



PREVALENCE OF DIARRHEAL DISEASES AND ASSOCIATED RISK FACTORS AMONG UNDER-FIVE CHILDREN IN NINE PRIORITY STATES OF INDIA: EVIDENCES FROM NFHS-4 (2015-16)

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Abstract: Diarrhoeal disease is the second leading cause of death among children aged under 5 years of age, and is accountable for death toll of 0.5 million children every year globally. In 2015, deaths from diarrhoea in India, among children under five accounted for 10 percent (117,285) of all deaths among children below the age of five. Thus, the aim of the present study is to investigate the prevalence of diarrheal diseases and associated risk factors among under-five children in nine priority states of India. The study used data from the fourth round of the National Family Health Survey (NFHS-IV), which was conducted during 2015–16. In the NFHS-IV survey, a total of 259,627 children under 5 were collected from India, out of which a total of 157,358 children from nine selected states were analysed. The study used Stata/MP Version 14.1 for appropriate bivariate and multivariate statistical analysis. The study has found that the 11 percent of children under age five years had diarrhoea in the two weeks before the survey: it was recorded highest in Uttarakhand (17%), followed by Uttar Pradesh (15%), and Bihar (10%). The prevalence of diarrhoea rises from 14 percent among children under age six months to 19 percent among those age 6-11 months, when complementary foods and other liquids are introduced. Prevalence remains high (16%) at age 12-23 months, which is the time when children begin to walk and are at increased risk of contamination from the environment. The results depicted in table shows that the age of the child, antenatal clinic visits, caste religion and WASH indicator were significantly associated with the risk of diarrhoea among children.

Keywords- Diarrhoea, Risk factors, NFHS, Priority states, Under-five children

I. Introduction

Globally, there are almost 1.7 billion cases of childhood diarrhoeal disease every year (WHO, 2020a). Mortality from diarrhoea has reduced over the past two decades from an expected 5 million deaths among children under five to 1.5 million deaths in 2004 (UNICEF/WHO, 2009). Diarrhoeal disease is the second leading cause of death among children aged under 5 years of age, and is accountable for death toll of 0.5 million children every year. Diarrhoea can last several days, and can leave the body without the water and salts that are necessary for survival. Earlier, for most people, severe dehydration and fluid loss were the leading causes for diarrhoea deaths. Now, other causes such as septic bacterial infections are probable to account for a growing share of all diarrhoea-associated deaths. Children who are undernourished or have reduced immunity as well as people living with HIV are at higher risk of life-threatening diarrhoea (WHO, 2017).

Diarrhoea is defined by the World Health Organization (WHO) as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual). It is usually a sign of an infection in the intestinal tract, which can be produced by a range of bacterial, viral and parasitic organisms. Infection is spread through adulterated or unhygienic food or drinking-water, or from person-to-person as a result of poor hygiene. Diarrhoea can last a number of days, and can leave the body deprived of the water and salts that are essential for survival. The risk of diarrhoea comes from dehydration. It is a main cause of death and severe illness in children under five years old (WHO, 2020b). A substantial extent of diarrhoeal disease can be prevented through safe drinking-water and suitable sanitation and hygiene (Keusch et al., 2016). Most diarrhoea can be take care from oral-rehydration and zinc (Bhutta et al., 2000). Breastfeeding affectedly decreases the risk of diarrhoea, ill health and mortality (Lamberti et al., 2011). In 2015, deaths from diarrhoea in Indian children under five accounted for 10% (117,285) of all deaths among children below the age of five (Tripathi, 2018). Thus, the aim

of the present study is to investigate the prevalence of diarrheal diseases and associated risk factors among under-five children in nine priority states of India.

