Risk Factors of Protein Energy Malnutrition "Kwashiorkor and Marasmus" among Children Under Five Years of Age in Assiut University Children Hospital

Awatef E. Ahmed, Zienab M. Elkady, Asmaa A. Hussein, and Amal A. Abdrbou

Departments of Pediatric Nursing, Faculty of Nursing and Pediatrics, Faculty of Medicine
Assiut University Hospital, Assiut University, Egypt

Abstract: The aim of the study is to identify the risk factors of protein energy malnutrition among children under five years of age in Assiut university children hospital. A correlation descriptive research design was chosen for this study**.** A convenient sampling design was followed to include children suffering from protein energy malnutrition aged below 5 years. Control group was purposively selected to be nearly age and sex matched. A total of 150 study and 150 control were included. The results revealed that PEM was more found in children in families of middle and low socioeconomic status with statistically significant differences, history of malnutrition in other sibling and younger age than others, statistically significant differences between practices of mothers in the cases than the control groups were found regarding breast feeding, artificial feeding and additional and adult food with low level of satisfactory practices observed among mothers in the cases than those in the control groups. From this study it can be concluded that several risk factors were found to be associated with PEM including, lower education level of the mother, number of children in the family as the number of children in the family decreased , the prevalence of PEM increased, low and middle family socioeconomic status, age of the child, children with the younger age are more vulnerable to have PEM than those of older age and mothers' practices regarding feeding of their children (breast feeding, artificial feeding as well as additional and adult food) unsatisfactory practices of mothers regarding feeding of their children increase the prevalence of PEM among their children. This study recommended that Supporting and promotion of breast feeding, avoid using of artificial feeding and bottles, health education to the mothers about proper feeding practices, breast feeding, artificial feeding and additional and adult food to prevent PEM, increasing mother's awareness related to risk factors of PEM and how to manage the different infections among their children and encourage vaccination at the appropriate time.

1. Introduction:

Malnutrition is a major health problem, especially in developing countries. It affects almost 800 million people, 20% of all in the developing countries. It is associated with about half of all children death worldwide (Kumar et al., 2002).

Inadequate food intake is the most common cause of malnutrition worldwide. In developing countries, it is secondary to insufficient or inappropriate food supplies or early cessation of breastfeeding. In some areas, cultural and religious food customs may play a role. Inadequate sanitation further endangers children by increasing the risk of infectious diseases that increase nutritional losses and alters metabolic demands (Grigsby, 2005).

Social, economic, biologic, and environmental factors may be the underlying causes for the insufficient food intake or ingestion of foods with proteins of nutritional quality that lead to Protein Energy Malnutrition (PEM). Additional factors are bottle–feeding, inadequate knowledge of proper child rearing practices and parental illiteracy. The most extreme forms of protein-energy malnutrition are Kwashiorkor and Marasmus (Wong's et al., 2007). Prevention of malnutrition in children starts with an emphasis on prenatal nutrition and good prenatal cares, health care providers should emphasis on the importance of breast feeding in the first years of life, in addition to the promotion of breast feeding, they should counsel parents on the appropriate introduction of nutritious supplemental foods. All pediatric nurses must be understand the importance of optimal nutrition for the normal healthy child, the nurse knows that in order for children of all ages to reach the goal of adequate nutrition, up- to- date advice and dietary support must by provided (Wongs et al., 2007).

Aim of the study

The aim of the study was to identify the risk factors of protein energy malnutrition (Kwashiorkor

and Marasmus) among children less than five years of age in Assiut university children hospital.

2. Subject and Methods
Research design:
A correlation descriptive research design was chosen for this study.

Subject
A convenient sampling design was followed to include children suffering from protein energy malnutrition aged below 5 years. Control group was purposively selected to be nearly age and sex matched. A total of 150 study and 150 control were included.

Characteristics of sample:
Study group consists of children aged less than 5 years attending to the rehydration medical and emergency unit at Assuit University Children Hospital and who were clinically diagnosed with protein energy malnutrition. Control group consists of nearly age and sex matches children who are free from diarrhea and attending to the well-baby clinic, and emergency unit Assiut University Children Hospital, those with no past history of protein energy malnutrition. Data collection of the study group was taken from mothers of infants and / or children under 5 years of age with protein energy malnutrition coming to the Assuit University Children Hospital (rehydration, medical and emergency units). Data collection of the control group was taken from mothers of infants and / or children under 5 years of age without protein-energy malnutrition coming to well-baby clinic for vaccination and emergency unit.

Tools of the study: Three tools were used to collect the required data for the study:
Structured Interview questionnaire sheet, Anthropometric assessment sheet and Socio economic scale (Abdel Tawab, 1998).
1- The structured interview questionnaire was developed specifically to collect data related to this study from mothers of both the study and the control groups it included.
Socio-demographic data related to mothers such as mother's age, educational level, working condition, residence, family size and marital condition.
Identification data related to the child as age of the child, sex, birth order, diagnosis, type of feeding, type of milk and vaccination.
c- Mothers practices as they responded related to breast feeding, artificial feeding and additional and adult foods.

2– Family socioeconomic scale:
It included, social economic data of the family were assessed using method of Abed-El-Tawab, (1998) which including: The educational level of the father and mother included 8 levels (illiterate, read and write, primary, preparatory, secondary, university, post graduate and doctoral) , income of the family in month included 6 levels, social status for the family includes occupation of the father and working condition of the mother, housing condition and residence and other items including questions to identify if the family buy daily newspaper, weekly or monthly journal, if they have a library in the house, if they participate in the club for activities, and if they have (car, taxi, video cassette, computer, dish, mobile, and or fax).

