COMPLEMENTARY FOODS FOR CHILDREN UNDER TWO YEARS OF AGE AND ITS RELATION TO NUTRITIONAL STATUS AND SELECTED SOCIO-DEMOGRAPHIC FACTORS IN BASRAH

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ABSTRACT

This is a cross-sectional study done in Basrah governorate during the period from the 1st of April to the end of August 2005, in two primary health care centers to identify feeding patterns for children 6-24 months of age, types of complementary foods given to these children and association with the studied children nutritional status. A total of 428 children were recruited in this survey; 205(47.9%) boys and 223(52.1%) girls. The majority of surveyed children (386 children, 90.2%) were receiving complementary foods alone or in combination with other forms of feeding like bottle or breast-feeding. Only 42 children (9.8%) have never been given complementary food. Breast-feeding was given alone or in combination with complementary food or formula feeding in 281 child (65.6%) of the sample. About 15.1% of the studied children were moderately stunted and 9.4% were severely stunted. Severe stunting was most common at the 19-24 month age group. From the total surveyed children, 5.1% were severely wasted and 15.6 % moderately wasted. There was a significant positive correlation between stunting and age. Both stunting and wasting show a statistically significant increase with age. Stunting was increased with increase in age more than wasting which also increased with age but to a lower extent. There was a significant negative correlation between parental education and malnutrition especially stunting as an increase in educational level was associated with a lower proportion of stunted children. For both parents, those who were illiterate or achieved only primary school education represent near half of the total number of families in this survey. Increase in both parental educations was associated with a significant improvement in frequency of different diet administration. About 37.7% and 17.3% of the surveyed children had two or three other siblings aged less than five years respectively. 63.1% of children were given drinking water without sterilization. Complementary food administration is positively correlated with age and negatively correlated with malnutrition. Administered foods were mainly in the form of low energy density food and were low in animal protein. Those children offered complementary foods less frequently are more likely to be malnourished. On the other hand, children who were breastfed were less likely to be malnourished even if complementary foods were not given. This nutritional survey has provided useful information about nutritional problems for children 6-24 months. Malnutrition affects a significant proportion of children from (6-24) months of age. Possible contributing factors include: lack of parental education especially among mothers, poor socioeconomic status of families and use of unsterilized water for drinking. Complementary foods administered to these children consist mainly of low energy density and low animal protein diet. Breast-feeding continues to be a very important as it protects against childhood malnutrition even after 6 months of age and through the second year of life.

INTRODUCTION

Malnutrition is a leading health problem among children in Iraq. A national survey done on under two years of age children attending the routine immunization sessions during 1999 showed that 12% of the children were malnourished, according to WHO reference criteria; 13.8% were stunted (i.e. had a low height-for-age, reflecting chronic malnutrition) and 9.2% were wasted (low weight-for-height, reflecting acute malnutrition). Possible contributing causes for this were inadequate intake of foods both in quantity and quality, high prevalence of infections and inappropriate feeding/weaning practices with an increased use of formula feeding[1]. In a study done by Gopaldas T et al, poor socio-economic variables, cultural beliefs, and lack of parental education, especially that of mothers, are all cited to affect a child's nutritional status[2]. Nutritional illiteracy and mothers' erroneous beliefs may result in mothers having inadequate feeding practices that would contribute to malnutrition in children particularly at the 6-18 months[3]. Weaning is a transitional period from breast-feeding to adult diet and usually is associated with a number of concerns and problems in developing countries. The major concerns are what foods should be given to the child and how and when they should be given[4]. Complementary foods (nearly the same meaning as supplementary feeding) are defined as any energy containing

