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Gulf Area Office

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INTRODUCTION

Women at childbearing age, pregnant and lactating mothers, and young children are more susceptible to malnutrition than other groups. However, maternal and child morbidity and mortality cannot be understood without examining the secondary health and social causes. Several health factors lead to maternal and child morbidity including anaemia, malnutrition, other specific nutritional deficiencies, infections, and metabolic disorders such as diabetes and obesity. Social causes of poor maternal and child health include illiteracy among mothers, age at marriage, socio-economic status and unsound beliefs and food habits (Worthington-Roberts and Williams, 1993).

In Bahrain, studies related to health and nutritional problems of mothers and young children are limited. Amine (1980) reported that anaemia, underweight and stunting were the common nutritional problems among pre-school and school children. Of pre-school children, 34% were anaemic (iron deficiency anemia). Underweight was common among 54% of school children (6-17 years). Overweight was the main nutrition problem among mothers (39.6% of them were obese based on weight for height). Iron deficiency anaemia was also found to be common among pregnant mothers as more than 50% of them were anaemic (Musaiger, 1984). A recent study on mothers attending health centers in Bahrain demonstrated that 42% of mothers were anaemic, using hemoglobin levels less than 11 g/dl (Moosa and Zein, 1996).

Zaghloul and Dodani (1984) assessed the growth patterns of pre-school children in Bahrain. During the first 6 to 9 months of life the gain in both weight and height exceeded or was equal to NCHS/ WHO standard. The growth then declined after this period and up to the fifth year of age. It was concluded that this decline was due to unsound weaning habits and feeding practices.

The meeting organized by UNICEF to propose priorities for the advancement of childhood for the nineties in the Arab Gulf region has emphasized the importance of carrying out epidemiologic studies to assess the magnitude of nutritional problems among mothers and children, as well as to study the factors associated with these problems (UNICEF, 1989).

OBJECTIVES

The main objectives of this survey were:

1. To assess the nutritional status of mothers in Bahrain.
2. To assess the nutritional status of preschool children in Bahrain (1-6 years).
3. To study the dietary habits of both mothers and children.
4. To study demographic and health characteristics of mothers in Bahrain.

MATERIALS AND METHODS

Sampling Technique

The study included mothers and their children (1-6 years). A multistage sampling technique was used to select the families with children less than 7 years old. Bahrain was divided into 337 blocks distributed in 11 geographical areas. Fifty-one blocks (15%) were selected randomly from the total blocks. The sampling procedure was performed according to the proportional distribution of blocks in each geographical area. Ten families were then selected from each block, to make a total sample of 510 families. However, the total sample obtained was 481 (94%) families due to the absence of some families and non-response of others. All children from 1-6 years old in the family were included in the study. A total of 569 children were included.

Households were selected from each block using a WHO sampling technique for diarrhoeal diseases (WHO, 1984). The distribution of the selected families by geographical areas is illustrated in Table 1. The highest number of families was obtained from Jidhafs (17.9%), followed by Manama (16.6%) and Riffa (14.3%). This distribution reflects the families with children less than 6 years rather than the total population in each geographical area.

Table (1)

Distribution of households included in the study by regions

Regions	No.	%
Hidd	20	4.3
Muharraq	60	12.5
Manama	80	16.6
Jidhafs	86	17.9
Northern Area	17	3.5
Sitra	40	8.3
Central Area	30	6.2
Essa Town	30	6.2
Rifaa	69	14.3
Western Area	30	6.2
Hamad Town	19	4.0
Total	**481**	**100.0**

Data Collection

Mothers were interviewed by trained female workers using a specially designed questionnaire. The questionnaire included information on:

- Social background of the family.
- Some vital statistics of mothers.
- Some health factors related to the mother and oldest child (less than 7 years).
- Dietary habits of the oldest child, using the 24 hour recall method.
- Frequency of consumption of certain foods by mothers.
- Weight and height of both mothers and all children aged 1-6 years.

Anthropometric Measurements

Weight was measured to the nearest 0.2 kg using a Seca digital scale with a 130 kg capacity (SECA, Integra 815, France). The weight was taken without shoes and with as few clothes as possible. To calculate the nude weight of mothers 0.5 kg was subtracted from the observed weight of each mother. Height was measured to the nearest 0.1 cm using a portable stadiometer (SECA, Model 220, W. Germany).

Nutritional Status of Mothers

Body Mass Index (BMI) was used to determine the nutritional status of mothers. Body Mass Index [Weight (kg) / Height^2 (cm)] has a high correlation with body fat, and it is highly recommended by the World Health Organization as a suitable indicator for measurement of the nutritional status of adults (WHO, 1990). Mothers were considered overweight and obese when their BMI was equal to or more than 25, while normal mothers were those who had a score of 20 to 24.99, and underweight mothers were those who had a score of less than 20 (WHO, 1990).

Educational Level of Mothers

Educational level of mothers was grouped into 3 levels: Low education included mothers who were illiterate and/or only read; middle education, included mothers who had intermediate and/or primary school education, and high education, included mothers who had secondary education and above.

Birth Weight

Birth weight was obtained from birth notification forms given to mothers after delivery. The birth weight was recorded for the older child (less than 7 years) in the family. However, about 82 (11%) children had no information on their birth weight, and therefore, they were excluded from our analysis. Infants who were less than 2500 grams at birth were considered as low birth weight infants.

From the value of weight and height obtained, stunting (weight for age), wasting (weight for height), and underweight (weight for age) were calculated. The results were categorized by sex and age. The NCHS (American) standard was used as a reference standard.

Pilot Study

A pilot study on 25 households was carried out in order to train the female workers and pretest the questionnaire, and check the accuracy and practicability of the weighing scales and stadiometres. Based on this pilot study some modifications were made to the questions, and the final questionnaire was then adopted.

Data Analysis

Data were statistically analyzed using the SPSS-PC$^+$ Statistical package. Anthropometric measurements of children were analyzed using the Anthro Software Programme developed by the Nutrition Division, CDC (USA) and the Nutrition Unit (WHO). This programme used the NCHS data as a reference standard for height and weight (CDC/WHO, 1990).

RESULTS AND DISCUSSION

DEMOGRAPHIC CHARACTERISTICS OF MOTHERS

Age

Almost all mothers studied were at reproduction age (16-45 years). Mothers aged less than 20 years represented 1.3% of total mothers (Table 2). Very young mothers run a relatively high risk of having malnutrition and other health problems. Teen-age mothers in many developing countries are markedly underweight with little adipose tissue and depleted muscle mass (WHO, 1988). In Bahrain, Musaiger (1985) found that mothers less than 20 years of age were more likely to deliver low birth weight (<2.5 kg) infants than older mothers.

Educational level

Educational level is one of the commonly used indicators for predicting health and nutritional status. Several studies have shown that the educational level is associated with the nutritional status of mothers and their children. In Kuwait, for example, it was reported that low education of the mother had a significant effect on the prevalence of malnutrition linked with gastroenteritis (El-Dosary et al, 1982).

About one third of mothers studied (38.1%) were highly educated (secondary education and above), 31.4 had middle education (primary and intermediate education), and the remaining 30.6% had low education (illiterate or read and write) as shown in Table 2. This finding is in agreement with that reported by Musaiger (1990a).

Employment

Employment has a significant impact on the food habits of the family, and in turn on nutritional status. Studies in Bahrain (Musaiger and Al-Ansari, 1992) and in Kuwait (Al-Awadi and Amine, 1989) demonstrated that employment has an association with the nutritional status of mothers. The study in Kuwait has shown that 63% of underweight women studied were those who do not work.

The present survey showed that most of the mothers studied (83.6%) were unemployed. This percentage compared favourably with that reported by other studies in Bahrain (Musaiger, 1990a). A study by the Ministry of Labour and Social Affairs (1989) found that 82% of mothers did not work.

