Assessment of Prevalence of Malnutrition among Under-Five Children in Rural Area of Haldwani

Preeti¹, Sadhana Awasthi², Rupali Gupta³, Thakkar Hemaben Kanubhai⁴

¹Senior Resident, Department of Community Medicine, Soban Singh Jeena Govt. Institute of Medical Sciences and Research, Almora, ²Professor and Head, Department of Community Medicine, Govt. Medical College, Haldwani, ³Senior Resident, Department of Community Medicine, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, ⁴Associate Professor, Department of Community Medicine, Govt. Medical College, Haldwani

How to cite this article: Preeti, Sadhana Awasthi, Rupali Gupta et. al. Assessment of Prevalence of Malnutrition among Under-Five Children in Rural Area of Haldwani. Indian Journal of Public Health Research and Development 2023;14(3).

Abstract

Background: Malnutrition in children is a global issue that may have both short- and long-term irreversible negative health consequences.

Objectives: To determine the prevalence of under-nutrition among the under-five children in rural area of Haldwani.

Material and methods: Community-based cross-sectional study.

Results: Four-hundred children were examined. The prevalence of undernutrition among children was depicted as underweight, stunting and wasting was 7.75%, 9.25% and 4% respectively.

Keywords: under-five children, malnutrition, Haldwani

Introduction

Malnutrition refers to deficiency or excess in nutrient intake, imbalance of essential nutrients or impaired nutrient utilization as per WHO⁵. Fundamental need for the development of each child is an adequate nutrition during infancy and early childhood and thus malnutrition plays an important role in their mortality and morbidity among under-five population and would lead to delayed mental and motor development during these determining years. Eventually malnutrition decreases the educational achievement, labor productivity and economic growth of a country.⁶

According to United Nations Inter-Agency Group for Child Mortality Estimation (UNIGME), Report 2021, in 2020, more than 5.0 million under 5 children, including 2.4 million newborns died due to preventable or treatable causes while WHO said that around 45% of deaths among under 5 children are linked to undernutrition and that of mostly occur in low- and middle-income countries.⁷ To combat this public health issue, Sustainable development goals were set by United Nations to achieve better health by 2030⁸.

The current study uses the WHO Z-score system and the composite index of anthropometric failure...
(CIAF) and Mid upper arm circumference (MUAC)\(^8,9\) to estimate the magnitude of under nutrition. On the bright side, improvement was seen in the number of underweight children in the country, rates of underweight have decreased from 66.0% to 58.1% for boys and 54.2% to 50.1% in girls in between 2000 and 2016.\(^10\) In NFHS-5 (2019-21) the prevalence of underweight, stunting and wasting among under 5 children in the country was 32.1%, 35.5% and 19.3% respectively\(^11\) while in Uttarakhand, the prevalence of underweight, stunting and wasting among under 5 children was found to be 21%, 27% and 13.2% respectively\(^12\) while no such details was available for Haldwani and that to rural area, hence the study is planned to determine the prevalence and associated risk factors for malnutrition among under five children of this region.

**Objectives:**

To determine the prevalence of under-nutrition among the under-five children in a rural area of Haldwani.

**Material and Methods**

This was a cross-sectional, community based study on Under-5 children (study population) conducted from January 2020 – July 2021 in the rural field practice area of the Department of Community Medicine, Government Medical College, Haldwani. Ethical clearance was obtained from the Institutional Ethics Committee.

**Inclusion criteria:** Those under five children whose parents or guardian’s had given consent.

**Exclusion criteria:** Those who refused to participate or did not give consent, those household that would remain locked even upto 3 visits and those children having congenital anomaly.

**Sampling method:** Simple random sampling

**Sample size:**

The total sample size is estimated using the formula: 

\[ n = \frac{4pq}{d^2}, \]

Where, \( n \) = sample size

\( p = \) prevalence of malnutrition in Uttarakhand (33.5 = 0.335) according to NFHS-4\(^13\)

\( q = 1-p \) (0.335)

\( d = \) error in estimation (5%)

The required sample size is calculated as:

\[ n = \frac{(4 \times 0.335 \times 0.665)}{(0.0025)} \]

\[ = 356 \]

After adding 10% non-response rate, \( n=396 \)

After rounding of final sample size will be 400

**Tools and Techniques:**

A pre-tested, semi structured questionnaire on malnutrition from previous literatures\(^14,15,16\) was formed. It includes: Performa, Weighing machine – spring type, infantometer, stadiometer, non-stretchable measuring tape.

