Progress in Stunting, and Underweight towards Millennium Development Goals in EAG States, India

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Introduction

Under nutrition is a significant cause of morbidity and mortality in infants and young children and is considered as a major public health problem around the world. The proportionate reduction in the underweight children below five years of age was an indicator of the Millennium Development Goals set by the United Nations in 2000. The Sustainable Development Goals, set by the United Nations to be achieved by 2030, target to ending all forms of malnutrition by 2030 through setting internationally agreed targets in terms of reduction in the prevalence of stunting and wasting in children below five years of age and addressing the nutrition needs of adolescent girls, pregnant women, lactating mothers and older persons. Worldwide, around one in every nine people (around 795 million) are estimated to be under nourished whereas more than two-third of the hungry people of the world live in Asia. In the developing countries, one in every three children suffers from stunted growth (UNDP, 2015). The latest estimates show that about 38 per cent children below five years of age are stunted while about 36 per cent are underweight (IIPS, 2017).

Under nutrition among women and children is the underlying cause of 3.5 million deaths, accounts for 35 per cent of the disease burden in children below five years of age and lowers by 11 per cent the total global disability adjusted life year (Black et al, 2008). Despite the impressive economic growth that India has witnessed in the recent past, the challenge of under nutrition among women and children of India continue to persist. Reduction in the prevalence of under nutrition is necessary for improving survival of children, reduction in the incidence of acute and chronic diseases, healthy development, and economic productivity of individuals and societies (Bryce et al, 2008; Victora et al, 2008; Swaminathan et al, 2019). Under nutrition during pregnancy contributes to poor fetal and early childhood growth and increased infant morbidity and mortality, with long-term adverse consequences for child development and life-long health (Black et al, 2013). Among Indian states, infant mortality is exceptionally high in Madhya Pradesh, Odisha, Uttar Pradesh, Rajasthan, Chhattisgarh, Bihar, and

Uttarakhand (Government of India, 2011). The child under nutrition arises from a combination of low birth weight, sub-optimum feeding, and infections such as diarrhea (Paul et al, 2011). In a recent study, it is found that the burden of under nutrition was disproportionately concentrated among poor children. In addition, average decline in under nutrition concealed large economic disparities across space and time in India (Pathak and Singh, 2011). Recent evidence suggests that under nutrition leads to increased likelihood of developing chronic diseases, and hence leads to high child morbidity and mortality. It also reduces long term physical development, cognitive skills, and consequently has a negative effect on school enrolment and productivity in later life (Swaminathan et al, 2019). Evidence also shows that under nutrition remains a leading problem in most parts of India. However, it is the most pronounced in Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan. In these states, more than half the children are under weight and stunted. Nearly half of the children in Orissa, Maharashtra and West Bengal are under weight while 50 per cent of children in Assam and Haryana are stunted. States having the lowest proportion of under weight and stunted children are Goa, Kerala, and all north-eastern states except Tripura and Meghalaya (Arnold, Nangia and Kapil, 2004; Mishra, Roy and Retherford, 2004; Nair, 2007).

It is in the above context that the present paper analyses the trend in the prevalence of stunting and underweight in the states of India in the context of the progress towards the targets set under the Millennium Development Goals and Sustainable Development Goals of the United Nations. The analysis is also expected to contribute to setting priorities, formulating policies and designing programmes directed towards addressing child under nutrition in India.

Data and Methods

The present study is based on the data available through four rounds of National Family Health Survey (NFHS) which were conducted during 1992-93 (NFHS-I); 1998-99 (NFHS-II); 2005- 2006 (NFHS-III); and 2015-16 (NFHS-IV). The NFHS provides information on fertility, mortality, and essential aspects of nutrition, health, and health care, especially for children aged 0-5 years. In order to assess the nutritional status of children, NFHS provides information about height and weight of children by age. Data about height and weight of children are available for all states of the country except for NFHS I in which data about height of children were not collected in Andhra Pradesh, West Bengal, Himachal Pradesh, Madhya Pradesh, and Tamil Nadu due to operational constraints. Based on the data on height and weight, z-scores related to height-for-age, weight-for-age and weight-for-height have been calculated for every child below five years of age following the approach recommended by the World Health Organization. In addition, clinical anthropometric and biochemical(CAB) component of NFHS-4 also provided data pertaining to the prevalence of under nutrition, anaemia, hypertension, HIV and blood glucose level through a series of bio-marker tests and measurements. In NFHS-IV, data related to height and weight of women aged 15-49 years and men aged 15-54 years were also collected. Details about the NFHS methodology are given elsewhere including the instruments used for measuring height and weight of children and adults - women and men - (IIPS, 2017).

