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PROTEIN ENERGY MALNUTRITION: KNOWLEDGE OF THE MOTHER A SIGNIFICANT ASSOCIATE OF CHILD'S NOURISHMENT STATUS, A STUDY AMONG 1-6 YEAR CHILDREN AND THEIR MOTHERS IN URBAN SLUMS OF OLD HUBLI

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ABSTRACT: BACKGROUND: Children are the precious possession of the family, community and the country. Nearly 200 million (30%), are malnourished in the world and over 2/3rd of malnourished are in Asia. Every 3rd underfed child in the world lives in India. India is home to 40% of world's malnourished children. According to global hunger index India ranks 117th of 119 countries in malnutrition. **OBJECTIVE:** 1. To find the prevalence of PEM among 1-6 year children. 2. To assess the knowledge of the mothers regarding adequate nutrition and its association to undernourishment. **METHODS:** Cross-sectional study among 150 children was undertaken for a period of 1 month from June to July 2014 at urban slums of old Hubli. Knowledge of mother was assessed by questionnaire, scores were assigned to responses and clinical examination of child along with anthropometry was carried out. **RESULTS:** Obtained by WHO Anthro Plus software through Z-scores, which showed 24.6% were moderately and 13.4% severely undernourished by weight and 22% were moderately and 25.4% severely stunted. Birth weight of child had significant (P<0.05) association with undernourishment. Knowledge scores regarding nutrition among mothers was good among 35.3%, moderate in 38.7% and poor in 26%, its correlation to undernourishment was significant (p<0.001). Pearson's correlation, showed a positive linear relationship between knowledge and nourishment and Linear Regression model established knowledge as a significant variable having independent and direct influence on nutritional status of child (p<0.001). **CONCLUSION:** Parent's literacy, knowledge and child's birth weight has a direct impact on child's nutritional status. Education and awareness is the key to progress.
KEYWORDS: PEM, children 1-6year, Old Hubli, Z-scores

INTRODUCTION: Nutrition may be defined as a process of providing or obtaining the food necessary for health and growth. It is very important for the overall development of a child, mainly the aspects concerned with physical, mental and socio-emotional development. The shortage of calories and proteins, that are essential for a normal growth and body maintenance is technically referred to as protein energy malnutrition (PEM).[1]

It is recognized that 56% of deaths occur in under six children in developing countries. One in every 3 malnourished children in the world lives in India.[2] India is home to 40% of world's malnourished children. According to global hunger index (GHI) developed by IFPRI, India ranks 117th of 119 countries in malnutrition.[3] All this emphasizes the complexity of the problem and the need for tackling the nutritional problem consciously.

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The infants and pre-school children are most vulnerable to retardation in growth as a result of malnutrition. The developing world's hunger is hidden hunger! Visible malnutrition is rare and it the time that the skin and bone image of the starving baby is no longer seen. The child receiving only 2/3rd of its calorie requirement may show no outward sign of hunger and even look normal, yet the child is too small for his age, has low resistance to infection and is therefore prone to illness.[4]

Malnutrition, poverty, co-morbidities like diarrhea, lack of health services, ignorance, poor environmental conditions, premature termination of breast feeding, poor maternal health, adverse cultural practices precipitates PEM in a child. Children born to educated mothers have a lower mortality risk because educated women tend to marry and have their first child at a later age than uneducated women. They also are likely to be more assertive and to play greater part in intra-family decision making in favor of their children's needs. Their husband's tend to be economically better off than those of uneducated women. Educated mothers may also make early and more effective use of health services.[5]

Hence, the global burden demands to fill up the grey area of the knowledge in protein energy malnutrition and to practically associate the mother's knowledge on nutrition to the nourishment of child. Also, attempt is made to address few of MDG's by this study.

- MDG 1: To eradicate extreme poverty and hunger.
- MDG 2: To reduce child mortality.
- MDG 5: To improve maternal health.

