Original Article:
Malnutrition among Under Five Children in Peri-Tribal areas: A study on Prevalence and Factors associated in Vadodara District of Gujarat State in India

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Abstract: Background: Malnutrition among under-five children is a foremost public health problem across India. United Nation estimates that 6.3 million under the age of five die in India, of which 45% die due to malnutrition. The objective of the study was to find out the prevalence and factors associated with malnutrition in terms of underweight, stunting, and wasting in children under five years of age in peri-tribal areas. Methods: Cross sectional study was conducted at the Anganwadi centres in 6 villages under the Rural Health Training Centre. Out of nine Anganwadi centres, five were selected using systematic random sampling method. Total of 370 children aged below five years were selected. Results: Among the 370 children aged 0-5 years, 29.1% children were normally nourished, 70.79% children were malnourished and had one or more form of malnutrition. Only stunting was present in 19.5% children and only wasting was present in 8.9% children. Both underweight and stunting were seen in 5.94% children. Both stunting and wasting were present in 22.16% children and wasting and underweight were present in 10.5% children, respectively, 1% Children were suffering from underweight, stunting and wasting. All three indices (Underweight, Stunting & Wasting) of under nutrition were found to be higher in low-birth-weight children. Conclusion: Mother's educational qualification is strongly associated with nutritional status of children. This might be due to better health care practices in terms of proper exclusive breast feeding, in-time complementary feeding and quality and quantity of complementary feeding among literate mothers as compared to illiterate mothers. Key Words: Malnutrition, Underweight, Stunting, Wasting, Birth Weight, Health Education.

Introduction:
Malnutrition among under-five children is a major public health issue throughout in India. Malnutrition indicates that children are either too short for their age or too thin. (1) United Nations (UN) estimates that about 6.3 million under-five mortality occurred in India, of which 45% died due to malnutrition. (2) According to the National Family Health Survey (NFHS-4) in 2016, 38.4% of the nation’s children are stunted (low height for age), 36% of the children are underweight (low weight for age), and 18% children are wasted (weight for height). (3) Studies had reported the short-term and long-term impact of early childhood malnutrition in developing countries. (4-8). The short-term effects include weaker immune system, a higher risk of developing diarrheal disease, acute respiratory infection, and delay in motor skills and cognitive and social development during childhood. (5-7) The long-term effects include high blood pressure, obesity, diabetes, and heart disease during adulthood. Stunting has permanent and irreversible consequences, hindering the physical and mental development of an individual. It has been associated with a high risk of diabetes, obesity and hypertension in future, an underdeveloped brain, poor performance in school and reduced earnings. Objective of the present study was to find out the prevalence of different forms of malnutrition, its associated factors and prevalence of malnutrition among under 5 children in peri-tribal areas of Vadodara District of Gujarat State in India.

Materials and Methods
Study Design: A community based cross-sectional study was carried out at the five selected villages using systematic random sampling method for selecting 370 children in the age group of 0-5 years during September to October 2017. Study Areas: Out of the total 9 Anganwadis under the 6 villages of Rural Health Training Centre (RHTC) Waghodia, 5 Anganwadi Centres (AWC) were selected using systematic random sampling method. All the children registered under these 5 Anganwadis aged below 5 years were included in the study. To follow the above procedure first a list of AWC's and the number of registered beneficiary children aged 0-5 years attending them was obtained from the department of Women
& Child Development, Wagodha. The total number of children (N=370) under each Anganwadi centre selected were as follows: 73, 87, 109, 52 & 53 from Gugliyapura-1, Limda-1, Madodhar, Tavra 1, Tavra 2 & Vesalpur respectively.

Data Collection: The data was collected by interviewing the mother or guardian during house-to-house visit. Then informed consent was taken from the participants. Data was collected using a predesigned and pre-tested Performa. Anthropometric Measurement was done for collecting the data on weight, height of the children.

The height and weight of each child was compared with WHO growth reference data (2006) for that particular age and sex to get weight-for-age, height-for-age and weight-for-height indices. Children below -2 SD of the reference median on any of these indices were considered as undernourished and termed as underweight, stunted and wasted respectively. Children below -3 SD were considered to be severely undernourished and children with weights above +2 SD according to weight-for-height criteria were considered overweight.

The mid upper arm circumference (MUAC) was used to classify malnutrition in children aged 1 to 5 years. Children with MUAC 12.5 to 13.5 CMs were considered as mildly malnourished and those less than 12.5cms were considered as severely malnourished.

