

Prevalence of Protein Energy Malnutrition (PEM) and its Association with Eruption of Primary Teeth

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Abstract

Protein energy malnutrition (PEM) is one of the most common undernutrition conditions leading to high mortality and morbidity rate among children influencing greatly the skeletal and dental development as well. The aim of the study was to find out the prevalence of PEM among pre-school children and its association with eruption of primary teeth. The study was conducted among 500 pre-school children attending Anganwadi centres of Kamrup District (Assam), adopting cross-sectional descriptive survey design. The samples were selected by using purposive sampling technique. The height and weight of the samples were measured and values obtained were compared with WHO guidelines. Eruption of primary teeth was evaluated by oral examination. It was revealed that the overall prevalence of PEM was 37 percent, whereas stunted and wasted subjects were of 67.03 percent and 23.78 percent, respectively and 9.19 percent subjects manifested as both wasted and stunted. Among 54.97 percent subjects with PEM, eruption of primary teeth was not completed.

Food is one of the major concerns of the mankind beginning from the time of conception and extending through the entire life span of an individual. It provides different nutrients, which are necessary for maintaining growth of an individual and for repair of the worn out and aging tissues. Human body requires these nutrients at recommended amount to maintain healthy tissues and organs' functions. Deficiencies of these nutrients result in malnutrition. Protein energy malnutrition (PEM) is one of the most common malnutrition conditions where deficiency of protein and energy occurs. Nutritional deficiencies may influence the skeletal system including dental development. Pre-school children are more vulnerable for this. Various risk factors of dental problem of this age group are detected and proved through many scholarly research studies. But very few studies are available to find out the relationship between PEM and Dentition.

WHO Global Database indicated that more than a third of the world's children are affected with malnutrition. The World Bank estimates that India is ranked 2nd in the world as per the number of children suffering from malnutrition, after Bangladesh. According to the recently released National Family Health Survey (NFHS-3) carried out in 2005-06, 40

percent of Indian children under the age of three are underweight, 45 percent are stunted and 23 percent are wasted. The prevalence of malnutrition varies across states of India, with Madhya Pradesh recording the highest rate (55%) and Kerala among the lowest (27%) (UNICEF, 2013).

India has shown remarkable progress and many nutrition intervention programmes have been implemented, but malnutrition remains highly prevalent in poor states of the country. Integrated Child Development Services (ICDS) initiated in 1975 is India's most ambitious multi-dimensional welfare programme to reach millions of children and mothers who are caught in the grip of malnutrition, diseases, illiteracy, ignorance and poverty. Anganwadi centres (AWCs) have been established under this programme to improve the nutritional and health status of children in the age group 0-6 years. Only a few studies have been done to study the nutritional status of anganwadi children. Therefore the present study was carried out at Anganwadi centres.

Objectives

The study was conducted with the following objectives: (1) To find out (a) prevalence and (b) degree of PEM among pre-school children of Kamrup district in Assam, (2) To compare the prevalence rate of PEM among urban and rural children, (3) To find out the (a) eruption status of primary teeth among pre-school children of Kamrup district Assam, and (b) association between

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PEM and eruption of primary teeth among pre-school children of Kamrup district Assam.

Hypothesis H₀₁: There is no significant association of PEM with the eruption of primary teeth.

Literature Review

Kavita et al (2010) reported that the prevalence of PEM among under-five children in Varanasi was 63.3 percent, which was higher in 3rd year of age as compared to 4th and 5th year while it was lowest during 2nd year of life and females were affected more than the males. Socio-economic factors, mother's literacy, and caste are significantly associated with PEM. Ahmed et al (2011) found that prevalence of PEM among 1-5 years old children from Aligarh was 56.4 percent with higher prevalence among females (58.6%) as compared to males (54.2%). Significant relationship was seen between PEM and sex, social class, caste and literacy status of parents.

Joshi et al (2011) found that the overall occurrence of PEM in under 6 years children of Bareilly was observed to be 49.44 percent, which was found higher (64.87%) in the age group of 3-6 years as compared to other age group. The proportion of grade I, II, III and IV of under nutrition observed was 45.49 percent, 38.30 percent, 14.86 and 1.35 percent respectively.

