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Community Based Management of Severe Malnutrition- Sam and Suw# in U5 Children of Tribal Area, Melghat, Central India

KEYWORDS: Severe acute malnutrition, severe underweight, community based management, under 5 children, MAHAN-RUTF.

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ABSTRACT *Background: Melghat has heavy burden of malnutrition, inadequate medical facilities and poor health seeking behavior by tribal. Hospital services have limited coverage and impact. Community based management of severe malnutrition is explored as alternative.*

Objective: To assess feasibility of community based management of severely malnourished children (SMC) in tribal Melghat.

Methods: A community based prospective trial was conducted in tribal Melghat from August-October 2012 with six months follow-up. A representative sample of 145 SMCs in 6-60 months age group from randomly chosen 14 villages was selected with one-stage cluster sampling. Locally prepared MAHAN-RUTF (Ready-to-Use Therapeutic Food) with micronutrients was given to SMCs for 90 days. Infection management and behavior change communication (BCC) of parents was done by Village Health Workers (VHWs).

Results: After 8 weeks 55.1% SAM and 15.6% SUW children recovered. Weight-gain/kg/day after 8th, 10th and 12th week among SAM was 2.6, 2.3, 2.2 gm and among SUW was 2.5, 1.9, 1.5 gm respectively. Case fatality rate for SAM was 2.0% and for SUW 0.8%. The relapse rates for recovered SAM and SUW were 3.03% and 11.1% respectively.

Conclusion: This pilot study of community based management of SAM and SUW is feasible and will be base for larger ongoing RCT.

Introduction

Globally, malnutrition remains one of the leading causes of morbidity and mortality among children[1-4] contributing to 60% of deaths in under-five (U5) children population.[1,5] The prevalence of underweight children in India is among the highest in the world, and is nearly double that of Sub-Saharan Africa with dire consequences for morbidity, mortality, productivity and economic growth.6 Prevalence of malnutrition amongst children remains alarmingly high in India; but it has been particularly reported much higher in tribal populations. As per the National Nutrition Monitoring Bureau report 2009 the prevalence in 1 to 5 yrs age group is, severe acute malnutrition (SAM) - 6%, severe underweight (SUW) - 20% and severe stunting- 26% in tribal India.7 Another study in tribal Maharashtra shows SAM- 7%, SUW-29%, and severe stunting - 30%, which is considered 'very high' by WHO.[8,9] Our study in 2012 showed very high[9] prevalence of severe malnutrition (SAM-7.1%, SUW-18.7%, Severe stunting- 34.4%, Indian Academy of Pediatrics (IAP) Grade III-IV- 6.7%) in U5 children in Melghat.[10]

Major contributing factors for severe malnutrition are faulty child feeding practices, infectious diseases like ARI, Diarrhea, Malaria, poor hygiene and sanitation, etc. [8,11,12] Coexisting infections add to the difficulty of maintaining metabolic control and increases risk of death among severely malnourished children.[13] Children with severe malnutrition have micronutrient deficiencies which need to be corrected for a complete nutritional recovery. All severely malnourished children should receive vitamins and minerals along with therapeutic diet.[14]

Medical facilities in tribal area of Melghat are grossly inadequate coupled with very low health seeking behavior by tribal.[15,16] Hospital based treatment grossly limits its coverage and impact. There is no specific program to tackle

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this heavy burden of severe malnutrition in 6 months to 60 months of age group of Melghat. Community based management of severe malnutrition is possible with specific therapeutic diet, micronutrient supplementation, treatment of associated illnesses, and behavior change communication (BCC) for hygiene and nutrition.[17-19] Therefore we planned a one-stage cluster randomized controlled trial for community based management of severe malnutrition by providing locally prepared ready to use therapeutic food (RUTF) along with micronutrient supplementation, home based treatment of infectious diseases and BCC of the target group for contributing factors through village health workers. This is a pilot study of the same project.