MATERIALS AND METHODS: A cross-sectional study among children aged 1-6 years residing in urban slums of old-Hubli was carried out for a period of 1 month, from June to July 2014. The sample size was calculated to 150, by using the formula $N=4pq/l^2$ with the prevalence of 54.8%[3] and a permissible error of 15%.

The data was collected through an interview after an informed consent, by house to house visit by a pre-designed questionnaire. The pilot study was done to understand the practical difficulties and questionnaire was finalized. First house was picked randomly in the field practice area of old-hubli. Subsequently every alternate house was picked up, enquired for the presence of child aged 1-6years and any one child in the family in that age group was picked randomly for the study. It went on until, the required sample of 150 children was met.

The required information from the mothers was obtained which includes, socio-demographic details and questions on knowledge regarding adequate nutrition.

A total of 15 knowledge based questions were asked in local language to the mother and scores were assigned to the responses, valid response was given 1 and invalid response a 0. The total scores were divided into poor (<4), moderate (5-10) and good (>10), with maximum attainable score being 15 and minimum 0. At the same time general physical examination and anthropometric measurements (like weight, height and mid arm circumference) of children were carried out using standardized weighing machine and measuring tape.

Following this, health education regarding the adequate nutrition and its importance in preventing recurrent illness along with the basic home management methods was also told to mothers.

The data was entered in Microsoft excel, analyzed using SPSS 20 software. The individual Z-scores were calculated by WHO Anthro-Plus software version 1.0.4 and compared with reference

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growth charts. The WHO recommended cut off points are a) severely underweight <-3 SD b) moderately underweight -2 to -3 SD c) normal -2 to +2 SD d) severely stunted <-3 SD e) moderately stunted -2 to -3 SD f) normal -2 to +2 SD.

Tests of significance like chi-square were done and the association of knowledge scores to Z-scores were evaluated by bivariate correlation and linear regression model was further applied to know whether knowledge regarding nutrition is a significant factor, that had an independent and direct influence on nutritional status of child.

The ones with the p-value of <0.05 was taken as statistically significant and then the data is presented.

RESULTS: Using WHO Anthro Plus software Z-scores were calculated for weight for age and height for age. 24.6% were moderately underweight and 13.4% severly and 22% were moderately stunted while 25.4% were stunted severely with means of -1.59 and -1.55 for weight and height with standard deviation of 1.32 and 2.01 respectively (Table no.1).

Majority (28%) of children for the study were in the age group of 13-24months followed by 25-36 months (26.7%). 51.3% of children were males and rest 48.7% were females. Majority 56% of children belong to Hindu religion and 44% were Muslims. Majority 32% belonged to class III and 31.2% to class I of socio-economic status according to modified B.G Prasad classification. The total number of undernourished children in each group with respect to weight and height is also shown in (Table no.2).

68.66% of mothers were illiterates and 89% of them being homemakers. 72% of fathers were illiterates and 53.3% of them were employed in other unskilled work (auto drivers, etc). 61.3% of children being raised in joint families. 68% of the mothers were in the age group 20-25 years at child birth,13.3% were in the age group of <20 years. 42.7% of children had birth weight of <2.5kg and 50% of children were of 1st birth order. The association birth weight to PEM was statistically significant by chi-square, at P<0.05. (Table no 3)

94% of mothers said colostrum to be given to child, 60.7% responded correctly with weaning age being 6 months. All the mothers rightly said the list of weaning foods and only 44% has correct knowledge of frequency of feeds. 51.3% were aware of PEM and its causative factors were poorly known. Only 34% thought premature termination of breast feeding may lead to PEM and others were unaware. 38% responded saying that they can manage diarrhea at home, while only 49.3% knew preparation of ORS. Only 49.3% knew the use growth charts. Of the total knowledge scores, 35.3% had good scores of >10, 38.7% moderate with scores 5-10 and 26% had poor scores of <4, this was found significant with undernourishments at P<0.0001. (Table no 4)

Bivariate correlation analysis of knowledge scores and Z-scores of WFA and HFA being 0.558 and 0.273 respectively, both being highly significant (at p<0.01) and showed a positive linear correlation. The Linear Regression model further established knowledge of the mother as a significant variable having an independent and direct influence on nourishment of child (p<0.0001). (Table no 5) (Table no 6)

DISCUSSION: Majority (28%) of children were in the age group of 13-24months followed by 25-36 months (26.7%), which is similar to a study by Ekanayake S, Sri Lanka in which 24% of the children were in the age group of 13-24 months.

