The Caste-Wealth Nexus and Child Nutrition: A Study of Empowered Action Group of States in India

Jang Bahadur Prasad[1], Prahlad Kumar[2]

[1, 2]Research Scholar at International Institute for Population, Sciences, Mumbai, India

Abstract: *Children are the most precious and sensitive nutrition sub-group of a nation. It is accepted that there is high death rate in children because of severe forms of malnutrition. The Scheduled Tribes (STs) or Adivasi and Scheduled Castes (SCs) were always economically and socially deprived group of the Indian society. The Empowered Action Group (EAG) states are the most vulnerable states in India. Moreover, no one study focuses on this socially deprived a group of society in the EAG-states. This paper seeks to examine the inequality in child nutrition among SCs/STs and non-SCs/STs of poor and non-poor households and its determinant in EAG-states of India using the third round of National Family Health Survey (NFHS-3). The analysis has used the cross-sectional data of NFHS-3 conducted during 2005-06 by using bi-variate and multivariate technique. Bi-variate has been used for obtaining the prevalence of stunting, wasting, and underweight in SCs/STs and non-SCs/STs between poor and non-poor children. Elsewhere, multivariate analysis has been used to find out the associated factors of child malnutrition. Findings from the analysis show that nearly two out of three under-five children were stunted and underweight whereas one out of three were wasted in poor households. Every second SCs/STs children were stunted (51%) in non-poor households. However, less than half of non-SCs/STs children were stunted (43%) and underweight (36%) in non-poor households. Mother's education, duration of breastfeeding, birth order and interaction between caste and wealth index were the significant (p<0.05) contributing factors for stunting, wasting and underweight. The SCs/STs of poor and non-poor households and non-SCs/STs of poor families children were more malnourished than non-SCs/STs of non-poor households. Findings suggest that for reducing the economic inequalities and caste effect there should be separate policy and making services more accessible to SCs/STs and poor non-SCs/STs to improve childhood nutrition in EAG-states.*

Keywords: Under-5 child nutrition, SCs/STs and non-SCs/STs, Poor and Non-poor

1. Introduction

Malnutrition has been one of the world's most pressing problems in economic development in which, children are the most precious and sensitive nutrition sub-group of a nation. It is accepted that there is high death rate in children because of severe forms of malnutrition. But, as, per report of Bellagio study group (2003), malnutrition is associated with 60% of all childhood deaths globally [1]. Nutrition throughout the first five years has an impact not only on growth and morbidity during childhood, but also acts as a determinant of nutritional status in adolescent and adult life. The prevalence of underweight children in India is highest in the world, and almost doubles that of Sub-Saharan Africa with dreadful consequences for mobility, mortality, productivity and economic development [2]. Approximately half of the preschool children are stunted, two-fifths of them are underweight and one-fifths of them are wasting. Virtually India has 60 million underweight children [3].

One of the major setbacks to India's national policy for health is widespread inequality in child nutrition along with the burden of malnutrition that was/is disproportionately concentrated among poor children [4]. Historically, most of the study on inequality focused on economic inequality ignoring the class-caste nexus. The official classification defines four categories of caste: scheduled castes (SCs), scheduled tribes (STs), Other Backward Classes (OBCs), and others [5]. The SCs and STs are two historically deprived, socially ostracized, economically exploited and denied human dignity and a sense of self-worth groups recognised in the constitution of India during the period of British rule in the Indian subcontinent. They were known as the depressed Classes [6]. The SCs, known as Dalits are at the lowest level in the hierarchy, constitute around 16% of the Indian population, a significant percentage of who live in rural areas and are landless agricultural labourers.

The STs, or *Adivasis* and SCs are the economically and socially deprived group in India. They comprise around 24% of India's population. OBCs and upper castes together constitute 76% of India's total population [5]. The deprivations of SCs and STs groups are associated with the historical processes of economic and social exclusion, and discrimination based on caste that starts from the Zamindari system in their pre-independent period to the independence period [7]. Still, it exists in many parts of the country. These groups are suffering from most acute economic and society violence. This is notable among the marginal farmers or landless labours where landlords still rely on this usurious system by paying minimum wages in cash or food or enforcing bonded labour for no wages. It is frequently met with violence, sometimes resulting in deaths or injury of the victim and sexual harassment against women from SC/ST communities.
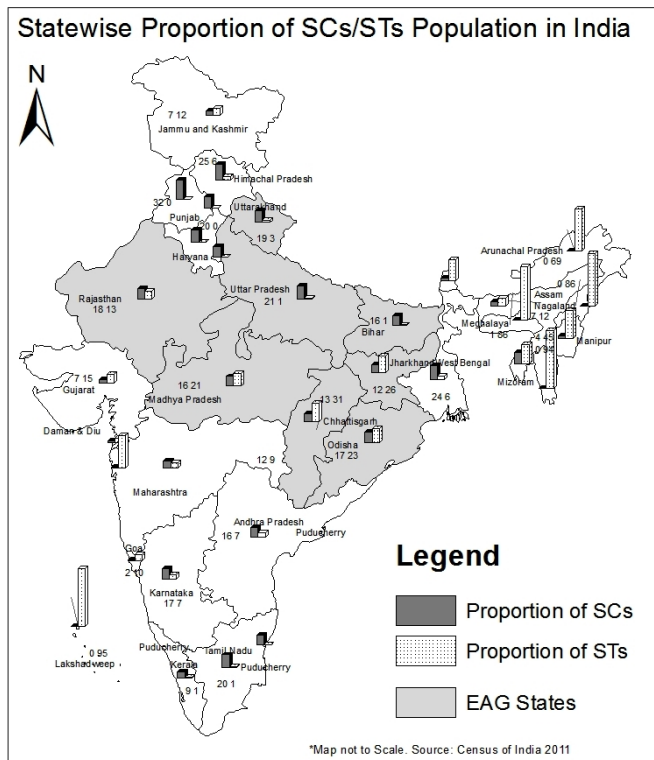
Figure 1: State wise proportion of SCs and STs in India, 2011