**Anthropometric indices\(^7\) Used:**

- **Weight** - The weight of the subjects was taken using spring scale weighing machine after adjusting the scale at ‘0’.
- **Length** of children less than 2 years old is measured lying down by using infantometer standing height is measured for children age 2 years or older by using stadiometer.
- **Underweight (Weight-for-age)** - Defined as the percentage of children whose weight for age is -2 SD to < -1 SD (mild UW), <-2 SD and ≥-3 SD (moderate UW) and <-3SD (severe UW) of the median of the WHO Child Growth Standards.
- **Stunting (Height-for-age)**: Defined as the percentage of children whose height for age is -2 SD to < -1 SD (mild stunting), <-2 SD and ≥-3 SD (moderate stunting) and <-3SD (severe stunting) of the median of the WHO Child Growth Standards.
- **Wasting (Weight-for-height)**: Defined as the percentage of children whose weight for height is -2 SD to < -1 SD (mild wasting), <-2 SD and ≥-3 SD (moderate wasting) and <-3SD (severe wasting) of the median of the WHO Child Growth Standards.
- **Mid upper arm circumference (MUAC)\(^8,9\)**

Between 6 months to five years of age, the arm circumference remains fairly constant.

Measurement is performed on the left arm, midway between the acromion and the
olecranon. The measuring tape is held gently without pressing the soft tissues. The tape must be flexible and non-stretchable and unaffected by temperatures.

- The reading should be accurate to the nearest 0.1 cm. Reading below 11.5 cm indicates severe malnutrition, >12.5 - 13.5 is moderate malnutrition, 12.5 - 11.5 cm is mild malnutrition and above 13.5 cm is normal.

- **Composite Index of Anthropometric Failure (CIAF):** The above mentioned indices only help in classification of children to various categories of under-nutrition but do not provide an estimate of overall prevalence of under-nutrition as a single measure. Moreover, the issue of multiple anthropometric failures was not addressed by these standard indices. The Svedberg’s model of the CIAF includes all children who are wasted, stunted, or underweight, and their combinations. It therefore provides a single measure with which the overall prevalence of under-nutrition can be estimated.

**Results**

The present study titled “Prevalence of malnutrition and associated risk factors among Under five Children in Haldwani district-Nainital” was conducted in the rural field practice area of Department of Community Medicine, GMC Haldwani. It was a community based cross-sectional study. A total of 400 subjects were included in the study. In present study, no overnutrition was found and only normal and undernutrition were found. So, undernutrition was further classified in moderate and severe category and further association was applied while mild were not consider in community studies.

In the present study, a total of 400 under five children were examined. Females were more (53.2%) as compared to 46.8% of male children. The mean age of the participants was 2.76± 1.42 months. Majority of the families were nuclear that comprises of approximately half (62%) of the children with family size upto 2. Maximum number of parent’s education found to be graduate and above in approximately a quarter (24.5% in mothers and 25.2% in fathers) of study subjects. Maximum number of the study subjects were belong to class II according to B.G. Prasad socio economic class classification 2021 and that comprises of half of them (52.5%).

| Table 1: Nutritional status according to age and gender of study subjects(n=400) |
|----------------------------------|---------------|----------------|----------------|---------------|
| Variables           | Total n (%) | Underweight n (%) | Stunting n (%) | Wasting n (%) |
| Male                | 187 (46.8)  | 18 (9.6)          | 15 (8)         | 07 (3.7)      |
| Female              | 213 (53.2)  | 13 (6.1)          | 22 (10.3)      | 09 (4.2)      |
| Age group           |              |                  |                |               |
| 0-11 m              | 80 (20)     | 01 (1.2)          | 06 (7.5)       | 04 (5)        |
| 12-23 m             | 107 (26.7)  | 09 (8.4)          | 09 (8.4)       | 03 (2.8)      |
| 24-35 m             | 63(15.8)    | 10 (15.8)         | 09 (14.2)      | 02 (3.2)      |
| 36-47 m             | 82 (20.5)   | 08 (9.7)          | 10 (12.2)      | 04 (4.8)      |
| 48-59 m             | 68(17)      | 03 (4.4)          | 03 (4.4)       | 03 (4.4)      |

There was 53.25% females out of which 6.1% were underweight, 10.3% were stunted while 3.7% were wasted as compared to 46.8% males, out of which 9.6% were underweight, 8% were stunted while 4.2% were wasted. Maximum number of participants were in 12-23 month age group followed by 36-47 months while underweight was maximum in age group of 24-35 months, stunting was found highest among age group of 36-47 months and wasting was most in 0-11 months and 36-47 months.
Table 2: CIAF Classification (B–Y) of study subjects (n=400)

