

*Original article*

# How parents' education and working status affect the nutrition and immunization status of preschool children in India

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## Abstract

**Objective:** The aim of the paper is to see how educational and working status of the parents affect the nutritional and immunization status of preschool children in India. **Methods:** We have used data of more than 24 000 preschool children spread over different states in India. The data were collected by National Family Health Survey (NFHS-2) in 1998-99. For assessing the nutritional status, only the Z-scores of weight-for-height (WHZ) have been computed and for immunization status, it has been seen whether BCG, DPT3, Polio3 and measles have been administered. Children who fall below  $-2SD$  ( $-3SD$ ) from median are considered to be moderately (severely) malnourished. **Results:** According to the NFHS-2 data, 70% of children are vaccinated by BCG, 50% receive the full course of DPT, 54% get all the three doses of polio and only 42% are protected from measles by vaccination in India. The percentages of moderately and severely wasted children in India are 12.1 and 2.8, respectively. There is a marked regional variation of these percentages. Bivariate and multivariate analysis clearly points to the need of educational status of mothers rather than fathers for proper nutritional and immunization status of preschool children. Parents' occupation and working status also have some effect, but not so pronounced as parents' education. **Conclusion:** The Indian preschool children need particular attention for high risk of wasting and low immunization. The prevalence of malnutrition can be arrested more by improving the mother's education level rather than their fathers and by raising the standard of living of their households.

**Keywords:** Wasting; Immunization; Education; Mother's working status; SLI; Preschool children; India

## INTRODUCTION

Insufficient intake of protein, calorie and micro-nutrients results in frequent infection and disease causing malnutrition in the form of stunting, wasting and being under weight among children. On the other hand, excessive intake of protein and calorie causes overweight and obesity. World Bank reports that 36 percent children of low income countries, 12 percent of middle income countries and 1 percent chil-

dren in the United States are malnourished<sup>[1]</sup>. Malnutrition today is responsible for nearly 5.2 million annual child deaths in the developing world<sup>[2]</sup>.

Like other developing countries, malnourishment is the biggest challenge in India. The prevalence of underweight among children in India is highest in the world and nearly double that of Sub-Saharan Africa. In India, out of total population, 17.5% constitute the (0-6) years age of children<sup>[3]</sup>. One in three of these children are born with low birth weight and are thus denied the best possible start of life which ultimately give rise to further health complications if not properly attended to. In South Asia, out of total women of child bearing age, 60 percent women are underweight and their half of the children are underweight. In South East Asia,

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the proportion of underweight women is 45 percent while it is 20 percent in Sub Saharan Africa.

About 55 percent of death among under five children in developing countries are due to malnutrition. So in this age, children are very susceptible to malnutrition as this is the growing age. There is high demand of protein and calorie for promoting growth during the early ages of childhood. Children become susceptible to malnutrition if due amount of protein and calorie are not provided to them.

Malnutrition is the result of complex interplay of diverse elements such as household living conditions, educational status which is related to the awareness of the family regarding sanitation and safe drinking water to protect the infection as well as infrastructure of the health facilities in the locality. So the assessment of malnutrition is an indicator of social and environmental living conditions.

A number of factors affect the child nutrition such as food availability and dietary intake, prevalence of infectious and parasitic diseases, access to health care, immunization against major childhood diseases, water supply and sanitations, socio-economic status etc. Demographic characters such as child's age, sex, birth interval, mother's age at child birth are associated with the child's nutrition [4-7]. It is observed that mother's year of education is often positively related with the improvement of child health [8], because educated mothers are more health conscious about their children than others.

It is reported that in India, due to childhood disease such as Pertussis, Polio, Measles and Tetanus, 429 000 children die [9]. Like malnutrition, immunization status of children is also dependent on socio-economic and demographic factors. Several studies show that lack of access to health services and low vaccination coverage is prevalent in poor households, among minorities of the rural and remote

areas [10-15]. The same studies show that immunization status is directly related with the mother's education, mother's access to media etc. So, besides malnutrition, protection of child health through immunization is a key indicator of the quality of life in developing countries.

The main purpose of the study is to determine the effect of socio-economic and demographic factors on acute under nutrition and immunization status of pre-school (0-3) years children in India and to see its spatial variation.

## MATERIALS AND METHODS

Data on nutritional and immunization status of children were from the data of NFHS-2, 1998-99 [16]. The survey was coordinated by International Institute for Population Sciences (IIPS). The survey covered a total 24 545 children of (0-35) months aged, over 26 states of India. The covariates are sectors such as rural/urban, mother's educational status, father's educational status, mother's occupational category, mother's working status, standard of living index of their houses etc.