Methods

Melghat is a difficult-to-reach, hilly, forest area in the state of Maharashtra (Central India) having population of around 3,00,000 scattered over 320 villages spread over 4000 sq Kms. Around 85% population is tribal, of which more than 90% are small farmers or agricultural laborers and are living below poverty line.[16,20] This community based prospective trial with one-stage cluster sampling method was conducted in Dharni & Chikhaldara blocks in tribal area of Melghat over a period of 3 months (i.e. August to October, 2012). Sampling frame was all SMCs in 6-60 months of age group from 320 villages. The study area constituted 14 randomly selected villages of Melghat. Sample size constituted randomly selected 145 SMCs in 6-60 months of age group from usual resident population of these 14 villages.

The project was implemented by MAHAN Trust, Melghat at community level in each village through semiliterate, tribal, local married women as Village Health Worker (VHW). VHWs were selected during Gram-sabhas (village meetings) which increased acceptance by community.

VHWs were trained for:

1. Anthropometry
2. Feeding MAHAN-RUTF with micronutrients
3. Treatment of fever, diarrhea, ARI, malaria, de-worming, etc.
4. BCC through health education of parents

Out of 145 study subjects 48 were SAM, 123 SUW and 45 IAP Grade III-IV. Many children were suffering from acute and acute-on-chronic malnutrition simultaneously and were falling in more than one categories of severe malnutrition. Parents of these SMCs were beneficiaries for BCC during the study period. Written informed consent was sought from the villagers during Gram-sabhas organized in each of the selected village. The anthropometric measurements of all children in 6 months to 60 months of age group were taken in July 2012 by VHWs and crosschecked by medical supervisors who were specially trained doctor and Auxiliary Nurse Midwives (ANMs). Anthropometry included weight, measured by standardized Salter weighing machines and height/length, recorded by standardized stadiometers.

Global Acute Malnutrition was defined as weight for height using standardized Z scores, WHZ. Severe Acute Malnutrition (SAM) is WHZ $\leq$ 3SD with or without bilateral edema. Underweight was defined as weight for age using WHO standardized Z scores, WAZ. Severe underweight (SUW) is WAZ $\leq$ 3SD.[21] IAP gradations were defined as per percentage of expected weight: Grade III: 50-60%, Grade IV: <50% of expected weight.[22] Customized software MAHANsoft, version 1.0, 2011 was used for data entry and gradation purpose.

MAHAN-RUTF with Micronutrients

All severely malnourished children were screened for appetite test as per WHO guidelines.[17] Children were screened for medical complications like fever, diarrhea, ARI, malaria, urinary tract infections (UTI), otitis media, tuberculosis, lethargy, edema, etc. Children with any serious illness were referred to hospital. However those who were not willing to go to hospital were managed by VHWs after taking high risk written consent. Those who passed appetite test were enrolled for 90 days MAHAN-RUTF therapy. MAHAN-RUTF is prepared by local tribal women in the form of 6 palatable dishes (Chivada, Ground nut-Til-Gul Patti, Daliya Poha, Mungdal khichri, Ground nut-Sago, Bhajni Thalipith/Upama). Each 100 gm packet of MAHAN-RUTF provided 500 to 550 calories and around 15-17 gm of proteins which was according to WHO formula.[17] Micronutrient supplementation with vitamins and minerals was done.

MAHAN-RUTF with micronutrient supplementation was given to severely malnourished children, 4 times a day under direct supervision of VHWs for 90 days. Parents were asked not to give any other food during the course of therapy. According to weight, a specified amount of feed was given so that all children received 4 to 6 gm proteins/kg/day and 175 kcal/kg/day with gradual escalation. Quality control of MAHAN-RUTF was done by random checking for accuracy of exact weight of each ingredient and hygiene. Taste register was maintained for any adverse reaction and palatability. External quality control was done by District Food and Drug Administration department at the beginning.

