pISSN 2394-6032 | eISSN 2394-6040

Research Article

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20151222

A cross-sectional study to assess the protein energy malnutrition in children between one to five years of age in a tribal area Parol, Thane district, Maharashtra, India

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Received: 06 October 2015 Revised: 08 October 2015 Accepted: 03 November 2015

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ABSTRACT

Background: Nutrition in children is considered as one of the foundation not only for good health and freedom from disease, but also for normal growth and development. Nutrition has a profound and largely incalculable impact on human health. Preschool children are most vulnerable to the effect of undernutrition because of rapid growth and thus their nutritional status is considered to be sensitive indicator of community health. The objective of the study was to study prevalence of protein energy malnutrition in children between one to five years of age; socioeconomic, demographic, ecological and other health problems associated with protein energy malnutrition; immunization status; to suggest appropriate recommendations based on observation.

Methods: The present study was carried out in a tribal area, Parol, Thane district, Maharashtra, India. The study population comprised of children in the age group of 1-5 years. The study was a cross sectional descriptive epidemiological study.

Results: In our study maximum number of children 26.83% were in the age group of 2-3 years. 97.33% were Hindus, 45.33% of the mothers were illiterate, 10.67% of the fathers were illiterate, and 51.11% of children belong to nuclear families. 30.22% were given exclusive breastfeeding for 6months.74.67% were completely immunized, 25.33% were partially immunized. There was statistically significant association between Acute Malnutrition and type of family, education of mother, Socioeconomic status, mother's age at marriage of less than 18 years, immunization status of the child, history of respiratory tract infection in last one month and history of diarrhea in last one month.

Conclusions: In our study, the number of male children was slightly higher than the female children. Faulty feeding practices were commonly observed in this area and most of the children's diet were not adequate for calories and proteins as per ICMR guidelines. Primary immunization was satisfactory in the study area, no child was unimmunized and around one forth was partially immunized.

Keywords: Protein energy malnutrition, Tribal area, Immunization status, Childhood illness, Indices of nutritional status

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INTRODUCTION

Nutrition in children is considered as one of the foundation not only for good health and freedom from disease, but also for normal growth and development. In the global campaign of Health for All, promotion of proper nutrition was one of the eight elements of Primary Health Care. Nutrition has a profound and largely incalculable impact on human health.

In the millennium declaration of September 2000. member states of the United Nations made a passionate commitment to address the crippling and multiplying problems in many developing areas of the world. Among this, the first goal is to eradicate extreme poverty, which is measured by the prevalence of underweight among the children. The target is to halve the burden of undernutrition. The next goal with regards to children is to achieve two third reductions in under-five mortality and infant mortality by 2015.3 Malnutrition is called an-Invisible Emergency because, much like an iceberg, its deadly menace lies mostly hidden from view. Preschool children are most vulnerable to the effect of undernutrition because of rapid growth and thus their nutritional status is considered to be sensitive indicator of community health.4 Malnutrition is more common in India than in Sub-Saharan Africa. One in every three malnourished children in the world lives in India.⁵ In India, around 46 per cent of all children below the age of three are too small for their age, 47 per cent are underweight and at least 16 per cent are wasted. Many of these children are severely malnourished. Malnutrition in children is not affected by food intake alone; it is also influenced by access to health services, quality of care for the child and pregnant mother as well as good hygiene practices. Girls are more at risk of malnutrition than boys because of their lower social status.⁵ Children are at greater risk of dying before age five if they are born in rural areas, poor households, or to a mother denied of basic education. More than half of under-five child deaths are due to diseases that are preventable and treatable through simple, affordable interventions. Strengthening health systems to provide such interventions to all children will save many young lives. Malnourished children, particularly those with severe malnutrition, have a higher risk of death from common childhood illness such as diarrhoea, pneumonia, and malaria.7

Malnutrition lowers the cell mediated immunity and thereby increases the susceptibility for the diseases. In developing nations, there is a significant risk of malnutrition and infection among children who are between first and fifth birthday, particularly those in the process of being weaned from breast milk. 2

METHODS

The present study was carried out in a tribal area, Parol, Thane district which has population of 20795. The study population comprised of children in the age group of 1-5 years.

