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Socio-Economic Factors, Feeding Behavior and Hygiene of Children Admitted to the Nutritional Rehabilitation Center at a Secondary Care Hospital

Bhushan Bande [1], Garima Agrawal Varshney [2], Shruti Gupta [2], Amit Agrawal [3*], Soumitra Sethia [4], Pramila Verma [2]

1. District Hospital, Khandwa, India.
2. Department of Pediatrics, Government Medical College, Khandwa, India.
3. Department of Pediatrics, Gandhi Medical College, Bhopal, Bhopal, India.
4. Department of Community Medicine, Government Medical College, Khandwa, India.

*Corresponding Author: Amit Agrawal (MD);
Address: Associate Professor, Department of Paediatrics, Gandhi Medical College, Bhopal (M.P.), India.
Tel: +91-9826616019 E-mail: agrawaldramit@yahoo.co.in

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ABSTRACT

Background and Objective: Social class, hygiene, and feeding behavior determine the status of nutrition in children during the first 1000 days of life. This study aimed to evaluate the association of the above factors with the need for admission to nutrition rehabilitation center.

Methods: This prospective study was conducted in the Nutritional Rehabilitation Center (NRC) of a secondary care center from April 2019 to March 2020. Convenience sampling was applied for the selection of study participants. Information about all the children suffering from severe acute malnutrition (SAM) was collected and documented, such as age, gender, social class, hand washing habits, breastfeeding, age of starting complementary feeding, anthropometry, and medical complications.

Findings: During the study period, 398 children with SAM were admitted to NRC. Moreover, 71.86% (n=286) of children were from 7 to 24 months and 88.43% (n= 352) of the children belonged to the families with upper/lower and lower socioeconomic status. Poor hand washing habits were seen in 36.18% (n=144) of families. The mean weight gain per child during a hospital stay was 8.3 gm/kg/day.

Conclusion: Inadequate complementary feeding practices and poor hygiene are the most common preventable causes leading to malnutrition and the majority of admissions to the NRC occurring before the age of two years.

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Introduction

Globally, malnutrition is a critical public health issue [1]. Wasting or acute malnutrition is a major contributory factor to child mortality. Annually, three million children die as a result of malnutrition all across the world. Globally, in 2018, 49 million children were wasted and 17 million were severely wasted [2]. In 2012, the World Health Assembly endorsed six global nutrition targets for 2025 [3]. One of them is reducing and maintaining childhood wasting to less than 5% [4].

According to the National Family Health Statistics (NFHS)-4 data, India has a substantial proportion of underweight (Weight for age less than 80% of normal) and malnourished children with wasting {(Weight for height less than -2 standard deviation (SD)} in 21% and severe wasting (Weight for height less than -3 SD) in 7.5% of children and under-five mortality of 50/1000 [5]. In the state of Madhya Pradesh (MP), 9.2% of the children had severe acute malnutrition (SAM). To fight the high prevalence of SAM in children, the state of MP has established 317 Nutrition Rehabilitation Centers (NRC) which provide care and treatment to SAM children as per World Health Organization (WHO) 2015 recommendations with a target to reduce the prevalence of SAM to <1% [6]. According to the NFHS-4 data, 46.4% of the children in the Khandwa district of MP state were underweight, 27.5% were wasted and 6.6% were severely wasted [5].

According to the WHO/United Nations International Children's Emergency Fund (UNICEF), the duration of the first 1000 days after the birth is a critical window period for nutritional interventions. As per the Infant and Young Child Feeding Guidelines (IYCF) guidelines 2016, exclusive breastfeeding (EBF) should be practiced for the first six months of life and complementary feeding should be started after this period [7]. Multiple risk factors such as wrong feeding practices, lack of hygiene and poor sanitation, and poor access to healthcare are directly linked to wasting [4] Additionally, infections, socio-economic inequalities, and low parental education are also reported as potential risk factors [8- 10]. Infections and inadequate diet are interlinked, and both increase the risk of wasting.

Children aged 6 to 24 months contribute to the maximum number of admissions in the NRC [11, 12]. Previous studies showed a strong co-relation of socio-economic factors, hygiene, and faulty feeding practices with wasting in children [11, 12]. However, most of these studies have been conducted in tertiary care hospitals and studies from secondary care centers are lacking where admitted patients are more representative of the community. Hence, the aim of this study was to find out the relationship of various socio-economic factors and feeding behavior with wasting in the children admitted to the NRC.

