Research Article

A study of severe acute malnourished children who failed to respond to therapy given under Mission Balam Sukham at anganwadi of Western India

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ABSTRACT

Background: Childhood under-nutrition is a major public health problem and developmental challenge in India. In this context, Government of Gujarat has launched Mission Balam Sukham to improve the nutrition status of child at anganwadi level, but there were children who did not improve after 30 days of enrollment. **Objectives:** The objectives of this study were (i) to compare respondent and non-respondent children who enrolled in Mission Balam Sukham in terms of their care taker's knowledge, attitude behavior and practices, their hygienic habits, and facilities provided by anganwadi and (ii) to find out reasons for failure to respond among those who treated under Mission Balam Sukham at anganwadi level. **Materials and Methods**: A case-control study was conducted at anganwadi center of Surat city. Sample size of 190 (cases 95 and controls 95) using the prevalence of those who improved from severe undernourishment (control) which is 50% and prevalence of those who did not improve at all (case) which is 30% based on results of pilot study of anganwadi. Odds ratio (OR) with 95% confidence interval was calculated. **Results:** Cases were found to have significant association with mother accompanied child at anganwadi (OR: 29.2 [11.53-73.99]), literacy (OR: 5.67 [2.79-11.55]), working status of mother (OR: 30.62 [12.07-77.71]), clean water supply at home (OR: 12.44 [6.267-24.71]), hand washing practices of child (OR: 106.9 [38.89-293.6]), contact with tuberculosis patient (OR: 3.037 [1.592-5.795]), having siblings (OR: 6.37 [2.86-14.18]) and cleanliness of anganwadi (OR: 4.73 [1.831-12.26]). **Conclusions:** At anganwadi under Mission Balam Sukham, improvement in child's nutrition is positively correlated with mother's care, hygienic practices, environment of home and anganwadi.

KEY WORDS: Anganwadi; Mission Balam Sukham; Nutrition

INTRODUCTION

Malnutrition among under-five children is a major public health problem in India. This is reflected by the fact that the prevalence of underweight children in India is among the highest in the world and is nearly double that of Sub-Saharan Africa.[1] Each year approximately 2.3 million deaths among 6-60 months aged children in developing countries are associated with malnutrition, which is about 41% of the total deaths in this age group.[2] Therefore, it is important for the health system to detect malnutrition at an early stage for planning and implementing timely interventions at the community level.

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Millennium development goal 1 (target 2) aims to halve, between 1990 and 2015, the proportion of people who suffer from hunger as measured by the prevalence of underweight among under-5 years children.[3] The burden of under-nutrition among under-five children has not changed much even though various intervention programs are in

operation in India. The need of the hour is to examine the burden of under-nutrition and its determining factors and assess the effectiveness of the various approaches to combat malnutrition among preschool children.

Severe acute malnutrition (SAM) remains a major killer of children as mortality rates in children with severe wasting are nine times higher than those in well-nourished children.[4] Outpatient therapeutic feeding program brings the service of management of SAM closer to the community by making services available at decentralized health facilities (primary health care units) in different resource-limited countries.

In this context, Government of Gujarat has launched Mission Balam Sukham to improve the nutrition status of child even at anganwadi level. However, pilot study suggests that there are children who do not improve after 30 days of enrollment at anganwadi level. The aim of this study is to find out reasons for failure to respond among those children.

Objectives

1. To compare respondent and non-respondent children who enrolled in Mission Balam Sukham in terms of their care taker's knowledge, attitude behavior and practices, their hygienic habits, and facilities provided by anganwadi.
2. To find out reasons for failure to respond among those who treated under Mission Balam Sukham at anganwadi level.

MATERIALS AND METHODS

Study Design and Setting

A case-control study was conducted from March 2014 to January 2016 at anganwadi center of Surat city.

Sample Size

The sample size of 190 (cases 95, controls 95) was derived by OpenEpi software using the prevalence of those who improved from severe undernourishment to moderate undernourishment (control) which is 50% and prevalence of those who did not improve at all (case) which is 30% in the pilot study of anganwadi associated with Surat Municipal Corporation (SMC).