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food that will displace or reduce intake of breast milk intake[5]. The time of introduction of complementary feeding is difficult to define with precision[5-7]. There is no nutritional indication to add complementary foods to the diet of the healthy term infant before the age of 4 months. Introduction of complementary foods by 2-3 months of age may be associated with a low nutritional status. Introduction of complementary foods by 4-5 months has been associated with a slightly slower linear growth compared to later introduction[8]. On the other hand, late weaning is a major problem since breast-milk ceases to be adequate to meet the infants' needs between the ages of four and six months. Increasing durations of exclusive breastfeeding (to six months) and improving complementary feeding will promote child growth and reduce infection and mortality[9]. In developing countries, the age of introduction of weaning foods is of public health importance because of the risk of diseases, particularly diarrheal diseases from contaminated weaning foods, and the risk of growth faltering and malnutrition from delayed weaning[10]. The American Academy of Pediatrics recommended that, in developing countries, where the use of potentially contaminated and or low nutrient dense foods puts the infants at risk for diarrhea and malnutrition; infants should be given *exclusively breast-feeding for six months*. Formula milk is known to displace breast milk more readily than does solid food, thus, reduces breast milk intake and decreases benefits of breast-feeding. It is recommended that breast fed infant is better given additional solid foods rather than formula. For formula-fed infants there is no need to give complementary foods before 6 months of age to meet the nutritional requirements[5]. There is no evidence to support the introduction of foods in particular order but it is quite important that these complementary foods should supply the increasing energy, protein and micronutrients requirements with increasing age[5].

The aims of this study were to identify the patterns of feeding practices in children 6-24 months of age, types and frequency of administration of complementary foods among these children, and related sociodemographic factors. Also it aimed, to identify the relationship of these variables with the surveyed children nutritional status.

SUBJECTS AND METHODS

This study was done in two primary health care centers in Basrah governorate, Southern of Iraq. The children involved in the survey were attending for routine immunization. The study was carried out during the period from (1st of April-31st August 2005). Four hundred-twenty eight children with an age range from 6 to 24 months were included in this survey. The sample size was calculated based on the following formula:

$$\text{Sample size} = n = \frac{z^2 (p \times q)}{(p \times e)^2} = 278 \text{ child}$$

Where n = required sample size

P = the proportion of children given cereals from a previous study done by Hassan MK[11], were 58% of studied sample.

q = 1 - p

e = An accepted range of error is (10%)

A number for the sample was chosen to be more than calculated sample size to improve sample selection. A questionnaire sheet was administered in the form of direct interview for each mother separately. The data collection form was developed in clear and objective language. The following data were obtained from each mother: name, age, sex, address, feeding method at present time (breast-feeding alone, bottle-feeding alone, mixed bottle and breast-feeding / or complementary foods added). Questions about what food is given is further extended to include the types of complementary food. These were divided in to six main groups (cereals and rice, meat and fish, eggs, fruits, vegetables and legumes). Also the mothers were asked exactly to indicate whether the food is given or not[12]. Accordingly their answers were divided as follows: Never given till the date of interview, rare (once or less per week), occasionally (not daily but more than once per week), or daily (including nearly daily)[12]. Other questions were: mother and father education and was divided as follows: illiterate, primary school, secondary school and higher education. Other information that were obtained: number of under five-year sibling (other than the index child), history of pica (which was defined as any eating of any non-nutritive substances). Information about water used for drinking were also collected from

mothers during the survey. Data on children's growth status were obtained by measuring weight and height. Weight was measured with minimum clothing and no shoes to the nearest 100 grams. Length was measured with an infantometer, following the standardized procedure. The anthropometric data were analyzed in terms of height-for-age (HAZ) and weight-for-height (WHZ) and by use of NutStat (one of Components of Epi Info™ for Windows, database and statistics software for public health professionals 07/09/2004), the obtained measures were further classified to determine malnourished children. NutStat is a program for recording and evaluating measurements of length, stature, weight, head circumference and arm circumference for children and adolescents. The program calculates number of standard deviations from the mean (Z-scores)[13-14]. The Z-score cutoff point recommended by WHO to classify low anthropometric levels is 2 SD units below the reference median for the indices (i.e. weight / height or height / age). For each child anthropometric measurement is so classified as follows: *for HAZ children were classified as normal (above -1 SD) and mild stunting (≤ -1 SD but > - 2SD), moderate stunting (≤ - 2 SD but > - 3SD) and severe stunting (≤ - 3 SD) . Using WHZ children were classified as normal (above 1 SD), mild wasting (≤ - 1 SD but >- 2SD), moderate wasting (≤ - 2 SD but > - 3SD) and severe wasting (≤ - 3 SD). P value < 0.05 is regarded as significant and <0.01 is regarded very significant. The obtained data were analyzed using a computer in which SPSS/PC+ software was installed.*

RESULTS

The survey group was composed of a total of 428 children aged from 6 months to 24 months who were presented to primary health care centre for routine immunization. There were 205(47.9%) boys and 223(52.1%) girls. The proportion of each age group were as follows: 268 (62.6%) infants aging 6-12 months, 93 (21.7%) children 13-18 months and 67(15.7%) children 19-24 months of age.

