Original article

Impact of Health Intervention on Nutritional status of Malnourished Children in an Urban slum of India

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ABSTRACT

Background: India has made huge strides in the past decades in warding off the spectre of famine. The Green Revolution should have gone a long way to tackling child malnutrition, Norman Borlaug's creation of dwarf spring wheat strains in the 1960s meant that India could feed itself at last. Better farming techniques and food security policies have made mass starvation a thing of the past. Yet the problem of child malnutrition remains critical, and the reasons it deserves concerted attention are many. **Methods:** The present study was carried out to assess the impact of health intervention (health and nutritional education) on nutritional status of children attending Anganwadi in Rafiq nagar Mumbai. A longitudinal interventional study was conducted at Rafiq Nagar urban slum. All children below 6 years of age attending 6 Anganwadis were included. The information was gathered by personal interview of mothers using semi-structured proformas. **Results:** Out of 194 children 93 (47.9%) were males. According to WHO malnutrition grading, 59.8% children were malnourished and only 90 (46.4%) were completely immunized. Malnutrition was prevalent in the age group of 1-2 years. Improvement in weights and heights of children was seen after health intervention for 6 months. **Conclusion:** Appropriate dietary modifications have to be done to ensure the increased calorie & protein intake as per the recommendations. Nutritional education should be considered as major intervention to reduce problem of Protein Energy Malnutrition (PEM). Mother should be properly educated about the nutritional needs of the growing children and importance of complete immunization.

KEYWORDS: Immunization, Health intervention, Malnutrition, Nutritional Education, Urban slum

INTRODUCTION

Future of the country is determined by the growing generation of the country. It is the health status of children of any country that represents the health status of people of that country. Since this growing generation is going to be the future productive citizens, they should be healthy enough to make use of the full potential of their productive age. Scientific evidence has shown that beyond the age of 2-3 years, the effects of chronic malnutrition are irreversible. Child malnutrition is the single biggest contributor to under-five mortality due to greater susceptibility to infections and slow recovery from illness. Misconception prevalent in the present time is the unavailability of the enough food. Between 6-18 months, food availability within the household is usually not the critical factor causing malnutrition. It is more often inadequate knowledge about feeding practices that are in the best interest of the child. The denial of as little as 200-300 calories in a young child's daily diet is what makes the difference between the normal growth and the faltering that predispose towards illness and death [1].

India is by no means the poorest country on earth; it doesn't have the lowest life expectancy or literacy, or the highest rate HIV/AIDS. India isn't at war, there is considerable foreign direct investment, and there is a large buffer stock of food grains. But it is far from the whole story. Mumbai, India's commercial capital is in many ways a microcosm of the country. Next to the breathtaking opulence of the down town area and the booming financial services industry, lies Asia's largest slum, the bustling Dharavi and Govandi, home to two million people – many of whom lack clean drinking water and basic sanitation.

According to the state government's data, 3.5% of Greater Mumbai's slum children under six die every year because of poor nutrition and increased risk of infections - a figure largely accepted by academicians and social workers. The city has about 0.73 million slum children below the age of four (according to the government National Family Health Survey), so at least 25,550 (3.5% of 0.73 million) children die of malnutrition and related illnesses every year. 'Malnutrition kills 56,000 children annually in urban slums' sources according to Times of India opinion dated 10/1/11. About 25,000 slum children in Mumbai die of malnutrition every year, a sad fact brought to focus by the recent deaths in Mumbai's Rafiq Nagar locality where the study was conducted [2].

These deaths occurred in a community of rag pickers that lives off Mumbai's biggest garbage dump. If they don't spend their day sorting out and selling garbage, they can't eat. The women are anaemic; their children are born underweight, and often don't survive beyond two months. Amongst those that do, their nutritional status keeps going down because they live only on breast milk.

Hence there is an urgent need to address the serious issue of why are malnutrition levels in India so high?

