

Feeding Practices Influencing Protein Energy Malnutrition in Children under Five Years Old at Kenyatta National Hospital, Kenya

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Abstract

Protein energy malnutrition (PEM) results from deficiency of proteins and energy. Children less than five years old are the most affected because of their immature immunity. Social, demographic, economic, environmental, political and medical factors had been found to interrelate and cause PEM. The study sought to determine the influence of feeding practices on PEM in children under five years old at KNH. One hundred and eighteen (118) children under five years old and their biological mothers participated in this cross-sectional quantitative study. Questionnaires were administered to the biological mothers of the children and anthropometric measurements were taken from the children. Multi-stage sampling was used to select eligible children plus their biological mothers. Analysis of data was done using SPSS and Chi-square was used to test the significance of the relationship between independent and dependent variables that were categorical in nature. Logistic regression was used to predict relationship between variables. The study found moderately high prevalence of underweight (59.3%) and stunting (53.3%) and low prevalence of wasting (33.9%) among children aged 0 to 59 months in KNH. The odds of a stunted child being fed on complementary feeds was approximately a third (OR=0.28 [95% CI 0.12-0.65; $P=0.003$]) that of a non-stunted child. The odds of a wasted child feeding less than normal during illness was approximately a third (OR=0.31 [95% CI 0.13-0.75; $P=0.009$]) that of a non-wasted child. There was high level in initiation of breastfeeding. Complementary feeding was commenced too early with children receiving complementary feeds as early as in the first day of life and an average of 4.3 months. The frequency of feeding children during illness was low.

Keywords: Protein Energy Malnutrition, Stunting, Wasting, Underweight,
Children **Introduction**

Protein energy malnutrition (PEM) is the most common form of malnutrition resulting from impairment of health from deficiency of proteins and energy. The clinical conditions that occur are children being underweight, Marasmus, Kwashiorkor and Marasmic-Kwashiorkor. Growth failure (or failure to thrive) is a further result of PEM that cannot be easily placed under any of these four conditions, but it is always its earliest sign. Both underweight and Kwashiorkor cases weigh 60 to 80% of the normal weight and marasmus and marasmic-kwashiorkor cases weighed below 60% of normal weight. There was presence of Oedema in both Kwashiorkor and Marasmic-Kwashiorkor cases (Stanfield, Balldin & Versluys, 2001). More recent nutrition surveys use 'wasting' and 'stunting' in defining PEM. Wasting is a feature of acute PEM, whereas stunting is a result of long-standing under nutrition. In any underweight child one or another of these may be noticeable.

The percentage of stunted, wasted and underweight children did not change substantially in Kenya between 1993 and 2003 (Kenya Demographic and Health Survey, 2003). The percentage of children below 5 years of age who were wasted was 7.8% in 1993, 6.1% in 1998, and 4.8% in 2003. The percentage of those who were stunted was 33.6%, 33% and 30.6% in 1993, 1998, and 2003 respectively (United Nation Children Fund, 2006). The prevalence of PEM in the developing countries was 40% while in the developed countries it ranged from 2 to 10%. In many parts of Africa, the prevalence of PEM in children under five years old was on average 40% estimated on the percentage of stunted children in any community (Stanfield *et al.*, 2001).

Problem Statement

Malnutrition, especially protein energy malnutrition, is a worldwide problem; however, developing countries are worse affected. In the developing world as a whole, over a quarter of children less than five years old were severely stunted. In Africa, the figure was over a third. In East Africa the level of stunting was over 44 % (Stanfield *et al.*, 2001). Nearly half of the children in Kenya less than five years are unable to grow to their full physical and mental potential owing to protein energy malnutrition. This is as a result of child feeding practices that affect their nutritional status (Kenya Demographic and Health Survey, 2003).

A study of children admitted at the KNH, the largest public hospital in Kenya, found prevalence of PEM among children less than 5 years to be 75% at admission. During hospital stay, 58% of them had

further deterioration in nutrition status when assessed using Nutritional Risk Index (NRI), and 34% had deteriorated when percentage weight loss was used to assess the nutritional status (Nyandiko, 2000).