The sample size formula for the method described is:

$$n_1 = \frac{(Z_{\alpha/2} + Z_{1-\beta})^2 \bar{p}\bar{q}(r+1)}{r(p_1 - p_2)^2}$$

n_1 = Number of cases (95)
n_2 = Number of controls (95)
$Z_{\alpha/2}$ = Standard normal deviate for two-tailed test based on alpha level (relates to the confidence interval (CI) level (95%)
Z_p = Standard normal deviate for one-tailed test based on beta level (relates to the power level) (80%)
r = Ratio of controls to cases
p_1 = Proportion of cases with exposure (30%) and $q_1 = 1 - p_1$
p_2 = Proportion of controls with exposure (50%) and $q_2 = 1 - p_2$

$$\bar{p} = \frac{p_1 + rp_2}{r+1} \text{ and } \bar{q} = 1 - \bar{p}.$$

Definitions for Case and Control

Failure to respond

Child who did not improve to higher WHO growth chart grade after 30 days of nutritional therapy at anganwadi center is defined as failure to respond.

Case

Case was a child who had received 30 days nutritional therapy at anganwadi center under mission Balam Sukham and could not improve to higher WHO growth chart grade.

Control

Control was a child who had received 30 days nutritional therapy at anganwadi center under Mission Balam Sukham and could improve to higher WHO growth chart grade.

Selection of subjects

Data of anganwadi which conducted the Mission Balam Sukham and children who did not respond were taken from Integrated Child Development Services (ICDS) division of SMC during the past 6 months preceding the start of data collection. Randomization technique was used to select cases among the children who did not respond to therapy. Random number table was used for randomization. Controls were selected from the same anganwadi from where the cases were taken and they must be enrolled during the same period. Data were collected by interviewing guardians and anganwadi workers.

Ethical issue

Ethical Approval was taken from the Institutional Ethics Sub-Committee of Surat Municipal Institute of Medical Education and Research. ICDS Department of SMC granted permission of data collection.

Informed written consent was taken after persuading the parents of participants and anganwadi workers about the possible benefits and implications of the study.

An assurance was given to maintain strict confidentiality of their personal information and information related with the study.

Statistical methods used

Data entry was done in Microsoft Excel. Data analysis was performed in Epi info. The primary outcome of the study is odds ratio (OR) which was calculated by comparing various independent variables between two dependent groups, i.e., improved and not improved children. 95% CI was calculated for each of the OR. To prove statistical significance Chi-square test was applied in case the dependent variables are qualitative.

RESULTS

Among the children under study, male were 61.1 and female were 38.9. Maximum numbers (42.1%) of children have one sibling. According to modified Prasad classification, socioeconomic classification was divided from 1 to 5 groups. Maximum (46.3%) families were of Class 5 followed by 45.3% of Class 4 and 8.4% were of Class 3. There were no families for Class 2 and 1.

No children had complications at the time of enrollment, and none of them were advised for the admission so all the children at the anganwadi were appropriate for enrollment at anganwadi for the nutrition program. Some (37.4%) did not attend all appointments at anganwadi. Reasons were asked for the same. Table 1 is describing characteristics of children under study.

Immunization status was complete for all children. HIV status was not known.

There is no association between age or gender of the enrolled child and change in the grade of the child.

There is an association between malnourished child had siblings and change in grade. As mentioned in Table 2, children who had siblings had 6 times higher chances of poor outcome.

There is an association between malnourished child had attended all appointments at anganwadi and improvement in grade. As mentioned in Table 2, children who did not attend all appointments at anganwadi had 3 times higher chances of poor outcome.

Among the various hygienic practices, washing of hands before eating has association with improvement in grade. Children who did not wash their hands before eating had 106 times higher chances of poor outcome. There is an association between malnourished child who was not able to complete food and improvement in grade. Children who were not able to complete food at anganwadi had 2.54 times higher chances of poor outcome.

Table 1: Profile of children included in study (*n*=190)

Variables	Frequency (%)
Gender of child	
Female	74 (38.9)
Male	116 (61.1)
Number of Siblings	
0	47 (24.7)
1	80 (42.1)
2	48 (25.3)
3	11 (5.8)
4	4 (2.1)
Age of child	
6 months to 3 years	71 (37.4)
3-6 years	119 (62.6)
Income (according to modified Prasad classification)*	
Class 3	16 (8.4)
Class 4	86 (45.3)
Class 5	88 (46.3)
No complications at the time of enrollment**	190 (100)
Advised for admission	
No	190 (100)
If yes, why didn't you go	
NA	190 (100)
Did you attended all appointments at anganwadi	
No	71 (37.4)
Yes	119 (62.6)
If no why	
Function in family	12 (6.3)
Health was not good	22 (11.6)
NA	119 (62.6)
Out of station	37 (19.5)
Complications while enrollment***	
No	168 (88.4)
Yes	22 (11.6)
If yes, received treatment	
NA	168 (86.8)
Yes	22 (13.2)
Immunisation status	
Complete	190 (100)
HIV	
Don't know	190 (100)
TB	
No	183 (96.3)
Yes	7 (3.7)
Contact with TB patient****	
No	130 (68.4)
Yes	60 (31.6)

