

PREVALENCE AND DETERMINANTS OF CHILDHOOD ANAEMIA IN RURAL INDIA: FINDINGS FROM NFHS-5 (2019–21)

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ABSTRACT

Introduction: Anaemia among children has been a serious public health problem especially in rural areas of Indian population as around two-third of population resides in rural areas, also with various social hindrance, illiteracy and other challenges. Moreover, a recent survey (NFHS-5, 2019-21) brought an attention as it showed a huge jump in prevalence of child anaemia (6–59 months) in India from 59% to 67% despite of a number of vertical interventions across different states. This study has analysed the extent of socio-economic predictors and spatial pattern of Child anaemia in rural regions of India.

Methods: Bivariate analysis and multivariate logistic regression analysis were used to assess the effects of various socio-demographic predictors on prevalence of child anaemia (6–59 months) in rural regions of India. Further, the spatial heterogeneity and pattern in the prevalence of child anaemia in rural regions were observed at state level.

Results: Anaemic mother, younger age mother were coming out to be significant risk factor for child anaemia. For instance, mother without anaemia were 42% less likely to had anaemic child and women with age 15–19 years 1.35 times (OR: 1.35; 95% CI: 1.29–1.41) more likely to had anaemic child compare to 35–49 years women. Among other predictors, mother's low education level, high child birth order, low social and economic status, mother without media exposer were significant facilitators for child anaemia. Spatial pattern of child anaemia at state level in rural regions of India showed most of the western and central region states like Gujarat, Rajasthan, Madhya Pradesh had highest prevalence of child anaemia.

Conclusion: Our findings provide several insights into the rural population of India. The government should pay more attention to significant factors like mothers education, low social and economic class, high child birth order, media exposer, especially to the women living in states with high child anaemia prevalence.

KEYWORD: Anaemia, chi-square test, logistic regression, spatial heterogeneity, odds ratio.

1. INTRODUCTION

Childhood anaemia continues to persist a major nutritional illness and a public health issue in India, and it is closely linked to child disability and mortality. [1] According to the World Health Organization, anaemia is a condition in which the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiological needs and anaemia in children of 6–59 months of age is defined as a haemoglobin level less than 11 g per decilitre. [2] The most common cause of anaemia is iron deficiency, and other causes include nutritional deficiencies, inflammation, parasitic infections, and certain inherited hemoglobinopathies. [3–6] The recent reports of proportion of children in 6–59 months of age having anaemia in India is alarming and viewed as severe and calls for public health interventions as it increases from around 59% (2015–16) to 67% (2019–21). [7] This problem is more serious in rural part of India as around two-third of population resides in rural areas, manifold with poverty, other social hindrance and iron deficient diet and very limited iron supplements. [8]

Without timely intervention, these children grow up anaemic and often marry early, giving birth to malnourished babies with less iron reserves who turn anaemic within the first few months after birth. There is a need to intervene in this intergenerational anaemia to ensure good health of the overall population. [6, 9–11] The Indian government has however recognized the need for this intervention and has devised various strategies to combat the anaemia and malnutrition; most of these efforts are reactive, such as anaemia programs, establishment of nutritional rehabilitation centres, and umbrella efforts to better maternal and child health under the National Health Mission. [12, 13] Initiatives such as National Nutritional Anaemia Programme (NNACP), Weekly Iron and Folic Acid Supplementation (WIFS), National Iron Plus Initiative (NIPI) and Anaemia Mukta Bharat Programme (AMBP) were aimed at reducing the incidence of anaemia in women and children. [14, 15, 16] NNACP launched as early as in 1970, while NIPI and AMBP are more recent programs designed specifically to tackle anaemia among the maternal and child health populations. AMBP was an intensified version of the existing NIPI program [14, 17, 18]. However, the rate of reduction of anaemia due to all these efforts are not up to the mark and to even worsen the situation it increases in recent years. [19] The objective of this study is to

determine the risk factors of childhood anaemia and provide the spatial mapping of distribution of Prevalence of Child Anaemia in rural areas of Indian states to get a snapshot of highly focused states to look upon.

