Status of Maternal Nutrition and Its Association with Nutritional Status of Under-Three Children in EAG-States and Assam, India

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ABSTRACT: *Background: Women are more malnourished than men, because of including women\'s reproductive biology, low social status, lack of education and poverty. The Socio-cultural traditions and disparities in household work patterns can also increase women\'s chances of being malnourished. It is difficult to measure exactly what proportions of losses are due to maternal malnutrition. Therefore the objective of this study was to determine the maternal nutritional status and its association with nutritional status of under-three children. Materials and methods: In "EAG-states and Assam" the number of children born during the three years preceding the survey and alive at the time of survey were 15789 & 13015 from NFHS-2 & NFHS-3 respectively. The data has been analyzed after using the national weight. Bivariate analysis has been done to see the change in level of maternal nutrition and its association with malnourished children. Results: In the poor households of "EAG states and Assam", the percent of underweight women was increased from 42.7 in 1998-99 to 46.4 in 2005-06 whereas it was steadily increased in rural settings and in urban settings it was steadily decreased and overweight was increased during 1998-99 to 2005-06. Uttar Pradesh, Uttaranchal was only states where percent distribution of underweight mother in SC/ST had increased while in other caste it had decreased. The prevalence of stunting of underweight mother had significantly increased in the states of Uttaranchal, Bihar, Madhya Pradesh, and Chhattisgarh while in the state of Assam it was highly increased from 35.4 in 1998-99 to 49.6 in 2005-06. EAG states and Assam", the prevalence of underweight children was high in normal mother in both period 1998-99 and 2005-06 in comparison to underweight mother in the respective period. Conclusion: The overall percent distribution of underweight women was increased in poor household, rural areas and SC/ST in most of the states of "EAG states and Assam". Moreover, the childhood under nutrition and maternal nutrition was serious problem in "EAG states" and the children of underweight mother in poor households were at much greater risk of being chronically undernourished than the children in the better households. Therefore, there is need for special public health policy and programs that is able*

I. INTRODUCTION :

Maternal and child malnutrition, encompassing both under nutrition and overweight, are global problems with important consequences for survival, incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies. Maternal and child under nutrition, including stunting, wasting, and deficiencies of essential vitamins and minerals, was the subject of a Series (Black et al., 2008; Victora et al., 2008; Bhutta et al., 2008; Morris, Cogill, &Uauy, 2008). Elsewhere, women are more malnourished than men, because of including women's reproductive biology, low social status, lack of education and poverty. The Socio-cultural traditions and disparities in household work patterns can also increase women's chances of being malnourished. It is difficult to measure exactly what proportions of losses are due to maternal malnutrition, but recent research shows that 60% of deaths of under-five children are associated with malnutrition and children's malnutrition is strongly correlated with mothers' poor nutritional status (Pelletier &Frongillo, 2003).Maternal nutritional status is important for herself, in case of capacity to reproduce, and development of her children, with implications for the health and reproductive capacity of the next generation's mothers. However, for decades women's nutrition have centered on nutrition during pregnancy and lactation and much of the concern has thus been for the newborn's health and well-being (Shepard et al., 1996). India continues have the burden of malnutrition, high prevalence of chronic energy deficiency, anemia among mothers and more number of severely undernourished children.

