

Trends of healthcare seeking for Acute Respiratory Infection (ARI) among Children under 5 over a decade in Bangladesh

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Master of Public Health

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DECLARATION

I am Nasrin Akter, student of department of pharmacy and public health, independent university; represent my thesis work on “Trends of healthcare seeking for Acute Respiratory Infection (ARI) among Children under 5 over a decade in Bangladesh” as requirement of completion of master degree. This thesis research was performed under supervision of Dr. Nafisa Huq, Assistant Prof. & Head. Department of Public Health, School Of Pharmacy and Public Health.

I hereby declare that this thesis has not been submitted to any other institute. Help that was taken from internet and books was referenced at reference.

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APPROVAL

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Abstract

Acute Respiratory Infection is a major public health concern in children under the age of five around the world. Bangladesh is among one of the countries dealing with a high child mortality rate caused by ARI. To reduce the disease severity and prevent associated morbidity and mortality, it is critical to seek professional care and receive immediate treatment. The objective of this study was therefore to assess the secular Trends of healthcare seeking for ARI among under five children with its decreasing prevalence over the years.

Secondary data from Bangladesh Demographic and Health Survey (BDHS) for the years 2011, 2014, 2017-2018 was used for this paper. Mothers (aged 15-49 years) were interviewed to collect information on the prevalence on recent occurrences of short, rapid breathing that was chest-related and/or difficult breathing that was chest-related during the past two weeks. Bivariate analysis was performed to estimate the prevalence of care seeking and its associated factors. The adjusted trend in the prevalence and predictors of care seeking were measured by multivariate regression methods.

ARI prevalence has decreased gradually over the last 10 years. ARI prevalence was 5.8% in 2011 which decreased to 3% in 2017-18. It is found that children aged less than 24 months had a higher ARI prevalence & male children had a higher risk. Children from younger mothers were also observed to be at higher risk of ARIs. The results also show that there has not been remarkable improvement in health care seeking from qualified personnel among under five children from 2011 to 2017-2018. According to the BDHS data, in 2011 only 201(41%) children sought care seeking for ARI from qualified doctors and 158(39%) in 2014 and 109(42%) in 2017.

ARIs continue to cause a high disease burden among Bangladesh's under-five children. Lack of appropriate health-seeking behavior is an important risk factor that should be paid attention to. The existing community based health care approach of the government can be further strengthened to enhance case detection and online care seeking from qualified professions.

In addition, more research to find out reasons for poor care seeking and or the pathways of care seeking behavior should be carried out for better solutions.

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Abbreviations

ARI	Acute respiratory infection
BDHS	Bangladesh demographic health survey
URI	Upper respiratory infection
LRI	lower respiratory infection
HIV	Human immunodeficiency virus
MDG	Millennium development goal
SDG	Sustainable development goal
ICDDRDB	International Centre for diarrhoeal disease research, Bangladesh
EPI	Expanded Program on Immunization
PCV	Pneumococcal conjugate Vaccine
NIPORT	National Institute of Population Research and Training
MCH	Maternal and Child Health
BBS	Bangladesh Bureau of Statistics
PSU	Primary Sampling Unit
EA	Enumeration Areas
NGO	Non-governmental organizations
WHO	World health organization
Hib	Haemophilus Influenza type b

Background:

Acute Respiratory Infection (ARI), which is widely recognized as an important public health concern for children is an infection that may interfere with normal breathing. It can affect both upper and lower respiratory system of the lungs causing upper and lower respiratory tract infections, URIs and LRIs respectively [1] and be associated with cough, fast breathing, difficulty in breathing, excluding children that had only a blocked nose. A child who has a cough, is breathing faster than usual with short, quick breaths or is having difficulty breathing, excluding children that had only a blocked nose are said to be suffering from an ARI. These symptoms of ARI coincide with those of pneumonia, so much so that ARI is very similar to Pneumonia and it was suggested that ARI be renamed 'presumed pneumonia' [2]. Pneumonia, a form of acute respiratory infection that affects the lungs, is a major cause of under-five child mortality and morbidity all over the world [3, 4].

Globally, the number of deaths per 1000 live births came down from 93 deaths per 1,000 live births in 1990 to 38 in 2019 [5]. The leading causes of death globally among children under five include pneumonia (15%), diarrheal diseases (8%), malaria (5%) and HIV/AIDS (2%) [6]. ARI, which includes things like pneumonia, common colds, etc., continues to be the leading cause of morbidity in children, accounting for over 70% of all morbidities in children under the age of five in developing countries [7].