Table (2)

Demographic Characteristics of the studied mothers

Characteristics	No.	%
Age (years) *		
< 20	6	1.3
20 - 29.9	208	43.8
30 - 39.9	222	46.7
40 +	39	8.2
Educational level		
Illiterate	111	23.1
Read and write	36	7.5
Primary	87	18.1
Intermediate	64	13.3
Secondary	111	23.1
Diploma	26	5.4
University	46	9.6
Employment		
Unemployed	402	83.6
Employed	79	16.4
Total	**481**	**100.0**

* Ages of 8 mothers were missing.

Mean Age at Marriage

Surprisingly the mean age of studied mothers at marriage was found to be relatively low (18 ± 4.7 years). Early age at marriage is one of the risk factors associated with the health and nutritional status of mothers and their children, especially among poor families. Data from Table 3 showed that there was a variation in age at marriage among

regions in Bahrain. In general, mean age at marriage was lower in rural areas such as Sitra (14.4 years), Western area (16.1 years) and Northern area (16.1 years), than in towns (above 18 years). In Saudi Arabia, Abdul Jabar and Wong (1988) reported similar findings as mean age at marriage was 18.3 years, and 14% of women were less than 15 years of age when they got married. The Central Statistics Organization, CSO (1997) has demonstrated that a relatively high percentage (13%) of women who got married in Bahrain during 1996 were less than 20 years of age. The hazards of teenage pregnancy are that it can cause maternal death and infants with low birthweight, which inturn affects infants survival.

Educated mothers were more likely to get married at a higher age than lower education mothers. As the educational level of mothers increased, the mean age at marriage progressively increased. It was 14.2 years for illiterate mothers and reached 22.8 years for university education mothers (Table 4). Compulsory enrolment of young girls in primary and intermediate schools is recommended to delay the age at marriage. Promotion of non-formal educational programmes for adult females should also be encouraged.

Mean Number of Children less than 7 years

The overall mean number of children less than 7 years was 1.6 children. The mean number of children less than 6 years for mothers included in the survey was slightly decreased as educational level of mothers increased. It was 1.8 children for illiterate mothers and decreased to 1.5 children for university education mothers (Table 5).

Family Size

The Household Budget Survey which was carried out in 1983/1984 in Bahrain showed that family size has a profound influence on per capita dietary intake (CSO, 1985). The fact that families with large number of members more often include young children means that they use more food and spend more than families with a small number of members (Musaiger and Miladi, 1995).

The mean family size in our survey was about 7 and varied from 5.3 children in Manama (the capital) to 9.6 children in the central area (Table 6). In general, families in rural areas had a higher mean family size than families in urban area.

When educational level was considered, it was found that as education of both mother and father decreased the mean family size increased too (Table 7). The mean family size was 9.7 children and 9.9 children among families with illiterate mothers and fathers, respectively, while it was 4.8 children among families with university education mothers or fathers.

Number of Past Deliveries

Multiple pregnancies linked with too many closely spaced pregnancies is a risk factor of maternal morbidity and mortality (Musaiger and Abdulkhalek, 1998). In most Arabian Gulf countries multiple pregnancies are common especially in rural areas. In Bahrain, the present survey demonstrated that the mean number of past deliveries was 4.5 with a standard deviation of 2.9. This result is similar to that reported by Abdul-Jabar and Wong (1988) in Saudi Arabia, as the mean number of pregnancies was 4.5.

Educational level has a negative influence on the number of past deliveries. The mean number of past deliveries was 7.4 for illiterate mothers and dropped dramatically to 2.5 for university education mothers (Table 8). These findings suggest that educated mothers are more interested in applying family planning to give more health care to their children.

Abortion

The proportion of mothers who had experienced abortion was relatively high (28%) as shown in Table 9. Early age at marriage is among the main causes of abortion. However, there are many other reasons for abortion. No attempt was made in this survey to study factors associated with abortion. We hope that this important topic is a subject for further investigation.

Diabetes Mellitus

Diabetes Mellitus is a problem of concern in Bahrain. The occurrence of diabetes in the community is associated with many environmental factors such as sedentary life-style, food habits, urbanization and socioeconomic factors. Obesity is a major risk factor for the incidence of non-insulin dependent diabetes (WHO, 1990).

Data obtained from the present survey showed that 8.5% of mothers gave a history of diabetes (Table 10). This prevalence is relatively low because it represents the diagnosed cases, as there are many other mothers who may have diabetes which is not yet diagnosed. A recent study on diabetes in Bahrain showed that 36% of women aged 50-69 years were diabetic (Al-Mahroos and McKeigue, 1998).

About 32% of mothers with a history of diabetes did not use any method for management of the disease, and 12% had insulin-dependent diabetes. Dietary management with/or without tablets was practised by 51.2% of mothers (Table 11). Of mothers, 5.8% had gestational diabetes of pregnancy (Table 12).

Cancer

Epidemiological studies in various parts of the world have showed that there is a positive association between dietary habits and some kinds of cancer (WHO, 1990, AICR, 1997). Cancer has become the second major cause of death, after cardiovascular diseases. Our survey showed that 18% of mothers have a family history of cancer (Table 13). This percentage is alarming, and more investigations are needed to explore the actual factors associated with the occurrence of cancer in the country.

Table (3)

Mean age at marriage of mothers by regions

Regions	Age at Marriage	
	Mean	S.D
Hidd	20.9	+ 3.5
Muharraq	18.1	+ 3.6
Manama	19.0	+ 4.7
Jidhafs	17.0	+ 4.1
Northern Area	16.1	3.8
Sitra	14.4	6.2
Central Area	17.0	5.0
Essa Town	20.2	3.9
Rifaa	19.8	4.8
Western Area	16.1	2.6
Hamad Town	19.1	4.6
Total	**18.0**	**4.7**

Table (4)

Mean age at marriage of mothers by educational level

Educational level	Age at Marriage	
	Mean	S.D
Illiterate	14.2	4.9
Read and write	15.0	3.6
Primary	16.8	4.0
Intermediate	18.9	2.9
Secondary	20.4	3.1
Diploma	21.6	2.3
University	22.8	2.8
Total	**18.0**	**4.7**

Table (5)

Mean number of children less than 7 years by mother's education

Educational level	Mean	S.D
Illiterate	1.8	0.8
Read and write	1.7	0.8
Primary	1.6	0.7
Intermediate	1.6	0.7
Secondary	1.5	0.6
Diploma	1.4	0.8
University	1.5	0.6
Total	**1.6**	**0.7**

Table (6)

Mean family size by regions

Regions	N	Family size	
		Mean	S.D
Hidd	20	5.5	1.8
Muharraq	60	6.0	2.6
Manama	80	5.3	2.5
Jidhafs	86	7.7	3.4
Northern Area	17	9.2	2.8
Sitra	40	7.6	3.1
Central Area	30	9.6	4.9
Essa Town	30	6.1	1.8
Rifaa	69	5.5	1.9
Western Area	30	8.3	3.4
Hamad Town	19	5.6	2.1
Total	**481**	**6.7**	**3.2**

Table (7)

Mean family size by education of mother and father

Educational level	Mother		Father	
	Mean	S.D	Mean	S.D
Illiterate	9.7	3.3	9.9	3.9
Read and write	8.6	3.3	9.1	4.1
Primary	6.7	2.3	7.3	3.5
Intermediate	5.8	2.9	6.0	2.3
Secondary	4.9	1.6	5.9	2.4
Diploma	5.1	1.5	5.9	2.5
University	4.8	1.6	4.8	1.5
Total				

Table (8)

Mean number of past deliveries by educational level of mothers

Educational level	No. of past deliveries	
	Mean	S.D
Illiterate	7.4	2.9
Read and write	6.1	3.2
Primary	4.8	2.3
Intermediate	3.6	2.3
Secondary	2.7	1.6
Diploma	3.0	1.6
University	2.5	1.5
Total	**4.5**	**2.9**