Moreover, today, 64% of the populations of India are chronically malnourished (Kurtz, 1999).According to third round of National Family Health Survey, maternal nutrition is measured by two indicators in which one is height and other one is Body Mass Index (BMI). The cutoff point for height is 145 cm used in NFHS-3. On the basis of this 12% of ever-married women are nutritionally at risk. Moreover, on the basis of BMI 36% women have high prevalence of nutritional deficiency and almost half (45%) moderately or severely thin. However, proportion of ever married women who are thin (33%) has slightly decreased from 36% in second round of NFHS. NFHS-3 also shows that serious nutritional problem occurred in rural women, women with no education, scheduled caste and scheduled tribe women and poor household women. The highest percent of shorter women (height less than 145 cm) in EAG states is Rajasthan. The proportion of women who are too thin is particularly high in Chhattisgarh (43 percent), Bihar (45 percent) and Jharkhand (43 percent) (IIPS, 2007).This study would try to explore the nutritional status in Empowered Action Group (EAG) and Assam which are economically and demographically backward among remaining states of India. These EAG states include the states of Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Orissa, Jharkhand, Chhattisgarh and Uttaranchal. In the previous decades 1990s, they were economically stagnant. Now, they have come out from the stagnation of economic and significantly contribute to the national economy. These states having much more poorest population among the remaining states of India and also stand on the lower most rank of the Human Development Index (Pandey et al., 2007).Demographically EAG-states have 43 percent illiterate female population (census-2011), share of children up to the six years contributes 53.2 percent of total national children (census-2011) and infant mortality is almost 48 percent (SRS-2013 September). However, Assam has 55 percent infant mortality rate. Moreover, Assam has similar socioeconomic and demographic characteristics. So, there is first need to study most vulnerable section of the country. Since to reduce the problem of maternal malnutrition has been a major concern irrespective of growth and development of the country. It would be helpful for better policy formulations. This paper explores(i) state wise change in maternal nutrition in "EAG-states and Assam" and (ii)measure the association between maternal and child nutrition usingsecond &third round of NFHS.

II. MATERIALS AND METHODS

Sources of data : Second and third round of National Family Health Survey (NFHS) has been used to examine the change in maternal nutrition and its association with under-five malnourished children in "EAG-states and Assam." The NFHS is nationwide surveys conducted with a representative sample of households throughout the country. Moreover, the Ministry of Health and Family Welfare, Government of India initiated the NFHS surveys to provide high quality of data on population and health indicator. The second round of NFHS was conduct in 1998-99. It covered a representative sample of over 91,000 ever married women age 15-49 years across all 26 states of India. However, the third round NFHS was conducted in 2005-06. It has been covered national representative sample of 124,385 women age 15-49 and 74,369 men age 15-54 from all 29 states. In "EAG-states and Assam" the number of children born during the three years preceding the survey and alive at the time of survey were 15789 & 13015 from NFHS-2 & NFHS-3 respectively. The data has been analyzed after using the national weight.

III. METHODS

Multi-stage, systematic and stratified sampling design was adopted for each state, where the primary sampling units were select 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. National and state level sampling weights were created to reflect sampling design (IIPS, 2007). The principle objective of NFHS is to provide national and states level estimates on fertility, mortality, family planning, and HIV related knowledge and on importance aspect of nutrition, health and information about health care services (IIPS, 2007). However, here in this paper examine the changes in maternal nutrition and its association with child nutrition. For this, I have used two methods namely BMI and chi-square test.

Body Mass Index (BMI) : Body Mass Index (BMI) was a simple index of weight-for-height that was commonly used to classify underweight, overweight and obesity in adults. It was defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). Here in this study BMI was categories into three parts namely underweight (BMI<18.5), Normal range ($18.5 \leq BMI \leq 24.9$) and overweight ($BMI \geq 25$) (WHO, 1995, WHO, 2000 and WHO 2004). BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to different body proportions. The health risks associated with increasing BMI are continuous and the interpretation of BMI grading in relation to risk may differ for different populations.

Outcome Variables : The outcome variables in the present study are height for age (stunting), weight for height (wasting), weight for age (underweight) and BMI for maternal nutrition. We have to use new reference population of the World Health Organization standard to estimate all three indicators for children below five years of age (WHO reference study group, 2006). Moreover the definition of stunting, wasting and underweight given by WHO is as The children whose height for age Z-score is less than minus two standard deviations (-2SD) from the median of the reference population are considered as short for age (stunted) and children whose height for age Z-score less than minus three standard deviation (-3SD) from the median of the reference population are considered as severely stunted. Stunting describe that over a long period of time failure to receive adequate nutrition. Therefore, height for age represents long-term effects of malnutrition in population. Similarly, weight for height index measures body mass in relation to body length and describe current nutritional status. The children whose weight for height Z-score is below minus two standard deviation from the median of the reference population are considered as thin (wasted), and whose Z- score less than minus three standard deviation from the reference population are considered as severely wasted. Underweight is a measure of protein-energy under nutrition. Underweight is describing the children whose weight for age Z- score less than minus two standard deviation from the median of the reference population are considered as underweight and whose weight for age Z-score less than minus three standard deviation from the median of the reference population as recommended by the world health organization(WHO) are considered as severely underweight.

