



## Prevalence and determinants of Protein Energy Malnutrition (PEM) among children under five years of age in rural communities of Lahore, Pakistan.

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**ABSTRACT... Objectives:** To investigate the prevalence and determinants of Protein energy malnutrition among children under five years of age in rural areas of Lahore, Pakistan. **Study Design:** Cross-sectional study. **Setting:** Four Rural Communities (Hussainabad, Shershah Colony, Dubai Town and Bhotia Pind) of Lahore, Pakistan. **Period:** September 2016 to March 2017. **Material & Methods:** Convenient sampling technique was used to collect data. Anthropometric measures were obtained from children under five years of age. **Results:** Prevalence of PEM was found to be 52.8% in children under five years of age in the rural communities of Lahore, Pakistan. Significant association was found in PEM and number of siblings, mother's literacy, father's educational level, socioeconomic status, Knowledge of mother regarding diet, housing condition. So, all these factors are considered as significant determinants of PEM. **Conclusion:** More children suffer from the burden of PEM. Risk factors like age, sex, type of family, number of siblings, mother's literacy, father's educational level, socioeconomic status, Knowledge of mother regarding diet, housing condition contribute greatly to develop PEM. There is a need to take measures to prevent the nation from this suffering. Steps must be taken to implement policies to prevent PEM. Government should launch educational interventions on large scale to alleviate this suffering. Health professional must pay special attention to this debilitating issue.

**Key words:** Malnutrition, Nutritional Status, Protein Energy, PEM, Under-Five.

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### INTRODUCTION

The term malnutrition refers to inadequate supply of nutrients and energy to the body cells as compared to body requirement for maintaining growth and ensuring daily functions of body.<sup>1</sup> Malnutrition connotes a persons' state of inadequate, excessive or disturbed consumption of energy in the form of nutrients. Malnutrition is categorized as under-nutrition and over-nutrition whereas, under-nutrition further grouped into stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient insufficiencies.<sup>2</sup> Protein energy malnutrition includes clinical disorders that result from lack of protein/caloric intake and range in severity from mild to severe degree.<sup>3</sup> Severe types of PEM known as Kwashiorkor and Marasmus result in higher fatality rate approximately 50-60%. Children suffer more in PEM and prevalence

in Asia is 70% among children.<sup>4</sup> Globally, PEM is more prevalent in developing countries due to various economic, social and situational factors.<sup>5</sup> In developing countries, under-nutrition is a serious health issue affecting the nutritional status of children.<sup>6</sup>

Pakistan is one of the developing country and facing the challenges of PEM. In spite of increased per capita food availability, crisis of PEM still prevail since last 20 years.<sup>7</sup> In 1997-98, approximately 8 million children were malnourished. The major contributing factors towards PEM are low birth weight due to inadequate intake of mothers, poverty, unemployment and illiteracy. True determinants of PEM are anthropometric measures which actually reflect the severity of disorder. Indirectly, anthropometric measures give a reflection of life status and quality.<sup>8</sup>

Characteristic features of PEM in children are inability to gain weight, slow growth rate, behavioral manifestations like mood swings, irritability, anxiety, attention deficit hyperactivity syndrome etc. In addition to macronutrient deficiencies other elements like iron, zinc, vitamin A and iodine also contribute to PEM. Clinical manifestations related to these elements are also severe like (fatigue, anemia, low cognitive function, headache, glossitis, and nail changes) related to iron deficiency, (goiter, developmental delay, and mental retardation) iodine insufficiency, (poor growth, rickets, and hypocalcemia) deficiency of Vitamin D and, (anemia, dwarfism, hepatosplenomegaly, hyperpigmentation and hypogonadism, acrodermatitis enteropathica, diminished immune response, poor wound healing) related to Zinc deficiency.<sup>9</sup>

Millennium Development Goals (MDG) report depict the ratio of one in every five children suffering from PEM in developing countries and consider PEM as a big challenge contributing to child morbidity and mortality.<sup>10</sup> Fourth millennium developmental goal aimed to improve child survival and reduce child mortality by combating malnutrition till 2015 with special considerations or children under five year of age.<sup>11</sup>

The purpose of this study is to investigate the prevalence of Protein energy malnutrition among children under five years of age in rural areas of Lahore, Pakistan.