Table (9)

Proportion of mothers with history of abortion

History of Abortion	No.	%
Yes	136	28.3
No	345	71.7
Total	**481**	**100.0**

Table (10)

Proportion of mothers who had history of diabetes

History of diabetes	No.	%
Diabetic	41	8.5
Non-diabetic	440	91.5
Total	**481**	**100.0**

Table (11)

Methods of management of diabetes

Methods	No.	%
Do not use	13	31.7
Diet management	11	26.8
Diet and tablets	10	24.4
Insulin injection	5	12.2
Others	2	4.9
Total	**41**	**100.0**

Table (12)

Proportion of mothers who had diabetes during pregnancy

Diabetes during pregnancy	No.	%
Yes	28	5.8
No	453	94.2
Total	**481**	**100.0**

Table (13)

History of cancer among the families of studied mothers

History of Cancer	No.	%
Yes	87	18.1
No	394	81.9
Total	**481**	**100.0**

FOOD INTAKE OF MOTHERS

An attempt was made in this survey to investigate the mothers' intake of foods commonly available in Bahrain and those which may be associated with diseases such as cancer and cardiovascular diseases.

The percent intake of foods commonly available in Bahrain by educational level of mothers is presented in Table 14. In general eggs, rice, bread, fresh vegetables and fruit, cheese, chicken and meat were the main foods commonly consumed by mothers. The lowest preferred foods were salted fish, white salted cheese, jam and canned tuna.

It was found that educational level had a significant association with the intake of some foods. The intake of canned vegetables, canned fruit, sambosa (vegetable pie), salted fish, red tea and carbonated beverages decreased as the educational level of mothers increased. In contrast, the intake of whole cow's milk, yoghurt, white salted cheese and honey increased as the educational level of mothers increased. Musaiger et al (1986) found that fresh fruit was mostly consumed by highly educated mothers; however, our findings showed that there is no effect of education on the intake of fresh fruit. The Household Budget Survey demonstrated that educational and income levels of the head of household have a significant effect on the consumption of fruit, meat, eggs and other high protein food (CSO, 1985).

Studies demonstrated a close relationship between the establishment of affluent diet (characterized by an excess of energy dense foods rich in fat and sugar, as well as low in dietary fiber) and a range of chronic non-infectious diseases such as coronary heart disease, various cancers, diabetes mellitus, dental caries, gastrointestinal disorders, and several bone and joint diseases (WHO, 1990, Leeds and Hussain, 1998).

Fresh vegetables and fruit were consumed almost daily by mothers, but the amount consumed may be low especially by the low educational group. This was confirmed by the Household Budget Survey (CSO, 1985) as the per capita intake of fruit and vegetables was lower among low socio-economic families than higher socio-economic families.

Mothers with a low level of education were more likely to consume foods rich in fat and carbohydrates, which may contribute to the occurrence of obesity. This is particularly true since most of the less educated mothers were unemployed (not shown in the tables) and less likely to practise exercise. Musaiger and Al-Ansari (1992) reported that the prevalence of obesity was higher among lower educated mothers than higher educated ones.

A strong positive relation between saturated fat intake and the incidence of coronary heart disease was reported (FAO, 1994). Data presented in this study shows that the intake of foods rich in saturated fatty acids are high, which in turn may indicate the high risk of coronary heart disease among studied mothers. Musaiger (1990b) demonstrated that many dishes commonly consumed in Bahrain are rich in cholesterol and saturated fatty acids. Nutrition education should, therefore, focus on reducing intake of these dishes, and encourage intake of less saturated fats and more unsaturated fats. The consumption of foods rich in fiber such as whole cereals, fruit and vegetables may also contribute to protect against coronary heart disease (James, 1988, O' Sullivan, 1998).

Foods which have positive association with some kinds of cancers are those rich in fat, alcohol, salted and pickled foods, while those with a negative association are foods rich in fiber and fruit and vegetables (AICR, 1997). Our survey showed that the mean intake of foods rich in fat was high, while the intake of salted foods varied with the type of food. For instance the mean monthly intake of salted dried fish was 4.3 times, while the mean intake of salted white cheese was 14.8 (not shown in tables). In general most Bahraini dishes are high in sodium, and the daily intake of sodium exceeds the daily requirements (Musaiger, 1988). Investigations are urgently needed to explore the role of diet in the occurrence of some types of cancer in Bahain.

Table (14)

Percent intake of some foods commonly available in Bahrain by educational level of mothers

Foods	Educational level			Total
	Low (N=147)	Middle (N=151)	High (N=183)	(N=481)
	%	%	%	%
Grilled meat	71.4	84.1	83.1	79.8
Sambosa (vegetable pie)	73.5	67.5	58.5	65.9
Canned Tuna	12.2	24.5	16.9	17.9
Canned vegetables	54.4	40.4	23.5	38.3
Canned fruit	57.8	35.8	27.3	39.3
Fish	97.3	96.0	94.5	95.8
Butter	49.0	45.0	40.4	44.5
Eggs	95.9	92.1	90.2	92.5
Rice	100.0	96.7	98.9	98.5
Wheat bread	99.3	98.0	96.7	97.9
Salted fish	23.1	17.2	7.1	15.4
Fresh vegetables	99.3	97.4	98.4	98.3
Fresh fruit	99.3	98.7	100.0	99.4
Red Tea	83.0	69.5	64.5	71.7
Tea with milk	88.4	85.4	82.5	85.2
Milk, whole	36.1	38.4	48.6	41.6
Yoghurt	66.0	72.2	69.4	69.2
Carbonated beverages	77.6	74.8	71.6	74.4
Jam	36.7	38.4	37.2	37.4
Dates	89.1	83.4	84.7	85.6
Cheese	92.5	91.4	95.6	93.3
Salted cheese	21.1	27.2	40.4	30.3
Chicken	95.9	96.0	96.2	96.0
Meat, beef or goat	93.9	92.1	93.4	93.1
Shrimps	86.4	78.1	78.1	80.7
Honey	36.7	49.7	60.7	49.9

NUTRITIONAL STATUS OF MOTHERS

In general, more than a quarter of mothers (27.7%) were normal (having optimal weight for height), while the majority were overweight and obese (65%), and only 7.3% were underweight. The proportion of underweight ranged from zero in some age groups (especially among those older than 42 years of age) to 18.2% among mothers at 21 years old. The percentage of obesity increased as the age of mothers increased, with the exception of mothers at age 46 where the percentage of obesity was the lowest (33.3%) (not shown in Table 15) . However, because of the small sample size in some age groups it is difficult to draw a concrete conclusion. Therefore, mothers were grouped into four age groups as shown in Table 15. Data in this table confirmed that the prevalence of obesity increases with age. About 53% of mothers aged less than 25 years were obese, and the percentage increased to 75% among mothers aged 35 years and more. The prevalence of underweight was almost double among young mothers (less than 25 years of age) when compared with other age groups.

Mean, median and standard deviation of body mass index (BMI) by age of mothers are given in Table 16. The mean BMI was the highest among mothers aged 30-34.9 years (29.1) and lowest among mothers aged less than 25 years (26.8). When the median of BMI for Bahraini women was compared with their counterparts in the United States (Must et al, 1991), the BMI for Bahraini women exceeded the American standards. This finding is in good agreement with studies in the other Gulf countries (Kordy and El-gamal, 1995, Al-Nuaim et al, 1996; Musaiger et al, 1998).

Several studies indicate that the prevalence of obesity has increased remarkably in Bahrain during the past ten years. Amine (1980) reported that about 39.7% of mothers in Bahrain were either overweight or obese (based on weight for height), however, the findings of the present study showed that the prevalence was 65%, an increase of 26%. This is an alarming situation, as obesity is a risk factor for several diseases, such as diabetes, coronary heart diseases, hypertension and some kinds of cancer. These diseases are the main

causes of death in Bahrain, and represents about 50% of total death (MOH, 1998).