This problem is particularly evident in the South Asian region where the child mortality rate is still among the highest in the world: with 51 deaths per 1000 live births [8]. In South Asia, more than 60 per cent of deaths amongst children aged under five years occur in very first month of life [9]. The South Asia region accounts for nearly one-third of global neonatal and child mortality under the age of five [10]. South and Southeast Asia have some of the highest rates of respiratory infection-related mortality in the world, with pneumonia accounting for almost 21% of all deaths in children under the age of five [11].

Bangladesh is among one of the countries dealing with a high child mortality rate caused by ARIs. In the 1990's, child mortality rate in Bangladesh was 143.8 deaths per 1000 of live birth [12, 13]. ARIs were responsible for approximately 39 percent of all pediatric hospital admissions and 40-60 percent of all pediatric outpatient department visits in 1992 [14]. Another study revealed in 2018 every hour more than one children dies of pneumonia

in Bangladesh [15]. In 2020 a study stated that about 24,300 children die from pneumonia in Bangladesh every year, making 18% of the children dying before completing 5 years of their age [16]. Several reasons have been identified as accountable for the morbidity and mortality of children due to ARI.

Multiple risk factors have been identified to be associated with the morbidity and mortality among children due to ARI. Research from developing countries like Bangladesh, Ethiopia, Nepal, and Uganda found that ARI is associated with variables like household socioeconomic status, child's age, parental education, and mothers' age [17, 18]. In rural areas, factors comparable to an absence of health care services, lack of awareness, poverty, indoor air pollution, lack of ventilation, overcrowding, antibiotic overuse and misuse, immune system deficiency, malnourishment are all important causes of ARI [19, 20].

Poor care-seeking is also an important cause of the high prevalence of ARI among children. Ahmed Ehsanur Rahman, an associate scientist at icddr,b's maternal and neonatal health department, said in the keynote address "Of the children who die of pneumonia in the country, 52% die at home; they do not receive any kind of treatment. Meanwhile, 3% of children die at home despite receiving medical treatment. About 45% of children die of pneumonia even after being taken to the hospital or a health center." [21]. The ARI control program in Bangladesh is based on the early identification and treatment of children who exhibit signs and symptoms of pneumonia [22]. However, for early identification followed by appropriate treatment, patients need to come in contact with skilled healthcare providers.

Bangladesh has a multiple healthcare system where there is a mixture of public, private and informal healthcare delivery. The public health care system provides health care services at the primary, secondary and tertiary levels [23] but the distribution and use of public health services is not uniform across the country. People with a higher education and economic background visit health-care facilities more frequently compared to those with a lower education and economic background [24]. People from the higher wealth quintile also use the private health care sector more than the poorer quintile [25]. However, there are reports of the poorer quintile accessing the private health sector as well when they fail to get expected results from the public or the informal sector. It was found in a study that among caregivers who seek sick child care outside the house, 15% seek treatment or advice from public sector sources, 55% from private sector sources, and 30% from other sources [25].

In 2014, a study showed that only forty-two percent of under-five children with symptoms of ARI were taken to a health facility for treatment [26]. That is because self-medication or non-prescribed use of medicines without professional advice or prescription or treatment from an unqualified doctor is a very common phenomenon in Bangladesh [27].

Over 65% of village people in Bangladesh obtain first-line health-care services primarily from village doctors [28]. An estimated 70–75% people of the country use traditional medicine for their healthcare [29, 30]. Another study found that 26.39% of children with ARI symptoms received treatment from a pharmacy, 26.03% received treatment from traditional health care provider, and households that are poorest or very poor are given additional preference by the public sector for treatment. However, children living in rural areas were 3.74 times more likely to receive care from traditional providers compared to urban children [31]. It is worth looking into how this trend of care-seeking has progressed over the last decade, and whether or not there have been changes. Along with room for improvement in the other risk factors, trends of care-seeking may also be responsible for the continued prevalence of ARIs.

However, there have been improvements in the situation, both on the global and local scale. The global under-five mortality rate had declined by 59 per cent. The global number of under-five deaths dropped to 5.2 (5.0, 5.6) million in 2019 from 12.5 (12.3, 12.7) million in 1990. Despite reduction in rates of mortality and morbidity, differences exist across regions and countries [32].

