RESEARCH ARTICLE

DOES HOUSEHOLD WEALTH STATUS PLAY AN IMPORTANT ROLE IN REDUCING CHRONIC CHILDHOOD UNDER-NUTRITION IN MEGHALAYA?

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ARTICLE INFO	ABSTRACT
	Most of the population in Meghalaya lives in poverty and are unable to obtain proper food for them while historically improvement in households economic conditions have benefited by only certain groups of the society. Thus, the problem of household food insecurity and under-nutrition remain critically important for the state of Meghalaya like any other developing countries of the world. Analysis of the study is based on 4,409 children aged 0-59 months (U-5) with the valid information on heights included in the fourth round of National Family Health Survey (NFHS-4). Objectives of this study is to examine how wealth status of households associated with nutritional status of children and what extent the children in poorer households were at greater risk of chronically undernourished than children in better-off households. The results of the study indicates that17% of the 4,409 children U-5 lives in the poorest 20% households are 3 times more likely to stunted as compared to the children in the richest 20% households [OR=3.09 at 95% CI (1.98-4.81)]. The effect of household wealth status on stunting significantly large when the analysis was adjusted for child's age, sex, birth order and duration of breastfeeding [OR=3.66 at 95% CI (2.14-6.25)]. Children born to poorest households are about 4 times [RRR=4.06, at 95% CI (1.63-10.09)] more likely to be severely stunted and 2 times [RRR=2.45, at 95% CI (1.07-5.62)] more likely to be moderately stunted as compared to the children in richest households. This study conclude that household wealth inequality is strongly associated with childhood stunting and its play an important role in reducing chronic childhood under-nutrition in Meghalaya. This study emphasizes that the state government's direct investments in improving food availability and access to poor households, making services more accessible to vulnerable population, as well as direct targeted nutrition and health interventions for young children will be key to improving health and nutritional status of children in Meghalaya.

INTRODUCTION

Despite the good economic performance over the last two decade, with more than 200 million food-insecure people, India is home to the largest number of hungry people in the world (FAO 2008; Nair 2007; Mazumdar 2010). India solely carrying the burden of 46.6 million stunted children, a third of world's total as per Global Nutrition Report 2018. According to the current trend analysed by India's food and nutrition security reports (2019), 31.4% of Indian children will be stunted by 2022 which means they will not be able to grow and develop properly. Though, stunting has declined by one fifth during last decade with an annual decline of around one percent (during 2005-06 to 2015-16) in India. Still the prevalence of stunting is above 30 percent across all states in

India, except Goa and Kerala while Bihar and Meghalaya worst performed among all the states of India (Food and Nutrition Security Analysis, India, 2019). As per the National Family Health Survey (NFHS-3) reports conducted during 2005-06, around 55% of the children under the age of five are stunted and 30% of them are severely stunted in Meghalaya. This figure represents one of the highest rates of chronically undernourished children in the country. Meghalaya is basically an agricultural state with about 80% of its population depending entirely on agriculture for their livelihood. Nearly 10% of the geographical area of Meghalaya is under cultivation which is characterised by limited use of modern techniques, low yields and low productivity. As a result, despite the vast majority of the population being engaged in agriculture, most of the population engaged in agriculture remain poor and imports food from other Indian states. The most of the indigenous people of Meghalaya lives in traditional, thatched roof huts, without basic amenities. The

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lack of basic amenities is directly or indirectly responsible for the prevalence of high childhood morbidities and malnutrition in this region. A number of studies have shown that children from poorer households trend to be more undernourished than children in the better-off households (Zere & McIntyre 2003;Hong et al 2006;Kanjilal et al 2010). However, the relationship between economic inequality and nutritional status of children is not conclusive. Generally economic growth does not benefit all sectors of the society equally and hence economic inequality across the country affects different sectors of the society differently. Economic well-being at the household level represents the availability of better food, hygienic living condition, better access to health services and nutritional status of children (Rao et al 2003; Singh et al 2015). In this study we examine how wealth status of household associated with nutritional status of children and its potential in reducing chronic childhood under-nutrition. We also examine effect of others potential risk factors and confounding factors on childhood under-nutrition and measure the extent to which children in poorer households were at greater risk of chronic under-nutrition than children in better-off households.