MATERIAL AND METHODS:

The data used for the study is taken from the fifth round of National Family Health Survey (2019–2021) conducted by the International Institute for Population Sciences, Mumbai. NFHS provides comprehensive information on several aspects of child nutrition. Haemoglobin testing was performed on all children age 6–59 months in the sample households using capillary blood. As per the standards of NFHS, children were considered anaemic when their haemoglobin level was below 11.0 g/dL. [7]

The final sample size of eligible children for anaemia testing included in the analysis after eliminating the missing observations from one or more variables under consideration was 131136. Ethical approval was not needed for this study as it was based on publicly available secondary data from fifth waves of the National Family Health Survey (NFHS). NFHS followed standardized procedures for data collection with ethical standards being compiled including informed consent obtained from respondents. Prevalence of anaemia among children is used as the dependent variable in the study. The dependent variable is dichotomous having 0 as “Not Anaemic” and 1 as “Anaemic. A set of background characteristics of the households along with factors associated with child and mother were used as predictors based on prior literature and availability of data. Religion, caste, wealth quintile were taken as key background characteristics and age of mother, sex of child, birth order, education of women, mother’s anaemic status were used as child and maternal factors in the study. The paper has used bivariate analysis to analyse the prevalence of anaemia among children in rural area by various predictors under consideration. Chi-square test with 5% level of significance has been used to assess association between predictors and response variable. Predictors with significant association in bivariate analysis were considered for multivariate Logistic regression analysis to their effect sizes. P-values less 5% were considered significant and 95% confidence interval has been provided. Also, Choropleth Map depicting distribution of Prevalence of Child Anaemia in rural areas of Indian states has been produced. It has been divided into three categories with prevalence 0 to 34%, 34.1% to 68% and 68.1% and above. States falling in third category are above the state average of prevalence of rural areas.

RESULTS:

Table 1: Distribution of final analytic sample of child anaemia and background characteristics in rural areas of India, (NFHS-V, 2019–2021).

Variables	Frequency (n= 131136)	Percentage (%)
Child anaemic		
No	40462	30.9
Yes	90675	69.1
Women anaemic		
No	50699	38.7
Yes	80438	61.3
Current age of women		
15-19	2980	2.3
20-34	117563	89.6
35-49	10594	8.1
Education of women		
No education	32667	24.9
Primary	17661	13.5
Secondary	66557	50.8
Higher	14251	10.9
Sex of child		
Male	68017	51.9
Female	63120	48.1
Child birth order		
1 st	48837	37.2
2 nd or 3 rd	64815	49.4
4 th or 5 th	13954	10.6
≥6	3530	2.7
Religion		
Hindu	107328	81.8
Muslim	18141	13.8
Others	5667	4.3
Caste		
SC	31993	24.4
ST	16064	12.2
OBC	56522	43.1

Others	26557	20.3
Wealth quintile		
Poorest	41547	31.7
Poorer	34585	26.4
Middle	26882	20.5
Richer	18966	14.5
Richest	9156	7.0
Media exposers		
No	45119	34.4
Yes	86017	65.6

Note: *percentage may not add up to 100, due to rounding off.

Table 2: Bivariate analysis of child anaemia by background characteristics in rural areas of India, (NFHS-V, 2019–2021).

Variables	Child Anaemia (%)	χ^2 , d.f	p- value
Women anaemic			
No	61.7	2148.97, 1	0.00*
Yes	73.8		
Current age of women			
15-19	79.9	225.32, 2	0.00*
20-34	69.2		
35-49	65.5		
Education of Women			
No education	72.8	450.77, 3	0.00*
Primary	70.3		
Secondary	68.3		
Higher	63.4		
Sex of child			
Male	69.1	0.038, 1	0.84
Female	69.2		
Child birth order			
1 st	67.6	121.37, 3	0.00*
2 nd or 3 rd	69.6		
4 th or 5 th	71.5		
≥6	72.7		
Religion			
Hindu	69.6	89.11, 2	0.00*
Muslim	68.4		
Others	63.8		
Caste			
SC	71.0	445.30, 3	0.00*
ST	75.0		
OBC	67.2		
Others	67.4		
Wealth quintile			
Poorest	72.5	485.62, 4	0.00*
Poorer	69.6		
Middle	67.7		
Richer	65.5		
Richest	64.0		
Media expose			
No	71.9	250.82, 1	0.00*
Yes	67.7		

Note: χ^2 : Chi-square; d.f: degree of freedom; *: significant at $\alpha=5\%$

Table 3: Result of Associations between selected predictors and child anaemia in rural areas of India. (NFHS-V, 2019–2021).