Study design

Cross sectional descriptive epidemiological study.

Inclusion criteria

- 1. 1-5 year children.
- 2. Residing at least for 6 month in study area.
- 3. Parents willing for study.

Exclusion criteria

- 1. Those children who are seriously ill.
- 2. Whose parents are not present during the visit.
- 3. Parents who are not willing for study.

Sample size is calculated considering the underweight status of children between 1-5 years of age. According to a study conducted by I.I.Meshram, N.Ariappa, N.Balakrishna⁹, the prevalence of underweight was 64%. The sample size is calculated using the formula n=4pq/12. The calculated sample size is 225.

Sampling technique

According to population proportion sample size method, the sample was taken from individual sub enter by stratified random sampling method.

Methodology

Consent was taken from parents or family head. Data was collected using preformed questionnaire, which includes general information, anthropometry and sociodemographic factors. The age of child was confirmed either by parents or anganwadi worker.

Anthropometric measurement like weight, was recorded with minimum clothes, using weighing machine, the height was recorded by the non-stretchable measuring tape. Head circumference and chest circumference was measured using a narrow, flexible and non-stretchable tape. Mid upper arm circumference was measured to the nearest millimetre at exact midpoint of the left arm using flexible and non-stretchable tape.

The indices of nutritional status like weight for age, height for age and weight for height was compared with the WHO growth charts for particular age and sex. Three commonly used under nutrition indicators namely stunting, underweight and wasting were used to evaluate the growth status of children. The data was compiled and

analysed using statistical package for social sciences software for appropriate statistical tests.

Ethical clearance

The study was approved by ethical committee of T.N. medical college, Mumbai.

RESULTS

Table 1: Distribution of children according to age and sex.

Age	Mal	es	Fema	ales	Tota	l
(In months)	No	%	No	%	No	%
13-24	31	25.20	27	26.47	58	25.84
25-36	25	20.33	34	33.33	59	26.83
37-48	33	26.83	19	18.63	52	22.73
49-60	34	27.64	22	21.57	56	24.61
Total	123	100.00	102	100.00	225	100.00

In the present study comprising of 225 children aged 1-5 years, maximum number of children (26.83%) were in the age group of 2-3 years.

Table 2: Distribution of children according to sociodemographic factors.

Sociodemographic factors	Children	
Religion	Number	Percentage
Hindu	219	97.33
Muslim	06	2.67
Total	225	100.00
Education of mothers		
Illiterate	102	45.33
Primary	113	50.22
Secondary	10	4.44
Higher secondary	0	0.00
College/Degree	0	0.00
Total	225	100.00
Education of father		
Illiterate	24	10.67
Primary	94	41.78
Secondary	85	37.78
Higher secondary	14	6.22
College/Degree	8	3.55
Total	225	100.00
Type of family		
Nuclear	115	51.11
Joint	84	37.33
Three generation	26	11.56
Total	225	100.00

Out 225 children, 97.33% were Hindus, 45.33% of the mothers were illiterate, 10.67% of the fathers were illiterate and 51.11% of children belong to nuclear families.

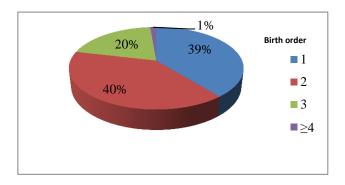


Figure 1: Distribution of children according to birth order.

In context to birth order, 39.56% were of birth order two, 39.11% were of birth order one, 20% were of birth order three and 1.33% were of birth order 4 or more.

Out of 225 children, 44.89% were given prelacteal feeds, 55.11% did not receive any prelacteal feeds.

Table 3: Distribution according to exclusive breast feeding.