MATERIALS AND METHODS

Analysis of data in this study is based on 4,409 children aged 0-59 months (U-5) with valid information on height (WHO-1995) included in the fourth round of National Family Health Survey (NFHS-4) conducted during April to September, 2015. Children whose information on height out of plausible limits (14) and flagged cases (231) were excluded from the analysis. The NFHS collected demographic, socioeconomic and health data from a representative sample of 9,202 women aged 15-49 years form 7,327 households. The survey used a stratified two-stage design while the national census, 2011 served as the sampling frame for selection of Primary Sampling Unites (PSUs). Generally PSUs were villages in rural areas and Census Enumeration Blocks (CEBs) in urban areas. The overall response rates of household and women were 98.2% and 96.9% respectively. Details of the sampling design are provided in the main NFHS-4 repots (IIPS and Macro International, NFHS-4, 2015-16). To assess the nutritional status of children, the survey measured the height and weight of all the children U-5. The nutritional status of children in this study was measured by a z-score of height-for-age. Which is serves as a good proxy for chronic under-nutrition among children.

A child is defined as stunted (chronically undernourished) if his/her height-for-age Z-score is below minus two standard deviations (-2 SD) from the median of the international reference population recommended by the World Health Organization. Children who are below minus three standard deviations (-3 SD) are considered severely stunted (Dibley et al 1987). In case of binary logistic regression we categorized the outcome variable as not stunting and stunting. While in case of multinomial logistic regression, we categorized as not stunting, moderately stunting, and severely stunting. Stunting includes both moderate and severe stunting. In this study household wealth index is used as a proxy indicator for overall household economic condition (Svedberg 2000; Moatula & Lhungdim 2014) which is estimated from several household durable assets and amenities using principal component analysis (PCA) technique. For this households were given scores based on the number and kinds of consumer goods that

they own, ranging from a television to a bicycle or car, and housing characteristics such as source of drinking water, toilet facilities and flooring material. National wealth quintiles are compiled by assigning the household scores to each usual household's member, ranking each person in the household's member by their score, and then distributing it into five equal categories namely poorest, poorer, middle, richer and richest each with 20 percent of the population.

Potential risk factors and confounders: Since household wealth inequality is associated with maternal nutritional status and other socioeconomic and demographic factors that can also affect the childhood nutritional stats (Hong & Mishra 2006). Therefore, in this study we used selected potential risk factors and confounders to estimate the adjusted effects of household wealth status on chronic childhood under-nutrition. These factors included - age of the children (0-5, 6-11, 12-23, 24-35, 36-47, 48-9), sex(boy, girl), birth order (1, 2, 3, 4, 5+) and duration of breastfeeding (never, 0-11, 12-17, 18-23, 24-29, 30+); mother's age (15-24, 25-34, 35-49), mother's education (no education, primary, secondary, higher),mother's body mass index (BMI)(<18.5, 18.5-24.9, ≥25.0 kg/ m^2) and anaemia status of mothers (not anaemic, anaemic); household accessing of safe drinking water (yes, no), availability of a hygienic toilet facility(yes, no) and residence (rural, urban). Table 1 presents the variable definitions in more details. The results are presented as percent of stunting and significance level (p-value) in bivariate analysis, results from binary and multinomial logistic regressions are presented as odds ratios (OR) and as relative risk ratios (RRR) respectively with 95% confidence interval (CI). The whole analysis is done by using STATA statistical software (STATA-14).