Based on the z-score for height-for-age, weight-for-age and weight-for-height, the nutritional status of every child was first classified into three categories: mild (-2 $\leq$ z <-1); moderate (-3 $\leq$ Z <-2); and severe (z <-3) and then modelled the time trend during 1992 through 2016 as a linear trend plus a smooth non-linear trend at the state level. The co-variates included in the analysis are age of the child, sex of the child, birth order, size of child at birth, birth weight, mother's age at the time of birth, mother's body mass index (BMI), mother's education, place of residence, caste, religion, economic condition of the household, and different household amenities. The analysis is limited to the Empowered Action Group states where the demographic and health situation is substantially below the national average. These states are Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh, and Uttarakhand.

Results

Our analysis shows that there has been a reduction in the prevalence of severe stunting in children below five years of age in EAG states during the two and a half decades between 1992 and 2016. The largest reduction in the proportion of the stunted children below five years of age occurred in Odisha where the proportion of stunted children below five years of age decreased from 25 per cent in 1992 to 12 per cent in 2015. The proportion of the severely stunted children has, however, remained the highest in Bihar throughout the period under reference, although, the proportion of severely stunted children in the state decreased from 38 per cent in 1992 to 21 per cent in 2015. Uttar Pradesh and Rajasthan have also reported a decrease in the prevalence of severely stunted children below five years of age during this period from 32 to 20 per cent and from 25 to 17 per cent respectively. On the other hand, when all eight EAG states are taken together, the data available through the National Family Health Survey suggest that, although, the nutritional status of children improved between 1992 to 2015 but it did not reach optimum level as envisioned by the growth standards of the World Health Organization. In Madhya Pradesh, the prevalence of severe stunting in children below five years of age decreased from 28 per cent in 1998 to 17 per cent in 2015 which means that, between 1998 and 2015, the prevalence of severe stunting in children below five years of age in the state decreased by about 37 per cent. Uttarakhand, Jharkhand and Chhattisgarh states came into existence in 2000 only so that data for these states are not available from NFHS I. However, data available from NFHS II indicate that the prevalence of severe stunting in children below five years of age decreased from 25 per cent in 1998 to 19 per cent in 2015 in Uttarakhand. Similarly, the prevalence of severe stunting decreased from 22 per cent to 14 per cent in Jharkhand and from 26 per cent to 15 per cent in Chhattisgarh during this period. This means that the prevalence of stunting in children below five years of age decreased by about 21 per cent in Jharkhand; by about 36 per cent in Uttarakhand and by about 40 per cent in Chhattisgarh between 1998 and 2015. The analysis also suggests that the prevalence of severe stunting in children below five years of age has increased in children belonging to the richest income group between 2005 to 2015 in Bihar, Rajasthan, Jharkhand Uttarakhand, and Chhattisgarh.

Discussion

The variation in the level and the trend in stunting and underweight across EAG states of India indicates high child under nutrition during the period 1992 through 2015. The present analysis indicates progress in the nutritional status of children over time in all EAG states but the prevalence of severe stunting has still been found to be very high in Bihar, followed by Uttar Pradesh Madhya Pradesh, Jharkhand, Rajasthan, Uttarakhand, and Odisha. The prevalence of severe underweight has been found to be the highest in Jharkhand followed by Bihar, Madhya Pradesh, Uttar Pradesh, Chhattisgarh, Rajasthan, Odisha and Uttarakhand. An earlier study (Tran et al, 2017) has also found that several states in India have made considerable progress in terms of the nutritional status of children in the last decade but the progress has not been uniform. Another study has also observed a pronounced improvement in stunting, underweight, and overall anthropometric failure, as well as in sever under nutrition, especially, severe stunting (Nie et al, 2019). Poor nutritional status of children is major development and public health issue in the EAG states of the country. Maternal mortality and infant mortality is also relatively higher in these states, especially, in Madhya Pradesh and Odisha. Many programmes have been launched in these states to combat child under nutrition but the situation still remains to be serious.

