



## Impact of Health Promoting Nutrition Intervention Package on Severe Malnutrition among Under-Five Children in Rural Northern India

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### Abstract

**Background:** Globally, 17 million children under 5 years of age are affected with severe malnutrition. Severe wasting is a key contributor (12.6%) to child deaths due to nutritional deficiencies and is responsible for several morbid conditions.

**Objective:** The purpose of this paper was to assess the impact of nutritional counseling intervention on severe malnutrition among rural under-five children in Northern India.

**Method:** Nine villages in an ongoing project were included in the study to include all the under-five children (N=573) from these villages. Nutritional assessment was performed as per World Health Organization (WHO) child growth standards. Based on their z-scores of malnourishment indicators, children affected with severe malnutrition were included for customized health promoting nutritional intervention, other than the regular nutrition counseling sessions for all malnourished under-five children. Post nutrition counseling changes in anthropometric measurements were recorded at an interval of 6 months.

**Results:** Significant changes were observed in mean z- scores before and after nutrition intervention that declined from -3.05 to -1.81 and -3.16 to



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-2.25 for weight for height (WHZ) and weight for age (WAZ), respectively.

**Conclusion:** The results showed that the intervention was effective in community-based management of severe malnutrition among children in rural Northern India.

## Introduction

Malnutrition is currently among one of the biggest challenges being faced by the modern world.<sup>1</sup> Its occurrence in early childhood affects the mental, physical and emotional development of children and their future productivity.<sup>2</sup> Prolonged states of malnourishment among children lead to significant consequences like delay in their physical growth and motor development; lower intelligence quotient (IQ), greater behavioral problems and deficient social skills, enhanced susceptibility to contracting diseases, etc.<sup>3, 4</sup> Being at the greatest risk of malnutrition during their growing period that demands high intake of protein and calories, pre-school children (1-6 years) are the most vulnerable segment of the community.<sup>5</sup>

India faces a substantial proportion of disease burden when it comes to malnutrition. According to the National Family Health Survey (NFHS) IV survey, it was observed that in rural Punjab 24.5 %, 16.1%, 5.9% and 21.1% under five children were stunted, wasted, severely wasted and underweight, respectively.<sup>6</sup>

Malnutrition can be under-nutrition (low weight and height for age) or over-nutrition (higher weight for age- tendency towards obesity).<sup>7</sup> Furthermore, malnutrition, specifically under-nutrition, can be of acute as well as of chronic origin. The most common form of chronic under-nutrition is stunting. Stunting is described as a height that is more than two z-scores below WHO Child Growth Standards median or simply low height for age. It is evident that the child starts to get affected by stunting *in-utero* itself. Avoidable factors like maternal health and nutrition play a significant role in determining the height a child will achieve due to his or her full growth potential. Although hereditary factors also play a role and these are unavoidable, timely access to adequate health care and better nutrition for pregnant women influences fetal growth and development of a child.<sup>8</sup>

A project titled 'Village Child Health and Nutrition Project' was initiated as a result of evidence generated from a need assessment survey in district Fatehgarh Sahib, Punjab.<sup>9</sup> The project activities included modification of existing infrastructure and services at the Anganwadi Centres and nutrition related health promotion activities (nutritional counseling, customized diet charts). The project itself intended to provide a conducive environment for better nutritional status through improved utilization of Anganwadi Centres. The intervention was considered a health promotion activity as it included one-to-one interaction with parents to sensitize them about the issue of malnutrition, counsel them about the right foods for good health, provide them the option to follow a diet chart which could be customized as per need; and, follow-up visits to keep them motivated. The methodology to deliver nutrition related health promotion activities and subsequent results are discussed in the following sections of this paper.

## Materials and Methods

### Study Design and Area

In the initial phase, a community based cross sectional study design was followed for baseline data collection in the nine rural areas of District Fatehgarh Sahib to identify the undernourished under-five children. In the next phase, intervention was delivered to the target population identified during the baseline survey.

### Study Population, Sampling, and Sampling Technique

Under the nine villages included in above mentioned Village Child Health and Nutrition Project, all the under-five children totaling to a number of 573 were included in the survey using Census-based sampling technique. Out of the total enrolled under-five children, 43 were reported to be severely malnourished (z-score for under-nutrition indicators below -3).<sup>10</sup> For the study, three children had to be omitted during the final data analysis since they

crossed the age of five years during end-line data collection in 2017 (n=40). They were, however, covered under the intervention services designed for the target group of children.

