Nutritional Profile of Preschool Children: A Review

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ABSTRACT This paper reviews the prevalence of undernutrition among preschool children. The current review uses the z-score system to estimate the magnitude of undernutrition among preschool children because it reflects both previous and current nutritional status of the children. Hitherto, the research results from India revealed that the prevalence of underweight (93.3%), stunting (86.6%) and wasting (85.3%) was the highest among the Kinnaura of Kinnaur in Himachal Pradesh, the lowest observed prevalence of underweight (15.0%), stunting (11.4%) and wasting (10.8%) was among the Punjabi preschool children (Punjab). Studies beyond India revealed that the highest and lowest prevalence of underweight, stunting and wasting was observed from Dhaka (Bangladesh) and Salvador (Central America). Thus, the present review revealed that the nutritional status of preschool children, particularly of tribal and rural areas, was in critical situation. Urgent nutritional attention is required.

INTRODUCTION

Health and nutritional status are two crucial and interlinked aspects of human development, which in turn interact with demographic variables in important ways. While health and nutrition conditions can be related with aggregate economic growth, there is no necessary or linear causation, and policy interventions can play an important role in determining both access to health services and nutrition, as well as outcome indicators in this area (West Bengal Human Development Report 2004). The present study is a review paper undertaken to determine the comparative prevalence of undernutrition widespread among preschool children of India and abroad. Stunting, underweight and wasting were used to evaluate the nutritional status of the subjects because these measures reflect both previous and current nutritional status of the children. A total number of 34 Indian and 9 international studies are reviewed here. Undernutrition is a deficiency of calories or of one or more essential nutrients. Globally, it is estimated that among preschool age children in developing countries, underweight, stunted and wasted accounts for 183, 226 and 67 million, respectively (Mitra and Tiwari 1997). India has the highest occurrence of childhood malnutrition in the world (Bamji 2003). One out of every three children less than five years of age in developing countries is malnourished. It is a major drain on developing countries’ prospects for development because malnourished children require more intense care from their parents and are less physically and intellectually productive as adults. Given the fundamental importance of undernutrition to child survival and health, the evaluation of nutritional status, especially among rural children of various ethnic groups, has immense implications for policy makers and planners alike (Nandy and Miranda 2008).

Chronic hunger and undernutrition is the worst tribulation of the poverty that still plagues millions of households in India, and the plight of children is of special concern. Undernutrition in childhood is one of the reasons for the high child mortality rate and is also highly detrimental for the future of those who survive (Pelletier 1994). Chronic undernutrition in childhood is linked to slower cognitive development and serious health impairments later in life that reduce the quality of life and also the economic productivity of people (Scrimshaw 1996). Undernutrition is hence not only a consequence of poverty but also a cause.

The current review uses the z-score system to estimate the magnitude of undernutrition among less than 6 years aged preschool children of Indian subcontinent and other countries.

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METHODS

The intent of the present literature review was to summarize research findings regarding the available evidence of nutritional status among preschool children.

Data on published literature (between 1988 and 2009) related to nutritional status of preschool children were collected by using electronic search engines (<GOOGLE and PUBMED>). The following key words used to conduct this search: preschool children, undernutrition, underweight, stunted and wasted. Likely studies for review were selected from published research studies in English language that reported prevalence of undernutrition (using stunting, underweight and wasting) by age and region basis worldwide. The lists of published related articles (references) were also used to trace the relevant studies. A total of 43 studies have been identified (34 studies were from India and 9 from other countries) where z-score were used for assessing the undernutrition among the preschool children.

Following the United States National Center for Health Statistics (NCHS) (Hamill et al. 1979) age- and sex- specific -2 z-scores has been considered to defining undernutrition.

Stunting: <-2 HAZ (z-score for height-for-age);
Underweight: <-2 WAZ (z-score for weight-for-age);
Wasting: <-2 WHZ (z-score for weight-for-height).

RESULT AND DISCUSSION

A total of 43 scientific papers were considered for this study. In India, the sample sizes ranged from 68 to 7413 children and the sample sizes reviewed in 9 International studies ranged from 157 to 17017. In majority of the studies, the age of the children was less than six years. Out of the 34 Indian studies, 11 comprised of tribals/indigenous groups (viz. Saharia, Gond, Kodaku, Raj Gond, Kalahandi, Dhodia, Kinnaura, Bhil, Dhur Gond, and Kamar) from the states of Rajasthan, Madhya Pradesh, Chhattisgarh, Madhya Pradesh, Orissa and Bihar and the Coastal, Himalayan and Desert regions. Table 1 shows the comparative prevalence of undernutrition, underweight, stunting and wasting of the preschool children under study. It appears from this table, that in the Indian subcontinent, the prevalence of underweight, stunting and wasting was 93.3%, 86.6% and 85.3%, respectively among the Kinnaura (Himalayan Ecology), which is observed to be the highest among all the reviewed populations from India. The prevalence of underweight, stunting and wasting was 15.0%, 11.4% and 10.8%, respectively among the Punjabi preschool children (Punjab), which is observed to be the lowest. Table 1 also shows that among all the reviewed studies from the other parts of the world, the highest prevalence of underweight, stunting and wasting was. 73.2%, 68.4% and 31.2%, respectively, was observed from Dhaka (Bangladesh). However, the prevalence of underweight, stunting and wasting was 10.5%, 22.0% and 2.9% respectively among the Salvador preschool children of Central America, which was observed to be the lowest.