(*Cond...*)

Table 1: (*Continued*)

Variables	Frequency (%)
Any other chronic illness	
Asthma	4 (2.1)
Sickle cell anemia	5 (2.6)
Psychological trauma*****	
No	155 (81.6)
Yes	35 (18.4)
Hygiene of child by seeing hands and nails	
Poor	153 (80.5)
Good	37 (19.5)
Bath everyday	
No	2 (1.1)
Yes	188 (98.9)
your child wash hands before eating	
No	92 (48.4)
Yes	98 (51.6)
All children eating from same dish	
NA	47 (24.7)
No	107 (56.3)
Yes	36 (18.9)

*Income class distribution was based on modified Prasad's classification. General index of July 2015 was 263 which was taken into calculation. **At time of enrollment child having complications like edema, anorexia, fever, persistent vomiting, severe dehydration, not alert, very weak, unconscious, convulsions, severe palmer pallor, breathing difficulties, skin infection needs further referral which cannot be treated at anganwadi level. ***Complications while enrollment included fever, diarrhea, dysentery, pneumonia, cough for>2 weeks, ear or skin infection, urinary infection or others if want to mention. All this complication can lead to weight loss or can hamper in gaining weight. ****Contact with TB included individual who shared an enclosed space with a TB index case≥4 h a weeks.[5] *****Psychological trauma is possible in the children who are from refugee family or families living with HIV/AIDS or any other chronic diseases in one/both parents or one/both parents are died. With unhealthy mental condition children cannot grow better so it was an effort to find out such environment. TB: Tuberculosis, NA: Not applicable

There is no association between malnourished child who used to eat from the same dish at home and improvement in grade. There is no association between malnourished children who got sick while enrollment and improvement in grade. There is an association between malnourished child who was suffering from tuberculosis (TB) and improvement in grade. Even children who had contact with TB patients had poor outcome. Children who had contact with TB patients had 3 times higher chances of poor outcome. Chronic diseases also hampered the growth of the child. Children who had chronic diseases had 8 times higher chances of poor outcome. Children who belonged to psychological traumatic families also had poor outcome. Children who belonged to psychological traumatic families had 3.6 times higher chances of poor outcome.

As mentioned in Table 3, there is no association between maternal age and improvement in grade. Literacy of mother has relation with improvement in grade of child. There are 5.6 times higher chances of poor outcome of child who had illiterate mother.

Working status of mother had an association with improvement in grade. Working mother had 30.6 times higher chances of poor outcome of the child. Working hours of mother had no association with improvement in grade. The economic Class 5, 4, 3 had no association with improvement in grade. Clean water supply and sanitary latrine at home had association with improvement in grade. There are 12.44 times higher chances of poor outcome of child who had no clean water supply at home. There were 20.7 times higher chances of poor outcome of child who had no sanitary latrine at home.

Mother accompanied child at anganwadi had association with better outcome. 29 times higher chances of non-improvement if mother did not accompany the child at anganwadi.

There was a provision for counseling to mother by anganwadi worker so that mother can look after her child's growth even after the program is over. Such type of counseling had a positive effect on child's grade. As mentioned in Table 4, mothers who were not explained about better food techniques for child had 2.48 times higher chances of non-improvement in child's grade. Mothers who were not explained about hygienic practices had 3.4 times higher chances of poor outcome in child's grade. Other than anganwadi food, mothers who were not explained about two times full meals should be given to child at home had 2.4 times higher chances of poor outcome. Mothers who were not advised for giving fruits to child at home had 1.9 times higher chances of poor outcome in child's grade. Mothers who were not explained about gentle loving care and playing with child had 2.8 times higher chances of poor outcome of nutrition therapy. Anganwadis which were not free of insects and rodents had 4.73 times higher chances of poor outcome.

