ORIGINAL ARTICLE

Nutrition profile of under-five year rural children and correlates of undernutrition in central India

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| Abstract | Introduction | Methodology | Results | Conclusion | References | Citation | Tables / Figures |

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Abstract

Background: High prevalence of undernutrition in Madhya Pradesh contributing to high mortality and morbidities among young children. **Aims & objectives**: to assess prevalence of undernutrition and its co-relates among under 5 year children in Madhya Pradesh. **Materials & Methods**: It was a community based cross- sectional study carried out in all the districts of Madhya Pradesh, India using systematic random sampling. **Results:** A total of 22,895 children (Boys:12379, Girls:10516), mean age 26.1 months, SD 15.9, were covered. The overall prevalence of underweight, stunting and wasting was about 52%, 49% and 26% respectively. The prevalence was significantly (p<0.01) higher among boys as compared to girls. The risk of underweight, stunting and wasting was significantly higher among children belonging to SC+ST communities (OR: 1.36, 1.21 & 1.23) as compared to others, among children of illiterate parents and landless labourers (OR: 1.27, 1.32 & 1.15). The risk of stunting was significantly higher among children living in HHs without electricity (OR: 1.41) and HHs not using sanitary latrine (OR: 1.29). Similarly, the risk of wasting was significantly higher among households not having access to safe drinking water, mothers not cleaning their hands before feeding and among children with history of morbidity during preceding fortnight. Prevalence of underweight (28%), stunting (17%) and wasting (34%) was significantly (p<0.01) lower among children who were exclusively breast fed up to 6 months. **Conclusions:** Multiple risk factors are associated with childhood undernutrition and needs multi-pronged and multi-sector approach to tackle the problem. The results will help planners to develop and implement appropriate intervention strategies, for effective control and prevention of undernutrition among under-five year children in Madhya Pradesh

Key Words

Underweight; stunting; wasting; prevalence; risk factors

Introduction

Undernutrition is the single important factor contributing to high mortality and morbidities among children. The global community has set a target of halving the prevalence of underweight among children by 2015 as a key indicator of progress towards the Millennium Development Goal (MDG) (1). Undernutrition in India is higher among the vulnerable sections of the population, especially among under 5 year children and women from rural communities and indigenous population groups. Undernutrition during intrauterine life and early childhood, affects adversely the growth and

development, leading to lowered economic productivity and human development in later part of life, which is largely irreversible (2). It is globally acknowledged that the window span of 1,000 days from conception to the end of second year of life is very critical (3).

Sub-optimal infant and child feeding coupled with burden of diseases are considered as most important risk factors of child undernutrition and are influenced by demographic, socio-economic, socio-cultural and environmental factors (4). Undernutrition also contributes significantly to the disability adjusted life years lost worldwide (5). For effective control and prevention of undernutrition, it is necessary to identify the risk factors and plan region specific intervention strategies. The emerging problem of the double burden of malnutrition, a paradox associated with nutrition transition, should also be considered in devising the intervention strategies (6).

According to NFHS-3 (2005-06) (7), the prevalence of underweight among under-five year rural children in the State of Madhya Pradesh was 63%, stunting 52% and wasting 36%. However, study carried out by National Nutrition Monitoring Bureau (NNMB) (8) in the State during the same period, reported relatively lower prevalence of underweight (46%) and wasting (24%) and higher prevalence of stunting (59%), as per WHO child growth standards.

A study was therefore carried out in the State of Madhya Pradesh during 2010, to assess the nutritional status of under 5 year rural children and the Infant & young child feeding practices at district level, so as to help develop district specific intervention strategies for control of undernutrition.

Aims & Objectives

1. To assess prevalence of undernutrition among <5 year rural children in all the districts of Madhya Pradesh
2. To study Infant & young child feeding practices among <3 year children

Material and Methods

The study was approved by the Institutional Ethical Review Committee of National Institute of Nutrition (NIN) and Scientific Advisory Committee (SAC). Informed written consent was obtained from the village head and oral informed consent was obtained from the mothers in selected HHs.