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51.3% of children were males and rest 48.7% were females. Majority 56% of children belong to Hindu religion and 44% were Muslims. 32% belonged to class III and 31.2% to class I of socio-economic status according to modified B.G Prasad classification.

68.66% of mothers were illiterates and 89% of them being homemakers, which is in contrary to the study by Prasot RM, in which 41% were illiterates and 49% were literates, showing the extent of illiteracy in urban slums. Among fathers, 72% were illiterates and 53.3% of them were employed in other unskilled work (quarry, auto drivers, etc). Mother's literacy status was not found to be significant, while father's literacy status was found to be statistically significant for underweight, indicating that literate fathers, being knowledgeable, can take better care of pregnancy of the mother and the child through better availing of services.

61.3% of children being raised in joint families, which contrary to the study by Divya Shettigar et.al in 2013 that reported 60% and 38% were nuclear and joint families respectively, though no statistical association was found with child's nutritional status, challenging the age old thought of joint families taking better care. Majority 68% of the mothers were in the age group 20-25 years at child birth, 13.3% of mothers were in the age group of <20 which is in contrary with study done by Ekanayake S, srilanka, which reported that 44% of the mothers fall in the age group 20-25 years.

35.3% had good knowledge scores of >10, 38.7% moderate with scores 5-10 and 26% had poor scores of <4, while undernourishment was found to be more among good and moderate scores. This can be explained by the fact that being knowledgeable alone is not enough, but one has to have good feeding practices also to combat PEM. Similarly, a study done in Bangladesh among under-fives by Azizur Rahmani and Soma Chowdhury Biswas, showed a low knowledge score of only 2.4%, moderate score of 30.3% and high score of 67.4% among mothers.

As per WHO standards, 62% had normal weight for their age, 24.6% were moderately undernourished and 13.4% severely. 52.6% had normal height for age, 22% were moderately stunted and 25.5% severely with means of -1.59 and -1.55 for weight and height with standard deviation of 1.32 and 2.01 respectively. Which is similar to a study done in Bangladesh among under-fives by Azizur Rahmani and Soma Chowdhury Biswas, which also showed 13% severely underweight and 18% severely stunted children with a Z-score mean of -1.83 and SD of 1.09 for weight and a Z-score mean of -1.81 and 1.4 SD for height.

Bivariate correlation analysis of knowledge scores and Z-scores of WFA and HFA being 0.558 and 0.273 respectively, both being highly significant (at p<0.01). The simple Linear Regression model, for WFA and HFA both being statistically highly significant at (p<0.0001), which is similar to a study done in Bangladesh by Azizur Rehaman and soma choudhary taking only HFA, which showed statistically significant bivariate correlation of -0.6316 and linear regression model also being significant at p=0.036. Hence, establishing the fact that knowledge of the mother is the independent and significant factor influencing nourishment status of child, along with good feeding practices.

CONCLUSION: A significant percentage of children are suffering from PEM 39.3% wasted and 48.7% stunted. The association of mother's knowledge with the nourishment of child is significantly related at p<0.0001. Education of mothers regarding basic nutritional requirements of child can do wonders in preventing malnutrition. Intense strengthening of ICDS services and inter-sectorial co-ordination for better implementing of the program is required to tackle the problem effectively.

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LIMITATIONS: The study period was limited and sample size was small, hence difficult to generalize the results. A pre and post-test evaluation with health education to mothers could have been done. Diet survey of children and its assessment should have been done.

