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NUTRITIONAL STATUS OF CHILDREN AGED ONE YEAR IN URBAN AND RURAL AREAS OF NORTH KARNATAKA – A CROSS SECTIONAL STUDY

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ABSTRACT

Introduction: Exclusive breast feeding and appropriate complementary feeding practices are the most effective interventions to improve child health and prevent malnutrition.

Methods: A cross-sectional study was done at urban and rural field practice areas of Department of Community Medicine, J. N. M. C., Belgaum. By random sampling, 380 rural mothers and 400 urban mothers having one year old child were selected. Information on socio-demographic variables, infant characteristics and infant feeding practices was collected from the mothers. Anthropometric measures of the infants were recorded.

Results: Only 16.25% urban and 15.26% rural mothers had practiced exclusive breast feeding till 6 months of age. Complementary feeds were initiated by as many as 69.20% urban mothers before the infant was 6 months old. Minimum acceptable diet was given by 31.0% of the urban and 9.51% of the rural mothers. Wasting and stunting was more among rural than urban children.

Conclusion: Nutritional status of urban infants is better than the rural infants. Various socio-demographic factors, infant characteristics and infant feeding practices were associated with the infants' nutritional status.

Key Words: Weight for age, length for age, weight for length, mid upper arm circumference, minimum acceptable diet

INTRODUCTION

Malnutrition erodes the foundations of global economy and progress by destroying the potential of millions of children worldwide. As a matter of fact, it is known that malnutrition costs life of children and if not, it makes them vulnerable for the entire life time with devastating and irreversible damage to the body. Fortunately, severe acute malnutrition is showing a decreasing trend in India.[1]Nevertheless, moderate malnutrition remains ubiquitous. As per NFHS-3, prevalence of stunting (length for age < -2 SD), wasting (weight for length < -2 SD) and low weight for age (<-2 SD) was 45.1%, 20.4% and 33.3% respectively.[2] Urban areas had lesser prevalence as compared to the rural areas.[2]

Causes of malnutrition are varied. Most common cause is the faulty feeding.[3] Fault in feeding practices can start from birth, if not fed exclusively on breast milk till 6 months and thereafter with inappropriate complementary feeding practices. A mother needs knowledge regarding these in order to practice them and that depends on the mother's education, her socio-economic status, her access to information regarding infant feeding, feeding taboos and so on. Rural mothers are generally not well educated; do not have better socio-economic status and have difficulty in accessing information

regarding breast feeding as compared to their urban counter parts.

Hence, this study was an attempt to compare the nutritional status of children in urban and rural areas at the age of one year and to study the association of socio-demographic factors, infant characteristics and infant feeding practices with the child's nutritional status.

METHODOLOGY

The study was conducted in the urban field practice area under Urban Health Centre, Khasbag and rural field practice area under Primary Health Centre, Vantamuri which are the field practice areas of J. N. Medical College, Belgaum. This study was conducted for a period of one year between January to December 2011.

Multi indicator coverage survey conducted jointly by UNICEF and Government of Maharashtra in all districts of the state showed that the prevalence of exclusive breast feeding in urban area was 49.0% and in rural area was 37.0%.[4] Absolute error of 5.0% was considered and by using the formula $n = 4pq/d^2$, sample size was worked out as 400 in urban and 380 in rural areas. Mothers in the above mentioned study areas having a child aged one year were included in this study.

The present study was approved by J. N. Medical College Institutional Ethics Committee on Human subjects' Research. Informed consent was taken from the study participants.

In urban area, information regarding the births during January to December 2010 was collected in January 2011 from 39 Anganwadis. There were a total of 664 mothers having a 1 year old child. By simple random sample method, using random number tables, 400 mothers were selected. They were interviewed in the month in which their infants completed one year in order to minimize recall bias regarding their infant feeding practices.