Study design: It was a community based cross-sectional study carried out in the rural areas in all the 50 districts of Madhya Pradesh.

Sample size and Sampling design: Considering a prevalence of 50% of underweight (weight for age <median -2SD of WHO standards) among <5year children, with 95% confidence limit, 5% of absolute precision, the minimum sample size of 400 children per district was required.

In each districts, a total of 20 villages were selected using systematic random sampling procedure.

Selection of Households (HHs) For selection of households, the village along with its hamlets, if any, was divided into 5 geographical areas, based on natural groups of households/streets/mohallas/ areas etc. Households belonging to Scheduled Caste (SC) and Scheduled Tribe (ST) communities generally constitute one group. From each of these groups, by selecting a random start, four consecutive HHs having at least one <5 year's child were covered for the study. Date of birth was taken from birth record such as immunization card, hospital discharge card, Mother & Child Protection (MCP) cards etc. In the selected HH, all the children of <5 year were included in the study. Thus, in each village, a total of 20 households (HHs) having at least one child of <5 years were covered.

Collection of data: The household demographic and socioeconomic particulars, infant and young child feeding practices and prevalence of morbidities during preceding fortnight were collected using structured pre-tested questionnaires. The anthropometric measurements such as weight and length/height were measured using standard equipment and procedure (9). The weight was measured using SECA weighing scale with accuracy of 0.1 kg and height using infanto-meter and stadio-meter with accuracy of 0.1 cm. Three investigators (2 post graduate research Assistant, having education of post-graduation in life sciences and 1 field worker having graduation in anthropology or life sciences) were trained for a week and standardized in the methodologies, before initiation of actual data collection.

Definition: 'Pucca' house means that the walls made of cement and bricks or stones and with a reinforced cement concrete roof (RCC), while 'semi pucca house' is one that has brick or stone walls and tiled or asbestos roof. Kutcha house is made of mud/thatched walls and thatched or tiled/asbestos roof (10).

Statistical Analysis: Prevalence of underweight, stunting and wasting according to SD classification was calculated using WHO child growth standards (11). Association between undernutrition and various household demographic, socioeconomic, socio-cultural variables, and child feeding practices was studied using chi-square test. The strength of association was assessed by computing odds ratios. Binary logistic regression analysis was used to study the effect of one independent variable on a dependent variable. Interaction between undernutrition and morbidity, IYCF practices was analyzed using general linear modeling technique. Further, stepwise logistic regression was carried out to find out the important significant risk factors associated with undernutrition (12). SPSS 19.0 version was used for the data analysis.

Results

A total of 22,895 children (Boys: 12, 379; Girls: 10, 516), under 5 years of age were covered from 19,756 households in 1,000 select villages for nutritional anthropometry, examination for presence of clinical signs of nutritional deficiency and history of morbidity during the previous fortnight. In addition, household socio-economic and demographic particulars were collected. Mean age of the children was 26.1 months with SD 15.9.

The prevalence of undernutrition among under-five year rural children in the state of Madhya Pradesh is presented in Table 1. The overall prevalence underweight was 51.8%, stunting was 48.8% and wasting was 25.9%. The prevalence was significantly (p<0.01) higher among boys compared to girls. The prevalence of underweight and stunting increased with age from 42% & 29% among 0-11 month children to 57% & 56% among 12-35 months' children, while the prevalence of wasting tended to decrease from 33% among 0-11 months' children to 17% among 36-59 month children. The prevalence was significantly (p<0.01) higher among children belonging to SC & ST community, living in nuclear families, children of illiterate parents, landless HHs, children of labourers and among children living in kutcha houses (Table 1).

Binary logistic regression analysis outcome variables such as underweight, stunting and wasting vs. all the independent variables was carried out to study the association in terms of odds ratio and presented in Table 2a & 2b. It was observed that the risk of underweight, stunting and wasting was significantly higher among children belonging to SC & ST communities, among children of illiterate parents, among landless HHs, among children of labourers, children living in kutcha houses, HHs using firewood for cooking purpose, low per capita income, not having electricity and not having sanitary latrine.