When all the eight EAG states are taken together, the present analysis suggests that, although, the nutritional status of children in these states has improved over time, yet it is still far away from the optimum nutritional status envisioned by the World Health Organization. Similar observations have also been made by Tran et al (2017). The government of India has recently launched the National Nutrition Mission (NNM) to address the challenge of child under nutrition, especially, in the EAG states. The main goal of NNM is to achieve significant improvement in the nutritional status of children aged 0-6 years, adolescent girls, pregnant women and lactating mothers in a time bound manner. Different EAG states have also launched state specific schemes to combat child under nutrition. The impact of these programmes and interventions is, however, yet to be seen.

Conclusions

The evidence available through the National Family Health Survey suggests that there has been an improvement in the nutritional status of children below 5 years of age in the EAG states of the country, although, the targets set under the Millennium Development Goal could not be achieved by 2015. The main challenge in these states to combat child under nutrition is the formulation of policy up to the village level. Lack of awareness about many programmes and interventions about combatting child under nutrition in these states is a very big issue because of very low female literacy. The nutritional status of women and children has improved in these states but the rate of improvement has been very slow. The Government of India has recently launched the Mothers' Absolute Affection (MAA) Programme throughout the country. This programme is directed towards the promotion of breastfeeding in the context of improving the nutritional status of children. The Programme aims at revitalising efforts to promote, protect

and support breastfeeding practices though the public health care delivery system to achieve higher breastfeeding prevalence. It is expected that the promotion of breastfeeding through the MAA Programme launched by the Government of India will have a telling impact on the nutritional status of children in the EAG states of the country.

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Table 1
Prevalence of severe, moderate and mild stunting and underweight in children below five years of age in EAG states, India.

States	NFHS Round				
	I	II	III	IV	% change
Severe stunting					
Bihar	37.4	32.4	26.5	21.1	-43.5
Uttar Pradesh	31.8	30.4	29.3	19.6	-38.4
Odisha	24.9	16.7	19.4	12.0	-51.7
Rajasthan	24.3	28.4	21.1	16.8	-30.9
Madhya Pradesh	NA	27.5	23.5	17.3	-37.2
Jharkhand	NA	NA	24.6	19.4	-21.1
Uttarakhand	NA	NA	21.5	13.8	-35.8
Chhattisgarh	NA	NA	25.5	15.4	-39.5
Moderate stunting					
Bihar	21.2	20.2	25.3	23.7	11.7
Uttar Pradesh	23.4	23.7	23.3	23.7	1.6
Odisha	21.4	25.6	24.1	21.0	-1.8
Rajasthan	17.1	22.7	19.7	20.7	21.1
Madhya Pradesh	NA	22.4	23.3	21.4	-4.6
Jharkhand	NA	NA	23.2	23.7	2.3
Uttarakhand	NA	NA	19.9	18.7	-5.9
Chhattisgarh	NA	NA	26.5	20.3	-23.4
Mild stunting					
Bihar	18.0	19.8	22.3	23.7	31.8
Uttar Pradesh	22.2	23.0	21.0	25.2	13.6
Odisha	24.8	26.2	25.4	28.1	13.4
Rajasthan	19.0	23.2	23.4	25.7	34.9
Madhya Pradesh	NA	23.1	25.1	25.5	10.3
Jharkhand	NA	NA	23.5	23.8	1.2
Uttarakhand	NA	NA	25.2	24.4	-2.9
Chhattisgarh	NA	NA	24.2	28.1	16.4
Severe under-weight					
Bihar	32.1	25.3	24.3	15.1	-52.9
Uttar Pradesh	23.6	21.6	16.7	12.2	-48.2
Odisha	22.6	20.0	14.4	9.4	-58.4
Rajasthan	18.8	20.7	15.5	11.8	-37.0
Madhya Pradesh	29.1	23.9	26.1	13.9	-52.2
Jharkhand	NA	NA	25.9	17.4	-33.0
Uttarakhand	NA	NA	14.4	7.8	-45.6
Chhattisgarh	NA	NA	17.4	11.2	-35.4

