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Research Article

Diarrhoea and ARI Risk Exposure Among Under-Five Children in Odisha, India: An evidence from NFHS-4

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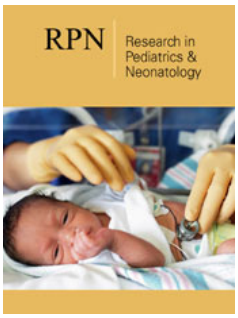

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Abstract

ARI and diarrhoea remain a major public health problem and leading causes of death among children in many countries including India. Based the on fourth round of National Family Health Survey (NFHS) India, the prevalence of Diarrhoea and ARI in Odisha and its sociocultural determinants was analysed. The results suggest that the age of the child, mother's education, place of residence, caste, place of cooking and smoking behaviour of parents is associated with ARI and diarrhoea prevalence. Policy interventions are needed to improve the economic status, nutrition status, spreading community awareness, and providing supplements can help in prevention of diarrhoea and ARIs.

Keywords: Diarrhoea; Acute respiratory infection; Under-five children; Mortality

Abbreviations: ARI: Acute Respiratory Infection; MPCE: Monthly Per Capita Consumption Expenditure; SC: Scheduled Caste; ST: Scheduled Tribe; OBC: Other Backward Class; NFHS: National Family Health Survey

Background

Acute Respiratory Infections (ARI) and diarrhea are the major leading causes of death among children aged 5 globally [1,2]. The scenario is not very improved in India. The estimated diarrhea-related death for children aged 0-6 years was 9.1% and the prevalence of diarrhea illness for Odisha was 9.8% which is higher than the national average [3]. In 2010, nearly 265,000 in-hospital deaths of young children were attributed to ARI globally, out of which 99% were reported from the developing countries [4].

Acute Respiratory Infection (ARI) is a serious infection that prevents normal breathing function. It usually begins as a viral infection in the nose, trachea (windpipe), or lungs. If the infection is not treated, it can spread to the entire respiratory system. Acute respiratory infection prevents the body from getting oxygen and can result in death. The major symptoms of ARIs are cough accompanied by short, rapid breathing that is chest-related, and/or difficulty in breathing. The prevalence of ARI in Odisha is 2.4% [3].

Higher prevalence of diarrhea and acute respiratory infection among the children under age 5 are the major factors behind the slow decline in under 5 mortalities [5,6]. Various studies show that diarrhea is the major leading causes of death among children in India. Study by Kamath et. al. show that among major states in India, Uttar Pradesh and Assam have higher prevalence of diarrhea deaths than rest of the states in India [7]. Most studies have focused that mother's education, age of the child, place of residence, wealth status of the family, improved toilet facility, and drinking water facility are the major causes of diarrhea and ARIs among children [4,7-9]. Diarrhea and ARI has been a crucial health concern in India, especially among

the children. In spite of various policy intervention, it has been an alarming concern in India. Therefore, the present study aims to show the prevalence of diarrhea and ARI among the children under age 5 in Odisha based on fourth round of National Family Health Survey (NFHS).

Methods

Data source

The present study uses data from fourth round of National Family Health Survey (NFHS) (2015-16) [3]. NFHS is large-scale survey conducted under the supervision of the Ministry of Health & Family Welfare (MoHFW), Government of India and International Institute for Population Sciences (IIPS), Mumbai, was the nodal agency for that survey. The total number of households studied were 601,509 across at the district, state/Union Territory (UT), and national levels, as well as separate estimates for urban and rural areas using two stage stratified sampling procedure [3]. The detailed sampling procedure is given in NFHS-4 report [3]. NFHS-4 collects data on health and family welfare, as well as data on emerging issues in these areas. The Clinical, Anthropometric, and Biochemical (CAB) component of NFHS-4 is designed to provide vital estimates of the prevalence of malnutrition, anemia, hypertension, HIV, and high blood glucose levels through a series of biomarker tests and measurements [3]. The present study analyzed the data from kids file, women's file and household file of NFHS-4 to show the prevalence of diarrhea and Acute Respiratory Infection among under five children in Odisha. The total study sample is 10,105 belongs to children under age five.