Variables	Variable's categories	Logistic Regression Model	
		OR	95% CI
	Intercept	1.59*	1.38-1.67

Women Anaemic	No	0.58*	0.57-0.60
	Yes	Ref.	-
Current age of women	15-19	2.44*	2.20-2.71
	20-34	1.35*	1.29-1.41
	35-49	Ref.	-
Education of women	No	1.24*	1.18-1.31
	Primary	1.14*	1.08-1.20
	Secondary	1.10*	1.06-1.15
	Higher	Ref.	-
Child birth order	1 st	0.74*	0.67-0.80
	2 nd or 3 rd	0.81*	0.75-0.88
	4 th or 5 th	0.86*	0.79-0.94
	≥6	Ref.	-
Religion	Hindu	1.34*	1.26-1.43
	Muslim	1.30*	1.22-1.39
	Others	Ref.	-
Caste	SC	1.12*	1.08-1.16
	ST	1.33*	1.26-1.39
	OBC	0.97	0.94-1.01
	Others	Ref.	-
Wealth quintile	Poorest	1.06*	1.01-1.12
	Poorer	1.02	0.97-1.08
	Middle	1.01	0.96-1.06
	Richer	0.98	0.93-1.03
	Richest	Ref.	-
Media Exposer	No	1.06*	1.03-1.09
	Yes	Ref.	-