Data Analysis: The data were then entered and analysed using the SPSS software (Version 24.0). Descriptive statistics were obtained for different parameters. Chi-square test was used to compare the association between the dependant and independent variable.

Ethical Clearance: Institutional Ethical Committee (IEC) of Parul Institute of Public Health has approved the research study entitled “Malnutrition among under five children in Peri-Tribal areas- a study on prevalence and factors associated in Vadodara district of Gujarat State in India” for the research purpose.

Results

Table 1 shows the prevalence and associated factors of malnutrition among under five children. Result shows that 52.4% were males and 47.6% were female children. With regards to age distribution, it was observed that highest number of children were found in 37-48 months (27.6%). In 0-12 months age group, male children were 51.4% and female children were 48.6%; in 13-24 months males numbered 46.3% and females were 53.7%; similarly in 25-36 months, 37-48 months and 49-60 months age group male and female children were 51.3% and 48.8%; 56.9% and 43.1% and 54.9% and 45.1% respectively.

Table 2 indicates the evaluation of nutritional status, revealing that 29.1% children were normally nourished whereas 70.78% children were malnourished and had at least one or more forms of malnutrition. Only stunting was present in 19.5% children and only wasting was present in 8.9% children. About 5.94% children were suffering from both underweight and stunting. Stunting and wasting were present in 22.16% children and wasting and underweight in 10.5% children.

Table 2: Malnutrition status of the children (N=370)

<table>
<thead>
<tr>
<th>Malnutrition status</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Malnutrition</td>
<td>108 (29.2)</td>
</tr>
<tr>
<td>Malnourished (one or more form of malnutrition)</td>
<td>262 (70.8)</td>
</tr>
</tbody>
</table>

Table 3: Malnutrition in children according to birth weight (N=370)

<table>
<thead>
<tr>
<th>Birth weight</th>
<th>Total</th>
<th>Underweight</th>
<th>Stunting</th>
<th>Wasting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>295 (79.7)</td>
<td>42 (14.2)</td>
<td>234 (79.3)</td>
<td>110 (37.3)</td>
</tr>
<tr>
<td>Low birth weight</td>
<td>69 (18.6)</td>
<td>24 (34.7)</td>
<td>43 (62.2)</td>
<td>34 (49.2)</td>
</tr>
<tr>
<td>Very low birth weight</td>
<td>6 (1.6)</td>
<td>3 (50.0)</td>
<td>4 (66.7)</td>
<td>3 (50)</td>
</tr>
<tr>
<td>Total</td>
<td>370 (100.0)</td>
<td>69 (18.6)</td>
<td>281 (76)</td>
<td>147 (39.7)</td>
</tr>
</tbody>
</table>

Table 4 shows most of the mothers (71.9%) had given colostrum to their children. With respect to stunting, the prevalence was 73.7% and 81.7% among children who received colostrum feeding and who had not received colostrum. The prevalence of wasting was found to be 42.1% and 33.7% among children who had and had not been given colostrum feeding respectively. Similar to the distribution among underweight and stunted children, the association among wasted children also was not statistically significant (p=0.361). With regard to pre-lacteal feeds, 37% of mothers had given pre-lacteal feeds to their children. Prevalence of underweight, stunting and wasting among children in whom pre-lacteal feeds were given was 21.2%, 72.3% and 43.1% respectively. In the present study, 79.5% children had received exclusive breast feeding up to 6 months of age. With respect to stunting, the prevalence was 75.6% and 76.3% among children who received exclusive breast feeding (EBF) and who had not received EBF. The prevalence of wasting was found to be 40.2% and 38.2% among children who had and had not been given EBF respectively. With regard to exclusive breast feeding...
feeding, percentage of underweight was found to be higher among children who did not receive exclusive breast feeding. Inadequate breast feeding might have led to nutritional deficiencies in children who were not breast fed adequately and also made them vulnerable to repeated infections which in turn lead to malnutrition.

