

## **DISENTANGLING THE INFLUENCE OF MATERNAL FACTORS ON NUTRITIONAL STATUS OF CHILDREN: COMMUNITY BASED STUDY IN AN URBAN SLUM OF INDIA**

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### **ABSTRACT**

Malnutrition is the major problem in developing countries especially in underserved areas such as urban slums. Most slum dwellers in India belong to the category of permanent necessitation, which are forced to live in the existing eco-cultured situations on account of poverty and social discard. Being the most vulnerable segment of the community the preschoolers (1-6 years) are at the greatest risk of malnutrition because of their growing period that demands high intake of protein and calories. The present community based longitudinal study was carried to assess the influence of maternal factors on nutritional status of urban slum children. It was conducted during January 2010 to June 2010 at urban slum of Cheetah Community, Mumbai, India. Total 190 children registered under six Anganwadis were included. The information was gathered by personal interview of mothers using semi-structured questionnaires. Out of 190 children 102 (53.7%) were malnourished. Significant association was seen between nutritional status of children and various maternal factors like mother's education, birth weight of baby, duration of exclusive breast feeding, time of initiation of breast feeding, sanitation practices in house, knowledge of mother's education about child's nutrition, immunization status of children and socioeconomic status of family. Thus, mother should be properly educated about the nutritional needs of the growing children and importance of complete immunization. Importance of exclusive breastfeeding, timely weaning and provision of protein and energy dense complementary food should be stressed. Mothers should be taught regarding the treatment of the common ailments in the house such as diarrhoea using homemade ORS.

**KEYWORDS:** Immunization, Malnutrition, Maternal Factors, Urban Slum

### **INTRODUCTION**

Health is the basic requirement of any society to develop and progress. Nutrition has major effects on health. Nutrition refers to the availability of energy and nutrients to the body's cells in relation to body requirements. Growth and development of any country is reflected by the growth and development of its children.<sup>1</sup>

Surveys carried out in different parts of India showed that, the diet and nutrition of majority people are inadequate in several aspects. Consequently, varying types of nutritional deficiencies result. Today malnutrition is the most debilitating health problem affecting millions of children. Malnutrition is not a pathological condition due to the deficiency of a single nutrient or calories, but a consequence of several interacting factors.<sup>2</sup>

Malnutrition is usually the result of a combination of inadequate dietary intake and infection. In children, malnutrition is synonymous with growth failure. Malnourished children are shorter and lighter than they should be for their age. To get a measure of malnutrition in a population, young children can be weighed and measured and the results compared to those of a 'reference population' known to have grown well.<sup>3</sup>

Globally, malnutrition has been responsible, directly or indirectly, for 60.0% of the 10.9 million deaths annually among under-five children. Well over two-thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life. No more than 35.0% of infants worldwide are exclusively breastfed during the first four months of life; complementary feeding frequently begins too early or too late, and foods are often nutritionally inadequate and unsafe. Malnourished children who survive are more frequently sick and suffer the life-long consequences of impaired development (WHO, 2003).<sup>4</sup>

Malnutrition is more common in India than in Sub-Saharan Africa. One in every three malnourished children in the world lives in India.<sup>4</sup> The prevalence of child malnutrition in India is the highest in the world, nearly double that of Sub-Saharan Africa, with the dire consequences of morbidity, mortality, productivity, and thereby the economic growth. Decline in child malnutrition over the last 15 years has been very slow; from 51.1 % in 1992-93 (National Family Health survey - NFHS I) to 47 % in 1998-99 (NFHS II) to 45.9 % in 2005-06 (NFHS III). What is worse is that child malnutrition has gone up to 50 % in 2007-08. Also, inequities in undernutrition do exist between demographic, socioeconomic and geographic groups in India, as can be seen from NFHS I, II, and III data. It may not be possible for India to achieve the nutrition Millennium Development Goal (MDG) by 2015 in spite of economic growth, unless urgent measures are taken for more and better investments in child development. Population is increasing by over 16 million every year and hence the number of malnourished children is actually increasing. Although preventing malnutrition needs to be the focus of our policy and program action, we have many children currently suffering from severe acute malnutrition.<sup>5</sup> Hence there is an urgent need to address the serious issue of why are malnutrition levels in India so high?