To determine the nutritional status of children only wasting children through "weight for height" index has been considered. Weight for height (WHZ) index is an indicator of thinness or wasting. Wasting is a short-term malnutrition due to acute starvation or severe disease, famine etc., but it may result also from a chronic dietary deficiency or disease. Z-score of weight for height "-2" was taken as a cut-off point for prevalence estimation [17]. Z-score is defined as the deviation of the value observed for an individual from the median of the reference population, divided by the standard deviation (SD) of the reference population, i.e.

$$Z\text{-score} = \frac{(\text{observed value}) - (\text{median of the reference population})}{(\text{SD of the reference population})}$$

The reference population was followed by the National Center for Health Statistics & WHO international reference population [18, 19]. It was proposed by Nutrition Foundation of India that WHO standard is applicable to Indian population [20]. The classifications of Z-score (followed by NCHS/WHO) are below normal (< -2), normal (-2 to < +2)

and above average (+2). To see the sex differences of under-nutrition of children, percentages of malnourished boys and girls according to weight for height (WHZ) have been found for each of the 26 states in India.

The child is considered as fully vaccinated if the child has taken one dose for BCG, three doses for DPT and Polio and single dose for measles before

0-35 months. Data on immunization status are verified from vaccination cards and in case, where a vaccination card was not available or a vaccination was not recorded on the card, the mother's recall of vaccination was accepted.

To draw the relative and effective intervention, the risk of Z-score value being less than  $-2$  (i. e. malnourished) has been related with the socio-economic variables using logistic regression analysis. The nutritional status of the child has been considered as dependent variable and socio-economic variables are considered as independent variables. Both the dependent and independent variables are taken as binary. Children whose Z-scores are below  $-2$  are coded as "1" and those with Z-scores  $-2$  or higher are coded as "0". An estimated odd ratio of "1" indicates that the nature of dependent variable is no different from the reference category. If the estimated odd ratio is  $>1$ , the probability of becoming malnourished is more in this category compared to the reference category and if it is  $<1$ , then it is just opposite to that of " $>1$ " case. The calculation was done by 12.0 version of SPSS (Statistical Package for Social Science). Significance levels of  $P < 0.01$ ,  $0.05$  and  $0.1$  were considered.

## RESULTS

This paper deals with the acute under nutrition and immunization status of (0-3) years children of India. It is true that in India, there is a wide variation in its geography and culture. Consequently, health status, health care and its nature of prevention exhibit a large variation over the different states and regions for most components. The study reveals that in India, there is no marked sex discrimination regarding acute malnutrition among the (0-3) years of children as the percentages of wasted boys and girls are 14.9 and 14.4 respectively. High prevalence of wasted children are found for both the boys and girls, in the following states: Orissa (24.8:24.3), Bihar (21.2:20.5), MP (19.7:19.9), Karnataka (21.3:18.7) and Tamil Nadu (19.5:18.6) and low frequent states are Sikkim (5.4:6), Manipur (7.6:7.9), Haryana (5.8:4.4), Punjab (8.5:5.8). Zone wise, low prevalent zones are North-east (10.5:9.3) and North zone (11.5:10.4), and high wasted zones are East (20.5:19.7), Central (15.3:15.4), West (16.7:18.4) and South (16.2:14.8). However, prevalences of malnourished male children

are slightly more than those of female children (also from Table 1).

Regarding immunization status, in India, 70% children are vaccinated by BCG, 50% have received the full course of DPT, 54% have got all the three doses of polio and only 42% children have the vaccine of Measles. Zone wise distribution shows that high frequent zones for four kinds of vaccination are South and West zones. Less frequent immunized zones of India are: East, North-east and Central zones. State wise, more than 90% immunized children are found in Goa, Kerala, Tamil Nadu, Maharashtra, Himachal Pradesh and New Delhi and very low frequencies are found in Bihar, Nagaland and Meghalaya (Tables 2A & 2B).

Multivariate analysis of the selected independent demographic and socio-economic variables with the nutritional and immunization status of children indicates that the strongest controlling variables are type of place, parent's educational status, and standard of living of the households. Children of urban areas with higher parental educational level and having relatively high standard of living possess better nutritional and immunization status than other children. Mothers working status had a reverse effect on the (0-3) years child's health status in the sense that the children of non-working mothers are less malnourished than other children. Working mothers get less time to spend for their children (Tables 1 & 3). Among the different states of immunization such as BCG, DPT, Polio and Measles, BCG is taken by maximum number of children.

To know whose contribution is more effective among fathers' and mothers' education, bivariate tables (Table 4-8) have been constructed, which show the percentage of malnourished children and percentage of children taking different type of immunization. Here fathers' education at one side and mothers' education on the other side have been constructed. It is seen from the immunization tables that there are more variations of the percentages of immunization along the line of mothers' education than their fathers' education. However, it is not so conspicuous for the case of percentage of malnourished children but mothers' education seems to be slightly more effective than the fathers' education. For example, let us take percentage of children who took BCG whose one of the parent is educated up to secondary level (Table 5). If we fix mothers' education at secondary level, the variation in the percentages of male

children is from 79.3 to 88.9 where as if we fix fathers' education at secondary level, the variation in the percentage of male children is 62.5 to 93.1, a wider range.