II. Data Source and Methodology

The study used data from the fourth round of the National Family Health Survey (NFHS-IV), which was conducted during 2015–16. The survey collected a sample of 0.6 million (IIPS & ICF, 2017) households from 640 districts in 36 states /union territories, based on the 2011 census. The surveys provide information on important health, nutrition, and demographic indicators of the country. For this study nine priority states have been selected (Rajasthan, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, Odisha and Assam). These states have adverse health and demographic indicators as acknowledged by the Ministry of Health & Family Welfare, Government of India (RGI, 2011). There are a total of 304 districts in these states. The DHS Kids Recode dataset (IAKR74DT) (DHS, 2020) has been used for analysis. Unit of analysis: Child under age 5 born to a woman interviewed. In the NFHS-IV survey, a total of 259,627 children under 5 were collected from India, out of which a total of 157,358 children from nine selected states were analysed. The study used Stata/MP Version 14.1 for appropriate bivariate and multivariate statistical analysis. The coding plan of the selected study variables is given in Table 1. Each variable has been carefully constructed using the DHS Statistics-7 (Ver. 2) (Croft et al., 2020) guide.

III. Results

The distribution of the sample in different categories of selected variables is shown in Table 2. The nine selected states accounted for more than 60 percent (0.16 million) of India's total sample (0.26 million) of children under 5 years of age. Twenty percent children were less than 1 year of age and 60 percent were 2 or more years old. Fifty-two percent were male and 48 percent were female. One-third of the total children were firstborn and about 21 percent were born at fourth or higher order. About 10 percent of the total children were born to adolescent mothers and about one-fifth (18%) were born to women 30 years of age or older. Twenty-eight percent of the mothers underweight (BMI <18.5 kg/m²) and 10 percent were overweight (BMI >25.0 kg/m²). About three-fifth women were anaemic. The distribution of women by number of antenatal care visits show that a quarter (25%) of them had no visits and 32 percent had four or more visits. Almost half of the women had had no mass media exposure. Educational attainment shows that 42 percent of women never received formal education and only 8 percent received higher education. The majority of children (82%) were from rural areas. Nearly one-third of the children were from Scheduled caste (SC)/ Scheduled tribe (ST) and over one-half were from Other Backward Class (OBC). Over four-fifths of the children belong to Hindu religion followed by Muslim (16%) and other. Over three-fifth children were from either poor or poorest wealth quintile and about 20 percent were either from the richer or richest group.

The prevalence of diarrhoea among children aged under 5 in nine selected states of India is shown in Figure 1. Eleven percent of children under age five years had diarrhoea in the two weeks before the survey. Further, it shows that the prevalence of diarrhoea was observed highest among children belong to in Uttarakhand (17%), followed by Uttar Pradesh (15%), and Bihar (10%). The lowest diarrhoeal prevalence was observed in Assam (3%), Jharkhand (7%) and Rajasthan (7%). The prevalence of diarrhoea rises from 14 percent among children under age six months to 19 percent among those age 6-11 months, when complementary foods and other liquids are introduced. Prevalence remains high (16%) at age 12-23 months, which is the time when children begin to walk and are at increased risk of contamination from the environment (Figure 2).

Overall, the mothers reported that 11 percent of children under age five years had diarrhoea in the two weeks before the survey. It varies from 5 to 17 percent across the different categories of background characteristics. The prevalence of diarrhoea observed higher among the children aged below 1 year (17%), and it declines upto 7 percent among children aged above 24 months. There is not much difference in the prevalence of diarrhoea by sex of the child. The prevalence of diarrhoea among children belong to younger mothers (14%) was higher than those in the older ages (10%). The antenatal care visits of pregnancy, mothers' access to information, education, and place of residence has not much difference on the prevalence of diarrhoea among children under 5. Across different ethnic groups the children belong to scheduled tribe (8%) had recorded lowest prevalence of diarrhoea. Whereas, children belong to Muslim religion had recorded highest prevalence of diarrhoea (13%), followed by Hindu (11%). Diarrhoea by wealth status of the household also shows no impact on its prevalence. The three WASH indicators taken in this study has also no impact on the prevalence of diarrhoea among children. Diarrhoea by these 3 WASH indicators are safe drinking water, toilet facility and stool disposal facility available with the household varies between 10 and 11 percent only.