## MATERIALS AND METHODOLOGY

The present study was a community based longitudinal study carried out during January 2010 to June 2010 in urban slum of Cheetah Camp community. There were around 9300 (Census 2001) children aged less than 5 years. The Anganwadi centre was considered as a sampling unit. There were total 57 Anganwadis at Cheetah camp. Out of these, 10 percent Anganwadis (i.e. 6 Anganwadis) were selected by using simple random sampling method. All the children aged 1-3 years registered in these Anganwadi were included in the study. Children having Grade IV malnutrition according to Indian academy of Paediatrics (IAP) were excluded from the study. Interview of one mother of malnourished child was not possible as she was absent. That child was excluded from main study. As per the record of the selected Anganwadis and the distribution of children according to their nutritional status is as follows:

**Table: Selected Anganwadis and the Distribution of Children According to their Nutritional**

S. No	Sector and Anganwadi (AW) no.	Children between 1yr to 3 Yr Age Group	Grades of Malnutrition (A/c to IAP Classification)				
			Normal	1	2	3	4
1	F, AW No. 20	24	15	7	2	0	0
2	A, AW No. 35	30	17	8	5	0	0
3	B, AW No. 22	31	11	8	9	3	0
4	J, AW No. 3	36	19	9	7	1	0
5	D, AW No.49	31	10	9	10	2	0
6	E, AW No. 61	39	16	12	8	3	0
<b>Total</b>		<b>191</b>	<b>88</b>	<b>53</b>	<b>41</b>	<b>9</b>	<b>0</b>

The necessary approvals were obtained from the following authorities to carry out the study.

The Dean of TN Medical College, Mumbai; Ethics committee of TN Medical College, Mumbai; Professor and Head, Department of Preventive and Social Medicine, TN Medical College, Mumbai; In Charge of Urban Health Center, Cheeta Camp, Mumbai.

Data collection tools were prepared (i.e. consent forms and preformed, pretested, semi-structured, open-ended questionnaires). Initially a pilot study was conducted by selecting two Anganwadis randomly which were excluded from main study. Pilot study helped to test and restructures the instrument required for the actual study. To reduce bias, the information was collected maintaining utmost privacy as per the convenience of the respondents. Time required to complete one interview was 30 minutes.

Home visits were done to interview the mother of the children to know sanitary practices followed in the family. Initially informed consent was obtained from study participants. Nutritional status of 1-3 years old children was assessed by computing weight for age and by grading the children using the IAP classification of Malnutrition. Dietary intake of protein and calories for 1-3 year old children was determined using the 24-hour dietary recall method from the child's mother at her home.

Two more visits were paid by the investigators to the home of the child if the mother was not available during the first visit. Child was considered non traceable if the mother was not available for interview at home even on the third visit. Apart from dietary history, mothers were interviewed related to breast feeding and complementary feeding practices. Medical examination and anthropometric measurements of the children were taken at Anganwadi.

**Table: Standard of Sanitation According to Briscoe's Scale<sup>6</sup>**

Behaviour		Points		
		3	2	1
Water	Drinking	tube well/tap	ring well	pond
	Washing	tube well/tap	ring well	pond
	Bathing	tube well/tap	ring well	pond
Defecation Children < 5 years		Latrine/ disposed off	open within compound	Anywhere
Hand washing by mother before eating /handling food		Yes	occasional	No
Hand washing by mother after defecation		Yes with soap	Yes with sand or ash	Yes with water
Appearance of mothers hands and cloth		Clean	one clean	unclean
Drinking water storage		direct use	clean, covered	Unclean, uncovered
Water for washing		direct use	clean, covered	Unclean, uncovered

Maximum score to be achieved was 21, which was grouped as 7-12 : Poor; 13-17 : Fair;18-21 : Good

#### **Assessment of Knowledge of Mother about Child's Nutrition**

The nutrition knowledge of mothers was evaluated. Each mother was asked a set of four questions about nutrition. The aspects of nutrition knowledge studied were: age for introducing weaning foods into a child's diet; diet during diarrhea; preparation of oral rehydration solution (ORS); growth-chart interpretation. A score of 2 was given for each valid answer. A mother's overall knowledge of nutrition was rated on a scale of 0 to 8 by calculating the total of all the valid responses she made.