It is interesting to see whether there is any relation in the percentages of malnourished children and the status of immunization. We have calculated the percentages of malnourished children separately for children who were immunized and for the children who were not immunized. No trend in the difference of these two percentages has been noticed for any of the groups (Tables 9 & 10). It seems malnutrition and the status of immunization are not related at all.

Correlations for factors, strictly speaking, have no meanings. But when the factors are binary taking values 0 and 1, only then the correlation coefficient may have some meaning but then the usual tests for correlation coefficient is not applicable. To test whether two binary variables are related or not, one has to perform  $\chi^2$  test taking  $2 \times 2$  contingency tables for each pair of binary variables. Here in Table 11, we have presented only the correlation coefficient without any test, just to see whether there is a positive or negative relation and the degree of such relations without performing any test. A positive value indicates that whenever one variable takes "0" there is more probability of the other binary variable also taking "0". In other words, we see whether the existence of one tally with the existence of the other. Table 11 indicates that the status of immunization is positively related with the parents' education, mothers' working status and standard of living index. So It is thus established that all the immunization variables are highly correlated with the socio-economic variables for both the boys and girls.

The binary variables of z-score of both the boys, girls and total wasted children of (0-3) years in India were subjected to logistic regression for investigating the determinants of nutritional status considering the selected socio-economic variables (Table 12). We have taken the value "1" for malnourished child and "0" for normal and overweight child. All the results show expected results. The result also shows better education of the parents provide better health for their child but comparatively mother's education is much more effective than their fathers. Women's work participation has a negative impact on their child's better nutritional status. Fi-

nally, it is seen that better standard of living has high positive impact on better nutritional status on (0-3) year's children.

## DISCUSSION

The study provides information about how educational status of parents and working status of mother affect the nutritional and immunization status of pre-school (0-3) years children of India. For this, it covers 24,545 children of 26 states and six zones of India. The study also provides information about the socio-economic variation in the level of nutritional and immunization status of the same children.

For assessing this study, we have taken the data of NFHS-2<sup>[16]</sup> which provides wealth of information on a wide variety of socio-demographic topics. The study states that in India, 14.9 % boys and 14.5% girls are wasted. Gender bias on malnutrition is not so much conspicuous in India. There is a considerable degree of variation of wasting children. Orissa, Bihar, MP, Karnataka show high percentage of wasted children while low frequent states are Sikkim, Manipur, Haryana, Punjab etc. Regarding immunization status, Goa, Kerala, New Delhi show highest occurrence and in Bihar, Nagaland, Meghalaya, percentage of immunized children are very meager.

Bivariate and multivariate analysis clearly points to the need of educational status of mothers rather than fathers for proper child care as it is reflected through nutritional and immunization status of the present study. Mother's occupation and working status have negative effect on child health because not-working mothers have less malnourished children than working mothers.

The study also reveals the urban superiority of nutritional and immunization status of (0-3) years children over rural India. It may be due to better infra-structural facilities and expenditure on health in urban areas. In rural areas the rate of utilization and expenditure on health is less due to the low health budget. The greater access to health services, safe water and sanitation facilities in urban areas are some of the possible causes for better nutritional status of children in urban areas. Standard of living index arrived at a single index which has a very good effect on the child health status and health prevention.

Table 1 Percentage of malnourished children according to the different socio-economic groups

Variables	Percentage of malnourished children								
	Moderate			Severe			Moderate + Severe		
	M	F	Total	M	F	Total	M	F	Total
Type of place									
Urban	10.4	9.8	10.1	2.3	1.8	2.1	12.7	11.6	12.2
Rural	12.7	12.5	12.6	3.0	2.9	2.9	15.7	15.4	15.6
Women's education									
Illiterate	13.7	13.5	13.6	3.6	3.4	3.5	17.3	16.4	17.1
Primary	12.3	12.2	12.2	2.6	2.5	2.5	14.9	14.6	14.8
Secondary	10.4	10.0	10.2	1.9	1.5	1.7	12.3	11.5	12.0
Higher	8.0	6.9	7.5	2.0	1.3	1.7	10.1	8.2	9.2
Father's education									
Illiterate	14.5	14.3	14.4	3.8	3.9	3.8	18.3	18.2	18.3
Primary	14.3	12.2	13.3	3.6	2.6	3.1	17.9	14.8	16.4
Secondary	10.9	11.6	11.2	2.1	2.1	2.1	12.9	13.7	13.3
Higher	9.4	8.2	8.8	2.3	1.9	2.1	11.8	10.1	11.0
Women's occupation									
No occupation	11.1	10.6	10.9	2.6	2.3	2.4	13.7	12.9	13.3
Professional/sales/ser	10.1	8.0	9.1	1.9	2.9	2.4	12.0	11.0	11.5
Others	14.8	15.1	15.0	3.6	3.3	3.5	18.4	18.5	18.5
Working status of mother									
Not working	11.1	10.6	10.9	2.6	2.3	2.4	13.3	12.9	13.3
Unpaid worker	14.0	13.5	13.8	3.5	2.9	3.2	17.5	16.4	17.0
Paid worker	14.5	15.0	13.9	3.6	2.4	3.5	18.1	17.4	17.4
SLI									
Low	15.5	15.3	15.4	4.1	3.7	3.9	19.6	19.0	19.3
Medium	11.5	11.0	11.3	2.4	2.5	2.4	13.9	13.5	13.7
High	8.4	7.9	8.2	2.0	1.0	1.5	10.4	8.9	9.7