The trained VHWs provided the treatment of infectious diseases like fever, diarrhea, ARI, otitis media, malaria, deworming, etc. with Paracetamol, Norfloxacin, half strength ORS, Amoxicillin, Chloroquine, and Albendazole in appropriate doses.[17] BCC of parents was done by imparting health education regarding hand washing, nail cutting, hygiene and nutrition through counseling, flipcharts, audiovisual film screening, practical demonstrations and street play. All these activities were supervised weekly by Medical supervisors and fortnightly by BCC supervisors. Anthropometry of enrolled children was weekly monitored till 12 weeks.

Results

Table 1 shows background characteristics of 145 study subjects. The distribution of severe malnutrition was SAM 49 (33.8%); acute–on-chronic malnutrition SUW 123 (84.8%) and IAP grade III-IV 46 (31.7%). Male and female distribution is almost equal in all categories. SAM was seen in > 2/3rd children in 6-24 months age group however; SUW was seen in almost 2/3rd children in 24-60 months age group. IAP grade III-IV was seen in > 3/4th children in 24-60 months age group. Low birth weight was found in 35.5% of SAM children and 46% of SUW children. Vast majority of these were full term low birth weight, i.e. they had intrauterine growth retardation. Thus malnutrition began at birth. Complicated severe malnutrition[17] was found in 9 (6.2%), who were referred to hospital but they refused to avail the facility.

Table 2 shows recovery of SMC and weight gain/kg/day of recovered children at the end of 8th, 10th and 12th week therapy of MAHAN-RUTF and micronutrient supplementation in specific amounts fulfilling appropriate need of SMCs. After 8 weeks 55.1% SAM, 15.6% SUW and 42.8%

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IAP Gr. III-IV SMCs recovered; while recovery after 10th and 12th week was comparatively lower which is 47.9% SAM, 16.3% SUW and 33.9% IAP Gr. III-IV after 10th week and 43.9% SAM, 12.9% SUW and 36.9% IAP Gr. III-IV after 12th week. Paired t test shows the p<0.001 for both SAM and SUW for before and after 8week, 10week and 12week MAHAN-RUTF and micronutrient therapy which is significant.

Weight gain/kg/day among SAM after 8th, 10th and 12th week was 2.6, 2.3 and 2.2 gm whereas among SUW it was 2.5, 1.9 and 1.5 gm respectively. For IAP Gr. III-IV, the weight gain/kg/day was 2.5, 1.9 and 1.6 gm after 8th, 10th and 12th week. There were 14 dropouts and one death after 8 weeks, 5 more dropouts after 10 weeks and 26 more dropouts till completion of therapy. Case fatality rate (CFR) for treated overall SMC was 0.7%. CFR for SAM was 2.0%, for SUW 0.8% and for IAP Gr. III-IV 2.2%.

Figure 1 shows percentage of weight gain in SAM children (WHZ <-3 SD) after eight weeks of MAHAN-RUTF and Micronutrients supplement therapy. Recovery from SAM was seen in 27 (55.1%) out of 49 children which means they moved from <-3SD to -2 or -1 SD or more as per WHO growth standard WHZ. 19 (70%) recovered SAM were moved from <-3SD to -2SD i.e. from SAM to MAM. 8 (30%) recovered SAM were moved from <-3SD to -1SD or more i.e. from SAM to Normal.

Figure 2 shows episodes of fever, diarrhea and ARI in SAM children. A gap of 7 days between two episodes was considered while counting episodes of infection. Episodes of infections were more in non-recovered than recovered SAM children.

All SMCs were followed up for next 6 months for relapse. Table 3 shows the rate of relapse in recovered SMCs. Out of 27 recovered SAM children 1 (3.03%) relapsed, whereas out of 18 recovered SUW children 2 (11.1%) relapsed and out of 24 recovered IAP Gr. III-IV 5 (20.8%) relapsed.

Discussion

Melghat is known for very high[9] burden of malnutrition coupled with inadequate & poor medical facilities. Tribal have poor health seeking behavior resulting in high mortality and morbidity in children. Thus, hospital based services have limited coverage and impact. There is no alternative for community based approach for management of large number of SMCs. July to October is the period of heavy rainfall associated with significant increase in infections leading to increase in malnutrition and child deaths within the year.