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No failure</td>
<td>330 (82.5)</td>
</tr>
<tr>
<td>B</td>
<td>Wasting</td>
<td>12 (3)</td>
</tr>
<tr>
<td>C</td>
<td>Wasting &amp; Underweight</td>
<td>01 (0.25)</td>
</tr>
<tr>
<td>D</td>
<td>Wasting + Stunting + Underweight</td>
<td>03 (0.75)</td>
</tr>
<tr>
<td>E</td>
<td>Stunting &amp; Underweight</td>
<td>09 (2.25)</td>
</tr>
<tr>
<td>F</td>
<td>Only stunting</td>
<td>25 (6.25)</td>
</tr>
<tr>
<td>Y</td>
<td>Only underweight</td>
<td>20 (5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>400 (100)</strong></td>
</tr>
</tbody>
</table>

In the present study, the under five children in which malnutrition was not seen were 82.5%. The prevalence of undernutrition among children was depicted as underweight, stunting and wasting was 7.75%, 9.25% and 4% respectively. Out of those who were found to be underweight, only underweight was seen in 5% while underweight and stunting in 2.5%, underweight and wasting in 0.2% and underweight, stunting and wasting in 0.7% subjects. Out of those who were found to be stunted, only stunting was present in 6.2% subjects. Out of those who were found to be wasted, only wasting seen in 3% subjects.

Table 3: Distribution of undernourished children according to severity (WHO)

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Total No. (%)</th>
<th>Moderately Undernourished No. (%)</th>
<th>Severely undernourished No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>31 (7.8)</td>
<td>28 (7)</td>
<td>03 (0.8)</td>
</tr>
<tr>
<td>Stunting</td>
<td>37(9.3)</td>
<td>37 (9.3)</td>
<td>00</td>
</tr>
<tr>
<td>Wasting</td>
<td>16 (4)</td>
<td>16 (4)</td>
<td>00</td>
</tr>
</tbody>
</table>

In the present study, moderate and severe underweight was found to be 7% and 0.75% respectively while moderate stunting and wasting was found to be 9.25% and 4% respectively.

Table 4: Nutritional status according to mid upper arm circumference (MUAC) (n=357)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total No. (%)</th>
<th>Normal (n=336)</th>
<th>Mild-moderate (n=17)</th>
<th>Severe malnourished (n=04)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>167 (46.8)</td>
<td>157 (94)</td>
<td>07 (4.2)</td>
<td>03 (1.8)</td>
</tr>
<tr>
<td>Female</td>
<td>190 (53.2)</td>
<td>179 (94.2)</td>
<td>10 (5.3)</td>
<td>01 (0.5)</td>
</tr>
<tr>
<td>Age(months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-12</td>
<td>44 (12.3)</td>
<td>36 (81.8)</td>
<td>08 (18.2)</td>
<td>00</td>
</tr>
<tr>
<td>13-36</td>
<td>194 (54.3)</td>
<td>184 (94.8)</td>
<td>07 (3.6)</td>
<td>03 (1.5)</td>
</tr>
<tr>
<td>37-60</td>
<td>119 (33.4)</td>
<td>116 (97.4)</td>
<td>02 (1.6)</td>
<td>01 (0.8)</td>
</tr>
</tbody>
</table>

In the present study, 357 children were above the age group of 6 months, so there mid upper arm circumference was taken. Out of 5.8% children that had decreased mid upper arm circumference, 4.8% were mild-moderately undernourished as having mid upper arm circumference found between 11.5 cm-13.5 cm while 1.1% were severely undernourished as having mid upper arm circumference found less than 11.5 cm. Out of 357, majority were females i.e., 53.2%. 5.3% females and 4.2% males were mild to moderately undernourished while 1.8% males were severely undernourished.
Approximately half of the children were under the age group of 13-36 months while in age group 6-12 month, 18.1% were mild to moderately undernourished.

**Discussion**

In this study, a total of 400 under-five children were studied children of rural field practice area, Department of Community Medicine, Haldwani, Distt. Nainital. Out of these, there were 53.3% female and 46.8% male. The mean age of the participants was 2.76± 1.42 months. Similar findings were shown in study by Bhavsar S et al., (2012)\(^\text{18}\) conducted in urban slums of Mumbai,Meshram II et al., (2012)\(^\text{19}\), P Stalin et al., (2013)\(^\text{20}\), Sharma A et al., (2015)\(^\text{21}\) found females more than males, while in study by Purohit L et al., (2017)\(^\text{22}\), Akhade KS et al., (2019)\(^\text{23}\) found more males than females.