In the rural area information regarding the births during January to December 2010 was collected in January 2011 from the birth registers of the sub centers of the above mentioned villages. There were 679 mothers and 380 mothers were selected using random number table. They were also interviewed in the month in which their infants completed one year.

Residential addresses of these mothers were collected from Anganwadi workers in urban and female health worker of the sub-centers in rural areas. Mothers were interviewed using a predesigned, pre-tested questionnaire regarding socio-demographic factors and infant feeding practices. If the mothers were not present at the time of visit, they were revisited for a maximum of three times. Despite three visits if they were unavailable then next mother in the list was chosen. Socio-economic status was classified using Modified B G Prasad's classification for the study period that is 2011 – 12.[5]

Social-economic class	Modified Prasad's classification[5] (per capita income in Rs/month)
I	4373 and above
II	2187 – 4372
III	1312 – 2186
IV	656 – 1311
V	655 and below

Anthropometry (length, weight, head circumference, chest circumference and mid upper arm circumference), head to toe examination and systemic examination was done for the one year olds. Length was measured using infantometer with fixed head board and a mobile foot board to the nearest 0.1 cm. Weight was measured to the nearest 0.1 kg using digital infant weighing scale.

Prevalence of under-nutrition as assessed by anthropometric indices - weight for age, length for age, weight for length, were computed from the WHO (2006) standards. [6]

Descriptive data were expressed as proportions and means. Associations were tested by the Chi square test. Factors which were significantly associated with weight for age were included for multiple logistic regressions. Analysis was done using IBM SPSS version 18.0 software.

RESULTS

Mean age of mothers was 23.45 ± 2.34 years in urban and 23.20 ± 2.64 years in rural areas. As many as 331 (82.75%) urban and 322 (84.74%) rural mothers were Hindus. A majority of 361 (90.25%) urban and 296 (77.89%) rural mothers were literates. Only 23 (5.80%) and 44 (11.58%) mothers of urban and rural areas respectively were working. In the urban area, 71 (17.80%) mothers were from the families belonging to Modified B.G. Prasad Class V compared to 66 (17.37%) rural mothers. None of the urban participants had delivered at home; whereas, 32 (8.42%) rural mothers had done so. ***(Table 1)***

As many as 163 (40.75%) urban and 226 (59.47%) rural mothers had male children and 237 (59.25%) urban and 154 (40.53%) rural mothers had female children. As many as 48 (12.0%) urban and 83 (21.84%) rural children were of the birth order 3 or more. There were 173 (43.25%) urban and 96 (25.26%) rural infants with a weight less than 2.5 kg at birth. ***(Table 2).***

Table 1: Distribution of mothers according to the socio-demographic variables

Socio-demographic variables	Urban (%) (n=400)	Rural (%) (n=380)	P value
Age (years)			
<19	22 (5.50)	20 (5.26)	0.95
20- 24	260 (65.00)	244 (64.21)	
≥ 25	118 (29.50)	116 (30.53)	
Religion			
Hindu	331 (82.75)	322 (84.74)	0.452
Others*	69 (17.25)	58 (15.26)	
Literacy status			
Illiterate	39 (9.75)	84 (22.11)	<0.01#
Literate	361 (90.25)	296 (77.89)	
Occupational status			
Housewife	377 (94.20)	336 (88.42)	<0.01#
Working	23 (5.80)	44 (11.58)	
Socio-economic status**			
I	21(5.20)	6 (1.58)	<0.001#
II	88 (22.00)	22 (5.79)	
III	95 (23.80)	108 (28.42)	
IV	125 (31.20)	178 (46.84)	
V	71 (17.80)	66 (17.37)	
Place of delivery			
Hospital	400 (100.00)	348 (91.58)	
Home	0 (0.00)	32 (8.42)	

*Muslims and Christians; **Modified B. G. Prasad classification[5]; # Statistically significant at p < 0.05

Table 2: Distribution of mothers according to infant characteristics and infant feeding practices