States	NFHS Round				
	I	II	III	IV	% change
Moderate underweight					
Bihar	31.0	27.8	31.8	27.7	-10.6
Uttar Pradesh	33.6	29.0	25.4	26.0	-22.5
Odisha	30.8	33.6	26.2	24.5	-20.5
Rajasthan	21.9	29.1	23.9	23.5	7.2
Madhya Pradesh	30.9	30.3	32.9	27.5	-11.0
Jharkhand	NA	NA	29.6	28.8	-2.7
Uttarakhand	NA	NA	21.0	17.6	-16.2
Chhattisgarh	NA	NA	29.2	25.7	-11.9
Mild underweight					
Bihar	20.6	25.0	28.6	32.5	57.4
Uttar Pradesh	25.2	25.9	32.5	34.3	36.3
Odisha	24.5	27.1	33.4	33.6	37.3
Rajasthan	23.7	28.4	31.8	32.8	38.6
Madhya Pradesh	23.6	25.9	25.1	33.6	42.7
Jharkhand	NA	NA	26.6	31.8	19.3
Uttarakhand	NA	NA	31.5	32.1	1.9
Chhattisgarh	NA	NA	32.4	36.4	12.1

Source: Authors' calculations

Table 2
Prevalence of severe, moderate and mild stunting in children below 5 years of age in EAG states by wealth index.

States	Wealth index	NFHS Round			
		I	II	III	IV
Bihar	Poorest	40.30	37.68	33.80	25.78
	Poorer	40.44	31.80	28.27	19.18
	Middle	33.98	29.64	28.26	12.32
	Richer	33.00	24.42	12.54	10.09
	Richest	22.18	16.92	5.00	6.86
Uttar Pradesh	Poorest	34.40	37.09	39.28	28.18
	Poorer	33.65	33.98	32.76	21.57
	Middle	30.92	32.82	26.41	16.59
	Richer	32.00	23.07	23.37	12.57
	Richest	22.54	11.29	10.37	7.96
Odisha	Poorest	32.66	22.08	29.62	17.42
	Poorer	26.53	14.52	18.36	11.88
	Middle	21.75	16.64	13.35	7.90
	Richer	18.32	7.08	5.91	5.41
	Richest	8.77	3.64	4.58	5.26
Madhya Pradesh	Poorest	NA	36.20	30.18	21.69
	Poorer	NA	37.09	19.10	18.93
	Middle	NA	26.79	22.26	14.62
	Richer	NA	16.16	18.12	15.26
	Richest	NA	9.47	15.09	10.36
Rajasthan	Poorest	23.81	40.42	32.46	25.19
	Poorer	27.93	32.87	25.87	19.75
	Middle	26.32	28.61	18.38	15.15
	Richer	24.19	24.00	16.19	12.32
	Richest	18.03	12.45	6.05	11.04
Jharkhand	Poorest	NA	NA	31.64	24.29
	Poorer	NA	NA	20.47	18.67
	Middle	NA	NA	17.97	15.42
	Richer	NA	NA	16.13	9.17
	Richest	NA	NA	3.66	7.86
Uttarakhand	Poorest	NA	NA	36.34	25.94
	Poorer	NA	NA	35.77	17.84
	Middle	NA	NA	28.12	17.00
	Richer	NA	NA	20.12	9.66
	Richest	NA	NA	6.99	10.10
Chhattisgarh	Poorest	NA	NA	30.35	20.52
	Poorer	NA	NA	29.45	17.04
	Middle	NA	NA	18.55	14.71
	Richer	NA	NA	18.73	8.22
	Richest	NA	NA	4.87	8.84