In our previous study, we have shown that prevalence of SUW in tribal community of Melghat is 18.7% and that of SAM is 7.1%.[10]. This huge burden of SUW is responsible for increased mortality and significant morbidity. It leads to susceptibility to illnesses, has profound effect on development of individual, scholastic backwardness and reduced income generating capacity as adult. Co-existence of acute and chronic malnutrition needs to be comprehensively addressed with combined multiple approaches.[23] It is therefore necessary to include SUWs in community based therapy project. We could not find any study on community based management of SUW children. In this study, almost half of SUWs are full term low birth weight reflecting intra-uterine growth retardation i.e. malnutrition at birth. Maternal and child health & nutrition services are required for prevention of chronic malnutrition. However, for management of severe acute-on chronic malnutrition (SUW) our treatment regime of MAHAN-RUTF with micronutrient therapy has shown 16.3% recovery. Relapse rate was more in recovered SUW and IAP Gr. III-IV children as compared to SAM children. It remains to be seen whether children with acute-on chronic malnutrition need longer follow up, further investigations for chronic diseases and may need longer duration of therapy. In 2001, Ashworth in his systematic review conducted during the 1980s and 1990s, Only 6 out of the 27 studies achieved CFRs of <5%, relapse/readmission rates of <10%, which can be taken as standard.[24]

The duration of this pilot study was kept as 12 weeks and recovery from severe malnutrition at the end of 8th, 10th and 12th week was assessed. We have found maximum recovery and weight gain/kg/day at the end of 8th week. It is evident that 55.1% SAM children recovered from severe malnutrition with average weight gain of 2.6 gm/kg/day after 8 weeks. The rate of weight gain decreased at the end of 10 and 12 weeks. It is possible that rapid weight gain only occurs when children are wasted. When the children approach to a normal weight for height, the rate of weight gain falls.[13] This may also be because of more number of defaulters during longer duration of therapy.

Weight gain of 3% to 15% was seen in 70% recovered SAM children with shift from <-3SD to -2SD. Weight gain of 15% to 49% was seen in 30% recovered SAM children with shift from <-3SD to -1SD or more. These 30% children had good appetite, no episodes of infections, were non-defaulters and showed no relapse at the end of 6 months follow up. Episodes of fever, diarrhea and ARI were more in non-recovered SAM children as compared to recovered SAM. Infections lead to increased rate of metabolism, decreases rate of recovery and is a contributory factor for increased relapse rate. It indicates that timely treatment of infections in the community by trained VHWs will improve recovery rate and prevent relapse of severe malnutrition. It is important that good referral system should be established.

Limiting factors of our study were-

1) Melghat is hilly, forest terrain with poor round the year availability of transportation and motorable roads. Annual rainfall is 1500 mm and many times there are lightening floods. Heavy rainfall and floods leading to interrupted supply of MAHAN-RUTF and micronutrients to villages.
2) During rainy season it was difficult to maintain proper hygiene and sanitation at the storage and feeding site of MAHAN-RUTF in the villages.
3) Though MAHAN-RUTF preparations were made considering socio-cultural habits and palatability, some MAHAN-RUTF preparations were not accepted by children and some preparations had less shelf life.
4) As this was a new project, inspite of intensive training, VHWs and supervisors made mistakes in maintaining the records.
5) We could not keep weekly anthropometry records in control group. Hence, randomized control trial was not possible.

Conclusion

Community based management of severe malnutrition is possible and SUW children can also be treated successfully. This pilot study is a part of larger study which is on way with a sample size of 1500 SMCs in each arm of RCT. Such programs lead to capacity building of the community to deal with menace of malnutrition. This study seems to

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be acceptable, cost-effective, achievable, safe and possible with locally available manpower and resources.