## MATERIAL & METHODS

A cross sectional study design was used to collect data about PEM at the rural areas of Lahore. The study was done in four rural communities (Hussainabad, Shershah Colony, Dubae Town and Bhobtia Pind) of Lahore. Convenient sampling technique was used to collect data. Sample size was calculated on the basis of 4PQ/L2<sup>12</sup> assuming the protein energy malnutrition (PEM) prevalence (P) of 50% in children (1-5 years) at 95% confidence interval. Sample size of the study was 400 children under five years of age. Inclusion criteria of study was all children residing in the selected rural areas having age less than five years and unhealthy conditions.

A predesigned and pretested questionnaire was used to collect demographic and personal information like age, sex, type of family, number of siblings, mother's literacy, father's educational level, socioeconomic status, Knowledge of mother regarding diet, housing condition and environmental sanitation.

Anthropometric measurement like weight of child in Kg was obtained by using Salter Speedo Mechanical Bathroom Scale with minimum clothing and without footwear. Prasad's scale<sup>13</sup> was used to determine socioeconomic status.

IAP<sup>14</sup> classification was done to categorize PEM in children. IAP classification measures weight for age in percentage to differentiate protein energy malnutrition.

Data was analyzed by using SPSS version 24. Chi-square test was applied to calculate significant p value.

## RESULTS

400 children under five years of age were studied, out of which the prevalence of PEM was found to be 52.8%. Table-I show the age and sex wise distribution of PEM.

Figures in parenthesis show percentages.

Age-  $\chi^2 = 21.551$ ,  $p < 0.001$  Sex-  $\chi^2 = 7.03$ ,  $p = 0.008$

Results of the study depict that more girls than boys suffer with PEM as Table#2 show the 56.8% of girls and 49.3% of boys have PEM ( $p = .008$ ).

Grade I protein energy malnutrition was found to be 32.2%; Grade II was 18% and Grade III 2.5%. Table-II depicts the relative percentages.

Findings regarding socio-demographic variables (Table-III) revealed that 48% children belonged to nuclear family and 51% were from joint family system. PEM was found to be more prevalent (57.4%) in nuclear than (48.2%) with ( $p = .003$ ).

Likewise, the ratio of PEM was found significantly higher (60%) in children with more siblings

than (43%) in children having 1-2 siblings with significant value ( $p < .001$ ).

Results also depict that children of mothers who were illiterate were having more PEM (58%) than children of literate mothers (48%) with p value of ( $p = .008$ ) so that an association was found between literacy rate of mother and children PEM.

Father's educational level was also significantly linked with children PEM as fathers who were illiterate or primary education having more children with PEM (60.4%) than educated fathers as depicted in Table-IV.

Socioeconomic status in this study depicted no

child belonging to class I. Children belonging to lower socioeconomic status were significantly malnourished ( $p = 0.009$ ) as revealed in Table-IV. Findings of the study show that 51.5% of mothers have inadequate dietary knowledge and PEM was found more prevalent (55.8%) among children of such mothers.

Housing and environmental conditions were found to have significant impact on PEM as children living in poor housing condition were affected more (72.2%).

Table-IV gives the detailed description of socio-demographic characteristics.

Age (Years)	Male		Female		Total	
	Children Studied	Under Weight	Children Studied	Under weight	Children Studied	Under Weight
1-5	217 (54.2)	107 (49.3)	183 (45.7)	104 (56.8)	400 (100)	211 (52.8)

**Table-I**

PEM	Male	Female	Total
Grade I (mild)	71(55)	58(44.9)	129(32.2)
Grade II (moderate)	30(40.5)	42(56.7)	72(18)
Grade III (severe)	6 (60)	4(40)	10(2.5)
<b>Total</b>	217(54.2)	183(45.7)	400(100)