Table 2A State wise distribution of nutritional (Weight for Height) and Immunization status of male children of age (0-35 months); India 1998-99

State	Boys								
	N	Nutritional status				Immunization status			
		Severe wasted ( < -3SD)	Moderate wasted ( < -2SD)	Normal(- 2SD - < +2SD)	Overweight ( ≥ +2SD)	BCG	DPT3	Polio3	Measles
North -East	1 673	2.2	8.3	84.1	5.4	60.1	42.7	42.6	32.1
Arunachal Pradesh	185	2.7	7.6	88.1	1.6	51.9	29.7	29.2	27.0
Assam	316	3.2	10.8	69.6	16.5	51.9	34.8	33.9	23.7
Manipur	292	2.1	5.5	90.8	1.7	67.8	50.3	50.7	32.2
Meghalaya	199	1.0	12.1	84.4	2.5	45.7	30.2	30.2	17.1
Mizoram	224	2.7	7.6	85.7	4.0	77.7	58.9	57.6	55.8
Nagaland	169	2.4	10.1	2.8	4.7	36.1	25.4	30.2	16.6
Sikkim	179	1.1	3.9	91.1	3.9	78.2	62.0	57.5	48.6
Tripura	109	0.9	9.2	88.1	1.8	75.2	51.4	55.0	40.4
East	2 272	4.2	16.3	77.2	2.3	58.1	40.2	47.3	29.3
Bihar	1 081	5.7	15.5	75.3	3.4	35.6	21.7	35.5	15.1
Orissa	666	4.2	20.6	74.3	0.9	80.6	58.1	59.8	44.3
West Bengal	525	1.1	12.4	84.6	1.9	75.6	55.4	55.8	39.6

State	Boys								
	Nutritional status					Immunization status			
	N	Severe wasted ( < -3SD)	Moderate wasted ( < -2SD)	Normal( -2SD - < +2SD)	Overweight ( ≥ +2SD)	BCG	DPT3	Polio3	Measles
Central	2 312	3.3	12.0	83.0	1.6	60.6	33.7	43.8	31.5
Madhya Pradesh	1 102	4.6	15.1	79.0	1.3	63.0	34.3	49.2	30.5
Uttar Pradesh	1 210	2.1	9.3	86.7	2.0	58.5	33.1	38.8	32.4
West	1 436	2.3	14.4	81.7	1.6	8.9	72.6	68.3	59.5
Goa	169	0.6	11.8	85.8	1.8	98.8	87.0	80.5	65.1
Gujarat	513	2.3	11.5	83.6	2.5	81.5	60.6	58.7	52.6
Maharashtra	754	2.7	17.0	79.4	0.9	91.8	77.6	72.1	62.9
North	3 271	2.0	9.5	86.0	2.5	74.9	53.4	56.3	46.5
Haryana	482	1.0	4.8	90.0	4.1	81.5	60.0	59.1	55.0
Himachal Pradesh	419	3.1	12.6	81.9	2.4	94.7	81.9	80.4	68.5
Jammu	435	1.6	11.0	84.1	3.2	89.9	66.4	67.1	56.1
New Delhi	329	4.0	9.1	83.6	3.3	92.7	72.0	55.9	65.3
Punjab	389	0.8	7.7	87.7	3.9	84.6	69.7	70.4	59.4
Rajasthan	1 217	1.9	10.4	86.7	1.1	52.3	26.1	38.7	23.0
South	1 894	3.0	13.2	82.0	2.5	90.5	74.0	71.5	57.6
Andhra Pradesh	462	2.4	5.8	89.8	1.9	88.5	65.2	60.8	45.7
Karnataka	529	4.3	17.0	76.9	1.7	82.6	66.9	66.7	50.9
Kerala	294	1.0	11.2	86.1	1.7	95.2	78.2	70.4	62.9
Tamil Nadu	609	3.1	16.4	78.7	1.8	96.6	84.7	84.2	70.0
India	12 858	2.8	12.1	82.6	2.5	71.3	51.3	54.3	42.0

Table 2B State wise distribution of nutritional (Weight for Height) and Immunization status of female children of age (0-35 months) : India 1998-99