MATERIALS AND METHODS

Present longitudinal interventional study was carried out in Rafiq Nagar, Govandi. Rafiq Nagar is located under the field practice area of Department of Preventive and Social Medicine, under the TN Medical College, Mumbai. This area has a large slum population and the TN Medical College provides its preventive, promotive and curative service through Urban Health Center and Health post under Municipal Corporation of Greater Mumbai. Rafiq Nagar is the area where all the garbage from Mumbai is dumped and called as dumping ground of Mumbai. Most of the people are rag pickers and depended on this occupation for their daily living.

This area has a total population of 9500 of which total child population under 6 years of age is 1600 [Data available from Integrated Child Development Services (ICDS) Mumbai office]. All children from age 0-6 years of age, registered in Anganwadi were included in the study. Total population of 0-6 years children in six Anganwadi was 230 out of which 194 were selected for the study as they fulfilled the study criteria. There was a loss of 36 children as the mothers were not

available during the study as mothers were involved in rag picking activity during the morning hours. Still efforts were made to motivate the mothers to attend the Anganwadi center and get enrolled into the study. When not responded by those mothers, their children were excluded from the study.

Implementation of study design

It consisted of six phases:

1. **Preparatory phase**

2. **Phase of data collection**

3. **Intervention phase**

4. **Phase of post intervention data collection**

5. **Phase of data analysis**

6. **Phase of interpretation and discussion**

1. Preparatory phase

Administrative approval was taken from following authorities.

- The Dean of TN Medical College, Mumbai

- Ethics committee of TN Medical College, Mumbai

- Professor and Head, Department of PSM, TN Medical College, Mumbai

- In-Charge of Urban Health Center, Shivaji Nagar Urban Health Center

- Child Development Project Officer of ICDS office Chembur, Mumbai.

1.1 Data collection tools

Data collection tools such as consent forms and preformed, pretested, semi-structured, open-ended questionnaire's were prepared. To reduce bias, the information was collected maintaining utmost privacy as per the convenience of the respondents. Time required to complete one interview was approximately 30 minutes.

1.2 Pilot study

A pilot study was carried out in the same area by selecting two Anganwadis randomly and the weights of the enrolled children were taken. If child was not available then home visit for taking the weight of the child was done. There were total 95 children in the Anganwadi out of which 82 were suffering from malnutrition. Amongst this 29 were in Grade I malnutrition, 42 Grade II, 7 Grade III and 4 were in Grade IV malnutrition scale (According to IAP malnutrition scale). These two Anganwadis selected in the pilot study were excluded from the main study.

2. Phase of data collection

Six different Anganwadi were selected by the lottery method from remaining 10 Anganwadis. Proper time schedule was prepared to cover these Anganwadi. Each Anganwadi was to be covered within duration of two weeks which were visited on the working day by the investigator. Anganwadi worker were intimated about the visit so that the Anganwadi worker and the Anganwadi Sevika could mobilize the mothers to the Anganwadi center so as to enroll the mothers in to the study. Mothers were called on the specific day and they were interviewed using a preformed, pretested, semi-structured questionnaire. The question put forward to the mother in the local language in which they were comfortable. Everybody responded adequately with Hindi language. Sufficient time was given to mother to think over and to respond appropriately. After the questionnaire was over anthropometric measurement of the child was taken. All the children were weighted on the Salter's weighing machine in kilograms and height of the child was noted in centimeters. Infantometer was used to measure the length of the children less than 1 year of age. Total calories intake of the child in last 24 hour was also noted down by recall method. All the queries about the child's health were addressed and the proper solution to the problem was provided in the same visit.

