropped sharply at the ripe stage. The total sugar content in both cultivars tended to increase all throughout maturation.

Sawaya, W.N. et al. Physical measurements, proximate analysis, and nutrient elements content of twenty-five date cultivars grown in Saudi Arabia at the Khalal (mature color) and tamer (ripe) stages. In proceeding of the First Symposium on The Date Palm, College of Agricultural Sciences and Food. King Faisal University, Al-Hassa, Saudi Arabia. 454-467. (1982)

Physical measurements including weight of fruits and weight of seed/fruit ratio on twenty-five date cultivars grown in Saudi Arabia showed great variation. The average weight of fruits at the Khalal stage varied between 9.12-26.8g and at the tamer stage varied between 5.92-18.26g. The weight of the seed/fruit ratio ranged from 0.79-1.84 in the Khalal stage and 0.62 - 1.25 at the Tamer stage. Proximate analyses results revealed low levels of fat and nitrogen at both stages of development, high levels of fiber, and fair amounts of ash. The levels of fat, nitrogen and fiber showed a consistent trend of decrease from the Khalal to the Tamer stage while the ash content maintained almost the same level at both stages. Results of the mineral analyses showed a high

content of K, low amount of Na and fair amounts of Ca, P, and Mg. The micronutrient contents revealed fair levels of Fe, Cu and Zn, traces of Mn, and the absence of F. The change from the Khalal to the Tamer stage was accompanied by a reduction in the amounts of all minerals for all the cultivars.

Sawaya, W.N. et al. Physical and chemical characterization of the major date varieties grown in Saudi Arabia. II. Sugars, tannins, vitamins A and C. Date Palm J. 2(2): 183-196. (1983)

Sugars, tannins, vitamin C and vitamin A analyses were done on fifty-five date varieties (*Phoenix dactylifera* L.) grown in Saudi Arabia at two different stages of maturity, Khalal (mature-colour) and Tamer (ripe). Results of the chemical and high pressure liquid chromatography analyses showed that the total sugar as well as reducing sugar contents were higher in the Tamer stage than at the Khalal stage. Sucrose content was higher at the Khalal than at the Tamer stage. Glucose and fructose were the only sugar monomers detected. In general, the majority of the local date varieties investigated were found to be the soft-date type characterized by the dominance of reducing sugars. Tannin content of the dates was substantial at the Khalal stage (1.2-6.7%) and then decreased at the Tamer stage (0.6-3.2%). In general, vitamin C content was low but higher at the Khalal stage (1.8-14.3 mg%) than at the Tamer stage (1.1-6.1 mg%). The concentration of (B-carotene expressed as International Units of vitamin A was substantial at the Khalal stage of maturity but very low or absent at the ripe Tamer stage suggesting that dates are a poor source of vitamin A.

Sawaya, W.N. et al. Physical and chemical characterization of three Saudi date cultivars at various stages of development. Can.Inst.Food Sci.Technol.J. 16(2): 87-91. (1983)

The aim of this study was to obtain data on the growth characteristics and chemical composition of three major date cultivars (Barni, Ruzeiz and Sifri), which are widely cultivated and consumed in Saudi Arabia. Maximum values, for weights, lengths and diameters of the fruits, as well as weight for seeds were observed during the early development stages and minimum values were found in the ripe (Tamer) stage. Similarly, fruits of the three cultivars contained maximum levels of moisture, crude protein, fat, crude fiber, ash, tannins, vitamins A and C in the early development stages, and minimum amounts in the Tamer stage. However, total sugar and reducing sugars contents increased progressively as the fruits matured. Sucrose contents became highest in the mature color khalal stage and then decreased to the lowest level in the Tamer stage. Reducing sugars were the dominant sugars throughout the ripening process and more so at the ripe stage suggesting that the three date cultivars under investigation were of the soft date type. Among the mineral elements, K was detected in high concentration compared to Na, Ca, Mg, P, Fe and Cu which were

presented in nutritionally significant amounts. Zinc was present in low amounts, while Mn was present in traces. All the minerals decreased with maturation of the fruits.

Sawaya, W.N. et al. Sugars, tannins and some vitamins contents of twenty-five date cultivars grown in Saudi Arabia at the Khalal (mature color) and tamer (ripe) stages. In proceeding of The First Symposium on The Date Palm, College of Agricultural Sciences and Food, King Faisal University, Al-Hassa, Saudi Arabia, 468-478. (1982)

Twenty-five date cultivars, *Phoenix dactylifera*, L., collected from four date-growing regions of the Kingdom of Saudi Arabia were studied at the Khalal (mature color) and Tamer (ripe) stages of maturity for their sugar, tannins and vitamins A and C contents. The total sugars and reducing sugars were, in general, higher in the Tamer stage while sucrose was higher in the Khalal stage. On the basis of the relative abundance of reducing to non-reducing sugars, all the cultivars except two were found to be soft-date type. Two cultivars, namely sukkarat Al-Shark and Sukkari, belonged to the group of semi-dry/dry date type. In all the cultivars, glucose and fructose were the only detected monomers. Tannins, vitamin-A and vitamin-C contents were higher at the Khalal stage and dropped to low levels in the Tamer stage. The studied date cultivars are considered to be a poor source of vitamin-A and vitamin-C contents especially at the Tamer stage.

Sawaya, et al. Studies on the chemical composition and nutritive value of sheep milk. *Milchwissenschaft*. 39(2): 90-93. (1984)

The chemical composition and nutritive value of ewe's milk of two breeds, Najdi and Nuaimi, of Saudi Arabia, were studied. The levels of milk constituents such as protein (4.9-5.2%), fat (5.1-6.5%) and total solids (16.2-17.1) respectively, were lower in both breeds compared to those of other sheep milks reported in the literature. The fatty acid profiles of the butterfat followed the same pattern as those of other sheep breeds, but minor differences were observed in the relative contents of certain fatty acids. The total sulphur amino acids were higher than those of cow milk proteins and those of some of the sheep milk of other breeds. The *in vitro* protein digestibility (81.4-82.3) was lower than that of ANRC casein while the C-PER values (2.60-2.73) were higher. Only minor differences were observed between the chemical composition and nutritional qualities of the milk of both breeds.

Sawaya, W.N. et al. Chemical composition and nutritive value of goat milk. *J.Dairy Sci*. 67(8):1655-1659. (1984)

Chemical analysis and nutritive value of goat milk of two breeds, Aardi and Masri indigenous of Saudi Arabia were investigated. Protein contents were 2.83% and 3.06% respectively, while that for fat were 3.28% and 3.41%, respectively. Both

protein and fat levels were lower than those of other goat milks. However, fatty acid profiles followed the same composition as milk fats of other goat breeds, whereas amino acids profiles revealed less sulphur amino acids. In vitro digestibility (86.2 and 87.0%, respectively), and protein efficiency ratio (2.84 and 2.57, respectively), were in general, comparable to those of cow's milk. No major differences were observed between chemical composition and nutritional qualities of milk of both breeds.

Sawaya, W.N. et al. The chemical composition and nutritive value of madeer. Ecol.Food Nutr. 55:29-37. (1984)

This paper investigated the chemical composition and nutritive value of a local hard cheese-like dairy product called madeer or (oggtt). This kind of cheese is made from goat's and/or sheep's milk by desert dwellers of Saudi Arabia. The cheese contained high amount of protein (35.5%) and fat (15.3%), and supply 424 kcal per 100 grams. It contained nutritionally significant amounts (mg/100g) of k(1991), Ca(982), P(957), pantothenic acid (1.45), riboflavin (0.40), thiamine (0.24), niacin (2.57) and folacin (50 ug/100g). Short-chain fatty acids (C4-C10) comprised 7.58% of the total fatty acids. Saturated fatty acids (C 12:0 - C 18:0) constituted the majority of fatty acids (60%). Oleic acid (25.78%) was the predominant unsaturated fatty acid, followed by linoleic (2.61%) and linolenic (1.29%) acids. The essential amino acids profile of this kind of cheese was higher than the FAO/WHO (1973) reference protein. The in-vitro protein digestibility (80.6%) was lower than that of ANRC-casein (90.0%), and the calculated protein efficiency ratio (2.69) was slightly higher than that of casein (2.50).

Sawaya, W.N. et al. Nutritional evaluation of various breads consumed in Saudi Arabia. Nutr.Rept.Int. 29(5): 1161-1170. (1984)

The chemical composition and nutritive value of five main types of bread consumed in Saudi Arabia were studied. They were white and brown Arabic breads, European, Yemeni and Samouli breads. The moisture content of the fresh breads varied between 31.6 to 38.1%. The highest level of protein was found in brown Arabic bread (10.8%), and the lowest in European bread (8%). The fat content was higher in European (3.5%) and Samouli (3.2%) breads compared to the remaining breads (0.2-0.3%). The mineral composition showed that the concentration of Na was very variable in the five breads. European bread contained higher amounts of Ca and P due to the inclusion of dry skimmed milk. However, in general, all breads were low in Ca giving rise to low Ca/P ratio. Thiamine (0.44-0.56 mg/100g), niacin (2.23-3.97 mg/100g) and riboflavin (0.07-0.15 mg/100g) were present in fairly good amounts in all breads. The amino acid composition data showed that lysine (33-39) was the first limiting essential amino acid in all the breads when compared to FAO/WHO reference protein. The in-vitro protein digestibility values of the breads (83.5-89.6%) showed minor variations. The calculated protein efficiency ratio values ranged between 0.70 in Yemeni bread to 1.21 in Samouli bread.

Sawaya, W.N. et al. Chemical composition and nutritional quality of tehineh (Sesame butter). *Food Chem.* 18:35-45. (1985)

The chemical composition and nutritional quality of tehineh, a paste of dehulled roasted sesame seeds, from Saudi Arabia and other countries, were studied. Results showed 24.7% protein, 58.9% fat, 2.3% fiber, 3.0% ash and <1.0% moisture. The tehineh contained relatively high amounts (mg/100 g) of P (692), Fe (7.19), Cu (1.96), Mn (1.46) and Zn (7.82) and low amounts of Ca (61) and Se (0.05). Gas-liquid chromatography (GLC) analysis of the oil revealed percentages of 42.4 for oleic, 39.7 for linoleic, 9.8 for palmitic and 6.4 for stearic acid. Lysine was the only limiting amino acid with a chemical score of 64, while the sulphur-containing amino acids (methionine + cystine) and tryptophan were present in amounts exceeding the requirement of the FAO/WHO (1973) reference protein. The in vitro protein digestibility (IVPD) value of 83.3% and the calculated protein efficiency ratio (C-PER), 2.14, were slightly higher than those of sesame seeds and both values were lower than the IVPD and C-PER of ANRC casein (90.0% and 2.50, respectively).

Sawaya, W.N. et al. Cholesterol contents and fatty acid composition of selected Saudi Arabian dishes. *Nutr. Rep. Int.* 31(3):593-600. (1985)

Twenty dishes commonly consumed in Saudi Arabia were analyzed for their cholesterol and fatty acid contents. The cholesterol content of the dishes ranged between 0.2-181.0 mg/100g dish of fresh weight basis. Shakshuka (composed of eggs, corn oil, tomatoes, and pepper) and Motabak malaham (composed of eggs, meat, oil and spices) contained the highest cholesterol level, 181 mg and 96.7 mg/100g, respectively, whereas Sawekah (wheat and butter) and motabak ma'moz (composed of eggs, banana, sugar and oil) came next in cholesterol contents, 26.0 mg and 24.5 mg/100g, respectively. Other dishes contained lower amounts of cholesterol between 0.2-13.2 mg/100g. Among the fatty acids, oleic, palmitic, linoleic and stearic acids were the predominant fatty acids. The polyunsaturated: monounsaturated: saturated fats ratios as well as polyunsaturated to saturated fat ratio (P:S) were generally not compatible with the values of the fifth dietary goal set by the U.S. Senate Select Committee on Nutrition and Human Needs in 1977.

Sawaya, W.N., et al. Chemical composition and nutritional quality of halva. *Nutr.Rept.Int.* 31(2): 389-397. (1985)

This paper reports the chemical composition and nutritive value of halva (halawa), a mixture of sesame butter and sugar. The proximate composition was 14% for protein, 31.6% for fat, 1.67% for crude fiber, 1.68% for ash and 2.95% for moisture. A high percentage of unsaturated fatty acids was shown (83%). Oleic (41.9%) and Linoleic (40.6%) were the dominant unsaturated fatty acids. The mineral contents of halva showed relatively higher levels of Ca (41 mg/100g), P (381 mg/100g) and Fe

(5.84 mg/100g) when compared to values reported in other Middle Eastern countries. The amino acid composition revealed that lysine was the first limiting amino acid resulting in chemical score of 64 for the protein. Sulphur amino acids (methionine + cystine), and tryptophan were present in amounts exceeding those of the FAO/WHO reference protein, except threonine which was 97% of the reference. The in-vitro protein digestibility and calculated protein efficiency ratio were 86.2%, and 2.17 respectively, compared to 90% and 2.50, respectively for casein. It was concluded that halva can be considered a nutritious food and easily digestible.

Sawaya, et al. Mineral and vitamin contents of sheep milk. Milchwissenschaft 40(2): 81-83. (1985)

Nine vitamins and mineral elements were determined in ewe's milk of two Saudi Arabian breeds, Najdi and Nuaimi. The levels of the different vitamins in the milk of both, Najdi and Nuaimi, respectively, were: vitamin A, 148 and 172 IU/100 g; thiamine, 0.072 and 0.077 mg/100 g; riboflavin, 0.206 and 0.270 mg/100 g; vitamin B6, 0.017 and 0.017 mg/100 g; niacin, 0.222 and 0.258 mg/100 g; pantothenic acid, 0.318 and 0.591 mg/100 g; ascorbic acid, 0.4 and 0.8 mg/100 g; vitamin B12, 0.23 and 0.29 mg/100 g and folacin, 7.13 and 3.24 mg/100 g. Among the minerals, the contents (mg/100 g) in the milk of Najdi and Nuaimi ewes, respectively, were: sodium 77.5 and 84.1; potassium 96.2 and 89.1; calcium 58.3 and 88.6; magnesium 13.3 and 13.6; phosphorus 111.6 and 121.5; iron 0.13 and 0.14; copper 0.08 and 0.07; zinc 0.24 and 0.21; and manganese 0.02 and 0.02. Both the vitamin contents and the mineral profile of ewe's milk were close to that of cow's milk.

Sawaya, W.N. et al. Chemical composition and nutritive value of truffles of Saudi Arabia. J. Food Science. 50(2): 450-453. (1985)

The chemical composition and nutritional quality of truffles of Saudi Arabia, *Terfezia clavaryi* and *Tirmania nivea*, were studied. Results showed 19.6 and 27.2% protein, 2.8 and 7.4% fat, 7.0 and 13.2% crude fiber, 4.6 and 5.4% ash and 1.8 and 5.1% ascorbic acid for *T. clavaryi* and *T. Nivea*, respectively. Both varieties contained high amounts of K and P and fair levels of Fe, Cu, Zn and Mn. All essential amino acids were present in fairly good amounts. Leucine and lysine were the first limiting amino acids in *T. clavaryi* and valine in *T. nivea*. In-vitro protein digestibility (82.8 - 86.7%) was slightly lower than that of Animal Nutrition Research Council (ANRC) casein (90.0%) but the calculated protein efficiency ration (2.1 - 2.49) was relatively close to the value of 2.5 for ANRC casein.

Sawaya, W.N. et al. Nutritional evaluation of selected meat based Saudi Arabian dishes. Ecol.Food Nutr. 18:171-182. (1986)

This paper presented the results on the chemical composition and protein nutritional

quality of 14 dishes commonly consumed in Saudi Arabia, and containing significant amounts of animal protein such as meat, fish and eggs. The dishes contained 46.6-82.6% moisture, 3.6-9.4% protein, 0.7-14.7% fat, 0.1-1.1% crude fiber, 0.8-2.4% ash, 3.9-4.09% nitrogen free extract, and 82-236 Kcal, per 100g food. The levels of K,P,Fe,Cu,Mn, and some B-vitamins were reasonably good. However, vitamin-A, folacin and ascorbic acid contents were present in lower amounts. Amino acid profiles were good when compared to the FAO/WHO (1973) reference protein profile except for one dish (Motabak ma'moz) which had lower concentration of both lysine and tryptophan. The chemical score ranged from 70 to 100, except for Motabak ma'moz, for which the chemical score was 51. Tryptophan was generally the first limiting essential amino acid except in two dishes where methionine + cystine or lysine were the first limiting essential amino acids. The in-Vitro protein digestibility values ranged from 80.6 to 90.3%. The calculated protein efficiency ratio varied between 1.51 to 3.06 when adjusted to ANRC casein value of 2.50.

Sawaya, W.N., Khalil, J.K. & Al-Shalhat, A.F. Mineral and vitamin content of goat's milk. *J.Am.Diet.Ass.* 84: 433-435. (1984)

Nine vitamin and mineral elements were determined in goat's milk of two breeds, Aardi and Masri, in Saudi Arabia. The concentrations of various vitamins in the milk of the Aardi and Masri goats, respectively, were: vitamin A, 77 and 203 IU/100 gm; thiamin, 0.047 and 0.030 mg/100 gm; riboflavin, 0.122 and 0.170 mg/100 gm; vitamin B-6, 0.045 and 0.046 mg/100 gm; niacin, 0.280 and 0.248 mg/100 gm; pantothenic acid, 0.247 and 0.191 mg/100 gm; ascorbin acid, 0.890 and 0.898 mg/100 gm; vitamin B-12, 0.07 and 0.06 mg/100 gm; and folacin, 0.2 and 0.7 mg/100 gm. Among the minerals, the concentrations (mg/100 gm) in the milk of Aardi and Masri goats, respectively, were: sodium, 58 and 53; potassium, 158 and 155; calcium, 88 and 116; magnesium, 13 and 13; phosphorus, 65 and 88; iron, 0.14 and 0.14; copper, 0.07 and 0.07; zinc, 0.15 and 0.15; and manganese, 0.02 and 0.02. Vitamin B-12 and folacin levels in goat's milk were lower than those in cow's milk. The mineral profile of goat's milk compared better with that of cow's milk.

Swaya, W.N., Khalil, J.K. & Safi, W.J. Nutritional quality of pearl millet flour and bread. *Qual Plant Foods Hum Nutr.* 34:117-125. (1984)

Market samples of pearl millet flour and bread from Saudi Arabia were analysed for chemical composition and nutritional quality. Pearl millet flour contained, on a dry weight basis, 17.4% protein, 6.3% fat, 2.8% fiber and 2.2% ash. Lysine was the most limiting essential amino acid with a chemical score of 53 (FAO/WHO, 1973). Linoleic acid (44.8%) and oleic acid (22.3%) were the dominant fatty acids in millet oil followed by stearic acid (4.0%) and linolenic acid (2.9%). The in vitro protein digestibility (IVPD) of millet flour was 75.6% and the calculated protein efficiency ratio (C-PER) was 1.38 in comparison to ANRC casein values of 90% and 2.50,

respectively. Baking at 300 C° for 15 min had only little effect on the proximate and fatty acid composition of the bread but decreased the arginine, cystine and lysine contents by 31.3%, 15.8% and 13.8%, respectively. The IVPD was not affected but the C-PER decreased by 18% on baking.

Sawaya, W.N., Khan, P. & Al-Shalhat, A.F. Physical and Chemical characteristics of ghee and butter from goat's and sheep's milk. Food Chem. 14: 227-232. (1984)

The physical and chemical characteristics and the fatty acid compositions of butter and ghee from two sheep breeds and one goat breed from Saudi Arabia were studied. Samples were prepared in the traditional manner practiced in the desert. Samples of butter made from both goat's and sheep's milk had relatively close iodine values. Reichert-Meissl and saponification numbers were comparable with those of cow's butter-fat. Fatty acid composition showed a relatively high degree of saturation (63.6 - 74.1%) with C16:0 (27.6 - 30.5%) and C18:1 (19.6 - 30.1%) being the predominant saturated and unsaturated fatty acids, respectively. There was no major effect of heat on chemical and physical characteristics of butter during its processing into ghee.

Chapter 2

FOOD CONSUMPTION PATTERNS

Al-Shawi, A. The dietary patterns and food habits of Kuwaiti housewives of three educational levels. Ed. J. Kuwait. 2:9-19. (1985)

Dietary habits of 225 Kuwaiti housewives of different educational levels were studied. Cereals and beverages were the main foods frequently consumed, while eggs, fish and legumes were the least consumed. Low educational housewives were more likely to consume sugar and sweets than higher educational housewives. The great majority of housewives ate their meals at home (82.7%, 98.7% and 96.0% for breakfast, lunch and dinner, respectively). As education increased the role of housewife in meal planning increased (49.3%, 56.0% and 64.0% for low, middle and high educational levels, respectively). It was found that housewives lacked knowledge of the relationship between foods and diseases.

Dawood, J.S., Prakash, P. & Ali, K.M.R. Nutritional Survey for Elderly People in Kuwait. Nutrition Unit, Preventive Medicine Section, Ministry of Public Health, Kuwait, 13 p. (1982)

The purpose of this study was to assess nutritional status of elderly people (over 59 years old) in Kuwait. A sample of 83 males and 81 females were selected from various polyclinics. Anthropometric measurements included were; height, weight, arm circumference and skinfold thickness. Haemoglobin, hematocrit, glucose, protein, serum albumin, cholesterol, vitamin C and vitamin A in blood were determined. Based on weight for height 25% of males and 53% of females were found obese. There percentages were 15.7% and 28.4%, respectively when based on skin fold thickness. Hypertension was more common among males (35%) than females (22%). Of the sample studied 13.4% were diabetic, and there was no significant differences between males and females. Iron deficiency anaemia was higher among females (18.5%) than among males (3.6%). The proportion of hypercholesteremia was 23.5%, of which 27% were among males and 18.9% among females. The mean level of cholesterol was 230 mg% in males and 208 mg% in females. The mean level of vitamin A and Beta carotene were respectively: 33.13 and 37.8 mg% for males, and 37.1 and 33 mg% for females.

Eid, N. & Bourisly, N. Bread consumption in Kuwait. Nut. Rep. Int. 33(6): 967-971. (1986)

This study looked into the consumption and composition of two types of bread in Kuwait. The study was based on a field survey of 1420 subjects from various age groups and nationalities. The results revealed that the average per capita daily consumption of bread was 277 grams. Sex, age, nationality and work activity significantly

affected bread consumption. The major types of bread consumed were Arabic and Iranian. The contribution of bread to the fulfillment of daily requirements was about 29-33% of energy, iron and thiamin, and 40-50% of protein and niacin.

Ghulam, L.J. Nutritional taboos and traditional practices in pregnancy and lactation including breast feeding. In Traditional Practices Affecting the Health of Women and Children. WHO/EMRO Technical Publication No.2, volume 2. WHO Regional Office of the Eastern Mediterranean, Alexandria, 67-74.(1978)

This paper study the beliefs and practices related to health and nutrition in two communities in Oman, namely Nizwa and Sohar. The sample consisted of 153 women in Nizwa and 219 women in Sohar. The results showed that 55% and 76% of women studied changed their meal patterns during pregnancy, in Nizwa and Sohar, respectively. The main change in the meal patterns was eating less (94% in both communities). The most important reason given for eating less was to make more room for the foetus, as many women believe that the foetus grows in the stomach. Some women ate less fish as they believe that the bones and scales of fish would harden the bones of the foetus and lead to complicated delivery. Some women avoided eating rice during lactation, as they believe that it discontinues the formation of mother's milk. The main food consumed during lactation was meat in Nizwa (82%), and chicken in Sohar (64%). Mothers started breast-feeding 3 to 7 days after delivery. In Sohar, 90% of mothers continued breast-feeding for two years. In Nizwa, 16% reported to stop breast-feeding between six months to one year of infant life, while the others continued breast-feeding for two years.