Mother's responses were considered valid if she provided the following information: Soft and semisolid foods (weaning food) should be introduced to children after completion of six months or less. A child should be given same or

more food during diarrhoeal episodes compare to child's normal diet. Diarrhoea should be managed by giving ORS or similar kind of fluids to the affected child. Homemade ORS should be made with three standard tablespoons of sugar and one-half standard teaspoon of salt per liter of water or by dissolve one ORS packet in one liter of boiled and cooled water.

Three growth charts were shown to the mothers. One chart showed weight gain every month (normal growth); the second showed no weight gain for six months (growth faltering); and the third showed continuous loss of weight (grade IV malnutrition). Mother's response was considered valid if she could interpret three charts correctly. If mother had more than one child in this age group, questions concerning her nutrition knowledge were asked with reference to the youngest child.

#### Scoring for Knowledge of Mother about Child's Nutrition

- Introduction of solid foods in diet: < 4 months (0 marks) / 4-6 months (0 marks)/ > 6 months (2 marks)
- Diet During diarrhoea: No or less food to be given (0 marks) / same or more food is given (2 marks)
- Preparation of ORS: not at all knows (0 marks) / partly correct (1 mark) / correct (2 marks)
- Growth chart interpretation: none correct (0 marks)/ 1 correct or 2 correct (1 mark)/ 3 correct (2 marks)

**Table: Scoring for Knowledge of Mother about Child's Nutrition**

Questions	Points		
	Valid	Partially Correct	Invalid
Introduction of solid food	2	0	0
Knowledge about preparation of ORS	2	1	0
Growth Chart interpretation	2	1	0
Diet during diarrhoea	2	0	0

Maximum score to be achieved was 8, which was grouped as - 0-2: Low; 3-6: Medium; 7-8: High

Collected data was entered in Microsoft excel and analyzed using SPSS 16.0 version. The comparison of Qualitative data was done using chi-square test. The confidence limit for significance was fixed at 95% level with p-value < 0.05

**Table: IAP Classification for Malnutrition <sup>7</sup>**

Nutritional Status	% of Standard Weight for Age (W/A)
Normal	More than 80% of (W/A)
Grade I	71 to 80% of (W/A)
Grade II	61 to 70% of (W/A)
Grade III	51 to 60% of (W/A)
Grade IV	Less than 50% of (W/A)

**Table: WHO Classification for Malnutrition <sup>7</sup>**

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

**RESULTS**

Total 190 children were included in this study. Table 1 shows, 97 (51.05%) were male children and 93 (48.9%) children were in the age group of 12-23 months. Out of 190 children, 130 (68.42%) were Muslims and 89 (46.84%) children belonged to nuclear family. According to Modified Prasad classification 104 (54.74%) children were from socio-economic class II & III. 78 (41.05%) mothers had completed their education up to secondary level, while 4 (2.11%) fathers were found illiterate as compared to mothers 13 (6.18%).

Table 2 shows nutritional status of children. Table 3 and 4 reveal association of various variables such as religion, socioeconomic status, mother’s age at the time of marriage, birth order of the child, sanitary practices, place of delivery ANC registration, time of initiation of breast feeding with nutritional status of children. Table 5 shows significant association of mother’s knowledge about child’s nutrition and nutritional status of children. As mother’s nutrition knowledge score improved prevalence of malnutrition decreased.