In Kenyatta National Hospital, especially in paediatrics medical wards, bed capacities increased to the extent that other patients with acute and chronic illnesses lacked where to be admitted and most of them died at home due to lack of access to medical services (Nyandiko, 2000). Medical personnel's were overwhelmed with a lot of work of caring for the under five-years-old children with PEM and their quality of services reduced (Nyandiko, 2000).

The most serious problem is increased risk of death resulting from PEM in under five-years-old children. Approximately 50% of one thousand deaths that occur each year in children under five-years-old in Kenyatta Hospital were directly or indirectly attributed to PEM according to 2006 statistics.

PEM leads to poverty and marital conflicts (Benn, 2002) in families. It has devastating consequences on growth and development of children under five-years-old. It has been reported that children who survive after suffering from PEM have low academic achievement in school and during adulthood their work productivity is reduced and their absenteeism from work place increased due to inferiority complex and increased hospital admission, which reduce a person's life time earning potential and the ability to contribute to the national economy (Nyandiko, 2000).

Despite all these, no study had been done to detect how feeding practices influenced development of PEM in children under five years old in KNH.

The study aimed to determine how feeding practices influenced development of PEM in children under five years old at KNH.

Materials and Methods

Study Design, Setting and Population

The research was a cross-sectional quantitative study carried out in medical paediatric wards, maternal and child health clinic and paediatrics outpatient clinic of KNH, Kenya. KNH is the largest referral hospital in Kenya. The study population comprised of children aged below 60 months in the above departments in KNH plus their biological mothers.

Sample Selection and Sample Size

Multi-stage sampling was used in selection of eligible children and their biological mothers. A total number of 118 children under five years old plus their biological mothers formed the sample size which was obtained using the Fisher's formula. Only the under-five years old children who fulfilled the following inclusion criteria were recruited in the study:

1. Children aged below 60 months.
2. Children who were admitted in medical paediatric ward, attending maternal and child health clinic or paediatric outpatient clinic of KNH.
3. Children whose mothers gave consent.
4. Children without chronic diseases, malignancies, or any physical or mental conditions.

Data Collection

Data was collected using questionnaire and anthropometric assessment devices (portable hanging scales were used to weigh and wooden length/height boards were used to take length/height of the children). Data collection was carried out from May to July 2009.

Pre-test of Study Tools

Prior to the study, a pilot study was conducted to discover any biased questions and amendment to ambiguous questions were done before starting actual data collection. Pilot study was conducted on a population with similar characteristics to the main study population using 10% of the total sample size. The respondents who participated in the pilot study were those admitted in medical paediatric ward at Mbagati District Hospital in Nairobi, Kenya.

Data Analysis and Presentation

Data was checked for completeness and consistency before entering into the computer. Data was analyzed using SPSS. The anthropometric statistical programme was employed to convert raw anthropometric measurements or data (weight, height or length of the children) into anthropometric indices and then these were compared with that of National centre Health statistics (NCHS) reference figures. Chi-square was used to test the significance of the relationship between independent and dependent variables that were categorical in nature. Logistic regression was used to predict relationship between variables. Presentation of the descriptive data was done in the form of descriptive statistics, frequency distributions, and graphic forms.

Ethical Consideration

Approval was sought from KNH ethical and research committee. Authority was sought from the Ministry of Health, Ministry of Higher Education, and KNH administrators. Consents were given by respondents (child's mother) to take data, measurements, and examine the child after explanation of the purpose, procedures to be taken, benefits and risks of the study. The respondents were also assured confidentiality of the data.

Results

Breastfeeding

Majority of the respondents were still breast feeding their children at the time of study, 66.1% (78); 79.5% (62) were breastfeeding their children on demand while 20.5% (16) had scheduled time for breastfeeding.

Among the 66.1% (78) of mothers interviewed who reported still breastfeeding their children, the number of times they breastfed their children in ascending pattern was: once, 6.5% (5); twice, 17.9% (14); thrice, 17.9% (14); four times, 39.8% (31), and greater or equal to five times 17.9% (14). The duration of breastfeeding was between the 1st day of birth and 36 months with mean of 17.1 months.