Factors contributing to obesity in Bahrain have not been well investigated. It is believed that lack of physical exercise and excessive intake of high calorie foods are responsible for the high prevalence of obesity in the country. Zaghloul et al (1984) found that the mean calorie intake of obese Bahraini girls was 2529 Kcal compared to 2037 Kcal of non-obese girls. The intake of fat was 79.2 grams for obese, whereas it was 61 grams for non-obese. Musaiger and Al-Ansari (1992) demonstrated that age, physical exercise, marital status, parity, nationality, and educational level have a significant association with obesity among women in Bahrain.

As the treatment of obesity is notoriously difficult because of the prolonged nature of the treatment, there is a great need to modify dietary habits of the mothers (and other population) and to encourage physical activity (WHO, 1990). This can be achieved by increasing the awareness of the public through the mass media, as well as through the school and college curricula.

Table (15)

Nutritional status of mothers by age group

Age (years)	N	Nutritional Status			Total
		Underweight	Normal	Obese	
< 25	79	12.7	34.2	53.1	100.0
25 – 29.9	133	6.7	35.4	57.9	100.0
30 – 34.9	140	5.7	24.3	70.0	100.0
35 +	117	6.0	18.8	75.2	100.0
Total	**469**	**7.3**	**27.7**	**65.0**	**100.0**

Table (16)

Mean, standard deviation and median of body mass index (BMI) by age of mothers

Age (years)	Mean	S.D	Median
< 25	26.8	5.8	25.5
25 - 29.9	27.1	5.6	26.0
30 - 34.9	29.1	5.8	29.1
35 +	28.9	5.8	29.3
Total	**28.1**	**5.8**	**27.9**

FOOD INTAK OF PRESCHOOL CHILDREN

Breakfast is considered an important meal, especially for preschool children. It was found that if the child ate a poor breakfast, he will have difficulty in obtaining its daily nutrient requirements (Morgan et al, 1986). Bread, milk, tea, cheese and eggs were the main foods consumed at breakfast among both boys and girls. Children in the younger age group were more likely to consume milk than the older children. In the younger age group rather more boys (48%) than girls (40%) drank milk at breakfast. This difference was not apparent in the older children (32% boys, 36% girls) (Table 17). There was statistically significant association between younger and older children in milk consumption ($p=0.04$). These findings are consisted with those of other investigators who showed as the child got olders, there was a decrease in milk consumption (Cala et al, 1980). On the other hand the percentage of children who consumed tea was higher among older than young children (46.3% and 38.6% among 4-6 and 1-3 year of age, respectively), but the difference was not statistically significant. In general, there was no statistically significant association between type of food consumed and sex of preschool children in both age groups.

The relatively high percentage of preschool children who consume tea in Bahrain may be a source of worry, as it is well documented that tea inhibits the absorption of non-haem iron due to its high tannin contents (DeMayer, 1989). It would therefore seem to be essential that

health education should focus on reducing the intake of tea, especially with meal, by preschool as well as school children.

In general the foods consumed at breakfast were nutritious (if taken in adequate amounts) and should be encouraged. However, one of the main barriers to improving food intake at breakfast is the widespread belief that breakfast should not include meat, chicken or fish as these foods are difficult to digest when consumed in the early morning (Musiager and Gregory, 1992). This belief may reduce the chances to diversify the eating patterns at breakfast.

Snacks are not always bad for children and nutritious snacks can make an important contribution to their daily nutrient requirements. In Saudi Arabia, it was found that the morning snack provided 9-13% of most nutrients for preschool children (Sawaya et al, 1988). In our survey canned drinks, fruit and corn-puffs were the main foods consumed by preschoolers between breakfast and lunch (Table 18). Sex of preschool children has no statistically significant association with type of foods consumed. As for age, milk and bread were the only foods which have statistically significant association between the two age groups (p=0.002 for milk and 0.001 for bread).

Table (17)

Percentage of children who consumed various foods at breakfast by age and sex

Foods	1-3 years			4-6 years		
	Boys	Girls	Total	Boys	Girls	Total
	%	%	%	%	%	%
Bread	62.5	65.7	63.9	63.4	62.9	63.2
Tea	38.3	39.0	38.6	47.3	45.4	46.3
Cheese	35.2	42.9	38.6	37.6	40.2	38.9
Eggs	31.3	35.2	33.0	37.6	33.0	35.3
Milk	47.7	40.0	44.2	32.3	36.1	34.2
Corn flakes	4.7	5.7	5.2	6.5	5.2	5.8
other	33.6	24.8	29.6	26.9	45.4	36.3

About 30% of both boys and girls consumed corn-puffs. This food is low in its nutritive value, and therefore parents should be discouraged to provide it to their children. Additionally, corn-puffs have a high sodium content (Musaiger, 1986). The high intake of sodium by children have been a matter of concern in a number of studies (BSMWP, 1987, Stanek et al, 1990). High intake of salt may be a predisposing factor for hypertension and cardiovascular diseases (CVD). The precise contribution of dietary sodium to the early pathogenesis of hypertension, beginning in childhood, remains unclear. However, it may be important to decrease the intake of sodium and increases that of potassium (WHO, 1990). This is particularly desirable in view of the remarkable increases in the prevalence of heart disease and hypertension in Bahrain (Musaiger, 1990c). Control should start in childhood when food habits are formed as the seeds of future diseases may be shown.

Chocolates were more preferred by older than younger children at morning snack, but the reverse are true for sweets and biscuits. The consumption of carbonated beverages was low during this period (Table 18). The nutritional value of chocolates, sweets and carbonated beverages is low and they contain a large amount of refined sugar. Mothers, therefore, should be advised to reduce giving such foods to their children, especially before a main meal such as lunch, because of their effect on the children's appetite for more nutritious foods.

Table (18)

Percentage of children who consumed various foods between breakfast and lunch by age and sex

Foods	1-3 years			4-6 years		
	Boys	Girls	Total	Boys	Girls	Total
	%	%	%	%	%	%
Corn-puffs	29.7	28.6	29.2	28.0	36.1	32.1
Canned drink	33.6	23.8	29.2	29.0	34.0	31.6
Fresh fruit	28.1	31.4	29.6	22.6	26.8	24.7
Potato-chips	8.6	10.5	9.4	17.2	8.2	12.6
Biscuits & sweets	18.0	17.1	17.6	9.7	13.4	11.6
Ice-cream	11.7	12.4	12.0	10.8	12.4	11.6
Chocolates	6.3	7.6	6.9	10.8	12.4	11.6
Bread	1.6	2.9	2.1	17.2	6.2	11.6
Carbonated – beverages	6.3	5.7	6.0	7.5	3.1	5.3
Milk	8.6	8.6	8.6	1.1	2.1	1.6
Others	13.3	15.2	14.2	25.8	16.5	21.1

Lunch is the main meal in Bahrain. Sawaya, et al (1988) found that it contributed more than 29% of the recommended daily allowances of protein, energy and iron for preschoolers. The foods consumed at lunch by our preschool children were the same as those consumed by adults in Bahrain (Musaiger, 1981). The main foods were rice with meat, chicken or fish (Table 19). A statistically significant association has been found between sex of children and rice consumption at age 1-3 years ($p=0.04$). In the older children more boys than girls consumed fish, whereas more girls than boys consumed chicken.