Kamel, B.S. and Martinez, O.B. Food availability for Kuwaiti and non-Kuwaiti households. Ecol.Food.Nutr. 15:191-201. (1984)

A sample of 1,134 Kuwaiti (K) and 1,444 non-Kuwaiti (NK) households in Kuwait was chosen at random to obtain information on food and nutrient availability in the household deduced from food purchase during one week. The data were studied according to income and taking into account households composition. Food availability among NK was found higher than in K households. However food was, on the average, abundant among the most privileged and adequate among the poor in both groups with respect to energy and protein. Nevertheless, K larger households spent, on the average, a higher proportion of their income to buy food than NK families. Kuwaiti households purchased more cereals, sugars and sweets and fish than NK households. With increased income, purchases of most food groups, especially protein-rich products, increased in both groups, but in K households cereal purchases declined. In spite of adequate dietary availability, low income families in both groups had poor diets, especially with respect of the provision of thiamin, riboflavin, vitamin A and calcium.

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

Dietary habits and foods consumed by Kuwaiti citizens were described based on data collected from 5000 adults of different educational and income levels. The data showed that while some traditional food habits were still adhered to, others were giving way to western type of foods. Wheat is the main staple, followed by rice; mutton and lamb are preferred over beef; but chicken and fish are also consumed. Diluted yogurt (roob) was traditionally taken during lunch, which is the main meal. Fresh fruits and vegetables were readily available, but their consumption was limited by purchasing power. Carbonated beverages, coffee and tea were consumed frequently with high sugar added. Some food preparation practices had different implications on nutrient values of food. In cooking, rice was soaked in warm water for a few hours and then the water was discarded; meat and vegetable mixtures might be boiled for a long time. Such food preparation methods tended to destroy valuable nutrients; but partially boiled vegetable, or not well cooked meat, were not popular. Although abundant food was available and considerable amounts were wasted, an analysis of nutrient intakes showed that dietary vitamin A, thiamin, riboflavin and calcium intakes were below that of the U.S. RDA for adult men and women. Iron and magnesium intakes of women were also unsatisfactory.

Musaiger, A.O. Food habits in Bahrain, dietary practices and social occasions. Ministry of Health, Bahrain, 62p (A). (1981)

This study is a survey of dietary practices and food habits of Bahraini families during social occasions. A random sample of 310 households was taken from the 8 geographical regions of Bahrain, representing 1% of the households. Al-harees (composed of wheat and meat) and Al-threed (composed of bread, meat and vegetables) were the main dishes consumed during the fasting month (Ramadan), while the Gadoo, composed of sweets, nuts and fruits, and rice with meat were the main dishes presented to the visitors during wedding and after pilgrimage, respectively. Tea or coffee with sweets were the main foods (63%) given to the visitors during griefs. Most of the families (61%) did not give their male children any food after circumcision. Others gave milk (10.6%), eggs (9%) and sweets (5.8%). About 25% of the housewives believed that nuts increase the sexual ability of the males. Relatives and friends (32%) were the main source of these beliefs, followed by the grandmother (23%). Most of the families (71.6%) ate together from the same dish, while 13.2% segregate the sexes. The majority of the housewives (92%) used canned foods in their diets. Almost 36% of the housewives agreed that the price of food affects the quality and quantity consumed.

Musaiger, A.O. Factors influencing food consumption in Bahrain. *Ecol.Food.Nutr.* 12:39-48. (1982)

This paper reviews the social and economic factors affecting food consumption in Bahrain. Industrialization led to a decline in the agricultural and fishing products with the result of more dependence on imported foods. Income and prices of foods limited the purchasing power of the households, particularly low social classes. The high fertility and family size affected the quantity of food consumed by different household members. Educational level of housewife and husband had also a potent effect on the food consumption pattern. Immigrants had their influence too. They introduced many dishes which have become popular in the Bahraini community. Television advertising of food products and utensils also played an important role in modifying the food consumption of Bahraini households.

Musaiger, A.O. Dietary habits of Bahraini housewives during pregnancy and lactation. J.Kwt.Med.Assoc. 16: 203-209. (1982)

This study reports the food habits of Bahraini housewives during pregnancy and lactation. A random sample of 310 households was taken from urban and rural areas of Bahrain. The housewives were interviewed in their homes and asked about their food habits during pregnancy, puerperium and lactation. The findings indicated that 45.5% of the housewives preferred fruit, milk, rice and high protein foods during pregnancy. About 14.5% of the housewives avoided spicy foods during this period. The main reason given for avoiding certain foods during pregnancy was that they were thought to be harmful to the mother (10%). Hesso (composed of eggs, watercress seed, animal fat, sugar and spices) and chicken were the main foods consumed during puerperium (41.9% and 13.2%, respectively). About half of housewives (52.6%) had no preference for any special food during lactation. About 18% preferred protein rich foods. Spicy foods were the main foods avoided (15.2%) during lactation, as they are believed to cause diarrhea to the infant (9%).

Musaiger, A.O. Bread in Bahrain, Consumption, Processing and Its Nutritive Value. Bahrain Centre for Studies and Research, Bahrain, 58p(A). (1988)

The paper discusses the consumption patterns, processing and nutritive value of the main types of bread consumed in Bahrain. A sample of 305 households were selected using stratified clustering random technique. About 16 bakeries were selected to study the processing and composition of different breads namely, tanoor, Labanese, French and chapati breads. The findings showed that tanoor bread is the preferable bread in Bahraini households. The average daily household consumption of bread was 8.5, 3.7 and 10 breads for tanoor, Labanese and chapati respectively. An average of 16 slices of French breads was consumed daily by household. Detailed information on processing of tanoor breads were also provided. Proximate composition of breads consumed showed similarity in protein, fiber and energy contents. Recommendations to improve the quality of tanoor bread were given.

Musaiger, A.O. Food-shopping behaviour in countries that are becoming industrialized. J.Cons. Stud. Hom. Econ. 13:53-60. (1989)

The paper gives the results of a study conducted to determine the food-shopping behaviour in Bahrain, and its association with nationality. A sample of 207 adults was interviewed on the spot in 18 major supermarkets. The findings revealed that the main reason for purchasing from a supermarket was the location (27%). Bahraini consumers were less likely than non-Bahraini to purchase meat products, fruit and vegetables from a supermarket. Production and expiry dates were the most important information read on the label of food products (40.3%). Wives made the major food-shopping decision in 64% of non-Bahraini consumers compared to 37% of Bahrainis. The study suggested that investigations on food-shopping behaviour in this region should be carried out in order to understand the current situation of food marketing.

Musaiger, A.O. Food Habits of Preschool Children in Oman. UNICEF/ Muscat Office. Oman. 27p. (1989)

The paper presents the results of a survey of food habits of preschool children (2-5 years) in Oman. The survey was carried out in five geographical regions, Muscat, Samail, Sur, Sohar, and Salalah. Mothers of children aged 2 to 5 years were interviewed in hospitals and health complexes. The total number of mothers interviewed was 255. The results showed that foods consumed at breakfast were similar to that of an adult, and consisted of bread (73%), tea (50%), eggs (41%), milk (33%) and cheese (15%). Canned drinks (23%), cornpuffs (19%), fruits (19%), and bread (15%) were the main foods consumed by preschool children between breakfast and lunch. Rice with meat, chicken or fish were the main foods consumed at lunch by preschool children. The same foods were also consumed by other members of the family. Foods items consumed between lunch and supper were similar to those consumed between breakfast and lunch. Preschool children's supper consisted mainly of bread (64%), milk (21%), meat (17%), eggs (10%) and chicken (9%). The main foods preferred by preschool children were fruits (16%), milk (14%), eggs (13%), canned drinks (11%), fish (11%), and meat (10%). Whereas the main foods disliked were rice (19%), fish (11%) and meat (9%). Fruits(30%), milk(30%), eggs(20%) and vegetables(18%) were among the main foods believed to be beneficial to preschool children. On the other hand, chocolates and sweets(10%), spicy foods(4%), contaminated foods(3%), cornpuffs (3%) and carbonated beverages (3%) were the main foods believed to be harmful to these children.

Musaiger, A.O. Food Habits of Teen-age Girls in Oman. UNICEF/ Muscat Office. Oman. 34p. (1989)

The paper gives the results of a survey carried out to find out the prevalence of underweight and obesity and to understand some of the food habits and beliefs of

adolescent girls in Oman. The survey was based on interviewing the adolescent girls aged 11 to 19 years in five geographical regions in Oman; Muscat, Samail, Sur, Sohar, and Salalah. The girls were selected from intermediate and secondary schools, and measured for weight and height. The survey included 708 girls. The findings showed that the prevalence of underweight among adolescent girls in Oman was very high (63%). The over-all percentage of obesity was 11.5%. The composition of breakfast of adolescent girls did not differ from that of the common breakfast in Oman. Breakfast was skipped by 21% of the girls. The main foods consumed between breakfast and lunch were canned drinks(58%), cheese sandwiches(26%), potato chips (20%), falafel sandwiches (16%), bread (14%) and chocolate and sweets (12%). Rice (87%), fish (52%), vegetables (31%), meat (20%) and chicken (18%) were the main food items consumed at lunch. Only 6% of girls skipped their lunch indicating that lunch is the least skipped meal by adolescent girls. A high percentage of adolescent girls (31%) skipped snacks between lunch and supper. Bread (68%), tea (21%), meat (15%), cheese (14%), and chicken (13%) were the main foods consumed at supper by adolescent girls. About 10% of girls skipped supper. About 20% of girls believed that some foods should be avoided during onset of puberty. Of adolescent girls, 83% agreed that pregnant mother should consume special foods. A high percentage of girls (40%) depended on television as main source of nutrition information. School curriculum came second in order (34%). About 74% of girls believed that mothers during puerperium should consume special foods. Honey (22%), milk (21%), ghee or saman (17%), assida (17%), meat (16%) and chicken (15%) were the main foods recommended during puerperium. Fruits (35%), chicken (34%), rice (28%), meat (25%) and fish (24%) were among the main foods liked by girls. On the other hand, fish (28%), fruits (17%), meat (15%) and vegetables were among the main foods disliked.

Musaiger, A.O. Food Habits During Pregnancy in Oman. UNICEF/Muscat Office. Oman. 27p. (1989)

The paper discusses the results of a survey carried out to determine the main food habits of pregnant mothers in Oman. The survey was carried out in five geographical areas in Oman; Muscat, Samail, Sur, Sohar, and Salalah. A total number of 298 mothers were interviewed in hospitals in these areas. Findings showed that mothers got married at a very early age. The mean age at marriage in the five geographical areas ranged from 15.0 to 16.6 years. The overall mean age at marriage was 15.6 years. The great majority (92%) of mothers had their deliveries at hospitals. About 27% of pregnant mothers ate less during pregnancy. On the other hand 18% of mothers ate more during pregnancy. Meat, vegetables, milk, fruits, and fish were the common foods preferred by pregnant mothers. The main reasons given for such preference were; benefit to mother (18.8%), for growth of the foetus (18.5%), and liked the taste of these foods (10.7%). Fish (19.8%), spicy foods (12.8%) and meat (7.4%) were the main food avoided during pregnancy. Of the mothers, 14.8% stated

that they did not like these foods during this period. Other reasons given were: harmful to mothers (6.7%) and because of nausea (5%). A high percentage (64%) of pregnant mothers reported that they had morning sickness. Lemon juice, citrus fruits and milk were the main food consumed to overcome morning sickness. Ghee (44%), chicken (39%), honey (39%), meat (27%) and fenugreek (19%) were the foods mostly consumed during puerperium. About 25% of mothers believed that these foods give more energy, 21% believed that these foods improve the health of mothers and 16% believed that such foods help to clean the uterus from blood. Milk (33%), fish (21%) and meat (20%) were the main foods believed to increase milk secretion.

Musaiger, A.O. El-Sherbini, A.F. & Amine, E.K. Education and food habits of Bahraini housewives. *J.Royal Soc. Hlth.* 106(3): 85-86,89. (1986)

The meal patterns and food habits of Bahraini mothers during pregnancy, puerperium and lactation, as well as supplementary foods given to infants were studied and associated with educational level of mothers. A random sample of 310 of households, representing 1% of the total households was taken. Education was found to be positively associated with the food habits of Bahraini mothers. Only 6% of low educated mothers ate fruits with lunch, whereas the proportions were 10.5% and 24.1% for middle and highly educated groups, respectively. The consumption of fruits during pregnancy was also found to be greater in the highly educated mothers. However, there was no clear association between educational level and types of food consumed during puerperium. Most of the mothers preferred to eat the traditional dishes which are commonly consumed after delivery (Hesso and Gellab). Sixty percent of low educated mothers and 50% of middle educated continued to take their normal daily diet during lactation period, as against 25.9% in highly educated mothers. The highly educated mothers were more likely to consume protein rich foods, fruits and vegetables during lactation period. Commercial baby foods were widely used as a supplement to infant diet by middle (89.5%) and highly (91.3%) educated mothers, compared to low educated mother (66.8%).

Prakash, P., Shubber, K.M. & Abdul-Ghani, Z.A., Food habits during pregnancy and lactation in Kuwait. *Nutrition Unit, Preventive Health Section, Ministry of Public Health, Kuwait*, 13 pp. (1984)

A total sample of 500 mothers were interviewed to obtain their food habits during pregnancy and lactation. Of mothers, 51% took extra milk, meat, vegetables and fruits during pregnancy, compared to 40% took these extra of foods during lactations. The main reason given for intake such foods was good for mother's and foetus' health (26% and 11% for pregnant and lactating mothers, respectively). Special foods consumed during post-partum were Asida, Hesso, Helba and Loohom. Spices (19.2%) and meat, fish and poultry (8.4%) were the main foods avoided during pregnancy and lactation periods. Dislike, and bad for mother's and foetus' health were

the main reasons given for avoiding these foods. Based on 24 hour dietary recall, calcium, iron, vitamin A and vitamin C were below 75% of US RDA for pregnant mothers. Except for protein, all other nutrients intake of lactating mothers were found below 75% of the RDA.

Salji, J.P. Contribution of dairy products to nutrient intake in Saudi Arabia. *Nut. Rep. Int.* 34(4):673-676. (1986)

The paper discusses the role of dairy products in nutrient intake in Saudi Arabia. Data were derived from local dairy production as well as imported dairy products for the year 1985. Findings indicated higher annual per capita consumption of milk (72.2 kg) and fermented dairy products (26.7 kg) when compared to other dairy products (1.4-6.6 kg). The contribution of nutrients derived from dairy products to the Recommended Daily Allowance was most significant for Ca(64%), P(49%), riboflavin(49%), vitamin B12(42%), protein (30%), and energy(19%). This contribution was greatest among younger population aged 1-10 years. Dairy products consumed in Saudi Arabia provided 100 mg of cholesterol and 18.5g of saturated fatty acids per capita per day. The ways and means of limiting the contribution to cholesterol, fatty acids and salt were discussed.

Sawaya, W.N., Tannous, R.I. & Othaimen, A.I. Dietary Survey on Infants and Preschool Children in Saudi Arabia. Ministry of Health/Ministry of Agriculture and Water, Saudi Arabia, 269 pp. (1985)

This report gives and discusses the results of a survey carried out to determine dietary intake, infant feeding habits, anthropometric measurements and nutritional deficiencies among preschool children (0-6 years) in Saudi Arabia. A total sample of 849 children from four geographical areas was randomly selected. The survey showed that most of the children were below the 90% median for weight and height. For both means weight and height of children, the majority fall below the NCHS standard. A common clinical sign was dental caries (11.2%). Bleeding gums was also very common (12.4%), particularly in older children. Goiter or thyroid enlargement was only reported in one area. Rickets was also observed in two areas. Breast-feeding was still the main method of feeding babies, however, 50% of the children supplemented breast-feeding with bottle-feeding. The age at which breast-feeding was stopped was high (upto 20 months), the major reason being new pregnancy. Age at introduction of weaning foods ranged from 6 to 15 months. Dietary information showed that the intake of protein and vitamin C exceeded the US Recommended Dietary Allowances, while iron was the most deficient nutrient. For infants calcium and phosphorus intake was adequate, while niacin was low. For all ages, most nutrients were below the RDA.

Sawaya, W.N., Tannous, R.I. & Othaimen, A.I. Nutrients intake of Saudi infants and preschool children by meal of the day. *Nut.Rep.Int.* 35(2):233-250. (1987)

This paper studies the nutrient intake of children aged 0 to 72 months through meals consumed during the day. Data were collected from 849 children from four different regions in Saudi Arabia. The mothers were interviewed and asked to recall the food intake of her child during 24 hours. For infants and children still on breast milk, the number of breast feedings per 24 hr were recorded. The results revealed that lunch contributed the highest percentage of the average total daily intake for all age groups with respect to protein (30%) and energy (35%), followed by supper (protein 26% and energy 23%). Breakfast's contribution of Ca, P and Fe was substantially high and accounted for 30, 36 and 30%, respectively, of the total daily intake of all age groups. The highest daily intake of vitamin C was mainly from lunch and morning snack (28% of the total). Differences in nutrients intake from different regions of the country and for different age groups investigated and were discussed.

Sawaya, W.N., Tannous, R.I., & Othaimen, A.I. Dietary intake of Saudi infants and preschool children. Ecol. Food. Nutr. 20:171-184. (1988)

Nutrients intake of 849 Saudi children aged 0-6 years was investigated by 24-hour dietary recall method. Findings showed that the intake of protein and vitamin C was adequate using US Recommended Daily Allowances, while that of iron was the least plentiful supply. For infants, calcium and phosphorus intakes were adequate because of the prolonged breast-feeding, but that of niacin was relatively low. For all age groups, the intake of energy, vitamin A and thiamin were below the standard. Regional variation in nutrient intake was observed particularly in energy and calcium.

Wirthe, W. et al. Nutritional status, food intake and nutrient supply of schoolchildren in Saudi Arabia. 2. Food intake and nutrient supply. Zeitschrift für Ernährungswissenschaft. 16(3): 184-197 (G). (1977)

Information on dietary intake and food consumption patterns during one week period were collected and analysed on 306 students aged 6 to 18 years old in 13 schools in various regions in Saudi Arabia. Cereal products were the main foods consumed. Of the children 70% did not reach the German Recommended Dietary Allowances for animal protein. Intake of carbohydrates was too high, while intake of linoleic acid, minerals, and vitamins was too low. A school lunch programme for Saudi students was recommended.

Zaghloul, N.E., El-Sherbini, A.F. & Al-Shayeb, F.A. Dietary factors and physical activity of obese and nonobese adolescent girls. Bull.High.Inst.Publ.Hlth. Alexandria XIV(3):31-49. (1984)

Two groups of High Nursing School girls in Bahrain, 40 obese and 34 non-obese,

were compared with regard to dietary intake and physical activity. Anthropometrics measurements taken were height, weight, biceps, triceps, subscapular and abdominal skinfold thickness. The obese group was found to consume significant more calories, protein, fat and carbohydrates than their non-obese peers. The majority of obese girls (72%) were categorized as less active compared to non-obese girls (27.8%). The anthropometric measurements showed a significantly high mean body weight, body mass index (BMI) and relative body weight. The skinfold thickness of obese group were significantly higher than that of non-obese group. The study suggested that overeating and physical inactivity are important factors in the occurrence of obesity among girls in Bahrain.

Zaghloul, N.E. & El-Shayeb, F.A. Dietary intake of college students in Bahrain. Bah. Med. Bull. 7(1):30-32. (1985)

Dietary intake of 66 students (31 males and 35 females) for 3 consecutive days was studied. The mean age of students was 19.69 ± 1.85 years. The findings revealed that male students consumed more calories and nutrients than females. In general the students had an adequate intake of most nutrients when compared with the US Recommended Dietary Allowances. The intake of protein, niacin, thiamin and vitamin C exceeded the RDA, while the intake of riboflavin and vitamin A was slightly lower. The consumption of iron was found to be low (73% of RDA) among females, and high (130% of RDA) among males. Comparison in nutrient intake between Bahraini students and others was also provided.

Chapter 3

INFANT FEEDING PRACTICES

Al-Bustan, M.H. Attitudes and practice of Kuwaiti women toward breast-feeding. Int.Quart.Comm.Hlth.Ed. 7(2): 135-148. (1987)

The paper analyses the results of a survey carried out on a sample of 585 upper social class mothers from different regions of Kuwait. The findings showed that 71% of newborns were breast-fed at birth. The percentage then declined to 50% by the time they are one month old, and to 10% when they reached the fifth month of their life. The average duration of breast-feeding is about 2 months. There was a wide variation between the attitudes and practices of breast-feeding among Kuwaiti mothers. Health education programmes and other supportive measures were recommended to encourage breast-feeding.

Al-Frayh, A.S. Infant formulae available in Saudi Arabia. Saudi Med. J. 7(3): 218-226. (1986)

This review gives details of various infant formula available in the market of Saudi Arabia, and compares their composition with the international recommendations. Data were collected from information declared on the label of formula. Information from publications was checked, where possible, with the manufacturer's product information. Findings suggested that there was little to choose between many formulae, but for young infant living in an area where sodium content in water is too high there were advantages in choosing a demineralized whey formula with a composition conforming to FAO/WHO guidelines. Several recommendations for health workers, manufacturers and government were provided.

Al-Frayh, A., Wong S.S. & Hauge, K.N. Infant feeding practices in Riyadh, Saudi Arabia. Ann Saudi Med. 8(3): 194-197. (1988)

Infant-feeding patterns of 4796 Saudi infants under one year of age were studied. The study was based on interviewing mothers in their homes. The average duration of breast-feeding was found to be 5.1 months. There was no relationship between maternal age and pattern of feeding, but level of mother's education did affect feeding practices. More educated mothers tended to breast-feed their children for a shorter period of time. Bottle-feeding was introduced below the age of one month in 27.3% of cases. The average age at which infants were given solid food was 3.45 months. The results suggested a decreasing incidence of breast-feeding along with diminishing length of nursing period.

Al-Othaimen, A.I., Villanueva, B.P. & Devol, E.B. The present trend in infant-feeding practices in Saudi Arabia. Food Nutr. Bull. 9(2): 62-68. (1988)

A cross-sectional survey was carried out on 767 Saudi children aged 0-9 years in order to obtain information on their feeding practices. The information was obtained through interviews of the mothers at home. Of the children studied 21.5% were breast-fed, 57.9% were mixed fed and 20.6% were bottle-fed. About 34% of mothers introduced weaning foods before 6 months of infants age. The main reasons given for weaning were insufficient breast milk and the age of the child. Using a bitter substance was the major method (60.8%) used for weaning (stop breast feeding). Fruits, starches and eggs were the main weaning foods given to children aged less than 6 months. The results showed a tendency for the young, rich and less-educated mothers to prolong breast-feeding upto two years and to introduce other foods early. Effective nutrition education programme was recommended to correct unsound feeding practices.