The prevalence of underweight and wasting were higher among children under five years old who were not breastfed at the time of the study. Despite the fact that there was no statistically significant difference between PEM and children who were either breastfed on demand or scheduled time, there was a higher prevalence in all the three nutritional indices of PEM in children breastfed on scheduled time than those on demand. Highest rates in all the three nutritional indicators were also found in children breastfed twice or less in a day and for duration of less or equal to 12 months (Table 1).

Table 1. Bi-variate analysis of breastfeeding pattern and PEM in under-five-years-old children

	Weight –for-age				Height for age				Weight-for-height			
	Normal n (%)	Under weight n (%)	Chi	P value	Normal n (%)	Stunte d n (%)	Chi	P valu e	Norm al n (%)	Wasted n (%)	Chi	P value
Breastfeeding			1.68	0.2			0.22	0.64			2.48	0.12
Yes	35(45)	43(55)			31(40)	46(60)			54(70)	23(30)		
No	13(33)	27(67)			14(45)	17(55)			21(55)	17(45)		
Demand	31(50)	31(50)	3.21	0.07	25(41)	36(59)	0.06	0.80	44(71)	18(29)	0.00	1.00
Scheduled	4(25)	12(75)			6(38)	10(62)			10(67)	5(33)		
Frequency			1.79	0.18			0.02	0.89			0.91	0.34
< or = to 2	6(32)	13(68)			7(39)	11(61)			11(61)	7(39)		
> than2 times	29(49)	30(51)			24(41)	35(59)			43(73)	16(27)		
Duration			2.06	0.15			3.46	0.06			0.82	0.36
< or = to 12	2(13)	13(87)			4(27)	11(73)			7(47)	8(53)		
> 12 months	9(41)	13(59)			8(62)	5(38)			13(62)	8(38)		

Complementary Feeding

By the time of the study, 83.1% (98) of the study children had been introduced to other foods or fluids other than breast milk. The age at which complementary feeding was introduced ranged between 1 day to 20 months while the mean age was 4.3 months sd (2.6). Twenty-nine point six per cent (29) of the mothers gave the reason for early introduction of complementary feeding as breast milk was not enough; 28.6% (28) children were old enough; 14.3% (14) children were crying a lot signifying they were not satisfied; 15.3% (15) were advised by a health worker; 2% (2) they were advised by other mothers and 10.2% (10) that the child had another twin brother or sister and therefore the breast-milk was not sufficient.

Among the 83.1% (98) of mothers interviewed who reported to have started weaning their children, the number of times they fed their children on other foods apart from breast milk daily in ascending manner were: twice 13.3% (13); thrice 28.6% (28); four times 27.5% (27) and greater or equal to five times 30.6% (30).

Most respondents, 79.6% (78), started with plain water, followed by tea, 13.3% (13), and lastly by cows' milk, 7.1% (7) as fluid. The sequence of semi-solid food which respondents started with in descending manner was: mashed fruits, 60.3% (59); plain *uji* (porridge), 35.7% (35), and enriched *uji* (enriched with, for example, milk products, groundnuts) and mashed food (for example, potatoes) each 2% (2). Of the respondents, 66.3% (65) reported using cup and spoon as method of feeding; 23.5% (23) used cup, and nursing bottles were used only by 10.2% (10) of respondents.

The prevalence of underweight and wasting was higher among children who were already on complementary feeding at the time of study. There was a statistical significance between children who had been started on complementary feeding at the time of study and PEM (stunting and wasting) (p values of 0.001 and 0.015 respectively). No statistical significance was computed between period of commencement and frequency of complementary feeding and PEM in children under five years old. In general, proportions of underweight and wasting in children under five years old increased with increase in complementary feeding frequency while stunting rate increased with decrease in complementary feeding frequency (Table 2).