**Table 1: Socio-Demographic Profile**

Socio Demographic Profile		Male (n-97)	Female (n-93)	Total (n-190)
Children’s Age group	12-23 months	51(52.6%)	42 (45.2%)	93 (48.9%)
	23-35 months	46 (47.4%)	51 (54.8%)	97 (51.1%)
Religion	Muslim	70 (72.2%)	60 (64.5%)	130 (68.4%)
	Hindu	27 (27.8%)	32 (34.4%)	59(31.1%)
	Other	0.00 (0%)	1 (1.1%)	1(0.5%)
Type of family	Nuclear	39 (40.2%)	50 (53.8%)	89 (46.8%)
	Joint	10 (10.3%)	9 (9.7%)	19 (10%)
	Three generation	48 (49.5%)	34 (36.6%)	82 (43.2%)
Socio-economic Class	I (Upper)	6 (6.2%)	6 (6.4%)	12 (6.3%)
	II (Upper Middle)	40 (41.2%)	34 (36.6%)	74 (38.9%)
	III (Lower Middle)	39 (40.2%)	43 (46.2%)	82 (43.2%)
	IV (Upper Lower)	12 (12.4%)	10 (10.8%)	22 (11.6%)
	V (Lower)	0 (0%)	0 (0%)	0 (0%)
Mother’s Education	Illiterate	7 (7.2%)	6 (6.2%)	13 (6.8%)
	Primary	33 (34%)	32 (34.4%)	65 (34.2%)
	Secondary	38 (39.2%)	40 (43%)	78 (41.1%)
	> S.S.C.	19 (19.6%)	15 (16.1%)	34 (17.9%)
Father’s Education	Illiterate	3 (3.1%)	1 (1.1%)	4 (2.1%)
	Primary	27 (27.8%)	31 (33.3%)	58 (30.5%)
	Secondary	34 (35.1%)	37 (39.8%)	71 (37.4%)
	> S.S.C.	33 (34%)	24 (25.8%)	57 (30%)
<b>Total</b>		<b>97 (51.1%)</b>	<b>93 (48.9%)</b>	<b>190 (100%)</b>

**Table 2: Indices of Nutritional Status (n-190)**

Indices	Normal	Malnourished
Weight for Age (W/A)	88 (47.4%)	102 (52.6%)
Height for Age (H/A)	107 (56.3%)	83 (43.7%)
Weight for Height (W/H)	156 (82.1%)	34 (17.9%)