A similar picture is seen for the indicator of 'stunting': nearly half of the children are 'stunted, that is, too short for their age. The gap of underweight children in between SCs and other caste are 5.2, 12.4 and 14.2 throughout the NFHS-1, NFHS-2, and NFHS-3 respectively. While this difference between ST and other castes are 4.5, 14.8 and 10.8 in NFHS-1, NFHS-2, and NFHS-3 respectively in India. It might be due to discrimination and stigma on "the grounds of untouchability" regarding access to public facilities, eating places, temples, residential choice, etc. It provides for fines and imprisonment of offenders [8].

The Anthropometric measurements in all three rounds of National family health surveys show that nearly half of the children have weights and heights too small for their age compared to the internationals standards. They are classified as 'undernourished' and stunted. The degree of undernourished is higher in among SCs as compared to non-SCs/STs. Uttar Pradesh, Orissa, Bihar, Madhya Pradesh, Rajasthan, West Bengal, Jammu and Kashmir, Karnataka, Himachal Pradesh and Maharashtra are the states, where majority of SCs children are undernourished [3].

However, EAG-states are also the socioeconomically and demographically backward states in India, where 43 percent of the female population is illiterate and share of children up to the six years contributes more than half of total national children. It also has almost 48 percent of infant mortality [9] and low human development index (HDI) than other states in India. In this regard, this paper uses available secondary data in an attempt to explore the nutritional status of children by economic inequality among SCs/STs and non-SCs/STs. And also tries to explain the caste and economic factors as the main factors affecting the child nutrition in the EAG states.

There are also attempts to investigate the underlying factors of a child undernutrition in the study area.

2. Materials and Method

Data
This study has obtained the data from a kid's file of the third round of Indian National Family Health Survey (NFHS-3). The NFHS-3 is the third in the series of national surveys and treated as Demographic and Health Survey (DHS) outside of India conducted by International Institute for Population Sciences (IIPS). The NFHS provides reliable estimates of infant and childhood mortality, childhood nutritional status, fertility, family planning and maternal and child health services, by place of residence at states and country level. The survey adopted multi-stage, systematic and stratified sampling design for each state, where the primary sampling units were chosen with probability proportional to the size. Systematic sampling with equal probability had been used for the household's selection, and all eligible women in each household were interviewed.

The NFHS-3 had interviewed ever-married women age 15-49 years and both ever-married and never married men age 15-54 were also surveyed. The total 124,385 women age 15-49 and 74,365 men age 15-54 were interviewed from all 29 states. Moreover, the present study has been taken full 30782 children from the EAG-states out of the total sample 56,438 children in India. The proportions of SCs and STs are substantially high in EAG states as compared to remaining states. Even the SCs and STs in EAG-states are a significantly more vulnerable section of the society as compared to the other section. So, there is a need to investigate the underlying factors of a child undernutrition in the study area.

Outcome Variables
The variables in this study are the height for age (stunting), weight for height (wasting) and weight for age (underweight). The study has used new reference population of the World Health Organization (WHO) standard to estimate all three indicators for children below five years old. However, these three nutritional status indicators are expressed in standard deviation unit (Z-score) from the median of the reference population. Each index gives different information about growth and body composition, which is used to assess the nutritional status of children.

Explanatory Variable
The caste and economic status of the household are the primary exposure variable in the study. The third round of NFHS does not provide direct data on income or consumption. However, it provides the information on a set of household assets and amenities like household quality, durable consumer goods and size of land holding, etc. Since, some of the previously studies have already applied these information to assess the economic status of the families and to hold the economic differentials in the population and health outcomes by creating the composite measure called wealth index [10 - 12]. Moreover, these studies have used the Principle Component Analysis (PCA) for constructing wealth

index based on selected household assets and amenities. The wealth index is subsequently divided into five quintiles such as poorest, poorer, middle, richer and richest. The bottom two quintiles (lower 40%) are considered as poor and remaining three are considered as non-poor. The classification has been made based on the previously published research [13, 14].

The present study includes the numbers of demographic and socioeconomics predictors in the analysis. These variables are age (< 12 months, 12-36 months, ≥36 months), sex (male, female), place of residence (urban and rural), religion (Hindu and Other), caste (SCs/STs and non-SCs/STs), mother's education (no education, primary, secondary, and higher), duration of breastfeeding (0-11 months, 12-17 months, >17 months), mother's age at first childbirth (12-18th years, 19-24th years, ≥25 years) and birth order (1-2, 3-4, 5 & above).

Statistical Analysis
Bi-variate and multivariate analyses were used with the help of SPSS version-20 and STATA version-10 software to measure the effect of nutrition status in under-5 year's children "in EAG states". Bi-variate is used for simple percentage distribution in SCs, STs, and other caste according to different background characteristics. Elsewhere, the prevalence of stunting, wasting, and underweight have also been obtained by bi-variate analysis. In this, WHO standard has been taken to compute the z-scores for weight for age, height for age and weight for height. However, multivariate has been used for estimating the risk of stunting, wasting & underweight in SCs/STs & non-SCs/STs in both poor and non-poor households according to different background characteristics.