Table 4: Malnutrition in children according to colostroium feeding, pre-lacteal feeds and exclusive breast feeding (N= 370)

<table>
<thead>
<tr>
<th>Colostrium</th>
<th>Total Children</th>
<th>Underweight</th>
<th>Stunted</th>
<th>Wasted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>Given</td>
<td>266 (71.9)</td>
<td>48 (18.1)</td>
<td>196 (73.7)</td>
<td>112 (42.1)</td>
</tr>
<tr>
<td>Not given</td>
<td>104 (28.1)</td>
<td>21 (20.2)</td>
<td>85 (81.7)</td>
<td>35 (33.7)</td>
</tr>
<tr>
<td>Total</td>
<td>370 (100.0)</td>
<td>69 (18.6)</td>
<td>281 (76.0)</td>
<td>147 (39.7)</td>
</tr>
</tbody>
</table>

X² = 2.768
P = 0.429
X² = 4.273
P = 0.233
X² = 3.203
P = 0.361

Table 5: Malnutrition in children according to mother’s education (N= 370)

<table>
<thead>
<tr>
<th>Education of Mother</th>
<th>Total Children</th>
<th>Underweight</th>
<th>Stunting</th>
<th>Wasting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>Illiterate</td>
<td>134 (36.2)</td>
<td>20 (14.8)</td>
<td>110 (76.8)</td>
<td>54 (40.3)</td>
</tr>
<tr>
<td>Primary school</td>
<td>187 (50.5)</td>
<td>38 (20.3)</td>
<td>138 (75.4)</td>
<td>75 (40.1)</td>
</tr>
<tr>
<td>Secondary school</td>
<td>41 (11.1)</td>
<td>10 (24.4)</td>
<td>32 (78.1)</td>
<td>15 (36.6)</td>
</tr>
<tr>
<td>Higher secondary school</td>
<td>8 (2.2)</td>
<td>1 (12.5)</td>
<td>5 (62.5)</td>
<td>3 (37.5)</td>
</tr>
<tr>
<td>Total Late rate</td>
<td>236 (63.7)</td>
<td>49 (20.8)</td>
<td>175 (74.2)</td>
<td>93 (39.4)</td>
</tr>
<tr>
<td>Total</td>
<td>370 (100.0)</td>
<td>69 (18.6)</td>
<td>285 (77.0)</td>
<td>147 (39.7)</td>
</tr>
</tbody>
</table>

X² = 8.740
P = 0.046
X² = 6.258
P = 0.014
X² = 7.262
P = 0.010

Table 5 shows that the prevalence of underweight among children borne by illiterate mothers and literate mothers was 14.8% and 57.2% respectively and difference was not highly significant (p = 0.046). In the height for age criteria, stunting was noted in 76.8% and 74.2% of children borne by illiterate and literate mothers respectively and was not highly significant (p = 0.714). Similarly, the prevalence of wasting among children borne by illiterate and literate mothers was observed to be 40.3% and 39.7% respectively, which was not highly significant (p = 0.610).

Discussion

The present study reveals that 2.97% children had only underweight, only stunting was present in 19.5% children and only wasting was present in 8.9% children. About 5.94% children were suffering from underweight and stunting both. Stunting and wasting were present in 22.16% children and wasting and underweight in 10.5% children, respectively, and 1% children were suffering from underweight, stunting and wasting.

Another study conducted by Ratnu et al, has estimated prevalence of underweight (26.4%), stunting (49%) and wasting (10.7%) in 0-5 year children of Junagadh district of Gujarat. (9) Rao et al in a study conducted for Regional Medical Research Centre for tribals (ICMR study), Jabalpur, India revealed that 61.6% of preschool children were underweight, 51.6% were stunted and 32.9% were wasted. (10) The study also revealed severe degree (below-3 SD) of underweight, stunting and wasting in 27.8%, 30.3% and 6.5% children respectively. The prevalence of underweight, stunting and wasting was 45%, 46% and 29% respectively. SE class IV and V, low birth weight, higher birth order, late age of starting complementary feeding, parents’ education were significantly associated with under-nutrition. (11)

The mean weight of children in the present study was similar as compared with another study conducted by Kriti A Patel et al., in Sangli district of western Maharashtra (12), where the mean weights of male children ranged from 5.4 ± 2.7 kg to 13.17 ± 3.5 kg and of females ranged from 6.76 ± 2.65 kg and 11.7 ± 2.6 kg, between 0 years and 5 years. Similarly, heights of male children were between 63.85 ± 2.7 cm and 95.57 ± 3.6 cm while in females between 60.15 ± 4.5 cm and 90.46 ± 8.9 cm. The mean heights observed in this study were very much similar with findings in the present study.