Table 3 shows the adjusted odds ratio or risk factors for diarrhoea among children aged under 5 years by selected background characteristics in nine priority states of India. The results depicted in table shows that the age of the child, antenatal clinic visits, caste religion and WASH indicator were significantly associated with the risk of diarrhoea among children. The children aged above 24 months were 49 percent less likely to observe diarrhoea compared to children aged below 1 year. Risk factor by caste group show that children belong to scheduled tribe (36%), other backward class (10%) and other caste (11%) were less likely to experience diarrhoea. Whereas by religion, the children belong to Muslim were 1.3 times more likely and Christian were 46 percent less likely to experience diarrhoea compared to reference category.

IV. Discussion

In the present study, the prevalence rates of diarrhoeal diseases among children under age of 5 years in the two weeks before the survey was found to be 11 percent. The prevalence rates of diarrhoea decreased significantly with increased age. These rates were highest in the age group of 6–11 months (19%) and were lowest among children aged 48–59 months (5%). This might be the consequence of the weakening of maternally attained antibodies and the beginning of weaning foods that are given in unhygienic way in rural areas. Apart, crawling typically begins at this age and the risk of putting unclean materials and fingers in the mouth during teething, is high especially in the rural settings, where these fingers are usually contaminated due to poor personal hygiene. In upper age groups, perhaps lower rate may occur because the children have started adopted to the milieu and food habits and the resistant system have developed to a large extent (Ahmed et al., 2008). The sex of the child had no significant effect on period prevalence rate of diarrhoea. The present study did not found the significant position relation with the safe drinking water and proper disposal of the child's stool. Whereas, it has been found in other studies that an increase in the unsafe disposal of children's stool in the community also increased the risk of diarrhoea in children (Bawankule et al., 2017). Curtis et al. (2001) advocated that health promotion programmes, through health education and mass media, resulted in 4 percent rise in safe disposal of stool in Burkina Faso (Curtis et al., 2001).