Multiple logistic regressions
Multiple logistic regressions are useful to obtain the odds of children having stunting, underweight and wasting. Now, the dependent variable in the model is stunting, underweight and wasting. The maximum likelihood function commonly estimates the Logistic Regression, model. Therefore, multiple logistic regression models take the form:

$$P = \frac{\exp(\beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 \ldots\ldots\ldots\ldots\ldots\ldots \beta nXn)}{1 + \exp(\beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 \ldots\ldots\ldots\ldots\ldots\ldots \beta nXn)}$$

The multiple logistic models were sometimes written differently as given below,

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots\ldots + \beta_n X_n$$

Where X_i's are covariates and β_i's are coefficients. P was predicted the probability and log odds of P and (1-P) provide the odds ratios with respect to the reference category.

Ethical considerations
The study is based on secondary analysis of existing third round of the National Family Health Survey (NFHS-3). It was conducted under the supervision of Ministry of Health and Family Welfare (MoHFW) Government of India. International Institute for Population Science (IIPS), Mumbai, India, was a nodal agency. That is a regional centre of teaching, training and research in the area of population sciences. The survey acquired informed consent from the mothers of the children included in the study before asking and obtaining the anthropometric measurement.

3. Results

SCs/STs and non-SCs/STs in poor and non-poor households
Table 1 Shows the percent distribution of SCs/STs and non-SCs/STs children in poor & non-poor households according to certain background characteristics in EAG states of India. This shows that around forty and sixty percent children in all age groups belonging to SCs/STs and non-SCs/STs respectively in poor forty percent households. Children were more skewed in all selected characteristics of SCs/STs and non-SCs/STs of non-poor households while in the poor house it was less skewed. One in every 5th child's mother (21.5%) in EAG-states had no education in SCs/STs non-poor households, whereas non-educated mothers were approximately 79 percent in non-SCs/STs. Moreover, one in every three children from SCs/STs and more than half of children from non-SCs/STs lived in urban settings of poor households.

Forty-four percent SCs/STs children had five and above order of births in poor households, whereas in the non-poor household it was nineteen percent. However, eighty-one percent non-SCs/STs children were in non-poor households having five and above order of births. The overall non-SCs/STs children were higher than SCs/STs in both poor and non-poor households in all selected characteristics.

Prevalence of stunting children in EAG-states
Table-2 shows that the prevalence of stunting, wasting and underweight children of under-five in SCs/STs and non-SCs/STs communities of poor and non-poor households in EAG states, India. Finding revel that stunting was prevalent among every third (59.3 %) of five SCs/STs and non SCs/STs children in poor households in the study area. The prevalence of stunting was highest in the age group 12-36 months in both categories SCs/STs and non-SCs/STs of poor households. Moreover, the prevalence of stunting in male and female was approximately same (60 %) in both categories of poor households whereas in non-poor households. The prevalence of stunting was 10 percent more in SC/ST than non-SC/ST communities. The prevalence of stunting was highly influenced by the maternal education in both categories of poor and non-poor households. Nearly 60 percent of the children were stunted in both poor SCs/STs and poor non-SCs/STs of illiterate mothers.

Table 1: Sample distribution of children aged 0-59 months by household economic status and other selected characteristics in EAG states, India 2005-06

Background characteristics	Poor			Non poor		
	SCs/ STs	Non SCs/STs	N	SCs/ STs	Non SCsSTs	N
Age in months						
0-12	43.5	56.5	5287	18.5	81.5	3456
12-36.	40.3	59.7	6598	17.0	83.0	4494
36-59	40.8	59.2	6512	18.4	81.6	4435
Sex of child						
Male	40.4	59.6	9430	17.7	82.3	6469
Female	42.4	57.6	8967	18.1	81.9	5916
Mother's education						
No Education	42.8	57.2	14805	21.5	78.5	4969
Primary	36.6	63.4	2012	19.3	80.7	1801
Secondary	34.2	65.8	1549	15.3	84.7	4629
Higher	35.5	64.5	32	9.0	91.0	985
Place of residence						
Urban	32.8	67.2	1076	21.0	79.0	4523
Rural	41.9	58.1	17321	16.1	83.9	7862
Duration of breast-feeding (in months)						
Never breast-fed	37.8	62.2	994	21.4	78.6	645
0-11	41.9	58.1	5329	16.2	83.8	4136
12-17.	41.2	58.8	6342	17.3	82.7	4104
18 and above	41.6	58.4	5734	20.0	80.0	3498
Mother's age at 1st childbirth						
12-18.	43.1	56.9	10870	21.4	78.6	4928
19-24	38.7	61.3	7017	15.9	84.1	6558
25 and above	41.0	59.0	510	13.7	86.3	899
Birth order						
1-2.	40.7	59.3	7229	16.9	83.1	7252
3-4.	39.9	60.1	5757	19.3	80.7	3332
5 & Above	43.8	56.2	5410	19.2	80.8	1801
Religion						
Hindu	46.4	53.6	15537	21.2	78.8	9911
Other	14.3	85.7	2860	4.4	95.6	2474

Table 2.1: Prevalence of stunting children of under-5 SC/ST and non-SC/ST in poor & non-poor households according to selected background characteristics in EAG states, India 2005-06

