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Factors associated with acute respiratory infection and healthcare-seeking behaviour among primary caregivers in Bangladesh: a study based on MICS 2019

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ABSTRACT

Introduction More than 80% of deaths due to preventable and treatable causes among under 5 (U5) children occur in the sub-Saharan Africa and the South-Asia, pneumonia remains one of the most common such causes. Bangladesh has demonstrated success in achieving the Millennium Development Goals, particularly in relation to target 4. Nevertheless, the country is still among the 10 countries with the highest number of deaths among U5 children in 2019. The current study aimed to identify factors associated with acute respiratory infections (ARIs) and the care-seeking behaviour of the children's care takes in Bangladesh.

Methods The cross-sectional study used data from the Multiple Indicator Cluster Survey, Bangladesh (2019) . U5 children were included in the analysis (n=22 779). A $p<0.05$ as considered statistically.

Results The prevalence of ARI in the past 2 weeks of survey was 2.03%. It was found that age of the child (in months), sex, residence, division, stunting, age of the mother and age of the father had statistically significant association ($p<0.05$). The adjusted odds ratio (AOR) of ARI were lower among older children aged 24–59 months (AOR 0.53; 95% CI 0.44 to 0.64; $p<0.001$), female (AOR 0.68; 95% CI 0.56 to 0.83; $p<0.001$) and children with father aged ≥25 years (AOR 0.61; 95% CI 0.42 to 0.88; $p=0.008$) and higher (AOR 1.31; 95% CI 1.07 to 1.61; $p=0.010$) among children with stunting. Among the children with ARI, 16.63% primary caregivers did not seek any treatment. Most of the children with ARI (65.01%) were treated with antibiotics.

Conclusions The prevalence of ARI was low. However, still a significant proportion of primary caregivers of U5 children with ARI fail to seek healthcare. The proportion of U5 children who are treated with antibiotics requires attention. Focus should be on younger fathers for promoting healthcare-seeking and good feeding practice to reduce malnutrition.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Nearly 5 million under 5 (U5) children died due to preventable and treatable causes in 2021.
⇒ Providing prompt and sufficient care for diarrhoeal disease and acute respiratory infections (ARIs) can decrease the likelihood of childhood mortality by 30%.
⇒ The leading cause of death in U5 children in Bangladesh is pneumonia, as it causes 13% of all deaths in that age group.
⇒ Low birth weight, absence of exclusive breast feeding, congested household surroundings, socioeconomic status, maternal education, inadequate immunisation, malnutrition and geographical location, etc are correlated with acute respiratory infections.

WHAT THIS STUDY ADDS

⇒ The prevalence of ARI in Bangladesh is 2.03%, 16.63% caregivers of children with ARI did not seek any treatment.
⇒ 65.01% of the children with ARI received treatment with antibiotics.
⇒ Age of the child, sex, father's age and stunting had statistically significant association with ARI.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Findings of this study suggest that health education programmes should be implemented to educate parents and caregivers about the importance of recognising the signs and symptoms of ARI and seeking appropriate medical care.
⇒ The focus should be on balanced diets and appropriate steps for malnutrition management.

INTRODUCTION

Death due to preventable and treatable causes is unfortunate. Unfortunately, nearly 5 million under 5 (U5) children died due to such causes in 2021 in the world. The sub-Saharan Africa and the South-Asia suffer mostly, with more than 80% of such deaths occurring in those regions.[1] Along with diseases such as malaria, diarrhoea, congenital anomalies,

birth asphyxia, pneumonia remains one of the most common causes of death among children of that age group.[2] In developing countries, this death toll is even higher because of the limited healthcare and public health response; making it harder to prevent and treat the disease.[3] Studies suggest that acute respiratory infections (ARIs) account for 20% of all deaths among U5 children.[4] Hence, it is important to treat children with respiratory infections timely and properly to reduce their risk of mortality as studies also suggest that providing prompt and sufficient care for diarrhoeal disease and ARIs can decrease the likelihood of childhood mortality by 30%.[5]

Ensuring the well-being and safety of children is an essential component in the attainment of worldwide health objectives, as evidenced by both the Millennium Development Goals (MDGs) and the more recent Sustainable Development Goals (SDGs). SDG 3.2 specifically targets a substantial reduction in mortality rates among U5 children by the year 2030, with a specified goal of achieving 25 deaths per 1000 live births.[6] Therefore, ARI is a crucial challenge that needs to be overcome to attain the target.[4]

The impact of ARIs on children must not be undervalued. In addition to its correlation with childhood mortality, ARI in children has been associated with a range of adverse health consequences.[7] During the initial 2 years of a child's life, there is a heightened prevalence of ARIs and diarrhoeal diseases, which can potentially impede the physical growth and development of the child. Thus, increasing the likelihood of future health complications after reaching adulthood.[8 9] Regrettably, a considerable number of parents of afflicted children fail to pursue medical attention, showing poor care-seeking practices and increasing the likelihood of grave maladies and potential fatality promptly and adequately.[10]

Bangladesh has demonstrated success in achieving the MDGs, particularly in relation to target 4. This was evidenced by a significant decrease (74%) in U5 mortality rates between 1990 and 2015.[11] Nevertheless, the country is still among the 10 countries with the highest number of deaths among U5 children in 2019.[2] Additionally, evidence from Bangladesh indicates that ARI accounted for approximately 39% of all hospital admissions among paediatric patients, and between 40% and 60% of the overall visits to paediatric outpatient departments.[12] Annually, well over 10 million new cases of pneumonia are diagnosed in U5 children in Bangladesh.[13] The leading cause of death in U5 children in Bangladesh is pneumonia, as it causes 13% of all deaths in that age group.[14] This scenario necessitates the attention of researchers to conduct a study on ARIs in children in Bangladesh. This study conducted a comprehensive examination of the Bangladesh Multiple Indicator Cluster Survey (MICS) 2019 dataset to ascertain the factors that contribute to childhood pneumonia, as well as the care-seeking behaviours of those responsible for the children's well-being.

Research conducted in various nations has indicated that low birth weight, absence of exclusive breast feeding, congested household surroundings, indoor air pollution, socioeconomic status, maternal education, exposure to cigarette smoke within the household, children born to adolescent mothers, inadequate immunisation, malnutrition and geographical location are correlated with ARIs.[10] Moreover, factors such as age, parental education, residence, media access, wealth status in known to affect healthcare-seeking behaviour of the primary caregiver.[15 16] Current study aimed to identify additional factors (such as nutritional status, paternal age, media exposure, fuel for cooking, location of the kitchen) associated with ARI and the care-seeking behaviour of the children's care takes in Bangladesh and contribute in reducing the burden of ARI in Bangladesh.

MATERIALS AND METHODS

Data overview

The current study used data that is nationally representative from the Bangladesh MICS 2019, which is a cross-sectional household survey that serves a multipurpose function of gathering internationally comparable data on the status of women and children. Its primary objective is to monitor the progress of health indicators of national development plans, the SDGs and other international commitments. The survey's two-stage sampling strategy employed enumeration areas (EAs) as the principal sampling units. In total, 3220 EAs were chosen from 64 districts through the utilisation of a probability proportional to size technique. During the second stage of the study, a total of 64 400 households were sampled by randomly selecting 20 households from each cluster (EA). The sample size was distributed across strata, with approximately 1000 households from each stratum. Subsequently, the MICS instruments were implemented through in-person interviews with participants between January and June in 2019. Data were downloaded in SPSS format (ch.sav, hl.sav, hh.sav and wm.sav) from the website (https://mics.unicef.org/surveys).[17] Details of the survey can be found elsewhere.[18]

Children aged 0–59 months were included in this study from the survey's publicly accessible children dataset (ch.sav file), then relevant variables were merged from the women dataset (wm.sav file), households dataset (hh.sav file) and household members' dataset (hl.sav file) using unique identifiers following the guideline provided by MICS.[19] A total of 22 779 children were considered for analysis after excluding children whose primary caretakers did not provide explicit consent, and missing values (or 'don't know' responses) for children on important variables (age of child, child ill with cough in last 2 weeks, frequency of reading newspaper or magazine, frequency of listening to the radio, frequency of watching TV). The procedure used to select children for this investigation is described in detail in figure 1.

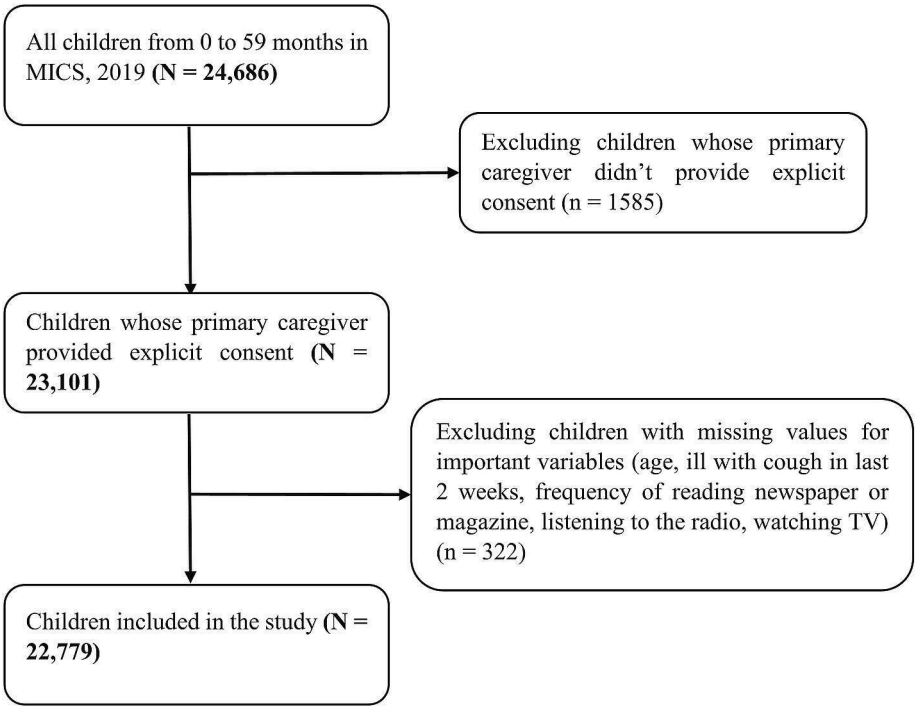

Figure 1 Selection of children from the Bangladesh 2019 MICS data. MICS, Multiple Indicator Cluster Survey; TV, television).

Variable specification

Variables were selected and recoded based on previous studies and available information in Bangladesh 2019 MICS data.[4 5 10]

Outcome variables

The current study had the following outcome variables: ARI (presumed pneumonia) and care-seeking practices.

Operational definitions

ARI (presumed pneumonia)

In the current study, the children were categorised as '1' if there was the presence of ARI and '0' if no ARI. ARI (presumed pneumonia) is defined as mothers' perceptions of a child who has a cough, is breathing faster than usual with short, quick breaths or is having difficulty in breathing, excluding children that had only a blocked nose during the past 2 weeks in accordance with the WHO.[20]

Care-seeking practices

Healthcare place/provider

The variable 'healthcare place/provider' was recoded using information on the variable of 'place sought care' (CA21) from the MICS data. The children were categorised as 'no treatment sought' if no treatment was sought. The category 'public provider' included those whose primary caretakers sought care from government hospitals, government clinics or health centres, community clinics, community health worker (CHW), mobile or outreach clinic and other public medical. In the category 'private provider', those children were included whose primary caretakers sought care from private hospital or clinic, private physician, private pharmacy, CHW (non-government), private mobile clinic, Non-governmental organization (NGO) clinic or hospital and other private medical. Those children whose parents sought are from both public and private providers were categories as 'both'. Finally, the category 'informal provider' consisted of those children whose parents sought care from a relative or friend, shop or market or street, traditional practitioner or other.[21]

Treatment with antibiotics

Pneumonia is an ARI that impacts the lungs. It can be attributed to various infectious agents such as viruses, bacteria and fungi. According to research, the use of antibiotics is recommended for the treatment of pneumonia.[22] Children were categorised into two categories. Children suffering from ARI and were treated with amoxicillin, cotrimoxazole, other antibiotic pill or syrup, other antibiotic injection or intravenous, were categorised as 'yes'. Others were categorised as 'no'.

Explanatory variables

The explanatory variables of the current study consisted of age of the child (in months), sex of the child, residence (urban or rural), division, family size, child ever been breastfed, living with natural mother and or father, age of the mother (in years), age of the father (in years), educational level of the mother, educational level of the father, primary caretaker being currently pregnant, ethnicity of the household head, cooking fuel, place of kitchen,

frequency of reading newspaper or magazine, frequency of listening to the radio, frequency of watching television (TV), wealth index quantile and nutritional status.

Some variables were coded into different categories based on a priori literature review. The age of the child was recoded into two categories: '0–23 months' and '24–59 months'; children aged 24–59 months were considered as older children and others as younger children (infant and toddlers).[23] The age of the mother was also recoded into two categories as '<20 years' and '≥20 years'. The age of the father also had '<25 years' and '≥25 years' categories. Family size was categorised into two groups: '0–4 members' and '>4 members'. Cooking fuel was categorised as 'clean and safe fuel' for those who use electric stove, liquefied petroleum gas or cooking gas stove, piped natural gas stove, biogas stove and liquid fuel stove; and as 'traditional or solid fuel' for those who use traditional solid fuel stove, three stone stove or open fire and other. A new variable 'media access' was created using the summation of three variables: frequency of reading newspaper or magazine, frequency of listening to the radio, frequency of watching TV. This variable had three categories: poor access (0–3 score), moderate access (4–6 score) and good access (7–9 score).

