Prevalence and Determinants of Under-nutrition among School-aged Children in an Urban Slum in India

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Abstract

School-aged children constitute as much as 20% of the Indian population. The age group of 5-14 years is often regarded as school-age. The foundation of good health and sound mind is laid during this period. It is widely known that under-nutrition is rampant amongst children of this age group. However, even large scale surveys such as National Family Health Survey (NFHS) conducted throughout India have not generated any information on prevalence of under-nutrition among school-aged children. While NFHS 1 covered nutritional status of children under 4 years of age, both NFHS 2 and 3 covered the same for children under 3 years of age. There is a genuine dearth of community-based studies regarding prevalence of and factors influencing under-nutrition among school-aged children. This paucity of studies is even more pronounced when it comes to children residing in urban slums of India. The objectives were to study the prevalence of and factors influencing under-nutrition among urban slum-dwelling children. This Cross sectional Study was done in an urban slum area in Meerut city over a period of Five months (February 2011-June 2011) among children in the age group of 5-14 years. Sample Size was Four hundred and Sampling Technique used was Simple Random Sampling. Data was collected by conducting house to house visits, measuring height and weight of children and also through interview using a structured questionnaire.

The prevalence of underweight in children was found to be 48.0% (95% CI 43.00-52.99). 56% of the undernourished children were boys. Significantly higher prevalence rates were observed among children having unpiped water supply to the house ([P<0.01], OR=4.64 (95% CI 1.52-14.13)), having suffered from diarrhoea in last 1 year ([P<0.001], OR=4.93 (95% CI 3.22-7.55)), having history of passing worms in last 6 months ([P<0.01], OR=2.00 (95% CI 1.25-3.20)), and among those children who had never taken deworming ([P<0.001], OR=2.95 (95% CI 1.83-4.76)).

The study concluded that, to combat under-nutrition among children in its entirety, good living conditions, along with adequate and good quality food, should be provided to each child.

Key Words: Underweight, Under-Nutrition, School-Aged Children, BMI for age.

Introduction

Children in the age group of 5-14 years are regarded as of school-age. It goes without saying that this period lays the foundation for good health and sound mind in children which persists with them through their lifetime.1

According to recent estimates in developing countries (1996-2005), approximately 146 million children are underweight. Of these 57 million children live in India.2 NFHS-3 (2005-06) states that 43% of children below the age five years are underweight for their age. However, it does not throw light on the prevalence of underweight among school-aged children.3,4 Studies conducted by independent authors in India quote the prevalence of underweight in school-aged children as around 50%.5,6,7

School-age period is marked by rapid growth, the very first sign of which is noticeable in the form of growth spurts. The first growth spurt, known as the preadolescent or mid growth spurt, is seen at around 6-8 years of age.8 This is followed by the adolescent growth spurt which occurs between 10-17 years of age. These growth spurts place extra demands on nutritional requirements. Moreover, adolescent girls need additional iron to compensate for menstrual blood loss.9 Proper food and good nutrition are essential for physical growth, sexual maturation, mental development, performance, productivity, health, and well-being of adolescents.9 The adolescent growth spurt starts at around 10 years in girls and 12 years in boys. The growth velocity peaks at around 12 years in girls and around 16 years in boys. As much as 80% of adolescent growth is completed in early adolescence (10-15 years). Increase in growth demands an equal increase in nutrition which is seldom provided for in developing countries.10

The classification based on weight for age, height for age, and weight for height were primarily devised for quantifying the prevalence of under-nutrition in under-five children. According to the WHO, Body mass index (BMI) is a more appropriate marker of thinness, overweight or obesity in an older child.11 The WHO currently recommends using BMI for age compared to reference standards (NCHS) and defines under-nutrition as <5th Centile of BMI for age.11

There are many factors present in the day to day household setting of children which make them vulnerable to under nutrition. In India, many studies have been conducted to find out the prevalence of under nutrition among children below 5 years of age but similar data among children in the age group of 5-14 years is limited. Moreover, majority of the studies among school-aged children have been conducted within school premises. There are few community-based studies related to this particular age group, particularly when one considers children residing in urban slum areas.

**Objectives**

1. To determine the prevalence of under-nutrition among school-aged children, and

2. To study the factors associated with under-nutrition in school-aged children.

**Material and Methods**

**Study Design:** Cross-sectional study.

**Study Setting:** The study was conducted in a slum area among families which were registered at Urban Health Training Centre of LLRM Medical College, Meerut.

**Study Subjects:** Children of registered families aged 5-14 years.

**Study Period:** The data for this study was collected from February 2011 to June 2011.

**Sample Size:** It was calculated using the formula 
\[ n = \left( \frac{Z \alpha}{p(1-p)} \right)^2 \times \frac{d^2}{r(1-r)} \]  
By taking prevalence of under-nutrition in school aged children as 50% with a relative precision of 10% and \( \alpha \) error 5%, an optimum sample size for the proposed study was calculated as 400.

**Sampling Technique:** There were 1867 registered families having children in the age group of 5-14 years. Children were selected by simple random sampling technique using random number table.

**Data Collection:** House to house visits.

**Data Collection Tools:** Physical measurements and structured questionnaire were utilized to collect the data.

On visiting each house, first an informed consent was obtained verbally from the parents who were willing to enrol their children in the study. Height and weight of each child was measured by means of a measuring tape and weighing scale respectively and other data were recorded by means of a structured questionnaire. The children stood barefoot during the measurement of height and weight. They stood erect on the weighing scale looking in front when the weight was recorded to the nearest 0.5 kg. At the time of measurement of height, the children stood with their head, buttocks and heels aligned against the wall. The tape was applied to the wall and the reading was taken to the nearest 0.1 cm. The nutritional status was assessed by the US Center for Disease Control and Prevention (CDC)-2000 BMI-for-age percentile charts available separately for boys and girls aged 2-20 years. In order to calculate BMI, weight and height of each child was measured. The BMI thus calculated was plotted on the CDC BMI-for-age chart to obtain a percentile ranking. The children who were found to have BMI below the 5th percentile were considered as underweight in accordance with the CDC classification.  