Infant characteristics and infant feeding practices	Urban (%) (n=400)	Rural (%) (n=380)	P value
Sex of the infant			
Male	163 (40.75)	226 (59.47)	<0.01#
Female	237 (59.25)	154 (40.53)	
Birth order of the infant			
< 3	352 (88.00)	297 (78.16)	<0.01#
≥ 3	48 (12.00)	83 (21.84)	
Birth weight of the infant			
Unknown	0 (0)	48 (12.63)	<0.01*#
< 2.5 kg	173 (43.25)	48 (12.63)	
≥ 2.5 kg	227 (56.75)	284 (74.74)	
Type of breast feeding			
Exclusive	65 (16.25)	58 (15.26)	0.921*
Predominant	309 (77.25)	296 (77.89)	
Partial	20 (5.00)	26 (6.85)	
Token	6 (1.50)	0 (0.00)	
Age at initiation of complementary feeding			
< 6 months	277(69.20)	90 (23.68)	<0.001#
At 6 months	115 (28.80)	160 (42.11)	
> 6 months	8 (2.00)	130 (34.21)	
Minimum acceptable diet			
Given	124 (31.0)	36 (9.51)	<0.001#
Not given	276 (69.0)	344 (90.49)	

*Those with unknown birth weight were combined with birth weight less than 2.5 kg category and token feeding category was combined with partial feeding category to calculate the chi square value.
#Statistically significant at p < 0.05

Unfortunately, only 65 (16.25%) urban and 58 (15.26%) rural mothers had practiced exclusive breast feeding till 6 months of age. ***(Table 2)***

Complementary feeds were initiated by as many as 277 (69.20%) urban mothers before the infant was 6 months old. Whereas, rural mothers were better in this aspect as a majority of 160 (42.11%) mothers had initiated complementary feeds at the recommended age of 6 months. Nevertheless, considerably large number of 130 (34.21%) rural mothers had delayed the initiation of complementary feeding to beyond 6 months of age. ***(Table 2)***

Minimum acceptable diet is giving ≥ 4 food groups and also giving it minimum number of times a day. It was observed that, 124 (31.0%) urban mothers and 36 (9.51%) rural mothers gave minimum acceptable diet to their infants. ***(Table 2)***

Mean lengths of the urban and the rural infants were 69.95 cm and 68.73 cm with standard deviations of 3.28 cm and 2.97 cm respectively **(t = 5.45, df = 778, p < 0.001)**. Mean weights of the urban and the rural infants were 7.99 kg and 7.85 kg with standard deviations of 1.0 kg and 0.96 kg respectively **(t = 1.99, df = 778, p = 0.047)**.

A total of 191 (47.75%) urban children were stunted (length for age less than -2 SD) as opposed to 270 (71.05%) rural children. (χ^2=47.778, DF=1, p < 0.001).Whereas, weight for age less than -2 SD was observed among 110 (27.50%) urban and 155 (40.79%) rural infants. (χ^2=15.343, DF=1, p < 0.001). Wasting (weight for length less than -2 SD) was observed among 14 (27.50%) urban and 17 (40.79%) rural infants. As many as 32 (8.00%) urban and 38 (10.00%) rural infants had a mid upper arm circumference of less than 12.5 cm. (χ^2= 4.65, DF=2, p = 0.098) *(Table 3)*

Table 3: Distribution of infants according to their anthropometric measurements

Anthropometry	Urban (%) (n=400)	Rural (%) (n=380)	P value
Length for age			
< -2 SD	191 (47.75)	270 (71.05)	<0.001#
-2 to +2 SD	209 (52.25)	110 (28.85)	
Weight for age			
< -2 SD	110 (27.75)	155 (40.79)	< 0.001#
-2 to +2 SD	290 (72.50)	225 (59..21)	
Weight for length			
< -2 SD	14 (27.50)	17 (40.79)	0.49
-2 to +2 SD	386 (72.50)	363 (59.21)	
Mid upper arm circumference			
< 12.5 cm	32 (8.00)	38 (10.00)	0.921
12.5 – 13.5 cm	248 (62.00)	278 (73.16)	
>13.5 cm	120 (30.00)	184 (48.42)	