### **Data Collection**

The anthropometric measurement of the study population was taken using the procedure stipulated by the WHO (2006).<sup>11</sup> The process was named as Aggressive Growth Monitoring as it was more vigorous and comprehensive as compared to the one performed using the Integrated Child Development Scheme (ICDS) of Government of India.<sup>12</sup> Information was collected in relation to the child's age, height, and weight. These measurements were made to assess the nutritional status of the children using specific indicators including weight for age, height for age and weight for height. The monitoring was done using standard UNICEF height board and digital weighing scale. The collected information was stored in the WHO Anthro software.

### **The Data Collection was Done at Two Stages**

preliminary data collection followed by the introduction of the intervention and post-intervention data collection of the participants enrolled in the intervention based on the preliminary results.

The total duration of study was nine months (October 2016 to July 2017) including preliminary survey, intervention plan development and its implementation followed by post-intervention survey.

### **Data Analyses**

The collected anthropometric data were analyzed using WHO Anthro Software.<sup>13</sup> This software provides the z-scores of various nutritional indicators ranging from zero to -3 z-score (and less) and from zero to +3 z-scores (and more). The malnutrition indicators included were actually the under-nutrition indicators (moving towards negative z-score values) involving wasting (low weight for height), stunting (low height for age) and underweight (low weight for age).

Further, the indicators were graded into mild, moderate and severe forms based on the z-scores. Since project aimed to assess the status of under-nutrition and appropriate intervention, the z-scores with negative values would describe the status of

under-nutrition and its grades. Thus the wasting, stunting and underweight were graded into mild (-2 to -1 z-score), moderate (-3 to -2 z-score) and severe ( $\leq -3$  z-score). In the present article, the change in the nutritional status of severely malnourished ( $\leq -3$  z-score) under-five children was analyzed using SPSS version 16. The change was measured in terms of change in z-scores.

### **Ethical Consideration**

The parents were provided an information sheet translated in regional language and the activities were performed after obtaining their informed consent.

Ethical clearance was taken earlier when baseline assessment was done. The malnourished children were selected from the baseline data. This is a field practice area of the investigators and the intervention presented here was initiated as a part of their community service.

### **Selection of Participants for Nutritional Intervention**

The children who had z-score values of any of the indicators below -3, were considered severely malnourished.<sup>10</sup> Under the intervention package, following activities were performed:

#### **Nutrition Counseling**

One on one home visits and nutrition counseling of mothers on adequate nutrition to the under-5 children was done. The mothers were informed of significance of diet in the development of children during their pregnancy and till two and five years of age after birth. They were told to identify symptoms of inadequate dietary intake by children, constipation being the major symptom, symptoms and management of pica disease in children.

#### **Diet Chart**

A diet chart favorable to the availability of food in the region was prepared. The diet chart had two subcategories: from birth to two years of age and from two years onwards up to five years of age. The parents were advised to focus on the timing and quantity of eating rather than strictly consuming the same food items as were mentioned in the diet chart, i.e. there was scope of customizing the diet chart as per the need expressed by the parents.

### Follow Up Visits

Two follow up visits were paid to each child enrolled in the intervention. This allowed the mothers to discuss any issues in following the instructions prescribed in the intervention program and to motivate them to keep following the instructions as much as possible. The follow ups also helped in learning about any sickness the child may have suffered from between two consecutive visits and appropriate action involving the diet chart.

The weight measurement was done for each child in the intervention during the follow-up visit as a motivational factor for the mothers to demonstrate impact of their efforts to bring change. Appropriate

diet modification was done for the children whose weight for age wasn't improving as expected on a particular follow up visit.

### Results

#### Preliminary Survey Findings

The preliminary data analysis revealed that out of 573 under-five children, 14.14% were suffering from any grade of wasting, whereas 15.71% and 19.22% children reported having suffered from any grade of stunting and underweight, respectively. The analysis revealed that 43 out of 573 (7.5%) under-five children fell into the category of severe malnutrition, making them potential population suffering from any sort of severe under-nutrition (Table 1).