The vast majority of surveyed children (386 children, 90.2%) were receiving complementary foods alone or in combination with other forms of feeding like bottle or breast-feeding. Only 42 children (9.8%) were never given any complementary food. Complementary food administration increases with age. However, still (17.8%) of those infants aged 6-9 months (total 35 children) and (6.5%) of children aged 22-24 months were never given any such food. For other age groups the proportion of such children were much less (P<0.001). Breast feeding was given alone or in combination with complementary foods or formula feeding in 281 children (65.6%) of the sample and bottle feeding in 229 children (53.5%) alone or in combination with breast feeding or complementary food.

Breast-feeding with no added food was given only in 26 infants (6.1%). The majority of these children were mainly in the age group 6-12 month (24 infant, 92.3%; and 2 children 19- 24 months, 7.7%). Bottle-feeding with no added food was present only in four infants (1%). After the age of 12 months, one child only was on bottle-feeding alone and two children were on breast-feeding alone without complementary foods.

Selected sociodemographic and nutritional parameters obtained and their frequency during this dietary screening are listed in (Table-1). A good proportion of both parents in this survey were either illiterate or achieved only primary school education. Mothers were found to be of lower education than fathers in this survey.

About (37.7%), (17.3%) and (2.8%) of the children included in the study were having 2, 3 or 4 other sibling of age less than five years respectively. (63.1%) of children were given drinking water without sterilization. For those babies given bottle-feeding, (68.6%) of mothers were sterilizing the bottles properly before use by boiling. Also, of these mothers (85.1%) were preparing the milk correctly; while the rest (14.9%) were giving their babies diluted milk.

Table 1. ***Distribution of selected sociodemographic and nutritional variables in the survey group.***

Selected variables	**Frequency No. (%)**
Mother education	
Illiterate	60 (14)
Primary school	206 (48.1)
Secondary school	135 (31.5)
Higher education	27 (6.3)
Total	428 (100)
Father education	
Illiterate	42 (9.8)
Primary school	150 (35)
Secondary school	160 (37.4)
Higher education	76 (17.8)
Total	428 (100)
Number of siblings under five years	
No other sibling	16 (3.7)
1	165 (38.6)
2	161 (37.6)
3	74 (17.3)
4	12 (2.8)
Total	*428 (100)*
Water sterilization	
Proper sterilization	158 (36.9)
Water given with no sterilization	270 (63.1)
Total	428 (100)
Pica	
Positive	53 (12.4)
Negative	375(87.6)
Total	*428(100)*
Bottle sterilization for those with bottle feeding	
Sterilization by boiling	120 (68.6)
No Sterilization	55 (31.4)
Total	*175 (100)*
Milk preparation for bottle fed infant	
Diluted milk	26(14.9)
Normal preparation	149 (85.1)
Total	*175 (100)*

The proportion of the surveyed children who were given complementary foods on daily basis [in order of frequency of administration]: (85.1%) were given rice and cereals, (52.1%) fruits, (25.5%) eggs. Other complementary foods were administered less frequently and include: (15.2 %) legumes, (15%) meat, fish, and (10.4%) vegetables (Table-2). From this table also, it is apparent that more frequent administration of complementary foods is related to increase in age of the child. The frequency of administration of cereals and rice on daily basis increase with age from (60.1%) at age 6-12 months to (74.2%) and (85%) at the age groups 13-18 and 19-24 months respectively. About (18.7%) of those 6-12 months and (5.4%) and (3%) of those 13-18 months and 19-24 months respectively were never given rice and cereals ($P<0.001$). Fruits were never administered to (22.2%) of surveyed children compared to (10.5%) and (15%) who were given either rarely (once or less per week) or occasionally (not daily but more than once per week) respectively. As for other foods, increase in frequency is increased by increasing age ($P<0.001$). Eggs were administered daily only to (25.5%) of the whole surveyed children, never given to (35%), rarely given to (21%), and in (18.5%) were occasionally given. The proportion of children less than 12 months of age who were not given eggs were more than at older age groups as (48.1%) never given eggs compared to (16.1%) and (9%) among children aged 13-18 months and 19-24 months