Methods

Study design and study setting

This descriptive observational study was conducted from April 2019 to March 2020 after obtaining approval from the ethical authority of the district hospital, Khandwa. It is a secondary care hospital, equipped with a 20-bedded NRC and located in the district Khandwa of the state of MP, India. The NRC at the district location offers facility-based treatment of malnutrition catering to children from the district as well as those referred from primary health centers of the surrounding areas.

Participants

All children consecutively admitted to NRC and fulfilled the definition of SAM were recruited in the study. Children with any chronic systemic disease affecting the nutritional status such as congenital heart disease, developmental anomalies, suspected inborn errors of metabolism, any defect requiring surgical intervention and any sick patient requiring intensive care were excluded from the study and were referred to the nearest tertiary care center for management. The SAM was diagnosed based on the definition proposed by the WHO/UNICEF (Children aged 6-59 months, having any one of the following; Weight for height (W/H) ratio <3 SD, mid-upper arm circumference (MUAC) <11.5 cm,

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and/or bilateral pitting edema as well as for children less than 6 months of age, anyone the following: W/H ratio <3SD, bilateral pitting edema, failure to gain weight, and poor feeding).

Data collection

Written informed consent was obtained from the parents or legal guardians of the eligible children. A detailed history was taken from the parents of all the recruited children including age, gender, socioeconomic status, birth order, duration of breastfeeding, details of complementary feeding, consumption of ready-mix food packets at home, and immunization history. Thorough clinical examination was done to rule out any systemic disease before recruitment and the clinical evidence of associated infections was recorded and managed accordingly.

At the time of admission, weight was measured by a standard electronic weighing scale, provided by UNICEF to all the NRCs, to the nearest 05 grams. During the stay, weight was recorded daily at the same time of the day to assess the weight gain. In children less than 2 years of age, the length was measured using an infantometer, and in children above 2 years of age, the height was measured using a standard scale (stadiometer) to the nearest millimeter. The weight/ height ratio was calculated, and WHO reference charts were used to interpret the W/H ratio to diagnose SAM [13]. The MUAC was measured by a non-stretchable tape at the mid-point of acromion and olecranon fossa on the non-dominant arm to the nearest millimeter. All SAM children were managed as per the standard protocols including medications, a standardized diet and micronutrients supplement [14]. Sick children were first stabilized in the pediatric ward and then transferred to the NRC. Blood transfusion was done according to WHO guidelines [15].

In the community, all children are registered in Anganwadi of respective areas, and children of age 7-36 months are provided with take-home energy-rich, fortified ready-mix food packets as an additional complementary food, which provides 525 Kcal/120 g of energy and 20 g/120 g of protein (halwa-mix - 600 g packet)) and 554 Kcal/125 g of energy and 23 g/125 g of protein (khichdi-mix - 625 g packet). These two types of packets are provided for the child as one packet/week by the Anganwadi centers, which is to be consumed in 5 days at home, as per guidelines of the Integrated child development scheme (ICDS) [16]. Socio-economic status was assessed by the modified Kuppuswamy scale 2019 [17]. Age of starting complementary feeding was noted and adequacy of feeding was assessed by the IYCF guidelines 2016 (table 1). Hand washing, personal hygiene (sanitation), and source of water supply were noted. The dictionary meaning of the word sanitation is the science of safeguarding health [18].

To do so, we could not find well-defined criteria for hygiene and sanitation, so the following points were considered for water supply, hygiene, and sanitation; Water supply: Tap water (3), hand-pump/borewell (2), and water from rivers, ponds, and wells (1); Hand hygiene: wash hands with soap, before and after feeding and toilet (3), hand washes after using the toilet (2), and no handwashing by soap (1); Sanitation: regular bath and wearing washed clothes and using clean bed sheets for the child (3), not taking a daily bath and changing bed sheets (2), very irregular change of clothes and giving bath to the child (1). Three points were given for satisfactory practice, two points for average, and one point was given for poor practice. Points of the above 3 habits were combined and the score was considered as, 3-5, 6-7, and 8-9 as poor, average, and satisfactory practices of hygiene, hand washing, and sanitation, respectively.