From above, we can conclude that the nutritional condition of majority of studied populations, particularly tribal and rural ones, was unsatisfactory. This implied that most of these were experiencing severe to critical nutritional stress. Proactive nutritional supplementation programmes are mandatory to improve the nutritional profile of these populations. These interventions should be monitored regularly to determine their efficacy in combating undernutrition.

Since malnutrition has many causes, only multiple and synergistic interventions embedded in true multisectoral programmes can be effective (Bhargava 2001). From this present review one can clearly understand the situation at a glance about the critical position of the tribal and rural preschoolers of developing countries with respect to other urban sectors of developing countries and developed countries that may be experiencing the opposite trends of malnutrition (that is, problem of overweight and obesity). This important point must be borne in mind before the authorities rethink about the policies made by the policy makers to plan for the effective strategies to combat the prevalence the undernutrition among children in disadvantaged populations. However, one of the limitations of the present review was the lack information on correlates of undernutrition. Future investigations should review the various correlates of undernutrition.
# Table 1: Nutritional status among preschool children of different national and international samples.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Population</th>
<th>N</th>
<th>Age group</th>
<th>Undernutrition</th>
<th>Study area</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saharia tribal children</td>
<td>238</td>
<td>1-5 years</td>
<td>-</td>
<td>Rajasthan, India</td>
<td>Rao et al. 2006</td>
</tr>
<tr>
<td>2</td>
<td>Gond tribal children</td>
<td>1022</td>
<td>1-5 years</td>
<td>-</td>
<td>M.P, India</td>
<td>Rao et al. 2005</td>
</tr>
<tr>
<td>3</td>
<td>Kodaku children</td>
<td>182</td>
<td>1-5 years</td>
<td>-</td>
<td>Chhattisgarh, India</td>
<td>Dolla et al. 2005</td>
</tr>
<tr>
<td>4</td>
<td>Raj Gond</td>
<td>123</td>
<td>1-5 years</td>
<td>-</td>
<td>M.P, India</td>
<td>Sharma et al. 2006</td>
</tr>
<tr>
<td>5</td>
<td>Kalahandi</td>
<td>751</td>
<td>0-5 years</td>
<td>-</td>
<td>Orissa, India</td>
<td>Mahapatra et al. 2000</td>
</tr>
<tr>
<td>6</td>
<td>Rural children</td>
<td>227</td>
<td>0-59 months</td>
<td>-</td>
<td>Kolkata, India</td>
<td>Dey and Chaudhuri 2008</td>
</tr>
<tr>
<td>7</td>
<td>Bauri children</td>
<td>219</td>
<td>2-6 years</td>
<td>48.4%</td>
<td>Purulia, W.B, India</td>
<td>Das and Bose 2009, JLS</td>
</tr>
<tr>
<td>8</td>
<td>ICDS children</td>
<td>673</td>
<td>1-5 years</td>
<td>39.4%</td>
<td>W.B, India</td>
<td>Biswas et al. 2009</td>
</tr>
<tr>
<td>9</td>
<td>Bauri children</td>
<td>347</td>
<td>2-6 years</td>
<td>51.2%</td>
<td>Purulia, W.B, India</td>