Primary outcome

The primary outcome of interest was diarrhea and Acute Respiratory Infection (ARI). A child had diarrhea if the mother reported that the child had diarrhea two weeks prior to the survey. ARI was reported if mother of the child reported that child has symptoms like cough accompanied by short, rapid breathing which is chest related and/or difficult breathing which is chest related.

Primary variable of interest

We assessed whether child, maternal and household level factors were associated with diarrhea and ARI in children under-5 years of age. The factors included were children's age (<6, 6-11, 12-23, 24-35, 36-47, 48-59); gender; place of residence (rural, urban); mothers education (no education, primary, secondary, higher); religion (Hindu, Muslim Christian others); caste (SC, ST, OBC, others); wealth index (poorest, poorer, middle, richer, richest); drinking water source (unimproved, improved); toilet facility (unimproved, improved), types of cooking fuel used (clean, others); place of cooking (in house, separate building, outdoor); and smoking behavior of parents (smokes cigarette/tobacco).

Data analysis

For the present study, data were analyzed using descriptive statistics and multivariable logistic regression. Descriptive statistics were used to describe the study sample, and to assess the prevalence of our primary outcomes (diarrhea and ARI) in our study sample. Regression was used to assess the relationship between primary variables of interest and primary outcomes. Data were analyzed using STATA (version 16).

Results

Table 1 shows the prevalence of diarrhea and ARI among the under 5 children in Odisha. The prevalence of ARIs varies by various socio-demographic characteristics. Male child (2.7%) aged between six to eleven months (3%), belongs to rural areas (2.7%), belongs to the poorest and middle wealth quintile are prevalent to ARI in comparison to their counterparts. In terms of mother's education, with increasing mother's education, the prevalence of ARI increases. ARI prevalence varies by smoking behavior of the parents. The prevalence of ARI is higher among children with parents having cigarette or tobacco smoking behavior (2.7%). Similarly cooking food in a separate building or outdoor can leads to higher prevalence of ARI.

Table 1: Prevalence of ARI and Diarrhea among under-five children in Odisha, 2015-16.

Sociodemographic variables	ARI Symptoms	P-value	Diarrhoea Prevalence	P-value	No. of Children
Age (in months)		**0.04**		**<0.001**	
<6	3.1		9.4		892
06-11	3.5		16.5		1002
12-23	2.7		14.3		2016
24-35	2.1		10.3		2035
36-47	2.7		7.2		2099
48-59	1.6		4.8		2061
Sex		**0.267**		**0.937**	
Male	2.7		10		5178
Female	2.2		9.7		4927
Residence		**0.072**		**<0.001**	
Urban	2		7.5		1612

Rural	2.6		10.3		8493
Mother's educational level		**0.008**		**0.01**	
No Education	1.7		9.2		3112
Primary	2.9		10.8		1454
Secondary	2.7		10.1		5019
Higher	3.2		8.8		520
Religion		**0.744**		**0.145**	
Hindu	2.5		9.9		9342
Christian	1.5		6		536
Muslim	4.4		12.8		205
Others	0		6.7		22
Caste		**0.03**		**0.002**	
SC	2.2		10.7		2180
ST	2		9.9		3174
OBC	2.3		8.3		3212
OTHERS	3.7		11.6		1539
Wealth Index		**0.114**		**0.005**	
Poorest	2.4		10.8		4141
Poorer	2.2		9.7		2617
Middle	3.5		10.1		1818
Richer	2.5		7.9		1014
Richest	0.9		5.7		515
Drinking Water Source		**0.019**		**0.095**	
Unimproved	1.6		8.3		1237
Improved water	2.6		10		8868
Type of Cooking Fuel		**0.316**			
Clean	2				1501
Unclean Fuel	2.5				8604
Food Cooked in		**0.004**			
In the house	2.1				6907
Separate building	3.4				1442
Outdoors	2.9				1756
Smoke		**0.171**			
Smokes cigarettes/ tobacco	2.7				871
Does not smoke	2.4				9234
Toilet Facility				**0.968**	
Unimproved			13.4		112
Improved			9.6		2938
Open			9.9		7055
Total	2.48				10105