Stepwise logistic regression analysis: logistic regression analysis was done to know the influence of important risk factor on undernutrition and is given in Table 3.

Underweight: The risk of underweight was 2 times higher among 12-35 month children as compared to 0-11 month children and 1.2 times higher among boys (OR 1.16; CI=1.10-1.23) compared to girls. The risk of underweight was 1.4 times higher among children belonging to SC & ST communities (OR: 1.36, CI=1.24-1.49) and 1.2 times higher among other Backward communities (OR: 1.15, CI=1.05- 1.26), as compared to the children from other Communities (OC). The risk was significantly (p<0.01) lower among the children living in joint families (OR: 0.92, CI=0.86-0.97) as compared to children living in nuclear families. The risk of underweight was significantly (p<0.01) higher among children of illiterate father (OR: 1.25, CI= 1.13-1.40) & illiterate mothers (OR: 1.45, CI=1.24-1.70), and mothers engaged in agriculture labour or agriculture (OR: 1.2 each). The risk was higher among children of HHs not using sanitary latrine (OR: 1.24, CI=1.13-1.36), HHs not having electricity (OR: 1.10, CI= 1.03-1.17), mothers not washing hand with soap before feeding the child (OR: 1.07) and children with history of morbidity during preceding fortnight (OR: 1.08; CI=1.02-1.14).

Stunting: The risk of stunting was 3 times higher among 12-35 month and 36-59 month children as compared to 0-11 month children and 1.2 times higher among boys (OR: 1.22; CI=1.16-1.29) compared to girls. The risk of stunting was significantly (p<0.01) higher among children belonging to SC & ST communities (OR: 1.21, 1.08-1.34), children of illiterate fathers (OR: 1.21, 1.08-1.35), children of illiterate mothers (OR: 1.33, 1.13-1.56), and landless HHs (OR: 1.32, 1.22-1.43). The risk was significantly (p<0.01) higher among HHs not having electricity (OR: 1.4, 1.31-1.50), and not using sanitary latrine (OR: 1.29, 1.17-1.41). The risk of stunting was significantly (p<0.01) lower among children living in joint families (OR: 0.93, 0.88-0.99).

Wasting: The risk of wasting was higher among children belonging to SC & ST communities (OR: 1.23, 1.10-1.37), children of illiterate fathers (OR: 1.27,

1.13-1.42), and among landless HHs (OR: 1.15, 1.05-1.425). The risk was higher among children whose mothers did not wash hands with soap before feeding and after defecation (OR: 1.16 & 1.12), and among children with history of morbidity during preceding fortnight (OR: 1.16, 1.09-1.24).

0 -11 month children

The data on Infant & young child feeding practices such as feeding of pre-lacteals before initiation of breastfeeding, initiation of breast feeding with in a hour, feeding of first secretion of breast milk (colostrum), exclusive breast feeding up to six months and start of complementary feeding on 5423 children is provided in Table 4. Chi-square analysis showed significant (p<0.05) association between initiation of breast feeding and the prevalence of underweight and wasting. Higher prevalence was observed among the children delayed in initiation of breast feeding beyond one hour. Significantly lower prevalence of underweight (28%), stunting (17%) and wasting (34%) was observed among those children who were exclusively breast fed up to six months of age as compared to those received complementary feeding in addition to breast milk. However, no significant association was found between feeding of pre-lacteals or colostrum and nutritional status. Though not statistically significant, prevalence of underweight and wasting was higher among children who started getting complementary feeding before 6 months of age as compared to children receiving complementary feeding at 6 month of age. Morbidity was present among 36% children receiving complementary food before 6 months as compared to 35% among those receiving Complementary food at 6-8 months of age. Among 0-5 month children, the prevalence of underweight and stunting was higher among children with history of morbidity during preceding fortnight but was not significant. Among 6-11 months' children, no significant difference was observed in the prevalence of undernutrition among children with history of morbidity (Table 4). No interaction effect of morbidity and feeding practices was observed on underweight, stunting and wasting among these age groups. There was no difference in the prevalence of morbidities among children receiving complementary feeding at different ages.