Outcome measures

Average weight gain (g/kg/day) was recorded during the stay and follow-up. All these children were followed-up weekly four times. Output was assessed as cured (weight gain more than 15% of the admission weight), defaulter (no follow-up/ not taking recommended treatment), death, and non-respondent (weight gain was less than 15% of the admission weight after four follow-ups).

Statistical Analysis

All variables were grouped as per mathematic transformation of them into nominal/ordinal/interval and ratio. Further point estimations with dispersion

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measures were calculated with the help of MS Excel, and the significance of the results obtained was checked by performing the Chi-square test using Statistical Package for the Social Sciences (SPSS-26). The significance level was statistically considered P<0.05.

Table 1. Amounts of Foods to Offer according to IYCF guideline 2016

Age	Texture	Frequency	Average amount of each meal
6-8 mo	Start with thick porridge, well-mashed foods	2-3 meals per day plus frequent BF	Start with 2-3 tablespoonful
9-11 mo	Finely chopped or mashed foods, and foods that baby can pick	3-4 meals plus BF. Depending on appetite offer 1-2 snacks	1/2 pf a 250 ml cup/bowl
12-23 mo	Family foods, chopped or mashed if necessary	3-4 meals plus BF. Depending on appetite offer 1-2 snacks	3/4 to one 250 ml cup/bowl

If the baby is not breastfed, give in addition: 1-2 cups of milk per day, and 1-2 extra meals per day. The amounts of food included in the table are recommended when the energy density of the meals is about 0.8 to 1.0 Kcal/g. If the energy density of the meals is about 0.6 Kcal/g, recommend increasing the energy density of the meal (adding special foods) or increasing the amount of food per meal. Find out what the energy content of complementary foods is in your setting and adapt the table accordingly.

Results

A total of 415 children fulfilled the criteria for admission to NRC, out of which, 17 children having additional co-morbid disorders were referred to Indore's tertiary care center for further therapy and excluded from the study. The remaining 398 children, admitted to NRC during the study period, were enrolled in the study. Among the 398 children, 206 (51.75%) and 192 (48.24%) were male and female, respectively. Out of them, 146 (36.68%) children were of age group 7-12 months and 140 (35.17%) children were of age group 13 -24 months (table 2). Table 2 depicts age distribution with SD score, maximum participants (n=286) were between 7-24 months group. The difference in different age group distribution came to be statistically significant ($p < 0.05$). Bilateral pitting edema was seen in 15 (3.77%) children on admission.

Birth order of children was first in 116 (29.14%), second in 155 (38.94%), third in 66 (16.58%), fourth in 34 (8.54%), fifth in 09 (2.26%) and sixth in 04 (1.0 %) children. Totally, 350 (87.93%) children were fully vaccinated as per their age. 38 out of 370 (10.27%) children above 6 months of age, passed an appetite test on admission, and among them, 27 children were wasted (W/H ratio <3 SD) and 10 children had very severe wasting (W/H ratio <4 SD).

Out of the total 398 children, 277 (69.59%) had some medical complications at the time of admission. Most of them were suffering from infectious diseases like diarrhea, pneumonia, bronchitis, pre-infantile tremor syndrome (pre-ITS), and some had multiple medical complications (table 3). Children in the less than 4 SD group have more medical complications as compared to the 3 SD group which is statically significant ($p <0.0001$).

Severe anemia (Hb <4 gm %) was found in 15 children, and Hb 4-6 gm% was found in 46 children. Totally, 159 (39.95%) children were first treated in the pediatric ward, stabilized, and then subjected to NRC protocol. Blood transfusion was carried out in 74 (18.59 %) children. Families of 322 children (80.90%) belonged to upper lower and 30 (7.53%) belonged to lower socio-economic class as per the modified Kuppuswamy scale (table 4). Poor hygiene practices were present in 144 (36.18%) families (score 3-5) (table 5).