Similar findings were found in another study where trend of malnutrition was decreasing with increase in maternal education. The three indices of nutritional status namely, weight for age, height for age, and weight for height were expressed in standard deviation units from the median for the international reference populations as per WHONCHS standards and were compared with WHONCHS growth reference data. The prevalence of underweight (weight for age below 2SD) was 43.67%. Half of the (50.3%) children were found stunted (height for age below -2 SD) with higher prevalence in 2nd and 5th year of life. Prevalence of wasting (wt. for ht. below 2SD) was comparatively low (23.2%) with a peak in 3rd year of life. These nutritional parameters showed a significant association with parental education. (13) Study carried out by A Mittal et al., in urban slums of Tripura, Patiala, overall, 70.75% of the mothers were literate up to different levels. Prevalence was the highest where mothers were illiterate (60.9% vs 21.2% where mother had education more than high school. Similarly, figures for stunting were 65.25% where mother was illiterate and 31.3% where education level was more than high school. Differences were statistically significant for both the cases. (14)

This finding was similar with findings in another study conducted by Paramita Sengupta et al., in an urban slum of Ludhiana where all forms of under nutrition were found to be higher in LBW children. Being born with low birth weight appears to carry a higher risk of being underweight in the first five years of life with the prevalence of underweight observed to be significantly higher (p=0.024) in the LBW children. Low birth weight babies take more efforts for increasing their body weight and have a much higher chances of being malnourished than their normal birth weight counterparts. This clearly emphasizes the role of maternal care during pregnancy in impacting malnutrition in India. (15)

In the study carried out by Dinesh Bhanderi et al., in Petlad town, a semi urban area of Anand district, Gujarat involving 300 under five children, prevalence of underweight and stunting was higher among children who had not received colostrum as compared with children who received colostrum feeding and the difference was statistically significant (p<
0.001), while for wasting there was not any significant difference between colostrum given or not given. (13) In another study conducted by Paramita Sengupta et al., in urban slums of Ludhiana, the highest prevalence of underweight children was found in those who were not given supplementary feeding even after 6 months followed by those in whom weaning was started before 4 months (p=0.021). Low birth weight of child was found to have adverse effect on nutritional status of children. (16)

The findings in our study reflect that educational qualification of mothers was strongly associated with nutritional status of their children. Mothers’ literacy played a protective role against malnutrition in children. This might be due to better health care practices in terms of proper exclusive breast feeding, in-time complementary feeding and quality and quantity of complementary feeding among literate mothers as compared to illiterate mothers.

Conclusion
The prevalence of malnutrition among under five children in peri-tribal areas is higher than thought. Exclusive breast feeding had beneficial effect in protecting children from malnutrition, as proportion of underweight was found to be higher in children who had not received exclusive breast feeding. Among mothers of malnourished children, giving pre-lacteal feeds, delayed starting of complementary feeding and neglecting diet during ill-health in children were predominant faulty practices found. Gender was not found to be associated factor with regards to providing care or feeding practices among normal and malnourished children. Mothers’ literacy had a much higher impact on better nutritional status of children. All forms of malnutrition were found less among the children with literate mothers. Low birth weight was found to have adverse effect on nutritional status of children and malnutrition was higher in children with low birth weight. This reiterates the impact of maternal nutrition and health condition during antenatal period on the nourishment of the child. Therefore, the continuum of care needs to be emphasised upon. Maternal nutrition being one of the most important factors for ensuring normal birth weight babies, needs a top priority and ensuring maternal nutrition will also ensure child nutrition.

Recommendation
There is need of nutritional counselling and education to mothers regarding proper complementary feeding during first year of children’s life to decrease problem of chronic malnutrition. Complementary feeding needs to be monitored more often by the field level workers like Anganwadi workers and Accredited Social Health Activist (ASHA) workers.

Limitation of the study
This study was limited to small peri-tribal areas with small sample size due to resource constraints. As this was a field-based study, any laboratory investigation was not carried out and it was limited to clinical examination and anthropometry measures.

Relevance of the study
Maternal nutrition being one of the most important factors for ensuring normal birth weight babies needs a foremost priority. Therefore, ensuring maternal nutrition and early initiation of breastfeeding practice in Indian rural areas along with adequate complementary feeding initiation at 6 months.

Declaration of Conflicting Interests: The authors declared no conflicts of interest.

Acknowledgement
We would like to extend our sincere acknowledgement to Institutional Ethics Committee of Parul Institute of Public Health, Parul University, Vadodara, Gujarat State who permitted us to conduct the research study in peri-tribal areas of Vadodara district. We also thank the respondents and concern authorities for their support and valuable information.

References: