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Prevalence and Determinants of Fever, Acute Respiratory Infections, and Diarrhea among Children in Bangladesh

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Abstract

Background: Childhood illnesses, including fever, acute respiratory infections (ARI), and diarrhea, remain leading causes of morbidity and mortality among children under five in low- and middle-income countries like Bangladesh. These conditions are influenced by socioeconomic, environmental, and behavioral factors, necessitating a comprehensive understanding of their prevalence and determinants to inform public health strategies. ***Objective***: This study aims to determine the prevalence and associated demographic, socioeconomic, and environmental factors for fever, ARIs, and diarrhea among children under five in Bangladesh, thereby providing insights for targeted interventions. ***Methodology***: Utilizing data from the Bangladesh Demographic and Health Survey (BDHS) 2017–18, this cross-sectional study examined a weighted sample of 8,421 children under five. Variables including demographics, socioeconomic status, and health-related factors were analyzed. Prevalence of fever, ARI, and diarrhea was recorded, with logistic regression models estimating odds ratios to identify associations between childhood illnesses and selected predictors. ***Results***: Among children aged 0–59 months, boys exhibited a higher prevalence of fever and ARI compared to girls. Children younger than 12 months showed the highest rates of all three illnesses, particularly ARI. Breastfeeding status, maternal age, and socioeconomic factors (e.g., parental education, wealth index) significantly influenced illness prevalence. Additionally, safe water access and sanitation were linked to lower fever and ARI prevalence. Vaccination status was also associated with illness patterns, highlighting complex health disparities. ***Conclusion***: The study identifies critical factors affecting the prevalence of fever, ARI, and diarrhea in children, emphasizing the need for interventions addressing environmental and socioeconomic risks. Improved water, sanitation, vaccination coverage, and healthcare access are recommended to reduce disease burden among children in Bangladesh.
Keywords: Childhood Illnesses, Fever, Acute Respiratory Infections, Diarrhea.

INTRODUCTION

Childhood illnesses such as fever, acute respiratory infections (ARI), and diarrhea remain significant public health concerns in many low- and middle-income countries, including Bangladesh. These conditions are particularly prevalent among children under five, representing a leading cause of morbidity and mortality in this age group [1-3]. In Bangladesh, the epidemiology of these conditions is influenced by a complex interplay of socioeconomic, environmental, and behavioral factors, each contributing to the high prevalence and transmission of these infectious diseases. Understanding the prevalence and determinants of these health issues is crucial for developing effective preventive strategies and interventions to protect vulnerable child populations [4].

Fever, often a symptom of underlying infections such as malaria or dengue, is common among children in Bangladesh. The incidence of fever can vary across regions, impacted by factors such as sanitation, climate, and local health practices [5-7]. Fever in children often leads to increased healthcare visits and poses a financial burden on families, who may lack access to appropriate care and timely treatment. Studying the prevalence of fever among children in Bangladesh is essential to identifying high-risk areas and implementing measures to address potential sources of infection [8].

Acute respiratory infections are another prevalent and life-threatening condition affecting children in Bangladesh, with pneumonia being one of the most severe forms of ARI. ARIs are typically spread through respiratory droplets and can quickly spread in crowded environments, such as homes with limited ventilation and close living quarters [9-11]. Contributing factors to ARIs include exposure to indoor air pollution, malnutrition, and inadequate vaccination coverage. These factors highlight the need for targeted interventions focusing on reducing risk factors and improving healthcare access for children suffering from respiratory infections.

Diarrhea remains a persistent health issue among children in Bangladesh, primarily due to poor water, sanitation, and hygiene (WASH) conditions. Pathogens that cause diarrhea, including bacteria, viruses, and parasites, are often transmitted through contaminated water or food sources. Diarrheal diseases are preventable yet continue to impact child health, leading to dehydration, malnutrition, and, in severe cases, death [12, 13]. The prevalence of diarrhea among children underscores the importance of improving WASH infrastructure and educating communities on safe hygiene practices to reduce the transmission of diarrheal pathogens.

Identifying the determinants of these conditions is essential for effective intervention. Factors such as household income, parental education, nutritional status, and healthcare access play significant roles in determining a child's risk of developing fever, ARIs, or diarrhea. Additionally, environmental conditions, such as air pollution and water quality, along with seasonal variations, are known to influence the occurrence of these diseases. Research on these determinants provides insight into the social and environmental conditions that increase disease risk among children, guiding policies and programs aimed at reducing health disparities.

OBJECTIVE

This study on the prevalence and determinants of fever, ARIs, and diarrhea among children in Bangladesh will contribute valuable data to inform public health strategies. By examining these conditions, we can better understand how to mitigate the risk factors associated with them and improve health outcomes for children.

METHODOLOGY

This study utilizes secondary data from the nationally representative Bangladesh Demographic and Health Survey (BDHS) 2017–18, with sampling based on enumeration areas (EAs) from the 2011 Population and Housing Census. A two-stage stratified sampling method was used, first selecting 675 EAs (227 urban, 448 rural), with data collection disrupted in three EAs due to natural disasters. In the second stage, 30 households were systematically selected from each EA, totaling 20,250 households. Interviews were conducted with 20,127 of 20,376 eligible women (response rate of 99%), and after excluding missing data, the final analysis sample comprised 8,421 children under five. The study, using a weighted sample, aimed to measure diarrhea, fever, and ARI prevalence within two weeks for children under five. Mothers were asked if their child had experienced these illnesses in the last two weeks, with responses recorded as a binary dependent variable (1 = Yes, 0 = No). Diarrhea, fever, and ARI were considered separately, given their unique sources of infection and health impacts. Diarrhea was linked to hygiene, water quality, and nutrition, fever to environmental factors and mosquito exposure, and ARI to air quality and housing conditions. The study included various socio-demographic factors (child's age, sex, parental education, wealth index, etc.) as covariates based on the BDHS dataset, prior literature, and data availability. Statistical analyses were performed using SPSS 24, including cross-tabulations and Pearson's Chi-square tests, followed by adjusted logistic regressions to examine the influence of selected variables on illness likelihood, assessing individual comorbidity factors for each disease. Odds ratios from logistic regressions highlighted the probability of disease occurrence relative to reference groups across all selected factors.

RESULTS

The analysis of children aged 0–59 months in Bangladesh (n = 8,421) for the year 2017–18 reveals notable demographic, socioeconomic, and health-related disparities in the prevalence of diarrhea, fever, and acute respiratory infections (ARI). Males had a higher incidence of fever and ARI compared to females (p < 0.001). Age also played a significant role, with children under 12 months experiencing the highest rates of all three illnesses, particularly ARI (p < 0.001). Currently breastfeeding children showed higher illness prevalence, notably with diarrhea and fever (p < 0.001). Socioeconomic factors, including education levels of parents and wealth index, influenced illness outcomes, where children from poorer households exhibited higher fever rates. Urban children and those with safe drinking water and modern toilets had a slightly reduced fever prevalence. Community and health characteristics were also significant: children born at home and those without BCG or DPT vaccinations demonstrated lower rates of diarrhea and ARI, though this may indicate a confounding effect rather than causation. This data highlights the complexity of factors influencing child health, emphasizing the need for targeted interventions.

Table 1: Demographic, socio-economic and community and health characteristics of studied children aged 0–59 months and their percentage distribution by three illness (i.e. diarrhea, fever and ARI) in Bangladesh, 2017–18 (*n* = 8,421)

Selected variables	Categories	Diarrhea	(%)	*p*-value	Fever (%)		*p*-value	ARI (%)		*p*-value
		No	Yes		No	Yes		No	Yes	
Demographic Sex of child	Male[a]	94.94	5.06	0.09	65.77	34.23	0.02	62.36	37.64	< 0.001
	Female	95.68	4.32		68.20	31.80		66.25	33.75	
Age of child (in months)	< 12[a]	94.12	5.88	< 0.001	63.44	36.56	< 0.001	62.08	37.92	< 0.001
	13–24	91.21	8.79		60.73	39.27		59.67	40.33	
	25 +	97.19	2.81		70.33	29.67		66.37	33.63	
Currently breastfeeding	No[a]	97.30	2.70	< 0.001	69.61	30.39	< 0.001	66.07	33.93	< 0.001
	Yes	93.89	6.11		65.05	34.95		62.93	37.07	
Age of mother at 1st birth (Years)	12-17[a]	95.38	4.62	0.33	65.44	34.56	0.03	63.40	36.60	0.24
	18–25	95.12	4.88		67.92	32.08		64.66	35.34	
	26 +	96.96	3.04		70.17	29.83		67.57	32.43	
Mother's BMI	Thin[a]	94.07	5.93	0.11	65.39	34.61	0.05	61.81	38.19	0.24
	Normal	95.43	4.57		66.14	33.86		64.39	35.61	
	Overweight	95.56	4.44		68.79	31.21		64.46	35.54	
Socio-economic Father's education	No[a]	96.28	3.72	0.03	67.83	32.17	0.77	64.78	35.22	0.58
	Primary	94.51	5.49		66.94	33.06		63.51	36.49	
	Secondary +	95.46	4.54		66.72	33.28		64.63	35.37	
Mother's education	No[a]	93.78	6.22	0.18	69.89	30.11	0.25	70.59	29.41	< 0.001
	Primary	95.47	4.53		66.33	33.67		64.77	35.23	
	Secondary +	95.41	4.59		66.87	33.13		63.26	36.74	
Wealth index	Poorest[a]	95.09	4.91	0.01	65.81	34.19	< 0.001	62.78	37.22	0.21
	Poorer	95.38	4.62		66.73	33.27		63.57	36.43	
	Middle	94.08	5.92		65.47	34.53		64.02	35.98	
	Richer	96.69	3.31		64.87	35.13		64.36	35.64	
	Richest	95.19	4.81		71.89	28.11		66.54	33.46	
Community and health Place of delivery	With Health Facility[a]	93.30	6.70	0.53	64.86	35.14	0.06	60.23	39.77	0.07
	Respondent's Home	93.73	6.27		62.37	37.63		62.68	37.32	
Delivery by caesarean section	No[a]	93.51	6.49	0.93	63.31	36.69	0.56	62.14	37.86	0.08
	Yes	93.57	6.43		64.14	35.86		60.16	39.84	

No. of living children	1[a]	94.79	5.21	0.04	67.01	32.99	0.30	61.58	38.42	< 0.001
	2–3	95.32	4.68		67.34	32.66		65.34	34.66	
	4 or more	96.81	3.19		64.69	35.31		66.89	33.11	
Religion	Muslim[a]	95.13	4.87	0.02	66.45	33.55	< 0.001	64.14	35.86	0.59
	Non-Muslim	97.17	2.83		72.47	27.53		65.18	34.82	
Place of residence	Urban[a]	95.58	4.42	0.47	69.05	30.95	0.01	65.24	34.76	0.23
	Rural	95.21	4.79		66.14	33.86		63.84	36.16	
Source of drinking water	Safe[a]	95.12	4.88	0.04	66.53	33.47	0.04	63.94	36.06	0.18
	Unsafe	96.42	3.58		69.45	30.55		65.96	34.04	
Type of toilet facility	Modern[a]	95.49	4.51	0.23	68.89	31.11	0.04	66.14	33.86	0.08
	Pit Latrine	95.02	4.98		65.95	34.05		63.39	36.61	
	Others	96.15	3.85		67.45	32.55		64.19	35.81	
Received BCG	No[a]	98.88	1.12	< 0.001	79.61	20.39	< 0.001	80.73	19.27	< 0.001
	Yes	93.14	6.86		62.43	37.57		60.03	39.97	
Received DPT	No[a]	96.57	3.43	< 0.001	71.20	28.80	< 0.001	69.66	30.34	< 0.001
	Yes	92.81	7.19		61.82	38.18		59.52	40.48	

The study examined the association between childhood diseases (diarrhea, fever, and acute respiratory infections, or ARI) and various demographic, socioeconomic, community, and health factors among children in Bangladesh. Results from Table 2 indicate that age, sex, and breastfeeding status were significant

factors influencing disease prevalence. Younger children (<12 months) were more susceptible to fever and ARI, while currently breastfeeding reduced the odds of these illnesses. Maternal factors, such as age at first birth and BMI, were also associated with disease prevalence, with younger mothers (12-17 years) showing higher odds for diarrhea. Socioeconomic indicators like maternal and paternal education and wealth index further impacted disease prevalence, where children from poorer households were more prone to diarrhea and fever.

Community factors, including rural or urban residence, access to safe water, and modern sanitation facilities, demonstrated significant associations with disease prevalence, particularly with fever and ARI. Notably, vaccination status also played a role, with BCG-vaccinated children exhibiting a higher likelihood of ARI and diarrhea. Overall, the findings underscore the multifaceted influence of demographic, socioeconomic, and environmental factors on childhood disease prevalence in Bangladesh.

Table 2: Regression coefficients and odds ratios for prevalence of diarrhea, fever and ARI by selected demographic, socio-economic and community and health characteristics of children in Bangladesh, 2017–18

Selected variables	Categories	Diarrheab (%) Adjusted OR (95% CI)	Feverb (%) Adjusted OR (95% CI)	ARIb (%) Adjusted OR (95% CI)
Demographic				
Sex	Malea	-	-	-
Age of child (in months)	Female < 12a	0.95 (0.76,1.2)** -	0.92 (0.82,0.98)* -	0.79 (0.70,0.89)*** -
	13–24	1.11 (0.84,1.46)	0.86 (0.74,1.00)*	0.89 (0.77,1.04)**
Currently breastfeeding	25 + Noa	0.65 (0.46,0.93)** -	0.66 (0.55,0.78)*** -	0.80 (0.67,0.95)** -
Age of mother at 1st birth (Years)	Yes 12-17a	1.44 (0.96,2.15) -	0.92 (0.76,0.97)* -	0.99 (0.83,1.21) -
	18–25	1.07 (0.84,1.37)	0.90 (0.80,1.02)*	0.91 (0.8,1.03)
Mother's BMI	26 + Thina	0.50 (0.21,1.17)** -	0.8 (0.57,1.13) -	0.79 (0.57,1.11) -
	Normal	0.82 (0.60,1.12)	0.94 (0.79,1.11)	0.93 (0.79,1.10)
	Overweight	1.01 (0.69,1.48)	0.86 (0.70,1.06)	0.97 (0.79,1.19)
Socio-economic	Noa	-	-	-
Father's education	Primary	1.32 (0.89,1.96)	1.04 (0.86,1.27)	1.02 (0.84,1.24)
Mother's education	Secondary + Noa	1.17 (0.76,1.78) -	1.08 (0.87,1.32) -	0.98 (0.8,1.21) -
	Primary	0.52 (0.33,0.83)**	1.02 (0.78,1.32)	0.98 (0.76,1.28)
Wealth index	Secondary + Pooresta	0.48 (0.31,0.77)*** -	1.06 (0.81,1.38) -	1.09 (0.83,1.42)** -
	Poorer	0.96 (0.67,1.39)	0.89 (0.74,1.08)**	0.89 (0.74,1.07)
	Middle	1.31 (0.90,1.90)**	1.03 (0.85,1.26)***	0.85 (0.7,1.04)
	Richer	0.79 (0.50,1.23)**	1.01 (0.82,1.26)	0.87 (0.7,1.08)**
	Richest	1.07 (0.63,1.82)	0.78 (0.60,0.83)*	0.87 (0.67,1.14)
Community and health				
Place of delivery	With health facilitya	-	-	-
Delivery by caesarean section	Respondent's home Noa	0.81 (0.58,1.11) -	1.16 (0.98,1.38) -	0.92 (0.77,0.98)* -
No. of living children	Yes 1a	0.92 (0.65,1.29) -	1.19 (0.99,1.42) -	1.03 (0.86,1.23) -
	2–3	0.95 (0.74,1.22)	1.13 (0.99,1.29)	0.89 (0.78,0.94)*
Religion	4 or more Muslima	0.60 (0.36,0.98)** -	1.30 (1.04,1.64)** -	1.00 (0.79,1.26) -
Place of residence	Non-Muslim Urbana	0.54 (0.32,0.93)** -	0.77 (0.61,0.97)** -	0.94 (0.76,1.17) -
Delivery by caesarean section	Rural Noa	1.01 (0.74,1.37) -	1.04 (0.89,1.21) -	0.98 (0.84,1.14) -
Source of drinking water	Yes Safea	0.92 (0.65,1.29) -	1.19 (0.99,1.42) -	1.03 (0.86,1.23) -
Type of toilet facility	Unsafe Moderna	0.59 (0.29,1.22)** -	0.79 (0.67,0.91)* -	0.73 (0.53,0.81)* -
	Pit Latrine	0.88 (0.61,1.27)	0.92 (0.76,1.11)	1.09 (0.90,1.31)
Received BCG	Others Noa	0.90 (0.42,1.93) -	1.17 (0.82,1.68) -	1.45 (1.01,2.07)** -
	Yes	3.84 1.33,11.04)**	1.98 (1.45,2.70)***	2.36 (1.72,3.23)***