Explanatory Variable L: NFHS-2 and NFHS-3 survey of India do not provide direct information on income or consumption. However, it gives information of a set of economic proxies such as household amenities, housing quality, consumer durables, and size of land holdings. Previous studies have used this information to assess the economic status of households, to know the economic differentials in the population and health outcomes by creating a composite measure called wealth index (Montgomery et al., 2000). The wealth index subsequently divided in into five groups' namely poorest, poorer, middle, richer, and richest and bottom to groups (lower 40%) were considered as poor and remaining three were non-poor. This classification is consistent with the previous study (Kumar & Singh, 2013). Moreover, the explanatory variables considered in the present study are place of residence (urban and rural), caste (SC/ST, other), wealth index (poor = poorest + poorer, non-poor = middle + richer + richest).

Findings

Maternal nutrition by quintile of household wealth : Table-1 shows that nutritional status of mother of less than three years of children in "EAG states and Assam" according to the household status. The percent distribution of underweight mother in poor household had been increased between 1998-99 and 2005-06 in Uttaranchal (29.4 to 37.9), Bihar (41.1to 48.7), Jharkhand (47.3 to 51.4), Madhya Pradesh (40 to 45.7), Rajasthan (37.8 to 44.6) and Assam (31.7 to 45.2). However in non-poor household, the percent distribution of it was increased in the states of Bihar (32.6 to 36.6), Madhya Pradesh (34.6 to 40.2) and Assam (27.9 to 32). The change in percent of overweight in both poor and non-poor household of each states has steadily increased from 1998-99 to 2005-06. In the poor household of "EAG states and Assam", the percent of underweight mother was increased from 42.7 in 1998-99 to 46.4 in 2005-06 whereas in non-poor household it was slightly decrease from 36 in 1998-99 to 35.2 in 2005-06. Moreover, the prevalence of overweight was also increased during 1998-99 to 2005-06.

Maternal nutrition by place of residence : As from the table-2, the percent distribution of underweight was increase in rural mother by more than 12 percent in the states of Assam during 1998-99 to 2005-06. Moreover, in urban mother, it was slightly increased from 27 in 1998-99 to 31.4 in 2005-06. The percent distribution of underweight in rural settings was steadily increased in the states of Uttaranchal Bihar Jharkhand, Madhya Pradesh and Rajasthan during 1998-99 to 2005-06. Moreover, it was increased in the states of Madhya Pradesh, Rajasthan and Uttar Pradesh. In "EAG states and Assam", the percent distribution of underweight was also steadily increased in rural settings whereas in urban settings, it was steadily decreased during 1998-99 to 2005-06. Moreover, the prevalence of overweight was increased more in urban settings than in rural settings over the period of 1998-99 to 2005-06.

Caste wise maternal nutrition : Table-3 demonstrate that the percent distribution of underweight mother was highly increased in SC/ST in the states of Bihar and Assam from 41.5 and 21.3 in 1998-99 to 51.7 and 32.8 in 2005-06. Moreover, in other caste, Assam was the only states where percent distribution of underweight mother was high from 33.1 in 1998-99 to 44.5 in 2005-06. The overall percent distribution of underweight in "EAG states and Assam" was increased in SC/ST from 41.8 in 1998-99 to 45.7 in 2005-06. However, in other caste, it was slightly increased from 37 in 1998-99 to 38.9 in 2005-06. Uttar Pradesh, Uttaranchal was the only states where percent distribution of underweight mother in SC/ST was increased while in other caste it was decreased.

The percent distribution of underweight was steadily increased in both SC/ST and other caste of Bihar, Madhya Pradesh and Rajasthan.