States	Wealth index	NFHS Round			
		I	II	III	IV
		Moderate stunting			
Bihar	Poorest	21.41	19.38	24.21	24.77
	Poorer	22.95	23.25	27.11	25.07
	Middle	19.86	20.89	29.74	21.62
	Richer	22.74	16.28	21.75	17.81
	Richest	13.34	16.00	16.67	13.15
Uttar Pradesh	Poorest	23.28	27.25	24.22	25.83
	Poorer	23.77	21.26	21.26	26.71
	Middle	25.84	22.00	27.02	23.46
	Richer	21.18	25.02	22.06	21.78
	Richest	21.50	22.16	20.86	16.08
Odisha	Poorest	21.94	25.86	29.74	25.51
	Poorer	21.22	31.60	22.08	23.48
	Middle	25.16	24.22	25.42	16.65
	Richer	21.83	21.71	15.84	14.01
	Richest	8.72	14.49	9.77	8.78
Madhya Pradesh	Poorest	NA	23.91	20.94	23.12
	Poorer	NA	20.26	27.49	22.63
	Middle	NA	25.64	26.68	23.41
	Richer	NA	24.50	24.61	19.27
	Richest	NA	16.26	17.09	15.55
Rajasthan	Poorest	17.46	18.38	17.29	22.88
	Poorer	16.67	24.02	19.68	22.28
	Middle	14.74	24.99	20.83	22.57
	Richer	18.71	22.74	24.97	19.45
	Richest	17.49	22.64	16.32	15.23
Jharkhand	Poorest	NA	NA	22.18	25.22
	Poorer	NA	NA	28.01	25.40
	Middle	NA	NA	24.77	23.88
	Richer	NA	NA	29.86	19.59
	Richest	NA	NA	10.06	11.79
Uttarakhand	Poorest	NA	NA	27.10	20.01
	Poorer	NA	NA	25.50	20.92
	Middle	NA	NA	22.65	23.14
	Richer	NA	NA	21.52	18.08
	Richest	NA	NA	11.96	13.54
Chhattisgarh	Poorest	NA	NA	26.09	21.11
	Poorer	NA	NA	29.24	21.15
	Middle	NA	NA	28.38	22.04
	Richer	NA	NA	27.92	18.19
	Richest	NA	NA	14.61	16.89

States	Wealth index	NFHS Round			
		I	II	III	IV
		Mild stunting			
Bihar	Poorest	15.81	17.91	23.39	22.36
	Poorer	17.08	17.58	20.83	25.44
	Middle	19.64	20.92	16.94	25.91
	Richer	22.53	26.28	23.74	24.71
	Richest	23.29	29.25	36.65	22.22
Uttar Pradesh	Poorest	20.81	19.43	17.19	22.26
	Poorer	20.96	22.94	21.16	25.19
	Middle	20.97	21.47	20.68	27.05
	Richer	24.81	28.57	24.80	27.79
	Richest	26.80	26.42	25.48	26.58
Odisha	Poorest	24.32	24.49	21.93	27.73
	Poorer	25.27	26.67	26.54	29.18
	Middle	25.69	26.31	27.87	29.18
	Richer	22.08	31.03	31.40	28.12
	Richest	28.46	26.63	25.88	20.55
Madhya Pradesh	Poorest	NA	14.89	25.29	24.35
	Poorer	NA	19.12	23.55	24.63
	Middle	NA	26.02	26.61	26.44
	Richer	NA	28.88	25.30	27.13
	Richest	NA	32.06	25.79	26.66
Rajasthan	Poorest	14.81	18.43	18.39	23.09
	Poorer	22.07	21.38	20.85	24.87
	Middle	17.54	23.00	28.17	27.04
	Richer	21.61	27.12	24.82	26.78
	Richest	21.86	26.96	26.68	26.45
Jharkhand	Poorest	NA	NA	19.44	21.75
	Poorer	NA	NA	28.96	24.93
	Middle	NA	NA	29.21	26.12
	Richer	NA	NA	26.45	27.54
	Richest	NA	NA	29.67	25.44
Uttarakhand	Poorest	NA	NA	11.61	13.77
	Poorer	NA	NA	20.74	24.51
	Middle	NA	NA	24.38	22.16
	Richer	NA	NA	31.45	28.56
	Richest	NA	NA	26.09	24.55
Chhattisgarh	Poorest	NA	NA	23.33	26.44
	Poorer	NA	NA	21.98	27.64
	Middle	NA	NA	28.08	30.59
	Richer	NA	NA	19.89	30.61
	Richest	NA	NA	33.03	27.14

Source: Authors' calculations

Weighing obesity with anthropometric measures

Table 1 /State/

Table 5

India 2019