Out of 27 (6.78%) children aged <6 months, 15 children were given top milk at home because of inadequate breast milk. Out of 371 children above 6 months of age, 38 children were started with the complementary feeding at 6 months of age, 211 children at 7-9 months of age, 39 children at 10 to 12 months of age, and in 27 children, it was started after the age of 12 months. In 49 children, only top milk, in 27 children, only biscuits with milk, and in

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190 children, liquid rice and pulses along with milk, biscuits, and junk foods were given as complementary food. Adequate complementary feeding was given to 37 children, as per IYCF guidelines, and from these 37 children, it was started in 30 children before 9 months of age. Above the age of 6 months, complementary feeding was not started in 56 children at home by the parents till the time of admission to the NRC (table 6). Out of 371, 315 started complementary feeding at different ages. Only 30 children were started adequate complementary feeding between 6-9 months of age as per guideline.

Out of 344 children (7 to 36 months of age group), 326 (94.76%) received supplementary take-home energy-rich food packets provided by Anganwadi. Out of these, 55 (15.98%) children consumed the complete number of take-home foods packets. 178 (44.72 %) children were fed partially, and 68 (17.08 %) children refused to eat those packets.

Total 79 children (19.85 %) had NRC stay of less than 7 days, 232 (58.29%) children had a stay of 8-14 days, and 87 (21.86%) children had a stay of 14 -21 days in NRC. The mean duration of stay in NRC was 11.63±3.65 days, and the mean weight gain of the children admitted to NRC was 8.30±1.14 gm/kg/day. Totally, 302 (75.87%) children were cured during NRC stay and during four follow-up visits, 31 (7.78%) were defaulters, 35 (8.79%) children were non-respondent and 2 (0.05%) ones died. The output of the NRC was good as per the NRC norms.

Table 2. Age wise distribution (N= 398)

SD Score	<6 mo	7-12 mo	13-24 mo	25-36 mo	37-59 mo	Total	P-value
<2SD	02	36	17	04	01	60 (15.07%)	P<0.05
<3SD	11	55	80	34	19	199 (50.0%)	
<4SD	14	55	43	20	7	139(34.92%)	
Total	**27 (6.78%)**	**146 (36.68%)**	**140 (35.17%)**	**58 (14.57%)**	**27 (6.78%)**	**398 (100%)**	

Table 3. Children with medical complication (N=277)

Disease	Median <2SD	< 3 SD (n=199)	< 4 SD (n=139)	Total
Infectious Diseases	27	67	78	172
Pre- ITS/ITS Severe Anenia/ BL Pitting Odema	18	27	24	69
Metabolic & Neurological	1	4	14	19
Congenital Heart disease	1	2	2	5
Surgical & Others	1	4	7	12
Total	**48**	**104**	**125**	**277**

Table 4. Socio economic status (N=398)

Category	Frequency	Percentage
Upper	01	0.25
Upper middle	07	1.75
Lower middle	38	9.54
Upper lower	322	80.90
Lower	30	7.53

Table 5. Hygiene/ hand washing/and sanitation score (N=398)

SD Score	3-5	6-7	8-9	Total	P Value
2<SD	22	32	06	60	P=0.033
3<SD	58	128	13	199	
4<SD	64	73	02	139	
Total	**144(36.18%)**	**233 (58.54%)**	**21 (5.27%)**	**398 (100%)**	

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Table 6. Age of starting complementary feeding as per IYCF Guidelines 2016 (N=371)

Age of initiation of complementary feeding	Feeding started as per guideline			Feeding not started (till admission)
	Incomplete	Complete	Total (n=315)	
Up-to age of 6 months	33	05	38 (12.0%)	08
7-9 months	186	25	211 (66.9%)	19
10-12 months	35	04	39 (12.38%)	16
>12 months	24	03	27 (8.57 %)	13
Total	**278 (88.25%)**	**37 (11.74%)**	**315 (100%)**	**56**

Discussion

This one-year observational study included 398 SAM children aged 0 to 59 months who were admitted to the district hospital's NRC during the period of study. Results were evaluated to assess the relationship of age of children, feeding behavior, hygiene, and social class with the wasting. Among the admitted children, 286 children (71.85%) were aged between 7-24 months. In a study by Dhanalakshmi et al., 50.95% of children were aged less than 24 months while in a study by Aguayo et al., 77.7% of SAM patients were 6-23 months old [11, 19]. Mahgoub HM et al, in Eastern Sudan also showed 72.6% of 1097 children with SAM were of age <2 years [20]. The higher admissions of children aged 7-24 months due to the SAM suggests a lack in providing adequate complementary feed along with breast milk during this crucial period.