Chowdhury, M.A.K.A. Infant-feeding practices and immunization in the Khamis Mushayt-area. Ann Saudi Med. 9(1):19-22. (1989)

This study investigated infant feeding practices and immunization status of children aged one month to two years and who were admitted to Civil Hospital in Khamis Mushayt, Saudi Arabia during a 5-month period. A sample of 368 mothers were interviewed. Findings revealed that 20.4% of babies were entirely bottle-fed at birth. The practice increased to 42.4% at 3 months and 47.2% at 6 months. The majority of mothers gave the lack of breast milk as the reason for starting artificial feeding. Fifty percent of mothers continued breast-feeding until the infant was at least 1 year of age. Seventy-eight percent of mothers of bottle-fed babies did not know proper formula-mixing, and 50% were not cleaning bottles properly. Weaning (giving solid or semisolid food) was delayed beyond 6 months in more than 40% of babies. Thirteen percent of the babies were not immunized. The majority of the babies from the Tihama area were not immunized and were being given raw goat milk, and 33% of them had brucellosis.

Elias, J.B.T. A Survey of place of delivery, modes of milk feeding and immunization in a primary health care centre in Saudi Arabia. Saudi Med J. 6(2):169-176. (1985)

A survey of 510 children less than 5 years of age was carried out in a primary health care center in Saudi Arabia in 1982. It was found that 76% of children were born in hospitals, and 24% at home. Hospital delivery was found to be related to availability of telephone at home and transportation. Although 68% of children were exclusively breast-fed immediately after birth, the percentage dropped to 38% at age 6 months, and to 22% at age 12 months. Of mothers using bottle feeding, 74% sterilized the bottle satisfactorily. Eighty seven percent of the children were immunized with BCG and DPT/OPV appropriately for their age. The paper discussed the significance of these findings and suggested ways of increasing the utilization of preventive medical services.

El-Madany, M. Breast-feeding pattern in Batna region. Medical Newsletter (Oman) 4(3): 12-18. (1988)

A cluster random sample of 398 mothers with children aged 0 to 24 months were selected from Batna region, Oman to study breast-feeding patterns. The study showed that the mean length of breast-feeding was 10.1 months. Mothers from rural areas were more likely to breast-feed their children than those from urban areas. There was a tendency for mothers who delivered at home to breast-feed their children longer than those who delivered at hospital (90% and 82%, respectively). Urbanization was found to be the main reason for gradual decline in breast-feeding.

El-Sayed, N.A. Infant feeding and weaning practices in Riyadh, Saudi Arabia. Bull.High Inst. Publ. Hlth. XV(1): 179-191. (1985)

The infant feeding and weaning patterns of 175 Saudi children aged about two years were studied. Mothers attended health centers and baby clinics were interviewed. Data revealed that 91.4% of children were breast fed (11.4% exclusively breast fed and 80% supplemented breast feeding), and 8.6% were artificially fed. Breast feeding continued for more than two years. The mean age of complete weaning was 16.4 months. Supplementary feeding was found to start early as 53.1% of children were given food other than breast milk, at 3-5 months of age. Fruits and vegetables (53.1%), milk and dairy products (50.9%) and eggs (41.1%) were the main weaning foods.

Ewida, E.H. & El-Nahry, F.I. Saudina: Protein food mixtures for feeding infants and young children in Saudi Arabia. Bull Nutr. Inst. (Cairo). 8(1): (1988)

The chemical composition of wheat (flour 72% extraction), dates, and some pulse seeds grown under Saudi Arabia environmental conditions were determined. Attempts were made to formulate eight Saudina food mixtures to be used as supplementary and weaning foods infants and young children in Saudi Arabia. Saudina mixtures were wheat based mixtures and comprised dates among their ingredients. Chemical composition and amino acid contents of ingredients were comparable with data reported by other investigators. Protein contents of Saudina mixtures ranged from 16.55% to, 18.25% with amino acid stores not less than 0.71. The mixtures contained most of the essential amino acids in optimal concentrations except threonine and lysine which were the most limiting amino acids. Protein quality of Saudina mixtures estimated by PER and NPU methods were in accordance with Codex guidelines where PER values were above 2.1 and NPU values were around 65.

Gunn, R. A. et al. Bottle feeding as a risk factor for cholera in infants. Lancet 2 (8145): 730-732. (1979)

To determine risk factors for cholera in infants, a retrospective matched-pair study of 42 cases and their controls was undertaken during an outbreak of E1 tor cholera in Bahrain in the autumn of 1978. The highest attack-rate of cholera (125/10,000) occurred in infants in the 6-11 month age-group, which corresponds to the weaning age in this community. Significantly more cases than controls were principally bottle fed (greater than 50% milk intake by bottle) than principally breast fed during the week before onset of illness ($P=0.004$). Analysis of various patterns of breast and bottle feeding did not determine whether the protection afforded by breast feeding had a negative effect (due to the lack of exposure to contaminated bottle feeding for breast fed infants) or a positive effect (due to protective functions of constituents of human breast milk). Cholera infection (with or without symptoms) among mothers of either case or control infants was uncommon (case mothers 3, control mothers 5), and mean serum vibriocidal and antitoxic antibody levels were similar for the two groups of mothers. These observations suggest that maternal infection did not affect the relative risk of infants having symptomatic cholera.

Harfouche, J. K. Breast-feeding Patterns; A Review of Studies in the Eastern Mediterranean Region. World Health Organization, Regional Office for the Eastern Mediterranean, Alexandria, Egypt, 323p. (1982)

This publication provides a review on the infant feeding practices of 22 countries in the Eastern Mediterranean Region including all Arab Gulf countries. The book is divided into 2 parts; the historical background and a global overview, and patterns of breast-feeding in the Eastern Mediterranean Region, country-by-country review. The pattern of infant feeding practices has scarcely been studied in this Region. Few studies were initiated in the 1960s but many of them were extracted from unpublished thesis or reports of WHO. A large majority of the studies comprised cross-sectional surveys. Evidence in many of the reviewed studies indicates that prolonged breast-feeding, the traditional pattern, has not decreased in all rural communities, since no social or economic conditions exist to favour artificial feeding, nor is processed or safe milk available at a reasonable cost. The most hazardous patterns which were reported are; bottle-feeding following early abrupt weaning under 3 months of age; and mixed-feeding (e.g. breast and bottle-fed milk given together). Delayed supplementation associated with the traditional prolonged breast-feeding pattern continues to be a major hazard. It can be stated that the most hazardous pattern of early abrupt weaning with bottle-feeding under the age of 3 months is largely responsible for the changing pattern of PEM from Kwashiorkor type previously emphasized, to the infantile-marasmic type currently having a wide prevalence in many countries of the Region (including the wealthy Gulf area) with serious implications for health and survival of infants, their physical and mental growth and development, and for the overall economy and progress of the countries concerned. The rapid infiltration of a wide variety of artificial milk and baby foods and feeding-bottles is, indeed, a drastic invasion and

a dramatic phenomenon brought forth by skilful methods of advertisement and tremendous commercial pressure, resorting to every possible means which appeals to health professionals and to the general public. Traditionally remote and isolated countries such as the People's Democratic Republic of Yemen, the Yemen Arab Republic, Djibouti, Qatar, United Arab Emirates and other countries of the Gulf area, seem now to suffer the highest risk of the bottle-feeding invasion.

Lankarani, S. & Musaiger, A.O. Home-based weaning foods for Bahrain. Bah.Med.Bull. 7,26-28. (1985)

Home-based weaning foods for six, nine and twelve month old infants were formulated. The foods mentioned in this report were prepared according to the food habits in Bahrain and the FAO/WHO Recommended Daily Allowances for infants. It was found that many Bahraini family dishes can be used as weaning foods after some modification. Nutrition education, should emphasise the correct method of preparing nutritious and hygienic weaning recipes based on local food resources and culture.

Lawson, M. Infant feeding habits in Riyadh. Saudi Med. J. (Supplement 1) 2:26-29. (1981)

A small survey on infant-feeding practices of mothers attended Riyadh Military Hospital was carried out. Sample size was not mentioned! The results showed that 72% of babies were entirely breastfed at the end of the first week, with a further 16% receiving supplementary feeding at this time. By three months only 42% of babies were entirely breastfed, and the percentage decreased to 11% at one year of age. The main reason given for supplementary feeding was inadequate milk supplies (52%). The majority of mothers gave rice, bread or vegetable soup as the first weaning food. Of the 31 baby milk examined, half of them had a higher protein content than was recommended by the FAO/WHO Codex Alimentarius Commission. It was concluded that malnutrition in this area is due to decreased breastfeeding, easy availability of infant formulae, poor hygiene and improper weaning practices.

Musaiger, A.O. The promotion of breast feeding in developing countries: Experience in Bahrain. Bull.Int.Ped. Assoc. 5(2): 67-74. (1983)

This report reviewed the breast-feeding situation and its association with employment of the mother in Bahrain. It was found that breast-feeding had declined gradually in the country, the rates decreased by 22.7% and 19.8% in urban and rural areas, respectively, during the period 1970-1980. Bahraini mothers were not aware of the benefit of breast-feeding due to illiteracy, ignorance, misleading advertisements and ineffective current health and nutrition education. A relatively high proportion of women in the labour force were not given adequate maternity leaves and benefits to

facilitate breast-feeding. Giving a mother one hour to breast-feed her child during working hours was not enough to support breast-feeding during the first months of child's life. It was recommended that maternity leave should be extended to three months instead of 45 days. Creches were recommended to be provided in or near the place of work of the women. Other recommendations to support breast-feeding in Bahrain were also given.

Musaiger, A.O. Food habits in Bahrain: infant feeding habits. *J.Trop.Ped.* 29:248-251. (1983)

The results of a survey of infant feeding practices in Bahrain were presented. A random sample of 310 households was taken from urban and rural areas of Bahrain. The housewives were interviewed in their homes and asked about various aspects of infant feeding. The results showed that 38.3% of the housewives breast-fed their infants for 18.24 months. About 61.9% of the housewives introduced supplementary foods at 3-6 months of age. Of the housewives, 24.2% avoided giving the child meat and fish during infancy. The main reason given was that they were hard for infants to digest (26.5%). About 74.2% of the housewives gave their babies commercial baby foods as supplementary foods. Of the housewives, 34.8% believed that the supplementary foods are nutritious for the infant. It was found that 55.5% of the children were weaned gradually. The main foods preferred after weaning were commercial baby foods (23.2%).

Musaiger, A.O. Some factors affecting breast-feeding in Bahrain. *Bah. Med. Bull.* 7(3): 99-102. (1985)

The paper presents and discusses the results of a study on some socio-economic factors affecting breast-feeding patterns in Bahrain. Data for this study was obtained from pre-natal files available in 12 health centres. Information on breast-feeding was collected from these files and correlated with mother's age, mother's nationality, mother's employment and geographical region. The sample studied included 1482 mothers from different areas of Bahrain. The results showed that as the age of the mothers increased, the practice of breast-feeding decreased. Bahraini mothers (75.6%) were more likely to practice breast-feeding than non-Bahraini mothers (66.4%). About 83% of rural mothers breast-fed their infants than the 69.4% of urban mothers. Employed mothers were less likely to breast-feed their infants compared with unemployed ones.

Musaiger, A.O. Encouragement and support of breast-feeding in the Arab Gulf States. In Jelliffe and Jelliffe (Editors): *Programmes to Promote Breast-feeding.* Oxford University Press, U.K. 145-149. (1988)

The activities aiming at promoting and supporting breastfeeding had greatly

increased in the Gulf States during the past five years. However, these activities were still not in proportion with the state of economic development of the region. This may be due to lack of awareness on the need of nutrition as a component of a social and economic development plan. Additionally, there were many factors influencing the effectiveness of a breast-feeding promotion programme in the Gulf; first, the severe shortage of nutritionists either medical or paramedical; secondly, the lack of appropriate legislations concerning infant formulas and other baby-foods; thirdly, the difficulty of controlling private clinics, which play an important role in encouraging bottle-feeding; fourthly, the deficiency in knowledge of nutrition and infant feeding by the health personnel. Finally, the high percentage of illiteracy, especially among mothers.

Musaiger, A.O. Rapid Assessment of Weaning Habits in Oman. UNICEF/Muscat Office. Oman 71p. (1988)

This survey was carried out to obtain a rapid assessment of weaning habits as well as other infant feeding practices in Oman. The survey was based on interviewing mothers who attended hospitals and health centers in 5 regions in Oman (Muscat, Salalah, Samail, Sur and Sohar). The sample size consisted of 383 mothers with children aged from one month to 2 years. It was found that breastfeeding is still the dominant practice of infant feeding in Oman. There has been no significant change in infant feeding practices in Oman during the past 8 years. Of children 50.1% were breastfed, 21.4% received artificial feeding, and 28.5% received mixed feeding. There is a trend however towards shortening the duration of breastfeeding. More than a quarter of mothers (27.2%) breastfed their children for less than 4 months, 23% continued breastfeeding upto the 6 months, and only 19.4% breastfed their children for more than one. A new pregnancy was the main reason given by mothers for discontinuing breastfeeding. The belief that colostrum is a harmful to the infant is widely spread in Oman. About 27% of mothers believed that colostrum is not good for the newborn, and consequently they start bottlefeeding from the first day of the infants life to replace breast milk. A high percentage of mothers (58.5%) stopped breastfeeding abruptly. Cerelac (44%) and rusks (10.4%) were the first main foods (other than breast milk) introduced to infants. About 31% of mothers started supplementary feeding before the infants reached the age of 4 months. Of mothers, 25% used infant formula before the infants reached 4 month of age.

Musaiger, A.O. and Lankarani, S. A study on Baby Foods Available in Bahrain. Ministry of Health, Bahrain. 42 p. (1986)

The study is critical review of information declared on the label of canned baby foods with comparing of their mineral and vitamin contents with the Codex Alimentarius Standard. The study was carried out through collection of all baby foods available in the market of Bahrain during April 1984. This included 203 types of baby foods.

The results showed that the labels of baby foods available in the market gave little or no information on nutrient contents. Information such as production date, instructions for use (in Arabic) were found to be deficient. The vitamin and mineral composition of the infant formulas were within the range recommended by the Codex Alimentarius, however, the results revealed that there was a wide variation in the nutrient composition. The prices of 100 grams of protein and 1000 Kcal were found to be higher in canned baby cereals when compared to fresh foods available in the market such as meat, chicken, wheat flour and rice.

Portoian-Shuhaiber, S. & Al-Rashied, A. Feeding practices and electrolyte disturbances among infants admitted with acute diarrhoea - a survey in Kuwait. *J.Trop.Ped.* 32:168-173. (1986)

This paper investigated feeding practices among infant with acute diarrhoea. Two hundred and four (204) mothers of infants 1-12 months of age were interviewed, when their infants were admitted with acute diarrhoea. The results showed that only 29% of infants were breast-fed, 57% artificially fed and 15% received mixed-feeding. Bedouin mothers were more likely to breast-feed their infants for longer periods as compared to other mothers. Of infants who received at least some formula feeding, 74% used humanized dried milk and 26% used unmodified dried milk. Of 145 infants on artificial milk, 61% of mothers changed their infants' milk. Frequent changing was common and 70% of mothers claimed that they changed their infants' milk based on advice of health staff. About 45% of mothers measured the scoop of powdered milk carefully, and 90% boiled the water for preparation of milk. Whereas 15% boiled drinking water. A higher prevalence of hyponatraemia and hypokalaemia than hypernatraemia were observed. There was no significant association between acute diarrhoea, type of feeding, measurement of milk powder and electrolyte disturbances. The study concluded that education of mothers as well as health staff are the most effective measure to overcome unsound infant feeding practices.

Portoian-Shuhaiber, S. Infantile diarrhoea due to water complementation of breast and bottle feeding. *Arch.Dis.Child.* 61: 1215-1218. (1986)

This study looked into the possible association between the types of water used and the frequency of admission in hospitals for acute infantile diarrhoea. The study included 204 infants aged 1-12 months, who were admitted with acute diarrhoea in two hospitals in Kuwait. It was found that 90% of mothers boiled water to prepare a powdered formula, but only 15% boiled water for drinking. The use of boiled water was four times more prevalent among bottle than breast-fed infants. The difference in water used among various social classes was statistically significant ($P < 0.001$), except for the use of filtered water, which was similar in each class (41-57%). Educational level of mothers had a significant effect on water used ($P < 0.001$). Although most

mothers gave water on most days, only 28% considered it necessary to give water 'always' during episodes of fever, vomiting or diarrhoea. About 19% of infants had more than one re-admission to hospital. Some association between re-admission and type of feeding was apparent, but it was not statistically significant. Type of drinking water and re-admission, however were associated. The number of re-admissions was twice as high among infants drinking unboiled water than among those drinking boiled or unboiled but filtered water.

Sawaya, W.N., et al. Breast-feeding practices in Saudi Arabia. Food Nutr. Bull. 9(2): 69-72. (1988)

Breast-feeding practices of 849 children aged 0-72 months from four regions in Saudi Arabia were studied. Results revealed that newborns were seldomly breast-fed at birth. They were given a few sips of water and then ghee until the mother lactates on the second or third day. The majority of infants (62%) were breast-fed for two years. However, bottle-feeding (along with breast-feeding) started as early as at 4 months of infant life. New pregnancy (38%), child's ability to eat food (12%), insufficient breast milk (12%) and child refused breast (12%) were the main reasons for stopping breast-feeding. The study showed a slight increase in bottle-feeding compared to earlier study.

Chapter 4

NUTRITION ANTHROPOMETRY

Abaheseen, M.A.A., Harrison, G.G. & Pearson, P.B. Nutritional status of Saudi Arab preschool children in the Eastern Province. Ecol. Food Nutr. 10(3):163-168. (1981)

Anthropometric measurements, breast-feeding patterns and other health indicators of 198 Saudi children aged 1 to 60 months attending a baby clinic in Dhahran, Saudi Arabia were studied. Using the Gomez index of body weight-for-age 31% of the children were found mildly, 5% moderately and none severely malnourished. Using the mid-arm circumference: head circumference ratio of Kanawati and McLaren, of the girls under 30 months old, 4.5% were severely malnourished and no child 30 to 36 months old was severely or moderately malnourished, but in all age groups 45 to 58% were mildly malnourished. Of all children 46% had been breast fed, 15.1% had been given commercial infant food and 38.9 had been breast fed and given commercial food. There was no significant difference in anthropometric measurements between the 3 groups by feeding except that children given the mixed feeding were taller than those exclusively breast or bottle fed. Duration of breast feeding was 1 to 32 months, average about 1 year. Solid food had been introduced at 2 to 24, mean 5.5 months, and there was no relation between that age and nutritional state. Median height and head circumference were close to those of USA children for the first few months, then less. The Saudi children were significantly smaller than USA children of the same age, but had about the same bodyweight as USA children of the same height. The boys were taller and heavier than Saudi children studied in 1962-67. Girls over 30 months old had greater deficits of height and bodyweight than boys of the same age, and smaller arm circumference and triceps skinfold thickness. Haematocrit was not related to sex but there was a higher incidence of low haematocrit among older than younger children.

Abdelfattah, M. Assessment of the nutritional status of school children in Sultanate of Oman. Bul.High.Inst.Publ. Hlth. (Alexandria) VIII(2): 229-240. (1978)

This survey was carried out to determine nutritional status of primary school boys in Sultanate of Oman. A sample of 568 children aged 7 to 17 years was chosen from two schools. Data obtained were anthropometrics (weight, height and arm circumference), clinical examination, dietary habits and hemoglobin level. The results revealed that only 5.1% of boys examined reached the standard weight (Harvard standard), and 9.2% reached the standard height. Using weight for height, it was found that only 14.3% reached the standard weight for height. Seven percent of boys had arm circumference same or above the standard. Among 126 boys examined for haemoglobin level, 67.5% had anaemia (Hb<11g/dl). Clinical examination showed that 4.4% of boys had signs of riboflavin deficiency, 2.3% had angular stomatitis, and 2.1% had cheiliosis. Of boys studied, 16% skipped their breakfast while 38% ate a

poor breakfast. Breakfast mainly consisted of tea or tea with bread or tea with milk and bread. Measures to improve nutritional status were briefly discussed.

Abdulla, M.A. Sebia, Z.A. & Swailem, A.R. Health and nutritional status of preschool children. Saudi Med.J. Monograph 1:11-18. (1982)

The paper discusses the factors affecting nutritional and health status of preschool children (less than 5 years) in two villages in Saudi Arabia. The sample consisted of 337 children, of whom 164 males and 173 females. Feeding practices, morbidity, immunization status, and anthropometric measurements (weight and height) were studied. Among 325 children, 58.8% were exclusively breast fed, 35.7% received bottle feeding, and 8.5% received mixed feeding. The average weaning age in these villages was 12.5 months. However, 11% of mothers continued to breast-feed their children for more than two years. Of the children studied 26.7% had diarrhoea and 32.3% had conjunctivitis. Only 54% of children had received some form of vaccine, 42% had never been immunized, and the history of immunization status was unknown in 4%. In general, signs of vitamin deficiencies were rare. Three cases of rickets and 2 cases of angular stomatitis were seen, and not a single case of vitamin A deficiency was detected. Using Harvard standard, only 39.2% had normal weight for age, and 0.9% had severe malnutrition. About 76% had normal weight for height and only 0.6% were severely wasted. 39% had normal height for age. Wasting was most common among the 12-23 months age group, and the percentage of stunted children increased progressively with age. It was concluded that malnutrition is still a health problem in some parts of Saudi Arabia in spite of the important economic advancement.

Al-Awadi, F. Nowaid, H. & Abdulla, H. Evaluation of average birth weight of Kuwaiti infants. Nutrition Department, Al-Sabah Hospital, Ministry of Public Health, Kuwait. 7p. (1978)

The birth weight of 5400 Kuwaiti infants born in hospitals and health centers during the year 1977 were measured. The average birthweight of Kuwaiti infant was 3231 grams (ranged from 5650 to 1170 g). There was no statistically significant difference in the average birth weight between hospitals and health centers children. The incidence of low birth weight (<2.5 Kg) was 6.7%.

Al-Othaimen, A.I. et al. A Nutrition survey of infants and pre-school children in Saudi Arabia. Saudi Med. J. 9(1): 40-48. (1988)

Anthropometric measurements and dietary intake data were obtained from 849 children aged 0-6 years. Sample was selected from four semi-rural regions of Saudi Arabia. The findings showed that none of the age groups reached the median height for age and none were classified as severely stunted, while mild to moderate stunting

was observed among most children. Weight for height measurements showed the absence of wasting in any degree for all children. The 24-hour dietary recall of food consumed indicates high intake of protein and vitamin C for all ages (more than 100% of US Recommended Daily Allowances). The 0-12 month age group had more than 100% of RDA for calcium, phosphorus and riboflavin because of their high consumption of milk. In general energy intakes were below the RDA in all children. Iron and niacin were grossly deficient despite high values for protein. Of children, 41.3% were exclusively breast-fed, 43.7% were both bottle and breast-fed, 6.5% were bottle-fed after breast-feeding, and 8.5% were solely bottle-fed. Weaning foods were introduced after 6 months of age, and bottle-feeding stopped after 20 months of age.