Stunting and sever stunting children according to maternal health status : Table-4 shows that the prevalence of stunting was high in normal mother in 1998-99 in all selected states except Jharkhand, Chhattisgarh and Orissa, whereas in 2005-06 it was high in all selected states except Chhattisgarh and Orissa as compare to underweight mother. Moreover, the prevalence of severe stunting was high in Uttar Pradesh, Uttaranchal, Madhya Pradesh and Rajasthan in 2005-06.Elsewhere, in "EAG states and Assam", the prevalence of stunting and severe stunting was also high of normal mother in both period 1998-99 and 2005-06 as compared to underweight mother. The prevalence of stunting of underweight mother had been increased in the states of Uttaranchal, Bihar, Madhya Pradesh, and Chhattisgarh. While in the state of Assam, it was highly increased from 35.4 in 1998-99 to 49.6 in 2005-06. Moreover, the prevalence of stunting was highly associated with maternal nutrition in all selected states except Uttaranchal and Rajasthan. However, the overall prevalence of stunting in "EAG states and Assam" of Underweight mother was increased from 42.3 in 1998-99 to 45 in 2005-06. Moreover, severe stunting was steadily increased during same period. However, the prevalence of stunting and severe stunting of overweight mother was slightly increased during 1998-99 to 2005-06.

Underweight and sever underweight children according to maternal health status : Table-5 reveals that in "EAG states and Assam", the prevalence of underweight was high of normal mother in both period 1998-99 and 2005-06 in comparison to underweight mother in respective period. But the prevalence of severe underweight children in normal mothers was high in 1998-99 while it was low in 2005-06. The percent distribution of underweight children of normal mother was high in both period 1998-99 and 2005-06 in the states of Uttar Pradesh, Uttaranchal, Madhya Pradesh and Rajasthan. The prevalence of underweight children of underweight mother was increased in the states of Uttaranchal, Bihar, Madhya Pradesh, Rajasthan and Assam from 1998-99 to 2005-06.The percent distribution of severe underweight children was increased in both severe underweight and overweight mother in all selected states except Uttar Pradesh and Rajasthan. However, the percent distribution of underweight children was highly associated with maternal nutritional status in all selected states except Uttaranchal during 1998-99 to 2005-06. Elsewhere, the overall percent distribution of underweight and severe underweight children of both underweight and overweight mothers in "EAG states and Assam" was steadily increased between 1998-99 and 2005-06.

Wasting and sever wasting children according to maternal health status : Table-6 shows that the prevalence of wasting and severe wasting according to maternal health in EAG-states and Assam. The percent distribution of wasting children was highly increased of underweight mothers from 42.8 in 1998-99 to 53 in 2005-06in Biharwhile the percent distribution of severe wasted children of underweight mothers was highly increased in the states of Uttar Pradesh, Bihar and Madhya Pradesh from 29.3, 37.7 and 37 in 1998-99 to 48, 55.7 and 49.3 respectively in 2005-06. However, in "EAG-states and Assam" the percent distribution of wasting children was slightly increased from 47.2 in 1998-99 to 50.3 in 2005-06.Whereas severe wasted children were more than 12 percent increased during 1998-99 to 2005-06. The percent distribution of wasting and severe wasting children was high in the states of Uttar Pradesh, Uttaranchal, Madhya Pradesh, Rajasthan and Assam of normal mother as compared to underweight mothers in 2005-06. However the percent distribution of underweight children was associated with maternal nutritional status in all selected states except Uttaranchal and Assam from 1998-99 to 2005-06.

IV. DISCUSSION

Uttaranchal, Bihar, Jharkhand, Madhya Pradesh, Rajasthan Assam was the states where underweight women was increased during 1998-99 to 2005-06 in poor household than non-poor household. Moreover, it was more than forty percent. This demonstrates that socio-economic status is one of the most important factors that affect women's nutritional outcomes. Similar information are demonstrate by Mosley and Chen in 1984. Socio-economic status affects a set of proximate determinants of health that directly affect the health and nutritional outcomes of children. Undernourished girls have greater likelihood of becoming undernourished mothers. Who have a greater chance of giving malnourished children (Ozaltin et. al, 2010).The association between poverty and under nutrition a manifestation of the somatic development pattern of children who live in poorer conditions with insufficient food intake, greater exposer to infections, and lack of access to basic health services (Judson, 2004). My study also demonstrates same things in the state of Chhattisgarh, Orissa and Assam in 2005-06. Therefore, adequate maternal nutrition are essential to prevent child nutrition (Walker et al. 2011).The caste and place of residence factor becomes very much important when study done in rural settings. The caste is much more rigid in rural as compared to urban settings.