respectively (P<0.001). In regard to legumes, with increase in age, legumes were increasingly given to children in the survey group. However, only (15.2%) of the children in the survey were given legumes daily, (35%) never given and (29 %) given only rarely (P<0.001). A rather similar picture is seen with administration of meat and fish to children in the survey group. However, compared to other types of complementary foods, meat and fish were less frequently given to children from 6-12 months as only (4.8%) were given these foods daily which is significantly lower than other foods, (18%) occasionally given and (50%) never given. During the second year, higher proportion of children were given this type of food but still (19.4%) of 13-18 months children and (7.5%) of 19-24 months were never given it. Significant proportion of these children were given these complementary foods occasionally (more than once per week meal but not daily) (P<0.001). The least frequently given diet were vegetables as only (10.4%) given it daily and (8.6%) occasionally (more than once per week meal but not daily) and this is more obvious in infants(P<0.001).

Table 2. ***Frequency of different complementary foods according to age of administration.***

Part A

Type of complimentary food	Frequency of administration n (%)				
	Never given No. (%)	≤ 1/week No. (%)	> 1/week No. (%)	Daily No. (%)	Total
Egg **					
6 - 12 months	129 (48.1)	66 (24.6)	40 (14.9)	33 (12.3)	268 (100)
13 - 18 months	15 (16.1)	15 (16.1)	22 (23.7)	41 (44.1)	93 (100)
19 - 24 months	6 (9)	9 (13.4)	17 (25.4)	35 (52.2)	67 (100)
Total	150 (35)	90 (21)	79 (18.5)	109 (25.5)	428 (100)
Legumes **					
6 - 12 months	120 (44.8)	89 (33.2)	31 (11.6)	28 (10.4)	268 (100)
13 - 18 months	20 (21.5)	26 (28)	29 (31.2)	18 (19.4)	93 (100)
19 - 24 months	11 (16.4)	9 (13.4)	28 (41.8)	19 (28.4)	67 (100)
Total	151 (35.4)	124 (29)	88 (20.6)	65 (15.2)	428 (100)
Meat and fish **					
6 - 12 months	134 (50)	73 (27.2)	48 (18)	13 (4.8)	268 (100)
13 - 18 months	18 (19.4)	23 (24.7)	27 (29)	25 (26.9)	93 (100)
19 - 24 months	5 (7.5)	14 (20.9)	22 (33)	26 (38.8)	67 (100)
Total	157 (36.7)	110 (25.7)	97 (22.6)	64 (15)	428 (100)

Table 2. ***Frequency of different types of complementary according to age of administration.***

Part B

Type of complementary food	Frequency of administration				
	Never given No. %	≤ 1/week No. %	1/week No. %	Daily No. %	Total No. %
Rice and wheat **					
6 - 12 months	50 (18.7)	39 (14.6)	18 (6.7)	161 (60.1)	268 (100)
13 - 18 months	5 (5.4)	10 (10.7)	9 (9.7)	69 (74.2)	93 (100)
19 - 24 months	2 (3)	3 (4.5)	5 (7.5)	57 (85)	67 (100)
Total	57 (13.3)	52 (12.1)	32 (7.5)	287 (67.1)	428 (100)
Fruits **					
6 - 12 months	77 (28.7)	31 (11.6)	38 (14)	122 (45.5)	268 (100)
13 - 18 months	7 (7.5)	8 (8.6)	16 (17)	62 (66.7)	93 (100)
19 - 24 months	11 (16.4)	6 (9)	11 (16)	39 (58.2)	67 (100)
Total	95 (22.2)	45 (10.5)	65 (15.2)	223 (52.1)	428 (100)
Vegetable **					
6 - 12 months	163 (60.8)	77 (28.7)	16 (6)	12 (4.5)	268 (100)
13 - 18 months	41 (44.1)	23 (24.7)	12 (13)	17 (18.3)	93 (100)
19 - 24 months	29 (43.3)	14 (20.9)	9 (13)	15 (22.4)	67 (100)
Total	233 (54.4)	114 (26.6)	37 (8.6)	44 (10.4)	428 (100)