Figure 1: Prevalence of diarrhoea by State among children aged 0-59 months

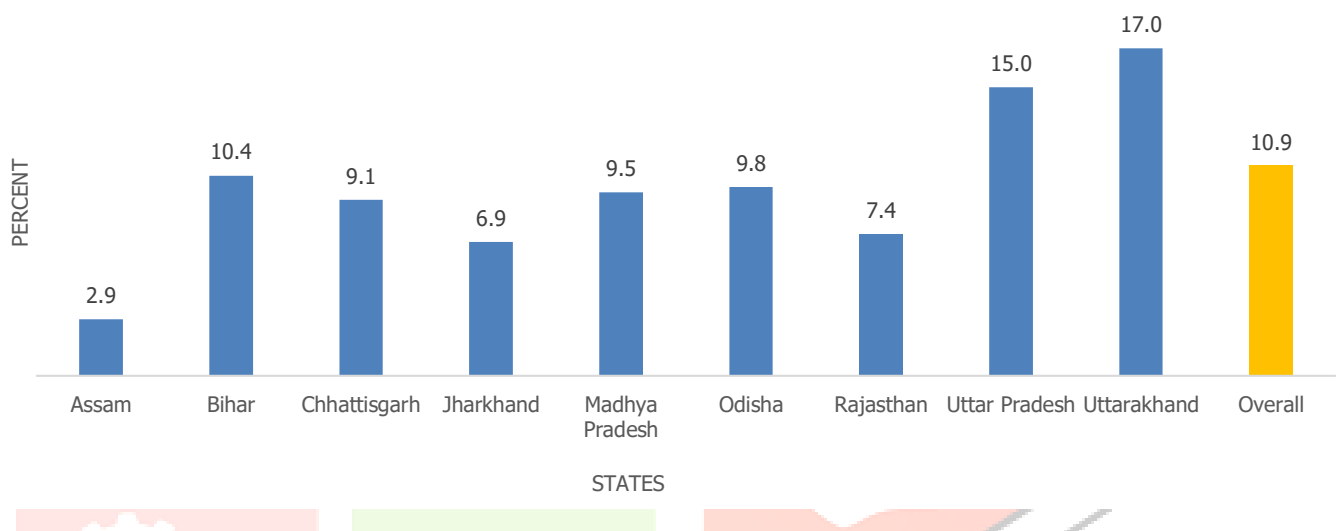


Figure 2: Prevalence of diarrhoea by age among children aged 0-59 months

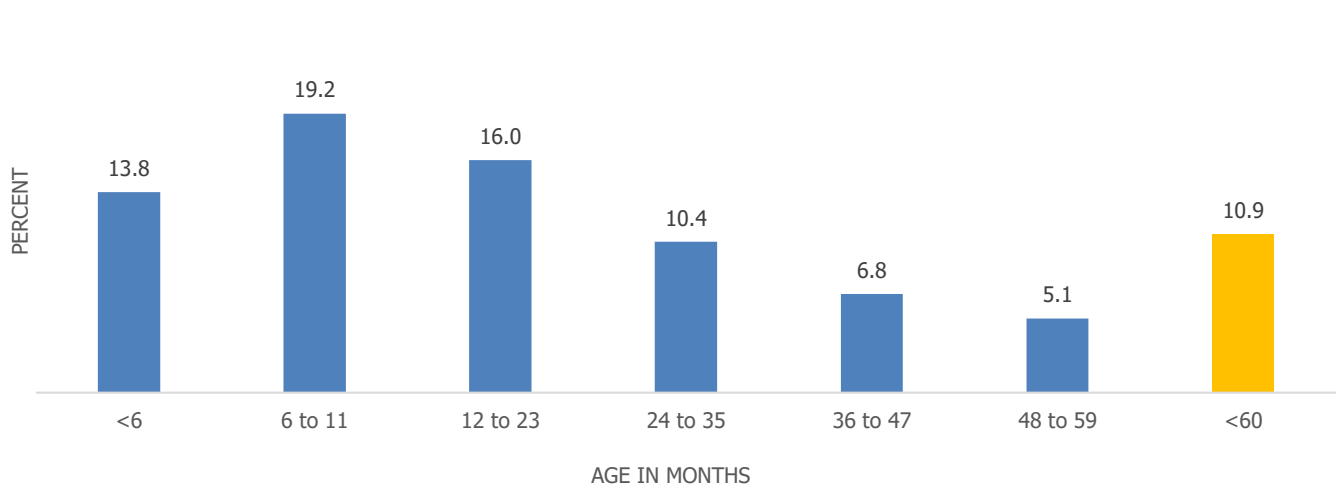


Table 1: Description of selected outcome and independent variables		
Variable	Description and Categorization	Analysis coding
Outcome variables		
Diarrhoea	Children under age 5 with diarrhoea at any time in the 2 weeks preceding the survey	Recoded for analysis as: 0 = No 1 = Yes
Explanatory variables		
Age of child (months)	The age of the child present in the month (0-59) is divided into three categories of months.	Recoded for analysis as: 1 = 0 to 11 2 = 11 to 23 3 = 24 to 59
Sex of child	Sex of child as reported in the birth history	Used same coding for analysis: 1 = Male 2 = Female
Mother's age	Current age of the mother	Recoded for analysis as: 1 = 19 and below 2 = 20 to 24 3 = 25 to 29 4 = 30 and above
ANC visits	Number of antenatal visits during pregnancy	Recoded for analysis as: 0 = No visit (0) 1 = Less frequent visits (1-3) 2 = Frequent visits (3+) [No visit includes "No antenatal visit" and "Don't know"]
Mother's access to information	Women regularly exposed to mass media. At least once a week: 1. Newspapers and magazines, 2. Television, 3. Radio, and At least once a month: 1. Cinema	Recoded for analysis as: 0 = No 1 = Yes [Yes includes regularly exposed to any mass media]
Education	Highest educational level No education– Women who never went to school; Primary– Women who did not complete one year of schooling even after going to school and those who completed 1 to 5 years of schooling; Secondary– 6 to 12 years of schooling; and Higher– More than 12 years of schooling.	Used same coding for analysis as: 0 = No education 1 = Primary 2 = Secondary 3 = Higher
Residence	Type of place of residence	Used same coding for analysis as: 1 = Urban 2 = Rural
Caste	The caste or tribe of the head of the household	Recoded for analysis as: 1 = Schedule caste 2 = Schedule tribe 3 = Other backward class 4 = Other [Others include, e.g., None of the above, and Don't know]
Religion	The religion of the head of the household	Recoded for analysis as: 1 = Hindu 2 = Muslim 3 = Other [Others include, e.g., Christian, Sikh, Buddhist/Neo-Buddhist, Jain, Jewish, Parsi/Zoroastrian, No religion, and Other]