Association between food intake and undernutrition (12-35 months' children)

Consumption of different food groups such as cereals & millets, pulses, green leafy vegetables, roots & tubers, fruits, milk & milk products, eggs, and meat/flesh foods were categorized into two groups, those consuming at least 3 or less food items or not taking any food items and those consuming 4 or more food items in their daily meals. It was observed that the prevalence of underweight and stunting was significantly higher among 12-17 and 18-23 months' children consuming 3 or less food items as compared to those consuming more than 4 food items, while prevalence of wasting was higher among 18-23 months' children receiving 3 or less food items as compared to those consuming more than 4 food items (37% vs. 29.9%) (Table 5).

Discussion

The present study carried out in 2010 revealed that the prevalence of underweight, stunting and wasting was 52%, 49% and 26% respectively. Study carried out earlier by NNMB in 2010 in the rural areas of Madhya Pradesh reported similar prevalence of underweight, stunting & wasting (53.5%, 53% and 29.8% respectively) (13), while the NFHS-3 reported higher prevalence for underweight and wasting (60% and 35% respectively), and comparable for stunting (50%) (7). The higher risk of being stunted and/or underweight with increase in age mostly after 6 months may be due to introduction of solid or complementary foods which increases the risk of infection because of unhygienic practices, reduces breast milk production and thus increases the risk of malnutrition (14). During the transition from infanthood to childhood, an infant becomes increasingly independent of their caregiver and starts to interact more with the environment through crawling and walking, making them at greater risk of entering a cycle of malnutrition and infection, especially in less hygienic environments (15).

Pre-school children constitute the most vulnerable segment of any community and their nutritional status is a sensitive indicator of health and nutritional status of community.

Several studies have shown an association between household socio-economic status and child nutrition (16,17). The present study also revealed significant association between nutritional status and different socio-economic & demographic variables and infant and child feeding practices prevailing in the community. The suboptimal infant and child feeding practices (initiation of breast feeding after 1 hr, initiation of complementary feeding before 6

months or after 9 months, giving 2-3 food items in complementary foods, feeding only 1-2 times daily etc.) were found to be significantly associated with higher prevalence of underweight, stunting and wasting.

Stepwise logistic regression analysis showed that the prevalence of underweight and stunting was significantly higher among 12-35 month children, among boys, among Children belonging to SC & ST communities, among children of illiterate parents, and among HHs not having sanitary latrines. Previous study carried out reported high prevalence of undernutrition among the socio-economically poor communities such as SC and ST (18). Higher prevalence of undernutrition among children of illiterate mothers suggest that educated mothers can do more efficient management of limited household resources, greater utilization of health care services, better health promoting behaviour, low fertility and more child-centered caring practices. Also educated women are more likely to get steadier, higher paying jobs; to get married to men with higher education and higher income; and to live in better neighbourhoods, which have influence on child health and survival (19). UNICEF (2009) (20) reported inequalities exists in nutrition across socio-economic groups.

There is some evidence that economic development is not a necessary condition to alleviate undernutrition in a population, the argument being that direct investment in preventive programs could also lead to improved nutritional status even in the absence of economic growth. (21,22). State-level growth is an upstream determinant influencing individuals through multiple pathways such as investment in preventive and social programs targeting the nutritional status of children, or investment in better agricultural practices, which increase productivity, decrease food insecurity and enable transfers of food-in-kind, or investment in infrastructure such as roads and colleges, which increases nutrition related knowledge of caregivers and access to a variety of foods. These findings reflect ineffective transfer along any/all of these pathways and not just through increased household wealth due to economic growth. It might even be argued that the gains, albeit modest, made in reducing undernutrition over the years are primarily a result of programs that intervene to improve health in general, for instance preventive health care (23,24), and nutritional status in particular such as

the Integrated Child Services Development Scheme (ICDS), a national program focused on prevention and treatment of childhood undernutrition. In conclusion, multiple risk factors are associated with childhood under nutrition that needs multi-pronged and multi-sectoral approach to tackle the situation.