Background characteristics	Stunting			
	Poor		Non-poor	
	SCs/ STs	Non SCs/ STs	SCs/STs	Non SCs/ STs
Age in months				
0-12	32.5	29.9	26.8	20.1
12-36	68.9	66.1	58.3	49.8
36-59	63.8	64.1	57.9	47.6
Sex of child				
Male	59.3	57.6	51.6	41.8
Female	59.2	58.1	51.1	43.3
Mother's education				
No Education	60.8	59.8	57.8	53.3
Primary	53.3	54.1	47.2	42.4
Secondary	51	47.6	48.7	37.2
Higher	37.5	31.3	16.7	20.5
Place of residence				
Urban	59	57.2	47.8	39.1
Rural	59.3	57.9	54	44.3
DBS				
Never breast-fed	69.9	67.8	52.2	46.8
0-11	37.7	37.7	35.6	28.6
12-17.	62.7	57.7	59.7	42.9
18 and above	68.3	68	57	51.6
Exclusive breast-feeding				
Yes	58.5	38.6	40	39.1
No	57.2	56.2	50.8	40.2
Mother's age at 1st childbirth				
12-18.	60	60	57.2	47.5
19-24	58.1	55	47.6	41.1
25 and above.	57.9	55.5	33.3	27.7
Birth order				
1-2.	58.5	54.7	48.9	38.8
3-4.	56.6	58.3	50.7	46.1
5 & Above	62.8	61.9	61.7	51.8
Religion				
Hindu	58.9	56.7	51.2	40.8
Other	65.7	62	54.7	48.7
Total	**59.3**	**57.9**	**51.4**	**42.5**
DBS : Duration of Breast Feeding (in months)				

Stunting was higher among those children who had never breastfed compare to those who were breastfed. The prevalence of stunting in both SCs/STs and non-SCs/STs was comparatively high among those children whose mother's age at first birth is in between 12-18 years. The prevalence of stunting was positively associated with the increasing birth order. The prevalence of stunting was slightly more in SCs/STs than non-SCs/STs in both Hindu and other religions of poor households than non-poor households.

Prevalence of wasting children in EAG-states
The prevalence of wasting (28.7 %) was slightly more in poor SCs/STs than the poor non-SCs/STs. More than one in every third of poor SCs/STs children was wasted in the age group of 0-12 months. This number was highest among all remaining poor and non-poor categories (**Table-2**). Eventually, the prevalence of wasting is decreased as the age of children increases. However, there was no change in the prevalence of wasting among both the sexes in poor and non-poor households. Mother's education was negatively associated with the prevalence of wasting. The prevalence of wasting is approximately 5 percent more in urban and rural SCs/STs than non-SCs/STs children in poor households whereas there was no profound difference had been found in non-poor households.

However, the prevalence of wasting was associated with duration of breastfeeding among those children who had breastfed. The prevalence of wasting was high among the children who were breastfed up to 0-12 months and then it decreases with increasing duration of breastfeeding. Birth order was positively associated with the prevalence of wasting in both SCs/STs and non-SCs/STs. Moreover, wasting children were more in SCs/STs than non-SCs/STs. Overall the prevalence of wasting was high in both poor and non-poor households of SCs/STs than non-SCs/STs.

Prevalence of underweight children in EAG-states
More than half of the SCs/STs and non-SCs/STs children were thin in the age group 12-36 months in poor households. There was the highest difference in the prevalence of underweight children in the age group 36-59 in between SCs/STs and non-SCs/STs of poor families. Mother's education was negatively associated with the prevalence of underweight children. The prevalence of underweight

children was more in poor families than a non-poor household in urban areas. The underweight children were associated with duration of breastfed. The prevalence of underweight was higher among the children who were never breastfed compared to those who had breastfed. Moreover, among children who were not exclusive breastfed were more underweight than those who were exclusive breastfed. The prevalence of underweight was considerably higher in among the children of higher birth order.

Table 2.2: Prevalence of wasting children of under-5 SC/ST and non-SC/ST in poor & non-poor households according to selected background characteristics in EAG states, India 2005-06

Background characteristics	Wasting			
	Poor		Non-poor	
	SCs/STs	Non SCs/STs	SCs/STs	Non SCs/STs
Age in months				
0-12	40	36.5	24.9	28.1
12-36.	29.9	23.2	21.9	17
36-59	21.5	16	16.2	14.1
Sex of child				
Male	30.4	23.8	21.8	18.4
Female	26.8	22.4	18.7	18.1
Mother's education				
No Education	28.4	23.1	20.2	20.6
Primary	31.9	24.3	19.4	17.6
Secondary	26.1	21.9	22.6	17.3
Higher	50	18.8	6.4	13.2
Place of residence				
Urban	27.7	23.2	19.3	18.9
Rural	28.7	23.1	21	17.9
DBS				
Never breast-fed	17	17.5	13	12.4
0-11	36.6	30.8	23.1	22.7
12-17.	28.7	23.1	23.6	17.3
18 and above	24.9	19.3	17.7	15.6
Exclusive breast-feeding				
Yes	36.6	22.9	30	24.6
No	33.1	27.6	24.9	19.1
Mother's age at 1st childbirth				
12-18.	29.2	24.2	22.1	19
19-24	27.3	21.8	18.7	18.1
25 and above.	35.2	20	17.6	15.3
Birth order				
1-2.	26.9	24.3	20.2	17.5
3-4.	29.5	22.7	20.5	18.2
5 & Above	30	22.1	19.9	21.5
Religion				
Hindu	28.3	23.5	20	17.7
Other	35	21.9	26.7	20.1
Total	**28.7**	**23.1**	**20.3**	**18.2**
DBS : Duration of Breast Feeding (in months)				

Though, more than half of the children in other religion were underweight in poor households than the non-poor households. Moreover, the underweight was high in SCs/STs than non-SCs/STs in both Hindu and other religion of poor and non-poor households (Table-2.3).