Al-Othaimen, A.I. & Villanueva, B.P. The effects of prolonged breast-feeding on the nutritional status of Saudi Arabian children. Ann Saudi Med. 8(2): 97-102. (1988)

A retrospective study was carried out on 767 Saudi children aged 0-36 months in order to determine infant feeding practices and their association with nutritional status. Of the 767 children, 21.5% were breast-fed completely and 68.4% used mixed feeding (breast, bottle, and glass). About 10% did not breast-feed. Breast-feeding was extended up to two years. A subsample of 538 was tested for anthropometric measurements and dietary adequacy of intake. Overall, the total subsample suffered some mild stunting, and all groups, both male and female, from 13-18 months upto 31-36 months were mildly stunted. Weight for height for all age groups was normal except for mild wasting in the male 0-6 and 7-12 month groups, according to the US National Center for Health Statistics standard. Protein, calcium, vitamin A, thiamin, riboflavin, and vitamin C intakes were higher than the World Health Organization Recommended Daily Allowance, and calories and iron intakes were significantly low for all age levels from birth to 3 years. The study showed that Saudi Arabian infants and children may suffer from mild malnutrition if the mother's milk is not enough for growth and development, and adequate supplementation is not provided.

Amine, E.K. Oman, Nutrition Status Survey UNICEF/Gulf Area Office, Abu-Dhabi, UAE, 91 p. (1980)

The objective of this survey was to provide baseline data on nutrition status of vulnerable groups in Oman. Cluster samples were taken from preschool children (428), primary (720), preparatory (340), and secondary (204) school students and adult females (303) from three geographical areas in Oman. The assessment of the nutritional status involved weight, height and haemoglobin concentration. Data concerning infant feeding were also collected. Harvard standard was used as a reference for weight and height measurements. The results showed that malnutrition was widely prevalent among preschool children as 24.1% were stunted, 62.9% were wasted and 65.9% were anaemic (Hb<11g/100ml). A slight improvement was observed in the

nutritional status of primary school children. The prevalence of stunting was 13.6%, wasting 66.7% and obesity 5.9%. Iron deficiency anaemia was observed among 53.5% of children. A considerable improvement was observed in the nutritional status of preparatory school children. The prevalence of stunting was 5.6%, mostly found among boys, and wasting 52.7%. Obesity was found in 9.7% of the sample. The total prevalence of anaemia was 22.9% for boys and 39.4% for girls. The magnitude of the nutritional problem among secondary school children was lower stunting was observed in 4.4%, while underweight was encountered in 49% of children. Obesity was observed in 8.3% of the sample. Anaemia was found among 29.6% of girls but not among boys of secondary school. The results suggested that overweight was becoming a health problem among adult females as 17.4% of them were obese based on weight for height. The prevalence of obesity varied from region to region (2.7%-47.1%). Anaemia was highly prevalent among adult females (58.7%). Of the preschool children 50.5% were breast-fed, 24.3% were artificially fed and 25.2% received mixed feeding. It was also found that 30.6% of children were weaned (from breast) gradually. Abrupt weaning was encountered in 19.9% of preschool children. About 46% of children weaned before they reached the age of 3 months. The main reasons for weaning were found to be: infant reached weaning age (26.9%), and milk insufficiency (24.4%).

Amine, E.K. Bahrain, Nutrition Status Survey. UNICEF, Gulf Area Office, Abu-Dhabi, 54 p. (1980)

The objective of this survey is to provide baseline data on nutritional status of the vulnerable groups in Bahrain. The study sample was taken in a systematic way to represent urban and semi-urban areas in the country. It covered 300 preschool children, 214 primary, 240 preparatory, 240 secondary students and 212 adult females. The assessment of the nutritional status involved measurements of weight, height and haemoglobin concentration. Harvard standard was used as a reference standard. Data on infant-feeding practices were also collected. The prevalence of stunting among preschool children was 14.3%, wasting 67.6% and iron-deficiency anaemia 34.6%. Among primary school children, the prevalence of stunting was slightly reduced to 13.1%, wasting was the same 67.7%, while the prevalence of iron-deficiency anaemia was lower: 29.7%. A considerable improvement was observed in the body measurements among preparatory school children. The prevalence of stunting was reduced to 4.6% mostly among female children. Wasting was relatively high (46.7%), and was also higher in female than in male children. Stunting among secondary school children was observed in 3.7%, and was mostly prevalent among females. Wasting was relatively higher (48.8%), and was also higher in female (51.7%) than in male (45.8%) school children. Obesity was observed among 15% of the female compared to 2.5% in male children. The prevalence of anaemia was very high among females (49%) compared to male (12.5%) children. Underweight was observed in 8% of adult females, while overweight was observed in 40% of them.

The results also showed that the prevalence of anaemia was very high in this group (49.6%). It was found that only 16% of infants were breast-fed, 8.2% were artificially fed, while the majority (75.8%) received mixed feeding. Of the infants, 15.9% were weaned before they reached 3 months of age, and 18.8% before 6 months of age. The mean weaning age was 13.9 and 17.2 months in urban and semi-urban areas respectively. Infant reached weaning age (24.5%) and new pregnancy (22.7%) were the main reasons for weaning. A suggestive programme to overcome nutritional problems is provided.

Bayoumi, A. et al. Standard for growth in prepubertal primary school Kuwaiti children, a cross-sectional study. Ann.Trop.Ped. 4:171-176. (1984)

The aims of this cross-sectional study is to construct local standards for growth of Kuwaiti children aged 6 to 10 years. The sample included 6765 children, of whom 3534 were boys and 3231 were girls. A minimum of 400 children were included in each of 16 age-sex groups studied. Anthropometric measurements for height and weight were obtained. The data were smoothed and presented as percentiles for weight-for-age, height-for-age, and weight-for-height. A comparison between locally constructed standard and Tanner standard revealed marked similarities in attainable growth. The authors concluded that the Western reference standards are suitable for use in Kuwait and probably in other similar developing countries, and the setting of lower targets for those countries is not recommended.

Eid, N. et al. Nutritional anthropometry of school children in Kuwait. Nut.Rep.Int. 33(2): 253-260. (1986)

A cross-sectional study was carried out on 4174 children aged 6 to 17 years old, in order to assess their nutritional status. Anthropometric measurements included height, weight, arm circumference and triceps skinfold thickness. The sample consisted of 2187 males and 1987 females. The results showed that school children in Kuwait had a normal rate of growth for height and weight when compared with the Harvard Standard. There was an improvement in nutritional status during the period 1957-1984. School children of 1984 were substantially taller and heavier than those of 1957. About 65% of the children were normally nourished, 13% were undernourished and 22% were overweight. Reduced muscle mass was found in 31% of the children and the same percentage was observed in triceps skinfold thickness.

El-Sayed, N.A. Nutritional status of preschool children attending day care centres in Riyadh, Saudi Arabia. J.Egypt.Publ. Hlth Ass. LXI(3&4): 21-40. (1985)

The nutritional status of 246 preschool children aged 2-5 years attending day-care centres in Riyadh, Saudi Arabia was assessed by anthropometric measurements. Data revealed that children were retarded in their physical growth compared with the

reference standard (Harvard - Stuart and Stevenson). Wasting was highest (10.4%) at 2 years of age, while stunting was highest (32.3%) at 4 years of age. Mild-moderate undernutrition ranged between 47.2% and 53.7%, being highest at the age of 2 years. No cases of severe undernutrition were observed.

Gregory, W.B. Bahrain youth: growth and development research project report. In Ishiko, T.(Editor). Physical Fitness Research. Proceeding of the 1981 International Council of Physical Fitness Research. Baseball Magazine Sha, Chiyoda-Ku, Tokyo. 121-126. (1983)

A sample of 181 Bahraini male children aged 6 to 18 years was selected randomly from schools in four urban areas. Information collected were medical history, clinical examination, blood chemistry, anthropometry, pulmonary function, ECG, and $\dot{V}O_2$ Max. Medical history and clinical examination compared favourably with youths from other population groups. The values of blood analyses were within the normal ranges of similar age groups of the world population. However, several subjects were found to have hematocrit, hemoglobin, and blood counts at the low end of the normal ranges. Height and weight measurements were compared to 1977 Bahraini youth data and showed a substantial increase in the mean height and weight for the period 1977-1981. Test on pulmonary function indicated that Bahraini youth had low vital capacity measurements when compared to predicted values. Of the children, 3.8% and 6% were classified as having cardiac and ECG abnormalities. The Bahraini children did not show the expected values of oxygen uptake (Max $\dot{V}O_2$) in the early age groups, but the values increased with age and reached low but acceptable value in the 15-18 year groups.

Kamel, S.M., Taha, M.A.H. & Abu-El Zein, F.M. A fetal growth standard for Kuwait - birthweight for gestational ages from 36 to 43 weeks. J.Kwt.Med.Ass. 19:23-30. (1985)

A fetal growth standard for Kuwait describing the relationship between birthweight centiles and gestational ages from 36 to 43 weeks is presented. This report is based on the analysis of 3694 single births included in the "High-risk Pregnancy Study of the Obstetric Population in Kuwait". The standard is derived from 1799 cases who can be considered as representative of the normal population of births in Kuwait. The birthweight for gestational ages of babies born to different Arab nationality mothers were compared. A consistent rank order of birthweight was demonstrated, with Kuwaiti mothers delivering lighter babies. The standard for Kuwait was compared with that reported for Portland, Denver and Cleveland. The value, possible applications and limitations of the standard derived are discussed.

Krueger, N.W. Size at birth in Najran, Saudi Arabia. Ann Saudi Med. 8(2): 113-116. (1988)

A total of 1436 infants of at least 19 nationalities, born in the King Khaled Hospital in Najran, Saudi Arabia during a one year period were included in this study. Of infants, 72.7% were Saudi nationals. Mothers age ranged between 14 and 47 years. The lowest abortion and stillbirth rate occurred in the group 25 to 31 years old. The number of Saudi preterm infants born was 80(7.7%). The mean birth weight of the 364 Saudi male infants born at 40 weeks' gestational age was 3.23 kg (SD 0.48 kg), the mean body length 51.7 cm (SD 2.5 cm), and the mean head circumference 34.6 cm (SD 1.5 cm). Equivalent values for 343 Saudi females were lower: mean birth weight 3.13 kg (SD 0.41 kg), mean body length 51.2 cm(SD 2.4 cm), and mean head circumference 34.2 (SD 1.8 cm). Due to incomplete information and some degree of uncertainty concerning the subjects' gestational age, this study may be of only relative importance. A prospective study including sonography for determination of gestational age was recommended in order to determine standardized anthropometric measurements of newborn in this region.

Mameesh, M.S. et al. Maternal anthropometric and socio-economic parameters associated with birth size in Kuwait. *Nutr.Rep.Int.* 32(1):35-39. (1985)

The aim of this study is to identify the parental anthropometric and socio-economic variables which are associated with birth size in three groups of mothers, namely urban Kuwaiti, Bedouin Kuwaiti and non-Kuwaiti. Regression analysis indicated that the maternal weight, height, age, parity, education and family income were significantly correlated to birth-size (birth weight, crown-heel length and head circumference of infants). The Beudouin group exhibited the least association between maternal parameters and birth size of their infants. The results suggested that regression analysis is a useful method to identify significant associations in relatively homogeneous population groups and may serve to guide, and monitor steps taken to improve pregnancy outcome.

Mostafa, S.A. Nutritional Status Assessment Among Preschool Children. *Nutrition Unit, Preventive Health Section, Ministry of Public Health, Kuwait*, 23p. (1979)

The physical growth of 1611 Kuwaiti children (863 males and 798 females) aged 6 to 59 months was studied. A cross-sectional survey covered five geographical areas in Kuwait was carried out in vaccination centres at Maternal and Child Health Centers. Weight, height and haemoglobin level were determined. Wasting or actual undernutrition, as determined by weight for height and also by using the Waterlow classification was not considered a public health problem among preschool children. The prevalence of acute undernutrition was 3.8%, of which 1.1% were severe and 2.7% were moderate cases. The prevalence of wasting and stunting was very low (0.1% for both). The prevalence of overweight was 1.8%. Using height for age, stunting was prevalent among 3.8% of children. Stunting was found to begin early

(at 6 months) and reached the peak at age-group 24-35 months; it then decreased as children become older. Iron deficiency anaemia was found among 46.9% of preschool children.

Mostafa, S.A. *Growth Pattern of Kuwaiti Children from Birth to 60 Months. Nutrition Unit, Preventive Health Section, Ministry of Public Health, Kuwait, 30 p. (1979)*

The physical growth of 2498 Kuwaiti children aged 0 to 60 months was measured by a cross-sectional survey. Height, weight, head, arm and chest circumferences as well as haemoglobin were measured. The median heights and weights of both males and females until 9 months of age fall between the 50th and 25th percentiles of U.S. Standard (NCHS). However, after nine months, the median weights and heights coincide with the 25th percentiles. Same trend was observed for head circumference. Skinfold thickness was compared with British Standard (Tanner). It was found that the median triceps and subscapular skinfolds for both sexes were below the 50th percentiles of the standard. The mean haemoglobin level among the children upto 24 months was slightly low (10.2 g/100 ml), while it was within the standard in the age group 25-60 months (11.1 g/100 ml). The study concluded that environmental factors and infectious diseases may have been responsible for the lower growth of Kuwaiti children in comparison with American and British standards.

Musaiger, A.O., Abdulsalam, M. & Marzooq, Q. *Anthropometric Measurements and Food Habits of Athletes in Bahrain. Nutrition Unit, Ministry of Health, Bahrain. 62p(A). (1989)*

This study was carried out to determine the physical and nutritional status of athletes. A sample consisting of 304 male athletes was selected. Measurements included weight, height and skinfold thickness. Food habits and type of foods consumed before and after a game were also investigated. The study showed that the anthropometric measurements of Bahraini athletes were lower than those of Olympic athletes. However, the average age of Bahraini athletes was less by 4 years, providing good opportunity for Bahrainis to improve their measurements. There was no change in food habits of Bahraini athletes as compared to the rest of the population, but some concern regarding the type of pre-competitive meals as related to their subsequent performance were expressed by some athletes.

Musaiger, A.O., Gregory, W.B. and Haas, J.D. *Growth patterns of school-children in Bahrain. Ann. Hum. Bio.16: 155-167. (1989)*

Physical growth of school children in Bahrain was assessed by a cross-sectional study on 1593 (818 boys and 775 girls) aged 6.5 to 18.5 years. The data were collected in 1986. The following anthropometric measures were included; height, weight, mid-

arm circumference, triceps, biceps, subscapular and suprailiac skinfold thickness. At all ages median heights of both Bahraini sexes fall between the 25th and 5th percentiles of the North American reference standard (NCHS). The median weights of boys fluctuates between the 25th and 5th percentiles, while those of girls fluctuates between the 50th and 10 percentiles of the standard. As for triceps skinfold the median of Bahraini boys and girls falls between the 50th and 25th percentiles, whereas the median arm circumference of both sexes is close to the 5th percentiles of reference data. The findings indicated a high subcutaneous fat store suggesting a lack of muscle development. The small body size of Bahraini children in relation to U.S. children can be attributed to various genetic, health, socioeconomic and environmental factors.

Nutrition Unit. Nutrition Status Assessment of Adults. Preventive Health Section, Ministry of Public Health, Kuwait, 89 p. (1981)

The aim of this survey is to assess nutritional status of adults Kuwaiti aged 16 to 60 years. A sample of 2067 adults (897 males and 1170 females) were chosen from 17 polyclinics from various regions in Kuwait. Weight, height, arm circumference, skinfold thickness, clinical signs, and laboratory test were measured. The findings indicated that obesity was a public health problem (32.2%), and more prevalent among females (40.4%) than males (9.2%). Cheilosis was observed in 2.2% of males and 5.2% of females. Iron deficiency anaemia was more evident in females (17.9%) than males (9.4%). The diet history analysis showed a low intake of vitamin A and iron. The DMF (Decayed, Missed and Filled) was 7.1 per case and 4.7 per head for males and 8 per case and 6.1 per head for females.

Nutrition Unit. Nutritional Status, Assessment of Adults (Non-Kuwaiti Arabs). Preventive Medicine Division, Ministry of Public Health, Kuwait, 114 p. (1981)

The objective of this survey was to assess nutritional status of Arab adults aged 18 years and above who are living in Kuwait. The sample comprised 873 adults, 491 males and 382 females. Subjects were selected from seventeen polyclinics from various regions in Kuwait. The subjects were divided into 3 main groups, Egyptians (including Sudanese), Shami (Palestinian, Jordanian, Lebanese, and Syrian) and Arabian Gulf people. Measures included height, weight, arm circumference, skinfold thickness, clinical signs and laboratory tests, as well as dietary intake. It was found that obesity is a public health problem, and it was more prevalent among age group 50-59 years (71.4%) than in other age groups. Among both males and females, Shami had the highest prevalence of obesity (39.8% and 76.9%, respectively) when compared with other nationalities (24.2% and 53.6%, in Arabian Gulf people, and 26.0% and 60.2%, in Egyptians, males and females, respectively). Iron deficiency anaemia was more prevalent among females (21.8%) than males (3.3%). Dietary history analysis suggested low intake of iron in all groups. The overall prevalence

of hypertension was 24.3% (27.3% and 20.4% among males and females, respectively). In general the intakes of calories, calcium, vitamin A and thiamine were below the US RDA for men, while women showed low intake in all nutrients.

Osman, A.K. United Arab Emirates, Nutrition Status Survey. UNICEF, Gulf Area Office, Abu-Dhabi, UAE.78p. (1981)

Nutrition status survey was carried out on 550 pregnant women, 550 preschool children, and 1080 school children in 8 geographical areas in United Arab Emirates. Mothers were asked about their dietary practices during pregnancy and lactation periods and infant feeding practices. Weight, height, haemoglobin level and intestinal parasitic infection were measured for all children. Almost all pregnant women had no special or extra diet during pregnancy, and some avoided certain foods during early pregnancy like lamb meat and fish as these foods were said to make them sick. About 5-19% of infants in different areas were given a formula immediately after delivery. The percentage of infants who were weaned at less than 3 months ranged from 19 to 35%. New pregnancy (40%) and lack of milk secretion (39.6%) were the main reasons for stopping breast-feeding. The mean weight of preschool children upto twelve months of age fell between 100 and 90% of the Harvard Standard, and then fluctuated between 100 and 80% of the standard. The mean height followed a similar pattern of weight for age, but in general they laid within the acceptable limits (between 90 and 100% of the standard). The mean weights and height for age of school children were below the 50th percentile of Howard and Meredith Standards. Of school children, 49.9% were anaemic (Hb <12 g/100 ml). Parasitic infection was a major problem, and the most common parasite was *Giardia lamblia*.

Rasheed, P., Al-Yousef, N. & Al-Dabal, B. Nutritional profile of Saudi primary schoolgirls in an urban region. Ann. Saudi Med. 9(4): 371-377. (1989)

Anthropometric measurements, hemoglobin and laboratory stool analysis were performed on 285 schoolgirls aged 6-13 years from the Eastern Province of Saudi Arabia. When compared to NCHS standard, the height-for-age measurements were below the median, lying between the 10th and 25th percentiles except in the 6-year-olds, who showed no stunting. This feature excludes the possibility of severe malnutrition in the prenatal period and infancy. Weight-for-height performance showed a trend toward overnutrition. The authors believed that there was a genetic rather than nutritional component for stunting in the older children. Of the children studied, 26.4% had iron-deficiency anaemia, and 9.2% were infected with one parasite or more, and anemia was common among those harboring parasitic infections.

Sebai, Z.A., El-Hazmi, M.A.F. & Serenius, F. Health profile of pre-school children in Tamnia villages, Saudi Arabia. Saudi Med. J. 2(Supp.1): 68-71. (1981)

A group of 279 preschool children from Tamnia villages in southwestern Saudi Arabia were examined clinically and anthropometrically. Blood, faeces and urine were analysed for 257 of them. They included 2 infants with marasmus, 1 infant with rickets, 10 children with mild to moderate enlargement of the liver and 3 children with mild enlargement of the spleen. Height-for-age and height-for-weight were related to the median of the Harvard standard and the children were classified as wasted or stunted in their growth. Of the children 2% had moderate wasting and fewer than 1% were severely wasted; 23% had moderate stunting indicating the presence of past and long-term nutritional deprivation. An action diagram based on the estimated degrees of wasting and stunting indicated that 28% of the children needed a planned action of better health services. Of the children 36% had Hb less than 11.7 g/100 ml. There was no malaria parasite or sickle-cell gene; 35% of the children were infested with 1 or more parasites. At the health centre there was practically no preventive activity such as antenatal care or health education and the centre was not accessible to all villages it was supposed to serve.

Sebai, Z.A. & Reinke, W.A. Anthropometric measurements among pre-school children in Wadi Turaba, Saudi Arabia. *J.Trop.Ped.* 27(3): 150-154. (1981)

Weight, height, head and chest circumferences were measured for 314 preschool children (0-5 years). The sample was selected from 3 communities: settled, semi-settled and nomadic communities. For weight and height measurements of male children, the settled community slightly exceeds and generally parallels the nomadic community. Both communities increasingly fall short of the Harvard Standard, exhibiting deficits of about 3 kgs in weight and 10 cms in height in the three year age group. Similar pattern was seen among females except that a more pronounced difference existed between the settled and nomadic communities. At three years of age, the difference was approximately one kg in weight and 5 cms in height. The predicted chest-to-head circumference ratio in all communities exceeded 1 among males only at the age of 3 years, and remained below 1 among females. The growth differences could be explained by genetic factors as well as by the synergism between malnutrition and infection.

Serenius, F. & Fougerouse, D. Health and nutritional status in rural Saudi Arabia. *Saudi Med J.* 2(Supplement 1): 10-22. (1981)

The results of three nutritional status surveys among 9827 preschool children aged 0 to 72 months were provided. The surveys covered three rural regions in Saudi Arabia, the deserts of the central region, mountainous area of Tamina and the coastland area of Tihama. The mean bodyweight for age in the 3 areas was close to the Harvard standard for the youngest infants but fell before the end of the 1st year of life. The means for the older children were lower in Tihama than in the other 2 areas. Mean bodyweight-for-height also fell significantly before the end of the 1st year. In the

desert the incidence of wasting was 12% at 6 to 11 months old, in Tamnia 5% and in Tihama 11%. Using Water low classification 2% of the children needed urgent attention and 26% required special attention.

Taha, S.A. et al. Size at birth of live-born Saudi infants. *British J. Obst.Gyna.* 91(12):1197-1202. (1984)

Anthropometric measurements were made of 967 singleton liveborn Saudi infants of gestational age 33 to 42 weeks who belonged to the high and middle social classes and who were born in Riyadh University Hospital. The 914 infants born at term (37 weeks or more) had a mean birthweight of $3.31 + 0.45$ kg, a mean length of $49.79 + 2.5$ cm, and a mean head circumference of $34.4. + 1.4$ cm. Values were significantly higher in male than female infants. Effect of sex in the study was not apparent until 40 weeks and later. Difference in body size was significant between the first-born and second infants but the trend was unimpressive with greater parity. Of the infants, 53 were born preterm; 21 of the preterm and 18 of the term infants weighted less than 2500 g, and overall incidence of low birthweight was 4%. Results were compared with other studies from Saudi Arabia and other countries. It was concluded that there was no significant difference between birthweights of upper-class Saudis and Europeans.