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		Number	Percent	Mean	Std. deviation
Weight for age (WFA)	normal	93	62%	-1.59	1.32
	moderate	37	24.6%		
	severe	20	13.4%		
Height for age (HFA)	Normal	79	52.6%	-1.55	2.01
	Moderate	33	22%		
	severe	38	25.4%		
Table 1: Distribution according to WHO standards (Z-scores) of weight for age and height for age					

Sl. no.	Variable		Enrolled %	Undernourished	
				WFA%	**HFA%**
1	**Age (months)**	13-24	42(28%)	13(8.7%)	18(12%)
		25-36	40(26.7%)	18(12%)	17(11.3%)
		37-48	27(18%)	12(8%)	17(11.3%)
		49-60	27(18%)	10(6.7%)	14(9.3%)
		61-72	14(9.3%)	6(4%)	7(4.7%)
		Total	**150(100%)**	**59(39.3%)**	**73(48.7%)**
2.	**Sex**	Male	77(51.3%)	25(16.7%)	34(22.7%)
		Female	73(48.7%)	34(22.7%)	39(26%)
		Total	**150(100%)**	**59(39.3%)**	**73(48.7%)**
3.	**Religion**	Hindu	84(56%)	30(20%)	36(24%)
		Muslim	66(44%)	29(19.3%)	37(24.7%)
		Total	**150(100%)**	**59(39.3%)**	**73(48.7%)**
4.	**Socio-economic status**	Class I	47(31.3%)	15(10%)	16(10.7%)
		Class II	42(28%)	13(8.7%)	19(12.7%)
		Class III	48(32%)	21(14%)	27(18%)
		Class IV	10(6.7%)	7(4.7%)	8(5.3%)
		Class V	3(2%)	3(2%)	3(2%)
		Total	**150(100%)**	**59(39.3%)**	**73(48.7%)**
Table 2: Distribution of socio-demographic parameters and nourishment status of the children under study					

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Sl. no	Variable		Number	Undernourished		X² (P value)
				WFA	HFA	
1.	Mothers Literacy status	Illiterate	103 (68.6%)	44(29.3%)	52(34.7%)	P> 0.05
		Literate	47 (31.3%)	15(10%)	21(14%)	
		Total	150 (100%)	59(39.3%)	73(48.7%)	
2.	Mothers occupation	Homemaker	134 (89.3%)	54 (36%)	67 (44.7%)	P> 0.05
		Laborer	6 (4%)	2 (1.3%)	2 (1.3%)	
		Others	10 (6.7%)	3 (2%)	4 (2.7%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
3.	Fathers Literacy status**	Illiterate	108 (72%)	46 (30.7%)	59 (39.3%)	P<0.05, only for stunting
		Literate	42 (28%)	13 (8.7%)	14 (9.3%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
4.	Fathers occupation	Office work	8 (5.3%)	0	2 (1.3%)	P>0.05
		Laborer	55 (36.7%)	25 (16.7%)	32 (21.3%)	
		Professional	7 (4.7%)	33 (22%)	36 (24%)	
		Others	80 (53.3%)	1 (0.7%)	3 (2%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
5.	Type of family	Nuclear	58 (38.7%)	21 (14%)	26 (17.3%)	P>0.05
		Joint	92 (61.3%)	38 (25.3%)	47 (31.3%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
6.	Age of mother during pregnancy	<20	20 (13.3%)	1 (0.7%)	1 (0.7%)	P>0.05
		20-25	102 (68%)	47 (31.3%)	64 (42.7%)	
		25-30	20 (13.3%)	10 (6.7%)	7 (4.7%)	
		>30	8 (5.3%)	1 (0.7%)	1 (0.7%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
7.	Birth weight of child**	<2.5kg	64 (42.7%)	31 (20.7%)	33 (22%)	P<0.05, only for underweight
		>2.5kg	86 (57.3%)	28 (18.7%)	40 (26.7%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
8.	Birth order	1	75 (50%)	33 (22%)	39 (26%)	P>0.05
		2	56 (37.3%)	22 (14.7%)	26 (17.3%)	
		>2	19 (12.6%)	5 (2.7%)	8 (5.4%)	
		Total	150 (100%)	59 (39.3%)	73 (48.7%)	
Table 3: Table showing the distribution according to child's mother's and father's literacy and occupation details						