#Statistically significant at p < 0.05

In the urban area, weight for age of the infants were significantly associated with maternal socio-demographic factors like religion and socio-economic status, infant characteristics like sex, birth order and birth weight of the infant and infant feeding practices like type of breast feeding, age at initiation of complementary feeds and giving minimum acceptable diet. ***(Table 4)***

Whereas in the rural area, weight for age of the infants were significantly associated with maternal socio-demographic factors like literacy, infant characteristics like sex, birth order and birth weight of the infant and infant feeding practices like age at initiation of complementary feeds and giving minimum acceptable diet.***(Table 4)***

When the factors which were significantly associated were used for multiple logistic regression, it was observed that, in the urban area male infants had 5.02 odds of having low weight for age as compared to female infants, exclusive and predominant breast feeding prevented low weight for age (adjusted OR 0.003 and 0.34 respectively), initiation of complementary feeds at age less than 6 months and the practice of giving minimum acceptable diet were also protective factors with an adjusted OR of 0.11 and 0.44 respectively. ***(Table 5)***

In the rural area male infants had 2.21 odds of having low weight for age as compared to female infants and the practice of giving minimum acceptable diet was protective with an adjusted OR of 0.24. ***(Table 5)***

Table 4: Association of weight for age with various socio-demographic factors, infant characteristics and infant feeding practices

Variables	Urban				Rural			
	Weight for age		Total (n=400)	P value	Weight for age		Total (n=380)	P value
	< - 2 SD (%) (n=110)	- 2 to + 2 SD (%) (n=290)			< - 2 SD (%)	- 2 to + 2 SD (%) (n=225)		
Religion								
Hindu	80 (24.2)	251 (75.8)	331	0.001#	131 (40.7)	191 (59.3)	322	0.921
Others	30 (43.5)	39 (56.5)	69		24 (41.4)	34 (58.6)	58	
Literacy								
Illiterate	16 (40.0)	24 (60.0)	40	0.062	46 (54.8)	38 (45.2)	84	0.003#
Literate	94 (26.1)	266 (73.9)	360		109 (36.8)	187 (63.2)	296	
Socio-economic status								
Class I	0 (0)	21 (100.0)	21	< 0.001#	1 (16.7)	5 (83.3)	6	0.08
Class II	12 (13.6)	76 (86.4)	88		9 (40.9)	13 (59.1)	22	
Class III	29 (30.5)	66 (69.5)	95		34 (31.5)	74 (68.5)	108	
Class IV	45 (36.0)	80 (64.0)	125		78(43.8)	100 (56.2)	178	
Class V	24 (33.8)	47 (66.2)	71		33 (50.0)	33 (50.0)	66	
Sex of the infant								
Male	66 (40.5)	97 (59.5)	163	0.001#	110 (48.7)	116 (51.3)	226	0.001#
Female	44 (18.6)	193 (81.4)	237		45 (29.2)	109 (70.8)	154	
Birth order of the infant								
1	44 (23.4)	144 (76.6)	188	0.017#	55 (35.9)	98 (64.1)	153	0.007#
2	46 (28.0)	118 (72.0)	164		67 (46.5)	77 (53.5)	144	
3	20 (45.5)	24 (54.5)	44		22 (32.4)	46 (67.6)	68	
4	0 (0)	4 (100.0)	4		11 (73.3)	4 (26.7)	15	
Birth weight of the infant								
< 2.5 kg	57 (32.9)	116 (67.1)	173	0.03#	54 (56.3)	42 (43.7)	96	0.001#
≥ 2.5 kg	53 (23.3)	174 (76.7)	227		101 (35.6)	183 (64.4)	284	
Type of breast feeding								
Exclusive	4 (6.2)	61 (93.8)	65	0.001#	21 (36.2)	37 (63.8)	58	0.44
Non exclusive	106 (31.6)	229 (68.4)	335		134 (41.6)	188 (58.4)	322	
Age at initiation of complementary feeding								
At < 6 months	85 (30.7)	192 (69.3)	277	0.001#	41 (45.6)	49 (54.4)	90	0.001#
At 6 months	19 (16.5)	96 (83.5)	115		45 (28.1)	115 (71.9)	160	
At > 6 months	6 (75.0)	2 (25.0)	8		69 (53.1)	61 (46.9)	130	
Minimum acceptable diet								
Given	17 (13.7)	107 (86.3)	124	0.001#	5 (13.9)	31 (86.1)	36	0.001#
Not given	93 (33.7)	183 (66.3)	276		150 (43.6)	194 (56.4)	344	