Mohammed et al (2012) reported that 35.5 percent and 11.8 percent pre-schoolers from Karnataka had grade I and grade II PEM respectively, whereas 47.3 percent of them were underweight and 27 percent were stunted. Sahbanathul (2013) reported that 50 percent pre-school children in north Chennai were underweight, 32 percent stunted, 37 percent wasted and 23 percent with impaired mid arm circumference. There was significant association between age and sex of the children with PEM ($p < 0.001$).

Kais & Droosh (2007) revealed that the prevalence of malnutrition as per height for age, weight for age and weight for height was 12.2 percent, 12.2 percent and 22.24 percent respectively among 6 years old children and significant and high significant differences in the mean number of primary teeth between the well-nourished and malnourished children was observed. Costa & Pereira (2010) reported that PEM during tooth development (odontogenesis) is associated with increased caries susceptibility, delayed eruption and structural enamel defects (enamel hypoplasia).

Methodology

It was a cross-sectional descriptive survey design set in Anganwadi centres of Kamrup district, Assam. Research variables were PEM and eruption of primary teeth. Demographic variables were age, sex, gesta-

tional maturity, birth weight, breast feeding status, age of initiation of complementary feeding, number of siblings, birth order of children and type of family, educational qualification and family income of parents.

Five hundred pre-school children aged 3-6 years old attending Anganwadi centres of Kamrup district, Assam were selected through purposive sampling technique were included.

Data collection tool: Data collection tool was developed based on WHO criteria to assess prevalence of PEM and eruption of primary teeth. It consists of three sections - (1) Demographic variables, (2) Anthropometric measurements which include height and weight of the children, and (3) Oral examination.

Data collection procedure: Interview of the parents, anthropometric measurement, and oral examination.

Results

Various sociodemographic data of the subjects and their parents were assessed and these are reflected in Table 1.

Prevalence of PEM: It was revealed that prevalence of PEM was 37.00 percent, out of this 67.03 percent subjects were stunted, 23.78 percent wasted and 9.19 percent subjects were wasted and stunted both. Out of these, majority of subjects (54.39%) were moderately stunted, 19.88 percent were severely stunted, 19.30 percent were moderately wasted and 6.43 percent children were severely wasted. The prevalence of PEM among urban children was higher (46.40%) whereas only 27.60 percent rural children suffered from PEM. The difference was statistically significant ($Z=4.61$, table value=2.58, $p < 0.01$). These are depicted in Figs 1-4 respectively.

Eruption status of primary teeth: Among majority of subjects (70.77%), eruption of primary teeth were completed and for 29.23 percent subjects, it was incomplete. Among 54.97 percent subjects with PEM, eruption of primary teeth was not completed whereas only in 29.23 percent subjects without PEM had incomplete eruption of primary teeth. This indicates that PEM may affect the eruption of primary teeth among subjects.

Association between PEM and Eruption status of primary teeth: *Statistical analysis:* The researcher set the null hypothesis H₀₁ that PEM do not have association with the eruption of primary teeth of subjects under this study. Under this hypothesis the chi-square value is $\chi^2=12.591$ with $df=1$, $p < 0.001$. It is highly significant, hence the null hypothesis is rejected. It can be concluded that PEM is associated with eruption of primary teeth among

Table 1: Frequency and percentage distribution of subjects according to demographic variables (n=500)