**Table-II**

Variables	Normal Weight	Under Weight	Total	Significance
<b>Type of family</b>				
Nuclear	83(42.5)	112(57.4)	195(48.0)	$\chi^2 = 9.03$ $p = 0.003$
Joint	106(51.7)	99(48.2)	205(51.2)	
<b>Number of siblings</b>				
1-2	99(56.8)	75(43)	174(43.5)	$\chi^2 = 10.862$ $p < 0.001$
$\geq 3$	90(39.8)	136(60)	226(56.5)	
<b>Mother's literacy</b>				
Illiterate	78(41.9)	108(58.0)	186(46.0)	$\chi^2 = 2.916$ $p = 0.088$
Literate	111(51.8)	103(48)	214(53.5)	
<b>Father's education</b>				
Illiterate & Primary school	95(39.5)	145(60.4)	240(60.0)	$\chi^2 = 12.857$ $p < 0.001$
Middle school & above	94(58.8)	66(41.3)	160(40.0)	
<b>Socioeconomic Status*</b>				
II	25(65.7)	13(34.2)	38(9.5)	$\chi^2 = 11.54$ $p = 0.009$
III	50(48.5)	53(51.4)	103(25.8)	
IV	60(44.8)	74(55.2)	134(33.5)	
V	54(33.2)	71(56.8)	125(31.2)	
<b>Dietary knowledge to Mother</b>				
Adequate	90(46.3)	104(53.6)	194(48.5)	$\chi^2 = 0.215$ $p = 0.643$
Inadequate	91(44)	115(55.8)	206(51.5)	
<b>Housing &amp; Environmental sanitation</b>				
Poor	30(27.7)	78(72.2)	108(27)	$\chi^2 = 59.072$ $p < 0.001$
Satisfactory	62(37.1)	105(62.8)	167(41.8)	
Good	97(77)	28(22.5)	125(31.2)	

**Table-IV.**

Percentages shown in parenthesis

## DISCUSSION

Study finding revealed the prevalence of PEM in children under five years of age in rural communities of Lahore and was found 52.8%. In contrast to a study the prevalence of PEM was found to be 56% in rural areas of Pakistan.<sup>15</sup> Results also show that more girls than boys suffer from PEM and ratio was 56.8% and 49.3% respectively. Prevalence of PEM was calculated same in both sexes without any differences.<sup>16</sup>

Finding of study revealed the severity of PEM according to IAP classification system. Severity of PEM was found to be 32.2% children with mild or Grade I, 18% with moderate or Grade II and Grade III was 2.5%. In accordance to 33% in Grade I, 18.3% in Grade II and 3.5% with Grade III of PEM in children under five years of age.<sup>17</sup> PEM was found more prevalent (57.4%) in nuclear than in joint family system (48.2%) with ( $p=.003$ ) which is supported by 63.8% and 52.9% in nuclear and joint family respectively.<sup>18</sup> PEM was found highest in children having more siblings (60%) than (43%) in children having 1-2 siblings with significant value ( $p<.001$ ). The findings are supported by a study reflecting more cases of PEM in children having 3-4 siblings.<sup>19</sup>

Study also depicted an association between mother's literacy and PEM. It was found that PEM was more in children of illiterate mothers (58%) and a direct impact of fathers' education was also revealed. Similar results associated with mother's literacy were found in a study.<sup>15</sup> PEM was found more prevalent in low socioeconomic status and significant results were obtained as ( $p=.009$ ). As more children from poor families were found malnourished.<sup>20</sup>

PEM was found more in children whose mothers have inadequate dietary knowledge as results revealed that PEM was 55.8% in such children. Findings are supported by a study that revealed significant influence of mother's dietary knowledge on PEM.<sup>21</sup>

It was found that PEM was more prevalent in

children living in poor housing and environmental conditions as 72.2% children with poor housing conditions suffered from PEM. Findings are supported by study that showed significant impact of housing condition on children PEM.<sup>22</sup>

## CONCLUSION

PEM is more prevalent in Pakistan as 52.8% children suffer with this problem. In long run PEM has great contribution towards different child ailments and increasing child mortality. There is a need to take measures to prevent the nation from this suffering. Steps must be taken to implement policies to prevent PEM. Government should launch educational interventions on large scale to alleviate this suffering. Health professional must pay special attention to this debilitating issue.

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## REFERENCES

1. World Health Organization, United Nations University. **Protein and amino acid requirements in human nutrition**. World Health Organization; 2007 Dec 15.
2. Unicef. WHO & The World Bank. 2012. **Levels and trends in child malnutrition: Joint child malnutrition estimates**. 2016 Oct.
3. Franco VH, Hotta JK, Jorge SM, Dos Santos JE. **Plasma fatty acids in children with grade III protein-energy malnutrition in its different clinical forms: marasmus, marasmic kwashiorkor, and kwashiorkor**. Journal of Tropical Pediatrics. 1999 Apr 1;45(2):71-5. doi:10.1093/tropej/45.2.71. PMID 10341499.
4. **Food and agriculture organization of the United Nations. Undernourishment around the world. In: The state of food insecurity in the world 2004**. Rome: The Organization; 2004.
5. Grover Z, Ee LC. **Protein energy malnutrition**. Pediatric Clinics. 2009 Oct 1; 56(5):1055-68.
6. Prasot RM, Verma SK, Kashyap S, Kanaujiya MK. **An epidemiological study of Protein Energy Malnutrition (PEM) among 1-6 years children in rural Lucknow, Uttar Pradesh, India**. IOSR J Dental Med Sci. 2014 Mar; 13(3):10-4.