There have been several attempts to look into the effects. These rigidities of the caste have on people's lives and the attainment they have in their lives (Nayar, 2007). As from this study, approximately all selected states except Uttaranchal were having more than forty percent underweight women in rural settings whereas in urban settings it was less than forty percent -

Table-1: The nutritional status of mothers of under three year's children in different states according to economic state

| State | NFHS-2 | | | | | | | | NFHS-3 | | | | | | | |
| | Poor | | | | Non-poor | | | | Poor | | | | Non-poor | | | |
	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N
Uttar Pradesh	44.5	54.6	0.9	1561	34.3	61.9	3.7	2908	43.1	55.4	1.5	3010	32.0	59.8	8.2	3309
Uttaranchal	29.4	70.6	0.0	17	28.9	63.9	7.2	83	37.9	58.6	3.4	58	26.5	62.4	11.1	189
Bihar	41.1	57.9	1.1	1806	32.6	64.1	3.3	1563	48.7	50.6	0.8	2336	36.6	58.0	5.4	1237
Jharkhand	47.3	52.0	0.7	150	52.9	45.1	2.0	51	51.4	47.7	0.9	685	39.2	54.1	6.7	329
Madhya Pradesh	40.0	59.4	0.5	732	34.6	61.9	3.5	1382	45.7	54.1	0.2	1032	40.2	56.9	2.9	1140
Chhattisgarh	53.7	45.6	0.8	259	49.7	48.7	1.6	374	51.9	47.2	0.9	335	39.6	57.4	3.1	359
Rajasthan	37.8	61.6	0.7	580	39.3	57.8	2.9	1376	44.6	53.1	2.3	789	37.3	59.2	3.5	1260
Orissa	52.0	47.5	0.5	585	45.6	51.8	2.7	485	51.2	47.8	1.0	586	36.4	58.6	5.0	503
Assam	31.7	66.8	1.5	325	27.9	70.1	2.1	341	45.2	54.0	0.8	504	32.0	58.8	9.2	284
Total	42.7	56.4	0.9	6015	36.0	60.7	3.3	8563	46.4	52.5	1.1	9335	35.2	58.7	6.0	8610

U.W. =underweight (<18.5), N. R. = Normal (18.5-24.9), O.O. = Overweight (>25.0)

Table-2: The nutritional status of mothers of under three year's children in different states according to place of residence

| State | NFHS-2 | | | | | | | | NFHS-3 | | | | | | | |
| | Rural | | | | Urban | | | | Rural | | | | Urban | | | |
	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N
Uttar Pradesh	39.6	58.8	1.5	3751	28.4	62.8	8.8	751	39.2	57.8	3.0	5168	29.1	57.2	13.7	1192
Uttaranchal	27.9	70.5	1.6	61	30.8	56.4	12.8	39	32.8	60.9	6.3	192	17.2	63.8	19.0	58
Bihar	37.1	61.3	1.7	3071	37.7	56.4	5.9	305	45.5	52.5	1.9	3198	34.3	60.3	5.4	411
Jharkhand	48.0	50.5	1.5	198	75.0	25.0	0.0	4	49.6	49.3	1.1	827	38.9	51.1	10.0	190
Madhya Pradesh	37.3	61.5	1.3	1637	33.8	59.5	6.7	479	45.4	54.3	0.3	1660	34.5	59.7	5.8	516
Chhattisgarh	52.2	47.1	0.8	531	47.6	48.5	3.9	103	47.3	51.6	1.0	583	36.0	56.8	7.2	111
Rajasthan	39.4	59.7	1.0	1572	36.5	55.8	7.7	389	40.3	57.5	2.1	1641	39.1	54.4	6.6	412

U.W. =underweight (<18.5), N. R. = Normal (18.5-24.9), O.O. = Overweight (>25.0)

Table-3: The nutritional status of mothers of under three year's children in different states according to caste