**Table 1: Preliminary survey findings from the aggressive growth monitoring: Distribution of various forms of under-nutrition among rural under-five children**

Variable	Frequency (Percentage) (n=573)
<b>1 Malnutrition Indicator</b>	
Wasting (low weight for height)	81 (14.14)
Stunting (low height for age)	90 (15.71)
Underweight (low weight for age)	110 (19.22)
<b>2 Severe under (mal)- nutrition (any indicator)</b>	
Children affected with Severe form of under-nutrition	43 (7.5)*

\*selected for the nutrition intervention

**Table 2: Effect of nutrition counseling on the nutritional status of SAM children**

Indicator (n=40)	Baseline Mean z-score	End-line Mean z-score	Mean difference/ change in z-score	p-value
WHZ (wasting)	-3.05 (0.90 SD)	-1.81 (1.30 SD)	-1.23 (1.5 SD)	0.000
HAZ (stunting)	-1.84 (1.9 SD)	-1.73 (1.6 SD)	-0.11 (1.3 SD)	0.59
WAZ (underweight)	-3.16 (0.78 SD)	-2.25 (1.18 SD)	-0.90 (0.93 SD)	0.000

### Post-intervention Findings

The participants who were recruited in the intervention were assessed for the nutritional status for six months from the baseline survey. Out of 43 participants, 40 under-five children qualified for the assessment of the effect of the intervention as three of the children crossed the age of five years during the end-line data collection.

The height and weight of 40 participants were measured and analysis was performed to assess

their nutritional status against three growth indicators i.e. stunting (low height for age), wasting (low weight for height) and underweight (low weight for age).

### Effect of Nutrition Intervention

The effect of health promoting nutrition intervention activities collectively on 40 children affected with severe malnutrition ( $\leq -3$  z-score) was measured and significant changes were observed in mean z-scores. The significant decline in wasting and underweight varied from -3.05 to -1.81 and -3.16 to -2.25 of mean

z-score values respectively. A statistically significant mean difference (change in the mean z-score) of participants was observed in relation to wasting and underweight but stunting (Table 2).

### Discussion

The preliminary findings of the nutritional status in the present study report 14.14% under-five children to be affected by wasting (low weight for height). Slightly higher prevalence of the same was found in the National Family Health Survey (NFHS) of 2015-16, where 16.1% under-five children in rural Punjab are affected by wasting.<sup>6</sup> The rest of the two indicators i.e. stunting and under-weight also show a similar trend (government data showed higher prevalence of both these in rural Punjab). It is however, worth mentioning that the country-level prevalence of the same indicators is much higher (stunting- 41.2%, wasting- 21.5% and underweight- 38.3%) than one found in the Northern state of Punjab in the present study as well as in comparison to the government data.<sup>14</sup> The role of public health counseling, the socio-economic status of the residents, diet, etc. tend to play a major role.<sup>15</sup> But the effects of the specific risk factors in the development of under-nutrition among children will help in deciding more precise and concerted public health counselling.<sup>16</sup> In India, economic differences and inequalities are considered to be the major cause of decades-long existence of malnutrition. The mid-day meal scheme and the Integrated Child Development Services (ICDS) scheme, both government programs, are thus intended to cater every child going to a government school up to a specific age, irrespective of the economic status of their families. Despite these initiatives, under-nutrition is still prevalent in India. More research is needed to refine the existing policies and develop the new ones to address the gaps.

The prevalence of any form of severe under-nutrition was reported to be 7.5% in the present study. The NFHS 2015-16 data reports the prevalence of severe wasting to be 7.4% in rural India and 5.9% in rural Punjab among under-five children.<sup>6, 14</sup> In our study, the prevalence was collectively derived from the three nutrition indicators whereas, in the government data, only severe wasting is reported. It may indicate wasting (low weight for height) to be one of the most common indicator of acute

under-nutrition and is on the rise in the nation.<sup>17</sup> Management of weight in children can easily result in improved nutritional status in relation to weight for their height and age, provided diagnosis and treatment of specific underlying infection is also taken into consideration.<sup>17</sup>