**Table 3: Association of Various Factors with Nutritional Status**

Variables		Normal (88)	Malnutrition Grading by W/A Criteria			Association
			Grade I (52)	Grade II (41)	Grade III (9)	
Sex	Male (n-97)	49 (50.5%)	25 (25.8%)	19 (19.6%)	4(4.1%)	p value- 0.7; Non-significant
	Female(n-93)	39 (44.3%)	27 (51.9%)	22 (53.7%)	5 (55.6%)	
Age in months	12 – 23 (n-93)	45 (48.3%)	25 (26.9%)	18 (19.4%)	5 (5.4%)	P value-0.85; Non-significant
	24 – 35 (n-97)	43(44.3)	27 (27.8%)	23 (23.7%)	4 (4.1%)	
Religion	Muslim (n-130)	61 (46.9%)	36 (27.7%)	28 (21.5%)	5 (3.9%)	P value-0.8; Non-significant
	Others (n-60)	27 (45%)	16 (26.7%)	13 (21.7%)	4 (6.6%)	
Socio-economic status	Class I (n-12)	8 (66.7%)	4 (33.3%)	0 (0%)	0 (0%)	p value< 0.01; Significant
	Class II (n-74)	45 (60.8%)	16 (21.6%)	11 (14.9%)	2 (2.7%)	
	Class III (82)	32 (39.1%)	22 (26.8%)	21 (25.6%)	7 (8.5%)	
	Class IV(n-22)	3 (13.6%)	10 (45.5%)	9 (40.9%)	0 (0%)	
Mother's Education	Illiterate (n-13)	2 (15.4%)	7 (53.8%)	3 (23.1%)	1 (7.7%)	p value< 0.01; Significant
	Primary (n-65)	25 (38.5%)	18 (27.7%)	17 (26.1%)	5 (7.7%)	
	Secondary (n- 78)	32 (41%)	25 (32.1%)	19 (24.4%)	2 (2.5%)	
	> S.S.C (n-34)	29 (85.3%)	2 (5.9%)	2 (5.9%)	1 (2.9%)	
Sanitary Practices in house	Good (n-82)	50 (61%)	22 (26.8%)	10 (12.2%)	0	p value < 0.01; Significant
	Fair (n-79)	31(39.3%)	21 (26.6%)	22 (27.8%)	5 (6.3%)	
	Poor (n-29)	7 (24.2%)	9 (31%)	9 (31%)	4 (13.8%)	
Birth weight in grams	< 2500 (n-51)	6 (11.7%)	23 (45.1%)	19 (37.3%)	3 (5.9%)	p value < 0.01; Significant
	≥2500 (n-139)	82 (59%)	29 (20.9%)	22 (15.8%)	6 (4.3%)	
Bottle feeding	Yes (n-88)	26 (29.5%)	32 (36.4%)	25 (28.4%)	5 (5.7%)	p value < 0.01; Significant
	No (n-102)	62 (60.8%)	20 (19.6%)	16 (15.7%)	4 (3.9%)	
Immunization status	Complete (n-109)	69 (63.3%)	24 (22%)	13 (11.9%)	3 (2.8%)	p value < 0.01; Significant
	Incomplete (n-81)	19 (23.4%)	28 (34.6%)	28 (34.6%)	6 (7.4%)	
Birth order	I (n-60)	38 (63.3%)	16 (26.7%)	6 (10%)	0 (0%)	p value < 0.01; Significant
	II (n-61)	29 (47.6%)	16 (26.2%)	13(21.3%)	3 (4.9%)	
	III (n-46)	19 (41.3%)	13 (28.3%)	12(26.1%)	2 (4.3%)	
	≥ IV (n-23)	2 (8.7%)	7(30.4%)	10(43.5%)	4 (17.4%)	
Duration from last pregnancy (in years)	First child (n-58)	39 (67.2%)	15 (25.9%)	4 (6.9%)	0 (0%)	p value < 0.01; Significant
	≤2 (n-31)	2 (6.4%)	8 (25.8%)	19(61.3%)	2 (6.4%)	
	2 – 3 (n-79)	33 (41.8%)	21 (26.6%)	18(22.8%)	7 (8.8%)	
	> 3 year (n-22)	14 (63.6%)	8 (36.4%)	0 (0%)	0 (0%)	
Mother's Age at marriage (in years)	< 18 (n-77)	14 (18.2%)	27 (35.1%)	29(37.7%)	7 (9.1%)	p value < 0.01; Significant
	18 – 21 (n-95)	60 (63.2%)	22 (23.2%)	12(12.6%)	1 (1.1%)	
	> 21 (n-18)	14 (77.8%)	3 (16.6%)	0 (0%)	1 (5.6%)	

**Table 4: Association of Various Factors with Nutritional Status**

Variable		Normal (88)	Malnutrition (102)	Association
Place of delivery	Institutional (n-164)	81 (49.4%)	83 (50.6%)	P value – 0.03; Significant
	Home (n-26)	7 (26.9%)	19 (73.1%)	
ANC Registration	Yes (n-178)	86 (48.3%)	92 (51.7%)	P value – 0.03; Significant
	No (n-12)	2 (16.7%)	10 (83.3%)	
Time of initiation of Breast feeding	< 1 hour (n-96)	55 (57.3%)	41 (42.7%)	P value – 0.008; Significant
	1 – 24 hour (n-75)	27 (36%)	48 (64%)	
	> 24 hour (n-19)	6 (31.6%)	13 (68.4%)	
Acute Ailments	Present (n-84)	31 (36.9%)	53 (63.1%)	P value – 0.02; Significant
	Absent (n-106)	57 (53.8%)	49 (46.2%)	