#Statistically significant at p < 0.05

Table 5: Multi logistic regression for various socio-demographic factors, infant characteristics and infant feeding practices with weight for age

Parameters	Urban (r^2 = 0.390)		Rural (r^2 = 0.201)	
	Adjusted OR (95% CI)	P Value	Adjusted OR (95% CI)	P Value
Religion			-	-
Hindu	0.597 (0.307-1.161)	0.128		
Others	1			
Literacy	-	-		
Illiterate			1.64 (0.96 – 2.83)	0.07
Literate			1	
Socio-economic status				
Class I	1.22 x 10^7 (0.00 x 10^7 – 2.64 x10^7)	0.99	-	-
Class II	1.83 (0.66 – 5.09)	0.25		
Class III	1.37 (0.59 – 3.13)	0.46		
Class IV	1.42(0.68 – 2.94)	0.35		
Class V	1			
Sex of the infant				
Male	5.02 (2.74 – 9.21)	< 0.001*	2.21 (1.39 – 3.52)	0.001*
Female	1		1	
Birth weight				
< 2.5 kg	1.92 (1.08 – 3.41)	<0.001*	2.16 (1.27 – 3.65)	0.004*
≥ 2.5 kg	1		1	
Type of breast feeding				
Exclusive	0.003 (0 – 0.23)	<0.001*	-	-
Predominant	0.34 (0.009 – 0.124)	<0.001*		
Partial	1			
Age at initiation of complementary feeding				
At < 6 months	0.11 (0.02 – 0.62)	0.01*	0.87 (0.49 – 1.56)	0.64
At 6 months	0.22 (0.04 – 1.34)	0.1	0.5 (0.29 – 0.86)	0.12
At > 6 months	1		1	
Minimum acceptable diet				
Given	0.44 (0.22 – 0.89)	0.02*	0.24 (0.09 – 0.69)	0.007*
Not given	1		1	

*Statistically significant at p < 0.05; Entry method has been used for multiple logistic regressions.
Dependent variable in the urban as well as the rural areas is the weight for age

Independent variables in the urban area are the religion and socio-economic status of the mother, sex and birth weight of the infant, type of breast feeding practiced, age at initiation of complementary feeding & minimum acceptable diet given.

Independent variables in the rural area are the literacy status of the mother, sex and birth weight of the infant, age at initiation of complementary feeding & minimum acceptable diet given.

DISCUSSION

Mothers who practiced exclusive breast feeding at 6 months were as low as 16.25% in urban and 15.26% in rural area. Majority of the mothers practiced predominant breast feeding in both urban as well as rural areas (77.25% and 77.89% respectively). Various studies[7, 8, 9] at international level showed that exclusive breast feeding rate ranged from 10.7% to 61.0%. Studies[4, 10, 11, 12, 13, 14, 15, 16]done in various states of India have showed that exclusive breast feeding rate ranged from 23.50% to 69.35%. On the contrary, A study done in villages of Central Karnataka by Banapurmath ET al[17] showed that exclusive breast feeding rate at 4 months was 61.26%. Probably, the low rate of exclusive breast feeding in the current study can be attributed to the cultural practice of giving a preparation named ghutti to the infant right from birth which is prevalent in northern part of Karnataka.