S. No	Variable	Subgroup	Normal f (%)	PEM f (%)	Total f (%)
1	Age (years)	3-4	185 (64.91)	100 (35.09)	285 (57.00)
		4-5	91 (65.94)	47 (34.06)	138 (27.60)
		5-6	39 (50.65)	38 (49.35)	77 (15.40)
2	Gender	Male	162 (65.06)	87 (34.94)	249 (49.80)
		Female	153 (60.96)	98 (39.04)	251 (50.20)
3	Gestational maturity	Term	257 (63.93)	145 (36.07)	402 (80.40)
		Preterm	24 (47.06)	27 (52.94)	51 (10.20)
		Post term	34 (72.34)	13 (27.66)	47 (9.40)
4	Birth weight	≥2.5 kg	228 (64.59)	125 (35.41)	353 (70.60)
		<2.5 kg	84 (57.14)	63 (42.86)	147 (29.40)
5	Breast feeding status	EBF for 6 months	222 (64.53)	122 (35.47)	344 (68.80)
		EBF for less than 6 months	50 (58.82)	35 (41.18)	85 (17.00)
		Mixed feeding for 6 months	14 (66.67)	07 (33.33)	21 (04.20)
		Not breast fed at all	26 (66.67)	13 (33.33)	39 (07.80)
		EBF for more than 6 months	3 (27.27)	8 (72.73)	11 (02.20)
6	Age of initiation of complementary feeding	Just after completion of 6 months	188 (65.96)	97 (34.04)	285 (57.00)
		Before completion of six months	57 (53.77)	49 (46.23)	106 (21.20)
		After completion of one year and more	70 (64.22)	39 (35.78)	109 (21.80)
7	Birth order	First	156 (71.56)	62 (28.44)	218 (43.60)
		Second	104 (55.91)	82 (44.09)	186 (37.20)
		Third	44 (56.41)	34 (43.59)	78 (15.60)
		Above third	11 (61.11)	7 (38.89)	18 (03.60)
8	Number of siblings	None	117 (80.14)	29 (19.86)	146 (29.20)
		One	113 (59.79)	76 (40.21)	189 (37.80)
		Two	70 (57.38)	52 (42.62)	122 (24.40)
		Three	13 (34.21)	25 (65.79)	38 (07.60)
		More than three	2 (40.00)	3 (60.00)	05 (01.00)
9	Educational status of mother	Illiterate	75 (59.52)	51 (40.48)	126 (25.20)
		Primary education	95 (61.69)	59 (38.31)	154 (30.80)
		Secondary education	94 (61.44)	59 (38.56)	153 (30.60)
		Higher secondary	27 (71.05)	11 (28.95)	38 (07.60)
		Graduate	24 (82.76)	5 (17.24)	29 (05.80)
10	Educational status of father	Illiterate	65 (63.73)	37 (36.27)	102 (20.40)
		Primary education	82 (54.30)	69 (45.70)	151 (30.20)
		Secondary education	109 (61.93)	67 (38.07)	176 (35.20)
		Higher secondary	34 (80.95)	08 (19.05)	42 (08.40)
		Graduate	25 (86.21)	04 (13.79)	29 (05.80)
		Total	315 (63.00)	185 (37.00)	500 (100)
11	Type of family	Nuclear	180 (60.60)	117 (39.39)	297 (59.40)
		Joint	124 (67.02)	61 (32.97)	185 (37.00)
		Extended	11 (61.11)	07 (38.89)	18 (03.60)
12	Monthly income of the family (Rs./month)	≤ 3000	50 (60.24)	33 (39.76)	83 (16.60)
		3001-5000	100 (57.47)	74 (42.53)	174 (34.80)
		5001-7000	55 (63.95)	31 (36.05)	86 (17.20)
		> 7000	110 (70.06)	47 (29.94)	157 (31.40)

subjects under this study (Table 2).

Discussion

In the present study, prevalence of PEM was assessed among 3-6 years old children. The findings brought out that prevalence of PEM was 37.00 percent, whereas 67.03 percent, 23.78 percent and 09.19 percent subjects were stunted, wasted and wasted &

stunted both respectively. These findings are consistent with the finding of Rajaratanm and Sampathkumar (2007) who observed more prevalence of stunting (27.6%) than wasting (9.9%) and simultaneous wasting & stunting (10.7%) among 0 - 3 year old children.

The study compared the prevalence rate of PEM among urban and rural subjects which shows that prevalence of PEM among urban subjects was higher (46.40%) as compared to rural subjects (27.60%) and this difference was found to be statistically significant ($z=4.61$, $p<0.01$). However, this finding is in contrast with the observation of Goudappa et al (2015), who revealed significantly higher prevalence of PEM among the rural children (71.1%) compared to the urban children (64.4%).

Significant association of PEM with eruption of primary teeth among our study subjects ($p<0.001$), is also consistent with the findings of Mohammed & Mahmood (2007), who observed significant differences in the mean number of primary teeth between the well-nourished and malnourished children.