**Table 5: Association of Mother's Knowledge with Nutritional Status of Children**

Mother's Knowledge		Normal (88)	Malnutrition (102)			Association
			Grade I (52)	Grade II (41)	Grade III (9)	
About growth chart interpretation	None correct (n-95)	28 (29.5%)	31 (32.6%)	28(29.5%)	8 (8.4%)	p-value < 0.01; Significant
	1 correct (n-57)	32 (56.1%)	16 (28.1%)	9 (15.8%)	0 (0%)	
	2 correct (n-24)	16 (66.7%)	3 (12.5%)	4 (16.6%)	1 (4.2%)	
	3 correct (n-14)	12 (85.7%)	2 (14.3%)	0 (0%)	0 (0%)	
Diet in Diarrhoea	Valid (n- 103)	54 (52.4%)	30 (29.1%)	15 (14.6%)	4 (3.9%)	p value- 0.06; non-significant
	Invalid (n-87)	34 (39.1%)	22 (25.3%)	26 (29.9%)	5 (5.7%)	
ORS preparation	Invalid (n -76)	19 (25%)	22 (28.9%)	27 (35.5%)	8 (10.5%)	p-value < 0.01; Significant
	Partially correct (n-74)	41 (55.4%)	22 (29.7%)	11(14.9%)	0 (0%)	
	Valid (n-40)	28 (70%)	8 (20%)	3 (7.5%)	1 (2.5%)	
Weaning food	Valid (n-117)	64 (54.7%)	28 (23.9%)	23 (19.7%)	2 (1.7%)	p-value < 0.01; Significant
	Invalid (n-73)	24 (32.9%)	24 (32.9%)	18 (24.6%)	7 (9.6%)	
Mother Knowledge Score	Low (n-57)	14 (24.6%)	18 (31.6%)	20 (35.1%)	5 (8.7%)	p-value < 0.01; Significant
	Medium (n-103)	53 (51.5%)	28 (27.2%)	19 (18.4%)	3 (2.9%)	
	High (n-30)	21 (70%)	6 (20%)	2 (6.7%)	1 (3.3%)	

## DISCUSSIONS

The present community based longitudinal study was carried out in Cheetah Camp urban slum from January 2010 to June 2010 by selecting 6 Anganwadi where we have found 102 (52.63%) undernourished children. Whereas 83 (43.68%) children were stunted and 34 (17.89%) children were wasted. Similar findings were found by Kumar et al.<sup>8</sup> According to NFHS III <sup>9</sup> in urban slum of Mumbai in the age group of 12 months to 35 months, there were 35.26% undernourished children, 51.92% were stunted and 14.16% were wasted.

In this study according to IAP grades of nutritional status 88 (46.32%) children were normal, while 52(27.37%) were in Grade I of malnutrition, 41 (21.58%) in Grade II and 9 (4.74%) children were in grade III malnutrition. Similar findings were noted by Verma et al.<sup>10</sup>, Chakraborty et al.<sup>11</sup>, Mittal et al.<sup>12</sup> and Harishankar et al.<sup>13</sup>

This study revealed that 48 (51.61%) children from the age group 12 to 23 months were malnourished while 54 (55.61%) children from the age group 24 to 35 months were malnourished. Whereas Mittal et al.<sup>12</sup> found 66 (40.74%) children from the age group 12 to 23 months were malnourished; while 49(40.16%) children from the age group 24 to 35 months were malnourished. Similarly, Harishankar et al.<sup>13</sup> found 33(32.1%) children in the age group of 12-23 months were malnourished while 23(21.7%) children in the age group of 24-35 months were malnourished. Mahajan et al.<sup>14</sup> noted more prevalence of malnutrition between one to three year age group compare to below one year age group.

In this study no significant association was seen between sex of the children and their nutritional status, though percentage of malnutrition was more in female children compared to male children. In contrast to this study, Kumar et al.<sup>8</sup>, Chakraborty et al.<sup>11</sup> and Prinja et al.<sup>15</sup> found more percentage of malnutrition among male children. Whereas Mahajan et al.<sup>14</sup> found more percentage of malnutrition among female children as compare to male children.

In this study we found that poor the social class of family more the chances of child being malnourished. Out of 22 children from class IV socioeconomic class 19 (86.36%) were detected malnourished compared to 4 (33.33%) of class I. Significant association was seen between nutritional status and socioeconomic status of the family. Similar was the finding of Mahajan et al.<sup>14</sup> and Avachat et al.<sup>16</sup>

Present study revealed that as the educational level of mothers increased, improvement in nutritional status of the children was seen. 11(84.62%) children were malnourished whose mothers were illiterate as compared to 4 (12.12%) whose mother completed 10 or more years of education. The association between education of mother & children's nutritional status was statistically significant. Similar finding was noted by Verma et al.<sup>10</sup> Chakraborty et al.<sup>11</sup> Mittal et al.<sup>12</sup> Harishankar et al.<sup>13</sup> and Mahajan et al.<sup>14</sup>

It was found that children belonging to families with good sanitary practices had less percentage of malnutrition compared to children with poor sanitary practices. Good sanitary practices reduces incidence of diarrhoea which results in good nutritional status of child. Similarly, Sayed et al.<sup>17</sup> and Mariko et al.<sup>18</sup> found good environmental conditions were associated with lower prevalence of malnutrition.