The utilisation of the Wealth Index is a pragmatic approach that capitalises on pre-existing data obtained from most household surveys, thereby providing significant perspectives on economic disparities. It is predicated on the concept that a household's economic status within the larger society can be inferred from its possession of conspicuous or readily accessible assets, services and amenities. Using the principal component analysis technique, household assets are identified as indicators of wealth, and they are assigned a weight or factor score. These scores are then normalised to have a mean of 0 and an SD of 1. The resulting standardised scores are used to determine the wealth quantile breakpoints, which are used to classify households into five categories: poorest, second, middle, fourth and richest.[11 24]

The assessment of nutritional status was conducted using three child growth standards, namely stunting, wasting and underweight, as recommended by the WHO. Stunting was defined as a height-for-age Z-score (HAZ) <−2 SDs below the median, underweight as a weight-for-age Z-score (WAZ) <−2 SDs, and wasting as a weight-for-height Z-score (WHZ) <−2 SDs.[25] Father's and mother's education had two categories: illiterate (preprimary or none) and literate (primary, secondary and higher secondary or more).

Statistical analysis

The study used IBM SPSS V.27 for merging datasets and jamovi V.2.3.21 for data analysis.[26] For descriptive statistics, the authors estimated frequency distribution, percentage, mean and SD. Continuous data were presented as mean and SD, while categorical variables were represented as counts and percentages. For inferential statistics, the study used the χ^2 test to find any association between categorical variables. A logistic regression model was developed with all significant variables identified by bivariate analysis to find the strength of association. A $p<0.05$ was considered statistically significant. All statistical tests were two sided and performed at a significance level of $\alpha=0.05$.

RESULTS

The final sample size of the study was 22 779. The prevalence of ARI in the past 2 weeks was 2.03%. Among the participants, 60.5% of children were from 24 to 59 months of age. Regarding children suffering from ARI, 54.9% of the children belonged to 0–23 months. Sex distribution among the children was almost equal (51.8% male and 48.2% female). The majority (81.3) lived in rural areas, almost all (95.8%) were ever breastfed.

Regarding child nutrition, 27.6% suffered from stunting, 22.7% suffered from underweight and 9.9% suffered from wasting. Most of the mothers belonged to (92.6%) ≥20 years age group and 94.7% of the fathers to ≥25 years. Regarding maternal education, 89.4% of mothers were literate and 95.2% had poor access to media. Most (24.7%) of the participants were from the poorest quintile, 84.9% of participants' household used traditional/solid fuel and 94.8% had a separate kitchen. It was found that age of the child (in months), sex, stunting, age of the mother and age of the father had statistically significant association ($p<0.05$) with children with ARI (table 1).

Multivariable logistic regression analysis indicates that ARI was significantly associated with age of the child, sex, stunting and age of the father. The odds of ARI are lower among older children than younger children (AOR 0.53; 95% CI 0.44 to 0.64; $p<0.001$). Female also had lower odds (AOR 0.68; 95% CI 0.56 to 0.83; $p<0.001$) of having ARI. Children with father aged ≥25 years had lower odds (AOR 0.61; 95% CI 0.42 to 0.88; $p=0.008$) of having ARI than <25 years. The odds of ARI were higher (AOR 1.31; 95% CI 1.07 to 1.60; $p=0.010$) among children with stunting (table 2).

The results presented in table 3 show ARI was present in 463 (2.03%) children in the past 2 weeks out of 22 779 children. Out of these 463 children, the primary caregiver of 16.63% did not seek any treatment. However, 14.04% sought treatment from public provider, 50.76% from public provider, 3.02% from both and 15.55% from informal provider. Concerning treatment, most of the children with ARI (65.01%) were treated with antibiotics (table 3).

DISCUSSION

The current study examined the care-seeking behaviour of U5 with ARIs for medical care and identified the associated factors using a nationwide representative survey (Bangladesh MICS, 2019). It was found that the prevalence of ARI is 2.03% which was similar to another study conducted in Bangladesh using Bangladesh Demographic

Table 1 Distribution and prevalence of ARI based on children's, parents' and household's-related factors in Bangladesh (n=22 779)

Characteristics	Children with ARI		Total f (%)	P value
	No f (%)	Yes f (%)		
Age of the child				
0–23 months	8746 (39.2)	254 (54.9)	9000 (39.5)	
24–59 months	13 570 (60.8)	209 (45.1)	13 779 (60.5)	<0.001
Sex				
Male	11 510 (51.6)	282 (60.9)	11 792 (51.8)	
Female	10 806 (48.4)	181 (39.1)	10 987 (48.2)	<0.001
Residence				
Urban	4167 (18.7)	87 (18.8)	4254 (18.7)	
Rural	18 149 (81.3)	376 (81.2)	18 525 (81.3)	0.949
Child ever breastfed (n=13 520)				
Yes	12 614 (95.7)	333 (96.5)	12 947 (95.8)	
No	561 (4.3)	12 (3.5)	573 (4.2)	0.478
Stunting (n=21 817)				
Absent	15 502 (72.5)	300 (67.7)	15 802 (72.4)	
Present	5872 (27.5)	143 (32.3)	6015 (27.6)	0.025
Underweight (n=22 191)				
Absent	16 821 (77.4)	330 (73.8)	17 151 (77.3)	
Present	4923 (22.6)	117 (26.2)	5040 (22.7)	0.078
Wasting (n=21 774)				
Absent	19 230 (90.2)	398 (89.8)	19 628 (90.1)	
Present	2101 (9.8)	45 (10.2)	2146 (9.9)	0.829
Age of the mother				
<20 years	1645 (7.4)	46 (9.9)	1691 (7.4)	
≥20 years	20 671 (92.6)	417 (90.1)	21 088 (92.6)	0.037
Age of the father (n=22 495)				
<25 years	1139 (5.2)	43 (9.3)	1182 (5.3)	
≥25 years	20 896 (94.8)	417 (90.7)	21 313 (94.7)	<0.001
Mother's education				
Illiterate	2370 (10.6)	45 (9.7)	2415 (10.6)	
Literate	19 946 (89.4)	418 (90.3)	20 364 (89.4)	0.533
Media access				
Poor access	21 242 (95.2)	438 (94.6)	21 680 (95.2)	
Moderate access	1023 (4.6)	24 (5.2)	1047 (4.6)	
Good access	51 (0.2)	1 (0.2)	52 (0.2)	0.829
Wealth quintile				
Poorest	5508 (24.7)	123 (26.6)	5631 (24.7)	
Poor	4645 (20.8)	104 (22.5)	4749 (20.8)	
Middle	4224 (18.9)	80 (17.3)	4304 (18.9)	
Rich	4195 (18.8)	83 (17.9)	4278 (18.8)	
Richest	3744 (16.8)	73 (15.8)	3817 (16.8)	0.671
Fuel use for cooking				
Clean and safe fuel	3363 (15.1)	71 (15.3)	3434 (15.1)	
Traditional/solid fuel	18 953 (84.9)	392 (84.7)	19 345 (84.9)	0.875

Continued

Table 1 Continued

Characteristics	Children with ARI		Total	P value
	No f (%)	Yes f (%)	f (%)	
Location of kitchen (n=22 769)				
No separate kitchen	1174 (5.3)	17 (3.7)	1191 (5.2)	
Separate kitchen	21 132 (94.7)	446 (96.3)	21 578 (94.8)	0.128

ARI, acute respiratory infection; f, frequency.

and Health Survey (BDHS) data 2017–2018.[4] Data were collected by the BDHS from late October to mid-March which significantly overlaps with the data collected during the current study. As seasonality significantly affects prevalence of ARI and both surveys covered the majority of the winter season (mid-December to mid-February), the similar findings are understandable.[27]

This study indicated that age of the child had a statistically significant association with ARI, with younger children being more affected than older children. This conforms with other studies conducted in Nepal,[10] Nigeria,[28] Tanzania[29] and another study conducted in Bangladesh.[30] One possible cause for this can be the immature defence mechanism of the younger children, which may lead to a higher incidence of ARI.

The current study found that females had lower odds of developing ARI than males. This finding supports a systematic review conducted among African children and Bangladesh.[4 31] A possible reason may be that, as reports suggest, females show a greater ability to elicit humoral and cellular immune responses to infection or antigenic stimulation compared with males.[32] As a result, female children exhibit better immunity against diseases such as ARI.