3. Intervention phase

Intervention phase consists of consists of following interventions.

a) During the first visit mother was interviewed and after that the mother was asked about the child's problems. General and the systemic examinations of the child were done and the child was assessed for presence of any kind of illnesses. If found child was referred to the nearest health facility for the treatment. Misconceptions regarding the child feeding practices were tried to be rectified in the same first visit by one to one health talk. Mother was encouraged to get the child completely immunized from the nearest health facility.

b) Monthly visit was made to the Anganwadi to assess the child for any kind of ailment and the appropriate intervention was provided for the same. The child was referred for the immunization, de-worming, vitamin A supplementation, iron folic acid and multivitamin supplementation to the pediatrician or the medical officer for any of the medical ailments for the expert opinion.

c) During the same period one group discussion was arranged in each Anganwadi where all the mothers were called on one specific day so as to facilitate the sharing of the ideas, beliefs and the problems of child rearing. The opportunity was not missed and mothers were educated regarding following issues:

- Exclusive breastfeeding

- Weaning and complementary feeding

- Importance of continued breastfeeding

- Immunization

- Contraception

- Identification of the child's medical ailments at the earliest stage and to start the treatment at the earliest

- Mothers were educated for diarrhoeal diseases, WHO Oral Rehydartion Solution (ORS), homemade ORS, respiratory illnesses, ear infections, de-worming practices, maintenance of proper hygiene and promotion of home based high calorie and high protein content food preparation. Guidelines for the same were taken from the ICDS office regarding the special home based food preparation.

In these group discussions efforts were also made to demonstrate the breastfeeding and weaning practices through skit plays. Poster competition was organized to make the learning more like fun so that mothers will not only listen to the health talk given but also will recollect the information in the poster making competition and hence would have the proper information about the breastfeeding.

All these interventions were carried out only for malnourished children.

4. Phase of post intervention data collection

This phase comprised of collection of the data regarding the height and weight of the children enrolled in the study after 6 months of follow up.

5. Phase of data analysis

Data thus collected on the preformed questionnaire was entered in the Exel Sheet 2007 and analysis of the data was done using SPSS 15.0 package and primer software. The comparison of Quantitative variables between and within the groups was done using student's t-test, while the Qualitative data was compared using chi-square test. The confidence limit for significance was fixed at 95% level with p-value < 0.05

6. Phase of interpretation and discussion

The findings of the present study were compared and discussed with other relevant studies done before and finally conclusion was drawn and recommendations drawn were put forward.

Nutritional Status of Children assessed by using

1) IAP classification for malnutrition [3]

Nutritional Status	% of Standard weight for age
Normal	More than 80%
Grade I	71 to 80%
Grade II	61 to 70%
Grade III	51 to 60%
Grade IV	Less than 50%

2) WHO classification for malnutrition [3]

	Normal	Moderate Undernutrition	Severe Undernutrition
Weight for height (W/H)	Standard deviation up to 2 of expected W/H; (i.e. > 79% of expected W/H)	Standard deviation score between 2 to 3 of expected W/H; (i.e.70-79% of expected W/H) – Moderate acute Malnutrition (MAM)	Standard deviation score below 3 of expected W/H; (i.e. <70% of expected W/H) - Severe acute Malnutrition (SAM)
Height for age (H/A)	Standard deviation up to 2 of expected H/A (i.e. > 89% of expected W/H)	Standard deviation score between 2 to 3 of expected H/A; (i.e. 85-89% of expected W/H) - Stunting	Standard deviation score below 3 of expected H/A; (i.e. < 85% of expected H/A) – Severe Stunting

RESULTS

Total 194 children were selected for the study of which101 (52.1%) were females and 93 (47.9%) were males. Table 1, 2 reveal that, according to WHO growth chart 116 (59.80%) children were suffering from malnutrition of which 73 (62.9%) children were suffering from moderate acute malnutrition (MAM) and 43 (37.1%) children were suffering from severe acute malnutrition (SAM). Moderate malnutrition was more prevalent in females and severe malnutrition was more prevalent amongst the males. Out of 194 children, 111 children (57.20%) were suffering from chronic malnutrition as they were below 5th percentile for their height for age. 84 (43.30%) were wasted as they were below 5th percentile for weight for their height.Out of 194 children, 90 (46.4%) children were partially immunized for their age. 14 (7.2%) children were non-immunized till the date. BCG and OPV 0 vaccine dose had the maximum coverage; but as the age advances frequency of individual vaccination decreased. Significant association was seen between immunization status and malnutrition.