* p value < 0.05
** p value < 0.01

About (15.1%) of the survey group were moderately stunted and (9.4%) were severely stunted (Table-3). Severe stunting was most prevalent in the age group 19-24 month (28.3%) compared to (5.4%) in children aged 13-18 months and (6%) in those 6-12 months of age. However, moderate stunting was more at 6-12 months age group (17.1%) compared to (16.1%) among children aged 13-18 months and (6%) in those 19-24 months of age, (P<0.001).

From the total surveyed children, (5.1%) were severely wasted and (15.6%) moderately wasted. Although severe wasting and moderate wasting were more in the age group 19-24 months than other age groups, the difference did not reach statistical significance, (P>0.05).

Table 3. ***Nutritional status of children in relation to age.***

Age groups months	Stunting[1] No. (%)		Wasting[2] No. (%)	
	< - 2SD HAZ	< - 3 SD HAZ	< - 2SD WHZ	< - 3 SD WHZ
6 – 12 total = 268	46 (17.1)	16 (6)	36 (13.4)	11 (4.1)
13 – 18 total =93	15 (16.1)	5 (5.4)	16 (17.2)	6 (6.5)
19 -24 total = 67	4 (6)	19 (28.3)	15 (22.4)	5 (7.5)
Total	65 (15.1)	40 (9.4)	67 (15.6)	22 (5.1)

[1] X^2 36.276 P < 0.001 (as related to age distribution)
[2] X^2 5.651 P > 0.05 (as related to age distribution)

There was a significant positive correlation between increase in age and increase in frequency of administration of different complementary foods in the survey group (Table-4). This is more significant for eggs, meat and legumes. It seems that younger age children were less frequently offered these groups of diet. Stunting was increased with increase in age more than wasting which also increased with age but to a lower extent. Children of increasing age were given less frequently sterilized water than younger children *(negative correlation)*. Increase in both parental educations was associated with significant improvement in frequency of different diet administration. In regard to complementary foods frequency, it was the mother's education, which showed more significant positive correlation than father's education. There was an obvious negative correlation between parental education and malnutrition especially stunting as an increased in education was associated with a lower proportion of stunted children. In regard to wasting, it was father's education, which showed a significant negative correlation, but not mother's education. There was a positive correlation between father's education *(but not that of mothers)* and use of sterilized water for drinking.

Table 4. ***Parental education and age correlated to dietary frequency and prevalence of malnutrition.***

Parameter	Mother's education R (p-value)	Father's education R (p value)	Age in months R (p value)
Frequency of administration of selected dietary items per week			
Eggs	0.131**	0.117*	0 .450**
Legumes	0.122*	0.081	0.34**
Fish and meat	0.213**	0.242**	0.464**
Rice wheat	0.159**	0.113*	0.237**
Fruit	0.098*	0.108*	0.173**
Vegetables	0.125**	0.067	0.259**
Proportion of stunting among the surveyed children	-0.105*	-0.101*	0.156**
Proportion of wasting among the surveyed children	-0.063	-0.097*	0.110*
Water sterilization	0.070	0.166**	-0.225**

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

For most of the dietary items *(eggs, fish and meat, rice and wheat, fruits)*, there is a trend that an increase in dietary frequency administration per week results in a decrease in the proportion of stunted children (<-2SD HAZ). This is more obvious when dietary frequency is increased from less than once a week to once a week or daily administration of that dietary item. In contrast, children not given the dietary item at all showed a lower proportion of stunting children for all the items surveyed (Table-5).