Wealth index	Constructed using data on a household's ownership of selected assets via principal components analysis. The household's ownership of a number of consumer items include such as a television and car; dwelling characteristics such as flooring material; type of drinking water source; toilet facilities; and other characteristics that related to wealth status. Each household is assigned a standardized score for each asset, where the score differs depending on whether or not the household owned that asset. These scores are summed by household, and individuals are ranked according to the total score of the household in which they reside. The sample is then divided into population quintiles -- five groups with the same number of individuals in each to create the break points that define wealth quintiles.	Used same coding for analysis as: 1 = Poorest 2 = Poorer 3 = Middle 4 = Richer 5 = Richest
Drinking water	The main source of drinking water for members of the household	Recoded for analysis as: 1 = Improved 2 = Unimproved
Type of toilet facility	The type of toilet facility members of the household usually use	Recoded for analysis as: 1 = Improved 2 = Unimproved
Disposal of children's stools	Children whose stools are disposed of appropriately	Recoded for analysis as: 1 = Proper 2 = Improper

Table 2: Percent distribution of children aged 0-59 months by selected characteristics in nine priority states of India, NFHS 2015-16

Background characteristics	Percent	Number
Age of child (months)		
0 to 11	19.9	29344
12 to 23	19.9	29285
24 to 59	60.2	88528
Sex of child		
Male	52.2	82177
Female	47.8	75181
Mother's age		
19 and below	2.5	3910
20 to 24	31.1	48988
25 to 29	38.3	60319
30 and above	28.1	44141
Antenatal clinic visits		
No visit (0)	21.8	24474
Less frequent visits (1-3)	44.0	49535
Frequent visits (3+)	34.2	38509
Mother's access to information		
No	47.6	74913
Yes	52.4	82445
Education		
No education	39.7	62510
Primary	15.5	24410
Secondary	37.4	58792
Higher	7.4	11646
Place of residence		
Urban	19.1	30104
Rural	80.9	127254
Caste		
Schedule caste	20.4	31360
Schedule tribe	15.4	23762
Other backward class	47.5	73190
Other	16.7	25640
Religion		
Hindu	82.2	129270
Muslim	15.5	24424
Christian	1.1	1781
Other	1.2	1883
Wealth index		
Poorest	36.7	57796
Poor	25.0	39340
Middle	16.7	26206
Richer	12.2	19152
Richest	9.5	14864
Drinking water		
Improved	83.9	131965
Unimproved	16.1	25393
Type of toilet facility		
Improved	35.8	56315
Unimproved	64.2	101043
Disposal of children's stools		
Proper	45.1	69386
Improper	54.9	84556
Total	100.0	157358