RESULTS

Seventeen percent of the 4,409 children aged 0-59 months (U-5) lives in the poorest 20% household while 40% of the children belongs to the poorer 20% household in Meghalaya which indicates a huge number of population lives in the poverty (Table 1). Male and female are equally distributed. Around 27% of the children were of single order birth and 20% of the children were of 5 and above ordered birth. In Meghalaya, about 93% of the 4409 children were breastfed while One-third (32.8%) of them stopped breastfeeding after the age of one year and only 14% of the them continue breastfeeding even after the age of 30 months. The majority children (56%) belongs to mothers with aged (25-34) years and one in every five children (20%) were born to mother with no education. About three quarter (75.9%) of the children born to mother with normal body mass index (18.5-24.9 kg/m^2) while 48% of the 4,409 children were born to anaemic mothers. By residence, majority of the children (87%) lives in rural area and only 13 % lives in urban areas. About half (48.4%) of the children lives in the household where no access of safe drinking-water facility and nearly three-quarter (72%) of the children born to household where no hygienic toilet facility is available. Overall, 44% of the children U-5 are stunted in Meghalaya (Table 1) which represent a higher rate of chronic childhood under-nutrition even above the national average (38%) and in fact, in the South Asian region (Food and Nutrition Security Analysis, India, 2019). The prevalence of stunting children declined from 51% to 25% as household standard of living increased form poorest to richest wealth quintile respectively (p=0.000). Prevalence of stunting children are less common in the early age of life and it increased rapidly with the age of children and birth order as

Table 1. Distribution of sample size and stunting children aged U-5 by household wealth status and other potentials factors, Meghalaya, 2015-16

Characteristic	No. of Children (Sample)	Distribution of children (weighted %)	Prevalence of Stunting children (%)
Meghalaya	4,409	100.0	44.0
Household wealth status			p=0.000
Richest	132	3.3	25.2
Richer	425	9.3	28.5
Middle	1,353	29.8	43.5
Poorer	1,768	40.5	46.7
poorest	731	17.1	51.0
Age(months)of children			p=0.000
0-5	360	8.4	13.2
6-11	428	10.4	25.7
12-23	846	20.2	42.5
24-35	833	19.1	49.2
36-47	913	21.7	52.2
48-59	859	20.2	51.44
Sex of child			p=0.001
Male	2,179	50.0	46.7
Female	2,230	50.0	41.5
Birth order of child			p=0.000
1	1,182	27.2	38.9
2	1,039	23.8	42.7
3	782	17.5	43.5
4	527	11.8	43.5
5 and above	879	19.7	53.1
Breastfeeding (months) Status			p=0.000
Never	243	7.3	49.4
0-11	1,039	32.8	27.4
12-17	703	21.6	45.2
18-23	400	12.0	45.8
24-29	392	12.3	45.9
30	470	14.1	37.5
Age(years) of mothers			p=0.130
15-24	1,016	22.9	41.4
25-34	2,443	55.6	44.2
35-49	950	21.5	46.3
Mothers Education			p=0.000
No education	870	20.0	46.4
Primary	1,309	29.7	51.5
secondary	1,978	44.1	39.6
Higher	252	6.3	32.2
Mother's BMI status (kg/m^2)			p=0.000
<18.5	590	14.4	53.7
18.5-24.9	3,383	75.9	43.3
25.0	408	9.8	36.8
Anaemia Status of mothers			p=0.001
Not Anaemic	1,794	51.9	49.0
Anaemic	1,706	48.1	43.3
Pace of Residence			p=0.001
Urban	564	13.4	37.18
Rural	3,845	86.6	45.05
Safe drinking water*			p=0.494
No	2,048	48.4	43.4
Yes	2,361	51.6	44.5
Hygienic toilet**			p=0.004
No	1,258	28.3	40.24
Yes	3,151	71.7	45.46

*Safe drinking water includes piped into dwelling, piped to yard/plot, public tap/stand pipe, tube well or borehole, protected well, protected spring, **Hygienic toilet includes flush to piped sewer system, flush to septic tank, flush to pit latrine, ventilated improved pit latrine. BMI= Body mass index, Source: Based on Author's computation from NFHS-4(2015-16)

expected because birth order is correlated with the age of children. Prevalence of stunting children are quite higher (49.4%) among never breastfed children compared to breastfed children. Children born to younger mothers (15-24 years) are less likely to be stunted as compared to older mothers but this difference is not statistically significant (p=0.130). As expected, children belongs to mothers with no education and less education are more likely to be stunted, 46.4% and 51.5 % respectively (p=0.000). Prevalence of stunting children negatively associated with the BMI status of mothers and it is generally high in rural areas (45%) than urban areas (37%).

Contrary to expectation, anaemia status of mothers, availability of safe drinking-water and hygienic toilet facility are not significantly associated with stunting.