State	Girls								
	Nutritional status					Immunization status			
	N	Severe ( < -3SD)	Wasted ( < -2SD)	Normal( -2SD - < +2SD)	Overweight ( ≥ +2SD)	BCG	DPT3	Polio3	Measles
North -East	1 562	1.9	7.4	84.2	6.6	60.9	41.2	43.7	31.2
Arunachal Pradesh	162	0.6	4.3	92.6	2.5	51.2	35.2	39.5	32.1
Assam	266	3.0	7.5	73.3	16.2	52.6	33.1	29.3	21.1
Manipur	278	1.4	6.5	87.8	4.3	73.0	56.1	59.7	41.0
Meghalaya	186	1.1	12.4	81.7	4.8	48.9	22.6	22.6	14.5
Mizoram	193	2.6	6.7	85.5	5.2	82.4	63.2	66.8	57.5
Nagaland	189	2.6	6.3	86.2	4.8	41.8	23.3	34.4	12.7
Sikkim	173	0.6	4.0	89.0	6.4	72.8	54.3	50.9	45.1
Tripura	115	2.6	13.0	80.0	4.3	60.9	34.8	43.5	21.7
East	2 085	3.9	15.8	78.4	1.9	56.5	36.6	46.7	28.8
Bihar	999	5.2	15.3	76.5	3.0	32.8	19.1	36.8	13.1
Orissa	602	3.7	20.6	75.4	0.3	80.1	53.3	57.5	45.8
West Bengal	484	1.4	10.7	86.2	1.7	76.0	51.9	53.5	40.1
Central	2 154	3.2	12.2	83.0	1.6	55.6	28.5	40.4	26.8
Madhya Pradesh	1 048	4.5	15.4	78.2	1.9	58.2	29.4	45.2	26.3
Uttar Pradesh	1 106	2.0	9.1	87.5	1.4	53.2	27.6	35.8	27.3
West	1 312	2.2	16.2	80.2	1.4	85.9	69.7	65.2	57.5
Goa	130	0.8	13.1	86.2	0.0	95.4	88.5	82.3	67.7

State	Girls								
	Nutritional status				Immunization status				
	N	Severe ( < -3SD)	Wasted ( < -2SD)	Normal( -2SD - < +2SD)	Overweight ( ≥ +2SD)	BCG	DPT3	Polio3	Measles
Gujarat	494	2.4	16.2	78.3	3.0	77.7	54.0	53.4	45.5
Maharashtra	688	2.3	16.9	80.4	0.4	90.0	77.3	70.5	64.1
North	2 782	1.8	8.6	86.6	3.0	71.4	49.1	53.3	42.6
Haryana	383	0.5	3.9	90.6	5.0	82.0	60.1	58.7	55.1
Himachal Pradesh	353	2.8	13.3	81.9	2.0	86.7	72.0	70.8	57.2
Jammu	359	0.8	9.2	85.5	4.5	84.1	60.7	66.0	46.2
New Delhi	243	3.7	7.4	87.2	1.6	91.8	70.8	54.3	61.3
Punjab	350	0.9	4.9	90.0	4.3	81.7	65.1	66.0	56.0
Rajasthan	1 094	2.2	10.0	85.8	2.0	50.6	24.1	37.4	23.9
South	1 792	2.5	12.3	82.9	2.4	89.3	73.2	70.8	57.1
Andhra Pradesh	464	0.9	8.0	88.8	2.4	87.9	70.5	6.8	53.2
Karnataka	508	3.5	15.2	78.9	2.4	80.7	62.6	63.4	48.6
Kerala	276	0.4	9.4	88.4	1.8	93.8	78.3	71.0	59.4
Tamil Nadu	544	3.9	14.7	78.7	2.8	96.1	82.7	80.9	67.1
India	11 687	2.6	11.8	82.9	2.8	68.8	48.0	52.5	39.6

Table 3 Percentage of immunized children according to the different socio-economic groups