Table1: Distribution of children according to age and nutritional status

Variables		Female (N-101)	Male (N-93)	Total
Age	Up to 1 year	3 (3%)	6 (6.5%)	9 (4.6%)
	1-2 years	13 (12.9%)	17(18.3%)	30 (15.5%)
	2-3 years	24 (23.8%)	21(22.6%)	45 (23.2%)
	More than 3 years	61 (60.4%)	49(52.7%)	110 (56.7%)
IAP grading of malnutrition	Grade I	44(43.6%)	31(33.3%)	75 (38.7%)
	Grade II	24(23.8%)	25 (26.9%)	49 (25.3%)
	Grade III	8 (7.9%)	3 (3.2%)	11(5.7%)
	Grade IV	0 (0%)	1 (1.1%)	1 (0.5%)
	Normal	25 (24.8%)	33 (35.5%)	58 (29.9%)
WHO grades of malnutrition	MAM (2 to 3 SD)	42 (41.6%)	31 (33.3%)	73 (37.6%)
	SAM (below 3 SD)	19 (18.8%)	24 (25.8%)	43 (22.2%)
	Normal	40 (39.6%)	38 (40.9%)	78 (40.2%)
Immunization status	Completely immunized	46 (45.5%)	44 (47.3%)	90 (46.4%)
	Partially immunized	48 (47.5%)	42 (45.2%)	90 (46.4%)
	Non-immunized	7(6.9%)	7 (7.5%)	14 (7.2%)
Height for age	Below fifth percentile	55 (54.5%)	56 (60.2%)	111 (57.2%)
	Fifth percentile and above	46 (45.5%)	37 (39.8%)	83 (42.8%)
Weight for height	Below fifth percentile	45 (44.6%)	39 (40.9%)	84 (43.3%)
	Fifth percentile and above	56 (55.4%)	54 (58.1%)	110 (56.7%)

Table 2: Immunization status of children

Immunization status	BCG & OPV	OPV, DPT, HBV1	OPV, DPT, HBV2	OPV, DPT, HBV 3	Measles	OPV/ DPT Booster
Yes	90.70%	88.10%	77.30%	63.90%	52.10%	35.10%
No	9.30%	11.90%	22.70%	36.10%	45.40%	56.20%

Table 3 shows, 58.8% of the children were suffering from pallor (anaemia), 46.9% of the children had the history of worms in stools in the past, 41.20% of the children have suffered from rashes all over the body with or without the history of fever, 41.20% of the children had the history of admission in hospital in the past for various reasons, 28.40% of the children had ear discharge at the time of initial general examination, 26.80% of the children had the history of admission in hospital due to lower respiratory tract infection (LRTI) and 25.80% of the children had history of loose stools more than 3 times a day in the past. Significant association was seen between these variables and the nutritional status of the children. Table 4 describes more improvement in mean weight and height of malnourished children compared to normal children after six months of intervention. Difference between mean weight and height of normal and malnourished children was decreased after six months of intervention.

Table 3: Association of malnutrition with various ailments and immunization status of children