Conclusion

It is concluded that the prevalence of undernutrition was high among children belonging to SC & ST communities, children of illiterate parents, of landless households, children of parents engaged in labour, living in kutcha house and not having sanitary latrine

Recommendation

It is recommended that improving maternal nutrition during pregnancy along with maternal education, sanitation, environmental hygiene, access to health care and proper ICDS supplementary feeding will improve nutritional status of children. As the prevalence of undernutrition is high among children from SC & ST community, improving their socio-economic status by involving them in income generating activities, will improve the purchasing power and thus nutritional status of their children.

Limitation of the study

Data was obtained from the mothers about the past history, hence recall bias is a major limitation, but the outcome such as height and weight was measure by trained staff.

Relevance of the study

The study will help the government in planning appropriate intervention and major allocation of resources in areas where high prevalence of undernutrition is present.

Authors Contribution

Meshram II prepares the manuscript, Venkaiah K carried out analyses and others help in critically reviewing the manuscript.

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Tables

TABLE 1 PREVALENCE (%) OF UNDERNUTRITION AMONG UNDER FIVE YEAR CHILDREN

Particulars		n	Underweight	Stunting	Wasting
Age groups	0-11	5453	41.5	29.0	32.8
12-35		10314	56.5	55.7	28.2
36-59		7128	53.0	54.2	17.2
Chi square,			327*	1135*	446.6*
Gender	Boys	12379	53.6	51.2	28.2
Girls		10516	49.8	46.0	23.2
Chi square,			33.2*	61.1*	73.9*

Community				
SC+ST	10833	57.2	52.7	28.7
BC	9238	49.0	46.6	24.2
Others	2824	40.6	41.1	20.7
Chi square,		296.3*	150.2*	97.1*
Type of Family				
Nuclear + E. Nuclear	15146	54.2	51.3	26.2
Joint	7749	47.3	44.1	25.3
Chi square,		97.9*	104.7*	1.8, NS
Literacy status of Father				
Illiterate	6702	58.7	54.3	30.0
1-7th class	5358	53.8	51.7	25.2
8th-10th class	7834	48.6	45.6	24.4
Inter & above	3002	41.4	40.0	21.8
Chi square,		299.6*	223*	92.8*
Literacy status of Mother				
Illiterate	11780	57.0	53.6	28.1
1-7th class	5680	49.6	47.3	24.1
8th-10th class	4491	44.5	41.3	23.5
Inter & above	945	35.3	35.3	19.9
Chi square,		335.2*	281.9*	69.8*
HHs land holdings				
Landless	9259	54.6	51.9	27.0
Landholders	13636	49.9	46.8	25.1
Chi square,		49.1*	58.3*	9.8*
Occupation of Father				
Labourers	11943	55.5	52.2	27.8
Cultivators	8828	48.1	45.5	24.1
Others	2124	46.4	44.1	22.4
Chi square,		139.6*	111.9*	50.1*
Occupation of Mother				
Labourers	6632	59.3	55.2	28.4
Cultivators	1704	55.2	49.2	27.7
Housewife/others	14559	48.0	45.9	24.5
Chi square,		241.8*	160*	39.7*
Type of house				
Kutcha	8615	55.1	52.5	27.1
Semi Pucca	12096	51.4	47.9	25.9
Pucca	2184	41.1	39.7	20.9
Chi square,		139.2*	125.4*	34.2*
*p<0.001				