Majority of the study subject’s (62%) belongs to nuclear families. Similar findings were shown in study byMeshram II et al., (2012)\(^\text{18}\), Purohit L et al., (2017)\(^\text{22}\), Sharma A et al., (2015)\(^\text{21}\) found more belong to nuclear family.

Regarding parent’s education, 24.5% in mother’s and 25.2% in father’s of study subjects were found to be graduate and above. Similar findings were shown in study by Gandhi Set al., (2014)\(^\text{24}\) depicted that mother’s and father’s education was more than high school and above, P Stalin et al., (2013)\(^\text{20}\) showed mother’s education was upto high school and above, while different findings were shown in study by Bhavsar S et al., (2012)\(^\text{18}\) conducted in urban slums of Mumbai, Meshram II et al., (2012)\(^\text{19}\) as parent’s education was illiteracy or upto primary level.

Out of 52.5% of the study subjects were belong to II class according to B.G. Prasad socio economic class. Studies showed different findings in Bhavsar S et al., (2012)\(^\text{18}\) showed more study subjects belonged to class IV and V, P Stalin et al., (2013)\(^\text{20}\) showed more belonged to class IV, Purohit L et al., (2017)\(^\text{22}\) showed more belonged to class V.

In the present study, out of underweight, stunting and wasting, moderate undernutrition more than that of severe undernutrition. Similar result found in study conducted by Chaudhary P and Agrawal M, (2018)\(^\text{25}\) in Slum Area of Jaipur City, Rajasthan. Another study conducted byLaghari ZA et al., (2015)\(^\text{26}\) among children under five years in district Sanghar, Sindh, Pakistan showed similar results and in study conducted by Idowu SO et al., (2020)\(^\text{27}\) information on anthropometric characteristics and associated factors among displaced under-five children is important to strengthen strategies to ameliorate malnutrition and promote child health. This study was conducted to identify the determinants of anthropometric indices among under-five children in internally displaced persons’ camps in Abuja, Nigeria. Methods: this cross-sectional study involved 317 mother-child (0-59 months) among under-five children in Nigeria while different results were found in study conducted in under-five Nepalese children of Borbote village, Ilam by Niraula SR et al., (2013)\(^\text{28}\) in Nepal acute undernutrition more than moderate undernutrition.

Out of those who were found to be underweight, only underweight was seen in 5% while underweight and stunting in 2.5%, underweight and wasting in 0.2% and underweight, stunting and wasting in 0.7% subjects. Out of those who were found to be stunted, only stunting was present in 6.2% subjects. Out of those who were found to be wasted, only wasting seen in 3% subjects. Similar result found in study conducted by Seetharaman N et al., (2007)\(^\text{29}\) in Coimbatore as no failure is found in maximum (31.4%) study subjects while another study conducted by Akhade KS et al., (2019)\(^\text{23}\) found that 58% of the study subjects were suffering from one or other form of “Anthropometric Failure”.

In the present study, 357 children were above the age group of 6 months in which mid upper arm circumference was taken. Out of 5.8% children that had decreased mid upper arm circumference, 4.8% were mild-moderately undernourished while 1.1% were severely undernourished as having mid upper arm circumference. Out of 357, majority were females i.e., 53.2%. 5.3% females and 4.2% males were mild to moderately undernourished while 1.8% males were severely undernourished. Similar results found in study conducted by Sethy G et al., (2017)\(^\text{9}\) in urban slum area of Berhampur city found that severe malnutrition was lower than that of normal, in Bhadoria AS et al., (2017)\(^\text{30}\) which is one-third of the world’s share. We planned a study to identify the prevalence of severe acute malnutrition (SAM)
found that MUAC for age varied significantly and in Oguizu AD and Okafor CA, (2019).[

**Conclusion**

This study reveals mild prevalence of malnutrition status among underfive children of rural field practise area of Dept. of Community Medicine, Haldwani, Uttarakhand. Out of which, stunting is most prevalent parameter for undernourishment. In this, females were more undernourished than males, and in age of child between 12 and 23 months were more undernourished.

**Ethical clearance:** Taken from Institutional Ethical Committee, Govt. Medical College, Haldwani, Uttarakhand

**Source of funding:** Nil

**Conflict of Interest:** Nil

**References**


7. Table 1, World Health Organization (WHO) classification of nutritional status of infants and children. Published online 2017.