Wirths, W. et al. Nutritional status, food intake and nutrient supply of schoolchildren in Saudi Arabia. 1. Anth-ropometric data. *Zeitschrift fur Ernahrungswissenschaft.* 16(1): 1-11.(G). (1977)

From anthropometric measurements of 341 pupils 6 to 19 years old, Saudi-Arabian boys were smaller and leaner than boys from Europe, USA, other Arab countries and well-to-do Indian boys.

Zaghloul, N.E. & Dodani, T. A study of the growth pattern of Bahraini children. *Bull. High. Inst. Publ. Hlth. (Alexandria)* 14:147-156. (1984)

In order to study the growth pattern of Bahraini children, a sample of 392 children aged from 0 to 5 years was chosen using multistage random sampling procedure from various regions in Bahrain. Anthropometric measurements namely weight, height, head and chest circumferences were taken, and compared with US standards (NCHS). Findings revealed that the growth pattern of Bahraini children in the first 6-9 months of life was good. The gain in both weight and height exceeded those of the American standard. The situation was reversed thereafter. From 9 months up to the end of fifth year there was a deficit in mean body weight and height when compared to the American standard. In both sexes, the head circumference compared well with the American standard up to age 6 months, but was found to be slightly after. The authors concluded that the physical growth of the preschool children was greatly influenced by the environment.

Abstract: This review discusses the role of nutrition in the prevention and management of chronic diseases. It highlights the importance of a balanced diet and regular physical activity in maintaining overall health and reducing the risk of various conditions such as heart disease, diabetes, and obesity.

Chapter 5

NUTRITION RELATED DISEASES

Keywords: Nutrition, Diet, Health, Disease, Prevention, Management

The relationship between nutrition and health is complex and multifaceted. A diet rich in fruits, vegetables, whole grains, and lean proteins is associated with a lower risk of chronic diseases. Conversely, a diet high in saturated fats, trans fats, and added sugars is linked to an increased risk of obesity, heart disease, and type 2 diabetes.

Understanding the underlying mechanisms of these relationships is crucial for developing effective prevention and management strategies. This chapter explores the role of various nutrients in human health and the impact of dietary patterns on disease risk.

Key nutrients such as vitamins, minerals, and antioxidants play a vital role in maintaining cellular function and protecting against oxidative stress. Deficiencies in these nutrients can lead to various health problems, including anemia, osteoporosis, and immune system dysfunction. Therefore, ensuring adequate intake of these essential nutrients is a primary goal of nutritional science.

Future research in this field aims to further elucidate the intricate pathways through which diet influences health outcomes. This knowledge will be instrumental in tailoring personalized nutrition plans for individuals at risk of or suffering from chronic diseases.

Al-Awadi, F. & Amine, E.K. Overweight and obesity in Kuwait. J Royal Soc. Hlth. (1989)

The aim of this study was to determine the prevalence of overweight and obesity among adult females. A multistage stratified sample of 2999 adult females was examined. 52.5% were found to be overweight (10-20% above reference weight tables) and 42% obese (more than 20% above reference standards). The numbers increased with age. There were fewer obese and more overweight the higher the standard of education, with a similar pattern with the husbands' standard of education. Obesity was more prevalent (46.8%) in non-working women, 36.8% among those in management and 32.9% among those in technical work, while the corresponding figures for those overweight were 47.7%, 56.9% and 62.2%. The prevalence of obesity increased with family size while that of overweight fell. A similar pattern was found with the number of children. Family income was inversely related to the prevalence of obesity and positively related to overweight.

Al-Awadi, et al. Nutritional Status of Kuwaiti Pregnant Women. Nutrition Department, Ministry of Public Health, Kuwait. 19p. (1976)

Dietary habits, hemoglobin, birth-weight, and clinical examination of 900 pregnant mothers who attended MCH Centers were determined. The study showed that 18.5% of mothers ate unbalanced diet. In some regions, 25% of mothers did not eat fresh vegetables and fruits on a daily basis. Iron deficiency anaemia (Hb <11g/100ml) was prevalent among 31% of mothers. The prevalence of low-birth weight (<2.5 kg) was 6.7%. Angular stomatitis was found among 21.1% of mothers.

Al-Awadi, F.A., et al. The Impact of Diet Control on Obesity in Kuwait. Health Research Department, Ministry of Public Health, Kuwait, 16 p. (1984)

The objective of this study was to evaluate the effect of reducing weight programme on 1154 obese patients who attended the Nutrition clinic at the Sabah Hospital in Kuwait. All patients were followed for six months but only 188 (16%) of them completed the programme. Clinical examination of the completed group showed a significant reduction in the abnormal cholesterol, triglyceride and uric acid levels. Haemoglobin level was found to be increased among these patients. The fasting blood sugar of diabetic patients returned to normal level at the end of programme.

Alayash, A. et al. Zinc and copper status in patients with sickle cell anaemia. Acta Haematologica. 77(2): 87-89. (1987)

Plasma zinc and copper concentrations estimated by atomic absorption spectroscopy were similar in 57 patients 16 to 45 years old with sickle-cell anaemia and in 45 controls from the Eastern Province of Saudi Arabia. Urinary Zn concentration and the Cu:Zn ratio were also similar in patients and controls. This result contrasts with values in North American black persons with sickle-cell anaemia who have Zn deficiency and a further decrease in Zn concentration during sickle-cell crises.

Bacchus, R.A. et al. The prevalence of diabetes mellitus in male Saudi Arabs. Diabetologia. 23(4):330-332. (1982)

The prevalence of diabetes mellitus in 1385 male subjects in the Al-Kharj area of Saudi Arabia was studied using WHO criteria for screening and interpretation of glucose tolerance tests. The prevalence increased with age. No diabetic patient was found in the group 24 years old or less and only one in the age range 25 to 34 years. There were 7 in the age range 35 to 44 years, 17 in the age range 45 to 54 years, 6 in the age range 55 to 64 years and 3 in the age range 65 years old and over. The patients in whom diabetes was detected were relatively symptom-free, but 65% were overweight.

Bacchus, R. et al The haematology reference range for Saudi Arabians. Saudi Med. J. 7(1):46-52. (1986)

Reference values for haematological parameters were delivered from a representative sample of 1376 Saudis (1266 males and 110 females), whose ages ranged from 18 to 60 years. Male subjects had significantly higher ($P < 0.001$) indices for haemoglobin, red blood count and mean corpuscular volume (mCV) compared with females. Leucopenia was a characteristic finding among the males. Saudi females had a significantly higher ($P < 0.001$) leucocyte counts compared with males. There were no significant differences between the sexes in either the MCH or MCHE. It was proposed that the values established in this study can be used as the haematology reference range for Saudi Arabians.

Bell, J. L. & Bacchus, R.A. Glucose tolerance in Saudi Arabs in relation to the criteria of the World Health Organization. Saudi Med. J. 5(1):61-64. (1984)

Oral glucose tolerance was tested with 75 g glucose loads in 243 Saudi Arabs and the results are considered in relation to WHO criteria. Of those classified as diabetics on the basis of post-glucose values, 6% had a fasting value of less than 90 mg/100 ml which, according to WHO criteria, excludes diabetes. Of the normal persons 59% and of the diabetics 42% had a fasting glucose between 90 and 120 mg/100 ml. There was, therefore, a large overlap in the fasting values of diabetics and normal persons and a 2-h post-glucose value was recommended for diabetic screening. In those classified as normal 18% had at least one value between 180 and 200 mg/100 ml and

11% above 200 mg/100 ml. Of the total studied, 2% would have fallen into a different category if WHO cut-off points in SI units had been used instead of traditional units. It was concluded that the WHO recommendations were not entirely suitable for interpretation of glucose values in Saudi Arabs. Long-term studies were needed to determine the clinical significance of curves which were normal on WHO criteria but which had some values during the test higher than were normally found in European and North American populations.

Blair, D. & Gregory, W.B. *The Nutrition status of Bahraini School Girls Ages 7-18: Blood, Anthropometric and Physical Capacity Indicators. Bahrain Sport Institute, Bahrain. 35p. (1986)*

A sample of 121 Bahraini girls aged 7-18 years drawn from 12 urban and suburban schools was examined for adequacy of growth, blood parameters, and physical fitness. The study showed that 24% of the girls had signs of iron deficiency. Iron deficiency was most prevalent among 15-18 year olds (42%). Twelve percent of the girls had blood profiles indicative of thalassemia minor, a mild form of the hereditary anemia. No vitamin-related anemias were observed. Serum cholesterol values were elevated in one case and blood glucose levels were normal. Heights are low for this sample but not unacceptably low in individuals. Weights were lower than expected for height and age. The fatness of the girls was normal compared to NCHS standard, but muscle mass was quite low. A low muscle mass in these girls could account for the low body weight. About 18% of the girls were excessively thin and 19% were obese. Exercise stress tests revealed a wide range of fitness among these girls, but most of the girls had a low maximum capacity to work for their ages.

Chang, R.W.S. et al. *Incidence of malnutrition among Saudi surgical patients: a preliminary survey. Saudi Med.J. 6(5):459-467. (1985)*

A study carried out among 200 Saudi surgical patients admitted routinely over a 2-week period showed that 39.5% of the patients had evidence of malnutrition. Clinically significant malnutrition however, was found in 14% of the patients. Four percent were severely malnourished with a complication rate that was 6 times that among normal patients. Ten of the patients were moderately malnourished with a complication rate that was 3 times the rate among normal patients. Severe malnutrition appeared to be disease-related affecting mainly patients with gastrointestinal tuberculosis or malignancies. Obesity, although very common, with an incidence of 20% and 38% among the male and female patients respectively, did not affect the outcome of surgery in this study.

Chang, R.W.S. et al. *Total parenteral nutrition: a four-year audit. Br.J.Surg. 73:656-658. (1986)*

A four-year audit was carried out on 278 patients who received 289 courses of total parenteral nutrition (TPN) over 5213 patient days in a Saudi Arabian hospital. One hundred and forty-seven patients were discharged healthy, two of these after home TPN. The overall mortality was 36 percent. ICU patients had the highest mortality (53 percent). Among the survivors, 74.8 % showed an improvement in nutritional status; the incidences of metabolic complications and catheter sepsis were 2.9% and 3.6%, respectively. As a direct result of the audit, changes were made on protocols and staffing patterns, and an attempt was made to address the major problem of better selection of patients.

Cook, G.C. Serum Cholesterol concentration in Arabs in Riyadh, Saudi Arabia, and its relation to adult hypolactasia. *Trop. Geog. Med.* 28(4):339-342. (1976)

A lactose tolerance test by mouth was carried out on five groups of Arabs (Bedouin, urban Saudi, Yemeni, Khadiry and Syrian) in order to diagnose the presence of adult hypolactasia or persistence of intestinal lactase in adult life. All subjects were admitted to hospital with minor illness. Mean serum cholesterol was found to be similar in all subjects except a Bedouin Woman (318 mg/100ml) was diabetic, and a khadiry man (280mg/100ml) had ischami heart disease. The mean value in subjects with hypolactasia was 197 mg/100 ml while that in those with persistent intestinal lactase was 196, indicating that a greater milk tolerance did not give rise to a higher mean cholesterol value. It was concluded that serum cholesterol in Arabs was normal or low compared with Northern Europeans. These findings were unexpected, as the incidence of diabetes and ischaemic cardiac disease was high in Riyadh.

Davidson, R. Haemoglobin values in preschool children and pregnant women. *Medical Newsletter (Oman)* III(2): 38-42. (1986)

Blood samples from 100 preschool children in six main villages of the Wadi, Oman, were collected for determinative of iron-deficiency anaemia. The last 1000 consecutive haemoglobin estimations from ante-natal women were recorded. The results showed that 40% of the preschool children had a haemoglobin less than 10 g/dl, while the percentage among women was 25%. Of the women, 53.8% had haemoglobin less than 11 g/dl.

Dawood, J. S. Nutritional Status of Pregnant Arab Women in Kuwait. *Nutrition Unit, Preventive Health Section. Ministry of Public Health, Kuwait.* 44p. (1986)

Nutritional status of 1580 pregnant Arab mothers (60% Kuwaiti and 40% non-Kuwaiti) was assessed. The survey was conducted in maternity clinics and hospitals from November 1985 to June 1986. Anthropometric measurements, haemoglobin levels, and 24-hour dietary recalls were determined. Forty-five percent of mothers were found obese according to their preconceptional weight. The difference in

weight, height and body mass index between Kuwaiti and non-Kuwaiti pregnant mothers was statistically significant. Of pregnant mothers, 39.8% were anaemic (Hb <11 g/dl). The incidence of diabetes, hypertension and smoking were 3.8%, 4.4% and 2.8% respectively. Dietary intake assessment showed a lower intake of iron, vitamin A and vitamin C.

Eid, N., et al. Anaemia in school children. A preliminary study. J. Kwt. Med. Assoc. 20:39-43. (1986)

Cross-sectional study on 1208 school children in Kuwait (6-17 years old) was carried out to determine the prevalence of iron deficiency anaemia. Findings showed that most boys (71.8%) had haemoglobin levels ranging from 13 to 15 g/dl, while the majority of girls (85.8%) had haemoglobin levels from 11 to 14 g/dl. Based on WHO classification, iron deficiency anaemia was more prevalent among girls (26%) than boys (13%), but was highly prevalent among younger boys (6-9 years) and adolescent girls than among other age groups. A more detailed study on types and causes of iron-deficiency anaemia was recommended.

El-Dosary, L. et al. Ecological factors influencing morbidity patterns of acute gastroenteritis in children under five years of age in Kuwait. Bull. High Inst Pub. Hlth. (Alexandria): XII(2): 49-66. (1982)

Three hundred children aged one month to five years and diagnosed as suffering from acute gastroenteritis were included in the study. They were residents of Kuwait city and were admitted to two hospitals. The results revealed that about 21% of children had more than one attack of gastroenteritis. Only 12% of children particularly young babies had severe cases of gastroenteritis. The highest proportion (68.3%) of gastroenteritis was found among children of low level educated mothers. The incidence of gastroenteritis during the first year was found to be higher (63.1%) among children who depend entirely on artificial feeding than those who had breast or mixed feeding (36.9%). The highest proportion (31.5%) of children with recurrent attacks of gastroenteritis was found among those with low birth weight (<2.5kg). Low educational level of mothers had a significant effect on the incidence of malnutrition associated with gastroenteritis ($Z=1.85$). Nationality of the mother had no significant effect on the incidence or recurrence of diarrheal attacks.

El-Hazmi, M.A., et al. Establishment of normal 'reference' ranges for haematological parameters for healthy Saudi Arabs. Trop. Geogr. Med. 34(4):333-339. (1982)

The normal 'reference' ranges of haematological parameters vary considerably under the influence of different factors, such as the age and sex, and various environmental factors. Furthermore, diurnal variations have also been observed. In this study the normal 'reference' ranges of haematological parameters established by analysing

samples from 804 healthy Saudi students (578 males and 226 females), with ages ranging between 20 and 29 years, are presented. Comparison of the mean values for Saudi with the values for the Western population showed that for the Saudi male the mean value for HbFe was slightly higher while for all other parameters the values were lower. Among the Saudi females, mean values for Hb Fe white blood cell counts and mean cell volume were slightly higher than those reported for western females. Mean values for all other parameters were lower than corresponding mean values in westerners.

El-Hazimi, M.A.F. & Warsy, A.S. Riboflavin status in a Saudi population - a study in Riyadh. Ann. Nutr. Metab. 31(4): 253-258. (1987)

The riboflavin level was studied in 715 Saudis (502 male and 213 female) in the Riyadh area using an estimation of red cell glutathione reductase activity in the presence and absence of FAD. The population was grouped according to age and the glutathione reductase activity coefficient (AC) was calculated in each of the groups. An AC value of 1.3 or above was found among 38% and 17% of females and males, respectively. Among females the lowest percentage was found in girls less than 12 years old, and the highest in those 21 to 30 years old; among males, boys less than 12 years and adults over 30 years old had the highest percentage.

Elidrissy, A.T.H. Protein-calorie nutritional status of infants with deficiency rickets in Riyadh. Ann.Saudi Med. 6(2): 101-104. (1986)

This study was carried out to elucidate the relationship between protein-calorie malnutrition (PCM) and rickets, since a positive correlation had already been reported from other areas of Middle East and India. Children with active rickets were assessed nutritionally, clinically and anthropometrically and were compared to nonrachitic children. The protein-calorie nutritional status of rachitic and nonrachitic children did not show a statistically significant difference. Only 31% of the rachitic children in this study were found malnourished in contrast to more than 70% reported in three other studies. Malnutrition was more marked after the first year of the child's life, especially among breast-fed infants who received no supplementary feeding. Nutritional rickets in Riyadh usually occurred as an isolated disease entity related to environmental deprivation of sunlight among infants with no dietary vitamin D supplementation. The PCM that may occur in some of the rachitic children, was found to be merely coincidental.

Elidrissy, A.T.H. Vitamin D deficiency rickets in a sunny country: Pathogenesis, clinical picture and management. Ann.Saudi Med. 7(2): 119-125. (1987)

Vitamin D deficiency rickets occurs in sunny countries, mainly due to man-made environmental factors associated with avoidance of sunshine. This situation can be

prevented by more health education regarding exposure to sunshine. House designs in urban areas need to be changed to allow for such exposure while still maintaining privacy. Fortification of foods with vitamin D is not without hazards and need not be advocated, but the risk groups can be given vitamin D supplementation in physiological doses. The tragic effects of vitamin D intoxication must be always borne in mind when prescribed as prophylaxis in massive doses. Finally, vitamin D deficiency diseases can be eradicated by more exposure to the sun.

Elidrissy, A.T.H., Sedrani, S.H. & Lawson, D.E.M. Vitamin D deficiency in mothers of rachitic infants. *Calcif Tissue Int.* 36:226-268. (1984)

This study was carried out to elucidate the relation between infantile rickets and maternal vitamin D status. The study group included 36 infants with clinical diagnosis of rickets which was radiologically confirmed. The feeding method, type of house, attitude, and history of exposure to sun were obtained. Samples of blood were collected from the rachitic infants and their mothers. Similarly treated control samples were collected from non-rachitic hospitalized children and from non-pregnant adult females. The results revealed that most of the rachitic infants were breast fed, some received unsupplemented infant feeding formulae, and all live in an environment that is devoid of sunlight. Their mean age at the time of onset was 10.5 months. 25-Hydroxyvitamin D (25 OHD) levels were found to be low in mothers of the rachitic infants. This maternal deficiency as a factor in pathogenesis of rickets in the infant was discussed. Proposals were made to prevent and or limit the occurrence of rickets.

Emara, M.K. & Bisharatulla, M.S. Acute myocardial infraction in diabetic patients in Kuwait. *Saudi Med. J.* 4(2): 139-146. (1983)

During a study period of sixteen months 142 cases of acute myocardial infarction were admitted to the Coronary Care Unit of Al-Adan Hospital. Diabetes mellitus was found in 40.8% of the cases and occurred in 51% of Kuwaiti and 31% of non-Kuwaiti patients. Twenty-two percent of diabetic patients had no chest pain but presented with nausea, vomiting and epigastric discomfort. Signs of left ventricular failure occurred in 55% of diabetics and 27% of non-diabetics. Hospital mortality for all cases was 19% and was higher in diabetics (27.6%) than in non-diabetics (13%). Increased mortality affected mainly diabetic females (60% mortality) and younger diabetic males (17.4% mortality). Pump failure caused more deaths in diabetics (69%) than in non-diabetics (36%), most probably due to severe vascular disease.

Farrag, O.L. The status of child nutrition in the Gulf Arab States. *J.Trop.Ped.* 29(6): 325-329. (1986)

This paper summarizes the main findings of several studies carried out by the UNICEF during the period 1978-1982, in the Arab Gulf States. The children of these affluent states were not only suffering from the same problems as those of the poorer

developing countries, in addition, are facing the negative impact of rapid economic development and the drastic social change that took place during a short period of time. In a study of a sample of 3258 children below the age of six, one third were found to be suffering from some form of malnutrition. The two nutrition status surveys carried out in Bahrain and Oman in 1978 have shown a serious decline in breastfeeding. Anaemia was extremely frequent; to the point that in some countries figures of 9 or 10 g Hb/100 ml were considered normal in school children. More than 60% of children were under 90% of normal level. While primary malnutrition was still existed in the Gulf States. Infection in the form of parasitic infections, diarrhoeal disease and malaria (in Oman) were reported. In UAE, a high percentage of pregnant women were not aware of the importance of a well-balanced diet during pregnancy, and had inadequate diets. The findings of these studies were used to set up programmes to improve the conditions of children in the Arab Gulf States.

Farsakh, F.A.A., Al-Khalily, A.S. & Mameesh, M.S. Plasma lead and erythrocyte zinc protoporphyrin in neonates/young children in Kuwait. *Ann.Nutr.Metab.* 31(5): 292-295. (1987)

Blood samples from a series of 797 non-selected Kuwaiti Bedouin infants less than 5 years old were analysed for lead and zinc protoporphyrin (Zpp). Increased blood Pb concentration (more than 25 µg/100 ml), which may indicate Pb poisoning, were found in 53 infants. These children had a mean blood Pb concentration of 47.1 ± 15.9 µg/100 ml and a mean blood Zpp concentration of 196 ± 11.5 µg/100 ml. The correlation coefficient between the concentration of Pb and Zpp in the blood was 0.78. The results indicate that Pb intoxication in newborn infants and children may be a significant health problem in Kuwait, and that measurement of blood Zpp can be used as a rapid and inexpensive microscreening method for Pb poisoning in newborn and older infants.

Fonseca, V. et al. Exposure to sunlight and vitamin D deficiency in Saudi Arabian women. *Postgrad Med. J.* 60(707): 589-591. (1984)

Plasma 25-hydroxy cholecalciferol (25-OH vitamin D) levels were examined in 31 Saudi Arabian women. The level of 25-OH vitamin D ranged from 2 to 18 ng/ml with a median of 6 ng/ml. Women living in apartments had significantly lower plasma 25-OH vitamin D than those living in villas and rural areas ($p < 0.02$). Women with daily average exposure to sunlight less than 30 minutes had significantly lower plasma 25-OH vitamin D than those with daily average exposure more than 30 minutes ($p = 0.002$). Inadequate exposure to sunlight as well as social customs are considered among the main factors leading to vitamin D deficiency.

Hussein, M.A. The effect of diet and mouth hygiene on the teeth health state of students at some schools of Saudi Arabia. *J.Egypt. Pub. Hlth Assoc.* LIV(1&2):35-40. (1979)

A survey on 90 nursing schools female students, 184 boys and 156 girls of primary school in Riyadh was carried out to examine the health of their teeth. The incidence of the teeth affection in the form of caries DMF (Decayed, Missed, Filled teeth) was high. Of primary school boys 69.9% had caries compared to 67.3% of girls. The DMF ratio among nursing students was 2.3. The soft kind of diet and its low content of vitamins A and C, as well as calcium and iron may have acted as predisposing factor. Incomplete mouth hygiene played also a vital role in worsening the teeth health of students.