Table 2. Bi-variate analysis of complementary feeding pattern and PEM in under-five-years-old children

	Weight-for-age				Height for age				Weight-for-height			
	Normal n (%)	Under weight n (%)	Chi	P value	Normal n (%)	Stunted n (%)	Chi	P value	Normal n (%)	Wasted n (%)	Chi	P value
Complementary feeding			3.37	0.05			10.1	0.001			5.90	0.015
Yes	36(37)	62(63)			43(49)	45(51)			58(60)	38(40)		
NO	12(60)	8(40)			2(10)	18(90)			17(90)	2(10)		
Started at			0.11	0.74			0.29	0.59			0.22	0.64
< or = to 6	34(37)	58(63)			40(48)	43(52)			54(60)	36(40)		
> 6 months	2(40)	3(60)			3(75)	1(25)			3(60)	2(40)		
Frequency			0.2	0.66			0.07	0.80			0.01	0.93
< or = to 2	6(46)	7(54)			4(40)	6(60)			8(62)	5(38)		
> 2 times	30(35)	55(65)			39(50)	39(50)			50(60)	33(40)		

Dietary Care during Illness

Most mothers, 84.7% (83), reported that their children fed less times during illness compared to when they were well. Only 2% (2) reported that their children fed more times than usual; 10.2% (10) reported they fed as usual and 3.1% (3) reported they fed on special food.

Over 96% (75) of the mothers who were breastfeeding continued breastfeeding their children during diarrhoea episodes and 79.6% (78) continued feeding their children with complementary diet. Nevertheless, 41.8% (41) reported giving their children special foods during diarrhoea; 30% (29) of the mothers were for the opinion that some types of foods should not be given to children during illness for various reasons as shown below (Table 3).

Table 3. Type of food or fluid and reasons for not giving the child during illness

Type of food or fluid	Reason
Meat	● Has a lot of cholesterol. ● Culturally was not child food
Mixture of beans and maize Plain beans or maize	● Are hard for chewing and child has less strength.
Beverages	● Has a lot of acid.
Alcohol	● Can damage child liver

The prevalence of underweight and wasted children under five years old was higher in mothers who reported that their children fed not less than normal (normal and more than normal). There was a statistically significant relationship between the times of feeding during illness and wasting in the children under five years old (p=0.02) (Table 4).

The prevalence of underweight children was higher among children under five years old whose mothers reported withdrawing breastfeeding during diarrhoea illness. Those who continued with

complementary feeding during diarrhoea showed high prevalence in all the three nutritional indicators of PEM. Notably also the prevalence of PEM was highest in children reported to be fed on special food during diarrhoea episodes (Table 4).

Table 4. Bi-variate analysis of dietary care during illnesses and PEM in less than five-years- old children

	<i>Weight-for-age</i>				<i>Height for age</i>				<i>Weight-for-height</i>			
	Norma ln (%)	Underwei ght n (%)	Ch i	P val ue	Norma ln (%)	Stunt ed n (%)	Ch i	P val ue	Norma ln (%)	Wast ed n (%)	Ch i	P val ue
Illness			0.0	0.77			0.1	0.70			5.4	0.02
< normal	31(37)	52(63)	8		36(48)	39(52)	5		53(65)	28(35)	5	
Not < normal	5(33)	10(67)			7(54)	6(46)			5(33)	10(67)		
Breastfeedi ng			0.0	0.86			0.1	0.73			0.2	0.61
Yes	34(45)	41(55)	3		29(39)	45(61)	2		51(69)	23(31)	6	
No	1(33)	2(67)			2(67)	1(33)			3(100)	0		
complemen tary feeding			0.1	0.74			0.4	0.52			1.7	0.19
Yes	28(36)	50(64)			33(47)	37(53)			44(57)	33(43)		
No	8(40)	12(60)			10(56)	8(44)			14(74)	5(26)		
special food			2.9	0.09			0.0	0.81			0.2	0.62
Yes	11(27)	30(73)	8		18(47)	20(53)	6		23(58)	17(42)	4	
No	25(44)	32(56)			25(50)	25(50)			35(63)	21(37)		
Some food not given			1.4	0.22			0.6	0.41			0.4	0.49
Yes	8(28)	21(72)	8		16(55)	13(45)	9		16(55)	13(45)	8	
No	28(41)	41(59)			27(46)	32(54)			42(63)	25(37)		

Discussion

Breastfeeding

The study findings of high levels of initiation of breastfeeding but few practice of exclusive breastfeeding was not surprising. This situation reflected the situation in Kenya where breastfeeding was almost universal with 97% of children being breastfed but only 13% of children under 6 months being exclusively breastfed (Kenya Demographic Health Survey, 2003). Such findings were also found in a study done in Busia (Akwara, 1994).