Effects of caste-wealth nexus on stunting
Table 3 present the multiple regression results predicting the impact of caste-wealth nexus on stunting in EAG-states of India. Five model were fitted sequentially in this estimation, with aim of observing the impact of caste-wealth Nexus on child's stunting and whether the effect of caste and wealth is sustained when other variables (age of child, mother's education, duration of breastfeeding, birth order, etc.) were introduced into the model. The estimation started with a simple model; caste regressed against child stunting. After that, we sequentially added other remaining selected variables. Model-1 indicates that child stunting is significantly related to caste ($p<0.01$). The odds of child stunting were 33% higher for SCs/STs than non-SCs/STs (OBCs and upper castes).

Table 2.3: Prevalence of wasting children of under-5 SC/ST and non-SC/ST in poor & non-poor households according to selected background characteristics in EAG states, India 2005-06

Background characteristics	Underweight			
	Poor		Non-poor	
	SCs/STs	Non SCs/STs	SCs/STs	Non SCs/STs
Age in months				
0-12	49.4	43.9	30.8	26.5
12-36.	63.3	57.5	45.9	37.9
36-59	61.5	53.8	46.4	40.5
Sex of child				
Male	59.9	52.3	42.3	35.4
Female	59.5	54.3	43.4	37.6
Mother's education				
No Education	60.5	55.1	48	45.5
Primary	55.9	49.2	36.5	37.5
Secondary	55	44.4	43	31.1
Higher	87.5	18.8	9	19.8
Place of residence				
Urban	60.2	51.3	38.9	34.2
Rural	59.7	53.4	45.7	37.6
DBS				
Never breast-fed	64.9	53.7	34.8	34.6
0-11	51.2	44.8	33.5	29.1
12-17.	59.8	51	52.4	34.5
18 and above	63.7	58.4	44.7	42.1
Exclusive breast-feeding				
Yes	59	43.4	45.5	47.8
No	60.8	58.6	48.8	38.5
Mother's age at 1st childbirth				
12-18.	59.7	55.1	48.9	41.3
19-24	59.3	50.5	38	35.1
25 and above.	66	54.9	31.5	21.4
Birth order				
1-2.	57.5	50.6	37.9	30
3-4.	59.1	54.3	44	39.9
5 & Above	63	55.9	58.1	44.8
Religion				
Hindu	59.3	52.6	42.3	35.6
Other	66.3	55.7	54.7	39.7
Total	**59.7**	**53.3**	**42.8**	**36.5**
DBS : Duration of Breast Feeding (in months)				

The addition of wealth quintiles in model-2 did not change the significance relationship between caste and child stunting. However, both wealth and caste were strongly related to

stunting (p<0.01, respectively). Poor households were 72 percent higher probability of being stunted children compare to non-poor households while children of SCs/STs communities were 16 percent more likely to be stunted about children of non-SCs/STs.

Model-3 introduces two other variables as the age of children and mothers education. Presence of these variables slightly attenuated the relationship among caste, wealth and child stunting. Model-4 controlling the remaining selected characteristics (like age of children, mother's education, duration of breastfeeding, mothers age at first childbirth, place of residence, birth order and religion) had little effect on the relationship between caste and child stunting and also between wealth and child stunting. The inclusion of interaction between caste and wealth and exclusion of individual caste & wealth in model-5 gave the significant relationship between interaction variable and child stunting.

Table 3: Odds ratio estimates of effects of caste-wealth nexus and other selected characteristics on stunting among children aged 0-59 months in EAG-states, India 2005-06

Background Characteristics	Model-1	Model-2	Model-3	Model-4	Model-5
Caste					
Non-SCs/STs	1.00	1.00	1.00	1.00	
SCs/STs	1.33***	1.16***	1.13***	1.15***	
Wealth Quintiles					
Non-poor		1.00	1.00	1.00	
Poor		1.72***	1.37***	1.32***	
Age in months					
0-12			1.00	1.00	1.00
12-36.			4.35***	3.57***	3.58***
36-59			3.79***	3.00***	3.01***
Mother's Education					
No Education			1.00	1.00	1.00
Primary			0.72***	0.75***	0.75***
Secondary			0.59***	0.63***	0.63***
Higher			0.22***	0.28***	0.29***
DBF (in months)					
Never breast-fed				1.00	1.00
0-11				0.79**	0.80**
17-Dec				0.93	0.94
18 and above				1.14	1.15
Mother's age at 1st childbirth					
18-Dec				1.00	1.00
19-24				0.91***	0.91***
25 and above				0.75***	0.75***
Place of Residence					
Urban				1.00	1.00
Rural				1.08**	1.10**
Birth Order					
1-2.				1.00	1.00
3-4.				0.98	0.98
5 & Above				1.12***	1.12***
Religion					
Hindu				1.00	1.00
Other				1.19***	1.19***
Interaction					
Non SCs/STs and Non Poor					1.00
Non SCs/STs and Poor					1.41***
SCs/STs and Non Poor					1.39***
SCs/STs and Poor					1.50***
Constant	1.01	0.77	0.35	0.4	0.38
-2 Log likelihood	34333.81	33918.42	31636.26	31499.52	31483.26
DBF: Duration of breast-feeding, **: p<.05, ***: p<0.01					

However, being in "SCs/STs and poor" status had highly

significant effect on child stunting but being in "non-SC/ST and poor" and SCs/STs and non-poor" economic condition reduce the chances of stunting. The introduction caste and economic status reduce the child stunting from 1.50 to 1.41 & 1.50 to 1.39 respectively (p<0.01).