Variables	Percentage of immunized children											
	BCG			DPT3			Polio3			Measles		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Place of Resident												
Urban	85.9	84.0	85.0	67.0	64.2	65.7	63.6	63.1	63.4	55.9	53.4	54.7
Rural	68.9	63.1	64.6	45.5	42.0	43.8	50.8	48.5	49.7	36.8	34.5	35.7
Women's education												
Illiterate	55.8	53.2	54.6	34.9	31.4	33.2	42.7	40.8	41.8	28.4	26.2	27.3
Primary	77.4	72.7	75.1	54.9	51.6	53.3	58.4	55.9	57.2	45.5	43.1	44.3
Secondary	86.9	86.6	86.7	68.3	66.7	67.6	65.5	65.0	65.3	55.3	54.1	54.7
Higher	94.5	95.1	94.8	79.2	77.7	78.5	73.2	73.7	73.5	66.1	64.5	65.4
Father's education												
Illiterate	52.1	50.1	51.1	32.2	30.1	31.2	40.1	39.7	39.9	25.8	24.2	25.0
Primary	67.0	65.8	66.4	47.5	43.4	45.5	51.5	49.0	50.3	37.4	36.3	36.9
Secondary	77.7	75.6	76.7	57.2	54.1	55.7	59.4	56.8	58.2	47.2	43.6	45.5
Higher	87.3	83.4	85.5	67.7	64.6	66.3	64.9	64.5	64.7	56.6	55.9	56.3
Women's occupation												
No occupation	73.7	71.4	72.6	53.7	50.6	52.2	55.0	53.7	54.4	43.7	41.4	42.6
Professional/sales/ser	85.4	82.9	84.2	70.1	63.4	66.8	68.9	64.4	66.7	58.4	54.4	56.4
Others	63.2	60.6	62.0	42.6	39.8	41.2	50.4	47.9	49.2	35.3	33.3	34.3
Mothers working status												
Not working	73.7	71.4	72.6	53.7	50.6	52.2	55.0	53.7	54.4	43.7	41.4	42.6
Unpaid worker	61.4	57.7	59.6	39.1	35.3	37.3	48.3	46.4	47.4	34.1	30.3	32.2
Paid worker	68.7	67.1	67.9	50.4	47.5	49.0	55.5	52.1	53.8	40.6	39.5	40.1
SLI												
Low	55.6	54.6	55.1	35.3	34.3	34.8	42.2	42.3	42.2	27.5	27.9	27.7
Medium	73.1	70.6	71.9	52.4	48.9	50.7	56.0	53.4	57.8	43.0	40.2	41.6
High	90.7	87.9	89.4	72.6	68.7	70.9	68.2	67.2	67.7	61.3	57.6	59.6

Table 4 Percentage of malnourished children according to their parents educational status

Father's Education	Mother's education									
	Illiterate		Primary		Secondary		Higher		All	
	M	F	M	F	M	F	M	F	M	F
Illiterate	18.7	19.0	16.0	13.7	15.7	12.7	0.0	40.0	18.3	18.2
Primary	18.5	15.0	18.1	14.7	15.5	14.0	10.0	14.3	17.9	14.8
Secondary	14.8	15.8	12.9	15.5	11.8	11.7	9.3	7.1	12.9	13.7
Higher	14.4	13.4	13.8	11.7	11.9	10.1	10.3	8.2	11.8	10.0
Total	17.3	16.9	14.9	14.6	12.3	11.5	10.1	8.2	14.9	14.4

Table 5 Percentage of BCG taken among the children according to their parents educational status

Father's Education	Mother's education									
	Illiterate		Primary		Secondary		Higher		Total	
	M	F	M	F	M	F	M	F	M	F
Illiterate	48.7	46.5	69.0	64.3	79.3	81.0	100.0	80.0	52.1	50.1
Primary	58.9	57.4	75.3	72.1	83.3	84.4	90.0	100.0	67.0	65.8
Secondary	62.5	60.4	80.9	75.9	87.0	87.2	93.1	97.1	77.7	75.6
Higher	83.4	53.8	78.8	72.4	88.9	87.0	94.9	94.5	87.3	83.4
Total	55.8	53.2	77.4	72.7	86.9	86.6	94.5	95.1	71.5	68.8

Table 6 Percentage of DPT3 taken among the children according to their parents educational status

Father's Education	Mother's education									
	Illiterate		Primary		Secondary		Higher		Total	
	M	F	M	F	M	F	M	F	M	F
Illiterate	29.3	27.0	44.4	40.8	60.7	58.8	100.0	80.0	32.2	30.1
Primary	39.1	33.3	55.4	51.6	65.3	65.5	80.0	78.6	47.5	43.4
Secondary	39.3	36.1	58.2	55.9	69.2	67.2	78.5	77.9	57.2	54.1
Higher	41.7	35.3	53.2	48.5	68.5	67.5	79.2	77.6	67.7	64.6
Total	34.9	31.4	54.9	51.6	68.3	66.7	79.2	77.7	51.3	48.0

Table 7 Percentage of Polio3 taken among the children according to their parents educational status

Father's Education	Mother's education									
	Illiterate		Primary		Secondary		Higher		Total	
	M	F	M	F	M	F	M	F	M	F
Illiterate	37.7	37.5	53.4	48.1	57.1	58.5	100.0	100.0	40.1	39.7
Primary	45.6	42.4	56.1	54.5	65.0	63.2	90.0	71.4	51.5	49.0
Secondary	47.8	44.2	60.9	59.0	66.4	65.4	75.7	75.0	59.4	56.8
Higher	46.0	43.8	60.6	57.1	65.0	66.1	72.4	73.2	64.9	64.5
Total	42.7	40.0	58.4	55.9	65.5	65.0	73.2	73.7	54.3	52.5



Table 8 Percentage of Measles taken among the children according to their parents educational status