Effect of household wealth stats in reducing childhood stunting: The unadjusted odds of stunting are 3.09 times higher among children living in the poorest 20% households than children in the richest 20% households [OR=3.09 at 95% CI (1.98-4.81)] (Table 2, model 1). The odds of stunting declines gradually as households economic conditions increases. This relationship is slightly low when the analysis was adjusted for child's age, sex, birth order, duration of breastfeeding and maternal characteristics [OR=2.95 at 95% CI (1.56-5.60)] (model 3).

Table 2. Binary logistic regression estimates the effects of household wealth inequality and other potential factors on childhood stunting, Meghalaya, 2015-16

Variables	Odds ratio (95% confidence interval)			
	Model 1	Model 2	Model 3	Model 4
Household wealth status				
Richest*	-	-	-	-
Richer	1.18 (0.73-1.89)	1.46(0.83-2.55)	1.28 (0.68-2.41)	1.29 (0.68-2.42)
Middle	2.28 (1.48-3.50)	2.52(1.51-4.22)	2.21 (1.21-4.03)	2.26 (1.22-4.16)
Poorer	2.60 (1.69-3.98)	2.92 (1.75-4.87)	2.32 (1.26-4.26)	2.46 (1.31-4.62)
poorest	3.09 (1.98-4.81)	3.66 (2.14-6.25)	2.95 (1.56-5.60)	3.26 (1.67-6.34)
Age(months)of children				
0-5*		-	-	-
6-11		2.19 (1.44-3.32)	2.11 (1.40-3.31)	2.30 (1.48-3.39)
12-23		5.78 (3.57-9.38)	2.77 (1.78-4.31)	2.90 (1.86-4.53)
24-35		8.38 (5.23-13.44)	3.94 (2.56-6.08)	4.07 (2.63-6.29)
36-47		7.89 (4.94-12.62)	3.82 (2.49-5.86)	3.88 (2.53-5.95)
48-59		9.07 (5.60-14.70)	4.48 (2.86-7.01)	4.64 (2.96-7.27)
Sex of child				
Male		-	-	-
Female		0.78 (0.67-0.92)	0.79 (0.66-0.94)	0.79 (0.67-0.94)
Birth order of child				
1*		-	-	-
2		1.10 (0.87-1.38)	1.17 (0.90-1.52)	1.17 (0.90-1.52)
3		1.03 (0.80-1.33)	1.21 (0.89-1.63)	1.19 (0.88-1.61)
4		1.08 (0.81-1.43)	1.32 (0.93-1.86)	1.28 (0.91-1.81))
5 and above		1.72 (1.35-2.18)	2.28 (1.63-3.19)	2.18 (1.55-3.06)
Breastfeeding (months) Status				
Never*		-	-	-
0-11		1.193 (0.78-1.80)	1.43 (0.91-2.26)	1.43 (0.91-2.26)
12-17		1.037 (0.71-1.51)	1.13 (.75-1.70)	1.10 (0.73-1.66)
18-23		1.03 (0.69-1.54)	1.19 (0.77-1.81)	1.16 (0.75-1.78)
24-29		0.85 (0.58-1.25)	1.03 (0.68-1.56)	1.03 (0.68-1.57)
30		0.60 (0.41-0.88)	0.76 (0.51-1.14)	0.78 (0.53-1.17)
Age(years) of mothers				
15-24*			-	-
25-34			0.95 (0.73-1.22)	0.96 (0.74-1.24)
35-49			0.67 (0.48-0.95)	0.68 (0.48-0.96)
Mother's Education				
No education*			-	-
Primary			1.22 (0.95-1.58)	1.20 (0.93-1.55)
secondary			0.98 (0.75-1.26)	0.97 (0.75-1.26)
Higher			1.13 (0.70-1.81)	1.12 (0.70-1.80)
Mother's BMI status (kg/m^2)				
<18.5*			-	-
18.5-24.9			0.58 (0.45-0.75)	0.59 (0.46-0.76)
25.0			0.51 (0.35-0.74)	0.52 (0.36-0.76)
Anaemia Status of mothers				
Not Anaemic*			-	-
Anaemic			0.98 (0.82-1.17)	0.99 (0.83-1.18)
Pace of Residence				
Urban*				-
Rural				1.13 (0.86-1.49)
Safe drinking water				
No*				-
Yes				1.28 (0.86-1.49)
Hygienic toilet				
No*				-
Yes				1.05 (1.04-1.56)