Effect of other risk factors on stunting
Among the control variables in model-3, as the age of children and education of mother were independently associated with child stunting. The odds of children in the age group 12-36 months were 4.4 times more likely to be stunted as compared to those who were less than one years (p<0.01). Mother's education was also significantly associated with stunting. The odds of stunting were 78 percent lower for children to the mother who got higher education compared to those that had no education. However, duration of breastfeeding, mother's age at first childbirth, place of residence, birth order and religion independently determine the nutritional status of children (model-4).

Table 4 Odds ratio estimates of effects of caste-wealth nexus and other selected characteristics on wasting among children aged 0-59 months in EAG-states, India 2005-06

Background Characteristics	Model-1	Model-2	Model-3	Model-4	Model-5
Caste					
Non-SCs/STs	1	1	1	1	
SCs/STs	1.40***	1.28***	1.28***	1.27***	
Wealth Quintiles					
Non-poor		1	1	1	
Poor		1.41***	1.32***	1.31***	
Age in months					
0-12			1	1	1
Dec-36			0.57***	0.54***	0.53***
36-59			0.39***	0.38***	0.37***
Mother's Education					
No Education			1	1	1
Primary			0.98	0.99	0.99
Secondary			0.86***	0.89***	0.88***
Higher			0.57***	0.60***	0.59***
DBF (in months)					
Never breast-fed				1	1
0-11				1.18	1.18
17-Dec				1.35***	1.34**
18 and above				1.16***	1.15
Mother's age at 1st childbirth					
18-Dec				1	1
19-24				0.90***	0.89***
25 and above				0.93	0.93
Interaction					
Non SCs/STs and Non Poor					1
Non SCs/STs and Poor					1.25***
SCs/STs and Non Poor					1.11
SCs/STs and Poor					1.66***
Constant	0.26	0.22	0.42	0.37	0.38
-2 Log likelihood	26461.01	26350.93	25769.94	25738.67	25732.88
DBF: Duration of breast-feeding, **: p<.05, ***: p<0.01					

Those children who took breastfeeding up to one year was 21 percent less likely to be stunt compared to those children who had never breastfed (p<0.05). The association between 5 & above birth order and child stunting was highly significant

(p<0.01). Consequently controlling other remaining variables in model-5, mother's education and mother's age at first childbirth had negatively associated with child stunting.

Effects of caste-wealth nexus on wasting

The unadjusted odds of wasting were 40 percent more likely for the children living in SCs/STs communities than among the children in the non-SCs/STs (OR = 1.40; p<0.01) (Table-4, model-1). In model-2, controlling the economic condition (wealth quintiles), odds of wasting among children of SCs/STs declined up to 12 percent (OR=1.28, p<0.01) from the real level.

Table 5: Odds ratio estimates of effects of caste-wealth nexus and other selected characteristics on underweight among children aged 0-59 months in EAG-states, India 2005-06

Background Characteristics	Model-1	Model-2	Model-3	Model-4	Model-5
Caste					
Non-SCs/STs	1	1	1	1	
SCs/STs	1.55***	1.30***	1.27***	1.25***	
Wealth Quintiles					
Non-poor		1	1	1	
Poor		1.99***	1.62***	1.57***	
Age in months					
0-12			1	1	1
Dec-36			1.72***	1.42***	1.42***
36-59			1.64***	1.32***	1.32***
Mother's Education					
No Education			1	1	1
Primary			0.77***	0.80***	0.80***
Secondary			0.64***	0.68***	0.68***
Higher			0.30***	0.36***	0.36***
DBF (in months)					
Never breast-fed				1	1
0-11				0.96	0.96
12-17.				1.15*	1.15
18 and above				1.31***	1.31***
Mother's age at 1st childbirth					
12-18.				1	1
19-24				0.91***	0.91***
25 and above				0.81***	0.81***
Birth Order					
2-Jan				1	1
4-Mar				1.07**	1.07**
5 & Above				1.17***	1.17***
Interaction					
Non SCs/STs and Non Poor					1
Non SCs/STs and Poor					1.55***
SCs/STs and Non Poor					1.21***
SCs/STs and Poor					1.98***
Constant	0.82	0.57	0.51	0.52	0.52
-2 Log likelihood	34227.15	33577.32	32993.47	32897.45	32896.75
DBF: Duration of breast-feeding, *: p<0.10, **: p<.05, ***: p<0.01					

The odds of wasting were 41 percent higher in poor forty percent households than the non-poor sixty percent

households. Additionally controlling the age of children, mother's education, duration of breastfeeding and mother's age at first childbirth, there were no change in odds of wasting for children in SCs/STs of poor households (Table-4, Model-4). In the model-5 including the interaction between caste and wealth variable and controlling age of children, mother's education, duration of breastfeeding and mothers age at first childbirth, the effect of "SC/ST and poor" on wasting remained large (OR= 1.66, P<0.01) and statistically highly significant than "non-SC/ST and non-poor" households children. Moreover, odds of wasting were 25 percent more likely for children in "non-SC/ST and poor" compared to "non-SC/ST and non-poor" households.