In this study home delivered children had more percentage of poor nutritional status. Out of 26 children who delivered at home, 19(73.08%) children were malnourished as compared to 83 (50.63%) children with institutional delivery. This was probably due to post natal care received after hospital delivery. The present study showed significant relationship between birth weight and nutritional status. Similar findings were noted by Avachat et al.<sup>16</sup> and Mahajan et al.<sup>14</sup>

Significant association between the nutritional status of the child with early initiation of breast feeding, exclusive breast feeding for six months and bottle feeding was seen. Similar findings were reported by Rasania et al.<sup>19</sup> and Ghosh et al.<sup>20</sup>

This study showed that out of 31, 29 (93%) children were malnourished where interval between two pregnancies was  $\leq 24$  months as compared to 8 (36.37%) out of 22 children where interval between sibling was  $> 36$  months. NFHS III survey report show 48% children were malnourished when interval between two pregnancies was  $\leq 24$  months compared to 40% malnourished children when interval between two pregnancies was  $> 36$  months.<sup>9</sup>

Prevalence of malnourishment in partially immunized children was more compared to those who were fully immunized. Also, severe degree of malnutrition was higher in partially immunized children as compared to fully immunized children. Similar findings were noted by Ray et al.<sup>21</sup>, Bannerjee et al.<sup>22</sup> and Mahajan et al.<sup>14</sup> This implies that partially immunized children were at higher risk of malnutrition as they were not protected against the vaccine preventable diseases including measles and contributed to the vicious cycle of malnutrition and infection.

In this study prevalence of malnutrition were increased with increase in birth order of children. The prevalence of malnutrition for first order birth was 31.58%, for second order 52.40%, for third order 58.7% and for 4<sup>th</sup> and above order it was 91.3%. Similar findings were reported by Harishankar et al.<sup>13</sup> and Verma et al.<sup>10</sup> While Farooq et al.<sup>23</sup> found no significant association between nutritional status and birth order.

It was observed that malnutrition was higher in children with acute ailments (Diarrhoea, ARI i.e. fever with cough and cold, Fever with Rash, Worm infestation in last three months) than those children who were not affected. This finding was similar to study conducted by Bhatia et al.<sup>24</sup> at Chandigarh.

In this study significant association was seen between mother's knowledge about child's nutrition and their ability to interpret a growth chart correctly with nutritional status of children. But no significant relationship was seen between mother's knowledge about diet during diarrhoea and nutritional status of children. These findings were similar to findings of Abbi et al.<sup>25</sup>

Overall statistically significant association was seen between score of mother's knowledge about child's nutrition and nutritional status of children. This finding was different from the finding of Lakshmi et al.<sup>26</sup> They found no significant relationship between mother's nutrition knowledge score and nutritional status of children.

## CONCLUSIONS AND RECOMMENDATIONS

Mother should be properly educated about the nutritional needs of the growing children and importance of complete immunization. Importance of exclusive breastfeeding, timely weaning and provision of protein and energy dense complementary food should be stressed. Appropriate dietary modifications should be done to ensure the increased calorie & protein intake as per the recommendations. Mother should be taught to monitor the growth of their children by regular weighting and noting on the WHO growth charts, so that the growth faltering can be diagnosed at an earlier stage and the necessary interventions can be taken. Proper sanitation of the drinking water should be promoted in the community to prevent the water born diseases in the children.

## ACKNOWLEDGEMENTS

Authors gratefully acknowledge all the staff of Department of Preventive and Social Medicine TN Medical College, Mumbai, India and Cheetah Camp Urban Health centre for their constant support and encouragement.

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