A Pilot study:
It was carried out on a group of 30 mothers and their infants or children less than 5 years, who suffering from protein energy malnutrition. Mothers and infants or children included in the pilot study were excluded from the sample. The purposes of the pilot study were to test the contents and validity of the questionnaire sheet and estimate the length of the time needed to fill the sheet. According to the results of the pilot study, the essential modifications in the sheet were done and the final form was developed.

Data collection Procedure:
Preparation of the tools used for the study after reviewing to the appropriate literature. An official letter from the faculty of nursing, Assuit University was prepared and delivered to the director of Assuit University Children Hospital asking for permission to collect the necessary data for this study. The work was carried out by the investigator herself. Data was collected during the period from June 2006 to June 2007. The collection of data was collected two days per week for the study group, and three days per week for the control group (scheduled days for vaccination in the well baby clinic). Each mother was interviewed individually to fill the structured interview questionnaire sheet and to assess the family socioeconomic status after complete explanation of study goal. Each mother reassured that information obtained are confidential and used only for the purpose of the study. Each child was assessed for his Body weight using a standardized scale. The length or height, head, chest, and mid-arm circumferences were assessed using a measuring tape.

3-Data analysis
The collected data were coded and verified prior to computerized data entry. Descriptive

statistics were calculated (e.g., frequency, percentage, mean and standard deviation). A significant P-value (probability of rejecting a correct null hypothesis) was considered if less than or – 0.05.

3. Results

Table (1) shows the comparison between the cases and the control groups regarding to identification data of their mothers. Statistically significant differences between the two groups were found regarding educational level, number of children in family and family size with higher prevalence of illiteracy among mothers of the cases than those of the control groups (68.7% and 44%, respectively), while university education constituted among 4% and 5.3% of mothers in the two groups respectively. (40.7% and 54.7%) of the families had 1-2 children respectively, also 24.6% of families in the cases group compared with 16% of those in the control group had 5 children and more. 66.7% and 47.3) of families in the two groups respectively had more than 7 persons.

No statistically significant differences between the cases and control groups were found regarding age of the mother, working condition, residence, marital status, presents of diseases and time between the current child and the next pregnancy.

Table (2) shows the comparison between the cases and the control groups of children according to their identification data. Statistically significant differences between children in the cases and the control groups were found regarding their age and history of malnutrition in other siblings. Regarding the age of children, the study revealed that more than half of children in the cases and the control groups (52% and 60.7%, respectively) were their age ranged from 2 months < 1 year. While children aged 3-5years were 6% and 14% in the cases and in the control groups respectively P.value (0.002), higher prevalence of children in the cases group rather than those in the control group was found in history of malnutrition in other sibling (21.3% and 2.7%, respectively). No statistically significant differences between the cases and control groups regarding children sex, birth order and incomplete vaccination, 23.4% of children their birth order was the fifth or more in the case group compared to 14.7 of those in the control group. In addition the table shows that 92% of children in the cases group had Marasmus.

Table (3) shows the comparison between the cases and the control groups of children regarding to their feeding pattern. Statistically significant differences between children in the cases and control groups were found regarding types of feeding offered since birth, types of milk, causes of artificial feeding

and method of feeding, all children in the two groups were on breast feeding (100%) while artificial feeding was constituted in 52.7% and 22.7% of children in the cases and the control groups respectively. Powder milk was prevalent in children in the two groups than other types 43% and 55.8% of them in the cases and the control group respectively. Regarding causes of artificial feeding responded by mothers of children in the cases and the control groups respectively were little amount of milk (63.3% and 26.8%) breast problem (13.9% and 20.6%) and working of the mother (7.6% and 26.8%) P.Value 0.001. The table also shows that using of bottle was more prevalent among the two groups, 59.4% and 79.4% for children in the cases and the control groups, respectively.

Table (4) shows comparison between the cases and the control groups of children regarding their mothers' practices related to artificial feeding. Statistically significant differences were found between the two groups regarding items of boiling bottle for 10 minutes (34.2% and 82.4%), boiling nipple for 3 minutes (26.6% and 79.4%), boiling water (58.2% and 88.2%), determine the correct amount of water and powder (49.4% and 82.4%), put the child in correct position (68.4% and 91.2%), eructation of the child (46.8% and 82.4%) and skip the remaining part (68.4% and 100%) for the cases and the control groups, respectively

Table (5) shows the comparison between the cases and the control groups of children regarding their mother's practices related to additional food (weaning) and adult food. Statistically significant differences were found between the two groups related items of time of starting the additional food and item of elements of food, more than half of mothers in the two groups responded that they start additional food before 6 months (54.1% and 52.6%), while 31.8% of mothers in the cases group and 43.2 % of them in the control group responded that they start additional food from 6 < 8 months (P-value 0.049). All elements of food were provided more prevalent among mothers in the control group than those in the cases group (p.value 0.0001) as for offering protein to the child meals, it responded by 72.9% of mothers in the cases group and 87.3% of them in the control group, carbohydrate responded by 78.8% and 95.8%, and balanced diet responded by 5.9% and 36.8% of mothers in the cases and the control groups respectively. No statistically significant differences between the two groups were found related items of number of meals per day, regulation of feeding, manner of feeding and keeping of food.