Effect of other risk factors on wasting

Among the control variables, child's age, mother's education and mother's age at first child birth had the strongest effect on the risk of wasting. With the household wealth status, caste and other factors controlled, these all had statistically significant effects (p<0.01), but these effects were small and less likely to reference category.

Effects of caste-wealth nexus on underweight

The unadjusted odds of underweight were 55 % higher among children living in the SCs/STs communities than among children in the non-SCs/STs (Table-5, model-1). The relationship remains changed when controlling household's economic status. In model-2, after controlling -household's economic situation, the odds of underweight were 30 percent higher among SCs/STs children as compared to non-SCs/STs, but the odds of underweight were 99 percent higher among forty percent poor households children relative to remaining sixty percent non-poor households children (OR=1.99, p<0.01).

Additionally, controlling the age of the child, mother's education reduce the effect of economic status by 37 percent but there were a slightly little change in effect of caste (Model-3). When duration of breastfeeding, mother's age at first child birth and birth order were also controlled in model-4, the effect of caste and household wealth quintiles on underweight were reduced slightly and highly statistically significant (p<0.01). In model-5, children who lived in "SC/ST and poor" and "non-SC/ST and poor" households were 98 and 55 percent correspondingly more likely to undernourish than those in "non-SC/ST and non-poor" children. Moreover, the odds of underweight were 21 percent higher for children in SC/ST than non-SC/ST in non-poor households and these all had highly statistically significant (p<0.01).

Effect of other risk factors on underweight

Age of child had the strongest effect on the likelihood of underweight among the selected control variables, and this effect was independent of the caste & wealth status and other characteristics (Table-5). With the control of caste and households wealth status, the child's age, mother's education, mother's age at first child birth and birth order all had statistically significant effects. The adjusted prevalence of underweight was significantly lower for educated mothers (p<0.01).

4. Discussion

The association between poverty and undernutrition is a manifestation of systematic development patterns of children who live in poorer circumstances with inadequate food intake, greater exposure to infections and lack of access to essential health services [15]. However, in the present analysis every second SCs/STs children of poor households were likely to be stunted. Elsewhere, 66 percent and 98 percent children were more likely to be wasted and underweight respectively as compared to non-SCs/STs in non-poor households. Moreover, non-SC/ST of poor families children were 41 percent, 55 percent and 25 percent more likely to be stunted, underweight and wasted respectively than non-SC/ST of non-poor households. It means childhood undernutrition is a serious problem in vulnerable section (SCs/STs and poor families of non-SCs/STs).

The children in the poor group are at a much higher risk of being chronically undernourished than the children in non-poor households; either they belong to SCs/STs or non-SCs/STs. These also indicated that household economic status is an important determinant of childhood malnutrition. It has also been documented and supported by rural Uganda study [16]. Moreover, we found that socio-economic status is significantly related to child stunting. Similar finding found from other studies [16, 17], which had statistically significant relationship between socio-economic status and child nutrition. The SCs/STs are historically disadvantaged, socially ostracized, economically exploited people and denied human dignity and a sense of self-worth groups recognised in the constitution of India during the period of British rule in the Indian subcontinent. They were known as the depressed Classes [6]. This study indicates that SCs/STs and non-SCs/STs of poor households are more malnourished that non-SCs/STs of non-poor households. It suggests that at the caste level, there may be some improvement in stigma and discrimination. But at the economic level there is discrimination. Overall this study has significant policy implication for child health in EAG-states in India. Evidence shows that improving nutritional status has many benefits that cannot be overemphasized including better health and survival [18-20].

Our study also indicates that mother's education is also significant predictors for child nutrition. Other studies [17, 21, 22] cleared that mother's education on child nutrition is only minimally attenuated by factors at child, maternal, households and community level. This suggests that improving years of schooling of the mother may have a significant influence on child nutrition and ultimately after poverty and caste cycle, education is a crucial predictor of child nutrition. Duration of breastfeeding, mother's age at first childbirth and birth order are independently and strongly associated with child nutrition. Stunting and underweight have a negative association with mother education. However, wasting has a positive relationship with mother school because, it typical results from acute malnutrition that occurs due to calorie elicit.

An increasing pattern of stunting and underweight by age is consistent with the typical pattern of increasing prevalence of childhood disease such as acute respiratory infections and diarrhoea by age in many developing countries [23]. It may not completely be due to the start of feeding solid food at around 4-6 months, which increases the likelihood of consuming contaminated foods. Also at this age, children start crawling and carried outdoors, this exposes them to infections. From precedent research shows that mother's education has been identified as one of the key factors in promoting health and nutrition, increasing household earnings and mediating the effect of economic status on health [24]. However, this study also concludes that maternal education is found to have a more effect on childhood stunting and underweight. This is partly because a vast majority (more than 70%) of mothers in EAG- states were illiterate.

5. Conclusion

The overall child malnutrition was high in a vulnerable section of the society (SCs/STs and poor households of non-SCs/STs) than non-vulnerable part of the community (non-SCs/STs in non-poor households). So, there is need for reducing economic inequality by making services more available to the SCs/STs and poor families of non-SCs/STs will be a key strategy to improve health and nutritional status of children in EAG- states. This study also demonstrates that addressing such socio-economic gradients in nutrition is essential to developing a sound policy for child nutrition for both SCs/STs and poor households of non-SCs/STs; a system that is responsive to improvement of families economic status supporting strategies for reducing and preventing undernutrition and also involves a combination of macroeconomic policies and targeted intervention programmes.