** Significant at $p<0.05$ by x^2 test.

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Sl. no	Question	Response	Number %
1.	Should colostrum be fed?	Yes	141 (94%)
		No	09 (6%)
2.	Ideal weaning age at 6 months?	Yes	91 (60.7%)
		No	59 (39.3%)
3.	List of weaning foods?	Valid	150 (100%)
		Invalid	0
4.	Frequency of feeds	>3	66 (44%)
		3 & less	84 (56%)
5.	Heard of PEM?	Yes	77 (51.3%)
		No	73 (48.7%)
6.	Does insufficient food cause malnutrition?	Yes	73 (48.7%)
		No	77 (51.3%)
7.	Lack of food hygiene can contribute?	Yes	67 (44.7%)
		No	83 (54.3%)
8.	Poverty leads to PEM?	Yes	66 (44%)
		No	84 (56%)
9.	Seen in any SES children?	Yes	58 (38.7%)
		No	92 (61.3%)
10.	Poor environment leads to malnutrition?	Yes	58 (38.7%)
		No	92 (61.3%)
11.	Premature termination of breast feeding	Yes	51 (34%)
		No	99 (66%)
12.	Poor maternal health leads to PEM?	Yes	47 (31.3%)
		No	103 (68.7%)
13.	Management of diarrhea with ORS?	Yes	57 (38%)
		No	93 (62%)
14.	Preparation of ORS?	Yes	74 (49.3%)
		No	76 (50.7%)
15.	Usage of growth charts?	Yes	74 (49.3%)
		No	76 (50.7%)

Total score Obtained	Number %	Undernourished	
		WFA	HFA
Good (>10)	63 (35.3%)	36 (24%)	29 (19.3%)
Moderate (5-10)	58 (38.7%)	20 (13.3%)	28 (18.7%)
Poor (<4)	39 (26%)	3 (2%)	16 (10.7%)
X^2 (P value)		$P<0.0001$ Highly significant	$P<0.0001$ Highly significant
Table 4: Distribution according to knowledge questions, their responses and total knowledge scores of mothers with the nourishment status			

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Pearson correlation	Score	WFA	HFA
Score	1	0.646*	0.289*
WFA	0.646*	1	0.523*
HFA	0.289*	0.523*	1
Table 5: Association of knowledge scores and Z-scores by bi-variate correlation			

*correlation is significant at the 0.01 level (2-tailed)

MODEL SUMMARY:

Model	R	R square	Adjusted R square	Std. Error of the estimate
1 (WFA)	0.646**	0.417	0.413	1.014
2 (HFA)	0.289**	0.084	0.077	1.939

ANOVA:

Model		Sum of squares	Df	Mean square	F	P value
1 (WFA)	Regression	108.893	1	108.893	105.796**	0.0001**
	residual	152.332	148	1.029		
	total	261.225	149			
2 (HFA)	Regression	50.803	1	50.803	13.500**	0.0001**
	Residual	556.945	148	3.763		
	total	607.74	149			

CO-EFFICIENTS:

		B	Std. Error	Beta	T	P value
1	(Constant)	-3.738	0.224	0.0646	-16.652	0.0001
	Score	0.257	0.025		10.286**	0.0001
2	(Constant)	-3.022	0.429	0.289	-7.039	0.0001
	Score	0.175	0.048		3.674**	0.0001
Table 6: Linear Regression Model analysis, with independent variable of knowledge scores of mother and dependent variables are Z-scores of Weight for age and Height for Age						

** Highly significant at P=0.0001

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