Note: * Significant at $\alpha=5\%$

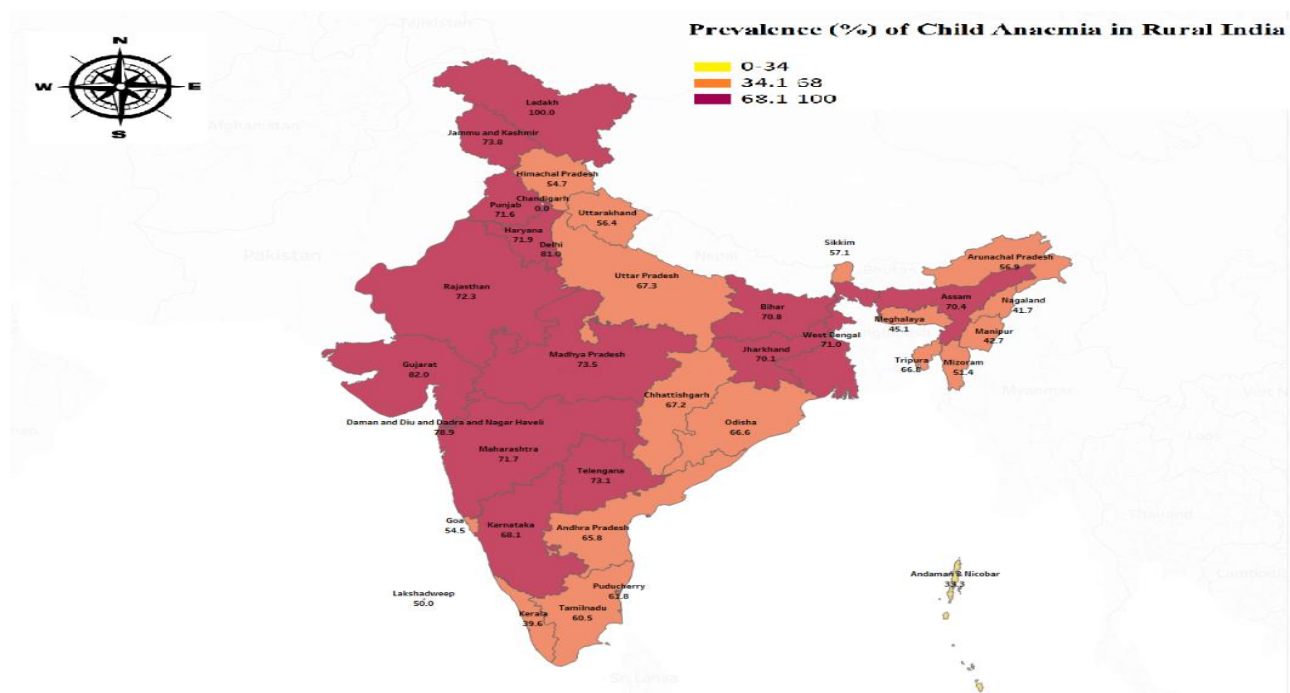


Fig. 1: Choropleth map depicting distribution of Prevalence of Child Anaemia in rural areas of Indian states, (NFHS-V, 2019-21).

Table 1 showing the frequency and percentage of child anaemia and background characteristics in rural areas of Indian states. Out of 131136 children more than two-third of the children was anaemic. Also 61.3% of women given birth in the last five years preceding the survey were also anaemic. Most of the women were of age group 20-34 years and with secondary level of education. Almost half of the children were of birth order 2nd or 3rd. Combined SC/ST women comprises of about one third of all women of rural areas. Majority of the mothers belonging to the poorest wealth quintile. Around one third of mother were not having any kind of media exposer viz; newspaper, television or radio.

Table 2 showing bivariate analysis of child anaemia by selected background characteristics in rural areas of India. The factors which are coming out to be significant (5% level of significance) here were only selected under multivariate logistic regression. It is very clear from the table that except sex of child all other factors were coming out to be significant.

Table 3 showing multivariate result of possible association between the predictors (which came out to be significant under bivariate analysis) and child anaemia in rural areas of India at 5% level of significance. Compared to anaemic mother, mother without anaemia were 42% (OR: 0.58; 95% CI: 0.57-0.60) less likely to had anaemic child. Child anaemia is coming out to be quite significant in younger age mother, as for example women with age 15-19 years and 20-34 were 1.35 times (OR: 1.35; 95% CI: 1.29-1.41) and 2.44 times (OR: 2.44; 95% CI: 2.20-2.71) more likely to had anaemic child respectively compared to women of age group 35-49 years. Education of women is also coming out to be significant predictors for child anaemia in rural areas of India. Likelihood of anaemic children decreases as education level increases for mother. For instance compared to women with higher education, women without education and primary level of education were respectively 24% and 14% more likely to had anaemic child. With reference to mother having six and above child birth order, women with first birth order were 26% (OR: 0.74; 95% CI: 0.67-0.80) less likely to had anaemic children. Hindu and Muslim women were respectively 34% and 30% more likely to had anaemic children compared to women of other religion. Also, Child in SC and ST categories were 1.12 times and 1.33 times more likely to had anaemic child compared to other caste (i.e., other than SC, SC, and OBC caste). Media exposer is coming out to be significant predictor as women not exposed to any media were 1.06 times (OR: 1.06; 95% CI: 1.03-1.09) more likely to had anaemic children compared to their counterparts. Women belonging to poorest wealth quintile were 1.06 times (OR: 1.06; 95% CI: 1.01-1.12) more likely to had anaemic children compared to richest categories women. However, other wealth quintile categories women viz; middle, Richer were coming out to be statistically similar to richest wealth quintile women at 5% level of significance.

Fig.1 shows the state wise prevalence of anaemia among children of 6-59 months. The national prevalence of child anaemia in rural area is found to be around 68%. The map shows most of the western region states and union territory of India had highest prevalence of child anaemia in rural areas viz; Maharashtra (71.7%), Gujarat (82%), Ladakh (100%), Telengana (73.1%), J&K (73.8%), Madhya Pradesh (73.5%), Dadra and Nagar Haveli (78.9). Also, Bihar (70.8%), Jharkhand (70.1%), West Bengal (71%) and Assam (70.4%) have more than the national average prevalence of child anaemia of rural areas. With the pattern of distribution, we can observe the northern states viz; Himachal Pradesh, Uttarakhand, Uttar Pradesh, eastern and southern region states like Odisha, Chhattisgarh, Andhra Pradesh, Tamil Nadu, Kerala and north-eastern states except Assam has the prevalence rate between 34.1% to 68%. The clustering of the disease was more in the central region and western region states.