The nutrition intervention package in the present research included one-on-one nutrition counseling, diet chart distribution and follow-up visits. Many nutrition intervention programs are already running in the country for under-five children, ICDS scheme being one of them.<sup>18,19</sup> Under the scheme, the Anganwadi Worker primarily manages delivery of food to the pregnant and lactating females along with under-five children and may pay a periodic visit to the children to find any case of under-nutrition. There is a lack of involvement of any nutrition expert at the grass-root level that affects the ICDS service delivery. This is because the Anganwadi Worker may not be able to effectively counsel the mother/family and, at times, may need an expert's guidance which is not provided under the ICDS. There is an established evidence of lack of Anganwadi Workers' capacity to adequately counsel the mothers about a malnourished child, as they had poor skills to identify the malnourished children based on the physical symptoms and anthropometric measurements.<sup>20</sup> Thus, rather than just informing Anganwadi Workers to take action for the severely under-nourished children, a team of experts was chosen to do the nutrition counseling with their help in persuading the community members to participate in the same. Other than that, the diet chart distribution was an innovative idea where the family could learn about the frequency, quantity and the type of food which could be fed to the child.<sup>21</sup> Another advantage of the diet chart was that the written information was provided to them and it helped the users in remembering appropriate feeding practices and associated instructions. The benefits of having access to written information were cited by the families during the follow-up visits. Many mothers came up with questions about alternative foods other than mentioned in the diet charts. It indicated that the introduction of diet charts encouraged them to think of other options for beneficial foods as children do tend to get bored of eating the same food on and on. The follow-up visits ensured the families' participation and full cooperation in adhering to

the intervention protocol. The direct involvement of nutritional experts boosted their confidence in favoring the locally available food items rather than getting confused about buying the diet supplements as advertised in the television commercials.

The post-intervention data collection on the nutrition indicators were performed six months after the intervention delivery to the participants. The findings were oriented to assess the effect of nutrition intervention on the concerned population. As mentioned above, there was a reduction in the mean z-score (i.e. shift towards positive) for wasting and underweight indicating the reduction in severity of under-nutrition. Other similar studies have reportedly taken the mean difference in z-scores to quantify the effect of a nutrition intervention.<sup>22</sup> The change was also observed pertaining to the occurrence of a severe form of stunting with a mean change of -0.11 z-score (1.3 Standard Deviation), but the change was not statistically significant. Many other nutrition intervention studies of a similar duration as the current study also came up with improvement, mainly in the acute forms of under-nutrition. This emphasizes the need of having stringent actions to improve low height for age and a coordinated action approach targeting the female health throughout her reproductive period (life-cycle approach) and care of the child (first 1000 days).<sup>23, 24</sup>

Health promoting nutritional intervention with positive outcomes indicates the possibility of dealing with the issue by sensitizing families about nutritional issues. Thus, not only the economic aspects matter but also the family's motivation and knowledge to adequately utilize the locally available food materials, many of those can be easily grown at home. In this study, the children were not assessed for achievement in motor milestones which would be beneficial in planning the educational activities among pre-schoolers. The limited region of the study limits its generalizability to all parts of Northern India or the entire country of India which is very diverse and, strictly speaking, the results are only applicable to the study region. Further process evaluation of nutritional intervention

or the role of individual components of intensive nutritional counseling was not undertaken in this study which can perhaps be taken up in future studies.

Since community engagement and their trust in the service providers is important in terms of beneficial effects of an intervention, the government programs may incorporate a strategy of periodic interaction of the nutrition experts with the target community members. The nutrition clinics can be established in the rural communities so that the accessibility to related services is no longer an issue. The nutrition workshops for the community members should be organized periodically where families can participate to prepare healthy foods from the locally available resources. This may aid as an interesting booster for them. The parents should be motivated to periodically monitor the nutritional status of their children (measurement of weight, height, etc.) and be made aware of the government initiative for self-evaluation of child growth using already available tools like Mother-Child Protection Card.

### Conclusions

The health promoting nutrition intervention including nutrition counseling and provision of diet chart among the under-five children was capable of reducing the occurrence of severe form of malnutrition in Northern India. Constant community-based interaction of nutrition experts engages the community more efficiently and empowers them to take initiatives with constant motivation.

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### Conflicts of Interest

The authors declare no conflict of interest.

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