Out of 10,105 under-five children the proportion of males and females with the prevalence of diarrhea is 10% and 9.7% respectively, belongs to rural areas 10.3% and urban areas 7.5%. The prevalence of ARI was highest in the age group 6-11 months (16.5%), followed by 12-23 months (14.3%), and comparatively lower in the 48-59 months' age group (4.8%). Regarding maternal educational status, prevalence of diarrhea is highest among those children having mother's education up to primary level (10.8%), followed by secondary education (10.1%). In terms of wealth index, poorest families have larger percentage of under-five children

with diarrhea prevalence (10.8%). The children with unimproved sources of toilet facilities had the highest rate of diarrhea (13.4%). In addition, the highest prevalence of diarrhea was recorded in the households that cooked food outdoor (12.8%). Regarding social composition, the prevalence of diarrhea is higher among Muslim child (12.8%) and belongs to Scheduled Castes (10.7%) and Other Backward Class community (11.6%).

The logistic regression of ARIs and Diarrhea and their associated factors is shown in Table 2. only five independent variables made a unique statistically significant contribution to the model and shows association with ARI (age category (48-59 month), mother's educational level, religion, place of cooking, and smoking behavior of parents). Children belongs to age group 48-59 months are 0.57 times less likely to suffer from ARIs (OR=0,57, CI=0.32-0.99). Mother's education is positively associated with the prevalence of ARIs. Children whose mothers are having higher education are 3 times more likely to suffer from ARIs (OR=3.12, CI=1.51-6.45). Smoking behavior of parents have been positively associated with the prevalence of ARIs. Children whose parents do not smoke are 0.6 times less likely to suffer from ARIs (OR=0.62, CI=0.40-0.96). However, it is found that in this study type of cooking fuel doesn't have any significance to the prevalence of ARIs.

Table 2: Estimated odds ratio obtained from logistic regression models of ARI and diarrhea among under-five aged children in Odisha, 2015-2016.

	ARI		Diarrhoea	
Background Characteristics	**Odds**	**C.I(95%)**	**Odds**	**C.I(95%)**
Age (In Months)				
<6®				
06-11	1.28	0.74-2.23	1.9***	1.42-2.56
12-23	1.02	0.61-1.70	1.81***	1.38-2.37
24-35	0.94	0.56-1.58	1.2	0.91-1.59
36-47	0.88	0.52-1.48	0.75	0.56-1.01
48-59	0.57***	0.32-0.99	0.49***	0.36-0.67
Sex				
Male				
Female	0.84	0.65-1.10	1	0.87-1.14
Residence				
Urban®				
Rural	1.5	0.95-2.36	1.39	1.11-1.75
Mother's educational level				
No Education®				
Primary	1.98***	1.27-3.09	1.36***	1.09-1.68
Secondary	1.91***	1.28-2.87	1.18	0.98-1.43
Higher	3.12***	1.51-6.45	1.15	0.75-1.75
Religion				
Hindu				
Christian®	1.03***	0.53-1.98	0.67***	0.47-0.96
Muslim	1.49	0.68-3.25	1.21	0.76-1.93
Others	1	0.00-0.00	0.54	0.07-4.06
Caste				
SC®				
ST	1.11	0.75-1.66	0.87	0.72-1.06
OBC	0.99	0.67-1.47	0.77	0.64-0.94
OTHERS	1.57***	1.01-2.44	1.15	0.91-1.45
Wealth Index				
Poorest®				
Poorer	0.7	0.48-1.01	0.79***	0.65-0.95
Middle	0.88	0.57-1.36	0.85	0.67-1.07

Richer	0.52	0.26-1.02	0.68***	0.48-0.97
Richest	0.26	0.09-0.79	0.54***	0.31-0.93
Drinking Water Source				
Unimproved®				
Improved water	1.81	1.08-3.04	1.2	0.96-1.50
Type of Cooking Fuel				
Clean®				
Unclean Fuel	0.99	0.57-1.71		
Food Cooked in				
In the house®				
Separate building	1.60***	1.13-2.26		
Outdoors	1.28	0.90-1.82		
Smoke				
Smokes cigarettes/ tobacco®				
Does not smoke	0.62***	0.40-0.96		
Toilet Facility				
Unimproved®				
Improved			1.32	0.67-2.59
Open			1.01	0.52-1.96