Father's Education	Mother's education									
	Illiterate		Primary		Secondary		Higher		Total	
	M	F	M	F	M	F	M	F	M	F
Illiterate	23.2	22.1	37.4	30.6	4.6	45.8	66.7	60.0	25.8	24.2
Primary	31.0	29.0	44.8	44.1	49.2	48.2	40.0	71.4	37.4	36.3
Secondary	33.0	29.8	48.4	46.0	55.9	53.3	69.6	60.4	47.2	43.0
Higher	37.1	29.1	45.8	46.4	57.1	59.2	65.5	65.6	56.6	55.9
Total	28.4	26.2	45.5	43.1	55.3	54.1	66.1	64.5	41.9	39.6

Table 9 Percentage of malnourished pre-school (0-3) children (Boys) according to the status of immunization for different socio-economic variables

Variables	BCG				DPT3				Polio3				Measles			
	Given		Not given		Given		Not given		Given		Not given		Given		Not given	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<b>Place of Resident</b>																
Urban	2 985	12.4	489	14.5	2 329	12.2	1 145	13.8	2 210	12.8	1 264	12.6	1 941	12.7	1 533	12.7
Rural	6 184	15.5	3 200	16.0	4 267	15.9	5 117	15.6	4 717	16.3	4 617	15.0	3 457	16.0	5 927	15.5
<b>Women's education</b>																
Illiterate	3 400	17.4	2 695	17.3	2 125	17.5	3 970	17.2	2 600	18.3	3 495	16.6	1 731	17.9	4 364	17.1
Primary	1 627	15.6	476	12.4	1 154	16.2	949	13.3	1 208	16.1	875	13.1	957	15.7	1 146	14.2
Secondary	2 977	12.5	450	11.3	2 341	13.0	1 086	11.0	2 246	13.5	1 181	10.2	1 895	13.5	1 532	11.0
Higher	1 165	10.0	68	11.8	976	10.0	257	10.1	903	9.4	330	11.8	815	10.4	418	9.3
<b>Father's education</b>																
Illiterate	1 673	18.8	1 538	17.8	1 033	19.1	2 178	17.9	1 289	19.6	1 922	17.4	827	19.0	2 384	18.0
Primary	1 477	17.6	727	18.6	1 047	17.9	1 157	18.0	1 134	17.8	1 070	18.0	825	18.8	1 379	17.4
Secondary	3 879	13.1	1 113	12.2	2 857	13.4	2 135	12.2	2 964	14.2	2 028	11.2	2 358	14.0	2 634	11.9
Higher	2 140	11.6	311	12.5	1 659	11.6	792	12.0	1 590	11.8	861	11.7	1 388	11.3	1 063	12.3
<b>Women's occupation</b>																
No occupation	6 647	13.7	2 370	13.7	4 842	13.6	4 175	13.8	4 963	14.2	4 054	13.1	3 944	13.8	5 073	13.6
Professional	363	11.8	62	12.9	298	12.1	127	11.8	293	11.3	132	13.6	248	12.1	177	11.9
Others	2 159	17.6	1257	19.9	1 456	18.4	1 960	18.4	1 721	18.8	1 695	18.0	1 206	18.7	2 210	18.3
<b>Mothers working status</b>																
Not working	6 647	13.7	2 370	13.7	4 842	13.6	4 175	13.8	4 963	14.2	4 054	13.1	3 944	13.8	5 073	13.6
Unpaid worker	991	17.7	623	17.2	631	17.3	983	17.6	779	17.7	835	17.2	550	17.8	1 064	17.3
Paid worker	1531	16.1	696	21.7	1 123	17.4	1 104	18.4	1 235	17.7	992	18.0	904	17.4	1 323	18.2
<b>SLI</b>																
Low	2 195	20.4	1752	18.6	1 392	21.9	2 555	18.3	1 664	22.4	2 283	17.5	1 087	22.6	2 860	18.4
Medium	4 585	13.9	1 691	13.6	3 290	13.8	2 986	13.8	3 517	14.2	2 759	13.3	2 676	14.3	3 579	13.5
High	2 389	10.3	246	11.4	1 914	10.5	721	10.1	1 796	10.5	839	10.3	1 614	10.5	1 021	10.3

Table 10 Percentage of malnourished pre-school (0-3) children (Boys) according to the status of immunization for different socio-economic variables