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Tables

Table 1: Background Characteristics of Severely Malnourished Children

	SAM		SUW		IAP Gr. III-IV		Total SMC	
Distribution of severe malnutrition	**49**		**123**		**46**		**145**	
Gender	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Males	24	49.0	65	52.8	19	41.3	73	50.3
Females	25	51.0	58	47.2	27	58.7	72	49.7
Age Group								
6 to 24 months	33	67.3	47	38.2	10	21.7	64	44.1
24-60 months	16	32.7	76	61.8	36	78.3	81	55.7
Low Birth Weight	**17**	**35.4**	**41**	**46.04**				
Full term LBW	16	33.3	36	40.4				
Pre term LBW	1	2.0	5	5.61				
***Complicated SMC at enrollment**								
Complicated	4	8.2	8	6.5	5	10.8	9	6.2
Non- Complicated	45	91.8	115	93.5	41	89.2	136	93.8

*93.8*Complicated severe malnutrition is determined by presence of edema feet and/or negative appetite test and/or any other illness.*

Table 2: Recovery and weight gain/kg/day in severely malnourished children

	Number	Recovered SMC		Wt gain in gm /kg /day in recovered children
		No.	%	
At the end of 8 week – (*n=130*)				
SAM*	49	27	55.1	2.6
SUW**	115	18	15.6	2.5
Grade III-IV	56	24	42.8	2.5
Dropouts	14			
Died	1			
** (paired t test: t = 7.85, df = 129, p < 0.001)*				
***(paired t test: t = 4.13, df = 129, p < 0.001)*				
At the end of 10 week - (*n=125*)				
SAM*	48	23	47.9	2.3
SUW**	110	18	16.3	1.9
Grade III-IV	53	18	33.9	1.9
Dropouts	5			
Died	0			
** (paired t test: t = 6.58, df = 118, p < 0.001)*				
***(paired t test: t = 3.25, df = 118, p < 0.001)*				
At the end of 12 week - (*n=99*)				
SAM*	41	18	43.9	2.2
SUW**	85	11	12.9	1.5
Grade III, IV	46	17	36.9	1.6
Dropouts	26			
Died	0			
** (paired t test: t = 6.85, df = 98, p < 0.001)*				
***(paired t test: t = 3.88, df = 98, p < 0.001)*				

Table 3: Rate of relapse in recovered SMCs

Recovered Children	Relapse at the end of 6 month	
	No.	%
SAM (n=27)	1	3.03
SUW (n=18)	2	11.1
IAP Gr. III-IV (n=24)	5	20.8

Figures

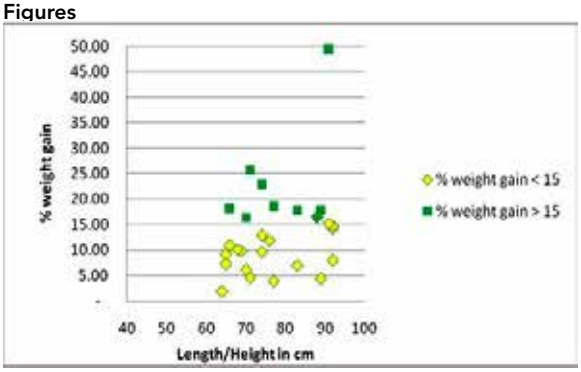

Figure 1: Percentage of weight gain in recovered SAM children after 8 weeks.

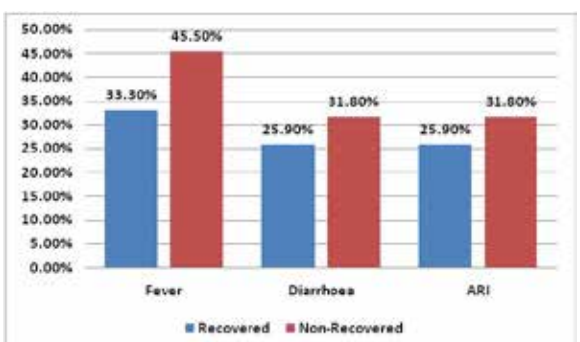

Figure 2: Episodes of fever, Diarrhea and ARI in SAM children

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