<td>Das and Bose 2009</td>
</tr>
<tr>
<td>10</td>
<td>Bengalee children</td>
<td>533</td>
<td>3-5 years</td>
<td>30.8%</td>
<td>Purulia, W.B, India</td>
<td>Bose et al. 2007</td>
</tr>
<tr>
<td>11</td>
<td>Dhodia children</td>
<td>306</td>
<td>0-5 (below 6 years)</td>
<td>-</td>
<td>W.B, India</td>
<td>Kshatriya and Ghosh 2008</td>
</tr>
<tr>
<td>12</td>
<td>Kinnaura children</td>
<td>327</td>
<td>0-5 (below 6 years)</td>
<td>93.3%</td>
<td>Coastal, India</td>
<td>Kshatriya and Ghosh 2008</td>
</tr>
<tr>
<td>13</td>
<td>Bhil Children</td>
<td>356</td>
<td>0-5 (below 6 years)</td>
<td>-</td>
<td>Himalayan ecology, India</td>
<td>Kshatriya and Ghosh 2008, NFHS-2 2005-06</td>
</tr>
<tr>
<td>14</td>
<td>Children</td>
<td>Un-known</td>
<td>&lt; 3 years</td>
<td>47.0%</td>
<td>Desert ecology, India</td>
<td>NFHS-2 2005-06</td>
</tr>
<tr>
<td>15</td>
<td>Children</td>
<td>Un-known</td>
<td>&lt; 3 years</td>
<td>45.9%</td>
<td>Western Rajasthan, India</td>
<td>Singh et al. 2006</td>
</tr>
<tr>
<td>16</td>
<td>Drought affected children</td>
<td>914</td>
<td>0-5 years</td>
<td>60.0%</td>
<td>-</td>
<td>Amritsar, Punjab, India</td>
</tr>
<tr>
<td>17</td>
<td>Sc pre-school</td>
<td>1000</td>
<td>1-5 years</td>
<td>90.8%</td>
<td>Bihar, India</td>
<td>Yadav and Singh 1999</td>
</tr>
<tr>
<td>18</td>
<td>Tribal children</td>
<td>1847</td>
<td>0-6 years</td>
<td>-</td>
<td>Tibet, India</td>
<td>B灰尘 ray et al. 2005</td>
</tr>
<tr>
<td>19</td>
<td>Refugee camp children</td>
<td>125</td>
<td>&lt; 5 years</td>
<td>34.4%</td>
<td>Tamil Nadu, India</td>
<td>Singhal and Pande 1997</td>
</tr>
<tr>
<td>20</td>
<td>Fishing community children</td>
<td>136</td>
<td>&lt; 5 years</td>
<td>35.3%</td>
<td>-</td>
<td>Tamil Nadu, India</td>
</tr>
<tr>
<td>21</td>
<td>ICDS children</td>
<td>3157</td>
<td>&lt; 5 years</td>
<td>62.9%</td>
<td>Vadodara city, India</td>
<td>Swami et al. 2000</td>
</tr>
<tr>
<td>22</td>
<td>Anganwari children</td>
<td>217</td>
<td>&lt; 5 years</td>
<td>-</td>
<td>Allahabad, India</td>
<td>Kumar et al 2006</td>
</tr>
<tr>
<td>23</td>
<td>Slum children</td>
<td>1061</td>
<td>1.5 – 3.5 years</td>
<td>-</td>
<td>Lucknow, India</td>
<td>Awasht and Pande 1997</td>
</tr>
<tr>
<td>24</td>
<td>Urban slum children</td>
<td>520</td>
<td>&lt;5 years</td>
<td>75.0%</td>
<td>Varanasi, India</td>
<td>Mishra et al. 2001</td>
</tr>
<tr>
<td>25</td>
<td>NIDS children</td>
<td>7413</td>
<td>&lt;5 years</td>
<td>42.0%</td>
<td>Chandigarh, India</td>
<td>Swami et al. 2000</td>
</tr>
</tbody>
</table>
The preschool children of several populations were experiencing severe to critical nutritional stress. Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was high (30-39%), whereas those of underweight (>30%) and wasting (>15%) were very high. Valuable health and nutritional promotion programs can be formulated based on the findings of such researches with the ultimate objective of decreasing childhood undernutrition worldwide.

