

Study on Prevalence of Protein Energy Malnutrition among Children of 3-6 Years of Age in the Study District

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Abstract :

Introduction : Children are generally most vulnerable and least able to help themselves. Malnutrition in its several forms of under nutrition has been coined as “silent emergency” by United Nations Children's Fund (UNICEF). Rural area shows inequalities in distribution of beneficiaries in form of structure, performance and pattern of economic growth. **Objectives** : To estimate prevalence of Protein Energy Malnutrition (PEM), to find out association between various factors and prevalence of malnutrition and to assess various aspects of feeding of child with prevalence of malnutrition in children of 3-6 years of age. **Method** : A community based cross sectional study was conducted on 3-6 years old children of rural area of study district. **Results** : Out of total 894 children, 27.96% children were underweight and 6.71% children were severely underweight. Malnutrition was seen in 42.78% children amongst those who did not consume calories as per Recommended Dietary Allowance (RDA). **Conclusion** : Protein energy malnutrition in form of underweight was present in more than one third children. Higher prevalence of malnutrition was found in children who had birth weight of less than 2.5 kilograms, having interpregnancy interval of less than 24 months, of birth order of 4 or more, who were breastfed for a period of 6 to 12 months, to whom complementary feeding was started before the age of 6 months or who were partially immunized.

Key words : Children of 3-6 years of age, Protein energy malnutrition, Underweight

Introduction :

The hearts of most grown-ups melt at the sight of small children who constitute one of the most vulnerable sections of society. Children are our supreme assets because children of today form the human resource of tomorrow.^[1] Children need extra care because these are generally the most vulnerable and least able to help themselves. Interventions early in life can thus have lifelong benefits not just for individual but for society as a whole.^[2]

It is now an established fact that the brain undergoes development and growth within the first five years of a child's life. Therefore, malnutrition of children under 5 years will surely lead to reduced mental abilities affecting the intellectual capabilities of the children when they reach adulthood. It is well recognised and documented that preschool children are a nutritionally vulnerable segment of population and their growth and nutritional status are useful and sensitive indicators for judging health of a community

or a nation.^[3, 4] Early childhood is a period of rapid growth and that nutritional insults during this period result into under or over nutrition.^[5, 6]

Malnutrition in its several forms of under nutrition, namely wasting, stunting and underweight has been coined as the “silent emergency” by the United Nations Children's Fund (UNICEF).^[7] Malnutrition and infection are the two most important factors that affect the growth of children. Under nutrition is associated with impaired immune function and consequent increased susceptibility to infections; infections aggravate undernutrition; if this vicious cycle continues it can result in death of the child. Nutrition plays a key role in physical, mental and emotional development of children and much emphasis has been given to provide good nutrition to growing populations especially in the formative years of life.^[8]

The subject gains more importance in rural children, due to certain adverse realities like

intake, frequent infections, lack of access to health services, illiteracy, unhygienic personal habits, adverse cultural practices etc. Major factors which modulate nutritional status during early childhood include birth weight, infant and young child feeding practices, morbidity due to infections, treatment of infections, nutrition care during infection and convalescence. Factors which are responsible for the higher prevalence of malnutrition comprise low birth weight, maternal health problems, delay in introduction of complementary feeds, faulty child care and other poor environmental conditions which are again more prevalent in rural areas.^[9] In association to neonatal and infant mortality and morbidity Low Birth Weight (LBW) is also associated with growth retardation in children and development of chronic diseases such as diabetes mellitus, cardiovascular diseases and hypertension in adults.^[10] Anthropometric assessment is widely used and often regarded as the best single measure for health and nutritional status in children.^[11]

Globally 52 million children under 5 years of age are wasted, 17 million are severely wasted and 155 million are stunted. Around 45% of deaths among children under-5 years of age are linked to undernutrition.^[12] According to National Family Health Survey (NFHS) – 4, under-5 mortality in India is 50 per 1000 live births, 38.4% children under 5 years of age are stunted, 21% are wasted, 7.5% are severely wasted and 35.7% are underweight.^[13]

Rural area shows inequalities in the distribution of the beneficiaries in the form of structure, performance and pattern of economic growth. Present study was undertaken on a socio-cultural and economically underprivileged group i.e. children of 3-6 years of age of rural area aiming to estimate prevalence of Protein Energy Malnutrition (PEM) among them. Apart from prevalence attempts are made to identify relationship of birth outcome, socio economic status, nutritional status, morbidity pattern, immunization status and factors associated with those on prevalence of Protein Energy Malnutrition (PEM).

Objectives:

- To estimate the prevalence of Protein Energy Malnutrition (PEM) in children of 3-6 years of age.