Variables	BCG				DPT3				Polio3				Measles			
	Given		Not given		Given		Not given		Given		Not given		Given		Not given	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<b>Place of Resident</b>																
Urban	2 654	11.2	504	13.5	2 026	11.5	1 132	11.8	1 993	11.6	1 165	11.5	1 685	10.6	1 473	12.7
Rural	5 385	14.8	3 144	16.4	3 584	14.8	4 945	15.9	4 140	15.1	4 389	15.7	2 943	15.2	5 586	15.6
<b>Women's education</b>																
Illiterate	3 015	17.0	2 649	16.9	1 781	16.9	383	16.9	2 311	17.1	3 353	16.8	1 483	16.0	4 181	17.2
Primary	1 459	14.8	548	14.2	1 036	15.6	971	13.6	1 121	15.2	886	14.0	865	15.4	1 142	14.1
Secondary	2 577	11.3	400	13.3	1 986	11.9	991	10.8	1 935	11.9	1 042	10.8	1 610	12.9	1 367	9.9
Higher	988	8.0	51	11.8	07	7.9	232	9.1	766	7.8	273	9.2	670	7.0	369	10.3
<b>Father's education</b>																
Illiterate	1 495	18.3	1 491	18.1	898	17.7	2 088	18.4	1 185	18.1	1 801	18.3	723	17.8	2 263	18.3
Primary	1 342	14.9	698	14.5	886	16.3	1154	13.6	1 000	15.2	1 040	14.3	740	14.9	1 300	14.7
Secondary	3 436	13.3	1 107	15.1	2 458	13.3	2 085	14.2	2 582	13.6	1 961	13.9	1 982	13.8	2 561	13.7
Higher	1 766	9.5	352	13.1	1 368	9.8	750	10.5	1 366	10.1	752	10.0	1 183	9.6	935	10.7
<b>Mothers occupation</b>																
No occupation	5 725	12.4	2 297	14.0	4 056	12.5	3 966	13.3	4 311	12.9	3 711	12.9	3 322	12.2	4 700	13.4
Professional/r	340	9.1	70	20.0	260	9.2	150	14.0	264	10.2	146	12.3	223	9.4	187	12.8
Others	1 974	17.9	1 281	19.4	1 294	17.9	1 961	18.9	1 558	17.7	1 697	19.3	1 083	18.4	2 172	18.6
<b>Mothers working status</b>																
Not working	5 725	12.4	2 297	14.0	4 056	12.5	3 966	13.3	4 311	12.9	3 711	12.9	3 322	12.2	4 700	13.4
Unpaid worker	889	15.1	651	18.1	544	15.4	996	16.9	715	14.4	825	18.1	466	16.1	1 074	16.5
Paid worker	1 425	17.6	700	20.6	1 010	16.9	1 115	20.1	1 107	18.0	1 018	19.3	840	17.3	1 285	19.5
<b>SLI</b>																
Low	2 033	19.5	1 692	18.4	1 277	20.5	2 448	18.2	1 575	20.3	2 150	18.1	1 041	20.0	2 684	18.6
Medium	4 058	13.1	1 687	14.5	2 809	13.2	2 936	13.8	3 069	13.2	2 676	13.8	2 309	13.3	3 436	13.6
High	1 948	8.7	269	10.4	1 524	8.5	693	9.8	1 489	8.9	728	9.1	1 278	8.6	939	9.4

Table 11 Correlation between different immunization status of children and different socio-economic variables among male children

Place	Mother's education		Father's education		Mother's Working status		SLI	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
BCG	0.333	0.346	0.278	0.259	0.092	0.098	0.274	0.251
DPT3	0.333	0.346	0.251	0.245	0.091	0.096	0.263	0.237
Polio3	0.230	0.242	0.180	0.176	0.037	0.047	0.186	0.172
Measles	0.279	0.286	0.223	0.220	0.064	0.071	0.240	0.208



Table 12 Results of logistic regression on the nutritional status of pre – school children (0-3 yrs. )

Variables	Total			Boys			Girls		
	Odd ratios	95% confidence intervals		Odd ratios	95% confidence intervals		Odd ratios	95% confidence intervals	
		Lower boundary	Upper boundary		Lower boundary	Upper boundary		Lower boundary	Upper boundary
Women's education									
Illiterate®	1.00			1.00			1.00		
	0.840 **	0.773	0.912	0.847 **	0.757	0.949	0.827 **	0.736	0.935
Husband's education									
Illiterate®	1.00			1.00			1.00		
	0.904 *	0.827	0.987	0.929	0.821	1.05	0.877 *	0.772	0.997
Women's work									
Not working®	1.00			1.00			1.00		
	1.239 **	1.148	1.337	1.205 **	1.084	1.339	1.280 **	1.146	1.429
Standard of living Index									
Low®	1.00			1.00			1.00		
	0.587 **	0.634	0.745	0.681	0.609	0.762	0.693 **	0.616	0.779
Constant	0.239 **			0.243 **			0.235 **		
P <sup>r</sup> values	259.11 **			125.09 **			136.27 **		

\*\* : <0.01 = 1% level \* :0.01 –0.05 = 5% level

## CONCLUSION

The findings of this study are very useful to identify the children who are particularly at high risk of wasting and needs immunization. The findings also support that the prevalence of malnutrition can be arrested more by improving the mother's educational level rather than their fathers and by raising the standard of living of their house-holds.

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