Exclusive breast feeding for 6 months	Number	Percent
Given	68	30.22
Not given	157	69.78
Total	225	100.00

In the present study, out of 225 children, 68 (30.22%) were given exclusive breastfeeding for 6 months.

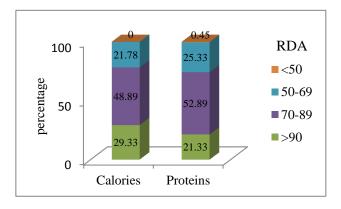


Figure 2: Distribution of children according to dietary adequacy.

In the present study 29.33%, 48.89%, 21.78% had RDA for Calories >90%, 70-89%, 50-69% respectively; none of the child had <50% RDA for Calories and 21.33%, 52.89%, 25.33% had RDA for Proteins >90%, 70-89%, 50-69% respectively and only 1 child (0.45%) had protein deficit of <50 RDA.

In the present study, out of 225 children, 74.67% were completely immunized, 25.33% were partially immunized.

Table 4: Distribution of children according to immunization status.

Immunization status	Children				
Illinumzation status	No.	Percentage			
Complete	168	74.67			
Partial	57	25.33			
Total	225	100.00			

Table 5: Distribution of children according to age and weight.

Age	Males		Females	Females		
(In months)	Children observed	Weight (In Kg±SD)	Children observed	Weight (In Kg±SD)		
13-24	31	8.54±1.07	27	8.46±0.94		
25-36	25	9.71±1.49	34	8.66±2.08		
37-48	33	11.37±1.93	19	10.84±1.78		
49-60	34	12.87±1.63	22	13.44±1.87		
13-60	123	10.74±2.29	102	10.04±2.61		

Table 6: Distribution of children according to height.

Age	Males Females				
(In months)	Children observed	Height (In Cm±SD)	Children observed	Height (In Cm±SD)	
13-24	31	75.81±1.62	27	76.04±2.80	
25-36	25	83.32±3.21	34	79.62±5.51	
37-48	33	89.42±4.23	19	88.47±3.85	
49-60	34	96.06±3.84	22	99.27±3.18	
13-60	123	86.59±8.38	102	84.56±9.71	

Table 7: Distribution of children according to WHO classification of malnutrition.

Indices	Normal		Undernourished		Severely	Normal		
indices	No.	%	No.	%	No.	%	No.	%
Weight for Age (underweight)	107	47.55	87	38.67	31	13.78	225	100
Height for Age (stunting)	133	59.11	78	34.67	14	6.22	225	100
Weight for Height (wasting)	114	50.67	81	36	30	13.33	225	100

The mean weight of male children in the 13-24 months, 25-36 months, 37-48 months and 49-60 months age group are 8.54 ± 1.07 kg, 9.71 ± 1.49 kg, 11.37 ± 1.93 kg, 12.87 ± 1.63 kg respectively. The mean weight of female children in the 13-24 months, 25-36 months, 37-48 months and 49-60 months age group are 8.46 ± 0.94 kg, 8.66 ± 2.08 kg, 10.84 ± 1.78 kg, 13.44 ± 1.87 kg respectively (Table 6).

Of the 225 children studied; 38.67%, 34.67%, 36% were underweight, stunted and wasted respectively and 13.78%, 6.22% and 13.33% were severely

underweight, stunted and wasted respectively (Table 7).

Table 8: Distribution of children according to mid upper arm circumference.

Mid upper arm circumference (in cm)	Number	%
>13.5	146	64.89
12.5-13.5	58	25.78
<12.5	21	9.33
Total	225	100.00

Based on mid upper arm circumference, mild malnutrition was present in 25.78% children and severe malnutrition was present in 9.33% children.

Table 9: Common morbidities reported in children in past one month from time of study.