Table (19)

Percentage of children who consumed various foods at lunch by age and sex

Foods	1-3 years			4-6 years		
	Boys	Girls	Total	Boys	Girls	Total
	%	%	%	%	%	%
Bread	87.5	95.2	91.0	88.2	90.7	89.5
Fish	44.5	50.5	47.2	53.8	46.4	50.0
Fresh fruit	22.7	26.7	24.5	29.0	26.8	27.9
Chicken	20.3	23.8	21.9	18.3	29.9	24.2
Fresh vegetables	22.7	17.1	20.2	18.3	24.7	21.6
Meat	27.3	21.9	24.9	20.4	14.4	17.4
Other	24.2	21.0	22.7	14.0	18.6	16.3

Interestingly, a relatively high percentage of preschool children consumed fresh fruit (26%) and vegetables (21%) with lunch. These foods are rich sources of vitamins and minerals, as well as dietary fiber, and their consumption is therefore very desirable. The association between fruit consumption and age of preschool children was statistically significant ($p=0.04$).

The fact that the majority of preschool children were eating the same foods as adults at lunch, leads to the conclusion that any recommendation for improving the dietary intake of preschoolers should focus on improving the food habits of the family in general.

Foods consumed between lunch and supper were not different from those consumed between breakfast and lunch and consists of corn-puffs, canned drink, fruit, sweets, chocolates and potato-chips (Table 20). Fruit juice, ice-cream and chocolates were the only foods who have statistically significant association with age of children ($p=0.02$, 0.01 and 0.02, respectively). Again many of foods consumed during this period were high in sodium. Stanke et al (1990) reported that most of preschool children in United States consumed sodium greater than the estimated safe and adequate range.

Table (20)

Percentage of children who consumed various foods between lunch and supper by age and sex

Foods	1-3 years			4-6 years		
	Boys	Girls	Total	Boys	Girls	Total
	%	%	%	%	%	%
Corn-puffs	29.7	36.2	32.6	33.3	36.1	34.7
Fresh fruit	22.7	25.7	24.0	25.8	24.7	25.3
Canned drink	30.5	37.1	33.5	22.6	23.7	23.2
Ice-cream	7.0	12.4	9.4	15.1	20.6	17.9
Potato-chips	14.8	14.3	14.6	17.2	16.5	16.8
Chocolates	10.2	5.7	8.2	16.1	13.4	15.3
Carbonated – beverages	5.5	8.6	6.9	14.0	10.3	12.1
Biscuits & sweets	26.6	17.1	22.3	10.8	11.3	11.1
Cheese	3.9	1.9	3.0	4.3	6.2	5.3
Milk	7.0	7.6	7.3	2.2	4.1	3.2
Others	15.6	19.0	17.2	21.5	11.3	16.3

The percentage of younger children who consumed canned drinks was higher than that of the older children, and girls in general preferred these drinks more than boys. In contrast, the percentage of older children who consumed ice-cream was higher than that of young children (17.9% and 9.4%, respectively). There were also some differences between boys and girls and between younger and older children in the intake of biscuits and sweets, chocolates, and carbonated beverages (Table 20).

Foods consumed at supper were more diverse than those eaten at breakfast or lunch. One reason for this is the habit of eating outside the home during the evening, or bringing prepared foods into the home (Musaiger and Gregory, 1992). Bread, meat, milk, cheese, vegetables and eggs were the main foods consumed by preschool children at supper (Table 21). Older children (4-6 years) were more likely to consume cheese and bread than younger ones (1-3 years).

Most of the foods consumed at supper are nutritious and mothers should be encouraged to continue giving their children these foods.

There was no statistically significant association between type of foods consumed at supper and sex of children in each age group. Tea and bread have a statistically significant association with age of children ($p=0.02$ and 0.01, respectively).

In general, the food habits of preschool children in Bahrain are acceptable. This study was limited to the quality of food consumed and not its quantity. It is difficult, therefore, to evaluate the nutrient intake based on the available data. However, the present study provides useful information which to proceed to carry out a quantitative investigation of nutrient intake in this important group of the population.

The high percentage of children who consumed sweets and carbonated beverages is a matter of concern. These foods doubtfully prevented the child from eating other more nutritious foods. The consumption of foods rich in salt such as corn-puffs, potato-chips and processed cheese is, as already mentioned a matter of concern. We suggest that nutrition education for improving the food habits of preschool children should concentrate on reducing the intake of sweets and salty foods, and increasing the consumption of foods such as milk, fruits and vegetables which contain a greater variety of necessary nutrients. The importance of these recommendations is underlined by the increased prevalence of hypertension and heart disease in Bahrain in recent years. Good food habits should be established during childhood if life-style factors affecting these diseases are to be controlled. Attention must also be given to the intake of foods rich in iron, as iron deficiency anaemia is one of the main nutritional problems among preschool children.

Table (21)

Percentage of children who consumed various foods at supper by age and sex

Foods	1-3 years			4-6 years		
	Boys	Girls	Total	Boys	Girls	Total
	%	%	%	%	%	%
Bread	41.4	48.6	44.6	60.2	53.2	56.8
Cheese	14.8	14.3	14.6	20.4	19.6	20.0
Meat	20.3	24.8	22.3	22.6	10.3	16.3
Eggs	21.9	17.1	19.7	11.8	16.5	14.2
Fresh vegetables	17.2	15.2	16.3	11.8	11.3	11.6
Chicken	11.7	9.5	10.7	12.9	10.3	11.6
Milk	9.4	8.6	9.0	7.5	8.2	7.9
Tea	3.9	1.9	3.0	8.6	7.2	7.9
Carbonated – beverages	3.1	4.8	3.9	9.7	4.1	6.8
Yoghurt	9.4	8.6	9.0	4.3	8.2	6.8
Fresh fruit	4.7	5.7	5.2	7.5	5.2	6.3
Rice	9.4	6.7	8.2	6.5	4.1	5.3
Others	39.1	48.6	43.3	44.1	53.6	48.9

BIRTH WEIGHT

Birth weight is a useful indicator for assessing the health status of the community. It is also used as a predictor for postnatal morbidity and mortality.

Studies in Bahrain showed that birth weight is significantly associated with nationality, sex of infant, geographical location, mother's age, parity and interval between births (Musaiger, 1985 and Musaiger and El-Shehabi, 1990).

In this survey birth weight was affected by the educational level of mother, sex of infant and geographical location. The prevalence of low birth weight (<2500 grams) was higher among low educated mothers (10.4%) than higher educated mothers (7.3%), as shown in

Table 22. Educational level is commonly used as an indicator for social class in Bahrain. Birth weight has been found to vary with social classes, as mothers in lower social classes are more likely to have low birth weight babies than mothers in higher social classes (Pipes and Trahms, 1993).

Male infants were less likely to have low birth weight than female infants. The prevalence was 7.5% and 10.7% among males and females, respectively (Table 23). This finding compared favourably with other studies in Bahrain (Musaiger, 1985; Musaiger and El-Samani, 1991) and other countries (UNICEF, 1997).

As for geographical areas, mothers in Essa Town (3.7%) had the lowest prevalence of low birth weight, while mothers in the Rifaa area had the highest prevalence (11.3%) as shown in Table 24. This finding is unexpected, because it is believed that more high social class mothers live in the Rifaa area. However, the recent vast expansion of housing has lead to an increase in the number of low social class families living in Rifaa, and this may explain in part the high prevalence of low birth weight.

Table (22)

Prevalence of low birth weight by educational level of mothers

Educational level	Birth weight				Total	
	Low		Normal			
	No.	%	No.	%	No.	%
Low*	23	(10.4)	199	(89.6)	222	(100.0)
High*	13	(7.3)	164	(92.7)	177	(100.0)
Total	**36**	**(9.0)**	**363**	**(91.0)**	**399**	**(100.0)**

* Low education includes illiterate, read & write, and primary education mothers. High education includes intermediate education and above.