**Data Analysis:** The data was analyzed using SPSS 20. Qualitative variables were described in percentages. Association between qualitative variables was analysed by chi-square test. Odds ratios and 95% confidence interval of the odds ratios were also calculated for the significant factors.

**Results**

The overall prevalence of underweight among children was found to be 48%. 56% of the undernourished children were boys.

**Table 1** describes the distribution of factors influencing underweight in school-aged children and **Table 2** shows the association of underweight with various factors. It was found that the prevalence of underweight was higher among children

**Table 1. Distribution of Factors Influencing Underweight in School aged Children**

<table>
<thead>
<tr>
<th>Water Supply in the home</th>
<th>Total No.</th>
<th>Underweight No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpiped</td>
<td>20</td>
<td>16</td>
<td>80.0</td>
</tr>
<tr>
<td>Piped</td>
<td>380</td>
<td>176</td>
<td>46.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>400</td>
<td>192</td>
<td>48.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diarrhoea in last 1 year</th>
<th>Total No.</th>
<th>Underweight No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>191</td>
<td>54</td>
<td>28.3</td>
</tr>
<tr>
<td>1Episode</td>
<td>79</td>
<td>48</td>
<td>60.8</td>
</tr>
<tr>
<td>2 Episodes</td>
<td>64</td>
<td>42</td>
<td>65.6</td>
</tr>
<tr>
<td>3 Episodes</td>
<td>41</td>
<td>27</td>
<td>65.9</td>
</tr>
<tr>
<td>&gt; 3 Episodes</td>
<td>25</td>
<td>21</td>
<td>84.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>400</td>
<td>192</td>
<td>48.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passed Worms in last 6 months</th>
<th>Total No.</th>
<th>Underweight No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>305</td>
<td>134</td>
<td>43.9</td>
</tr>
<tr>
<td>Yes</td>
<td>95</td>
<td>58</td>
<td>61.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>400</td>
<td>192</td>
<td>48.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When was deworming last taken</th>
<th>Total No.</th>
<th>Underweight No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 months back</td>
<td>96</td>
<td>20</td>
<td>20.8</td>
</tr>
<tr>
<td>&gt;6 months back</td>
<td>205</td>
<td>105</td>
<td>51.2</td>
</tr>
<tr>
<td>Never took deworming</td>
<td>99</td>
<td>67</td>
<td>67.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>400</td>
<td>192</td>
<td>48.0</td>
</tr>
</tbody>
</table>
having unpiped water supply (80%) when compared to those having piped water supply to their houses (46.3%, P<0.01). Another factor found to be associated with underweight in the study population was the history of diarrhoea in the last 1 year. While the prevalence of underweight in children not having suffered from diarrhoea in the last 1 year was 28.3%, the prevalence was higher among those having suffered from 1 (60.8%), 2 (65.6%), 3 (65.9%), or >3 (84%) episodes of diarrhoea (P<0.001). Prevalence of underweight was also higher among those having history of having passed worms in last 6 months (61.1%) compared to those having no such history (43.9%, P<0.05) and in those who had never taken deworming (67.7%) and those who had taken it > 6 months back (51.2%) compared to those who had taken it < 6 months back (20.8%, P<0.001).

### Discussion

The prevalence of underweight among children (BMI for age <5th percentile) in the present study was observed as 48%. This is slightly lower than the 58.2% reported by Hasanet al (2011),13 much higher than 11.1% reported by Anjum et al (2012)14 and exactly similar to Mandal et al (2014)15 who reported prevalence of thinness as 48%.

In the present study significant association was found in the prevalence of underweight among children receiving unpiped water supply in their homes in comparison to piped water supply (P<0.01). This is similar to the findings of Anjum et al (2006)14 who analyzed the determinants of child weight and height in Sri Lanka and found that access to piped water improves child's nutritional status.

Significant association was found between underweight and the episodes of diarrhoea in last 1 year (P<0.001). This is in accordance with the findings of Torres et al (2000)16 who reported that diarrhoea is a significant correlate of retarded weight gain among children above preschool age.

A history of passing worms in the past 6 months was also found to be significantly associated with underweight among participants in the present study (P<0.05). This is in contrast to the findings of Zulkifli et al (2000)17 who recorded no significant association between geo-helmint infection and malnutrition and Andrade et al(2001)18 who found no relationship between intensity of soil-transmitted helminthiasis and wasting in children.

In the present study, it was also observed that the prevalence of underweight among children who had taken deworming < 6 months back was significantly lower when compared to children who taken deworming > 6 months back or those who had never taken deworming (P<0.001). This is in accordance with the findings of a randomised controlled trial in Uganda20 in 2006 which showed that providing periodic deworming resulted in an increase in weight for 10% of children when treatment was given twice a year and 5% children when treatment was given annually.

### Conclusion

Supplementary feeding programmes initiated by the Government of India like Mid-day meal scheme are indeed a good attempt to combat malnutrition among school-aged children but more needs to be done. Good housing with sanitary living conditions and good environment are a must for growing children to attain their full growth potential. Such environment will minimize the chances of contracting diarrhoea and helminthic infections in children. Good housing also means that all children will have access to potable water supply. It is highly desirable that all children between 5-14 years of age be provided deworming every 6 months.

### End Note

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