Table (6) shows the relationship between mothers' educational level and level of their practices

regarding breast-feeding in both groups. No statistically significant difference was found between mothers educational level and levels of their practices regarding breast feeding either in the cases or in the control groups.71.1% of mothers with unsatisfactory level of practices regarding breast feeding in the cases group compared with 52.8% of those in the control group were illiterate, while 11.7% of mothers with satisfactory level regarding practices of breast feeding in the cases group compared with 42.3% of those in the control group had secondary level of education.

Statistically significant difference was found between mothers in the cases and the control groups and levels of their practices regarding breast feeding with higher satisfactory level observed among illiterate mothers in the cases group than those in the control group 65% and 39.2%, respectively (P. 0.025). While lower satisfactory level of breast feeding practices was observed among mother secondary level of education in the cases group than those in the control group (11.7 % and 42.3% respectively. P. value 0.000).

Table (7) shows the relationship between mothers' educational level and levels of their practices regarding artificial feeding in the both groups. No statistically significant difference between level of education and practices of artificial feeding among mothers in the cases or in the control groups.26.1% of mothers with satisfactory level of artificial feeding practices in the cases compared with 54.8% of those in the control groups were had secondary education while (81.8%) of mothers with unsatisfactory level in their practices of artificial feeding in the cases group compared with 100% of them in the control group were illiterate.

Statistically significant differences was found between illiterate mothers in the cases and those in control groups and levels of their practices regarding artificial feeding with higher prevalence of satisfactory level of practices observed among mothers in the cases than those in the control groups 60.9 % and 35.5% respectively. (P value 0.000)

Table (8) shows the relationship between mothers' educational level and levels of their practices regarding additional and adult food in both groups. No statistical significant difference was found between mothers educational level and levels of their practices regarding additional and adult in the cases and the control groups, 14.9% and 45.9% of mothers with satisfactory level of in the cases and the control groups, respectively, had secondary level of education, while 61.1% and 38.1% of those with unsatisfactory level in their practices regarding additional and adult food in the cases and the control groups, respectively, were illiterate.

Table (9) shows the relationship between socioeconomic status of mothers and levels of their practices regarding artificial feeding in the both groups. No statistically significant difference was found between socioeconomic status of the mothers and levels of their practices regarding artificial feeding in the cases and the control group, unsatisfactory level of practices was more prevalent among mothers in the middle socioeconomic status in the both groups, 87.9% and 66.7% of mothers in the cases and the control groups, respectively.

Statistically significant difference was found between mothers with middle socioeconomic status in the cases and those in the control groups and levels of their practices regarding artificial feeding with higher prevalence of satisfactory level of practices observed among mothers in the cases than those of control groups (65.2 % and 61.3 % P. value 0.000).

Table (10) shows the relationship between socioeconomic status and mother practice regarding to breast-feeding in both groups. Statistically significant difference was found between socioeconomic status and mothers' practices regarding to breast-feeding in the control group (P-value 0.003), 73.3 % and 55.7% of mothers in the cases and the control groups respectively with satisfactory level in their practices of breast feeding were in the middle socioeconomic status. The table also shows statistically significant differences were found between mothers with middle and low socioeconomic status in the cases and the control groups and levels of their practices regarding breast feeding with higher satisfactory levels of practices among mother with middle socioeconomic status in the cases than those in the control groups (73.3% and 55.7 %, respectively, P 0.025) as well as lower satisfactory levels of practices among mothers with lower socioeconomic status in the cases than those in the control groups (11.7% and 37.1% , respectively, p. value 0.010).

Figure (1) shows comparison between socioeconomic class among parents in the cases and the control groups, statistically significant difference between the cases and the control groups was found regarding socioeconomic class among parents with high prevalence of the middle socioeconomic class in the both groups (74.7% and 64%, respectively). Also the high socioeconomic class was constituted in 9.3% of parents in the cases and 28% of those in the control groups.

Fig(2) shows the relationship between socioeconomic status and mothers' practices regarding additional and adult food in the both groups. No statistically significant difference was found between socioeconomic status the mothers practices regarding additional and adult food either in

the cases or in the control groups, satisfactory level of practices regarding additional and adult food was more prevalent among mothers in the cases group than those in the control group were constituted in the high and the middle socioeconomic status. 19.4% and 5.4% of mothers in the cases and the control groups, respectively, for the high socioeconomic status, 73.1% and 59.5 % of mothers in the cases and the control groups respectively for the middle socioeconomic status.

No statistically significant differences were found between socioeconomic status of mothers in the cases and the control groups and levels of their practices regarding additional and adult food.

Figure (1): Comparison between the socioeconomic class among parents of children in the cases and control group
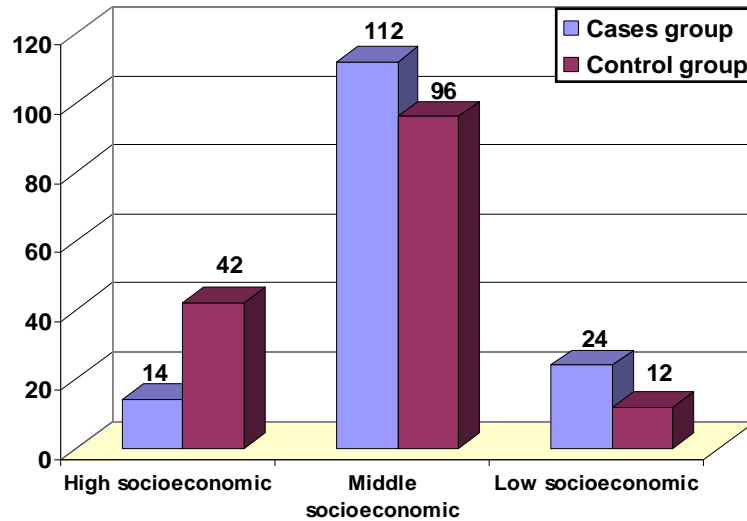