$X^2 = 1.09$, $p = 0.29$

Table (23)

Prevalence of low birth weight by sex of infants

Sex of infant	Birth weight				Total	
	Low		Normal			
	No.	%	No.	%	No.	%
Male	16	(7.5)	196	(92.5)	212	(100.0)
Female	20	(10.7)	167	(89.3)	187	(100.0)
Total	**36**	**(9.0)**	**363**	**(91.0)**	**399**	**(100.0)**

X^2= 1.2, p = 0.27

Table (24)

Prevalence of low birth weight by region in Bahrain

Region	Birth weight				Total	
	Low		Normal			
	No.	%	No.	%	No.	%
Hidd	2	(10.5)	17	(89.5)	19	(100.0)
Muharraq	3	(5.6)	51	(94.4)	54	(100.0)
Manama	7	(10.0)	63	(90.0)	70	(100.0)
Jidhafs	6	(10.0)	54	(90.0)	60	(100.0)
Northern Area	1	(10.0)	9	(90.0)	10	(100.0)
Sitra	2	(9.1)	20	(90.0)	22	(100.0)
Central Area	3	(11.1)	24	(88.9)	27	(100.0)
Essa Town	1	(3.7)	26	(96.3)	27	(100.0)
Rifaa	7	(11.3)	55	(88.7)	62	(100.0)
Western Area	2	(6.9)	27	(9.3)	29	(100.0)
Hamad Town	2	(10.5)	17	(89.5)	19	(100.0)
Total	**36**	**(9.0)**	**363**	**(91.0)**	**399**	**(100.0)**

NUTRITIONAL STATUS OF CHILDREN

The pattern of malnutrition in the community provides information about the nature of dietary deficiency, and this may participate in any nutrition programme (Jelliffe and Jelliffe, 1989). Anthropometric measurements are the most commonly used direct indicators for assessing protein-energy malnutrition and obesity. Therefore, weight and height were used in this survey to measure the nutritional status of preschool children.

The findings revealed that the prevalence of stunting was higher among boys (29.1%) than girls (19.8%), while that of wasting was similar among boys and girls (2.7% and 3.3%, respectively). Underweight was more common among boys (15.2%) than girls (9.5%), as shown in Table 25.

The prevalence of stunting was the highest among both boys and girls at 1-1.9 years of age (53.8% and 31.6%, respectively). Wasting was highest among girls aged 5-5.9 years and lowest among girls aged 3-3.9 years (there was no wasting among this group). For boys, the prevalence of wasting reached the peak at 3-3.9 years, (there was no wasting) and the lowest prevalence was among boys aged 2-2.9 and 5-5.9 years. Underweight was more prevalent among boys (15.2%) than girls (9.5%).

Malnutrition among preschool children can be attributed to several environmental, health and nutritional factors. Early stoppage of breast feeding, unsound weaning practices, and infectious diseases are the main causes of undernutrition among young children in Bahrain (Musaiger, 1987).

Mean, standard deviation and median weight and height of preschool children are illustrated in Tables 31 and 32. There was no difference in the median weight and height between boys and girls during the first five years of life.

Median weight and height of Bahraini preschool children were compared with the 50^{th} percentiles of NCHS standard (Figures 1 and

2). The median weight and height of both boys and girls were below the 50th percentiles of the standard. The gap in growth between Bahraini and American children was greater among boys than girls. At 2-2.9 years the gap between the median weight of Bahraini and American children was small and then it increased thereafter. The same trend was also observed among girls.

When data from this study are compared with those reported in 1983 (Zaghloul, 1984), it can seen that the growth pattern of Bahraini preschool children has slightly improved. This may be due to improvement in health services and environmental sanitation. Nevertheless, more investigations are needed to study factors affecting growth patterns of children in Bahrain.

Table (25)

Prevalence of undernutrition among preschool children in Bahrain

Age (Years)	Total No.		Stunting (height/age)		Wasting (weight/height)		Under-weight (weight/age)	
	M	F	M %	F %	M %	F %	M %	F %
1-1.9	65	57	53.8	31.6	3.1	1.8	23.0	12.3
2-2.9	86	66	25.6	16.7	0.0	3.0	12.8	9.1
3-3.9	53	54	18.9	14.8	5.7	0.0	7.5	11.1
4-4.9	60	65	21.7	20.0	5.0	6.2	15.0	4.6
5-5.9	32	31	18.8	12.9	0.0	6.5	18.8	12.9
Total	**296**	**273**	**29.1**	**19.8**	**2.7**	**3.3**	**15.2**	**9.5**

Table (26)

Mean, Standard Deviation (SD), and Median of weight of preschool children by age group and sex

Age (Years)	Boys			Girls			Total		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
1-1.9	9.8	1.5	10.0	10.2	1.9	10.2	10.0	1.7	10.0
2-2.9	12.7	1.4	12.7	12.4	1.6	12.2	12.5	1.5	12.5
3-3.9	14.6	3.3	14.0	14.0	2.1	13.8	14.3	2.8	13.8
4-4.9	15.8	2.0	15.5	15.7	2.1	15.5	15.7	2.0	15.5
5-5.9	17.9	3.2	17.8	17.4	2.2	17.4	17.7	2.8	17.6

Table (27)

Mean, Standard Deviation (SD), and Median of height of preschool children by age group and sex

Age (Years)	Boys			Girls			Total		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
1-1.9	75.3	6.0	76.0	76.1	6.3	76.0	75.7	6.1	76.0
2-2.9	86.5	6.0	86.5	86.1	4.9	85.0	86.4	5.5	85.8
3-3.9	94.6	6.7	94.0	93.4	4.4	92.0	94.0	5.7	93.0
4-4.9	100.6	7.7	101.5	100.2	4.3	100.0	100.4	6.1	100.0
5-5.9	107.7	6.4	107.3	106.7	6.1	108.0	107.2	6.3	107.5