Table 5. ***Frequency of stunting (<-2SD HAZ) in relation to frequency of different types of complementary food***

Food item	Frequency of administration No. (%)				
	Never given	*≤ 1/week*	*> 1/week*	*Daily*	*P-value*
Eggs	29 (19.3)	32 (35.6)	21 (26.6)	23 (21.1)	0.03
Total	150 (100)	90 (100)	79 (100)	109 (100)	
Fish and meat	31 (19.7)	39 (35.5)	22 (22.7)	13 (20.3)	0.02
Total	157 (100)	110 (100)	97 (100)	64 (100)	
Legumes	29 (19.2)	43 (34.7)	16 (18.2)	17 (26.2)	0.011
Total	151 (100)	124 (100)	88 (100)	65 (100)	
Rice and wheat	10 (17.5)	27 (51.9)	9 (28.1)	59 (20.6)	.0001
Total	57 (100)	52 (100)	32 (100)	287 (100)	
Fruits	22 (23.2)	22 (48.9)	14 (21.5)	47 (21.1)	0.001
Total	95 (100)	45 (100)	65 (100)	223 (100)	
Vegetables	43 (18.5)	41 (36)	7 (18.9)	14 (31.8)	0.002
Total	233 (100)	114 (100)	37 (100)	44 (100)	

From careful looking to (Table-6), increasing in dietary frequency administration per week results in a decrease in the proportion of wasted children (< - 2 SD WHZ). This is obvious when dietary frequency is increased from less than once a week to once a week or daily administration.

Table 6. ***Frequency of wasting (< - 2SD WHZ) in relation of frequency of different types of complementary food.***

Food item	Frequency of administration No. (%)				
	Never given	*≤ 1/week*	*> 1/week*	*Daily*	*P -value*
Eggs	17 (11.3)	35 (38.9)	19 (24.1)	18 (16.5)	0.001
Total	*150 (100)*	*90 (100)*	*79 (100)*	*109 (100)*	
Fish and meat	17 (10.8)	42 (38.2)	18 (18.6)	12 (18.8)	0.001
Total	*157 (100)*	*110 (100)*	*97 (100)*	*64 (100)*	
Legumes	14 (9. 3)	46 (37.1)	16 (18.2)	13 (20)	0.001
Total	*151 (100)*	*124 (100)*	*88 (100)*	*65 (100)*	
Rice and wheat	7 (12.3)	25 (48.1)	12 (37.5)	45 (15.7)	0.001
Total	*157 (100)*	*110 (100)*	*97 (100)*	*64 (100)*	
Fruits	11 (11.6)	21 (46.7)	16 (24.6)	41 (18.4)	0.001
Total	*95 (100)*	*45 (100)*	*65 (100)*	*223 (100)*	
Vegetables	23 (9.9)	48 (42.1)	9 (24.3)	9 (20.5)	0.001
Total	*233 (100)*	*114 (100)*	*37 (100)*	*44 (100)*	

Also, more frequent dietary administration of complementary foods result in reduction of wasting greater than reduction of stunting and less administration associated with more wasting than stunting. For example, the proportion of wasted children among those given eggs daily were (16.5%) compared to stunting which was (21.1%). Also for legumes, for those given it daily, (20%) were having wasting compared to stunting which was (26.2%). Dietary frequency is inversely related to administration of breast-feeding. Those children never given dietary items are more likely to be breast fed than those given diet more frequently on daily basis weekly (Table-7).

Table 7. ***Distribution of breast-feeding among surveyed children in relation to frequency of different types of complementary foods.***

Dietary items	Frequency of administration No. (%)				P- value
	Never given	*≤ 1/week*	*> 1/week*	*Daily*	
Eggs	126 (84)	41 (45.6)	51 (64.6)	63 (57.8)	0.001
Total	*150 (100)*	*90 (100)*	*79 (100)*	*109 (100)*	
Legumes	126 (83.4)	67 (54)	50 (56.8)	38 (58.5)	0.001
Total	*151 (100)*	*124 (100)*	*88 (100)*	*65 (100)*	
Fish and meat	134 (85.4)	52 (47.3)	62 (63.9)	33 (51.6)	0.001
Total	*157 (100)*	*110 (100)*	*97 (100)*	*64 (100)*	
Rice and wheat	50 (87.7)	22 (42.3)	23 (71.9)	186 (64.8)	0.001
Total	*57 (100)*	*52 (100)*	*32 (100)*	*287 (100)*	
Fruits	79 (83.2)	14 (31.1)	46 (70.8)	142 (63.7)	0.001
Total	*95 (100)*	*45 (100)*	*65 (100)*	*223 (100)*	
Vegetables	181 (77.7)	57 (50)	21 (56.8)	22 (50)	0.001
Total	*233 (100)*	*114 (100)*	*37 (100)*	*44 (100)*	