Fig 2: The relationship between socioeconomic status and mothers' practices regarding additional and adult food in the both groups
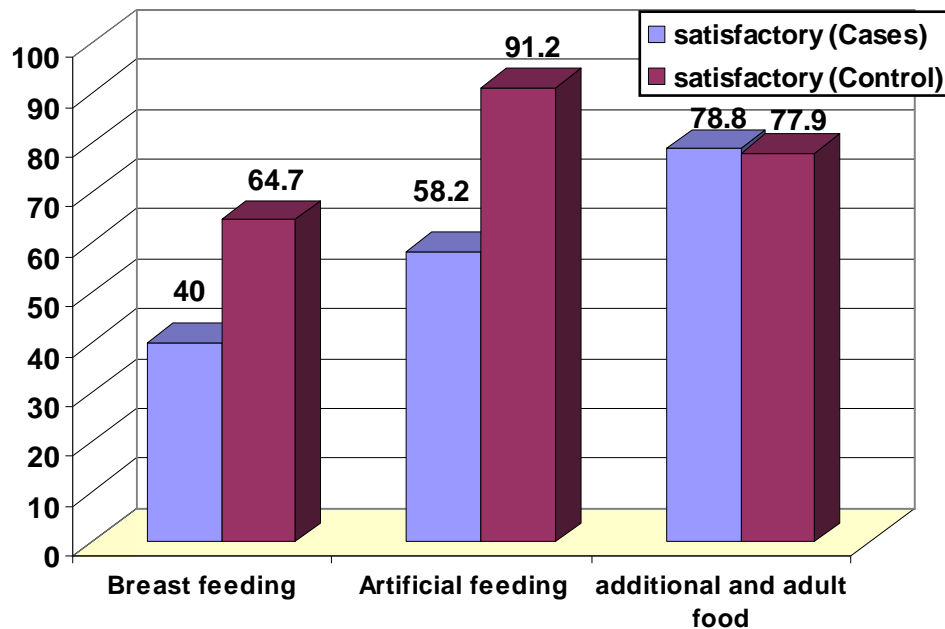
Table (1): Comparison between cases and the control groups regarding identification data of their mothers:

Item	Cases group (n = 150)		Control group (n = 150)		Chi-square	P-value
	No	%	No	%		
Age of the mother					3.290	0.349
20 years <	102	68.0	115	76.7		
30 years <	44	29.3	35	23.3		
40 years and more	4	2.7	0	0		
Educational level					28.259	0.000*
Illiterate	103	68.7	66	44.0		
Basic education	21	14	21	14		
Secondary	20	13.3	55	36.7		
University	6	4.0	8	5.3		
Working condition					0.561	0.454
Working	7	4.7	10	6.7		
House wives	143	95.3	140	93.3		
Residence					0.000	1.000
Urban	11	7.3	11	7.3		
Rural	139	92.7	139	92.7		
Number of children in family					6.521	0.038*
1 – 2	61	40.7	82	54.7		
3 – 4	52	34.7	44	29.3		
5 and more	37	24.6	24	16		
Family size					15.956	0.000*
< 4 persons	18	12.0	44	29.3		
5 – 6 persons	32	21.3	35	23.3		
7 and more	100	66.7	71	47.3		
Marital status					2.014	0.365
Divorced and widow	1	1.7	3	2		
Married	149	99.3	147	98		
Mother have diseases	17	11.3	14	9.3	324	0.569
Time between the current child and the next pregnancy					6.894	0.075
< 4 months	6	4	-	-		
More than 4 months	14	9.3	15	10.0		

* Statistically significant at p < 0.05

Table (2) : Comparison between cases and control groups of children regarding to their identification data:

Item	Cases group (n = 150)		Control group (n = 150)		Chi-square	P-value
	No	%	No	%		
Age of the child					11.988	0.002*
2m < 1 years	78	52.0	91	60.7		
1 < 3 years	63	42.0	38	25.3		
3 – 5 years	9	6.0	21	14.0		
Sex					2.000	0.157
Male	84	56.0	96	64.0		
Female	66	44.0	54	36.0		
Birth order					9.973	0.076
First	29	19.3	48	32.0		
Second	33	22.0	38	25.3		
Third	3	22.0	29	19.3		
Fourth	20	13.3	13	8.7		
Fifth and more	35	23.4	22	14.7		
Diagnosis						
Marasmus	138	92.0	-	-		
Kwashiorkor	8	5.3	-	-		
Marasmic Kwashiorkor	4	2.7	-	-		
Incomplete Vaccination	14	9.3	23	15.3	2.497	0.114
History of malnutrition in other siblings	32	21.3	4	2.7	24.747	0.000*

- Statistically significant at p < 0.05

Table (3) : Comparison between the cases and the control groups of children regarding their feeding pattern

Item	Cases group (n = 150)		Control group (n = 150)		Chi-square	P-value
Type of feeding offering since birth						
Breast feeding	150	100	150	100	16.47	0.0002*
Artificial feeding	79	52.7	34	22.7		
Additional and adult food	85	56.7	95	63.3		
Type of milk	**(n=79)**		**(n=34)**			
Cow	24	30.4	9	26.4	7.64	0.050*
Buffalo	8	10.1	6	17.7		
Powder	34	43.0	19	55.8		
Mixed	13	16.5	0	0		
Causes of artificial feeding						
Breast problem	11	13.9	7	20.6	16.01	0.0011*
Little amount of milk	50	63.3	20	26.8		
Working of the mother	6	7.6	10	29.4		
Multiple cases	38	48.1	5	14.7		
Method of feeding						
By bottle	47	59.4	27	79.4	7.28	0.0262*
By cup	26	32.9	3	8.8		
By spoon	6	10.7	4	11.8		

* Statistically significant at p < 0.05

 # More than one type of feeding responded by the mother and more than one cause of artificial feeding responded by a mother.

