

ORIGINAL ARTICLE

Immunization status and childhood morbidities as determinants of PEM among under-five children in slums of KanpurNeha Agarwal¹, Ram Pravesh Sharma², Suresh Chandra³, Punit Varma⁴, Tanu Midha⁵, Seema Nigam⁶¹Resident, ²Professor and Head, ^{3,6}Professor, ⁴Associate Professor, ⁵Assistant Professor, Department of Community Medicine, GSVM Medical College, Kanpur, India

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Citation

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Abstract

Introduction: Childhood morbidities like Acute Respiratory Infections (ARI), diarrhoea and malnutrition are very common. As per NFHS-3, only 23% children aged 12-23 months were fully immunized in Uttar Pradesh. 9% under-five children had diarrhoea and 7.1% had ARI. **Objective:** To assess the impact of immunization status and childhood morbidities on nutritional status of under five children. **Material & Methods:** A cross sectional study was carried out among under five children in slums of Kanpur, using 30 cluster sampling technique. The sample size was calculated to be 375. From each slum, 13 subjects were studied thus giving a total sample size of 390. A pre-designed and pre-tested questionnaire was used to illicit the requisite information from the mothers of study subjects. Weight was recorded using standard technique for the same. Protein Energy Malnutrition (PEM) was graded using IAP classification. Analysis of data was done using percentages and Chi square test. **Results:** The overall prevalence of PEM was found to be 54.87%. Malnutrition was found to be significantly higher (69.23%) among unimmunized study subjects ($p \leq 0.05$). Among children who reported episodes of ARI and diarrhoea within last 1 month, 67.86% and 78.52% subjects respectively were malnourished. The association between PEM and these childhood morbidities was found to be statistically significant ($p \leq 0.05$). **Conclusion:** Prevention of diarrhoea and ARI and complete immunization of children under five years of age through National programmes and other health measures is the need of the hour for combating malnutrition in under five.

Key Words

PEM; Under-Five; Diarrhea; Immunization; Morbidity; Slum

Introduction

Childhood malnutrition is a significant health problem in developing countries and is one of the main causes of infant and child morbidity and mortality. Protein energy malnutrition (PEM), which is manifested as decrease in weight for age or height for age or weight for height, is the most widely prevalent form of malnutrition among under-five children. Both malnutrition and infection act synergistically. It is a vicious circle – infection

contributing to malnutrition and malnutrition contributing to infection [1].

As per NFHS-3, 48% of the children below five years are stunted, 42.5% are underweight and 19.8% are wasted in India [2]. In Meerut, overall there were an estimated 44% stunted, 10% wasted and 28% underweight under-five children. Of these, 46% stunted, 9% wasted and 26% underweight children were living in slums [2]. Studies by Pant Bhawna *et al* (2013) [3] in Meerut and Prasot Ram Milan *et al* (2014) [4] in Lucknow found the prevalence of PEM to be 53.57% and 54.8% respectively.

India also contributes to more than 20% of the child deaths in the world. About 1.83 million children die annually before completing their fifth birthday – most of them due to preventable causes [5]. The extent of childhood morbidity and mortality caused by Acute Respiratory Infections (ARI), diarrhoea, malaria, measles and malnutrition is substantial. Out of these, malnutrition is the leading cause as it indirectly predisposes to all other diseases. Only 23% children aged 12-23 months were fully immunized in Uttar Pradesh [2]. 9% under-five children had diarrhea and 7.1% had ARI.

The urban poor, mainly residing in slums, comprise about one-fourth of India's 285 million urban population. Uttar Pradesh, the most populous Indian state, with nearly 11 million urban poor, houses the largest number of urban poor in a single state. United Nation Development Program's (UNDP) Urban Poverty Report, 2009 has pegged the number of slum dwellers in Uttar Pradesh at 44 lakhs [6].

Overcrowding, poor housing, choked drains, high density of insects and rodents, lack of garbage disposal facilities, poor personal hygiene and unhygienic conditions are a hall mark of such slums. Children are the worst victims of these circumstances. Further, the prevailing economic situation in the slums dwellers force them to wean their children on poor quality diet, thereby predisposing them to malnutrition and superimposition of infections/infestation causes mortality. Given the poor immunization coverage and high prevalence of ARI and diarrhea among slum children, the present study was carried out.

Aims & Objectives

To assess the impact of immunization status and childhood morbidities on nutritional status of under-five children.

Material and Methods

A cross-sectional study was carried out among under five children in slums of Kanpur, using 30 cluster sampling technique of WHO. The study was carried out in 30 slums, selected from 380 identified slums of District Kanpur.