- To find out association between various factors and prevalence of malnutrition in children of 3-6 years of age.
- To assess various aspects of feeding of child with prevalence of malnutrition in children of 3-6 years of age.

Method:

Community based cross sectional study was conducted from August 2017 to August 2018. Present study was carried out on 3-6 years old children of rural area of the study district. All the children of 3-6 years of age group in the district were the target population. Sample size was calculated for the population of 157556 children as per Census 2011 Data. Prevalence of malnutrition among under-5 children in rural area of the study district is 33.2%.^[14] With precision level of 4%, taking design effect of 1.5 and considering non-response rate around 10% the final sample size was $(n) \approx 875$ children of 3-6 years.

Two stage sampling technique was used. In first stage, from total 6 talukas of the study district, 35 villages were selected by cluster sampling technique. In second stage, from total 35 villages, 25 children of 3-6 years of age group were selected after obtaining list of all children in the age group of 3-6 years from the anganwadi by simple random sampling technique from each village. Thus total 875 children were selected from the study district as samples.

Data were collected in a predesigned and pretested proforma after getting consent from the parents and the information was obtained from mother or primary care giver of child. Data collection was divided in to interview schedule and anthropometric measurements. Close ended interview schedule was designed for the mother or the primary care taker of children.

Weight, height and mid arm circumference were measured of all study subjects as anthropometry is very sensitive and useful tool to measure nutritional status.

Data entry was done in EPI INFO software. Z scores were compared for weight for age using Microsoft Excel software. Data analysis was primarily

carried out in EPI INFO software. EPI INFO software and Microsoft Excel were used to create graphs for present study. Descriptive analysis was done for all predictor and outcome variables. Chi square test was used to find association between predictor and outcome variables.

Under nutrition is the outcome variable in the present study and it was calculated by parameter WAZ (weight for age). WHO growth standards were used to define under nutrition. Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic undernutrition. Children whose weight-for-age Z-score was below minus two standard deviations (-2 SD) from the median of the reference population were classified as underweight. Children whose weight-for-age Z-score was below minus three standard deviations (-3 SD) from the median were considered severely underweight.

Results :

Table 1 shows that about two-fifth of 894 children i.e. 363 (40.6%) were in the age group of 4-5 years, followed by 309 (34.56%) in the age group of 3-4 years and 222 (24.83%) in the age group of 5-6 years. Observation also shows that out of 894 children 463 (51.79%) were males and 431 (48.21%) were females.

Table 2 reveals that out of 894 children, 310 (34.68%) children were malnourished of whom 250 (27.96%) were underweight while 60 (6.71%) were severely underweight. Sex wise distribution of malnutrition was found to be somewhat higher in females (35.27%) than males (34.13%).

Table 1 : Age and sex wise distribution of children

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
3-4 years	157	33.91%	152	35.27%	309	34.56%
4-5 years	195	42.12%	168	38.98%	363	40.60%
5-6 years	111	23.97%	111	25.75%	222	24.83%
Total	463	100.00%	431	100.00%	894	100.00%

Table 2: Distribution of children according to their Weight for Age (Underweight)

Weight for Age (Underweight)	Male		Female		Total	
	No.	%	No.	%	No.	%
Normal $\geq 2SD$	305	65.87%	279	64.73%	584	65.32%
Underweight $< -2SD$ and $\geq 3SD$	135	29.16%	115	26.68%	250	27.96%
Severe underweight $< -3SD$	23	4.97%	37	8.58%	60	6.71%
Total	463	100.00%	431	100.00%	894	100.00%

Table 3: Association between consumption of calories as per recommended daily allowance (RDA) and malnutrition in children

Consumption of calories as per Recommended Daily Allowance (RDA)	Normal		PEM		Total	
	No.	%	No.	%	No.	%
Yes	279	77.29%	82	22.71%	361	100.00%
No	305	57.22%	228	42.78%	533	100.00%
Total	584	65.32%	310	34.68%	894	100.00%

($\chi^2 = 38.243$, DF = 1, p < 0.00001)

Table 4: Association between various demographic variables and malnutrition in children