Table (4): Comparison between the cases and the control groups of children regarding their mothers' practices related to artificial feeding:

Item	Cases group (n = 79)		Control group (n = 34)		Chi-square	P-value
	No	**%**	**No**	**%**		
Preparation of artificial feeding						
Hand washing	71	89.9	34	100	3.705	0.100
Wash equipment	75	94.9	34	100	1.785	0.100
Boiling bottle for 10 minutes	27	34.2	28	82.4	23.328	0.000*
Boiling nipple and cover for 3 minutes	21	26.6	27	79.4	27.131	0.000*
Boiling water for 5 minutes	46	58.2	30	88.2	9.719	0.000*
Determine the correct amount of water and powder	39	49.4	28	82.4	5.803	0.025*
Shake the bottle well	52	65.8	26	76.5	1.260	0.100
Check temperature	61	77.2	31	91.2	2.923	0.100
Put the child in correct position	54	68.4	31	91.2	6.642	0.001*
Eructation of the child after feeding	37	46.8	28	82.4	12.311	0.000*
Skip the remaining part of feeding	54	68.4	34	100	13.816	0.000*

* Statistically significant at p < 0.05

Table (5) : Comparison between the cases and the control groups of children regarding their mothers' practices related to additional and weaning food:

Item	Cases group		Control group		Chi-square	P-value
	No =85	%	No =95	%		
Time of starting additional food:					7.85	0.049*
Before 6 months	46	54.1	50	52.6		
6 < 8 months	27	31.8	41	43.2		
8 < 12 months	8	9.4	4	4.2		
12 months and more	4	4.7	0	0		
Element of food					25.09	0.0001*
Protein	62	72.9	83	87.3		
Carbohydrate	76	78.8	91	95.8		
Vitamins	42	49.4	81	85.3		
Butter, oil	14	16.5	52	54.7		
Balanced diet	5	5.9	35	36.8		
Number of meals / day					3.67	0.299
1	3	3.5	0	0		
2	11	12.9	13	13.7		
3	23	27.0	21	22.1		
4 or more	48	56.5	61	64.2		
Regulation of feeding					0.73	0.391
On demand	82	96.5	89	93.7		
Schedule	3	3.5	6	6.3		
Manner of feeding					0.03	0.8705
By self	26	30.6	28	29.5		
By mother	59	69.4	67	70.5		
Keeping of food					1.84	0.179
In the refrigerator	65	76.7	72	75.8		
Out of the refrigerator	20	23.3	13	24.2		

| **Statistically significant at p < 0.05**

|

Table (6): The relationship between mothers' educational level and levels of their practices regarding breast feeding in the both groups:

Item	Cases group				Control group				X^2	P.value
	Satisfactory N= 60		Unsatisfactory N=90		Satisfactory N=97		Unsatisfactory N=53			
	No	%	No	%			No	%		
Educational level										
Illiterate	39	65	64	71.1	38	39.2	28	52.8	6.301*	*0.025
Read and write	2	3.3	5	5.6	1	1.0	1	1.9	0.643	<0.100
Primary	3	5.0	2	2.2	2	2.1	5	9.4	1.185	<0.100
Preparatory	4	6.7	5	5.6	7	7.2	5	9.4	0.398*	<0.100
Secondary	7	11.7	13	14.4	41	42.3	14	26.4	9.995	*0.000
University	5	8.3	1	1.1	8	8.2	-	-	1.436	<0.100
Chi-square	6.387				6.387					
P-value	0.270				0.270					

* Statistically significant at p < 0.05

Table (7): The relationship between mothers' educational level and their practices regarding artificial feeding in the both groups:

Item	Cases group				Control group				X^2	P.value
	Satisfactory N= 46		Unsatisfactory N=33		Satisfactory N=31		Unsatisfactory N=3			
	No	%	No	%			No	%		
Educational level										
Illiterate	28	60.9	27	81.8	11	35.5	3	100	8.672	*0.000
Read and write	1	2.2	1	3.0	1	3.2	-	-	0.750	<0.100
Primary	1	2.2	1	3.0	-	-	-	-	Not valid	-
Preparatory	2	4.3	2	6.1	-	-	-	-	Not valid	-
Secondary	12	26.1	1	3.0	17	54.8	-	-	1.353	<0.100
University	2	4.3	1	3.0	2	6.5	-	-	0.833	<0.100
Chi-square	7.729				4.700					
P-value	0.172				0.195					

* Statistically significant at p < 0.05

Table (8): The relationship between mothers' educational level and levels of their practices regarding additional and adult food in the both groups:

Item	Cases group				Control group				X^2	P.value
	Satisfactory N= 67		Unsatisfactory N=18		Satisfactory N=74		Unsatisfactory N=21			
	No	%	No	%			No	%		
Educational level										
Illiterate	43	64.2	11	61.1	25	33.8	8	38.1	0.180	<0.100
Read and write	4	6.0	-	-	1	1.4	-	-	Not valid	---
Primary	2	3.0	2	11.1	3	4.1	1	4.8	0.800	<0.100
Preparatory	6	9.0	-	-	6	8.1	3	14.3	2.500	<0.100
Secondary	10	14.9	4	22.2	34	45.9	8	38.1	0.566	<0.100
University	2	3.0	1	5.6	5	6.8	1	4.8	0.321	<0.100
Chi-square	**5.423**				**1.381**					
P-value	**0.366**				**0.926**					

* Statistically significant at p < 0.05

Table (9): The relationship between socioeconomic status of the mothers and level of their practice regarding to artificial feeding in the both groups:

Item	Cases group				Control group				X^2	P.value
	Satisfactory N = 46		Unsatisfactory N = 33		Satisfactory N = 31		Unsatisfactory N = 3			
	No	%	No	%	No	%	No	%		
High	8	17.4	3	9.1	1	3.2	1	33.3	0.410	<0.100
Middle	30	65.2	29	87.9	19	61.3	2	66.7	10.248	*0.000
Low	8	17.4	1	3	11	35.5	-	-	1.287	<0.100
Chi-square	5.751				5.292					
P-value	0.056				0.071					

* Statistically significant at p < 0.05

Table (10): The relationship between socioeconomic status and mothers practice regarding to breast feeding in the both groups:

Item	Cases group				Control group				X²	P.value
	Satisfactory N=60		Unsatisfactory N=90		Satisfactory N=97		Unsatisfactory N=53			
	No	%	No	%	No	%	No	%		
High	9	15	15	16.7	7	7.2	5	9.4	1.406	<0.100
Middle	44	73.3	68	75.6	54	55.7	42	79.2	5.970	*0.025
Low	7	11.7	7	7.8	36	37.1	6	11.3	7.513	*0.010
Chi-square	0.670				11.330					
P-value	0.715				0.003*					

* Statistically significant at p < 0.05

4. Discussion

Malnutrition is common and is responsible directly or indirectly for about half of all deaths of children under five years of age. (Baqui and Ahmed, 2006). This study was designed to identify the possible risk factor of protein energy malnutrition in children less than five years of age.

Results of the present study indicated that statistically significant differences were found between mothers in the cases and control groups regarding their educational level, as shown in table (1). As well as this study revealed that 71.1% and 52.8% of mothers with unsatisfactory level of their practices regarding breast feeding in the cases and the control groups respectively were illiterate. The majority of mothers (81.8% and 100%), with unsatisfactory level of their practices regarding artificial feeding in the cases and the control groups, respectively, were illiterate In addition 61.1% and 38.1% of mothers with unsatisfactory level of their practices regarding additional and adult food in the cases and the control groups, respectively, were illiterate.

The lower educational level of the mothers was considered a risk factor for malnutrition in the present study. Findings of this study are in agreement with many authors as Youssef et al. (2000) who found that, the higher education level of the mothers, the better perception and estimation of malnutrition in their children, also Khin-Maung et al., (1994) found that, low level of mothers education was associated with high relative risk and high etiologic for malnutrition. They suggested that improving the educational level of mothers would be of public health importance. This also are in agreements with Thabet (2002) who examined maternal beliefs and practices in feeding young children during diarrhea and found that lower educational level of the mother consider a risk factor for malnutrition.

Results of the present study revealed that statistically significant difference was found between mothers in the cases and control groups regarding their family size, very large family size was significantly higher among the cases group in comparison to the control group. This is not unexpected as the higher the family size the lower care given to the children and the hence diarrhea transmission of infection and malnutrition. These results not agree with Thabet (2002) who found that the smaller the family size the greater the frequency of diarrhea infection. The present study also revealed that families in the cases with one or two children had higher prevalence of malnutrition among their children than those with 5 and more children; this can be explained by the lower experience of the mother with one child about mode of transmission of infection, and improper handling of feeding and weaning practices as well as other risk factors for malnutrition. This result disagree with Pelto (1991) and Khin-Maung et al., (1994) who described that, mothers with more than three children is among risk factors for diarrhea and malnutrition

statistically significant difference was found between parents in the cases and those in the control groups regarding their socio economic status with higher percentages of middle and low socio economic status among parents in the cases than those in the control groups as shown in figure (1) as well as more than three quarters of mothers in cases group with unsatisfactory level in their practices related to breast feeding, artificial feedings and additional and adult food were constituted in the middle socioeconomic class. These findings are supported by many authors as Wong et al. (2007) who show malnutrition more common in among children with low socio economic level, also Debra et al. (2008) stated that poor economical status and social structure are the important factor for the development of malnutrition and added that nutritional deficiency condition are

by-product of bad economy, insufficient education, ignorance, lack of knowledge regarding food values, inadequate sanitary environmental, large family size, disturbed family, (broken family) closely spaced families with repeated pregnancies, working mothers, infant with low birth weight and premature.