Morbidity	Number	%
ARI	81	36.00
Diarrhea	61	27.11
Worm infestation	38	16.89
Skin infection (Scabies, Pyoderma)	15	6.67

Acute respiratory infections 36% was the commonest morbidity reported in children, followed by Diarrhoea in 27.11% children, history of passing worms in 16.89% children and skin infections (e.g.- scabies, pyoderma) in 6.67% children.

DISCUSSION

Our study revealed that 97.33% of the children belonged to Hindu religion and 2.67% Muslim when compared to a study conducted in Ghaziabad where 96.62% were Hindus and 3.37% were Muslims. 10

The illiteracy status of mothers was higher in our study as compared to the national average of 34.5% for females. This may be due to wide inter and intrastate variation pertaining to literacy status. 51.11% belong to nuclear families which was similar to study conducted by Divakar SV Balaji PA, Poornima S, Varne SR, Ali SS, Puttaswamy M. 12

30.22% were given exclusive breast feeding for 6 months, which is less, when compared with the NFHS data (53% of children in Maharashtra are exclusively breastfed).⁶ This may be due to the variation in the social and cultural practices in that area.

The study undertaken in Ghaziabad revealed that the children's diet was adequate for proteins but was deficient in energy. ¹⁰ In another study conducted in a rural area near Mysore, Karnataka revealed that the nutrient intake was grossly inadequate. ¹³ An ICMR study has observed that energy intakes are about 70% of RDA in children of 1-6 years age group, while the protein intake was found to be adequate. ¹⁴

The percentage of completely immunized was slightly higher in our study compared with NFHS data (59% of children age 12-23 months in Maharashtra are fully immunized). The mean weight of male and female children in our study was similar to a study conducted by V.G. Rao, Raju Yadav, C. K. Dolla, in tribal preschool children near Jabalpur. The mean height of male and female children in our study was similar to a study conducted by V. G. Rao, Raju Yadav, C.K.Dolla, in tribal preschool children near Jabalpur. In a study conducted

by Kumar D, Goel NK, Mittal PC, Mishra P, 36.4% were underweight, 51.6% were stunted and 10.6% were wasted. In a study conducted by Bisai S, Bose K, Ghosh A, the prevalence of underweight, stunting and wasting was 33.9%, 26.1% and 19.4%, respectively. Of these, 9.1%, 9.7% and 3.6% children were found to be severely underweight, stunted and wasted. The study conducted by Regional Medical Research Center for Tribals (ICMR), Jabalpur, India revealed that 61.6% preschool were underweight, 51.6% were stunted and 32.9% were wasted. According to NFHS 3 the total prevalence of underweight, stunting and wasting in Maharashtra was 33%, 44%, 17% respectively. These were comparable with our study findings.

In a study conducted in a rural area in Faridabad district, malnutrition was detected in 27.2% of the children. ¹⁸

Acute respiratory infections (36%) were the commonest morbidity reported in children, followed by Diarrhoea (27.11%) children. According to NFHS 3, number of children with diarrhoea and acute respiratory infection in the two weeks before survey were 8% and 5% respectively.⁶

Acute malnutrition was more common in 1-3 years age group (60.36%), compared to 3-5 years age group (39.64%), compared to a study conducted by Chakraborty S where the prevalence of PEM was found to be significantly higher in the age group of 1-3 years (80.9%) as compared to other age groups. 19 Critical age at which undernutrition starts is around 6 months and growth flattering is at peak in second year of life. Up to 6 months, the babies thrive well on breast milk which is adequate for normal growth and development, thereafter the baby needs supplementary feeds in addition to breastfeeding. Most mothers delay the weaning (giving complementary or supplementary foods) in young children and secondly the quantities of foods given are quite inadequate for normal growth and development. Cereals are deliberately not encouraged or are given in very small quantities. In a study conducted by, Patel KA et al, 51.4% were males, majority in the age group of 2-3 years, of which 63% children were malnourished, majority in Grade I malnutrition. Out of the total females, 72% were malnourished.²⁰

Dey I, Chaudhuri RN found that 55.9%, 51.4% and 42.3% of the girls were underweight, stunted and wasted respectively compared to 46.6%, 40.5% and 35.3% of the boys. Harishankar et al, prevalence of malnutrition was found to be more in female children (53.01%) as compared to males (45.85%). Severe grade of malnutrition was also prevalent in females (2.19%) as compared to their male counterparts. Halani KD, more girls (68.2%) were malnourished than boys (58%).