DISCUSSION

This survey has revealed that malnutrition is still a serious childhood problem in Basrah. Its etiology is more than due to the effect of economic status of the community but other important causes should be considered. Breast feeding although is regarded as the most important protective factor for children's health in the first two years but also proper complementary food practices are quite vital for the promotion of this effect after the age of 6 months and especially during the second year of life and there after. Mother's related factors are on the top of the factors that directly affect the health of their children particularly nutrition. Nutrition screening and evaluation have become integral part of many parts of health care and supplemental food programs for infants and children. Community based nutrition surveys provide an accurate idea about food administered to children. It can give an idea about the approximate caloric intake per day. Dietary screening is aimed to identify those infants and children who may appear to have nutritional problems. Although the information it give are rather qualitative, it can be concluded from these, who are the children that are at risk of malnutrition[12]. The vast majority of children in this survey were receiving complementary food at an appropriate age, around the age of 6 months. This is also evident in previous studies where mothers tend to administer foods even before 6 months of age[15]. However still (17.8%) of those aged 6-9 months did not receive complementary food by this age. It is clear in this study that delayed complementary food administration is not a major problem, but certain dietary items with caloric and protein value are given late and infrequently. This was also observed by **Hassan KH**, who showed that the diet of children aged 6-36 months was consisted mainly of low value diet[11]**,** and also seen by a WHO global survey[16]. Breast-feeding was common among the surveyed group. In contrast, bottle-feeding was administered less than breast-feeding and commonly given in addition to breast-feeding. Most of these children were given additional complementary foods. Those mothers who continue breast-feeding for a period up to 12 months of age may be aware of the protective effects of breast milk or breast-feeding may be regarded as a cultural norm among the low

social class people[17]. Despite this, malnutrition was not prevented. In this survey, illiteracy and primary school education among parents were prevalent in a significant proportion of the surveyed children's parents. This has its adverse effects on knowledge about hygiene, feeding practices and role of birth spacing. There may be also a nutritional illiteracy among parents which may be present even among those who are regarded as educated that would contribute more to the above factors and it may be an additional factor contributing to bad complementary practices and thus malnutrition[3]. The families of the surveyed group usually consist of two or more other siblings less than five years, reflecting a short inter-pregnancy interval for mothers. It was a common practice from mothers to give a non-sterilized water for children above 6 months of age. These last observations would also confirm the importance of education of parents. Increase in both parental educations was associated with a significant improvement in frequency of different diet administration with more effect of that of mothers over that of fathers. This last effect is expected as mothers are directly involved in food preparation more than fathers and their knowledge would exert such a positive effect[11,17]. On other hand, this would also explain partly why less educated parents have more malnourished children as there was an obvious negative correlation between parental education and malnutrition especially stunting. In regard to wasting, it was the father's education which showed a significant negative correlation but not mother's education. These observation are in agreement with other studies[11]. There was a positive correlation between father's education but not that of mothers and use of sterilized water for drinking. Although both parents education shows a correlation, but it was father's education which showed a more strong relation. Children of increasing age were given less frequently sterilized water than younger children. This reflects indirectly that mothers tend to sterilize water only for infants rather than older children. Complementary foods most frequently administered were rice, cereals and fruits. This is also shown in other studies[11,15,18]. Other complementary foods were given much less frequently on daily basis. The introduction of complementary feeding in this manner, use of low-calorie density foods, is in disagreement with the recommendations[5,19]. This would certainly have an adverse effect on the total caloric and protein value of the diet of these children. There was a significant positive correlation between increase in age and increase in frequency of administration of different dietary items in the survey group. This is more significant for eggs, meat and legumes. It seems that younger age children were less frequently offered these groups of diet. This is contradictory with complementary food recommendation regarding age of administration by 6 month of age. It seems that younger age children were less frequently offered these groups of diet. These findings obviously would explain the higher proportion of stunting and wasting in our survey as shown by the significant association between increasing complementary food administration and less malnutrition. For most of the dietary items there is a trend that an increasing in dietary frequency administration is associated with a decrease in the proportion of stunted children (<-2SDHAZ) and wasted children (-2SDWHZ). In contrast, those children never given the dietary item showed a lower proportion of stunted and wasted children for all the items surveyed. This can be explained by that most of these children were more breast fed than those given diet more frequently weekly. This would suggest a protective effect against malnutrition for at least from more severe malnutrition. It has been suggested that children consuming greater amounts of energy from breast milk could receive either fewer meals or foods with correspondingly lower levels of energy density[20]. But as children get older, they need either increasingly greater levels of energy density or feeding frequency or some combination of the two. The nutritional role of mother's milk in the second year is inversely related to the adequacy of the complementary diet. Breast milk is an irreplaceable source of fat and vitamin A. When the weaning diet is inadequate for key nutrients because of low intake or poor bioavailability, breast milk assumes greater nutritional significance in the second year of life but does not guarantee adequate nutrient intakes[21]. Results of published studies of the effects of three different