Kamel, K. et al. Blood levels of selected nutritional status indicators in young men from a rapidly modernizing society in Abu-Dhabi, United Arab Emirates. *Am.J. Clin. Nutr.* 32(10): 2150-2153. (1979)

Blood parameters which include hematocrit, serum protein, serum transferrin, serum calcium, serum iron, serum folate, and red blood cell folate were assessed in two groups of young males (10 expatriates as a control group and 30 Bedouin army recruits). Hematocrit, serum protein, transferrin and calcium were found adequate in both groups. Serum iron was found adequate in both groups but was not so in four of the recruits. Average serum folate was similar in the two groups, except in two recruits who were deficient at levels less than 3.0 ng/ml. About 37% of recruits and 50% of controls had serum folate higher than 5.9 ng/ml. Nine recruits had borderline red blood cell folate (<200 to >100 ng/ml). All others had levels higher than 200 ng/ml. Low vegetable consumption may have contributed to low folate levels.

Karrar, Z.A. & Abdulla, M.A. Gastroenteritis among children in Riyadh: A prospective analysis of 254 hospital admissions. *Ann Trop Ped.* 1(2): 119-122. (1981)

A prospective study was carried out on 254 infants and children admitted with gastroenteritis to the Children's Hospital, Riyadh, Saudi Arabia during five months period. It was found that 80% of the admitted children were less than one year of age and 65.4% were on bottle-feeding. The incidence of second and third-degree malnutrition was 38.9%, with marasmus being the most common type of malnutrition. Hypernatraemic dehydration occurred in 12.6% of the cases. The parasitic and bacterial isolation rate was 23.8%. Salmonellae and E. Coli were the most common organisms. The mortality rate was 9.1% and was higher among malnourished, those with hypernatraemia and younger age group.

Kingston, M. & Skoog, W.C. Diabetes in Saudi Arabia. *Saudi Med. J.* 7(2): 130-142. (1986)

A total of 222 consecutive noninsulin-dependent Saudi Arabian diabetics, most of whom were not treated with insulin despite severe hyperglycaemia, are described. Several features were unusual. Onset in middle-age with obesity (85%) was similar

to diabetes in the West; coronary artery disease, large vessel peripheral vascular disease, retinopathy and proteinuria were less common. Hyperosmolar coma and ketoacidosis were rare despite severe hyperglycaemia, mean fasting serum glucose (FSG) 264 ± 105 mg/100 ml. The low frequency of ketoacidosis was due to maintenance of normal basal insulin even when diabetes was severe. Nocturia was absent in about 50% and polyuria was mild, mean daily urine volume and glucose excretion being 1990 ml and 87.4 g. The mean standing systolic blood pressure (112 mmHg) of 68 patients with FSG 300 mg/100 ml or more was significantly lower than their supine blood pressure (127 mmHg) and the standing blood pressure (125 mmHg) of 53 patients with FSG 200 mg/100 ml or less. The standing blood pressure in 23 patients increased significantly after treatment with insulin. It is postulated that sodium depletion from osmotic natriuresis and low water intake by limiting water excretion, account for the findings and also exacerbate hyperglycaemia. Low blood pressure, low cholesterol and perhaps low peripheral insulin may protect against atherosclerosis and microangiopathy.

Krayyem, L.M., Khuffash, F.A. & Sethi, S.K. The sodium status in children with acute gastroenteritis in Kuwait. *J. Kwt. Med. Assoc.* 19: 227- (1985)

Over a 15 month-period 600 children with gastroenteritis were prospectively studied for their sodium levels in relation to age and nutritional status. Isonatraemia was found in 507 cases (84.5%), hyponatraemia in 76 (12.7%) and hypernatraemia in 17 (2.8%) cases. Hypernatraemia was commoner in infants than in older children (3.6% and 1.1% respectively); and in overweight children (6.5%). Severely malnourished children showed a high incidence of both electrolyte abnormalities (Hyponatraemia 19.8% and hypernatraemia 4.2%). The incidence of hyponatraemia decreased gradually with improvement of the nutritional status. In the 17 patients with hypernatraemia the serum sodium level ranged between 150-168 mmol/l (mean 157.8, median 158). There was no mortality attributable to hypernatraemia and only one patient (5.9%) suffered from permanent brain damage. Hypernatraemia seems to be declining in our practice with favourable outcome. A high index of suspicion is still needed in view of the absence of a classical clinical picture in malnourished children.

Mameesh, M.S. et al. Maternal plasma proteins, magnesium, zinc and copper concentration at term associated with birth size in Kuwait. *Acta Vitaminologica et Enzymologica.* 7(3&4): 183-187. (1985)

Proteins and magnesium in serum of 57 Arab mothers, mean age 23.5 years, at delivery in hospital in Kuwait did not correlate with body measurements of infants. Zinc and copper in serum positively correlated with birthweight, body length and head circumference. Results indicate a low Zn and Cu intake resulting during pregnancy in serum values inadequate for the requirements of the growing foetus.

Moghraby, S.A.A. et al. Parity and vitamin D metabolites. *Ann. Trop. Ped.* 7:210-213. (1987)

Twenty-five hydroxycalciferol (25-OHD), 1, 25-dihydroxyvitamin D (1,25(OH)₂D), calcium (Ca), phosphorus (P), alkaline phosphatase, and total protein were estimated in 86 Saudi pregnant women. They were divided into two groups, group I, parity 5 or more, and group II, parity 4 or less. The mean level of 25-OHD was 10.4 (S.D. 6.5) ng/ml in group I, and for group II 8.2 (6.1) ng/ml with no significant statistical difference between the groups. 1,25 (OH)₂ D mean levels, in group I was 45.5 (S.D. 30.2) ng/ml and 36.9 (S.D. 27.1) ng/ml in group II. No significant difference was shown. Levels of vitamin D metabolites were comparable with non-pregnant levels in Saudi Arabia but lower than others reported in Western populations. The study showed no effect of increasing parity on levels of vitamin D metabolites.

Mokhtar, N.A. & Ghaly, I.M. Lactose intolerance, a cause of recurrent diarrhea in Kuwait. *Gaz. Egypt Ped. Ass.* 22(2): 113-118. (1974)

This study includes 198 patients convalescing from gastroenteritis. The patients were divided into 2 groups; group I was given Y2 cream milk formula and group II was given Y2 cream lactase free formula. The incidence of diarrhea was higher in first group than second group (28% and 12.3%, respectively). Diarrhea was accompanied by the appearance of reducing substances in the stools in 22% of cases and acid stools in 37% of cases of first group, compared to 0% and 9%, respectively in second group. Transient lactose intolerance is considered a possible cause of recurrent diarrhea. The administration of a lactose-free formula to patients convalescent from severe gastroenteritis is recommended to diminish the incidence of recurrent diarrhea and stop the vicious cycle.

Musaiger, A.O. & Abdulaziz, S.A. Nutritional Disorders Among Hospitalized Patients in Bahrain. *Nutrition Unit, Ministry of Health, Bahrain*, 30 p. (1985)

Information related to some nutritional disorders among hospitalized patients admitted to the main governmental hospital (Salmaniya Hospital) for the period 1980-1982 were presented. All patients with nutritional disorders as the first diagnosis were included. The findings indicated that 39.6% of the diabetics belonged to age group 50 years and above. The prevalence of diabetes was higher among females (58.4%) than males (41.6%) for the year 1982. In general, the prevalence of hereditary haemolytic anaemias was higher among children than adults. In 1982, about 25% of hospitalized anaemics were in the age group 1-4 years. Almost all of the hereditary anaemics were Bahrainis (98%), which leads to the conclusion that the hereditary haemolytic anaemias constitute a health problem for Bahraini but not for expatriate. The prevalence of the hereditary haemolytic anaemias was higher in rural than urban areas. Only small cases of iron-deficiency anaemia were reported

annually as a first diagnosis (48 cases). This may be attributed to either under-reporting of cases or that iron-deficiency anaemia was secondly or thirdly diagnosed. About half of the anaemics belonged to the age group less than 10 years (55%). An annual prevalence of 30 cases of marasmus was reported. About 64% of hospitalized children with marasmus were less than one year of age. The prevalence of marasmus was higher among rural than urban children. Only 5 cases of Kwashiorkor were reported during 1980-1982 period.

Musaiger, A.O. & Abdulaziz, S.A. Demographic characteristics of hospitalized patients with diabetes in Bahrain. Bah. Med. Bull. 8(2): 73-76. (1986)

The demographic characteristics of patients with diabetes who were admitted to Salmaniya Medical Centre in Bahrain for the period 1980-1982 were reviewed and analysed. The results showed that the majority of diabetics were more than 50 years of age. About 88% of the diabetics were Bahraini and most of the reported cases were in the urban areas. For the year 1982, it was found that the percentage of Bahraini female diabetics was higher than males in all age groups, except in the less than 10 years age group and those older than 49 years. Proper health education for the public and training of the physicians on dietary management of diabetes were recommended to control diabetes in the community.

Nutrition Unit. Maternal and Fetal Nutrition. Preventive Health Section. Ministry of Public Health. Kuwait. 17p. (1979)

A random sample of 310 Kuwaiti mothers and their newborns representing two socio-economic groups was studied to assess the relation between maternal and neonate nutritional status. The nutritional status was assessed by anthropometric measurements and diet history of mothers. There was some difference as regards the nutrients intake between mothers in the two socio-economic groups. Furthermore a statistically significant difference was observed in their anthropometric measurements. This difference between the two groups of mothers is reflected in a similar statistically significant difference between their infants in weight, length and chest circumference. The findings confirmed that the nutritional status of mothers had an important effect on the nutritional status of their infants.

Nutrition Unit. Gastroenteritis Among Breast and Bottle-fed Infants. Preventive Health Section, Ministry of Public Health, Kuwait. 7p. (1979)

A sample of 751 infants and young children (3-24 months) was selected from three health centres and through home visits of mothers in different areas in order to determine the relationship between gastroenteritis and infant feeding practices. The findings revealed that the frequency of gastroenteritis attack was more among bottle-fed infants than breast-fed infants. At age group 3-5 and 6-8 months, the percentage

of bottle-fed infants who got one attack of gastroenteritis was double those of breast-fed. Five percent of infants at age group 3-5 months and 12% of infants at age group 6-8 months got more than two attacks. Among age group 9-11 and 12-24 months, the percentage of breast-fed babies who got gastroenteritis was higher compared to their younger counterparts, but was still lower when compared to bottled fed babies. This may be attributed to introduction of weaning foods and the condition of weaning diarrhoea.

Nutrition Unit. Obesity, Hypertension Among Diabetes. Preventive Health Section, Ministry of Public Health, Kuwait, 15 p. (1982)

A sample of 2067 and 873 Kuwaiti and non-Kuwaiti, adults was selected from 17 polyclinics and examined for diabetes, obesity and hypertension. Of Kuwaiti, 6.4% were diabetic compared to 9.1% in non-Kuwaiti. About 57% of males and 73% of females of total sample knew that they had diabetes. Using Quetlet Index, 52% of males and 88% of females were obese. As for hypertension, 42% of males and 25% of females were hypertensive.

Omar, A. et al. Diabetes mellitus in Al-Ain: the impact on hospital services. Emirates med. J. 3: 119-122. (1985)

Patients with diabetes mellitus made up 5.8% of all general medical admissions to the Al-Ain Hospital over a 5-years period ending October 1984. Of these 685 adults. The case records of 360 patients were available for review and are the material for the clinical part of this study: 40.6% of these were of indigent nationality, and 61.8% of patients in this group were female. Type II diabetes mellitus featured in 71.7% of patients in this same group, whose ages ranged from 41 to 70 years. The larger expatriate patient group showed a male preponderance (67.2%) and presented at a younger age (range 21-50 years). 43% of patients in this group showed type I diabetes mellitus. Both groups of patients presented relatively low body weights (less than 70kg) and, although compliance to therapy was satisfactory, there was notably poor clinical control of their disease. The rate of both acute and chronic complications was low and, although overall mortality was noted at 3.2%, no deaths could be directly attributed to the metabolic derangements associated with the disease.

Sebai, Z.A. The Health of the Family in a Changing Arabia. Tihama Publications, Fourth Edition, Jeddah, Saudi Arabia. 155p. (1984)

This study highlights the changes in health and nutrition status which have occurred in one of the rural areas in Saudi Arabia during the period 1967-1981. The study is divided into four chapters. The first one gives a background on geography and population of study area. The second chapter focuses on the health and nutrition situation in Turaba in 1967 based on results of a health survey on 314 households.

Information on daily consumption of certain foods, infant feeding practices, sanitary environment, diarrhea diseases, infant mortality, anthropometric measurements, intestinal parasitic infections, and health knowledge and attitudes were provided. The third chapter examines the change in health status during 1967-1981. It underlines the great change which took place in socio-economic status during this period. People are more attracted by modern medicine but health services are still not easily accessible for a high proportion of families. The health center in Turaba had a minimum contribution to the promotion of health among the people. The fourth chapter gives a plan of action to provide better health services in Turaba.

Sebai, Z.A. *Diabetes mellitus in Saudi Arabia. Postgraduate Doctor Middle East. 10(10):582-586. (1987)*

The article reviews literature on the problem of diabetes mellitus in Saudi Arabia. Although diabetes mellitus in Saudi Arabia has attracted the attention of many researchers in the last five years, only a few studies have been published. These studies were carried out in local communities and mostly amongst hospital patients. The general impression from the limited literature available is that diabetes mellitus is an emerging problem in Saudi Arabia, particularly in urban societies. Some studies showed a relatively high prevalence of 4.5 percent in urban communities. It was suggested that the rapid socioeconomic changes which the country has experienced over the last 20 years, must have contributed to the high prevalence rate. Many questions regarding the magnitude of the problem, its distribution, contributing factors, pathogenesis and criteria for diagnosis still need to be answered.

Sebai, Z.A. *Nutritional disorders in Saudi Arabia: a review. Family Practice. 5: 56-61. (1988)*

This paper reviews the nutritional problems in Saudi Arabia. Iron deficiency anaemia and a mild to moderate degree of stunting and wasting among preschool children were reported. Ignorance and misconception are the main causes of these problems. Overnutrition has been observed recently especially among the middle and upper class of urban population. Generally, an improvement in the nutritional status has been observed during the last two decades. This is a repercussion of socio-economic development and improvement in education, dietary habits, and environmental conditions. The author recommended to establish Saudi standards for health and nutrition to be used for planning and evaluation of health and nutritional programmes.

Sebai, Z.A. *Cancer in Saudi Arabia. Ann. Saudi Med. 9(1): 55-63. (1989).*

This article reviews the literature on the problem of cancer in Saudi Arabia. Several studies on cancer have been undertaken in Saudi Arabia, mostly of an epidemiological nature, to define the magnitude of the problem. In the absence of a national survey

or national cancer registration, these studies are the old source of information to date on cancer in the Kingdom. A comparison of prevalence or incidence between Saudi Arabia and other countries is quite difficult because of a lack of information on the base population and difference in the age distribution. Cancer in Saudi Arabia is an ever-increasing problem as people change their life style and longevity increases. The incidence of cancer is estimated at around 800 new cases per million population per year. More than 70% of the cancer patients are admitted to hospitals in an advanced stage. Health education programmes for the public and for health professionals should promote awareness, early diagnosis, and prompt treatment.

Sedrani, S.H. Low 25 Hydroxyvitamin D and normal serum calcium concentration in Saudi Arabia: Riyadh Region. Ann. Nutr. Metab. 28(3): 181-185. (1984)

This report presents data on the levels of 25-Hydroxyvitamin D and serum calcium in normal Saudi and other ethnic groups. Serum levels of the circulating form of vitamin D, 25-Hydroxyvitamin D, and calcium were measured in 104 Saudi, 44 Jordanians, 17 Egyptians, and 10 other subjects aged between 18 and 23 years. All subjects were male university students living in Riyadh for more than 2 years. The mean and standard deviation of 25-Hydroxyvitamin D levels were 12.8 + 6.3, 11.0 + 5.8, 11.9 + 6.9, and 11.9 + 5.0 ng/ml, respectively. The prevalence of serum 25-Hydroxyvitamin D below 10 ng/ml were 45%, 53% and 50% for Saudis, Jordanians, Egyptians and others, respectively. All subjects had normal serum calcium concentration. There was no correlation between 25-Hydroxyvitamin D and serum calcium levels in the subjects investigated. The results indicated a tendency for a low vitamin D status among residents of Saudi Arabia in spite of abundant sunlight all the year round.

Sedrani, S.H. Are Saudis at risk of developing vitamin D deficiency? Saudi Med.J. 7(5):427-433. (1986)

This report attempts to highlight the vitamin D status of Saudis. In spite of abundant sunlight, vitamin D deficiency is common in Saudi Arabia because of minimal exposure to the sun. In addition, Saudi women usually go through a continuous cycle of pregnancy and lactation, which further depletes their vitamin D stores. Young children are kept indoors until they are independent at about the age of 2 years and their mothers are of the opinion that the sun is harmful for the child. The report focuses on the importance of ensuring that children, pregnant and lactating women, adult males and females and the elderly expose themselves to natural UV light for a short time each day. Further investigations on factors associated with vitamin D deficiency are recommended.

Sedrani, S.H. Influence of age, sex, urbanism/ruralism, seasonal variations and vitamin D status on plasma concentrations of vitamin D-binding protein and free 25-Hydroxyvitamin D. Asia Pacific Comm. Bioch. 1(3):139-145. (1987)

This paper studied the influence of some demographic factors seasonal variation, and vitamin D status on plasma concentrations of vitamin D-binding and the calculated concentrations of free 25-Hydroxyvitamin D. A sample of 695 children and 909 adult Saudis in the Riyadh region was included. Females had higher levels of vitamin D-binding protein and lower free 25-Hydroxyvitamin D concentrations than males. The plasma vitamin D-binding protein concentration was significantly higher ($P < 0.0001$) in urban than in rural dwellers. The calculated concentration of free 25-Hydroxyvitamin D was significantly higher ($P < 0.0001$) in rural than in urban dwellers. Adults of both sexes had significantly higher ($P < 0.0001$) vitamin D-binding protein concentrations than children, whereas the free 25-Hydroxyvitamin D levels were similar in both groups. Alteration in vitamin D status of subjects did not alter the levels of vitamin D-binding protein. The reasons for these findings, and the correlations between plasma vitamin D-binding protein, total and free 25-Hydroxyvitamin D were discussed.

Sedrani, S.H. Vitamin D status of Saudi men. *Trop.geogr.Med.* 36: 181-187. (1984)

This paper investigates the vitamin D status of Saudi Arabian population, with the aim of reporting data on the levels of 25-(OH) D, 1,25-(OH)₂ D, and to compare these levels between Saudis and non-Saudis. The sample included 65 Saudis, 45 white and 12 dark-skinned non-Saudis. The subjects were healthy male blood donors and living in Riyadh, Saudi Arabia for more than one year. A relatively high percentage (29%) were found to have low serum levels of 25-(OH)D and to be at risk of developing vitamin D deficiency. Serum levels of 1,25-Hydroxyvitamin D were normal in all subjects studied and are comparable with those for the Western population. Avoidance of sunshine is probably the main factor contributing to vitamin D deficiency in Saudi Arabia. Encouragement of exposure to sunlight and fortification of food with vitamin D are indispensable measures for improving the vitamin D status of the population.

Serenius, F., Elidrissy, A.T.H., & Dandona, P. Vitamin D nutrition in pregnant women at term and in newly born babies in Saudi Arabia. *J.Clin.Path.* 37(4): 444-447. (1984)

A survey to assess the vitamin D level in 119 pregnant women at term and in their newborn infants was made in Riyadh, Saudi Arabia. Concentrations of 25-hydroxyvitamin D 25-(OH)D were below 4 ng/ml in 30 of 119 maternal serum samples, in 11 of which they were undetectable. The median concentration of 25-(OH)D was 5.7 ng/ml comparable to that in Asian vegetarian women at term in London. Of 119 cord samples 50 had undetectable 25-(OH)D, and a total of 81 samples had 25-(OH)D concentrations of less than 4 ng/ml. Despite the low 25-(OH)D concentrations cord blood had calcium concentrations higher than those in maternal blood; serum albumin concentration was similar in maternal and cord samples. Higher socioecon-

omic background of women, antenatal care and vitamin D supplementation were significantly associated with higher concentrations of 25-(OH)D. Vitamin D supplementation had no significant effect on 25-(OH)D concentration in cord samples or on the weight of the newborn infants. This study shows the high prevalence of marginal vitamin D nutrition in women in Saudi Arabia, which may predispose babies to rickets during infancy. In a country endowed with plentiful sunshine, the exclusion of sunshine by thick dark veils and bad housing probably contribute to this marginal state of vitamin D nutrition.

Shawky, R.M. & El-Din, S.S. Iron deficiency anaemia in children in Um-Al-Quwain, United Arab Emirates. *J.Egypt Soc. Parasitol.* 12(1):217-224. (1982)

Iron deficiency anaemia was examined for 500 Arab children aged 4 months to 6 years who attended the Pediatric Clinic at UAE Hospital in Um-Al-Quwain. The following parameters were assessed; haemoglobin, hematocrit, blood smear and reticulocyte count, glucose-6-phosphate dehydrogenase, serum iron level (for 50 children), blood smear for malaria parasites, serum protein, occult blood in stool, urine and stool examination. Of children 46.4% had iron deficiency anaemia ($Hg < 11 \text{ g}/100\text{ml}$ and hematocrit $< 33\%$). About 45% of infants were bottle-fed either using cow's milk or dried milk which was not fortified with iron. From 2 to 6 years of age, children were fed a staple diet of rice and bread with little animal protein or green leafy vegetables. Infections and parasitic infestations were considered as direct causes of iron deficiency anaemia among 65% of children. Malnutrition secondary to illness was observed among 17% of children with anaemia, and malnutrition due to dietary deficiency was seen in 46% of anaemic children.

Smart, I.S., Duncan, M.E. & Kalina, J.M. Haemoglobin levels and anaemia in pregnant Saudi women. *Saudi Med J.* 4(3): 263-268. (1983)

This paper described the variation of haemoglobin levels and prevalence of anaemia in 217 pregnant Saudi women attended the Jeddah Armed Force Hospital. First trimester haemoglobin were obtained from 97 women, second trimester levels from 143 women, third trimester level from 140 women, and post-partum levels from 186 women. The average pre-pregnancy haemoglobin, excluding cases of anaemia, was 12.4 g/dl in 54 cases measured. The results showed that haemoglobin levels fell from onset of pregnancy towards term. Both the iron-supplemented and non-supplemented groups showed an identical pre-term steady decrease in haemoglobin. While no effect of age alone was found, the women over 40 years of age started with haemoglobin levels equivalent to those of younger age groups but dropped to a lower level at pre-term. No effect of parity was seen, suggesting that the increased complication rate in primigravid and grand multiparous women does not include anaemia. The study concluded that haemoglobin levels and anaemia in pregnancy have the same pattern as elsewhere in the world.