Usually prevalence of severe malnutrition is much more in young girls compared to young boys below 5 years of age. This is due to differential child rearing practices observed including feeding and health care seeking behaviour.

In a study conducted by Patel KA the findings related to Acute Malnutrition and the type of family was similar.²⁰

Table 10: Association between various factors and acute malnutrition.

	Acute Malnutritio	on	
Age Group	Present	Absent	Total
13-24	32	26	58
25-36	35	24	59
37-48	24	28	52
49-60	20	36	56
Total	111	114	225
X2=7.512 df=3 p=0.057	111	117	223
Sex			
Female	51	51	102
Male	60	63	123
Total	111	114	225
X2=0.033 df=1 p=0.855	111	117	223
Type of Family			
Nuclear	44	71	115
Joint	50	34	84
Three Generation	17	9	26
Total			
	111	114	225
X2=11.810 df=2 p=0.03			
Mothers education Illiterate	5 0	4.4	102
	58	44	102
Primary	48	65	113
Secondary*	5	5	10
Higher secondary/Degree	0	0	0
Total	111	114	225
X2=4.232 df=1 p=0.040			
Socioeconomic status scale	_	_	
Class I	2	7	9
Class II	7	9	16
Class III	10	19	29
Class IV	52	65	117
Class V	40	14	54
Total	111	114	225
X2=19.747 df=4 p=0.001			
Total family members			
Up to 3	9	9	18
3 to 5	40	54	94
More than 5	62	51	113
Total	111	114	225
X2=3.116 df=2 p=0.211			
Birth order			
1	36	52	88
2	43	46	89
3	30	15	45
4 & more	2	1	3
Total	111	114	225
X2=7.334 df=1 p=0.007			
Exclusive breastfeeding (for 6 months)			
Given	27	41	68
Not Given	84	73	157
Total	111	114	225

X2=3.614 df=1 p=0.057			
Age of Marriage			
Less than 18 years	48	32	80
18 years and more	63	82	145
Total	111	114	225
X2=5.651 df=1 p=0.017			
Immunization Status			
Completely Immunized	76	92	168
Partially Immunized	35	22	57
Total	111	114	225
X2=4.450 df=1 p=0.035			
H/o Respiratory tract infection in last one	month		
Present	50	31	81
Absent	61	83	144
Total	111	114	225
X2=7.779 df=1 p=0.005			
H/o diarrhea in last one month			
Present	40	21	61
Absent	71	93	164
Total	111	114	225
X2=8.831 df=1 p=0.003			

In studies conducted by Chakraborthy S, the overall PEM prevalence was seen to be higher among the children of illiterate mothers. A Mittal, J Singh, SK Ahluwalia; mother's education seemed to play a protective role against child's malnutrition. Prevalence was the highest where mothers were illiterate (60.9%) v/s value of 21.2% where mother had education more than high school. When the conduction is the conduction of the c

In studies conducted by Harishankar, the prevalence of all grades of malnutrition increases with birth order, 43.5% in birth order three and above 26.9% in birth order two and 20.38% in birth order one.²²

In studies conducted by Chakraborty S et al, the proportions of underweight among children who had exclusive breastfed for less than 6 months (64.6%) were significantly higher (p<0.01) than those who were breastfed more than 6 months (35.4%).