Result of the present study indicated that statistically significant differences were found between children in the cases and the control groups related to their age with high percentages of children in the cases group in the age ranged from 1 to less than 3 years, and history of malnutrition in other sibling. This could be attributed to inadequate intake of food because mothers' ignorance regarding food values and unsatisfactory levels which obtained in their practices related to feeding of children (breast feeding, artificial feeding and additional and adult food)

The present study revealed that more than half of children in the cases group (52%) who had malnutrition their ages were less than one year, this can be explained that food supply did not meet rapid rate of growth in the first years; besides the effect of malnutrition may not be in fact apparent until approximately 4 months after it has an effects on weight velocity. Finding of the present study is in the line with those obtained by Seward et al 1994 who showed that malnutrition is more prevalent among children aged from 2 months to less 1 years related to rapid growth in infancy and improper handling of weaning practices also finding of the present study agree with Sabry (2004) who found that the majority of children with malnutrition (94%) their age ranged from 6 to less than 15 months and illustrated that 33.3% of children in the age group ranged from 6 to 24 months exposed to under nutrition. Penny (2003) reported that the high incidences of marasmus were found to be more common among children aged between 6 to 12 months.

Results of the present study noted that fourth, fifth and more birth order constituted in 36.7% of children in the cases group compared with 23.4% of those in the control group while the first birth order was constituted in 19.3% and 32% of children in the cases and the control group respectively with no statistically significant difference as shown in table 2. This could be attributed to overcrowding, poor health of the mother from recurrent pregnancy and labor and inability to provide good rearing for the child. Finding of the present study is supported by those of Thabet (2002) and Sandy et al., (2004) who reported that children who were of the fifth or higher birth order had significantly higher risk for malnutrition when compared with those who were of the first or second birth order.

Healthy growth is achieved through correct diet, during the initial stage of life, human milk, undoubtedly, the food that most unites the ideal nutritional characteristics, with the correct balance of nutrients. Furthermore, it aids in the development of innumerable immunological and psychological advantages which are important to the reduction of infant morbidity and mortality. Breast milk is important to the child, the mother, thier family and society in general (Mishref, 2007).

As regarding type of feeding, the present study revealed that breast milk was offered to all children (100%) either in the cases or in the control groups while artificial feeding was more prevalent among children in the cases than those in the control groups (52.7 % and 22.7%, respectively) with statistically significant difference. In addition the present study indicated that using of powder milk and bottle was most popular among children in the cases and those in the control groups with statistically significant differences. So exposure of children to artificial feeding, using powder milk and bottles are considered risk factors of malnutrition among children because the powder milk is expensive, the mother at that time dilute the formula which affect the constitution of milk and lead to inadequate intake of suitable food elements as well as improper preparation of artificial feeding which was observed in the present study among mothers in the cases group compared with those in the control group with statistically significant differences related items of boiling bottle for 10 minutes, boiling nipple and cover for 3 minutes, boiling water for 5 minutes, determine the correct amount of water and powder, shake the bottle we, check temperature and skip the remaining part of feeding.

Breast feeding influences hormones such as ghrelin, leptin and IGF in infancy, mainly during the first 4 months of life. Further evidence by Pelletier et al. (2001) reported that breast feeding have higher serum leptin. The presence of leptin in breast milk might have a significant role in growth, appetite and regulation of nutrition in infancy, especially the early lactation period.

Ziegler et al., 2003 stated that some time before the infant is born is whether the infant will be breastfed or formula-fed. In the control group the most common feeding is the breast feeding (54%) it is agree with Food and Agriculture Organization (2000) which considered breast milk the natural food for full-term infant during the first months of life, it is always available the proper temperature and requires no preparation time. Breast milk alone provides adequate nutrition through the first 6 months of life and breast milk has many advantages than formula milk it contains many substances which help in

maintaining growth of infant and protection of them from any diseases.

In addition improper handling of artificial feeding among mothers in the cases group may be considered the cause of higher exposure of their children to infections than children in the control group.

The present study revealed that there was statistically significant difference found between children in the cases and the control groups reacted to number of previous hospitalization with high percentages of hospitalization 3,4 So, recurrent hospitalization is considered risk factor to PEM in children less than 5 years. This result supported by Hendricks et al. (1995) who stated that hospitalized children are also at risk for PEM when they experience complex conditions, such as oncology disease, genetic disease, or neurological disease, requiring prolonged and complicated hospital care. In these conditions, the challenging nutritional management is often overlooked and insufficient.

As regards of children in the cases group results of the present study indicated that (56%) of them were males and (44%) of them were females. this finding was supported by Bisharat, (1998) who found that child care practices during diseases vary according to the sex of the child. Male children were also brought to the diarrhea treatment center at the nearest major hospital more often than females children and female children were significantly more ill when they were brought for treatment. this might be related to cultural factors that mothers are more anxious about their male children than females. While Kleigman, et al. (2006) stated that no sexual predilection exists and Sabry 2004 showed that malnutrition is common in females than male this may be attributed to the presence of discrimination in feeding and rearing patterns of boys compared of girls especially in rural areas

Result of the present study indicated that statistically significant differences were found between children the cases and the control groups regarding their mothers' practices related to time of starting additional food and elements of food about half of mothers delayed starting additional food to their children after 6 months in the both groups but 14.1% of children in the cases compared with 4.2% of them in the control group exposed to additional food from 8 and more months as well as food elements as protein, carbohydrates, vitamins, butter, oil were offered in less frequently for children in the cases group than those in the control group as shown in table (5). These results are congruent with those obtained by Fernando 1991, Youssef (2000).

The report of WHO (1996) emphasized that, because of a great importance of early weaning and the characteristic of weaning food it is essential to start weaning foods at 6 months of age in addition to being high quality food. Also it recommended exclusive breast feeding for 6 months and weaning starts at 6 months.

The order of food introduction, as well as specific amount to be given, are based on tradition rather than on scientific studies (Behrman et al. 2006).