The logistic regression of diarrhea prevalence and their associated factor shows that age of the child, mothers' educational level, wealth status of the family, are major predictors of diarrhea among the under 5 children in Odisha. Children belong to the age group (6-11) months are 1.9 times more likely to have diarrhea prevalence than children of age group less than 6 months (OR=1.9, CI=1.42-2.56). Odds of having diarrhea in age group (12-23) months are 1.8 times than children <6 months (OR=1.81, CI=1.38-2.37). As age is increasing odd of having diarrhea is decreasing. The prevalence of diarrhea are 0.5 times less likely to occur for children belonging to age group (48-59) months than in age group <6 months (OR=0.49, CI=0.36-0.67).

Children living in a household where mothers are having lower education i.e., mothers having primary level of education have significantly higher prevalence of having diarrhea than those having no education (OR=1.33, CI=1.07-1.65). According to wealth quintile, the prevalence of having diarrhea among under 5 children belongs to richest background (OR=0.54, CI=0.31-0.93) is significantly lower in comparison to those children belongs to poorest background (OR=0.79, CI=0.65-0.95). In Christians community, odds of having diarrhea are 0.6 times less likely than Hindu religion and it is significant (OR=0.67, CI=0.47-0.96). In our study, types of drinking water used, and the place of cooking did not have significant impact on the prevalence of diarrhea among the children under 5 years of age in Odisha.

Discussion

The present study provides an insight into the prevalence of diarrhea and Acute Respiratory Infection (ARI) among the under 5 children in Odisha, based on the fourth round of National Family Health Survey (NFHS), India. Our study found that the prevalence of diarrhea and ARI were 9.8% and 2.4% respectively. It has been observed that children aged 6-11 and 12-23 months were associated with a higher prevalence of diarrhea, while the children aged <6 and 6-11 were having higher prevalence of ARI. Children's mothers' educational level, wealth, caste, religion, place of cooking, and smoking behavior of parents has significant association with diarrhea and ARI prevalence. This finding is consistent with many previous studies [6,10-13]. Children below age 6 months are having low prevalence of both ARI and diarrhea. The reasons as explained by previous studies that children within this age group are exclusively breastfeed, which reflect the role of breastfeeding on reducing diarrhea and respiratory infection [14,15].

Our results show children whose mothers are educated had higher prevalence of both ARI and diarrhea, which contradicts to the findings of previous studies [12]. The probable reason may be that educated mothers more accurately reports the prevalence of ARI and diarrhea than the uneducated mothers. Results also supports that those children belong to the richest wealth quintile are having lower prevalence of both ARI and diarrhea. Our findings is in conformity with the previous researches in Ghana and Ethiopia [16,17]. The reason being that richer households have quick and better access to childcare and have proper nutrition, as well as the ways to protect contamination of their floors and water. Our results are consistent with the previous studies that children in the rural setting are more prone to diarrhea and ARI in comparison to their urban counterparts [17]. Our study found that smoking behavior of parents have significant impacts on the prevalence of ARIs among the children under aged 5 years. However, we did not find any significant association between diarrhea with the sex of the

child, place of residence, sources of drinking water, and the place of cooking in our study.

The present study has several limitations. We have excluded the nutritional intake of the children, BMI, knowledge, and awareness about these diseases into our study which can be future research areas. Apart from that due to cross sectional nature of the study, causal relationship cannot be ensured.

Conclusion

Our study found that the prevalence of diarrhea is still higher in Odisha. Among every ten children under age five, one had diarrhea. We observed that children aged 6-11 and 12-23 months were associated with a higher prevalence of diarrhea, while the children aged <6 and 6-11 had a higher prevalence of ARI. The prevalence of diarrhea is associated with the age of a child, mother's education, and wealth status. While the prevalence of ARI is associated with age, place of cooking in the household, and parents' smoking behavior. Diarrhea and ARI prevalence could be reduced by implementing interventions to improve the economic status and nutrition status, increasing community awareness and providing supplements for the prevention of diarrhea and ARIs.

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