DISCUSSION

The association between the prevalence of targeted childhood diseases and various socio-economic, demographic, and health factors was examined among children under five in Bangladesh. Key outcome variables included the number of diarrheal episodes, ARI symptoms, and instances of fever among the youngest children in the two weeks preceding the BDHS survey. To analyze disease prevalence, the authors constructed three binary variables, each representing the presence or absence of a specific illness [11]. Another study explored these diseases individually using BDHS data from 1993–2014, highlighting that although diarrhea affected fewer children, fever and ARI were far more common. Factors such as chronic malnutrition, prenatal care, breastfeeding practices, maternal education, healthcare access, vaccine coverage, and household wealth appear to be substantial contributors to the higher prevalence of fever and ARI [12].

Findings indicate that male children tend to experience illness more frequently than female children, possibly because boys often play outdoors, increasing their exposure to contaminated air. Additionally, older children generally have lower illness risk, likely due to immunity development and an improved ability to navigate their surroundings, such as avoiding unsanitary areas and eating healthier foods. Maternal age and education significantly influence childhood illness, as higher literacy levels enhance maternal awareness and access to health information. Educated mothers are better equipped to recognize illness symptoms in children, contributing to lower neonatal morbidity and mortality rates in Bangladesh. Conversely, mothers with limited schooling often lack knowledge and practices essential for childcare, nutrition, hygiene, breastfeeding, and healthcare access, factors that may contribute to increased childhood illness risk.

Surprisingly, breastfeeding was not found to be a significant factor in diarrhea and ARI risk, aligning with other studies [13-15]. However, access to safe drinking water and improved sanitation facilities was identified as critical in preventing diarrhea. Interestingly, children without access to safe drinking water showed a lower risk of diarrhea than those who did. The study also reported that children vaccinated with BCG and DPT were unexpectedly more prone to diarrhea than unvaccinated peers. Furthermore, children born by cesarean section were at greater risk of fever, while access to modern sanitation facilities reduced fever risk, likely due to lower fecal contamination. Socioeconomic factors like household wealth were also influential, as children from the poorest families faced a higher fever risk due to lower living standards, reduced healthcare access, and chronic malnutrition.

Living conditions were also associated with childhood illness risks. Children with more than two siblings faced a significantly higher fever risk, possibly due to increased exposure to pathogens in crowded households. Religious affiliation was also a factor, with Muslim children more likely to suffer from fever than non-Muslims. Geographical differences were evident, with children in the Chittagong, Dhaka, Khulna, and Mymensingh divisions having a lower fever risk than those in Barisal, while those in Rangpur and Sylhet had a slightly higher fever risk. Such regional variations might be due to differences in air quality, climate, fuel sources for cooking, and healthcare access.

Particularly, ARI risk was lower among female children, children over two years old, children born via natural delivery, those with access to modern latrines, those living in rural areas, and children with multiple siblings. These factors may be linked to lower exposure to fecal contamination in food, water, utensils, and toys. Conversely, ARI risk was higher for children in northwestern regions, such as Rajshahi and Rangpur, which, despite better socioeconomic conditions, experience different environmental factors than other areas. These regional disparities could reflect variations in socio-demographic, environmental, and behavioral household characteristics, highlighting the need for targeted interventions to address diverse factors affecting child health in Bangladesh.

CONCLUSION

In conclusion, the analysis of childhood illness prevalence in Bangladesh highlights the complex interplay of demographic, socioeconomic, and environmental factors influencing the rates of diarrhea, fever, and acute respiratory infections (ARI). The findings indicate that younger children, particularly those under 12 months, are at greater risk for these diseases, with males and children who are currently breastfeeding also exhibiting higher illness rates. Socioeconomic factors such as parental education, household wealth, and access to safe water and sanitation significantly affect disease outcomes, with poorer children facing increased illness risk. Vaccination status, maternal age and BMI, and living conditions such as household size and place of residence further contribute to the variation in disease prevalence. The study underscores the importance of targeted interventions that address these multifaceted risk factors to improve child health outcomes in Bangladesh.

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