5. Conclusion

From this study it can be concluded that several risk factors were found to be associated with PEM including: Lower education level of the mother; number of children in the family as the number of children in the family decreased , the prevalence of PEM increased; low and middle family socioeconomic status; age of the child, children with the younger age are more vulnerable to have PEM than those of older age and mothers' practices regarding feeding of their children (breast feeding, artificial feeding as well as additional and adult food) unsatisfactory practices of mothers regarding feeding of their children increase the prevalence of PEM among their children.

Recommendations
The study recommends that:

1- Supporting and promotion of breast feeding.

2- Avoid using of artificial feeding and bottles.

3- Health education to the mothers about proper feeding practices, breast feeding, artificial feeding and additional and adult food to prevent PEM.

4- Increasing mother's awareness related to risk factors of PEM and how to manage the different infections among their children.

5- Encourage vaccination at the appropriate time.

6- Improving the educational level of mothers would be a public health importance.

7- The importance of continued breast feeding of the unweaned child and early feeding of the weaning one.

8- Increase mother's awareness related Family planning.

9- Health education to the mother about importance of growth monitoring to the infant or child.

Corresponding author
Asmaa A. Hussein
Departments of Pediatric Nursing, Faculty of Nursing

Assiut University, Egypt

6. References:

Abd El Tawb (1998): Socio economic scale, Faculty of Education, Assiut University.

Baqui AH, Ahmed T (2006): Diarrhoea and malnutrition in children. BMJ: 332: 378.

Behrman, RE, Kliegmon RM & Arivin M (2006): Nelson text book of pediatric, W.B. Saunders Company, Philadelphia, London, p.p. 105 – 108, 143 – 146.

Bisharat L (1998): Diarrhea and Urban poor, regional adviser, urban development, UNICEF, Middle East and North Africa.

Debra, L. Price, MSN, RN, CPNP, CNE and Julie F, Gwin, MN, (2008): Pediatric Nursing, An introductory text, China, 10th ed. 169 – 170.

Fernando EV (1991): PEM. In eds. Decker BC. Pediatric castrointes disease volume two, Part 3, p. 1596-1611.

Food and Agriculture Organization (2000): The state of food insecurity in the world: 2000, Food and Agriculture Organization of the United Nations, Rome Italy.

Grigsby Donna G., MD, (2005): www.eMedicine, Malnutrition.

Hendricks K M, Duggan, Callagher (1995): Malnutrition in hospitalized pediatric patients, current prevalence. Arch pediatric Adolesc Med;149.

Khin-Maung U, Myo_Khin, Nyi-Win, Hman, Nyunt-Nyunt-Wei, Thein, Thein_Myint & Buffer TC (1994): Risk factor for persistent diarrhea malnutrition in Burmese children. J. Trop. Pediatry, 40: 41 – 8.

Kliegman, R. M., Jenson, H.B., Marcdante, K.J., and Behrman, R.E. (2006): Nelson essential of pediatrics (5th, ed.): Philadelphia, Saunders.

Kumar S, Olson DL and Schwenk WF (2002): Malnutrition in the pediatric population, Disease a Month, 48, 703 – 712.

Mishref (2007): Nutritional requirements in paediatric diseases, Unpublished master thesis, Faculty of Medicine, Assiut University Unpublished thesis, p.1.

Parul Dalta (2007): Pediatric Nursing, First edition, Sanat printers, Kundli, 199 – 205.

Pelletier DL, Olson CM, Frongillo EA Jr (2001): Food insecurity, hunger, and undernutrition. In Bowman Ba, Russel RM (editors): Present knowledge in nutrition, 8th ed., Washington, DC, ILSI Press, pp. 701 – 713.

Pelto GH (1991): The role of behavioral research in the prevention and management of invasive diarrhea, Rev Infect Dis., 13 Supple 4 (5): 255 – 8.

Penny, ME (2003): Protein-energy malnutrition: Pathophysiology, Clinical consequences, and treatment, In Walker WA, Watkins JB, Duggan C, editors: Nutrition in pediatrics, ed3, Hamilton, Ontario, BC Decker.

Sabry N (2004): Effect of feeding on marsmic children, Alexandria University, Unpublished doctorate, Faculty of Nursing.

Sandiy, H., Ndekha MJ, Briend A, Ashown P and Manary MJ (2004): Home-based treatment of malnourished Malawian children with locally produced or imported ready – to – use food, J Pediatr Coastro enterol Nutr. 39,. 141 – 146.

Thabet, N (2002): Maternal beliefs and practice in feeding infants and young children during diarrhea in Assiut University hospital, Unpublished Master Thesis in Pediatric Nursing, Assiut Univ.

WHO (1996): Control of diarrheal diseases, NCDDP, Ministry of Health, WHO, UNICEF, Cairo, September, PP. 5 – 35.

Wong DL, Hockenberry, M. Winkelstein, ML, Wilson D, Ahmann E & Divito-Thomas PA (2007): Whaley and Wong's Mosby Company. Philadelphia, London, 865-68.

Youssef, Y (2000): Risk factor of persistent diarrhea and malnutrition under five years of age in Assiut University Hospital. Unpublished Master, Faculty of Nursing

Ziegler, TR, Evans ME and Fernande Z, Estivaris C, (2003): Trophic and cytoprotective nutrition for intestinal adaptation, Mucosal repair, and barrier function, Annu Rev. Nutr., 23: 229 – 261.

3/6/3011