Along with a global decline in child mortality and morbidity rates, Bangladesh too, has achieved remarkable progress in child survival over the last three decades, with thousands of children now having a higher chance of survival compared to 1990 [31]. The decline in child morbidity and mortality may be attributed to improvements in many of the aforementioned risk factors: improvements in socioeconomic status, paternal and maternal education status. The socio-economic condition of the people of Bangladesh, maternal and paternal education, age of marriage has improved over time. Over the last decade, living standards have also improved in both rural and urban settings [33]. Another study found that higher maternal educational status, access to improved water and sanitation facilities, and living in higher wealth quintile households were protective factors against ARI among children [34].

Among the South Asian countries, Bangladesh, Nepal, and Sri Lanka met most of the Millennium Development Goal (MDGs) targets [35]. Bangladesh received the UN award for

its remarkable achievements in attaining the Millennium Development Goals (MDGs), specifically target 4 by attaining a 74% decline in under-five deaths from 1990–2015 [36]. After the ending of MDGs in 2016, Sustainable Development Goals (SDG) started with 17 goals. Target 3.2 of the SDG is to reduce under-five mortality (U5M) rates to 25 deaths per 1,000 live births by 2030 [37]. A recent government report claims that, despite various challenges, Bangladesh is on track to achieve Sustainable Development Goals [38]. The prevalence of ARIs among children under-five years of age in Bangladesh was 54 per 1000 children in 2014. Following the introduction of the Pneumococcal conjugate Vaccine (PCV) in the Government's routine Expanded Program of Immunization (EPI) in March 2015 [39], a study conducted in 2017 found the prevalence of ARIs among children under-five years of age in Bangladesh to be 30 per 1000 children [40]. The number of deaths per 1000 live births came down from 143.8 deaths in 1990 to 28.95 deaths in 2020 [13].

Despite this notable improvement there is a long way to go as Bangladesh still has high levels of child mortality and morbidity, majorly caused by pneumonia, an ARI, among the South Asian countries [13]. Strong and equitable health systems are needed to adequately prevent, diagnose and treat pneumonia, and provide children with their basic human right to good-quality healthcare [15].

In spite of the fact that ARI remains a public health concern in Bangladesh, only a few research studies have focused on the care-seeking pattern for ARI. As care-seeking is diverse and non-uniform, it is worth looking into factors associated with it and its patterns over the years. There have been many studies on ARI prevalence and determining factors so far but no study has been done on trends of healthcare seeking for ARI among under 5 children.

I would like to see, in my thesis how the care seeking pattern has changed in the last 10 years and what factors it is associated with. This study aimed to explore the healthcare seeking behaviors as well as any associated socio-demographic factors and to find out which areas of health sector is preferable for care-seeking of childhood ARI in Bangladesh using nationwide representative data from Bangladesh. This study used the most recent nationally representative data and also previous two nationally representative data which ensures that the findings are generalizable to children in Bangladesh. The socio-economic condition of Bangladesh has been increased, maternal education increased and Living standard also increased. All contributed to decreased in ARI prevalence, but why not falling further? That is why looking into care seeking: whether or not pattern has changed over 10 years. I wanted to know what factors are

associated with children getting ARIs, where are they receiving more care seeking and whether there has been any change in care-seeking in last 10 years.

Methodology:

Study definition:

Acute Respiratory Infection:

The under 5 children with symptoms of ARI were selected on the basis of short, rapid breathing that was chest-related and/or difficult breathing that was chest-related during the past two weeks according to the BDHS questionnaire.

Data sources:

The study is focused on cross-sectional data from three cycles of the Bangladesh Demographic and Health Survey, which have been conducted between 2011 and 2017. This survey was carried out with the approval of the Ministry of Health's National Institute of Population Research and Training (NIPORT), Health Education and Family Welfare Division [26]. In 2011 survey was conducted between July to December 2011, in 2014 which was conducted between June and November 2014 and in 2017 which was implemented from October 2017 to March 2018. The surveys were conducted using a multi-staged stratified sampling technique to collect important information on maternal and child health (MCH), including childhood morbidity and healthcare-seeking practices, allowing estimate of MCH indicators at the national and divisional levels [41].

Study population:

The BDHS sample is nationally representative and includes everyone who lives in a non-institutional dwelling unit in the country. To choose respondents for the study, random household sampling was used. Assuming that this is a sub analysis of an existing dataset, authorization from survey participants was not required, as the National Institute of Population Studies had obtained prior approval upon completion of the survey. The main purpose of these surveys is to provide country-wide data necessary for monitoring and evaluation of population, health, and nutrition programs and assist in evidence-based health policy making.