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Table 1: Contd...

<table>
<thead>
<tr>
<th>S. No.</th>
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<th>Age group</th>
<th>Under-nutrition</th>
<th>WAZ</th>
<th>HAZ</th>
<th>WHZ</th>
<th>Study area</th>
<th>Reference</th>
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<tbody>
<tr>
<td>26</td>
<td>ICDS children</td>
<td>1286</td>
<td>&lt;5 years</td>
<td>51.6%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Chandigarh, India</td>
<td>Swami et al. 2001</td>
</tr>
<tr>
<td>27</td>
<td>Urban slum children</td>
<td>486</td>
<td>&lt; 5 years</td>
<td>81.8%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Delhi, India</td>
<td>Kapil and Bali 1989</td>
</tr>
<tr>
<td>28</td>
<td>Urban slum children</td>
<td>630</td>
<td>&lt; 6 years</td>
<td>57.6%</td>
<td>53.0%</td>
<td>-</td>
<td>22.5%</td>
<td>Delhi, India</td>
<td>Saxena et al. 1997</td>
</tr>
<tr>
<td>29</td>
<td>Urban slum preschool children</td>
<td>584</td>
<td>&lt; 6 years</td>
<td>60.5%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Srinagar, India</td>
<td>Bhat et al. 1997</td>
</tr>
<tr>
<td>30</td>
<td>Dhur Gond</td>
<td>68</td>
<td>&lt; 5 years</td>
<td>100.0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Chhattisgarh, India</td>
<td>Chandraker et al 2009</td>
</tr>
<tr>
<td>31</td>
<td>Slum children</td>
<td>113</td>
<td>3-6 years</td>
<td>63.7%</td>
<td>47.8%</td>
<td>32.7%</td>
<td>-</td>
<td>Midnapore Town, W.B, India</td>
<td>Bisal et al. 2009</td>
</tr>
<tr>
<td>32</td>
<td>Kamar tribal children (Boys)</td>
<td>309</td>
<td>4-6 years</td>
<td>93.8%</td>
<td>66.0%</td>
<td>85.5%</td>
<td>-</td>
<td>Chhattisgarh, India</td>
<td>Mitra et al. 2007</td>
</tr>
<tr>
<td>33</td>
<td>Pre-school children</td>
<td>6531</td>
<td>1 – 5 years</td>
<td>15.0%</td>
<td>11.4%</td>
<td>10.8%</td>
<td>-</td>
<td>Punjab, India</td>
<td>Kaur et al. 2005</td>
</tr>
<tr>
<td>34</td>
<td>Slum children</td>
<td>100</td>
<td>0-60 months</td>
<td>43.0%</td>
<td>35.0%</td>
<td>28.0%</td>
<td>-</td>
<td>Gujarat</td>
<td>Shah and Patel 2009</td>
</tr>
<tr>
<td>35</td>
<td>Pre-school children</td>
<td>392</td>
<td>0-5 years</td>
<td>73.2%</td>
<td>68.4%</td>
<td>31.2%</td>
<td>-</td>
<td>Dhaka, Bangladesh, Western Kenya</td>
<td>Pryer et al. 2003</td>
</tr>
<tr>
<td>36</td>
<td>Rural Children</td>
<td>2103</td>
<td>0-5 years</td>
<td>20.0%</td>
<td>30.0%</td>
<td>4.0%</td>
<td>-</td>
<td>Western Kenya</td>
<td>Arthar et al. 2003</td>
</tr>
<tr>
<td>37</td>
<td>Children</td>
<td>157</td>
<td>&lt; 5 years</td>
<td>30.0%</td>
<td>47.0%</td>
<td>7.0%</td>
<td>-</td>
<td>China, Vietnam</td>
<td>Bless et al. 2004</td>
</tr>
<tr>
<td>38</td>
<td>Tibetan Children</td>
<td>1655</td>
<td>0-3 years</td>
<td>23.7%</td>
<td>39.0%</td>
<td>5.6%</td>
<td>-</td>
<td>Japan</td>
<td>Dang 2004</td>
</tr>
<tr>
<td>39</td>
<td>Children</td>
<td>650</td>
<td>&lt; 5 years</td>
<td>31.8%</td>
<td>44.3%</td>
<td>11.9%</td>
<td>-</td>
<td>Vietnam</td>
<td>Hien and Kam 2008</td>
</tr>
<tr>
<td>40</td>
<td>Preschool children</td>
<td>511</td>
<td>0-59 months</td>
<td>40.0%</td>
<td>61.0%</td>
<td>17.0%</td>
<td>-</td>
<td>Kano, Nigeria</td>
<td>Icenyi et al. 2009</td>
</tr>
<tr>
<td>41</td>
<td>Salvadorian children</td>
<td>17017</td>
<td>3-59 months</td>
<td>10.5%</td>
<td>22.0%</td>
<td>2.9%</td>
<td>-</td>
<td>Salvador</td>
<td>Srawn et al. 1996</td>
</tr>
<tr>
<td>42</td>
<td>Pre-school children</td>
<td>17017</td>
<td>0-6 years</td>
<td>23.3%</td>
<td>15.4%</td>
<td>3.1%</td>
<td>-</td>
<td>Cape Verde Island, Bangladesh</td>
<td>Wennberg 1988</td>
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<tr>
<td>43</td>
<td>Pre-school children</td>
<td>5333</td>
<td>&lt; 5 years</td>
<td>47.0%</td>
<td>44.0%</td>
<td>10.0%</td>
<td>-</td>
<td>-</td>
<td>Rahman and Chowdhury 2009</td>
</tr>
</tbody>
</table>

CONCLUSION

The preschool children of several populations were experiencing severe to critical nutritional stress. Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was high (30-39%), whereas those of underweight (>30%) and wasting (>15%) were very high. Valuable health and nutritional promotion programs can be formulated based on the findings of such researches with the ultimate objective of decreasing childhood undernutrition worldwide.
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