The frequency of breastfeeding in the study population can be said to be low with only 17.9% of mothers' breastfeeding more or equal to five times daily. This was far much lower than the Kenyan situation where the frequency of breastfeeding was a common occurrence with 92% of infants under 6 months of age breastfeeding for 5 or more times in a day (Kenya Demographic Health Survey, 2003).

The duration of breastfeeding was between the 1st day of birth and 36 months with mean of 17.1 months in the current study. This was comparable to findings of study done in Busia (Akwara, 1994). These findings were also comparable to the situation in Kenya, where the mean duration of breastfeeding was 17.6 months (Kenya Demographic Health Survey, 2003).

The high prevalence of PEM found among children who were breastfed twice or less in a day was associated to lack of adequate nutrients from breast milk. This increased chances of contracting childhood infections since they had less maternal antibodies to fight the intruding antigens since they were gotten from breast milk. These findings supported a study done in Moi Teaching and Referral Hospital (MTRH), Eldoret (Ayaya, Esamal, Rotich & Olwambula, 2004).

The findings that the prevalence of PEM was higher among children breastfed for less or equal to 12 months contrasted the findings of a study done in Uganda where children under five years old who

were stunted was highest among children breastfed for over 2 years (Efata, 2000). This finding in the current study was attributed to inadequate nutrients to the children due to shorter duration of breastfeeding as breast milk was the best source of these. Also the rate of these children contracting infections was increased because of less maternal antibodies to fight the foreign antigens and thus they were highly susceptible to childhood infections.

Complementary Feeding

In the study children were introduced to complementary feeds too early (mean age was 4.3 months). This practice of early complementary feeding was well documented as a practice in Kenya. By the age of 2 to 3 months almost half of the children were given complementary feeds (Kenya Demographic Health Survey, 2003). The findings were also comparable to findings of another study done in Uganda where the mean age of introduction of complementary feeds was 4.9 months (Efata, 2000). Early introduction of complementary feeds deprived infants off breast milk nutrients.

Although there was a statistical association ($p=0.003$) between stunting and whether the child had started on complementary feeds after logistic regression, this was in contrast with a study done in Uganda which showed no association between the two (Mehangye, 2000). The probability of a child on complementary feeds being stunted was a third. Complementary feeds were not nutritious as breast milk. Most were prepared locally, not considering their quality because of the economic crisis in the country. Also the process of preparation was not usually hygienic, predisposing the children to pathogens which had a direct and indirect effect in development of PEM.

Although there was no statistical significance between the period at which complementary feeding was commenced and PEM, the prevalence of underweight and stunted children was higher (63% and 52% respectively) among those children introduced to complimentary feeds less or equal to 6 months. PEM in these children developed due to deprivation of maternal breast milk nutrients. These children were also at increased risk of childhood infections due to low immunity and unhygienic complementary feeds. However, the above findings contradicted those of a study done in Uganda where by underweight and stunted children were more among children who were given complementary feeds late (Mehangye, 2000).

Dietary Care during Illness

The study findings that most mothers (84.7%) feed their children less times during illness, contrasted the recommendation from health workers advocating for increased feeding when children were sick. Sick children required small frequent meals, since infections affected their appetite and also it interfered with their gastrointestinal motility (Tomkins & Watson, 1994). Majority of mothers (96% and 79.6%) in the study continued breastfeeding and feeding their children on complementary feeds during diarrhoea respectively. These findings were similar to those done in Kibera slum in Kenya (Ibtisam, 1998).

The number of feeding during illness and wasting in children of age less than five years was found to be statistically significant ($p=0.009$) after adjusting for child's age and sex. The probability of a child who was fed less than normal during illness becoming wasted was a third. During illness the body metabolic rate increased as it fought the intruding antigens and tried to bring homeostatic balance. The body demand was higher than the supply due to poor appetite, vomiting and poverty and hence the stored nutrients ended up being utilized. The body muscles eventually atrophied. These findings were in contrast to those from Kibera that showed no statistical significance (Ibtisam, 1998).