Variables	Normal (%)	PEM (%)	Total (%)	χ^2 value	p value
Social class					
Upper	260 (73.03%)	96 (26.97%)	356 (100%)	15.522	0.000082
Lower	324 (60.22%)	214 (39.78%)	538 (100%)		
Type of family					
Nuclear	219 (62.93%)	129 (37.07%)	348 (100%)	4.171	0.124
Joint	215 (64.18%)	120 (35.82%)	335 (100%)		
Three generation	150 (71.09%)	61 (28.91%)	211 (100%)		
Overcrowding					
Present	354 (61.78%)	219 (38.22%)	573 (100%)	8.85	0.00293
Absent	230 (71.65%)	91 (28.35%)	321 (100%)		
Literacy status of mother					
Illiterate	123 (58.29%)	88 (41.71%)	211 (100%)	6.027	0.0141
Literate	461 (67.5%)	222 (32.5%)	683 (100%)		
Occupation of mother					
Home maker	467 (67.88%)	221 (32.12%)	688 (100%)	20.975	0.00032
Service	15 (88.24%)	2 (11.76%)	17 (100%)		
Business	8 (80%)	2 (20%)	10 (100%)		
Labourer	35 (47.95%)	38 (52.05%)	73 (100%)		
Agricultural	59 (55.66%)	47 (44.34%)	106 (100%)		

According to table 3 prevalence of malnutrition was higher (42.78%) in children who did not consume calories as per Recommended Daily Allowance (RDA) for their age in comparison to those children who were consuming calories as per RDA (22.71%). Observed difference was statistically highly significant.

Table 5: Association between various indicators in children and PEM

Indicators	Normal (%)	PEM (%)	Total (%)	χ^2 value	p value
Birth weight					
< 2.5 kg	32 (45.71%)	38 (54.29%)	70 (100%)	12.893	0.00033
≥ 2.5 kg	552 (66.99%)	272 (33.01%)	824 (100%)		
Period since last birth (months)					
< 24	55 (53.92%)	47 (46.08%)	102 (100%)	13.806	0.001
24 - 36	89 (57.42%)	66 (42.58%)	155 (100%)		
> 36	184 (71.6%)	73 (28.4%)	257 (100%)		
Birth order					
1	256 (67.37%)	124 (32.63%)	380 (100%)	14.995	0.00182
2	232 (68.24%)	108 (31.76%)	340 (100%)		
3	67 (61.47%)	42 (38.53%)	109 (100%)		
4 or more	29 (44.62%)	36 (55.38%)	65 (100%)		
Duration of breast feeding					
< 6 months	16 (76.19%)	5 (23.81%)	21 (100%)	1.121	0.571
6-12 months	39 (65%)	21 (35%)	60 (100%)		
> 12 months	529 (65.07%)	284 (34.93%)	813 (100%)		
Age at complementary feeding					
Before 6 months	32 (50%)	32 (50%)	64 (100%)	7.147	0.00751
At or After 6 months	552 (66.51%)	278 (33.49%)	830 (100%)		
Immunization status					
Fully immunized	571 (67.41%)	276 (32.59%)	847 (100%)	31.069	< 0.00001
Partially immunized	13 (27.66%)	34 (72.34%)	47 (100%)		

Table 4 shows association between various demographic variables and malnutrition in children. The prevalence of malnutrition was higher i.e. 39.78% in children belonging to lower social class compared to children belonging to upper social class (26.97%). Observed difference was statistically highly significant. Prevalence of malnutrition was higher i.e. 37.07% in children belonging to nuclear families, followed by 35.82% and 28.91% in children belonging joint families and three generation families respectively. Observed difference was statistically not significant. Distribution of children according to type of house revealed that prevalence of malnutrition was higher (38.22%) in children who dwelled in overcrowded houses, while it was lower (28.35%) in

children who dwelled in houses where there was no overcrowding. Observed difference was statistically significant. Literacy status of mothers showed that prevalence of malnutrition was high in children of mothers who were illiterate i.e. 41.71%, while prevalence of malnutrition was less (32.5%) in children of mothers who were literate. Observed difference was statistically significant. Prevalence of malnutrition was higher among children of mothers who were labourers and involved in agricultural work (52.05% and 44.34% respectively) as compared to those children whose mothers were home maker (32.12%), doing business (20%) or doing service (11.76%). Observed difference was statistically highly significant.

Table 5 shows association between various variables related to children and malnutrition in them. Prevalence of malnutrition was higher i.e. 54.29% in children who had birth weight of less than 2.5 kilograms, as compared to children (33.01%) who had birth weight of more than 2.5 kilograms. Observed difference was statistically highly significant. In the present study, prevalence of malnutrition was highest i.e. 46.08% in children having interpregnancy interval of less than 24 months followed by 42.58% and 28.4% in children having interpregnancy interval between 24 to 36 months and more than 36 months respectively. Observed difference was statistically highly significant. The prevalence of malnutrition was high i.e. 55.38% in children of birth order of 4 or more followed by 38.53% and 32.63% in children of birth order 3 and 1 respectively. The prevalence of malnutrition was lowest i.e. 31.76% in children of birth order 2. Observed difference was statistically highly significant. Results also revealed that the prevalence of malnutrition was 35% in children who were breastfed for a period of 6 to 12 months as compared to 34.93% and 23.81% children who were breast fed for more than 12 months and less than 6 months respectively. Observed difference was statistically not significant. Prevalence of malnutrition was less in children to whom complementary feeding was started at or after the age of 6 months (33.49%), whereas it was higher in children to whom complementary feeding was started before the age of 6 months (50%). Observed difference was statistically significant. Immunization status of children showed that the prevalence of malnutrition was high in partially immunized children i.e. 72.34%, while it was 32.59% in fully immunized children. Observed difference was statistically highly significant.