In all 3 surveys a structured questionnaire was administered by trained and experienced interviewers. As a sampling frame, the survey utilized a list of enumeration areas (EAs) from the 2011 Population and Housing Census of the People's Republic of Bangladesh given by the Bangladesh Bureau of Statistics (BBS) (BBS 2011). The survey's primary sampling unit (PSU) is an EA with an average of 120 families.

A two-stage stratified sample of households was used for the survey. In 2011 in the first step, 600 EAs were chosen, with 207 clusters in urban regions and 393 in rural areas, with probability proportional to EA size and then, from each EA, a systematic sample of 30 households was chosen, for a total sample of approximately 17,181 households and a total 17,842 ever-married women age 15-49 were interviewed.

In 2014 in the first step, 600 EAs were elected, with 207 EAs in urban areas and 393 in rural areas, with probability proportional to EA size and from each EA, a systematic sample of 30 households was selected, for a total sample of approximately 17,300 households. A total of 18,245 ever-married women age 15-49 were identified in these households and 17,863 were interviewed, for a response rate of 98 percent.

The BDHS 2017-2018 at the first stage, 675 enumeration areas (EAs) were chosen with probability proportionate to size (227 in urban regions and 448 in rural areas) and then, from each EA, a systematic sample of 30 households was chosen, for a total sample of approximately 20,250 households and a total 20,100 ever-married women age 15-49 were interviewed.

In all this survey, ever-married women between the ages of 15 - 49 were approached for an interview to gather information on, child health, and nutritional status. Mothers were asked to give information on the history of cough accompanied by short, fast chest-related breathing and/or trouble in breathing among children aged 0-59 months in the two weeks before to the survey in order to elicit ARIs specific information. According to the case definition 484, 403 and 258 children in BDHS 2011, 2014 and 2017-2018 respectively with acute respiratory symptoms were finally analyzed.

Outcome variables:

In this study, the response variable is care seeking behavior. That means parents sought care for their child with ARI symptoms. Care seeking behavior is coded as “1” if the child care

seeking was from qualified doctors and “0”, if care seeking was from unqualified personnel or no care seeking.

Qualified doctors included personnel from any medically trained providers in a public facility such as any hospital (district, medical college, and specialized), Maternal and Child Welfare Centre (MCWC), Upazila Health Complex (UHC), Union Health & Family Welfare Centre (UH&FWC), community clinics and Private care facilities such as private doctors, private clinics, private medical sectors, private medical college hospitals. Care provided by unqualified/untrained personnel such as NGO static and satellite clinics, satellite clinic/EPI outreach site, satellite clinics, health assistant or Community Health Care Providers, traditional healers, field workers and pharmacy or no care seeking.

Independent variables:

Explanatory variables included sex of child (male and female), current age of child (in months), the nutritional status of the child, age of mother, maternal education level, father’s education level, place of residence, division, wealth index of the households.

The under five children age were categorized into 6 categories (< 6 months, 6-11 months, 12–23 months, 24–35 months, 36–47 months, and 48–59 months). Mother’s age was also categorized into 6 categories. The nutritional status of children was measured using WHO-recommended child physical growth indices, which included producing z-scores for 'height-for-age (stunting)'. Children were considered stunted if their z-score for each nutritional status was 'two standard deviations below the median of the WHO reference population,' according to WHO criteria. The household wealth index is a measure of living standard. The wealth index was calculated according to the DHS guidelines and grouped into the 'poorest', 'poorer', 'middle', 'richer', and 'richest' quintiles for households with under-five children.

Data processing and analysis:

Frequency and percentages were calculated for ARI and its care seeking. The trends of health care seeking with ARI symptoms children were determined separately for the individual, according to the study parameters for different time period. To evaluate the prevalence of ARIs and healthcare-seeking behavior, descriptive bivariate analysis methodologies were derived and differentiated using socio-demographic, economic characteristics. Bivariate analysis is

done to examine the association between the dependent variable and all other independent variables separately.

Odds ratios of treatment seeking for ARI across the survey years were measured using binary logistic regression analysis. Binary logistic regression analysis was used to study the characteristics that influence health care consumption, and the results were provided as an odds ratio (OR) with 95 percent confidence intervals for adjusted models. The statistical package STATA (stata/MP 14.2) was used for all statistical analyses, and results were evaluated as statistically significant for 5% level of significance.