Majority of the mothers in the urban area started complementary feeds before the age of 6 months (69.2%); whereas, in the rural areas, majority did so at the age of 6 months (42.1%). Difference in the age at which complementary feeds were started by urban and rural mothers was statistically significant **(p<0.001)**. Similarly, in a study done by Mushaphi et al[18] in Vhembe District of Limpopo Province it was observed that about 77.30% mothers had started complementary foods to their infants before 6 months of age. A little different observation was made in the urban and rural areas of Bihar in a study carried out by Yadav et al[19] that 17.70% urban and 13.10% rural mothers started complementary foods

before 6 months of age and 53.70% urban and 54.20% rural mothers started complementary foods between 6 to 12 months of age.

Urban children aged one year had better weight for age and length for age compared to their rural counterparts. A study conducted in Burkina Faso in the year 2002 showed that the urban children had better nutritional status than rural children.[20] A research employing data from 36 of the most recent Demographic and Health Surveys conducted in South Asia, Sub-Saharan Africa and Latin America and the Caribbean showed that urban infants had a better nutritional status in terms of weight for age, length for age and weight for length.[21]

Socio-demographic profile of the mothers like religion, literacy and socio-economic status as well as infant characteristics such as sex, birth order and the birth weight had statistically significant association with the anthropometric measures. Type of breast feeding, age at initiation of complementary feeds and minimum acceptable diet also had significant association with nutritional status of the child. Maternal education and household socio-economic status are the major determinants of infant feeding practices and in turn the nutritional status of infant. Better educated mothers have better understanding in the matters of infant feeding. Socio-economic status decides the quality and quantity of foods given.

In a study conducted in Burkina Faso in the year 2002 it was observed that maternal schooling and household economic status had statistically significant association with infants' nutritional status.[20] However, type of breast feeding and top feeding pattern did not have any association.[20] This difference probably could be attributed to the difference in the quality of top feeds.

Another study carried out in rural Bangladesh from the year 2001 till 2003 showed that exclusive breast feeding till 6 months of age and appropriate weaning were associated with gain in weight and length.[22] A research employing data from 36 of the most recent Demographic and Health Surveys conducted in South Asia, Sub-Saharan Africa and Latin America and the Caribbean proved that the most important determinant of the nutritional status of an infant was the maternal education and household economic status.[21]

Limitation of the study is the inability to assess the quality of complementary foods in terms of proximate principles, vitamins and minerals. Also, the quantity of the complementary feeds in terms of the volume of each feed could not be elicited. These parameters might add to the better understanding of the determinants of poor nutritional status. Laboratory examinations could not be done to look for the specific nutritional deficiencies.

Information, education and communication regarding exclusive breast feeding and appropriate complementary feeding must be intensified and targeted not only to the mothers but also to the other family members concerned directly or indirectly with child care. Knowledge regarding the locally available low cost foods belonging to various food groups and their importance must be propagated well along with the minimum number of feeds to be given to the infant. Female education ought to be given utmost importance and also opportunity for income generation must be created in order to improve the socio-economic status particularly in rural areas. Family welfare methods have to be advocated more intensively in order to ensure small family norms. Maternal nutrition and appropriate antenatal care needs to be given its due importance in order to bring about optimum birth weight. Further studies with higher level of evidence must be conducted in order to bring about necessary policy changes.

CONCLUSION

Nutritional status of urban infants is better than the rural infants. Socio-demographic factors like religion, literacy and socio-economic status of the mothers, infant characteristics like sex, birth weight and birth order as well as infant feeding practices like type of breast feeding practiced, age at initiation of complementary feeds and giving of minimum acceptable diet were associated with the infants' nutritional status.

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