Taha, S. A., Dost, S. M., & Sedrani, S. H. 25-Hydroxyvitamin D and total calcium: extraordinarily low plasma concentrations in Saudi mothers and their neonates. *Pediatric Research* 18(8): 739-741. (1984)

This paper looks into the role of vitamin D in the pathogenesis of neonatal hypocalcemia in Saudi Arabia. Venous blood was obtained from 100 consecutive and unselected Saudi mothers and their neonates within 48h after delivery. Plasma level of 25-Hydroxyvitamin D(25-OHD) and total calcium were measured in paired samples. Fifty-nine mothers and 70 neonates had subnormal 25-OHD levels (less than 10ng/ml). Plasma Ca concentrations were low in 61% of the mothers and 59% of the newborns consisting of 10 preterm and 38 full term babies. There were significant correlation between the plasma levels of maternal and neonatal 25-OHD, maternal 25-OHD and Ca, neonatal 25-OHD and Ca, and, maternal and neonatal calcium levels. Nevertheless, maternal 25-OHD was not invariably higher than that in the infant. Normocalcemia was observed in 29 neonates and 26 mothers (20 mothers/baby pairs) in the presence of subnormal maternal 25-OHD. Twenty babies and 16 mothers including nine mother/baby pairs had hypocalcemia in the presence of normal levels of 25-OHD. This indicates that vitamin D plays a crucial, but not exclusive, role in calcium homeostasis during pregnancy. The study concluded that vitamin D deficiency is very prevalent during pregnancy in Saudi Arabia, and that asymptomatic hypocalcemia in full term babies is far commoner than is generally appreciated. It considered that vitamin D deficiency is primarily due to lack of exposure to sunlight. Encouragement to fortification of food and to expose to sunlight were the only alternative measures to correct the situation.

Taha, T. et al. Diabetes mellitus in Kuwait, incidence in the first 29 years of life. *Diabetologia*. 25(4):306- 308. (1983)

The paper reports on the incidence of diabetes mellitus among Kuwaiti population aged 0 to 29 years for the year 1980-1981. The incidence was found 22.1 per 100,000 population. As age increased the incidence of diabetes increased without any remarkable peaks. The lowest incidence was seen among age group 0 to 19 years (5.61 per 100,000). The total number of female diabetic patients exceeded the number of male patients by 32%. The male:female sex ratio among patients was 0.68, and it was significantly less than that of the same age group in the general population.

Woodhouse, N.J.Y. & Norton, W.L. Low vitamin D levels in Saudi Arabians. *King Faisal Sepc. Hospt.Med.J.* 2(3): 127-131. (1982)

Circulating 25-hydroxycholecalciferol (25-OHD) levels were measured in 134 adults; 82 Saudi Arabian patients, 43 normal Saudi Arabians, and nine Western employees of the King Faisal Specialist Hospital. The mean circulating 25-OHD level was much lower in the normal Saudis (3.6 ng/ml) and Saudi patients (3.2ng/ml) than

in Westerners (17.1 ng/ml) ($p < 0.01$). There was no significant difference between the mean, normal Saudi male (3.9 ng/ml) and female (3.2 ng/ml) values, but rural Saudi (4.18 ng/ml) were higher than urban Saudi (3.14 ng/ml) values ($p < 0.05$). The 25-OHD levels were undetectable (< 2.0 ng/ml) in three patients with fluorid osteomalacia as well as in eight normal subjects and 26 patients without clinical or biochemical evidence of vitamin D deficiency. The 25-OHD levels increased from a mean of 2.8 ng/ml to 10.2 ng/ml during oral administration of vitamin D, 800 to 1200 IU daily ($p < 0.01$). It was found that the circulating level of 25-OHD is low in the Saudi Arabian population. This is due to a poor dietary intake and reduced synthesis of vitamin D by the skin. Both men and women avoid sunlight exposure and completely cover the skin with clothing. Individuals at risk, such as patients confined to the house for any reason, women during pregnancy and lactation, growing children, and patients on certain anticonvulsant medications should receive dietary supplements of vitamin D. Fortification of grain and milk products could help eliminate nutritional ricket and osteomalacia in Saudi Arabia.

Zaghloul, N.E., El-Sherbini, A.F. & Al-Shayeb, F.A. Dietary factors and physical activity of obese and nonobese adolescent girls. Bull. High Inst. Pub. Hlth. XIV(3):31-49. (1984)

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

Chapter 6

NUTRITION EDUCATION AND COMMUNICATION

Dagher, S. (Editor). *Proceedings of Inter-country Symposium on Nutrition Education in the Gulf States (26-28 January, 1987): FAO/Ministry of Health, Bahrain 91p(A). (1987)*

This publication includes papers presented at the Inter-country Symposium on Nutrition Education in the Gulf States which was organized by the Food and Agriculture Organization and held in Bahrain in 1987. The publication is divided into 3 parts. First part includes summaries of the discussions, conclusions, and the recommendations of the working groups. The second part includes the technical papers as well as country papers. The third part includes the programme, speeches of both Bahrain and FAO representatives and list of participants. Papers presented relate to the following topics: the importance of mass media in nutrition education, nutrition education in the Middle East, nutrition education in school curriculum and nutrition education in Bahrain, Kuwait and Saudi Arabia.

Musaiger, A.O. *The impact of television food advertisements on dietary behaviour of Bahraini housewives. Ecol. Food.Nutr. 13: 109-114. (1983)*

The objective of this study is to evaluate the effect of television food advertisements on dietary behaviour of Bahraini housewives. The housewives were interviewed twice in their homes, before and after exposure to certain food advertisements. A sample of 1260 households was randomly drawn from Manama City (the capital of Bahrain), for the first interview, and a sub-sample of 310 households for the second interview. The study showed that 42% and 47% of the housewives believed and moderately believed in food advertisement claims, respectively. Three new food advertisements were viewed during the study period (Galactina Baby Foods, C.P.Tea Bag and Fresh-up fruit drinks). Of the housewives, 41.6% used Fresh-up drinks, 25% used Galactina Baby Foods and 1.6% used C.P.Tea Bag. Findings suggest that advertising plays an important role in modifying dietary habits of Bahraini housewives.

Musaiger, A.O. *Can nutrition education compete with advertising messages in developing countries? In Turner, S.A. and Ingle, R.B. (editors), New Developments in Nutrition Education. UNESCO, Nutrition Education Series No.11, Paris, 212-216. (1985)*

This paper discusses the influence of advertising on food habits, and the need to apply an effective nutrition education programme. Advertising is becoming one of the main sources of nutrition information. In Bahrain, it was found that 74% of housewives agreed that food advertisements let them know about good and healthy foods. Advertising usually induces many unsound food habits, by putting on view or publicising

unnecessary food items, and providing misleading information. With the persuasion of advertising, poor households shift from their staple foods to other expensive and less nutritive foods. In the Arabian Gulf countries, consumption of fresh foods such as fruit has declined, while sales of canned foods have increased. More consideration should be given to the regulations concerning food advertising claims. People need more information on the meaning of nutritional terms and concepts. An effective nutrition education programme is therefore highly recommended.

Musaiger, A.O. The Newly Industrializing countries - nutrition education in the face of rapid change. Experience in Bahrain. In Taylor, T.G. and Jenkins N.K. (editors). Proceedings of the XII International Congress of Nutrition, (1985). John Libbey, London, 917-920. (1986)

This paper reviews the difficulties in teaching nutrition in Bahrain. Nutrition education faces a big challenge from advertising, particularly with the rapid growth of the mass media. Advertising plays an important role in changing food habits. Television food advertisements frequently contain little or no sound information on nutrition. Advertising claims are highly accepted as fact by consumers, and this sharply affects the nutrition education message. Illiteracy and ignorance about sound nutrition is highly responsible for poor nutritional status in Bahrain. Mothers are always selected as the target group for communication messages, but father and policy makers are neglected. In Bahrain, education of mothers would not help much in improving the nutritional status of the family because the father has a great influence on decision-making and food purchasing. Bahraini families become more dependent on the services of housemaids, who are responsible for home managements and feeding the children. This creates new target group. The geographical location of Bahrain, allows its people to see as much as six to ten TV broadcasting channels from neighbouring countries. Thus, there is no guarantee that the nutrition message will reach the audience. Lack of technical staff and poor planning have also contributed to a deficiency of nutrition education programmes.

Musaiger, A.O. et al. Children's response to television food advertisements in Bahrain. HYGIE V(4):30-35. (1986)

The aim of this study was to determine the role of advertising in food habits of children in Bahrain. A sample of 1260 mothers were randomly selected and asked about the response of their children to the television food advertisements. The findings showed that the effect of food advertisements varied with social class. In low social class 66.5% of the children requested for particular food advertised on TV, compared to 52.7% and 42.1% of the children in the middle and high social classes, respectively. Children in the age group 6-12 years asked more for food viewed in TV advertisements (43.2%), than other age groups. Mothers of high social class (41.6%) were less responded to the children request for food advertised, compared to mothers of middle

(58.2%) and low (67.3%) social classes. The results suggested that advertising has an important role in modifying the children's food habits in Bahrain. Regulation of advertising claims, as well as an effective nutrition education were recommended in order to reduce the negative influence of food advertising.

Musaiger, A.O. Food labelling regulations in Bahrain. *J.Royal Soc. Hlth.* 3:96-97. (1989)

The purpose of this study was to determine the compliance with labelling regulations. The study was carried out in two stages, before implementation of the food labelling regulations (in 1983) and after their implementation (in 1987). Information is required on production date, expiry date, storage instruction and Arabic description. A total of 1896 and 2539 brand names of prepacked foods were studied in the first and second stages respectively. In general there was an increase in the percentage of informative label after the implementation of the regulations. The declaration of production and expiry date increased by 57.3% and 49.8%, respectively. Arabic description on labels increased by 39.3%, but information on storage conditions improved by only 4%.

Chapter 7

FOOD CONTROL

Ali, A.A., Dudani, T. & Abdulrahim, I.Y. Salmonellosis outbreak linked to improper handling of food in a hotel in Bahrain. Bahrain Med. Bull. 8(3):119- (1986)

In July 1986, an outbreak of gastroenteritis occurred at a wedding party in one of the hotels in Bahrain. Out of 159 guests who were contacted, 105 (66%) developed symptoms at median incubation period of 11 hours. The symptoms were characterised by severe diarrhoea, abdominal pain, headache, high fever, nausea and/or vomiting. Out of 105 patients, 13 (12.4%) received intravenous drip (IV) and four were hospitalised. Salmonella serotypes Norwich group C1, Paris group C3, and Kentucky Group C3 were isolated from patients, food and food handlers. An epidemiologic investigation demonstrated that cold roast chicken, garlic chicken, chicken curry, cold turkey, cold roast beef, cold fish, salad, rice and dessert were vehicles of the outbreak. No left-over foods were available, but similar food preparations and ingredients were analysed 36 hours later and found to be contaminated with Salmonella. We assume that raw foods of animal origin (meat, poultry, eggs, fish) were highly contaminated with Salmonella, and other foods became contaminated by cross-contamination. Improper food handling and inadequate time/temperature exposure were the main contributing factors of the outbreak.

Al-Mohizea, I.S. Microbial quality of camels' raw milk in Riyadh markets. Egyptian J.Dairy Sci. 14: 173-180. (1986)

The microbial quality of camel's raw milk in Riyadh city was investigated. Twenty-nine samples taken from local shops were included in this study. Each sample was analyzed for; aerobic plate count, total coliforms, and coagulase positive Staphylococcus aureus. Twenty samples were screened for Salmonella, Bacillus cereus, and Yersinia enterocolitica. The results of this study indicated that the microbial counts of samples taken from one shop varied enormously which reflects the failure in maintaining consistent good hygiene. The aerobic plate count exceeded 105 CFU/ml in 13 samples and averaged $2.2 \times 10^5 \pm 3.7 \times 10^5$ CFU/ml. All samples tested were found to contain coliforms in excess of 10/ml with an average of $5.1 \times 10^3 + 1.4 \times 10^4$ /ml. Coagulase positive Staphylococcus aureus was detected in all samples with an average of $1.3 \times 10^3 + 2.2 \times 10^3$ /ml. Salmonella, Bacillus cereus, and Yersinia enterocolitica were sporadically detected in some samples. Thus it was concluded that camels' raw milk, although may qualify for processing, could present health hazard to the traditional consumers if drunk raw.

Al-Mohizea, I.S. Microbial examination of Riyadh Drinking Water. J.Coll.Agric.King Saud 8(1): 91-100. (1986)

In order to assess the microbial quality of Riyadh drinking water, samples from main

reservoirs, check points of the distribution network, and 400 households were taken and analyzed. Results indicated that water provided by Riyadh Water and Sewage Authority is safe for drinking as proved by the absence of coliforms and presence of adequate chlorine residual in both main reservoirs and distribution network. House tap water, however, may represent some potential threat to public health in some sections of the city. The problem seems to be related to lower reservoirs of some houses in the old sections of the city.

Al-Mohizea, I.S., Mousa, E.I. & Fawzi, N.M. Microbiological studies on two common types of bread in Saudi Arabia. Cereal Foods World 32(9):610-612. (1987)

Samples of two types of bread widely consumed in Saudi Arabia were collected from 15 semi-automatic commercial bakeries. Plate counts of total aerobes, total coliforms, spore formers, and yeasts and molds were determined on each sample. The moldfree shelf life and the mold genera responsible for bread spoilage were also studied. Plate counts indicated that the initial microbial loads were low in the majority of samples. Furthermore, no significant correlations ($P < 0.05$) were observed between the initial counts and the moldfree shelf lives. Whereas wide variation existed in moldfree shelf lives among bread samples from different bakeries, mafroud (pita-type) bread, in general, exhibited a better microbial keeping quality than samouli (French-type) bread. *Penicillium* predominated over all other molds in breads stored at refrigerator temperature, followed by *Neurospora*, whereas at room temperature *Penicillium* and *Aspergillus* predominated, followed by *Rhizopus* and *Neurospora*.

Al-Mohizea, I.S. Bacteriological assessment of wells' water in Riyadh area. J.Coll.Agric.King Saud Univ. 9(1):17-24. (1987)

The bacteriological quality of untreated wells' water in Riyadh area was evaluated. Samples were collected from twelve private wells and analyzed for total aerobes, total coliforms, fecal coliforms and for presence of *Salmonella*. In addition, three wells were bacteriologically monitored over a four-week period. The total bacterial counts ranged from 30 to 3.7×10^4 CFU/ml with an average of 4.6×10^2 CFU/ml. The coliform organisms were detected in eight wells with a range of 2.2 to 48 and an average of 7/100 ml; fecal coliforms were present in only one well. *Salmonella* was detected in three wells. Data, also revealed that, the bacterial loads of wells' water are enormously changing. Results, in general, suggest that bacterial counts of such untreated waters were relatively low. Nevertheless, it was recommended to restrict their use to domestic purposes other than drinking or food preparation, to avoid possible contamination by pathogens.

Al-Mohizea, I.S., Abu-Lehia, I.H. & El-Behery, M.M. Acceptability of laboratory made oggt using different types of milk. Cult.Dairy Prod.J. (August): 20-23. (1988)

Oggt, a traditional dry fermented dairy product, is usually prepared by the Arabian Beduins from sheep's buttermilk under uncontrolled conditions. A laboratory method was developed to prepare it from both sheep's and cow's milk; whole, gravity creamed and buttermilk. The final products were organoleptically evaluated and chemically analyzed. Results indicated that the laboratory made oggt was generally accepted by the panelists. Oggt type products made from cow's milk were superior to the corresponding types made of sheep's milk. Furthermore, using sheep's buttermilk resulted in an oggt of inferior quality. The fat level of the final product was found to markedly affect its sensory attributes.

Mousa, E.I. & Al-Mohizea, I.S. Bread Baking in Saudi Arabia. Cereal Foods World. 32(9): 614-618. (1987)

The technological aspects and physical characteristics of some type of breads widely consumed in Saudi Arabia were investigated. The milling and baking industries are expanding rapidly as a result of the top priority assigned to their by the Saudi government. The baking industry has developed from a traditional and manually operated industry to a highly automated one. Six types of breads samouli, mafrood, tannouri, burr, tamees, and korsan were thoroughly studied. Information regarding the formula, breadmaking technology, and physical characteristics of each type of bread was presented.

Musaiger, A.O. Food poisoning outbreaks in Bahrain. Health & Hygiene. 10: 21-24. (1989)

This paper highlights the current situation of food poisoning outbreaks in Bahrain and suggests measures to control such outbreaks. Changing in food consumption patterns, rapid growth of shops and canteens which are providing take-away meals, the increase in the employment of women, increased dependence on housemaids, increased use of foreign food handlers, camping outside home and ignorance were the main reasons for the increase in food poisoning cases in Bahrain. The most common food practices contributing to food poisoning were inadequate reheating of cooked foods, holding the cooked foods at warm temperature for a long time, poor hygienic conditions in kitchen, cross contamination and infected food handlers. Education and training of food handlers as well as food inspectors, proper health education, and routine medical examination of food handlers were the main suggested measures to control food poisoning in the country.

Musaiger, A.O. & Aldallal, Z.S. Information declared on the label of prepackaged foods available in the market of Bahrain. Food Industries (Baghdad)8:23-35 (A). (1987)

The aim of this paper is to study the information declared on the labels of 1896 prepackaged foods in Bahrain. The following information were studied; production

date, expiry date, storage instruction, Arabic description, list of ingredients, and net weight. The results showed that production date was not declared on 62.4% of the labels of food studied. About 55% of the labels had no expiry date. Canned meat, fish and poultry were the main foods which had no expiry dates (82.1%). Storage instruction was declared on 21% of the foods, while Arabic description was declared on 40% of the foods studied. The authors emphasised the need for establishing general standard for the labelling of prepackaged foods.

Nabali, H. et al. Evaluation of training food service managers in Bahrain. J.Env.Hlth. 98(6): 315-318. (1986)

A two and a half day training course on foodborne disease control and sanitation for managers of food service establishments was developed as a part of the food safety program in Bahrain. Comparison of pre-test and post-test scores indicated a statistically significant increase in the managers' knowledge of the subject at the completion of the course. Based on topics emphasized in the course (e.g. time-temperature control), eight objective measurements were made in establishments from which managers were trained and from an equal number of matched control establishments from which persons were not trained. These measurements were evaluated before the training and approximately one month later. Evidence of change in practice was demonstrated for four of these measurements in establishments where managers were trained. Results supported activities that call for the development of manager training and suggested that training of managers could be effective in improving food safety in food service establishments.

Salji, J. P., Saudi, S.R. & Mashhadi, A. Shelf life of plain liquid Yogurt manufactured in Saudi Arabia. J. Food Protection 50(2): 123-126. (1987)

The shelf life of plain liquid yogurt under local conditions of manufacture and handling has been investigated. Initial coliform counts of <1 cfu/ml in the product remained constant throughout 14 d of storage at 7, 10 or 15C°. With initial counts of mold and yeast not exceeding 1 cfu/ml, growth of these microorganisms was nominal (22 cfu/ml) after 14 d of storage at 7C°. At 10 and 15C° storage, however mold and yeast increased substantially from initial levels not exceeding 1 cfu/ml to 2x10³ cfu/ml and 3x10³ cfu/ml after 5 and 10 d of storage respectively. The high initial quality of the product, with < 10 cfu/ml coliform, < 10 cfu/ml mold and yeast and a hedonic score of 8 (like very much), was maintained for 5 d at 7C° storage. After 5 d of storage at 7C°, the mold and yeast count and organoleptic property of the product became unacceptable. The organoleptic quality deteriorated irrespective of the microbial contamination of the product. Quality assessment of the product before expiration (4 d) and under prevailing commercial conditions of manufacture, handling and storage revealed acceptable sensory and microbial quality. The possible causes of product sensory deterioration irrespective of growth of mold and yeast are discussed.

Chapter 8

OTHERS

Abu-Al-Saud, A.S. A survey of the pattern of parasitic infections in Saudi Arabia. Saudi Med.J. 4(2): 117-122. (1983)

This paper investigates the prevalence of parasites in native-born Saudi Arabian males and females of various ages, attending the Riyadh Military Hospital from October 1978 to October 1979. The methods used were direct microscopy and concentration technique. A total of 8736 specimens of faeces were examined. The prevalence of parasites was found to be 9.3%. The major parasites isolated were: *Giardia lamblia* (69%), *Hymenolepis nana* (13.8%), *Schistosoma mansoni* (6.8%), *Trichuris trichiura* (2.8%) and *Entamoeba histolytica* (1.5%). The prevalence of parasites by age and sex was shown. The highest prevalence was found in the 0-5 years age group (25.9%).

Abu-Al-Saud, A.S. Faecal parasites in non-Saudi catering and domestic staff at the Riyadh Military Hospital. Saudi Med.J. 4(3):259-262. (1983)

The objective of this study was to investigate the prevalence of faecal parasites in all personnel applying for catering and domestic work in the Riyadh Military Hospital or returning to their jobs after vacations abroad. Direct examination and concentration methods were used. The great majority of the catering and domestic staff were Indian (92.6%), and none is Saudi. Of the 203 staff investigated 41.4% were positive for parasites. No intestinal symptoms were present. A single infection was present in 50%, a double infection in 45.2%, and triple infection in 2.4%. The main parasites isolated were: *Trichuris trichiura* (43.2%), *Ancylostoma duodenale* (25.8%), *Ascaris lumbricoides* (15.2%) and *Giardia lamblia* (14.4%). The types of parasites and their percentage of the total were compared with parasites isolated from Saudi patients. It is concluded that expatriate catering and domestic staff, especially those coming from an endemic area, should have mandatory faecal examination for parasites as part of their medical check up before employment.

Al-Madani, A.A. et al. Intestinal parasites in urban and rural communities of Abha, Saudi Arabia. Ann.Saudi Med. 9(2): 182-185. (1989)

Fecal samples from 1036 individuals living in urban and rural communities in the Abha area of the Asir Province were examined for intestinal parasitic infections. The infection rates with protozoan parasites were usually high. *Giardia lamblia*, *Entamoeba histolytica*, and *Entamoeba coli* occurred in 13.2% of the urban population while *G. lamblia*, *Blastocystis hominis*, and the helminthic parasite, *Hymenolepis nana*, were detected in 26.8% of the rural population. The regional differences in parasite prevalence between urban and rural communities appeared to be related to the source of water used, as well as socioeconomic and environmental factors.

Al-Mousa, Z. (Editor). Proceedings of the First National Workshop on Nutrition. Ministry of Public Health, Kuwait. 180p(A). (1989)

This publication contains papers presented at the First National Workshop on Nutrition held in Kuwait between November 28th and December 2nd 1987. The purposes of this workshop are to understand the role of each governmental sector in improving nutritional status and to determine the programmes needed to promote nutrition. The documents is divided into 3 parts. The first part contains the recommendations of the working groups as well as the general recommendations. The second part gives the papers presented at the workshop, and the third part provides the official speeches and the workshop programme. Topics discussed included on nutritional situation in Kuwait, nutrition education, food control, and nutrition training and planning.

Al-Quadsi, S.S., Hammoudeh, S. & Eid, N. Kuwait's. Food security. J.Gulf Arabian Peninsula Studies(Kuwait) 11: 45- 70(A). (1985)

Food security can be defined in terms of availability, accessibility, and nutritional adequacy. Because of Kuwait's high per capita income and generous food subsidies, food is readily accessible to the majority of the population. The real threat to food security lies in Kuwait's excessive dependence on imports, which leaves the country vulnerable to short-term interruptions in availability, whether they are natural, economic, or political. Domestic production of certain food items has been steadily increasing, mainly because of government support of large-scale food production. Kuwait's self-sufficiency on certain food items, notably poultry, eggs, fruit, and vegetables, is on the increase. However, due to various factors, such as climate, shortage of fresh water for irrigation and soil salinity, the growth and development of the agricultural sector is lagging behind other sectors of the economy. The combination of rising per capita income, fast population growth, and a lagging domestic agricultural sector has negative implications for food security. The Country's food security will not to be improved simply by increasing domestic production because the opportunities for expanding domestic production are too limited. Complete self-sufficiency is also beyond the means even of a country with Kuwait's wealth. Food security policies and planning must therefore encompass the full range of food-related issues, including demand and supply. Attention must be given to the basic nutritional needs of the population and to the quantity of food consumed.