DISCUSSION

The conceptual framework of child under-nutrition highlights the multisectoral nature of the nutrition problem.[6] Contrary to other studies,[7,8] males were more than females among children who did not improve. The gender-related finding could be due to more boys enrolled. As per the behavior of most of the Indian society, people are more conscious about the health of the male child and also care for them as compare to female.

According to this study, children who had more than two siblings had higher chances of poor outcome when enrolled for Mission Balam Sukham. This finding is supported by another study done in Punjab which says that place

Table 2: Comparison as per outcome post completion of nutrition therapy (*n*=190)

Variable	Grade changed*		*P* value	OR	95% CI
	Not improved	Improved			
Female child	38 (40.0)	36 (37.9)	0.766	1.093	0.6097-1.958
Have siblings	86 (90.5)	57 (60.0)	<0.001	6.37	2.863-14.18
More than 2 siblings	15 (17.4)	0 (0.0)	<0.001	Undefined	Undefined
Did not attended all appointments at anganwadi	48 (50.5)	23 (24.2)	<0.001	3.197	1.723-5.932
Did not wash hands before eating (child)	85 (89.5)	7 (7.4)	<0.001	106.9	38.89-293.6
Child was not able to complete food**	16 (16.8)	7 (7.4)	0.045	2.546	0.9959-6.509
Complications while enrollment	13 (13.7)	9 (9.5)	0.364	1.515	0.6146-3.734
TB present	7 (7.4)	0 (0.0)	0.014	Undefined	Undefined
Contact with TB patient present	41 (43.2)	19 (20.0)	0.001	3.037	1.592-5.795
Chronic diseases present	8 (8.4)	1 (1.1)	0.035	8.644	1.059-70.52
Psychological trauma in family present	26 (27.4)	9 (9.5)	0.001	3.601	1.583-8.187

*Grade change means that child's weight shift in the graph from red to yellow or yellow to green. **Child was able to complete the food or not was decided on the basis of mother's information about the same. From the total 30 days, if the child was not able to complete food for any one session for more than 20 days was defined as inability to complete food. OR: Odds ratio, CI: Confidence interval, TB: Tuberculosis

Table 3: Comparison of maternal factors according to outcome after completion of therapy (*n*=190)

Variable	Grade changed		*P* value	OR	95% CI
	Not improved	improved			
Maternal age (20-30 years)	51 (53.7)	45 (47.4)	0.468	1.288	0.7284-2.277
Literacy of mother (illiterate and informal education)	45 (47.4)	13 (13.7)	<0.001	5.677	2.79-11.55
Working mother	64 (67.4)	6 (6.3)	<0.001	30.62	12.07-77.71
Income (class 5)	50 (52.6)	38 (40.0)	0.0808	1.667	0.93-2.96
No clean water supply	75 (78.8)	22 (23.2)	<0.001	12.44	6.267-24.71
Sanitary latrine absent	86 (90.5)	30 (31.6)	<0.001	20.7	9.196-46.61
Mother did not accompanied child at anganwadi	63 (66.3)	6 (6.3)	<0.001	29.2	11.53-73.99

OR: Odds ratio, CI: Confidence interval

Table 4: Comparison of quality of services according to outcome of children after completion of nutrition therapy (*n*=190)

Variable	Grade changed		*P* value	OR	95% CI
	Not improved	improved			
Did not explain better food technique	42 (44.2)	23 (24.2)	0.004	2.481	1.335-4.611
Did not explain about hygienic practices	55 (57.9)	27 (28.4)	<0.001	3.463	1.893-6.334
Did not advise for two times full meal at home	49 (51.6)	29 (30.5)	0.003	2.424	1.339-4.39
Did not advise for advice for giving fruits to child at home	57 (60.0)	41 (43.2)	0.02	1.976	1.109-3.519
Did not explain about gentle loving care and playing	66 (69.5)	42 (44.2)	<0.001	2.872	1.583-5.209
Anganwadi was not free of insects and rodents	23 (24.2)	6 (6.3)	0.001	4.738	1.831-12.26

OR: Odds ratio, CI: Confidence interval

of residence, household wealth, age of child, awareness regarding diarrheal disease and acute respiratory tract infection control, number of under 5 years children and source of drinking water were strong predictors of child nutritional status in developing countries.[9] Income was not associated with the improvement in the grade. However, it is important to note that there were no families from Class 1 and 2. There are chances that because of such families were not part of the study and among Class 3, 4 and 5, the standard of living does not have much difference. There were some children who were not regular at anganwadi so they have not improved. This indirectly says that they were not so attentive toward the efforts of government. Complications while enrollment even did not affect the improvement in the grade which can be interpreted that those all who get minor illness and get immediate treatment, illness do not hamper the growth.