7. **National Institute of Health, Government of Pakistan.** National Nutrition Survey Report 1985–1987. NIH/GOP, Islamabad, 1988.
8. Raju D, D'Souza R. **Child undernutrition in Pakistan: what do we know?**. The World Bank; 2017 May 4.
9. Shashidhar, H. R. (2016). **Protein energy malnutrition**. Retrieved on 5th June, 2017 from <http://emedicine.medscape.com/article/985140-clinical> [7] Ndukwu, C. I., Egbuonu, I., Ulasi, T. O. and Ebenebe, J. C. (2013).
10. Sachs JD. **From millennium development goals to sustainable development goals**. The Lancet. 2012 Jun 9; 379(9832):2206-11.
11. Waage J, Banerji R, Campbell O, Chirwa E, Collender G, Dieltiens V, Dorward A, Godfrey-Faussett P, Hanvoravongchai P, Kingdon G, Little A. **The millennium development goals: A cross-sectoral analysis and principles for goal setting after 2015: Lancet and London International Development Centre Commission**. The lancet. 2010 Sep 18; 376(9745):991-1023.
12. Mahajan B K. **Methods in biostatistics, Jaypee Publishers**, 7th Edition 2010 (84).
13. Dudala SR, Reddy KA, Prabhu GR. **Prasad's socio-economic status classification-An update for 2014**. Int J Res Health Sci. 2014 Jul 31; 2(3):875-.
14. Khadilkar VV, Khadilkar AV, Choudhury P, Agarwal KN, Ugra D, Shah NK. **IAP growth monitoring guidelines for children from birth to 18 years**. Indian Pediatr. 2007 Mar 1; 44(3):187-97.
15. Shah SM, Selwyn BJ, Luby S, Merchant A, Bano R. **Prevalence and correlates of stunting among children in rural Pakistan**. Pediatrics international. 2003 Feb 1; 45(1):49-53.
16. Qureshi SK, Nazli H, Soomro GY. **Nutritional status in Pakistan**. Pakistan institute of development economics (PIDE); 2001 Jan.
17. Kumar T, Deswal BS. **An epidemiological study of protein energy malnutrition among children below six years' age in an urban slum of Gurgaon, Haryana, India**. International Journal of Community Medicine and Public Health. 2016 Dec 24; 3(9):2431-6.
18. Singh AK, Jain S, Bhatnagar M, Singh JV, Garg SK, Chopra H, Bajpai SK. **Socio-demographic determinants of malnutrition among children of 1-6 years of age in rural Meerut**. Indian J Prev Soc Med. 2012 Jul; 43(3):278-82.
19. Sengupta, Paramita., Philip, Nina and Benjamin, A. I. **Epidemiological correlates of under-nutrition in under-5years children in an urban slum of Ludhiana**. Health and Population: Perspectives and Issues 2010, Vol. 33 (1), 1-9.
20. Bhavsar S, Hemant M, Kulkarni R. **Maternal and environmental factors affecting the nutritional status of children in Mumbai urban slum**. International Journal of Scientific and Research Publications. 2012 Nov;2(11):1-9.
21. Hirani SA. **Malnutrition in young Pakistani children**. Journal of Ayub Medical College. 2012; 24(2):150.
22. Arif GM, Nazir S, Satti MN, Farooq S. **Child malnutrition in Pakistan: Trends and determinants**. Pak Inst Dev Econ. 2012 Jul;2012:1-8.

### AUTHORSHIP AND CONTRIBUTION DECLARATION

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1	Zafar Iqbal Bhatti	Conceived designed and did statistical analysis.	
2	Khuram Nawaz	Did data collection and manuscript writing.	
3	Muhammad Ali	Did review and final editing of manuscript.	