References

[1] M. Claeson, D. Gillespie, H. Mshinda, H. Troedsson, CG Victoria, "Bellagio study group on child survival: Knowledge into action for child survival". Lancet, (362), pp. 323-327, 2003.

[2] M. Gragnolati, M. Shekar, M. Das Gupta, C. Bredenkamp, & Y. K. Lee, India's undernourished children: a call for reform and action, 2005.

[3] International Institute for Population Sciences (IIPS) and Macro International, "National Family Health Survey (NFHS-3,) 2005-06: India", 2007.

[4] P. K. Pathak, & A. Singh, "Trends in malnutrition among children in India: growing inequalities across different economic groups," Social Science & Medicine, *73*(4), 576-585, 2011.

[5] R. Baru, A. Acharya, S. Acharya, A. K., Shiva Kumar, & K. Nagaraj, "Inequities in access to health services in India: caste, class and region," Economic and Political Weekly, *45*(38), 49-58, 2010.

[6] Ministry of Social Justice and Empowerment, Scheduled Caste Welfare - List of Scheduled Castes. Amended up to Constitutional Provision, New Delhi: MoSJE Government of India, 2002.

[7] Sukhadeo. Thorat, "Dalits in India: Search for a Common Destiny," New Delhi: SAGE Publications India Pvt Ltd.doi, 2009. [online]. Available: on http://dx.doi.org/10. 4135/9788132101086.

[8] Scheduled Caste of India world dictionary of minorities, 2014. [Online]. Available: on htpp:// www.faqs.org/minorities/SouthAsia/Schedule Caste of India. [Assessed: January 23, 2014].

[9] SRS Bulletins, India, December, 2013, Available: censusindia.gov.in/vital_statistics/SRS_Bulletins/Bulletins.html, [Assessed: January 23, 2014].

[10] UNICEF, " Public resources for children in India: A study of the budgets of Rajasthan" UNICEF, 2007, Available:www.unicef.org/.../Public_Resource, [Assessed: May 29, 2013].

[11] D. Filmer, & L. H. Pritchett, "Estimating wealth effects without expenditure Data—Or tears: An application to educational enrollments in states of India," Demography, 38(1), 115-132, 2001.

[12] S. Vyas, & L. Kumaranayake, "Constructing socio-economic status indices: how to use principal components analysis," Health policy and planning, 21(6), 459-468, 2006.

[13] O. A. O'Donnell, & A. Wagstaff, "Analyzing health equity using household survey data: a guide to techniques and their implementation," World Bank Publications, 2008.

[14] A. Kumar, & A. Singh, "Decomposing the gap in childhood under nutrition between poor and non–poor in urban India, 2005–06," PloS one,8(5), e64972, 2013.

[15] M. De Onis, & World Health Organization, "WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development," 2006.

[16] H. Wamani, T. Tylleskär, A. N. Åstrøm, J. K. Tumwine, & S. Peterson, "Mothers' education but not fathers' education, household assets or land ownership is the best predictor of child health inequalities in rural Uganda," International Journal for Equity in Health, 3(1), 9, 2004.

[17] M. B. Frost, R. Forste, & D. W. Haas, "Maternal education and child nutritional status in Bolivia: finding the links," Social science & medicine, 60(2), 395-407, 2005.

[18] C. G. Victora, L. Adair, C. Fall, P. C. Hallal, R. Martorell, L. Richter, & H. S. Sachdev, " Maternal and child under nutrition: consequences for adult health and human capital," The lancet, 371(9609), 340-357, 2008.

[19] S. Grantham-McGregor, Y. B. Cheung, S. Cueto, P. Glewwe, L. Richter, & B. Strupp, "Developmental potential in the first 5 years for children in developing countries," The Lancet, 369(9555), 60-70, 2007.

[20] R. E. Black, L. H. Allen, Z. A. Bhutta, L. E. Caulfield, M. De Onis, M. Ezzati, ... & J. Rivera, "Maternal and child under nutrition: global and regional exposures and health consequences," The lancet, 371(9608), 243-260, 2008.

[21] P. Glewwe, "Why does mother's schooling raise child health in developing countries? Evidence from Morocco," Journal of human resources, 124-159, 1999.

[22] S. Desai, & S. Alva, "Maternal education and child health: Is there a strong causal relationship?," Demography, 35(1), 71-81, 1998.

[23] V. Mishra, "Indoor air pollution from biomass combustion and acute respiratory illness in preschool age children in Zimbabwe," International Journal of Epidemiology, 32(5), 847-853, 2003.

[24] R. Peña, S. Wall, & L. A. Persson, "The effect of poverty, social inequity, and maternal education on infant mortality in Nicaragua, 1988-1993,".American Journal of Public Health, 90(1), 64, 2000.

Author Profile

Jang Bahadur Prasad received the B.Sc (Mathematics and Statistics) from Veer Bahadur Singh Purvanchal University Jaunpur, M.Sc. (in Health Statistics) from Banaras Hindu University (BHU), Varanasi, Master in Population Science (MPS) and M.Phil (Population Studies) from International Institute for Population Sciences (IIPS), Mumbai in 2010, 2012, 2013 and 2014 respectively. Currently, he pursues Ph.D from IIPS, Mumbai, India.

Prahlad Kumar MPS, M.Phil. and PhD from International Institute for Population Sciences, Mumbai, India.