State	NFHS-2								NFHS-3							
	SC/ST				Other				SC/ST				Other			
	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N	U.W.	N.R.	O.O.	N
Uttar Pradesh	39.6	58.8	1.7	1089	36.4	60.4	3.2	3227	43.6	53.5	2.9	1737	35.0	59.3	5.8	4623
Uttaranchal	31.6	63.2	5.3	19	28.4	65.4	6.2	81	35.4	61.5	3.1	65	27.0	61.6	11.4	185
Bihar	41.5	57.4	1.1	964	35.4	62.2	2.5	2413	51.7	47.2	1.1	750	42.2	55.2	2.7	2854
Jharkhand	46.7	50.0	3.3	92	49.5	50.5	0.0	111	46.1	52.2	1.7	414	48.6	47.8	3.6	603
Madhya Pradesh	38.2	60.9	1.0	820	35.4	61.2	3.5	1295	45.1	54.5	0.4	921	41.2	56.3	2.5	1254
Chhattisgarh	52.9	47.1	0.0	308	50.0	47.5	2.5	326	45.6	53.1	1.3	320	45.5	51.9	2.7	374
Rajasthan	41.7	57.4	0.9	674	37.3	59.7	3.0	1284	44.0	55.6	0.4	734	37.9	57.7	4.5	1320
Orissa	55.1	44.5	0.4	483	44.2	53.4	2.4	588	54.0	45.5	0.6	506	37.4	58.0	4.5	617
Assam	21.3	77.8	1.0	207	33.1	64.9	2.0	450	32.8	64.2	3.0	201	44.5	51.5	4.0	375
Total	41.8	57.1	1.1	4656	37.0	60.1	2.9	9775	45.7	52.7	1.5	5648	38.9	56.8	4.3	12205

U.W. =underweight (<18.5), N. R.= Normal (18.5-24.9), O.O. = Overweight (>25.0)

Table-4: Prevalence of stunting and sever stunting children of under-three according to their mother nutritional status in selected states

State	Stunting										Severe stunting									
	NFHS-2					NFHS-3					NFHS-2					NFHS-3				
	U.W.	N.R.	O.O.	χ^2	N	U.W.	N.R.	O.O.	χ^2	N	U.W.	N.R.	O.O.	χ^2	N	U.W.	N.R.	O.O.	χ^2	N
Uttar Pradesh	42.1	56.1	1.8	38.8*	2022	40.5	55.4	4.1	28.8*	2699	45.1	52.8	2.1	34.1*	1135	40.9	54.9	4.1	13.5*	1519
Uttaranchal	28.2	69.2	2.6	1.5	39	35.4	59.8	4.9	5.1	82	23.8	71.4	4.8	0.5	21	41.5	53.7	4.9	3.9	41
Bihar	41.3	57.6	1	21.5*	1348	48.4	50.2	1.4	28.6*	1608	42.1	56.8	1.2	11.1*	844	54.5	45	0.5	54.2*	820
Jharkhand	51.9	48.1	0	0.2	81	49.2	50	0.8	10.2*	396	50	50	0	0.0	50	49.3	49.3	1.4	1.8	209
Madhya Pradesh	38.3	60	1.7	6.7*	807	46.3	52.6	1.2	6.8*	858	38	61.3	0.7	10.0*	434	48.2	50.5	1.4	5.6	440
Chhattisgarh	51.9	47.4	0.7	0.4	285	52.6	46.1	1.2	15.9*	323	47.4	51.4	1.2	3.5	173	52.1	46.6	1.2	4.6	163
Rajasthan	42.1	56.6	1.3	18.8*	843	42.1	55.1	2.7	1.8	700	41.6	57.5	0.8	9.4*	471	39.2	58.6	2.3	0.6	355
Orissa	51.1	47.7	1.2	1.8	407	51.5	46.9	1.6	18.8*	437	51.5	47.9	0.6	1.4	163	55.2	44.3	0.5	14.1*	192
Assam	35.4	62.7	1.9	1.1	209	49.6	48.2	2.1	17.3*	280	35	63.6	1.4	0.1	140	51.1	46.6	2.3	7.8*	131
Total	42.3	56.2	1.5	71.3*	6041	45	52.5	2.5	99.5*	7383	42.9	55.7	1.4	37.4*	3431	46.5	51.2	2.4	65.2*	3870

Level of significance: * P<0.05; U.W. =underweight (<18.5), N. R.= Normal (18.5-24.9), O.O. = Overweight (>25.0); % = percent

Table-5: Prevalence of underweight and sever underweight children of under-three according to their mother nutritional status in selected states