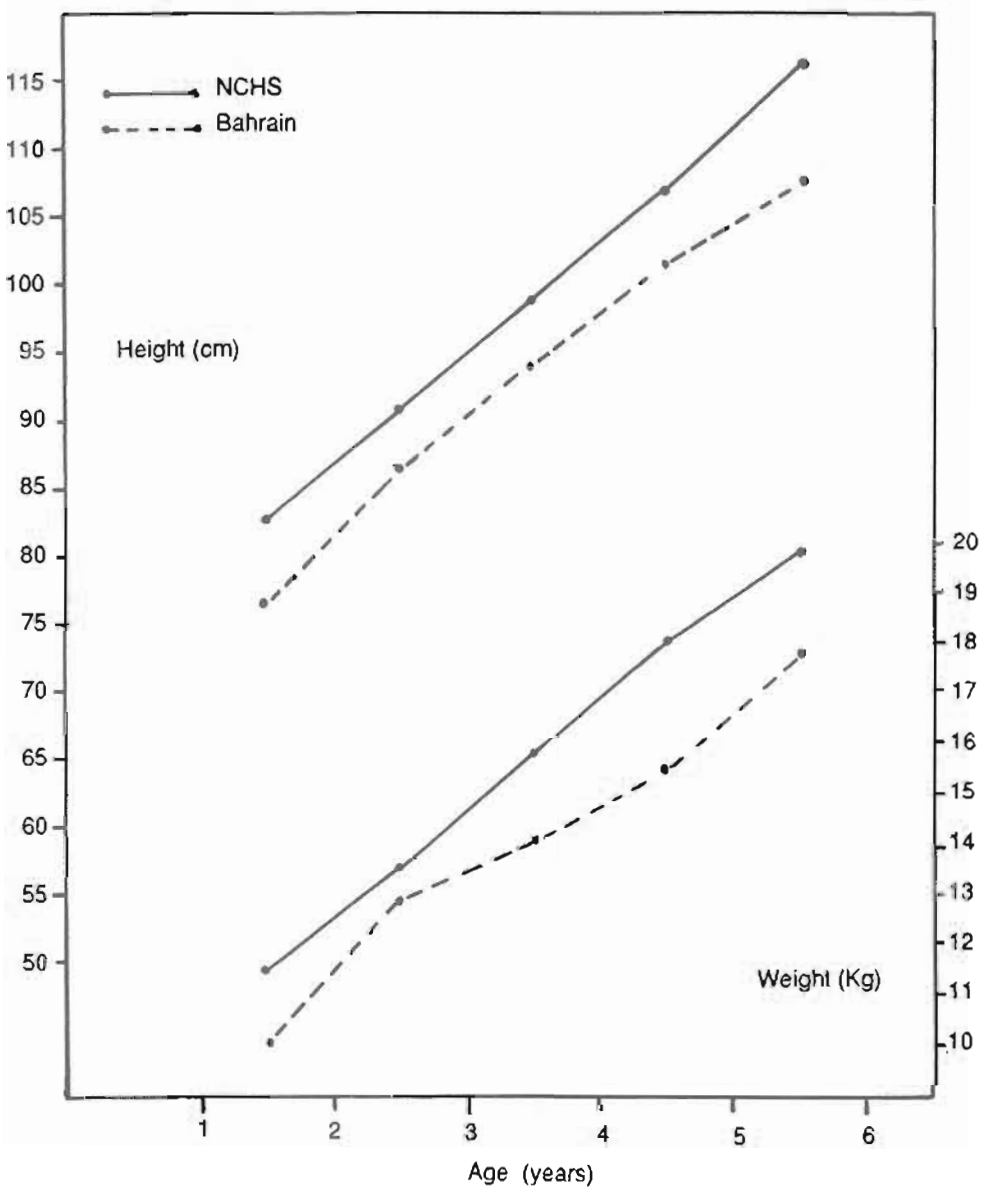

Figure 1: Median weight and height of male Bahraini preschool children compared with the 50th percentiles of NCHS.

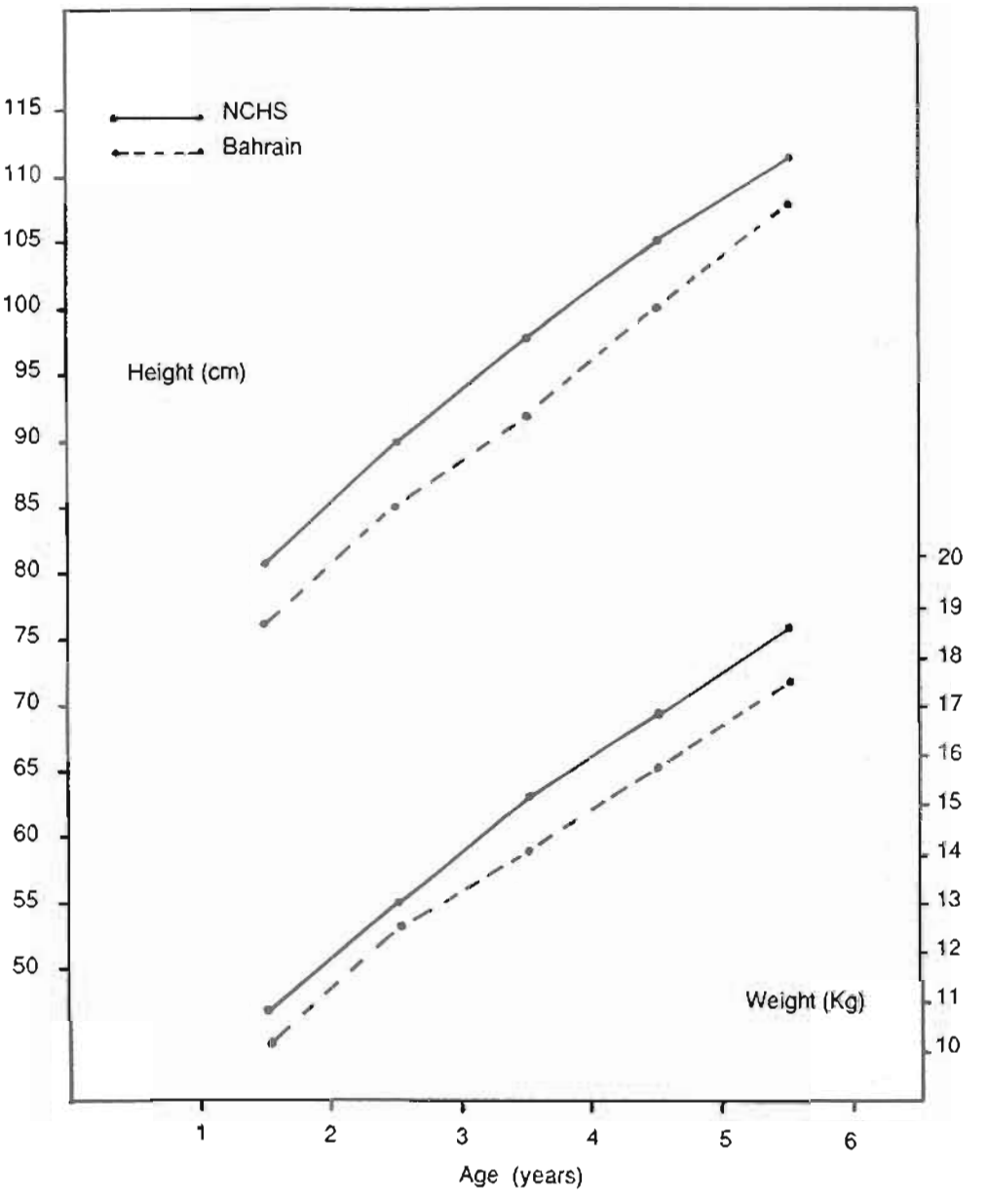

Figure 2: Median weight and height of female Bahraini preschool children compared with the 50th percentiles of NCHS.

RECOMMENDATIONS

1. Health education programmes should focus on improving the knowledge of mothers and other care-givers on the nutritional needs of preschool children. Information on daily nutrient requirements and proper food habits for preschoolers is essential.

2. The knowledge and skills of community health workers and family physicians in the management of nutritional disorders, especially obesity, underweight, diabetes and coronary heart disease should be improved. This can be achieved by organizing short courses through College of Health Sciences or other bodies.

3. More attention should be paid to foods provided for preschool children in nursery schools and kindergartens in Bahrain. A short course in nutrition for preschoolers should be conducted for the teachers in these institutes.

4. Spacing between pregnancies, especially among adolescent mothers, should be encouraged in MCH clinics and also through health and social education programmes. One way to do this is by encouraging breastfeeding for as long a period as possible. It is well documented that breastfeeding has a positive association with lactational amenorrhoea.

5. The enrolment of girls in schools and the continuance of their school education should be encouraged. This will help in part in delaying early marriage among adolescent mothers.

6. As demonstrated by this survey, obesity is the main problem among mothers in Bahrain. Preventive programmes to reduce the prevalence of obesity among women is highly recommended. These programmes should include the following activities: correction of misconceptions regarding obesity, the provision of improved information in the school curriculum on weight management, and the encouragement of physical exercise in schools and other institutes.

7. Health education programmes should focus on preventive measures for diseases of affluence, particularly those linked with dietary habits, such as cancer, hypertension, diabetes, overweight and coronary heart disease.

8. MCH services should include more nutritional activities such as nutritional screening of teen-age girls, and management of nutritional problems among preschoolers, pregnant and lactating mothers.

9. Growth charts in health centers should be utilised properly. It was found that growth charts have not been utilized efficiently in growth monitoring of preschool children. More attention should be paid to the education of mothers as well as health staff in the interpretation and utilization of growth charts.

10. Nutrition should be integrated with other health promotion programmes. Nutrition activities can be well integrated with MCH activities and oral hygiene programmes.

11. Further in depth studies on diet and its links with diseases of affluence in Bahrain are urgently needed.

REFERENCES

Abdul Jabbar, F. and Wong, S.S (1988): Menarchal Age, Marriage, and Reproduction Among Saudi Women. *Anne. Saudi Med.* 8, 438-442.