The minimum sample size was calculated as 375 using the formula $(n) = Z^2 P(1-P)/d^2$, taking the prevalence of underweight [2] in children under five years as 42.4%, an allowable error of 5% and level of significance as 5%. Sample size was rounded off to obtain a number completely divisible by 30, thus giving a sample size of 390.

From each slum, 13 subjects were studied thus giving a total sample size of 390. The first house in a cluster was selected by going to the centre of a cluster, spinning a pencil, and selecting the first house in the direction of the pencil. Each next household was selected sequentially until a total of 13 eligible children in the age group 0-60 months were covered. If there were more than one sibling in a house, then the youngest sibling was chosen for the study.

All mothers were explained the purpose of study and their consent was taken for the same. A pre designed and pre tested questionnaire was used to illicit the requisite information. Mothers were interviewed regarding immunization status and any episode of illness in the past 1 month in their under-fives. Weight was recorded using standard technique for the same. Analysis of data was done using percentages and Chi square test. Protein Energy Malnutrition (PEM) was graded using IAP classification [1].

INDIAN ACADEMY OF PEDIATRICS CLASSIFICATION OF PEM:

NUTRITIONAL STATUS	WEIGHT FOR AGE (%)
Normal	> 80%
Grade I malnutrition (mild)	71-80%
Grade II malnutrition (moderate)	61-70%
Grade III malnutrition (severe)	51-60%
Grade IV malnutrition (very severe)	≤ 50%

Results

A total of 390 under five children were studied. Out of these, 188 (48.21%) were males and 202 (51.79%) were females. As per IAP classification, 45.13% subjects had normal weight for age while 54.87% had PEM. There were 33.08%, 19.23% and 2.56% subjects with Grade I, II and III malnutrition. No study subject had Grade IV malnutrition ([Table 1](#)).

[Table 2](#) shows that 38.72% children were fully immunized, 54.62% were partially immunized and 6.67% were unimmunized. PEM was significantly higher (69.23%) among unimmunized study subjects as compared to fully immunized counterparts (40.4%). A statistically significant association was found between PEM and the immunization status of study subjects.

[Table 3](#) shows significant association between PEM and diarrhoea. Subjects with history of diarrhoea in last 1 month were more (78.52%) malnourished than those without diarrhoea (42.35%). [Table 4](#) reveals that among children who reported episodes of ARI within last 1 month, 67.86% were malnourished as compared to those without ARI (52.69%). The

association between PEM and ARI was found to be statistically significant. [Table 5](#) shows that 56.3% subjects were malnourished among those with a positive history of passing worms in stools. The prevalence of PEM among subjects with no history of passing worms in stools in last 1 month was observed to be 54.12%. However, the association between the two was not found to be statistically significant.

Discussion

The present study shows that 54.87% subjects had PEM as per IAP classification. Mallik S *et al* (2006) [7] in Kolkata, Ahmad Ehtisham *et al* (2011) [8] in Aligarh, Narkhede Vinod *et al* (2011) [9] in Nagpur & Singh A K *et al* (2012) [10] in Meerut reported almost similar findings i.e. 51%, 56.4%, 52.23% & 57.4% PEM respectively in their studies.

The present study also revealed that prevalence of Grade I, II and III malnutrition among under-fives was 33.08%, 19.23% and 2.56% respectively. No subject had grade IV malnutrition. Almost similar findings with regards to Grades of PEM were observed by Narkhede Vinod *et al* (2011) [9] with 32.18% children in grade I, 16.09% in grade II and 3.46% in grade III. Studies carried out by Bhatia V *et al* (2007) [11] in Chandigarh and Ahmad Ehtisham *et al* (2011) [8] in Aligarh also revealed almost similar findings in the trend.

In our study, 38.72% children were fully immunized, 54.62% were partially immunized and 6.67% were unimmunized. Study by Agrawal SC *et al* (2014) [12] reported that the number of children with complete, partial and no immunization were 41.4%, 44.8% and 13.8% respectively. Similarly, Trivedi R *et al* (2014) [13] found that out of all the children covered, 72.4 % were fully immunized and 21.9 % were partially immunized and 5.7% were not immunized. The corresponding figures in a study in urban slum of Mumbai, were reported to be 46.4% for fully immunized and 7.2% for unimmunized subjects by Saiprasad B *et al* (2013) [14].

Partially immunized and unimmunized children are at a greater risk of PEM, as they are not protected against vaccine preventable diseases. Such children enter the vicious cycle of malnutrition and infection. In our study, the prevalence of malnutrition in fully immunized, partially immunized and unimmunized subjects was found to be 28.5%, 63.08% and 8.4% respectively. While the corresponding figures in a study in Varanasi slums by Baranwal K *et al* (2011) [15] were 61.7%, 68.4% and 72.7% respectively.