*Reference group, See Table 1 for variable definitions, Source: Based on Author's computation from NFHS-4(2015-16)

However, in the full model while the analysis was adjusted for maternal and child's characteristics with place of residence, availability of safe drinking-water and hygienic toilet facility, the effect of household's wealth stats on stunting significantly large. With these all factors controlled, children among the poorest 20% households are 3.26 times more likely to stunted as compared to the children in the richest 20% households [OR=3.26 at 95% CI (1.67-6.34)] (model 4). We found that household wealth status has a strong negative effect on childhood stunting in each model (Table 2). These results clearly reveals that the household economic well-being has played an important role in reducing childhood stunting to some extent. Table 3 provides the estimates from the multinomial logistic regression with adjusted effect of household wealth status on moderate and severe stunting

separately. It shows that children born to poorest 20% households are about 4 times [RRR=4.06, at 95% CI (1.63-10.09)] more likely to be severely stunted and 2 times [RRR=2.45, at 95% CI (1.07-5.62)] more likely to be moderately stunted as compared to the children in richest 20% households. Children belongs to middle class family (middle wealth quintile) are nearly 3 times [RRR=2.65, at 95% CI (1.24-5.67)] more likely to be moderately stunted as compared to the children in economically well-off family (richest wealth quintile).

This results indicates that the household wealth inequality has strong negative effects on both moderate and severe stunting, but the effect is significantly stronger for severe stunting than moderate stunting.

Table 3. Multinomial logistic regression estimates the effects of household wealth inequality and other potential factors on moderate and severe stunting among children aged U-5, Meghalaya, 2015-16

Variables	Relative risk ratio (95% CI)	
	Moderate stunting	Severe stunting
Household wealth status		
Richest*	-	-
Richer	1.65 (0.76-3.58)	0.81 (0.32-2.04)
Middle	2.65 (1.24-5.67)	1.72 (0.73-4.04)
Poorer	2.44 (1.12-5.33)	2.41 (1.00-5.76)
poorest	2.45 (1.07-5.62)	4.06 (1.63-10.09)
Age(months)of children		
0-5*	-	-
6-11	1.96 (1.13-3.15)	3.84 (2.01-6.32)
12-23	2.16 (1.28-3.66)	4.33 (2.37-7.93)
24-35	2.72 (1.63-4.56)	6.78 (3.76-12.22)
36-47	3.55 (2.16-5.85)	4.30 (2.37-7.81)
48-59	4.23 (2.51-7.14)	5.24 (1.81-7.76)
Sex of child		
Male	-	-
Female	0.81 (0.66-1.00)	0.77 (0.61-0.97)
Birth order of child		
1*	-	-
2	1.12 (0.82-1.53)	1.24 (0.87-1.77)
3	1.20 (0.84-1.72)	1.19 (0.79-1.80)
4	1.17 (0.77-1.79)	1.43 (0.91-2.26)
5 and above	2.10 (1.41-3.13)	2.29 (1.47-3.57)
Breastfeeding (months) Status		
Never*	-	-
0-11	1.38 (0.81-2.36)	1.48 (0.82-2.66)
12-17	1.23 (0.76-1.99)	0.95 (0.56-1.63)
18-23	1.05 (0.63-1.76)	1.27 (0.73-2.21)
24-29	1.16 0.71-1.89()	0.87 (0.50-1.52)
30	0.65 (0.40-1.04)	0.99 (0.59-1.66)
Age(years) of mothers		
15-24*	-	-
25-34	0.91 (0.67-1.23)	1.03 (0.73-1.45)
35-49	0.66 (0.44-1.00)	0.71 (0.45-1.12)
Mother's Education		
No education*	-	-
Primary	1.38 (1.00-1.89)	1.03 (0.75-1.43)
secondary	1.09 (0.79-1.50)	0.87 (0.62-1.20)
Higher	1.33 (0.76-2.31)	0.90 (0.46-1.77)
Mother's BMI status		
<18.5*		
18.5-24.9	0.63 (0.47-0.86)	0.54 (0.39-0.75)
25.0	0.622 (0.40-0.95)	0.42 (0.25-0.68)
Anaemia Status of mothers		
Not Anaemic	-	-
Anaemic	0.94 (0.76-1.16)	1.06 (0.84-1.34)
Pace of Residence		
Urban*	-	-
Rural	1.11 (0.80-1.53)	1.19 (0.81-1.77)
Safe drinking water		
No*	-	-
Yes	1.29 (1.01-1.64)	1.27 (0.97-1.65)
Hygienic toilet		
No*	-	-
Yes	0.95 (0.75-1.21)	1.17 (0.90-1.52)