Out of 370 children more than 6 months of age, only 38 (10.27%) children passed the appetite test on admission, which is due to the reductive adaptation and latent infection resulting in poor appetite in children with SAM. Totally, 277 (69.59%) of 398 children were having medical complications at the time of admission. This was similar to the findings in a study done by Dhanalakshmi et al., so that in their study, 72.91% of children and 80.46% of children in our previous study had medical complications at the time of admission [11, 21]. Out of the total of 398 admissions, 139 children had very severe wasting; out of them, 125 (89.92%) children had associated medical complications, indicating a strong association of infection with the severity of wasting (p<0.001). Families of 80.90% of children belonged to upper lower (category 4) and 7.53% belong to lower class (category 5) of the socio-economic scale. Only one family belonged to the upper category, representing poverty, low income, and low education level are consistent factors associated with malnutrition.

Satisfactory hygiene habits including water supply, hand washing, and sanitation were observed only in 5.27% of the families. The current study found poor hygiene practice in 46.04% of very severely wasted children and in 29.14% of severely wasted children, which was statistically significant (p= 0.033). This observation indicates that poor hygiene habits increase the severity of wasting in these children. A study by Rana et al., in Arville, Gujrat suggested that inadequate hand wash practices increased the acute malnutrition risk in children [22]. In a case-control study from central India, it was observed that poor handwashing habits increased children's vulnerability to infection, and infection impacts acute malnutrition.[23]. This is in accordance with previous research from India and Ethiopia [24, 25]. A good handwashing and surrounding hygiene are very important preventive measures for good health and transmission of diseases via the fecal-oral route is largely prevented, leading to less morbidity and better health.

Out of 371 children aged 7-59 months, complementary feeding was started in 249 (67.11%) children before the age of 9 months. It was of a wide variety and inadequate quality for most of the children, which included milk, biscuits, diluted rice and pulse, and junk foods. Only in 30 (8.08%) cases, adequate complementary feeding was started before the age of 9 months as per IYCF guidelines. This is following the data reported by NFHS-4 of the district Khandwa, where only 2.7% of the children were getting an adequate diet during the age of 6-29 months. As per NFHS-4 data [5], in the Madhya Pradesh state, the percentage of infants who are fed correctly based on the three recommendations of IYCF is merely 8.1% and

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13.1% in the age groups 6-8 and 9-11 months, respectively. In the research conducted by Rasania and Sachdev [26], it was found that the complementary feeding was initiated at an optimal age in 42.9% of children, while 24.5% of children had early commencement of complementary feeding (less than 4 months), and in the rest, it was delayed beyond 6 months. Jones G et al estimated that an additional 6% of child deaths can be prevented with appropriate complementary feeding [27].

Take-home food packets were not fed properly to the children, indicating a lack of awareness among parents, about complementary feeding practices. This causes the maximum number of admissions in NRC, from the early age group of 6 months up to the age of 24 months, which was 71.85% (n=286) in our study. Infections and severity of wasting had linear co-relation as children with very severe wasting had more medical complications; especially, infections at the time of admission.

Limitations of the study

This study has certain limitations including the small sample size and lack of a control group. This was a hospital-based, done in a single NRC of a district hospital; therefore, the results could not be generalized to the community. Moreover, most of the results related to the feeding behaviour were based on the history provided by the parents affected by the recall bias**.** Studies, done in various NRCs of the state, including community-based approach, may give a more composite view.

Conclusion

Poor hygiene and inadequate feeding practices are the important preventable factors causing wasting and infections in children. There is a need to focus more on children of age group 6-24 months, which is the major burden of SAM. The ongoing study suggested that supervised monitoring of proper complementary feeding, right from the 6 months of age should be done, and awareness about personal hygiene should be improved.

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Ethical approval

This study was conducted after obtaining approval from the ethical authority of the district hospital, Khandwa (No. 46/EC/DHK/2019)

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Conflict of interest

There was no conflict of interest.

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