It was interesting to note that those children whose mothers continued breastfeeding, and were given complementary and special feeds during diarrheal episodes showed high rates of PEM. This was attributed to the children being fed less frequency as reported by most mothers (84.7%) during illness. Moreover, because most of respondents exhibited poor living and also due to post election violence of the year 2007 that brought economic crisis in the country, they could not afford nutritious foods necessary for children who were sick. As a result, they ended up giving their children complementary and special feeds which were not nutritious. These findings were in contrast with the study done in Kibera slum in Kenya (Ibtisam, 1998), where malnutrition rate were lower in children who continued breastfeeding and were given special feeds during diarrheal episodes.

Conclusion

There is a high level in initiation of breastfeeding among women in Kenya. The frequency of breastfeeding is low with some mothers breastfeeding five times or more in a day. The prevalence of PEM is higher among those children breastfed for less or equal to two times in a day and among those children breastfed for less or equal to 12 months.

Complementary feeding is generally commenced too early with children receiving complementary feeds as early as in the first day of life and an average of 4.3 months. There is a significant relation between stunting and complementary feeding. The proportion of underweight and stunted children is higher among children introduced to complementary feeding less or equal to 6 months.

The frequency of feeding children during illness is also low. Most of the mothers feed their children fewer times than usual during illness. Among the wasted and underweight children, the rates are higher among children who are fed not less times than normal during illness. Wasting is significantly associated with the times of feeding during illness. The practice of breastfeeding and complementary feeding during diarrhoea episodes is however high.

Recommendations

Health education should be enhanced in the hospital setting, particularly in maternal child health clinics. These programmes should be initiated in an integrated approach. Nutrition education programmes should especially target the promotion of under five-years-old children feeding practices such as:

1. Promotion of proper breastfeeding practices such as exclusive breastfeeding during the 1st 6 months of infant's life, breastfeeding on demand as opposed on scheduled time, high frequency of breastfeeding daily and continued breastfeeding to two years or beyond.
2. Promotion of appropriate complementary feeding such as beginning it at the 6th month of infant's life, proper preparation and hygiene during complementary feeding and ensuring that the complementary feeds are balanced nutritionally.
3. Promotion of adequate feeding of the child during illness (that is, giving small and frequent feeds).

References

- Akwara, A. P. (1994). Breast feeding and infant and child mortality in Amagaro Division of Busia District, Kenya. *Africa Population Studies*, paper No. 10.
- Ayaya, S. O., Esamal, F. O., Rotich, J., & Olwambula, A. R. (2004). Socio-economic factors predisposing under five years old to severe protein energy malnutrition at Moi Teaching and Referral Hospital, Eldoret, Kenya. *East Africa Medical Journal*, 81(8), 415-422.
- Benn, H. (2002). DFID'S Bid to break child poverty cycle. Water and sanitation update. *East Africa Medical Journal*, 9(2), 14.
- Efata, M. C. (2000). *The Prevalence of Malnutrition among Children 6 to 59 Months and some Maternal associated Factors in Busia Sub-District in Tororo District, Uganda* (Msc, thesis). Applied Nutrition Programme, University of Nairobi.
- Ibtisam, A. E. (1998). *Prevalence of Malnutrition and some associated Factors on Child's Nutritional Status in an Urban Slum, Kibera, Nairobi, Kenya* (Msc, Thesis). Applied Nutrition Programme, University of Nairobi.
- Kenya Demographic and Health Survey (2003). *National council for population and development*. Central Bureau of statistics, Republic of Kenya.
- Mehangye, G. M. (2000). *Maternal Health and Nutritional Status and its effect on Child's Nutritional Status 6 to 36 Months in Slums of Mbarara, Uganda*, Msc, thesis, Applied nutrition programme, University of Nairobi.
- Nyandiko, M. (2000). *Deteriorating Nutritional Status of Patients admitted in KNH: Magnitude and Consequences* (M.Med thesis). University of Nairobi.
- Stanfield, P., Balldin, B., & Versluys, Z (2001). *Child health* (2nd ed.). Published by the African medical and research foundation (AMREF), Wilson Airport. Nairobi, Kenya.
- United Nations Children Fund (2006). *The state of the world children*. Oxford University Press.