When mother was asked about HIV status of the child then all replied that they do not know. There are two possibilities in such situation that either they were never tested or they did not want to disclose the status. The question was asked just to know that if the HIV positivity is related to malnutrition in

children.[6] HIV has exacerbating effects on under-nutrition far beyond its impact on health services. HIV infection reduces household food production both now and in the future, restricts the access to available food and necessary health care that the household had before a member or members became infected with HIV, and lowers the quality of nutritional care received by children and others dependent on individuals infected with the virus.[6] Childhood TB was associated with poor improvement in malnourished child. From available research, it appeared that malnutrition is a predictor of TB disease and is associated with worse outcomes.[10]

Maternal factors also significantly affect child's nutritional status.[9,11] In this study, maternal age was not associated with improvement in grade. It can be because there was no mother below 20 years in the study which is actually high-risk age group. Goa, Kerala, North-Eastern states, and Punjab had low percentages of malnourishment (since women were relatively well-educated).[12] There were mothers who were working and this was also related with absence of mother at anganwadi during the nutrition program. If the mother has less time to spend with child, then it is obvious that child's development cannot be proper. Poor environmental conditions may increase insect and protozoan infections and also contribute to environmental deficiencies in micronutrients. Micronutrient deficiencies can have serious and irreparable consequences on health, mortality, and economic productivity. There are four principal micronutrient deficiencies of public health concern—vitamin A, iron, zinc, and iodine.[6] Considering this fact, there was a provision for micronutrient supplements after enrollment. Some people might be ignorant on how to care for their young children as they might undervalue healthy practices.[13] Therefore, there were provisions for counseling of mother about better food techniques, hygienic practices, gentle loving care and playing with child. Such type of counseling was effective in improvement in child's growth.

Recommendations

Increase awareness about family planning. Anganwadi workers should be motivated to counsel mothers for adopting one or other family planning method.

TB in children should be treated more attentively to reduce permanent disability. Contact with TB patients should be decreased. In direction of that, it is necessary to make people aware of the mode of transmission of TB and also that the children are more prone to get such diseases in very short exposure so that such kind of morbidity can be reduced. Other chronic illness such as asthma and sickle cell anemia was associated with non-improvement in grade so such children should be treated promptly. It is also necessary to motivate their parents to follow-up regularly and give all the medication on proper time. Referral of such children should be immediate.

People should be aware about importance of hand washing practices and consequences of poor hand washing practices. There should be campaign on such issue at community level.

Children should be motivated to attend all the appointments at the anganwadi. Anganwadi worker should be gentle and calm while handling the children. Environment of anganwadi should be such that children like to come at anganwadi. Toys and pictures should be available to entertain children.

There were even children who were not able to complete the food given under Mission Balam Sukham. Food of anganwadi should be proper in taste that children can have them in adequate amount. It should be proper in spices, oil, and temperature when it is served to children.

There should be some rules for working mother whose child is below 6 years for timings of work, type of work they should be allotted so that they should be in such situation that when they are at home, they should be in such condition that they can take care of children. Mothers should be motivated to accompany children during such program.

Anganwadi worker should explain mother about better food techniques. Mother should be explained about hygienic practices. Mother should be advised for two times full meal at home. Mother should be advised for giving fruits to child at home. Mother should be explained about gentle loving care and playing with children which is necessary for good mental health and development of children.

Cleanliness of anganwadi should be maintained properly. There should be insecticidal spraying during nonworking day of anganwadi. Anganwadi workers should be motivated for maintenance of the hygiene at anganwadi.

CONCLUSIONS

From this study, we conclude children having more than 2 siblings, TB or other chronic illness, poor hand washing practices, and psychological trauma were having a poor outcome after nutritional therapy at anganwadi. Working mother, illiteracy and not accompanying children were associated with poor outcome of children. Poor environmental conditions like unavailability of clean water supply and sanitary latrine at home were associated with poor outcome. Along with all this, poor quality of nutritional counseling and unhygienic conditions at anganwadi were also associated with poor outcome.

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