State	Underweight										Severe underweight									
	NFHS-2					NFHS-3					NFHS-2					NFHS-3				
	U.W.	N.R.	O.O.	χ²	N	U.W.	N.R.	O.O.	χ²	N	U.W.	N.R.	O.O.	χ²	N	U.W.	N.R.	O.O.	χ²	N
Uttar Pradesh	45.9	52.7	1.4	110.9*	1876	44.9	52.2	2.9	105.6*	2143	50.4	48.4	1.3	67.9*	798	48.6	48.6	2.7	60.9*	876
Uttaranchal	28.6	67.4	4	1.2	36	38.8	55.2	6	4.9	67	28.6	71.4	0	1.1	14	34.6	57.7	7.7	0.5	26
Bihar	43.6	55.3	1.1	45.5*	1355	51.9	47.6	0.5	125.8*	1764	47.2	51.7	1.1	32.2*	627	57.4	42.6	0	84.6*	788
Jharkhand	52.8	47.2	0	0.6	89	52.4	46.5	1.1	16.1*	458	47.2	52.8	0	0.34	53	58	41.6	0.5	15.3*	219
Madhya Pradesh	41.3	58	0.7	37.6*	876	48.1	51.5	0.5	38.8*	1067	44.7	55	0.3	20.8*	389	52.1	47.5	0.4	25.1*	495
Chhattisgarh	57	42.3	0.7	5.1*	300	55.4	43.9	0.7	25.7*	294	52.3	47.7	0	1.5	128	62	38	0	16.1*	108
Rajasthan	44.5	54.3	1.2	34.7*	822	45.6	51.6	2.8	12.7*	643	48.2	51.5	0.3	23.5*	336	46.1	52.3	1.6	4.7	243
Orissa	54.7	45	0.4	21.3*	505	52.9	46.1	1	24.7*	395	59.9	40.1	0	14.5*	192	60.7	38.7	0.7	20.5*	150
Assam	45.6	54.4	0	16.4*	149	52	46.7	1.2	23.9*	244	44.6	55.4	0	3.9	56	57.7	39.7	2.6	10.7*	78
Total	45.8	53.1	1	265.7*	6008	48.7	49.7	1.6	377.9*	7075	49	50.3	0.7	149.0*	2593	53.2	45.6	1.2	242.0*	2983

Level of significance: * P<0.05;   U.W. =underweight (<18.5), N. R.= Normal (18.5-24.9), O.O. = Overweight (>25.0); % = percent

Table-6: Prevalence of wasting and sever wasting children of under-three according to their mother nutritional status in selected states

State	Wasting										Severe wasting									
	NFHS-2					NFHS-3					NFHS-2					NFHS-3				
	U.W.	N.R.	O.O.	χ²	N	U.W.	N.R.	O.O.	χ²	N	U.W.	N.R.	O.O.	χ²	N	U.W.	N.R.	O.O.	χ²	N
Uttar Pradesh	50.4	48.4	1.2	29.9*	403	47.6	49.8	2.6	62.4*	1004	29.3	68	2.7	2.6	75	48	49.7	2.3	21.3*	354
Uttaranchal	37.5	62.5	0	0.7	8	36.8	60.5	2.6	3.1	38	100	0	0	2.5	1	45.5	45.5	9.1	1.4	11
Bihar	42.8	55.6	1.5	6.8*	523	53	46.5	0.6	58.2*	1046	37.7	59.4	2.9	0.9	138	55.7	44.3	0	24.6*	332
Jharkhand	46.2	53.8	0	0.4	39	53.6	45	1.3	8.1*	302	50	50	0	0.0	8	55.7	44.3	0	6.9*	131
Madhya Pradesh	41.7	57.4	0.9	7.7*	331	49.5	50.1	0.4	26.5*	727	37	63	0	2.3	73	49.3	50	0.7	5.6	280
Chhattisgarh	58.2	39.6	2.2	4.5	91	58.4	39.6	2	13.4*	149	55.6	44.4	0	0.2	18	62.5	33.3	4.2	7.7*	48
Rajasthan	50	49	1	13.1*	192	47.3	51.1	1.5	12.3*	395	34.4	62.5	3.1	0.3	32	40.8	54.4	4.8	2.4	125
Orissa	54.6	45.4	0	7.9*	227	52.7	47.3	0	15.7*	237	48.6	51.4	0	0.6	37	49.2	50.8	0	2.4	65
Assam	43.6	54.5	1.8	2.7	55	46.1	50.4	3.5	1.8	115	35.7	64.3	0	0.2	14	43.2	51.4	5.4	0.5	37