meal frequencies and four energy densities on total daily energy intakes by fully weaned, recovering malnourished children between 6-18 months of age indicate that both energy density and meal frequency are significant determinants of total energy intake[22], with increasing age from 6-24 months, and the time of complementary feeding, were associated with more malnutrition as shown in other studies[11,23,24]. Stunting was increased with increase in age more than wasting which also increased with age but to a lower extent. Severe stunting was most at the 19-24 month age group (28.3%). On other hand, moderate stunting was more at 6-12 months age group (17.1%) versus (16.1%) at 13-18 months and (6%) at 19-24 months. This can be explained by increasing caloric and protein needs with increasing age coupled with poor complementary foods administration practices in this study[3,24]. Protein sources are deficient in the complementary foods of the children surveyed. Both micronutrients and macronutrients are somewhat deficient in the diet of these children. In a study done in India an intervention trial to improve composition of food, low consumption of foods of animal origin, have resulted in limited physical growth, because food given was mainly legumes and cereals. Other trials that included animal foods gave better outcomes regarding weight and length[23]. Accordingly, an educational intervention should be carried to promote appropriate complementary feeding practices and physical growth in infants and young children. In addition to that introduction of meat as an early complementary food have the advantage of providing iron and zinc in a highly bioavailable form[4]. Higher proportion of malnutrition was seen in this survey in comparison with previous study done in Basrah which has revealed that (13%) and (16.6%) of the examined children were wasted and stunted respectively[11]. In this survey, (15.1%) of group were moderately stunted and (9.4%) were severely stunted. From the total surveyed children, (5.1%) were severely wasted and (15.6%) moderately wasted. Also, in comparison with previously published national data, malnutrition was also increased (13.8% were stunted and 9.2% were wasted)[1]. This can be explained by the above-explained factors in this survey. Added to this, the possible poor economic status of the surveyed families as indicated by the levels of education of the parents, number of siblings and quality of food used by these families as mothers give types of food to their children similar to food they consume. Severe stunting was the mostly increased form of malnutrition in between these studies. This could be the result of cumulative and deteriorating socioeconomic and health situation of this community. It also reflects the chronicity of this childhood problem and its impact on children growth. It is also noticeable, that malnutrition is more prevalent more than in nearby gulf region[11].

It can be concluded from this survey that malnutrition affects a significant proportion of children from 6 to 24 months of age. Children although are offered complementary foods at appropriate age, but these foods are mainly of low energy density food and less animal protein is given. Possible contributing factors are lack of parental education especially for mothers, poor socioeconomic status of families and use of unsterilized water for drinking which may predispose to infection and then malnutrition. Breast-feeding continues to be a very important preventive measure against childhood malnutrition even after 6 months of age and through the second year of life.

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