Suvra Pathi et al, it was observed that malnutrition was higher in those infants who were partially breastfed and top fed (71.4%) when compared with the infants who were exclusively breast fed (21.21%).²⁵

In study conducted by Anita Raj showed malnutrition was more common in children, whose mothers were married before the age of 18 years. ²⁶

In studies conducted by Sandip Kumar Ray, a significantly higher prevalence of malnourished children were observed amongst partially immunized and non-immunized children (81.25% and 88.23% respectively) in comparison to fully immunized children (62.07%).²⁷

In studies conducted by, Shubhada Avachat et al in rural area of western Maharashtra, India, the prevalence of recurrent diarrhoea were 9.81%. Malnutrition was significantly associated with recurrent diarrhoea and 21% of malnourished children had the same. Sandip Kumar Ray, it was noted that 37.9% children suffered from diarrhoeal episodes. Among the children with acute respiratory tract infection, 69.98 per cent were suffering from malnutrition with 8.32% having severe degree of malnutrition. The same of the prevalence of malnutrition. The same of the prevalence of the prevalence

Unclean food, utensils and dirty hands, unsafe water and unsafe excreta disposal leads to infections and most common being diarrhoea and worm infestation. A repeated attack of diarrhoea and acute respiratory infections lowers the nutritional status. Continuing feeding during illness and more diet during convalescence period is essential for catch up growth. Adequate eating during illness reduces the severity of illness and gives energy to the body. In a study done by Harishankar et al, the prevalence of malnutrition was found to be 52.2%, 35.7% and 11.9% in children belonging to low, middle socioeconomic status group respectively.²²

In study conducted by, Swami, H. M. et al in Chandigarh, where, with increase in family size malnutrition also increased.²⁹

CONCLUSION

In our study, the number of male children was slightly higher than the female children. Majority of the children were Hindus. The literacy rate was higher in fathers of under-five children than mothers. The main occupation among fathers of under-five children was labourers and most mothers were homemaker. Maximum number of children belonged to nuclear families and socio-economic classes IV and V. Faulty feeding practices were commonly observed in this area and most of the children's diet were not adequate for calories and proteins as per ICMR guidelines. However, calorie consumption was better than protein consumption. Primary immunization was satisfactory in the study area, no child was unimmunized and around one forth were partially immunized. The mean height and weight of the children was lesser than the WHO reference data. Nearly half of the children were underweight, nearly two fifth were stunted and two fifth of the children were wasted. Mother's literacy had an impact on the nutritional status of the children. Lower socio-economic condition, higher birth order, lower birth interval and faulty feeding habits were found to have an adverse effect on the nutritional status of the children. On the other hand higher socioeconomic status, lower birth order, higher birth interval and proper feeding habits had a beneficial effect in protecting children from malnutrition.

Recommendations

- Mothers should be advised to initiate breast feeding within one hour of delivery.
- 2. Importance of exclusive breast feeding for the first 6 months of the baby's life and proper weaning thereafter should be properly explained to the mother.
- 3. Nutritional education has to be imparted to the people regarding consumption of a cost-effective nutritious diet.
- 4. Improve nutrition of pregnant and lactating mothers with supplementation of Iron and Folic acid tablets.
- 5. Special efforts have to be made to improve acceptance of family planning methods for limiting the family and to give adequate spacing between children. 100% Immunization, Deworming and Vitamin A supplementation has to be ensured.
- 6. Environmental sanitation has to be promoted in reducing infection and breaking the vicious cycle of infection leading to undernutrition.
- 7. Socio-economic development among the rural masses needs to be ensured which is an important factor to tackle malnutrition, mainly undernutrition.
- 8. Government should allot more money in health sector for integrated health packages and should ensure proper functioning of health programmes.

Limitations

Dietary intake was assessed by 24-hour recall method and application of better and elaborate methods of dietary intake assessment was beyond the scope of the study.

ACKNOWLEDGEMENTS

The authors express gratitude to the children and their parents who participated in the study for their support and co-operation.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Khargekar NC, Khargekar VC, Shingade PP. A cross-sectional study to assess the protein energy malnutrition in children between one to five years of age in a tribal area Parol, Thane district, Maharashtra, India. Int J Community Med Public Health 2016;3:112-20.