TABLE 2A BINARY LOGISTIC REGRESSION FOR UNDERNUTRITION BY SOCIOECONOMIC VARIABLES

Variable	Underweight	Stunting	Wasting
	OR (CI)	OR (CI)	OR (CI)
Community			
SC+ST	1.95* (1.79, 2.12)	1.59* (1.46, 1.73)	1.53* (1.39, 1.69)
BC	1.40* (1.28, 1.52)	1.25* (1.14,1.36)	1.11 (1.09, 1.34)
Others	Reference	Reference	Reference
Type of Family			
Nuclear + E. Nuclear	Reference	Reference	Reference
Joint	0.75* (0.71, 0.80)	0.75* (0.71, 0.79)	0.95 (0.89, 1.02)
Family Size			
1 - 4	Reference	Reference	Reference
5 - 9	1.01* (0.95, 1.07)	1.04* (0.98, 1.11)	0.96 (0.90, 1.03)
≥ 10	0.82 (0.74, 0.90)	0.84* (0.76 ,0.92)	0.94 (0.85, 1.05)
Literacy of Father			
Illiterate	2.01* (1.84-2.19)	1.78* (1.63-1.94)	1.53* (1.31-1.69)
1-7th class	1.65* (1.50-1.80)	1.60* (1.46-1.75)	1.21* (1.08-1.34)
8th-12th class	1.33* (1.22-1.45)	1.25* (1.15-1.37)	1.15* (1.04-1.28)

Graduation & above	Reference	Reference	Reference
Literacy of Mother			
Illiterate	2.42* (2.11-2.78)	2.11* (1.84-2.43)	1.57* (1.33-1.85)
1-7th class	1.80* (1.56-2.08)	1.64* (1.42-1.89)	1.27* (1.07-1.51)
8th-12th class	1.47* (1.27-1.69)	1.29* (1.11-1.49)	1.23* (1.03-1.47)
Graduation & above	Reference	Reference	Reference
Household Landholding status (acres)			
Landless or <2.5	1.63* (1.53, 1.75)	1.63* (1.52, 1.74)	1.27* (1.17, 1.37)
2.5-5.0	1.42* (1.31, 1.54)	1.42* (1.31, 1.54)	1.15* (1.05, 1.27)
>5.0	Reference	Reference	Reference
Occupation of Father			
Laboure	1.42* (1.29, 1.56)	1.37* (1.25, 1.50)	1.32* (1.18, 1.47)
Cultivators	1.05* (0.96, 1.16)	1.05 (0.96, 1.16)	1.09 (0.97, 1.23)
Others	Reference	Reference	Reference
Occupation of Mother			
Labourers	1.57* (1.48, 1.66)	1.44* (1.36, 1.52)	1.22* (1.14, 1.30)
Cultivators	1.32* (1.19, 1.46)	1.13* (1.02, 1.25)	1.18* (1.05, 1.32)
Others	Reference	Reference	Reference
Type of house			
Kutcha	1.76* (1.60, 1.93)	1.68* (1.53, 1.85)	1.40* (1.25, 1.57)
Semi Pucca	1.51* (1.38, 1.66)	1.39* (1.27, 1.53)	1.32* (1.18, 1.47)
Pucca	Reference	Reference	Reference
Drinking Water Source			
Tap/Tube	1.15* (1.08, 1.23)	1.01 (0.94, 1.07)	1.16* (1.07, 1.24)
Others	Reference	Reference	Reference
Type of Cooking fuel			
Firewood	1.99* (1.70, 2.33)	1.71* (1.46, 2.01)	1.39* (1.15, 1.68)
Others	Reference	Reference	Reference

TABLE 2B BINARY LOGISTIC REGRESSION FOR UNDERNUTRITION BY SOCIOECONOMIC VARIABLES, MORBIDITY AND HYEGINIC PRACTICES

Variable	Underweight	Stunting	Wasting
	OR (CI)	OR (CI)	OR (CI)
Electricity			
Present	Reference	Reference	Reference
Absent	1.27* (1.19, 1.35)	1.55* (1.46, 1.65)	0.97 (0.91, 1.05)
Sanitary latrine			
Present & used	Reference	Reference	Reference
Absent	1.81* (1.67, 1.96)	1.75* (1.61, 1.90)	1.33* (1.20, 1.46)
Mother washes her hands before feeding the child			
Yes	Reference	Reference	Reference
No	1.09* (1.02, 1.17)	0.95 (0.88, 1.01)	1.14* (1.05, 1.23)
Wash hands after defecation			
Yes	Reference	Reference	Reference
No	1.08* (1.02, 1.15)	1.11* (1.04, 1.17)	1.07 (1.00, 1.14)
Per capita monthly Income (Rs.)			
< 300	1.24* (1.14, 1.35)	1.12* (1.03, 1.22)	1.26* (1.14, 1.39)
300-600	1.22* (1.14, 1.31)	1.22* (1.14, 1.30)	1.10* (1.02, 1.18)
600-900	1.18* (1.10, 1.27)	1.18* (1.09, 1.27)	1.07 (0.98, 1.16)
≥ 900	Reference	Reference	Reference
History of morbidity during preceding fortnight			
Yes	1.07* (1.01, 1.13)	0.97 (0.92, 1.03)	1.19* (1.12, 1.26)
No	Reference	Reference	Reference