Conclusion

Despite various interventional measures the prevalence of PEM is high among children. The eruption of primary teeth is affected among malnourished children. By improving the nutritional status of the children, occurrence of PEM

can be reduced and dental health status improved. A significant percentage of nation's economy is utilised in the health sectors and children constitute a higher percentage in this regard. So to stabilise the economic condition of the country it is important to improve the health status of children. As an interventional measure, a pamphlet on prevention of malnutrition and dental problems among children

Table 2: Association of PEM with eruption of primary teeth (n=500)

Nutritional status	Complete	Incomplete	Total	df	Chi square	Table value	P-value
Normal	244	71	315	1	12.591	7.82	<0.001
PEM	116	69	185				
Total	360	140	500				

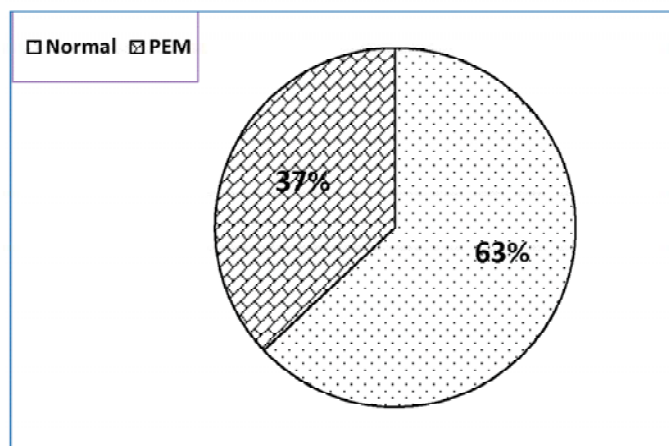


Fig 1: Prevalence of protein energy malnutrition among pre-school children.

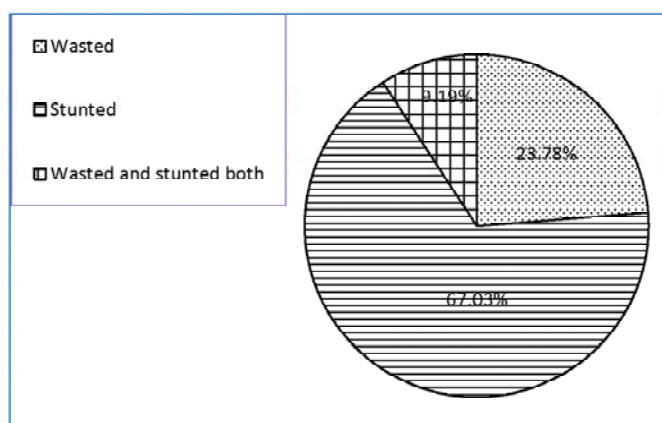


Fig 2: Prevalence of PEM according to types.

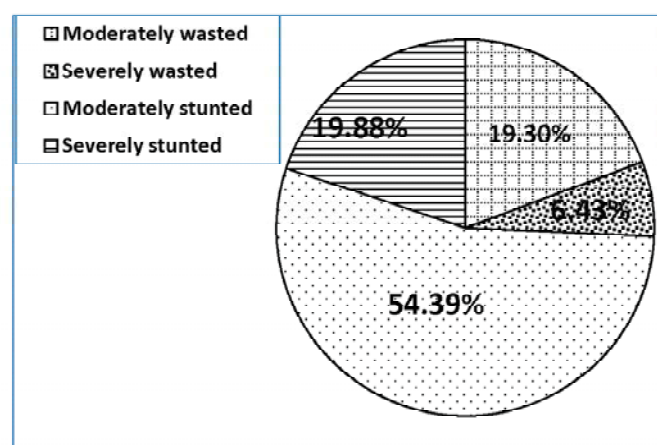


Fig 3: Distribution of subjects according to degree of PEM.

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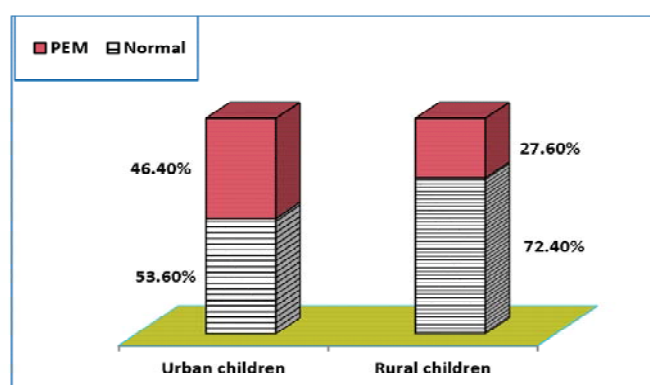


Fig 4: Prevalence of PEM among urban and rural children.