DISCUSSION:

This study attempted to assess the influence of the socio-demographic conditions on the anaemic condition of 6-59 month old children in rural regions of India anaemia is still considered to be a major public health problem especially in rural region of India as majority of population resides in rural areas, manifold with impoverishment, other social hindrance and iron deficient diet and very limited iron supplements. [8] Though the levels of anaemia among children vary by background factors like lowest household wealth quintile and maternal factors, more than half of the children in India are suffering either from mild or moderate anaemia. Quite significant proportion of children had mild and moderate anaemia, while few remained in the severe category. An uneven patterning of anaemia is observed where the highest burden of anaemia is shared by the poorest people.

Maternal age showed an effect with anaemia status of their children, mothers age (35 years and above) shows a protective effect for anaemia in children compared to mother in lower age group. This could be due to low maternal age contributes to low birth weight (LBW) babies, in turn, LBW in children might contribute to low haemoglobin level in the blood. [20-23] In support with our findings, conclusions from other studies also indicate that women with low educational level were more likely to have anaemic children, shows a significant association between education and anaemia. [24, 25] This could be because of the mother's level of education, in its turn, influences the practices related to the child's health care. [26] In our study Anaemia mother proved to be a significant biological factor of children suffering from anaemia, they are at risk of developmental difficulties. This is supported by various other studies as well. [27, 28] Our study shows Hindu and Muslim women were more likely to anaemic children compared to women of other religion. Also likelihood of Child Anaemia is higher in SC and ST categories against other castes. Social factors were found to be significantly associated with the prevalence of anaemia among children reported by other studies as well. [29, 30] In this study, children with lower birth orders in a family were less likely to be anaemic compared to those with six or above birth order, which is supported by various other studies. [31, 32] This could be because an increase in the number of children associated with increased health problems due to competition for food, infections, and cross contaminations. [33] The findings of the study reveal a higher prevalence of worse anaemic status among children of the most indigent socioeconomic status. On the contrary, the children belonging to the highest and most well-off households even in rural setups are associated with better nutritional status and were less vulnerable to get anaemia. This proves the point here, that socioeconomic status becomes an important determinant of distribution of anaemia and malnutrition among children across the states in rural regions. This socioeconomic inequality widens the gap between rich and poor and acts as an important factor of improving or degrading the development of an individual in the society and proves the fact that we are a deeply unequal society borne out by several yardsticks. [34, 35] This study also indicated that children from mothers with no media exposure were 1.06 times more likely be anaemic compared to those from mothers with media exposure. This finding is supported by other studies where children from mothers with no media exposure were more likely to report anaemia compared to their counterparts. [36, 37] The reason could be mothers' media exposure may affect childcare practices through enhancing the

knowledge of mothers on child feeding activities, disease prevention practices, and improving health-seeking behaviours. [38]

Our study observed that trend and pattern was the same over different states, but varied slightly in magnitude. Severe anaemia prevalence was seen among western and central zone states. The states identified were Gujarat, Rajasthan, Madhya Pradesh, Haryana, Jammu and Kashmir, Karnataka, and Maharashtra. These states need to be focused more. Northern region states viz; Uttar Pradesh, Uttarakhand and southern zone states like Andhra Pradesh, Tamil Nadu and north-eastern states except Assam showed mild level of Prevalence of child anaemia in rural regions.

CONCLUSION:

Our research sheds light on a pressing issue: the alarming levels of child anaemia in rural India, and uncovered crucial insights, pinpointing risk factors such as young mothers, limited education, high birth order, media isolation, religion, and caste categories. Economic status also plays a pivotal role. Moreover, spatial variability of child anaemia in rural areas of India enhanced the findings of this paper. Hence, the government should focus on these high-prevalence states, working hand in hand with local health offices, and concerned organizations to pay more attention to these significant factors like wealth index, education of mother, media exposure and safeguard our children from the grip of anaemia.

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