This study indicated that the stunting in children was associated with ARI. There were higher odds of ARI among the stunted children in comparison with normal children. This finding is consistent with other studies.[10 31 33] As malnutrition causes a lack of immunity in the child stunting (which indicates chronic malnutrition) may lead to being affected with ARI. Paternal age was also found to be significant with U5 children with older fathers having lower odds of having ARI. There might be a compound of several factors for the association like older fathers having more awareness regarding causes of ARI, exposure to other children having ARI leading to a better understanding, etc. However, additional studies are needed to rule it out as a potential confounder.

Among the children with ARI, 16.63% of the caregivers did not seek any treatment. As the guardians of children suffering from ARI are often unable to recognise the

Table 2 Association of ARI with characteristics of participants

Predictors	OR (95% CI: lower-upper)	P value	AOR (95% CI: lower-upper)	P value
Age of the child				
0–23 months	Ref			
24–59 months	0.53 (0.44 to 0.64)	<0.001	0.53 (0.44 to 0.64)	<0.001
Sex				
Male	Ref			
Female	0.68 (0.57 to 0.83)	<0.001	0.68 (0.56 to 0.83)	<0.001
Stunting				
Absent	Ref			
Present	1.26 (1.03 to 1.54)	0.025	1.31 (1.07 to 1.60)	0.010
Age of the mother				
<20 years	Ref			
≥20 years	0.72 (0.53 to 0.98)	0.038	1.07 (0.75 to 1.53)	0.715
Age of the father				
<25 years	Ref			
≥25 years	0.53 (0.38 to 0.73)	<0.001	0.61 (0.42 to 0.88)	0.008

Reference category: children with ARI: no.
AOR, adjusted odds ratio; ARI, acute respiratory infection.

Table 3 Care-seeking practices of primary caregiver among children with ARI in Bangladesh

Care seeking for ARI	Frequency (n)	%	95% CI	
			Upper	Lower
No of children with ARI	463	2.03	1.86	2.22
Healthcare place/provider (n=463)				
No treatment sought	77	16.63	13.52	20.29
Public provider	65	14.04	11.17	17.50
Private provider	235	50.76	46.21	55.28
Both public and private	14	3.02	1.81	5.01
Informal provider	72	15.55	12.53	19.13
Treatment with antibiotic (n=463)				
No	162	34.99	30.79	39.44
Yes	301	65.01	60.56	69.22

ARI, acute respiratory infection.

signs and symptoms, they may fail to seek healthcare. Another study conducted in Bangladesh reports the percentage to be much higher.[34] This difference may be because the second study was conducted in rural Bangladesh, whereas the current study consists of both urban and rural respondents. Only 14.04% sought treatment from the public provider, and more than half (50.76%) sought treatment from the private provider. This finding was consistent with the findings of the Nepal study.[10]

Regarding treatment, most of the children received antibiotics. This study shows that nearly one-third of the children with ARI did not seek care from public or private providers, which is consistent with the study conducted in other countries.[35]

The study has several limitations. Due to the cross-sectional nature of the design, we could not establish a causal relationship between outcome and predictor variables. Also, due to the possibility of reporting bias, some issues related to practice may differ from the actual scenario. Finally, the ARI symptoms were reported by the mothers or caregivers. As such, some caregivers may report more symptoms. Despite these limitations, the current study also provides some valuable insights. As it suggests, increasing awareness among younger fathers regarding ARI can promote healthcare-seeking behaviour. Additionally, curbing malnutrition can also have a positive impact.

CONCLUSION

ARI is one of the major causes of U5 mortality globally. However, seeking treatment at the appropriate time can reduce U5 childhood mortality significantly. The current study found that the prevalence of ARI was low. However, almost one-third of the primary caregivers did not seek treatment from public or private providers and a similar proportion of the affected children are not treated with antibiotics. Focus is needed for health education among younger fathers to seek proper care for their child's ARI when needed. Additionally, good feeding practices should be promoted to reduce malnutrition which is shown in the current study to have an inverse impact on being affected with ARI. Further research is needed to focus on these interventions to assess their impact on ARI prevalence in Bangladesh.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study analysed data from a pre-existing survey conducted by UNICEF, where all personal information of participants had been removed to protect their privacy. Since the data set used in the analysis was deidentified and permission was taken from the relevant authority to use it, no ethical approval was needed for studies using secondary data. Additionally, the Bangladesh Bureau of Statistics and UNICEF obtained informed consent from participants before they participated in the survey.

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Data availability statement Data are available in a public, open access repository. Data are available from an openly accessible website.

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