*P<0.05

TABLE 3 STEPWISE LOGISTIC REGRESSION ANALYSIS FOR UNDERNUTRITION

Variable	Underweight	Stunting	Wasting
	OR (CI)	OR (CI)	OR (CI)
Age groups (months)			
0-11	Reference	Reference	Reference
12-35	1.82* (1.70, 1.95)	3.19* (2.97, 3.43)	0.78* (0.73, 0.84)

36-59	1.54* (1.43, 1.65)	2.91* (2.69, 3.14)	0.41* (0.37, 0.44)
Gender			
Boys	1.16* (1.10, 1.23)	1.22* (1.16, 1.29)	1.32* (1.25, 1.41)
Girls	Reference	Reference	Reference
Community			
SC+ST	1.36* (1.24, 1.49)	1.21* (1.08, 1.34)	1.23* (1.10, 1.37)
BC	1.15* (1.05, 1.26)	1.06 (0.97, 1.16)	1.09 (0.98, 1.21)
Others	Reference	Reference	Reference
Type of Family			
Nuclear	Reference	Reference	-
Joint	0.92* (0.86, 0.97)	0.93* (0.88, 0.99)	-
Literacy status of Father			
Illiterate	1.25* (1.13, 1.40)	1.21* (1.08, 1.35)	1.27* (1.13, 1.42)
1-7th class	1.16* (1.05, 1.29)	1.18* (1.06 , 1.31)	1.07 (0.96, 1.20)
8th-12th class	1.11* (1.01, 1.22)	1.09** (1.00, 1.20)	1.07 (0.97, 1.19)
Graduation & above	Reference	Reference	Reference
Literacy status of Mother			
Illiterate	1.45* (1.24, 1.70)	1.33* (1.13, 1.56)	-
1-7th class	1.30* (1.11, 1.52)	1.21** (1.02, 1.42)	-
8th-12th class	1.22* (1.05, 1.42)	1.09 (0.93, 1.27)	-
Graduation & above	Reference	Reference	-
Land holding (acres)			
Nil or <2.5	1.27* (1.17, 1.38)	1.32* (1.22, 1.43)	1.15* (1.05, 1.25)
2.5-5.0	1.21* (1.11, 1.31)	1.21* (1.11, 1.32)	1.09** (1.00, 1.20)
>5.0	Reference	Reference	Reference
Occupation of Mother			
Labourers	1.11* (1.04, 1.19)	0.98 (0.91, 1.05)	1.11* (1.03, 1.20)
Cultivators	1.18* (1.06, 1.32)	0.96 (0.86, 1.06)	1.22* (1.08, 1.38)
Service/business	0.89 (0.71, 1.12)	0.66* (0.52, 0.84)	1.08 (0.84, 1.40)
Others (Housewife)	Reference	Reference	Reference
Electricity			
Absent	1.10* (1.03, 1.17)	1.41* (1.31, 1.50)	-
Source of Drinking Water			
Tap/Tube	Reference	-	1.11* (1.03, 1.20)
Others	1.08** (1.00-1.15)	-	Reference
Sanitary Latrine			
Absent	1.24* (1.13, 1.36)	1.29* (1.17, 1.41)	-
Hand washing practices of mothers before feeding the child			
No	1.07** (1.00-1.14)		1.16* (1.07, 1.25)
Wash hands after defecation			
No	1.07* (1.02, 1.14)	-	1.12* (1.05, 1.19)
History of morbidity during preceding fortnight			
Yes	1.08* (1.02, 1.14)	-	1.16* (1.09, 1.24)