Childhood morbidities are often associated with increased nutritional demand. The condition is further worsened by decreased appetite and restriction of food by care givers. Repeated episodes of childhood illnesses also reflect poor standard of sanitation and poor environmental conditions.

Our study revealed that 78.52% children with diarrhea had PEM while among those with ARI, the prevalence of PEM was 67.86%. Out of the total malnourished subjects, 35.51% subjects were passing worms in stools in past 1 month. This figure correlates with the findings of Bhatia V *et al* (2007) [11] in Chandigarh, where 20.45% malnourished children were passing worms in stools in the last 6 months.

The present study thus revealed that the various type of infections among under-five age group children predispose them to malnutrition and this is also corroborated by the observations made by Baranwal K *et al* (2011) [15], who reported higher prevalence of PEM (82.0%) in children who gave history of recurrent illness, as compared to those not having recurrent illness (PEM 57.9%). Narkhede V *et al* (2012) [9] observed that in Nagpur, prevalence of undernutrition was higher among children having ARI (61.97%), followed by those with diarrhoea (57.14%). The association was found to be statistically significant when children with past illness were compared to those without past illness

Conclusion

As per IAP classification, 54.87% subjects were malnourished while 45.13% had normal nutritional status. The prevalence of Grade I, II and III malnutrition was 33.08%, 19.23% and 2.56% respectively. No study subject had Grade IV malnutrition. Immunization status was found to be significantly associated with PEM. Diarrheal and ARI episodes in past 1 month were significantly associated with malnutrition.

Recommendation

An effective intervention to safeguard nutrition and health is high immunization coverage against diseases and infections leading to deaths. The communities need to be targeted to reach 100% immunization coverage. Priority must be given to health education on home management of diarrhoea with oral rehydration solution and home available fluids to combat severe dehydration. Together with oral rehydration solution, the correct feeding of a child with diarrhoea should also be

emphasized. NGOs already working in urban areas for other projects can be utilized to provide information, education and communication support for child care.

Steps should be taken to control Acute Respiratory Infections (ARI) and other minor ailments at the community level with the active involvement of the family and community. Periodical de-worming of under five children should be done.

Limitation of the study

Laboratory investigations and dietary survey could not be done due to financial constraints. Hence, only anthropometric measurements were taken to assess PEM in children.

Relevance of the study

Immunization status and childhood morbidities like ARI, diarrhoea and worm infestation are important factors associated with protein energy malnutrition in India.

Authors Contribution

NA, RPS, SC: Conception and design, acquisition of data, or analysis and interpretation of data; drafting the article and revising it; and final approval of the version to be published. PV, TM, SN: analysis and interpretation of data; drafting the article and revising it; and final approval of the version to be published.

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Tables

TABLE 1 NUTRITIONAL STATUS OF STUDY SUBJECTS AS PER IAP CLASSIFICATION

Nutritional status	Study subjects	
	No.	%
Normal	176	45.13
Grade I	129	33.08
Grade II	75	19.23
Grade III	10	2.56
Grade IV	-	-
Total	390	100

TABLE 2 PEM IN RELATION TO IMMUNIZATION STATUS

Immunization status	Total	PEM	
	No.	No.	%
Fully immunized	151	61	40.40
Partially immunized	213	135	63.38
Unimmunized	26	18	69.23
Total	390	214	54.87

$\chi^2 = 21.168$, C.I.= 95%, d.f.= 2, $p \leq 0.05$

TABLE 3 PEM IN RELATION TO DIARRHOEA IN PRECEDING 1 MONTH

Diarrhea	Total	PEM	
	No.	No.	%
Present	135	106	78.52
Absent	255	108	42.35
Total	390	214	54.87

$\chi^2 = 45.174$, C.I.= 95%, d.f.=1, $p \leq 0.05$

TABLE 4 PEM IN RELATION TO ARI IN PRECEDING 1 MONTH

ARI*	Total	PEM	
	No.	No.	%
Present	56	38	67.86
Absent	334	176	52.69
Total	390	214	54.87

$\chi^2 = 3.861$, C.I.= 95%, d.f.=1, $p \leq 0.05$

TABLE 5 PEM IN RELATION TO WORM INFESTATION IN PRECEDING 1 MONTH

Worm infestation	Total	PEM	
	No.	No.	%
Present	135	76	56.30
Absent	255	138	54.12
Total	390	214	54.87

$\chi^2 = 0.093$, C.I.= 95%, df=1, $p > 0.05$