Discussion:

According to National Family Health Survey (NFHS) – 4, 35.7% children under 5 years of age were underweight and 11% children were severely underweight. The results were similar to the present

study. National Family Health Survey – 4 (2015-2016) reported that poor rich ratio was nearly 2.5 for underweight category meaning lowest quintile group has 2.5 times more prevalence of underweight (48.6%) compared to highest wealth quintile group (20.1%).^[15] The results of the present study were slightly different from NFHS – 4. The reason behind higher number of children being malnourished belonging to nuclear families was lack of knowledge regarding proper feeding habits or working parents. Mahendrakar et al (1996)^[16] found similar results in their study that morbidity in children was more common in overcrowded houses than in non overcrowded house. A. Mittal and S. K. Ahluwalia (2007)^[17] in their study also found similar results of high prevalence of malnutrition in children of illiterate mothers (60.9%) as compared to children of mother's education above high school level (21.2%). A. Mittal and J. Singh (2007)^[17] also found similar results of high prevalence among children of working mothers (46.15%) as compared with housewives (37.8%).

M. Shafiqur Rahman et al. (2016)^[18] found similar results that the prevalence of malnutrition was high (56.2%) in children with low birth weight as compared to children (38.1%) having normal birth weight. J. Lakshmi A and K. Begum (2003)^[19] in their study also found similar results of higher prevalence of malnutrition with higher birth order, it was found 34% in birth order 1, 39% in birth order 2-3 and 56% in birth order more than 4 or more. Victora CG et al. (1984)^[20] in their study found that prevalence of malnutrition was smallest in those children breast-fed for 3 to 6 months, but after this age nutritional status appeared to be worse in those breast-fed for longer. The results were similar to the present study. The reason behind more number of children found being malnourished who were breastfed for the period of 6 to 12 months and for more than 12 months was that proper complementary feeding was not initiated after the age of 6 months. Anita Khokhar and S. Singh (2003)^[21] in their study also found similar results that the prevalence of malnutrition was high in children weaning early (64.8%) as

compared to children breast feed exclusively up to six months (35.2%). S. N. Dwivedi et al (1992)^[22] in their study found that immunized children experience less malnutrition (57.0%) in comparison to unimmunized children (66.40%).

Conclusion:

Protein energy malnutrition in the form of underweight was present in more than one third children, while some children suffered from severe underweight. Prevalence of malnutrition was somewhat higher in female children than in male children. Prevalence of malnutrition was highest in the age group of 5 to 6 years and lowest in the age group of 4 to 5 years. Children who did not consume calories as per Recommended Daily Allowance (RDA) for their age showed higher prevalence of malnutrition in comparison to those children who were consuming calories as per RDA. Prevalence of malnutrition was more in children belonging to social class I, belonging to nuclear families, who dwelled in overcrowded houses, whose mother were illiterate or of mothers who were labourer and engaged in agricultural work. Higher prevalence of malnutrition was found in children who had birth weight of less than 2.5 kilograms, having interpregnancy interval of less than 24 months, of birth order of 4 or more, who were breastfed for a period of 6 to 12 months, to whom complementary feeding was started before the age of 6 months or who were partially immunized.

Recommendations:

Maternal education is positively related with child rearing practices and utilization of child health services. So, female literacy should be improved for promotion of child health, prevention of malnutrition and associated morbidities and better utilization of services. Mothers should be counselled regarding young child feeding practices like importance of colostrums, initiation of breast feeding, exclusive breast feeding during antenatal period. Nutritional education and time to time counselling of mothers should be done regarding initiation of

complementary feeding and also the quality and quantity of food that can be given after six months of age. Health care providers like anganwadi workers, ASHA and Female Health Workers need to be sensitized time to time about infant and young child feeding. Immunization protects against common vaccine preventable diseases and also has protective effects over stunting. Routine immunization coverage should be maintained at high level and services need to be strengthened. Regular growth monitoring of each and every child by trained and qualified health care providers is very essential for early detection in growth faltering. Monitoring activities for situation of malnutrition and factors responsible for it at local levels should be strengthened and supervised.

Declaration:

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Conflict of Interest: Nil

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