*Reference group, See Table 1 for variable definitions, Source: Based on Author's computation from NFHS-4(2015-16)

Role of other potential risk factors and confounders on childhood stunting: In this study, among the control variables, age of children and birth order has played strongest role in determining chronic childhood stunting and this effect is independent of households wealth status and others maternal and households characteristics (Table 2). When we controlled households wealth status and other factors such as age and birth order of children, duration of breastfeeding and education of mothers, residence, safe drinking-water and hygienic toilet facility - all have statistically significant effects on childhood stunting, but these effects are generally small. When all other factors controlled in model 4 (Tale 2), the effect of sex of child, mother's BMI and anaemia status, age of mothers are found small and not statistically significant. Table 3 reveals that among the control variables the effects of residence, child's age and birth order on moderate and severe stunting are significantly large but the effects is more stronger in sever stunting than moderate stunting and the effects of mother education is stronger for moderate stunting.

DISCUSSION AND CONCLUSION

Children who lives in poverty, poor health conditions with insufficient food intake, always have a higher risk of infection and lack of access to basic health care facilities (Alderman 2005; Singh 2020). The most directly manifestation of inadequate food intake and a poor diet is low birth weights, low height and high rate of infection among children. As we earlier stated that the India has a large number of hungry people distributed across the country. According to Indian State Hunger Index, not a single state in India falls in the "low hunger" or "moderate hunger" category defined by the Global Hunger Index (GHI) 2008. Instead, most states fall in the "alarming" category. Results of this study clearly indicates that the chronic childhood under-nutrition is a serious public health problem in Meghalaya. Children born to poorest 20% households are about 4 times [RRR=4.06, at 95% CI (1.63-10.09)] more likely to be severely stunted and 2 times [RRR=2.45, at 95% CI (1.07- 5.62)] more likely to be moderately stunted as compared to the children in richest 20% households. Hence it is clear evidence that the household economic stats is an important indicator of childhood stunting. In this study, we have also observed lack of sex differential in child stunting which indicates that there is no intra-household gender bias in feeding and health care for children in Meghalaya. On the other hand, this study found no significant role of mother's age, household water and sanitation conditions in childhood stunting. However in this study, we found that maternal education have only a small effect on child stunting , even when we control for mother's education, this effect does not vary to some extent.

Government of India (GOI) has launch many programs and strategic plans to improve the nutritional status of vulnerable children like- Special Nutrition Programme (1970–1971), Balwadi Nutrition Programme (1970–1971), Applied Nutritional Programme (2003). Recently the GOI has launched the Prime Minister's Overarching Scheme for Holistic Nutrition (POSHAN) Abhiyaan to improve the nutritional outcomes for children, pregnant women and lactating mothers. The GOI reveals that the POSHAN Abhiyan targeted to decline stunting at least 2 percent per annum from the existing 38.4 percent to 25 percent by 2022. Goa and Kerala have already achieved this level in NFHS-4 (2015-16) but many of the Indian states still far from this level while Meghalaya is the most one of them. One of the potential limitation of this study is that, it does not control for diet and health care indicators. Another potential limitation is - the study used an indirect measure of household wealth status. However, in developing country like India, it is hard to obtained reliable income and expenditure information. So assets-based index is generally considered as a good proxy indicator for household overall wealth status. Despite these limitations, collaborating with the central ministry, the state government's direct

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investments in improving food availability and access for poor households, making services more accessible to vulnerable population, as well as direct targeted nutrition and health interventions for young children will be key to improving health and nutritional status of children in Meghalaya.

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