Significant p<0.05

TABLE 4 ASSOCIATION BETWEEN INFANT & YOUNG CHILD FEEDING PRACTICES AND THE PREVALENCE OF UNDERNUTRITION (0-11 MONTH CHILDREN)

Particulars	n	Underweight	Normal	Stunting	Normal	Wasting	Normal
Pre-Lacteals							
Given	877	43.2	56.8	28.4	71.7	32.4	67.6
Not given	4573	41.2	58.8	29.1	70.9	32.9	67.1
P value		>0.05		>0.05		>0.05	
Initiation of breast feeding							
<1 hour	1439	39.1	60.9	30.6	69.4	30.3	69.7
≥ 1 hour	4014	42.4	57.6	28.4	71.6	33.7	66.3
P value		<0.05		>0.05		<0.05	
Feeding of colostrum							
Given	5014	41.4	58.6	28.6	71.4	32.9	67.1
Discarded	439	42.1	59.9	32.6	67.4	32.0	68.0
P value		>0.05		>0.05		>0.05	

Current feeding practices (0-5 months)							
Excl. B.F	1493	28.2	71.8	17.2	82.8	33.8	66.2
B.F.+ Water	532	25.8	74.2	16.4	83.6	28.1	71.9
B.F. + C.F.	78	53.8	46.2	33.3	66.6	41.0	59.0
	P value	P<0.001		P<0.001		P<0.05	
0-2 month children							
Morbidity							
Present	146	22.6	77.4	15.1	84.9	39.6	60.4
Absent	729	17.6	82.4	11.8	88.2	32.0	68.0
	P value	>0.05		>0.05		0.07	
3-5 month children							
Morbidity							
Present	362	38.4	61.6	24.1	75.9	32.1	67.9
Absent	886	34.6	65.4	20.2	79.8	32.1	67.9
	P value	>0.05		>0.05		>0.05	
Age at complementary feeding (6-11 months)							
<6	189	54.5	45.5	30.9	69.1	41.0	59.0
9-11/ EBF	1689	50.7	49.3	37.7	62.3	31.2	67.3
6-8 months	1472	49.5	50.5	34.9	65.1	34.1	65.9
P value		>0.05		0.07		0.01	
Breast fed+ complementary fed children (6-8 months)							
Morbidity							
Present	638	42.5	57.5	27.9	72.1	31.3	68.7
Absent	1081	46.3	53.7	32.4	67.6	30.6	69.4
	P value	>0.05		0.05		>0.05	
Breast fed+ complementary fed children (9-11 months)							
Morbidity							
Present	616	53.6	46.4	39.0	61.0	35.2	64.8
Absent	1015	55.4	44.6	43.3	54.7	35.3	64.7
	P value	>0.05		>0.05		>0.05	

EBF-Exclusive breast fed

TABLE 5 ASSOCIATION BETWEEN FEEDING PRACTICES AND UNDERNUTRITION AMONG 12-35 MONTH CHILDREN

Particulars	n	Undernutrition					
Age groups		Weight for Age		Height for Age		Weight for Height	
		Underweight	Normal	Stunting	Normal	Wasting	Normal
12-17 months							
≤3 food groups	633	55.1	44.9	49.1	50.9	34.5	65.5
≥ 4 food groups	1967	50.9	49.1	45.0	55.0	35.8	64.2
P value		0.06		0.07		NS	
18-23 months							
≤3 food groups	368	63.9	36.1	62.2	37.8	37.2	62.8
≥ 4 food groups	2615	55.9	44.1	57.1	42.9	29.9	70.1
P value		0.001		0.06		0.004	
24-29 months							
≤3 food groups	205	65.9	34.1	60.0	40.0	28.3	71.7
≥ 4 food groups	2148	58.9	41.1	57.5	42.5	25.4	74.6
P value		0.05		NS		NS	
30-35 months							
≤3 food groups	158	58.9	41.1	62.0	40.0	24.1	75.8
≥ 4 food groups	2220	58.0	42.0	61.6	38.4	19.2	80.8
P value		NS		NS		NS	