Amine, E.K., Al-Awadi, F. & Rabie, M. Evaluation of the effectiveness of nutrition counseling Programme in Kuwait. J Egyptian Public Hlth LXIII (596): (1988)

This study was carried out to evaluate the effectiveness of nutrition counseling offered at Al-Sabah nutrition clinic, Kuwait. A predesigned questionnaire was used to collect data from 8284 patients regarding the objective of their visit, age, sex height, body weight, duration of counseling and the change in body weight. The results indicate

that the great majority of the patients (85.7%) attend the clinic to lose weight, a much lower proportion (13.9%) was to gain weight. It was found that around 45% of the patients who attended the clinic to gain or lose weight, did achieve that objective, around 6 - 7% achieved the opposite results and 45 - 55% of the patients did not show a significant change in body weight. The mean gain in body weight was 3.1 kg while the mean loss of body weight was 6.6 kg. The change in body weight was significantly affected by the age of the patient and duration of counseling but was slightly modified by patients sex.

Amine, E.K. & Al-Awadi, F. Patients' satisfaction with diets presented in Kuwaiti hospitals. J.Egyptian Public Hlth LXIV (3&4). (1989)

The study was implemented to investigate patients' satisfaction with diets presented in Kuwaiti hospitals. Four hospitals were included in the study, Al-Sabah and Chest disease hospitals in which dietary services are offered directly by the nutrition and catering administration of the Ministry of Health and Al-Jahra and Farwanya hospitals in which dietary services are offered by catering companies. The survey included 171 Kuwaiti and 355 non-Kuwaiti patients. Data was collected by direct interview technique using a precoded questionnaire. The patients were questioned about their opinion of the hospital diet, its quantity, temperature, time of presentation and how frequently do they bring foods from outside the hospital. The result of this study show that patients reported that breakfast and dinner were offered early. In the mean time 30.2% reported that the quantity of food offered is more than required and as a result 50% of the patients did not consume all the food offered to them. It was found that 10% of the patients felt hungry after consuming hospital meals, 21.4% received exogenous food either regularly or occasionally. The results also show that 11.6% of the patients received diets that were not compatible with their diagnosis.

Aziz, M. Population growth and food production in the Arab-Gulf States: 1975-1980. J.Gulf Arabian Peninsula Studies (Kuwait) 11:63-95(A). (1985)

The six Arab-Gulf States namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates present a large gap between population growth and food production. The paper analyzes the figures for food production in comparison to those for food demand and discusses possibility for achieving food security in several selected foodstuffs (cereals, fruits, vegetables, meat, fish, eggs, milk, sugar and fats and oils). The analysis shows a great variations of per-capita food supplies available for human consumption. During the period of 1975-1980, there was a remarkable increase in the consumption of cereals, fruits, potatoes, meat, eggs, milk, sugar and fat. The consumption of fish and fresh vegetables has declined by 11.9 and 5.4%, respectively. Most of the countries have difficulty in achieving self-sufficiency in cereals, vegetables, fruits, and meat, but have achieved some degree of self-sufficiency in fish and milk. The author suggested several means to increase food

production and self-sufficiency such as increasing the cultivated area, intensification and diversification of food production, changing food habits and avoidance of food wastage.

Ba'aqeel, H.S. Perinatal outcome: Is young maternal age a risk factor? Ann. Saudi Med. 9(2): 144-149. (1989)

The study attempted to determine, through an historical prospective design, whether adolescent pregnancy in Saudi Arabia is associated with an adverse perinatal outcome. Ninety-two adolescent mothers 18 years of age or less were matched to 92 mothers aged 20 to 29 for nationality, height, parity, gestation at booking, previous reproductive history, and presence in the current pregnancy of multiple gestation, renal disease, heart disease, and diabetes. All the patients were married. There was no significant difference between the two groups in birth weight, fetal size at birth, maternal weight gain, and the frequency of the 15 complications of pregnancy studied. In the Saudi society where different social and behavioral conditions prevail, the findings in this study support the notion that socioeconomic status and behavioral attitudes affect the perinatal outcome in adolescent pregnancy rather than age per se.

Bhatty, M.A., Al-Sibai, H. & Marwah, S.M. A Survey of mother and child care in the Saudi community in Rabiayah, Tarut Island. Saudi Med. J. 4(1): 37-43. (1983)

Survey of the mother and child care in 200 families in Rabaiyah, Tarut Island, Saudi Arabia was made by fourth-year medical students of King Faisal University, Dammam. The main findings were: female marriage around menarche; early pregnancies; high parity; extremely poor antenatal service; most deliveries handled by untrained traditional birth attendants and contaminated drinking water supply. It had been recognized that more orientation of medical students towards the use of new teaching methods within the old systems of education was not enough. Top priority recommendations were given for the problem of wide divergencies between academic and training goals on the one hand and service requirements, consumers' expectations, life style and socioeconomic and cultural settings on the other. The paper highlights the trend for developing indigenous training technology through community participation of Saudi medical students in the typical Saudi community; the need for the development of maternal and child care is emphasized.

Eid, N. et al. Household food wastage in Kuwait. Annual Research Report, Kuwait Institute for Scientific Research, Kuwait. 54-56. (1981)

The potentially edible food waste for whole day was collected from 119 households consisting of 694 subjects. Moisture, protein and fat contents of food waste were determined. Per capita protein wasted was 85.7 and 36.5g for Kuwaiti and non-

Kuwaiti, while that for energy was 1.7 and 1.1 MJ, respectively. It was concluded that there is a large amount of food wasted in Kuwait, and measures should be taken to reduce this waste and to improve food utilization through nutrition education.

El-Shafei, A.M. & Rao, P.S.S. Epidemiological Aspects of Maternal Health in Bahrain. Ministry of Health, Bahrain. 192p. (1987)

A cross-sectional survey on 3000 women (2000 antenatal cases and 1000 gynaecological cases) resident in 9 geographical areas of Bahrain was carried out. Information on socio-economic background, fertility parameters, health status, infant and childhood mortality, and family planning practices were obtained. Of women, 54% got married at age 15-19 years. About 10.2% of 12758 pregnancies reported by women were wasted; 1.2% were stillbirths and 9% were abortions. The mean systolic blood pressures was 115(10) mm/Hg, while that for diastolic blood pressure was 73(8) mm/Hg. About 8% of women were anaemic (Hb<10g%), 13% had sickle cell trait and 0.7% had sickle cell disease. Among the lower social class there was a significantly higher prevalence of anaemia in the younger age groups which decreased after 30 years of age. However, no such trend could be discerned for the upper social class. The infant mortality rate was 19.3 in low social class compared to 14.7 per 1000 in upper social class. In general women in upper class, younger and educated were more aware of the fertility control methods.

El-Sherbini, A.A. Environmental adversity and food policy in the Arab Gulf States. Food Policy May: 97-104. (1980)

Since the oil embargo of 1973, the Gulf States have emerged as important financial power. However, apart from Iraq, the spiral in oil revenue has had little effect in promoting the development of agriculture in general and food production in particular. The ratio of planned investment in agriculture to aggregate planned investment is about 20% for Iraq, 8% for Saudi Arabia, and 5% for Oman. The ratio is much lower for the other four Gulf States. The author suggested that agricultural development may be important even under harsh ecological conditions, and that the limiting factor is the lack of skilled manpower needed to cope with the management of complex enterprise systems.

Farrag, O., Miladi, S. & Amine, E.(Editors). Proceedings of First Regional Workshop on Nutrition As Related to Child and Mother Health in the Gulf Countries. UNICEF/ Gulf Area Office, Abu-Dhabi. 105p. (1980)

This publication contains papers presented at the First Regional Workshop on Nutrition held in Bahrain 5-10th April, 1980. From the papers presented and discussions held it was concluded that malnutrition was prevailing among different population groups but mainly among pre-school children in the Gulf countries.

Malnutrition was characterized by high infant mortality and growth retardation among pre-school children. Some of the contributing factors stated, were the abandonment of breast-feeding, the wide-spread trend for bottle-feeding, poor weaning practices, mothers' ignorance and infectious diseases. It was noticed that health services were more orientated to curative, with limited emphasis on preventive medicine. In some countries the food control system is not satisfactory: with lack of food laws and standards, and inadequate laboratories. The discussion showed the important role that mass media can play in the promotion of health and nutrition status. It was also noted that there is lack of vital statistical data and information on the nutritional status of the population in certain countries. Based on the above, two types of recommendations were discussed and approved. The first were general recommendations which have to be implemented at a regional level. The second were specific recommendations which need to be implemented at national level.

Frost, G. & Pirani, S. Meal frequency and nutritional intake during Ramadan: a pilot study. *Hum. Nutr. Appl.Nutr* 41A: 47-50. (1987)

A study was carried out to compare the nutrients intake and meal pattern during and after Ramadan. It was found that in a sample group of 15 young Saudis there was a significant increase in caloric, fat, carbohydrates, and protein intake after Ramadan. Although there was a significant reduction in meal frequency and in number of meals taken outside home, a significant increase in body weight was noted during Ramadan.

Hamdan, I.Y., El-Nawawy, A. & Mameesh, M.(Editors). *Advances In Food Industries Development In The Arab World. Kuwait Institute for Scientific Research, Kuwait* (349 p E, 297p A). (1988)

This book includes the proceedings of the First Conference on the Development of Food Industries in the Arab World which was held in Kuwait, Oct. 13-16, 1986. The papers were presented in their original languages (Arabic or English). The English part includes nine chapters: new trends in food production systems, fish industry, meat industry, date industry, dairy industry, baby food industry, animal feed industry, unconventional methods for food production and quality and control standards. The Arabic part includes six chapters: importance of food industries in Arab World, fish industry, dates industry, cereals industry, dairy industry and animal feed industry. Papers related to Arab Gulf states are in the following topics: food storage, development of fish industry, composition of local breads, dairy and dates industries.

Hawass, N.D., Alnuzha, M.M. & Kolawole, T. *Adult geophagia-report of three cases with review of the literature. Trop. Geog. Med.* 39(2): 191-195. (1987)

This study reports three cases of adult geophagia in Saudi Arabia. Two adults had a history of eating mud, and the other of eating pebbles. Radiographs showed dense

opacities in the intestine particularly in the colon. The association of geophagia with iron-deficiency anaemia, hepatomegaly, dwarfism and hypogonadism was observed. Clinical and pathological changes caused by geophagia were provided. The role of socio-cultural and other predisposing factors in the causes of geophagia was discussed.

Ministry of Health. Diarrhoeal Diseases Morbidity, Mortality and Treatment Rates and Immunization Coverage, Ministry of Health/WHO/UNICEF, Bahrain. 60p. (1986)

This report evaluates the current government programme for the control of diarrhoeal diseases and for immunization under the integrated primary health care system. It contains recommendations and suggestions for further improving the quality of care for children under 5 years of age in Bahrain. A survey was conducted during the months of April and May 1986. The sample drawn using the cluster sampling technique, included 4114 children under 5 years of age. Out of the total number, 378 suffered from diarrhoea. The proportion of children with diarrhoea onset in the previous 2 weeks was found to be 9.2%. The results gave the breakdown by regions and by age group. Of the children, 200 suffered from diarrhoea and were treated with ORS resulting in 52.9% ORS usage rate. It was found out that 16 children less than 5 years died in the previous year giving an under 5 mortality rate of 3.9/1000. Out of this number, 4 died from diarrhoeal diseases giving an under 5 diarrhoea associated mortality of 0.97/1000 and under 5 diarrhoeal deaths ratio of 25%. The estimated number of episodes of diarrhoea/child/year for Bahrain is found to be 2.4. This figure varies from region to region, the lowest being at Muharraq region (1.2 episodes of diarrhoea/year) and the highest at Northern region (8.7 episodes/years). The number of children in the age group 1-2 years was 809 children, of whom 82.5% were found to be fully immunized. The immunization coverage in this age group as follows; DPT3, 96.5%; Polio 3, 95%; Measles 82.5%. The Control of diarrhoeal diseases in Bahrain has made a substantial progress. ORS usage rate is relatively high, the diarrhoea-associated mortality is almost negligible. The immunization programme has made a very good progress towards its goal of protecting children against the six target diseases.

Musaiger, A.O. Assessment of dietary services in hospitals in Bahrain. Ministry of Health. Bahrain, 26(E),53(A). (1981)

The study investigated the dietary services in 3 governmental hospitals in Bahrain, through questionnaires designed to determine the patient's reactions and attitudes towards dietary services; the type of diet offered to patients; and the current food services. The weight of foods given to patients during 24 hours was also measured. A systematic random sample of about 30% of the total patients in each hospital was taken. The total sample included 165 patients (104 from Salmaniya Medical Centre, 41 from Maternity Hospital and 20 from Chest Hospital). The findings showed that

41% of patients in Salmaniya Medical Center did not require special diet. The assessment of the nutritive value of meals offered to patients over a 24 hour period showed a higher amount of protein and calcium than the US Recommended Daily Allowances (RDA). The amount of iron was deficient for adult females but adequate for adult males. About 76% of the patients agreed that the meals offered were good. All the patients felt satisfied with behaviour of the persons presenting the meals. Most of them (66.7%) did not express a preference for Bahraini or non-Bahraini nurses. However, 28% of the patients preferred Bahraini nurses because of ease of communication. Almost 64% of patients stated that their relatives and friends brought foods from home for them. Fruits (54.5%) and canned juices (26.7%) were the main foods brought. A high percentage (43.6%) preferred foods brought from home to that offered in hospitals. They attributed their preferences to tastiness and cleanliness of home made food (29%).

Musaiger, A.O. Studies On Nutrition In Bahrain. Nutrition Unit, Ministry of Health, Bahrain. 42p. (1984)

This publication includes 16 summaries of studies carried out by the Nutrition Unit during the period 1981-1983. It contains some details on unpublished reports, and a brief summary on published reports. The studies included are; Birth-weight in Bahrain, infant feeding practices, factors affecting breast-feeding, infant-feeding practices of hospitalized malnourished children, some demographic and health information about pregnant mothers, average body weight of various age and sex groups, nutritional deficiencies of patients discharged from Salmaniya Medical Center, assessment of dietary services in hospitals, social and economic factors affecting food consumption, dietary habits of pregnant mothers visiting health centres, food habits in Bahrain, food practices and preferences of college students, food purchasing habits of consumers, food and nutrition indicators, some factors influencing causes of death, and information present on the label of prepackaged foods available in the market of Bahrain.

Musaiger, A.O. Nutrition situation of children in Bahrain. Al-Baheth(Lebanon) 7(39): 49-61(A). (1985)

This paper reviews the current nutrition situation of preschool and school children in Bahrain. Breast-feeding has decreased steadily, and the mothers introduced weaning foods at very early age of infant life. Many of mothers lack proper information in preparing foods for infants. Malnutrition is still prevalent among children in Bahrain. This is mainly due to infectious and parasitic diseases, deficiency in some nutrients and lack of health awareness. Most foods provided for children in primary schools are nutritionally poor, such as corn-puffs, potato chips, carbonated beverages and sweets. Measures to overcome nutritional problems of children in the country are discussed.

Musaiger, A.O. Nutrition situation in the Arabian Gulf Countries. *J.Royal. Soc. Hlth.* 105: 104-106. (1985)

This paper provides an overview of nutrition situation in the Arabian Gulf countries; namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE). These states enjoy good economic situation with high per capita income and sufficient supply of food; despite this, malnutrition continues to appear. First degree malnutrition exists in this area, though second degree malnutrition is more frequent. Marasmus and anaemia are the main undernutrition problems. Gastroenteritis, intestinal parasitism and unproper food habits are believed to be responsible for the prevalence of underweight and anaemia among the children. On the other hand, obesity, diabetes, hypertension and heart diseases are the common public health problems of the adults.

Musaiger, A.O. Factors associated with birthweight in Bahrain. *J.Trop.Ped.Hyg.* 88:31-36. (1985)

This study was carried out to provide information on birthweight in Bahrain, and to determine its association with various demographic and maternal factors. The sample studied include 6793 infants represented 67% of the total number of registered births for 1980. Of the infants studied 51.5% were males and 48.5% were females. The mean birthweight for males was 3223g, while that for females was 3140g. There was a higher incidence of low birthweight (<2500g) among females (7.9%) than males (6.9%). The proportion with low birthweight was higher in rural areas, non-Bahraini mothers and very young mothers. In general, mothers were least likely to bear low-birth weight when interval between births was greater than 24 months. It was found that sex, geographical location, mother's age and interval between births contributed significantly to birthweight of the new born. Mother's nationality and the number of past deliveries were not significant contributory factors.

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

This paper discusses the food and nutrition situation in the Arabian Gulf countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. The paper is divided into four parts. The first part discusses the economic development and change in food situation before and after oil discovery. The second part reviews the health situation with emphasis on birthweight, causes of death, communicable diseases, and hereditary anaemias. The third part presents the food situation with details of food production, food imports, food industries and food consumption patterns. The last part focuses on the nutrition situation with emphasis on composition of diet, nutrients intake, food habits, infant and school feeding, nutrition anthropometry, nutrition related diseases and nutrition programmes in the Gulf. It is

concluded that the state of nutrition has not kept pace with economic development. Nutrition problems associated with affluence, such as obesity, diabetes, hypertension and heart diseases, and those associated with underfeeding, such as growth retardation, anaemia and infectious diseases, are present. Most nutritional problems seem to be the results of change in food habits, illiteracy and ignorance rather than shortage in food supply or low income.

Musaiger, A.O. Nutrition assessment in Bahrain, lessons and experiences. In proceeding of Inter-Country Workshop on Nutrition Assessment, Cairo; 1-5 November, (1986) FAO, Rome. (1988)

During the past 6 years, various nutrition assessment surveys were carried out in Bahrain. However, most of these surveys have methodological problems and lacked some important information such as dietary intake and clinical examinations. A comprehensive nutrition assessment survey was carried out recently taking into consideration the drawbacks in previous surveys. There was inadequate use of the findings of the nutritional assessment conducted in Bahrain, due to several reasons such as the low priority given to nutrition, the absence of food and nutrition programmes, and less attention and support given by both policy makers and international organizations. To overcome these problems, the Nutrition Unit of the Public Health Directorate Ministry of Health has developed a plan to organize the nutritional activities and to establish relevant programmes, including the formulation of a comprehensive food and nutrition programme for the state of Bahrain. However, all these activities would have little effect if nutrition programmes are not considered as essential part of primary health care and agricultural development programmes.

Musaiger, A.O. & Gregory, W.B. Intestinal parasitic infections among school children in Bahrain. J Trop. Ped. 35: 45-46. (1989)

The prevalence of intestinal parasitic infections among school children aged 6-20 years was investigated by using direct microscopic examination of stool. The findings revealed that hookworms (*Necator americanus* and *Ancylostoma duodenale*) were not detected, and only one infection of *Entamoeba histolytica* was found. The most common parasites found were *Giardia lamblia* (4.7%), *Trichuris trichura* (3.8%), and *Hymenolepis nana* (3.4%). The total prevalence of intestinal infection among school children was 14.3%, which compared favourably with many other developing countries.

Musaiger, A.O. & Aldallal Z.A. Factors affecting causes of death in Bahrain (1976-1980). Bahrain Med. Bull. 6(3): 111-114. (1984)

The relationship between sex, age, nationality and place of residence and causes of death in Bahrain was investigated, using data reported in death registration files for

the period 1976-1980. The results showed that males had a higher incidence of deaths caused by circulatory system diseases, injury and poisoning than females. The main causes of deaths in infancy were due to certain conditions originating in the perinatal period (53%). Injury and poisoning were the leading causes of death for the age group 1-4 years and 5-19 years (32.8% and 41.3%, respectively). Diseases of the circulatory system were the major cause of death for the age group over 20 years. Bahrainis were more subjected than expatriates to infective and parasitic diseases, neoplasms and diseases of the respiratory system. In general, the contribution of infective and parasitic diseases was higher in rural areas in comparison to urban areas.

Scott, T.G. *The effect of the muslim fast of Ramadan on routine laboratory investigations. King Abdulaziz Medical Journal 1(4): 23-35. (1981)*

The mean values of 24 biochemical and 12 haematological laboratory tests in routine use were obtained from apparently healthy male Saudi blood donors. The effects of the Ramadan fast were studied on a before-during-after basis. Similar investigations were made on two Western volunteers who also observed the fast, together with an additional study of their 24 hour urine samples. Significant elevations were found in serum acid phosphates, bilirubin, aspartate aminotransferase, and albumin-globulin ratio. Significant decrease in lactate dehydrogenase, creatinine kinase, alpha-hydroxybutyrate dehydrogenase and serum globulin levels were also found. The most significant haematological changes were a decrease in the numbers of circulating erythrocytes and an increase in their mean cell volume. Discrepancies between the two ethnic groups were also found and are discussed.

Sjovall, A. *Radiological assessment of skeletal maturity in Gulf Arab children. Saudi Med. J. 5(2): 190-196. (1984)*

The hand and wrist skeleton in Gulf Arab children showed a marked variability in the development of the individual bones, often with marked retardation. This can be caused by inadequate diet, illness and other unfavourable environmental conditions. It is still possible to estimate the skeletal age of children above 2 years old by the Greulich & Pyle 'Atlas' and the 'maximum value' method described. The results should, however, be used with caution, and only to assess the skeletal development of the child, not to estimate chronological age.

Rahman, H., AlKhayat, A. & Menon, N. *Lead poisoning in infancy unusual causes in the U.A.E. Ann Trop. Ped.6:213-217. (1986)*

Six infants, three of them neonates, were diagnosed as having acute lead poisoning; four of them had acute encephalopathy. All had been given an indigenous preparation, 'Bint Al Zahab' (Daughter of Gold), for abdominal colic and early

passage of meconium after birth. Chemical analysis of this powder revealed a lead content of 82.5%. The index case had anaemia with punctate basophilia, dense metaphyseal lines on X-ray and markedly raised blood lead levels, arousing a strong index of suspicion for the early diagnosis of subsequent cases. Computerized axial tomography (CAT) scan in three-cases showed signs of early cerebral cortical atrophy. The picture of cerebral oedema was absent in the four cases of acute lead encephalopathy. The importance of prevention and the ideal management is discussed.

Shoukry, M. I. Effect of fasting Ramadan on plasma lipoproteins and apoproteins. Saudi Med. J. 7(6): 561-565. (1986)

The sequence of alterations in the concentration and composition of different plasma lipoproteins following fasting in Ramadan is not known. The author therefore monitored the concentration of cholesterol and triglycerides in the major lipoprotein fractions (very low density lipoproteins (VLDL), low density lipoproteins (LDL), and high density lipoproteins (HDL) in 30 healthy volunteers at the beginning and at the end of Ramadan. In addition, plasma Apo C II and Apo C III were also measured. There was a significant increase in plasma cholesterol with an increase in cholesterol concentration in the low and very low density lipoproteins fractions (LDL and VLDL). Triglycerides were also increased as reflected by an increase in the VLDL-TG. A significant decrease was observed in the level of plasma Apo C II and Apo C III, though the ratio of their concentrations did not change. These changes although unlikely to affect normal people may be significant in patients. Physicians working in Muslim countries should be aware that fasting in Ramadan may affect some laboratory findings.