Table 3: Prevalence of diarrhoea among children aged 0–59 months by selected background characteristics in high priority states of India, NFHS 2015–16

Background characteristics	Percent	Number
Age of child (months)		
0 to 11	16.7	29344
12 to 23	16.0	29285
24 to 59	7.4	88528
Sex of child		
Male	11.3	77499
Female	10.5	71205
Mother's age		
19 and below	14.3	3579
20 to 24	12.4	46189
25 to 29	10.5	57375
30 and above	9.6	41561
Antenatal clinic visits		
No visit (0)	12.4	23250
Less frequent visits (1-3)	13.1	47718
Frequent visits (3+)	13.2	37443
Mother's access to information		
No	10.8	70197
Yes	11.0	78507
Education		
No education	10.4	58448
Primary	11.9	22960
Secondary	10.9	56016
Higher	11.4	11280
Place of residence		
Urban	10.8	28758
Rural	10.9	119946
Caste		
Schedule caste	11.5	29422
Schedule tribe	8.2	22395
Other backward class	11.3	69206
Other	11.2	24435
Religion		
Hindu	10.6	122136
Muslim	12.6	23078
Christian	4.9	1697
Other	7.1	1793
Wealth index		
Poorest	10.8	53994
Poor	10.8	37120
Middle	11.1	24873
Richer	11.6	18297
Richest	10.5	14420
Drinking water		
Improved	11.0	124667
Unimproved	10.1	24037
Type of toilet facility		
Improved	10.9	53722
Unimproved	10.9	94982
Disposal of children's stools		
Proper	11.3	66977
Improper	10.6	81330
Total	10.9	148307

Table 4: Adjusted odds ratio (aOR) for children aged 0-59 months had diarrhoea by selected background characteristics in nine priority states of India, NFHS 2015-16

Background characteristics	aOR	Sig	[95% CI]	
Age of child (months)				
0 to 11 ®	1.000		.	.
12 to 23	0.991		0.947	1.038
24 to 59	0.513	***	0.490	0.538
Sex of child				
Male ®	1.000		.	.
Female	0.955	**	0.920	0.991
Mother's age				
19 and below ®	1.000		.	.
20 to 24	1.053		0.947	1.171
25 to 29	0.991		0.890	1.103
30 and above	0.881	**	0.788	0.984
Antenatal clinic visits				
No visit (0) ®	1.000		.	.
Less frequent visits (1-3)	1.082	***	1.028	1.139
Frequent visits (3+)	1.117	***	1.056	1.181
Mother's access to information				
No ®	1.000		.	.
Yes	0.975		0.930	1.022
Education				
No education ®	1.000		.	.
Primary	1.073	**	1.013	1.137
Secondary	0.949	**	0.902	0.998
Higher	0.965		0.887	1.050
Place of residence				
Urban ®	1.000		.	.
Rural	1.018		0.964	1.074
Caste				
Schedule caste ®	1.000		.	.
Schedule tribe	0.646	***	0.603	0.693
Other backward class	0.909	***	0.865	0.955
Other	0.892	***	0.837	0.951
Religion				
Hindu ®	1.000		.	.
Muslim	1.323	***	1.253	1.398
Christian	0.543	***	0.423	0.696
Other	0.768	**	0.627	0.941
Wealth index				
Poorest ®	1.000		.	.
Poor	1.001		0.949	1.057
Middle	1.062	*	0.992	1.136
Richer	1.092	**	1.006	1.187
Richest	1.015		0.920	1.121
Drinking water				
Improved ®	1.000		.	.
Unimproved	0.885	***	0.839	0.933
Type of toilet facility				
Improved ®	1.000		.	.
Unimproved	1.079	***	1.024	1.137
Disposal of children's stools				
Proper ®	1.000		.	.
Improper	0.902	***	0.867	0.939

®- Reference category; aOR- Adjusted odds ratio; Sig- Significance level at 0.05; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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