Al-Mahroos, F. and McKeigue, P. (1998): Obesity, Physical activity and prevalence of diabetes in Bahraini Arab native population. *Bahrain Med. Bull,* 20,3, 114-118.

Al-Nuaim, A. et al (1996): High Prevalence of Overweight and Obesity in Saudi Arabia, *Int.J.Obes Relat Metab Disord*, 20,6, 547-552.

American Institute for Cancer Research (AICR) (1997): *Food, Nutrition and the Prevention of Cancer: A Global Perspective*. AICR, Washington, USA.

Al-Awadi, F. and Amine, E.K. (1990): Overweight and Obesity among Women in Kuwait. *J. Royal Soc. Hlth.* 109, 175-177.

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

Birmingham School Meals Working Parity (BSMWP) (1987): Recommendations for school meals. *Nutr. & Hlth* 4, 234-246.

Cala, R.F. Zabik, M.E. and Morgan, K.J. (1980): Snacking and its nutrients contribution to the diet of school-age children. *School Food Serv. Res. Rev.* 4, 113-116.

CDC/WHO (1990): *Anthro, Software for Calculating Pediatric Anthropometry*. WHO, Geneva.

Central Statistics Organization (CSO) (1985): *Household Expenditure and Income Survey.* Council of Ministers, Bahrain.

Central Statistics Organization (CSO) (1997): *Statistical Abstracts 1996*. Council of Ministers, Bahrain.

DeMayer, E.M. (1989): *Preventing and Controlling Iron Deficiency Anaemia,* WHO, Geneva.

El-Dosary, L. et al (1982): Ecological Factors Influencing Morbidity Patterns of Acute Gastroenteritis in Children Under Five Years of Age in Kuwait. *Bull. High Inst. Publ. Hlth (Alexandria),* 12, 49-65.

James, W.P.T. (1988): *Healthy Nutrition.* WHO Regional Publication, No. 24, Regional Office for Europe, Copenhagen.

Jelliffe, D.B. and Jelliffe, E.F. (1989): Communicty Nutritional Assessment. Oxford University Press. New York, U.S.A.

Kordy, and El-gamal, (1995): A study of Pattern of Body Mass Index (BMI) and Prevalence in a Saudi Population. *Asia Pac J Public Health*, 8,2, 59-65

Leeds, A.R. and Hussain, K. (1998): A review of the effects of dietary fiber and their potential benefits in health. *Int.J. Food SC. Nutr*. 49,55-58.

Ministry of Health (MOH) (1998): Health Statistics, 1996-1997. Manama, Bahrain.

Ministry of Labour and Social Affairs (1989): *Knowledge and attitudes towards Family Planning among Bahraini Families*. Bahrain (in Arabic).

Moosa, K. and Zein, Z.N. (1995): Assessment of The Iron Status and Dietary Intake of Pregnant Women in Bahrain. Ministry of Health, Bahrain.

Morgan, K.J., Zabik, M.E. and Stampling G. (1986): Breakfast consumption patterns of US children and adolescents. *Nutrition Research* 6, 635-646.

Musaiger, A.O. (1981): *Food Habits in Bahrain*, Ministry of Health, Bahrain (in Arabic).

Musaiger, A.O. (1984): Studies on Nutrition in Bahrain, Ministry of Health, Bahrain.

Musaiger, A.O. (1985): Factors Associated with Birth Weight in Bahrain. *J. Trop. Med. Hyg*, 88, 31-36.

Musaiger, A.O. (1987): The State of Food and Nutrition in the Arabian Gulf Countries. *Wld Rev. Nutr. Diet.* 54, 105-173.

Musaiger, A.O. (1990a): *Social Factors Affecting Breastfeeding in Bahrain*. Ministry of Health, Bahrain (in Arabic).

Musaiger, A.O. (1990b): *Cholesterol and Fatty Acid Profile of Foods and Dishes Commonly Consumed in Bahrain*. Bahrain Center for Research and Studies, Bahrain.

Musaiger, A.O. (1990c): Nutrition disorders associated with affluence in Bahrain. *Family Practise* 7, 9-13.

Musaiger, A.O. (1988): *Traditional Dishes of Bahrain*. Al-Yamani Commercial and Management Services Bureau, Bahrain.

Musaiger, A.O. et al (1986): Education and Food Habits of Bahraini Housewives. *J.Royal Soc. Hlth*, 106, 85-86.

Musaiger, A.O. and El-Shehabi (1990): Geographical Distribution of Birth Weight in Bahrain. *Bah. Med. Bull.* 12, 73-76.

Musaiger, A.O. and El-Samani, F.2 (1991): Demographic and Maternal Factors Predicting Birth Weight in Bahrain. *Saudi Medical.* 12, 485-488

Musiager, A.O. and Gregory, W.B. (1992): Dietary habits of school children in Bahrain. *J. Royal Soc. Hlth*, 112, 159-162.

Musaiger, A.O. and Al-Ansari, M. (1992): Factors associated with obesity among women in Bahrain. *Int. Quart Comm. Hlth Educ.* 12,2, 129-136.

Musaiger, A.O. and Miladi, S. (1995): *Food Consumption Patterns and Dietary Habits in the Arab countries of the Gulf.* FAO/RNEA, Cairo, Egypt.

Musaiger, A.O. and Abdulkhalek, N. (1998): Nutritional problems among pregnant women in GCC countries. *Bahrain Med. Bull.* 20,3, 95-97.

Musaiger, A.O. et al (1998): Factors associated with obesity among women attending health centers in Qatar. *Int J Food SC. Nutr.* 49, 53-58.

Must, A., Dallal, G.E. and Dietz, W.H. (1991): Reference data for obesity: 85 th and 95 th percentiles of body mass index (wt/ht^2) and triceps skinfold thickness *Am J Clin. Nutr.* 53, 839-846.

O' Sullivan, K. (1998): Fiber and its role in health and diseases. *Int. J. Food SC. Nutr.* 49, 59-512.

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

Stanek, K., Abbott, D. and Cramer, S. (1990): Diet quality and eating environment of preschool children. *J. Am. Diet. Assoc.* 90, 1582-1584.

UNICEF (1989): *Proceeding of the Meeting of Experts to Propose Priorities for the Advancement of Childhood for the Nineties in the Arab Gulf Region.* UNICEF/Gulf Area Office, Riyadh.

UNICEF (1997): *The State of The World's children, 1996.* Oxford University Press. New York, U.S.A.

WHO (1984): *Guideline Food a sample Survey of Diarrhoeal Disease Morbidity, Mortality and Treatment*. Geneva, Switzerland.

WHO (1988): *Maternal and Infant Mortality in the Eastern Mediterranean Region*. WHO Regional Office for the Eastern Mediterranean. Alexandria, Egypt.

WHO (1990): *Diet, Nutrition, and the Prevention of Chronic Diseases*. Geneva, Switzerland.

Worthington-Roberts, B. and Williams, S.R. (1993): *Nutrition in Pregnancy and Lactation*. Mosby, New York, U.S.A.

Zaghloul, N.E. and Dodani, T (1984): A study of the Growth Pattern of Bahraini children. *Bull. High Inst Public Hlth* (Alexandria), 4, 147-156

Zaghloul, N.E. et al (1984): Dietary factors and physical activity of obese and non-obese adolescents. *Bull High Inst. Publ. Hlth*, 14, 31-49.

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Women at childbearing age, pregnant and lactating mothers, and young children are more susceptible to malnutrition than other groups. However, maternal and child morbidity and mortality cannot be understood without examining the secondary health and social causes.

In Bahrain, studies related to health and nutritional problems of mothers and young children are limited.

The main objectives of this survey were:

- *To assess the nutritional status of mothers in Bahrain.*
- *To assess the nutritional status of preschool children in Bahrain (1-6 years).*
- *To study the dietary habits of both mothers and children.*
- *To study demographic and health characteristics of mothers in Bahrain.*