Variables		Total	Malnutrition		Chi-square test	p value
			Present (116)	Absent (78)		
History of (H/O) Ear discharge	Yes	55 (28.4%)	40 (34.5%)	15 (19.2%)	5.31	0.02
	No	139 (71.6%)	76 (65.5%)	63 (80.8%)		
H/O Worm infestation	Yes	91 (46.9%)	66 (56.9%)	25 (32.1%)	11.56	0.01
	No	103 (53.1%)	50 (43.1%)	53 (67.9%)		
Pallor	Yes	114 (58.8%)	84 (72.4%)	20 (25.6%)	39.2	0.01
	No	80 (41.2%)	32 (27.6%)	58 (74.4%)		
H/O LRTI	Yes	52 (26.8%)	40 (34.5%)	12 (15.4%)	8.67	0.01
	No	142 (73.2%)	76 (65.5%)	66 (84.6%)		
H/O Chronic Diarrhoea	Yes	50 (25.8)	38 (32.8%)	12 (15.4%)	7.36	0.01
	No	144 (74.2%)	78 (67.2%)	66 (84.6%)		
H/O hospital admission in Past	Yes	80 (41.2%)	58 (50%)	22 (28.2%)	9.41	0.01
	No	114 (48.8%)	58 (50%)	56 (71.8%)		
H/O rash with or without fever	Yes	80 (41.2%)	60 (51.7%)	20 (25.6%)	12.04	0.01
	No	114 (48.8%)	56 (48.3%)	58 (74.4%)		
Immunization Status	Completely Immunized till date		43 (37.1%)	47(60.3%)	10.1	0.006
	Partially immunized till date		63 (54.3%)	27 (34.6%)		
	Not immunized		10 (8.6%)	4 (5.1%)		

Table 4: Effect of intervention on weight and height of malnourished children

Groups	N	Mean	SD	SEM	Paired t test	p value
Weight of normal children before the intervention	78	12.32	2.6	0.29	3.53	< 0.01
Weight of normal children 6 months after the intervention	78	13.49	2.6	0.28		
Weight of malnourished children before the intervention	116	10.47	2.1	0.2	22.41	< 0.01

Weight of malnourished children 6 months after the intervention	116	11.95	2.2	0.2		
Height of normal children before the intervention	78	88.48	12.3	1.4	1.4	0.17
Height of normal children 6 months after the intervention	78	89.92	15.8	1.8		
Height of malnourished children before the intervention	116	87.69	10.1	0.9	33	< 0.01
Height of malnourished children 6 months after the intervention	116	89.18	10.1	0.9		

DISCUSSION

The present interventional study was conducted during the period of October 2009 to October 2011 and the sampling method adopted was the simple random. In the present study, according to the WHO growth chart 116 (59.80%) children were suffering from malnutrition. Of these 116 children 73 (62.9%) children were suffering from moderate acute malnutrition (MAM) and 43 (37.1%) children were suffering from severe acute malnutrition (SAM).

Out of 194 children 111 children (57.20%) were suffering from chronic malnutrition as they were below 5th percentile (less than 2 SD) for their height for age. It can be aptly said that these children were stunted and had not achieved their normal height for their age. 84 (43.30%) out of 194 children were wasted as they were below 5th percentile (less than 2 SD) for weight for their height and shows that these children had been suffering from wasting. More females were suffering from wasting disease. Goel et al. in their study found that 57.4% children were malnourished. Out of which Grade I 107(19.8%), Grade II 137(25.4%), Grade III 45 (8.3%) & Grade IV 21 (3.9%) [4]. Kapil et al in their study in Delhi revealed that overall prevalence of PEM was found to be 81.8%, while 19.11%, 41.4%, 5.7 % and 0.2 % of children had grades Normal, Grade I, Grade II, Grade III, and Grade IV PEM respectively [5]. Similarly Steinohff et al in their study in Tamil Nadu found that 45% of the children were underweight (low weight for age), 51% were stunted (low height for age) and 21% were wasted (low weight for height) [6].

Out of 194 children, 90 (46.4%) children partially immunized for their age and 14 (7.2%) children were non-immunized till the date. According to the national statistics of NFHS III [7], 57.6% of the children in India in urban area are completely immunized for their age. Total children who got BCG in the urban area are 86.9%, three doses of polio vaccine were 83.1%, three doses of DPT vaccine were 69.1% and measles vaccine were 71.8%.