Level of significance: * P<0.05;   U.W. =underweight (<18.5), N. R. = Normal (18.5-24.9), O.O. = Overweight (>25.0); % = percent

in 2005-06. But malnutrition inequality increased dramatically in both urban and rural settings. These assertions were also confirmed by chalasani in 2012. There was more than forty percent SC/ST and other caste women of Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh and Assam states were underweight in 2005-06. i.e. there is no inequality in these states but when we had seen the change in underweight women during 1998-99 to 2005-06.

We got that these states have inequality. Schedule Caste underweight women were always increased during 1998-99 to 2005-06 whereas other caste underweight women were either stagnate or slightly declined during same period. It's may be due to stigma and discrimination of "the ground of untouchability" in regard to public facilities, eating places, residential choice etc. and provides for fines and imprisonment of offenders (Scheduled Caste of India world dictionary of minorities, 2014).

This paper also demonstrates that maternal nutrition has strongest correlation with nutritional status of children. Nutritional status of mother wassignificantly associated with child nutritional status. This statement has been approved by Pelletier &Frongillo in 2003 that children's malnutrition is strongly correlated with mothers' poor nutritional status.This study also tells that Uttar Pradesh, Uttaranchal, Madhya Pradesh and Rajasthan was the states where the stunting, wasting and underweight children was more of normal women than the underweight women. It's shows that child malnutrition is not only outcome of maternal nutrition but also there will be some others factor which are directly and indirectly affects the child nutritional status. It may be household food security through public distribution systems, food intakes, socio-economic condition, literacy of parents and personal hygiene. Improving these factors may help in improving the nutritional status of children (Meshram et al., 2012).

V. SUMMARY AND CONCLUSION

Maternal and Childhood under nutrition was serious problem in "EAG states". The children of underweight mother in poor household were at much greater risk of being chronically undernourished than the children in the better household. However, the nutritional status of mothers of under-five children was varies from state to states, and in each states it was varies according to wealth quintile, place of residence and ethnicity from 1998-99 to 2005-06. Bihar, Madhya Pradesh and Assam were the states where the percent distribution of underweight women was increased in both categories of wealth index and ethnicity. Moreover, Madhya Pradesh, Rajasthan and Assam were the states where the percent of underweight women was increased in both rural and urban settings during given period. However, the overall percent distribution of underweight women was slightellyincreased in poor household, rural and SC/ST community of each selected states except Uttar Pradesh, Chhattisgarh and Orissa. The child nutrition was significantly associated with maternal nutrition in all selected states except Uttaranchal in 2005-06, whereas in 1998-99 Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan states were highly associated with maternal nutrition. Moreover, the association between mothersand child nutrition was increased in most of the states of "EAG states and Assam" during 1998-99 to 2005-06. One of the most important outcome of the this study was that those women who had normal BMI had highest number of malnourished children than underweight women in the states of Uttar Pradesh, Uttaranchal, Madhya Pradesh and Rajasthan.

Recommendation and policy implications

➢ Further research is required at regional, sub-regional and across different socioeconomic group to explore the further effecting factors on child nutritional status.

➢ State wise differences in maternal and child nutrition highlighted by this study and also appear that maternal nutrition is not a only issue of malnourished children but also there is some other important factors involved in that ie. wealth index, place of residence, caste etc. Hence, at later stage in professional achievement that need to be further studied.

➢ At policy level, there is need to reducing economic inequality and implementing some more services in EAG states and Assam will be key to improving nutritional status of under-five children.

➢ The states needs to focus on place of residence and caste differences on maternal and child nutrition in separate attention to implement the policies.

➢ The study shows that that Rural areas, Poor household, SC/ST group was more suffering from malnutrition in EAG-states and Assam. Therefore, there is need to prepared separate policy for these vulnerable section of the society.

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