Out of 116 children who were suffering from malnutrition, only 43 (37.1%) of the children were completely immunized for their age, 63 (54.3%) were partially immunized for their age and 10 (8.6%) not immunized at all. It clearly showed that the immunization has definite protective role against malnutrition. Similar results were noted by Semba et al [8] and Reddaiah et al [9]. Children having poor environmental conditions like kuccha house, open defecation practices, no tap water had poor nutritional status. These findings were quite similar with the study findings of Sayed et al [10] and a case study from Goundam Cercle, Timbuktu Region of Mali [11].

Children having ear discharge, pallor, history lower respiratory tract infection, worm in stool or history of admission in hospital had poor nutritional status. These infections predispose child to malnutrition. It can be viewed in other way; the malnourished children have weaker immune status and this exposed them to repeated infections. Thus malnutrition is a vicious cycle where a malnourished child has a weak disease fighting ability and this lower immunity in the

child makes the child more susceptible to malnutrition. Similar results were reported by Dwivedi et al [12], Bhatia et al. [13] and Ray et al [14]. Dwivedi et al. [12] found the prevalence of malnutrition was significantly higher among the children with a history of infection (81.8%) and worm infestation (77.0%) in comparison to those without history of infection (13.1%) and worm infestation (61.9%) respectively. Bhatia et al. [13] found a statistically significant relationship between acute ailments (diarrhoea, ARI) with malnutrition where 73.08% children were suffering from malnutrition in comparison with 42.08% children when no acute ailment had occurred. It was observed that among these children, 20.45% children were passing worms in stools in the last 6 months and 25.24% gave history of pica with or without abdominal pain. Some children were having both the problems (worms in stools and pica).

Ray et al [14] conducted a study to determine the extent of malnutrition among young children in an urban slum community in India in 1986. 41.18% of the undernourished had upper respiratory tract infections, 52.82% had diarrhoea, and 97.37% had parasitic infections. The respective proportions for nourished children were 59.46%, 40.54%, and 78.57%. Statistically significant differences occurred only for parasitic infections.

In our study the mean weight gain in the malnourished children after intervention was 1.48 kilograms as compared to normal children i.e.1.17 kilograms. Thus the overall difference of weight gain between the two groups was 310 grams. Though this association was not significant, the difference itself tells that careful monitoring of the children will lead to the weight gain in a better manner and thus the improvement in the nutritional status of the malnourished child. Also, significant improvement in the heights of the malnourished children was seen after intervention. The difference in mean height gain between the normal and the malnourished children was 0.05 centimetres after six months of intervention. Thus similar rate of height gain was seen in both categories of children. Similar findings were noted by Maria et al. [15]. In their study they provided carefully delivered dietary advice, antibiotics, anti-helminthics and vitamin supplements to moderately and severely malnourished children under 3 years of age.

All children improved and the response of 36 children, who were treated in the first year, showed an accelerated weight gain, with catch-up growth and the maintenance of length gain. There was a significant increase in the weight for age, at 1.9% per month over six months, which exceeds the rate reported with food supplementation programs and nutrition rehabilitation centers. Similarly Harendra et al. [16] assessed the efficacy of homemade energy dense food on prevention of growth faltering. Study found that mean weight gain by intervention group was 2.43 kg while for control group it was 2.02 kg after 8 months. Also Banerjee et al [17] found that mean weight gain was 80.81 gms after 4 wks of nutritional education in West Bengal. This weight gain was higher than expected weight gain but statistically not significant.

CONCLUSSION

Nutritional education should be considered as a major intervention to reduce the problem of PEM. Use of non expensive, culturally acceptable nutritious recipes should be promoted and demonstrated. As the education status of the mothers cannot be improved further but there is lot of scope to improve the knowledge of mothers regarding proper child rearing practices.Mothers should be taught regarding the treatment of the common ailments in the house such as diarrhoea using homemade ORS and to monitor the growth of their children by regular weighting and noting on the WHO growth charts, so that the growth faltering can be diagnosed at an earlier stage and the necessary timely interventions can be taken.

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