Result:

Prevalence of ARI and care seeking:

According to the Table 1 the trends in the percentage of children experienced with ARI for 2011 to 2017 BDH Surveys to focus the picture of the vulnerability of ARI at a glance. The findings show a moderate variation in prevalence of ARI. The total sample included 1,145 children in the three rounds of the survey (2011, 2014, and 2017-2018) those who have symptoms of ARI. There were 8324 children identified during the BDHS 2011, of which 484 (5.81%) had ARI according to case definition. On the other hand, during BDHS 2014, there were 7692 children among which 403 (5.38%) were with ARI and during BDHS 2017-2018 out of 8321 children, 258(3%) children had ARI according to case definition.

It is noted that a few of the ARI experienced children seek a health facility. This indicates that either the guardians are unable to identify ARI or ignore the disease due to lack of knowledge regarding the long term impact of ARI. According to the BDHS data, in 2011 only 202(42%) children sought care seeking for ARI from qualified doctors and 158(39%) in 2014 and 109(42%) in 2017.

Thus it is seen that the tendency of people to seek health care from qualified doctors did not change much between 2011 to 2017-18.

Table 1 prevalence of ARI and care seeking over one decade

	BDHS 2011	BDHS 2014	BDHS 2017-2018
Total number of children	N=8324	N=7692	N=8312
Children with ARI	484 (5.81%)	403 (5.38%)	258 (3%)
Sought Care seeking for ARI from qualified personnel	201 (41%)	157 (39%)	109 (42%)
Sought Care seeking for ARI from unqualified personnel / no care seeking	283 (59%)	246 (61%)	149 (58%)

Sample characteristics:

Basic socio-demographic characteristics of the sample population were summarized in Table 2. In brief, majority of the children is from 0 months to 23 months of age are more affected by ARI. Children aged less than 23 months were found to be more vulnerable to ARI. And male children is more affected than the female children it has not changed much in these 10 years. Regarding maternal and household characteristics, children of mothers aged 15 to 29 years are more susceptible to ARI than other age group mothers. The rural children are more suffered from ARI than urban children both in 2011 and 2014 but in 2017-2018 it has changed. According to the divisions in 2011 children from Chottogram (7.4%) division was more affected by ARI than others but in 2017 some changes have taken place and children of Rangpur (5.9%) division are being affected more than others divisions while Khulna (1.7%) division had the lowest. Majority of the ARI affected children's were from poorest and poorer households. Social demographically not too much change was observed between 2011 and 2017.

Table 2 Frequency distribution of ARI & care seeking from qualified personnel among under-five children and bivariate analysis of care seeking who had symptoms of ARI

Variables	2011				2014				2017-2018			
	Total (%)	Had ARI	Care seeking prevalence	p-value	Total (%)	Had ARI	Care seeking prevalence	p-value	Total (%)	Had ARI	Care seeking prevalence	p-value
Sex of Child												
Male	51	6.6	44.24	0.159	52	6.1	38.43	0.802	52	3.6	47	0.037
Female	49	4.9	38		48	4.6	39.66		48	2.6	34	
Child Age (in months)												
<6	10	6.2	45.83	0.029	9	6.7	45.00	0.403	11	2.85	57	0.052
6-11	10	7.4	51.52		11	8.5	39.13		10	5.17	55	
12-23	18	6.9	43.75		21	6.5	45.05		20	4.09	41	
24-35	18	6.1	46.74		20	5.5	40.00		20	1.98	44	
36-47	22	4.9	36.67		20	3.9	31.15		19	3	29	
48-59	21	4.5	26.32		20	3.1	30.77		20	1.92	31	
Age of Mother												
15-19	14	6.4	44.59	0.578	15	8	39.77	0.590	13	4.6	51	0.528
20-24	37	5.9	40.22		34	5.5	34.07		35	2.4	49	
25-29	26	5.2	39.53		28	5.1	38.14		28	2.9	35	
30-34	14	5.0	48.39		16	3.7	47.73		17	2.4	37	
35-39	6	4.5	44.00		6	5.7	45.45		6	3.1	25	
39+	3	3.3	20.00		2	3.6	50.00		2		50	
Division												
Barisal	6	7.0	39.68		6	4.1	34.29		6	4.2	50	

Chottogram	23	7.4	26.50		21	4.8	41.33		21	2.7	53	
Dhaka	30	4.6	42.19		35	5.1	37.50		26	2.0	29	
Khulna	9	6.4	58.06		7	5.8	48.00		9	1.7	50	
Rajshahi	13	5.5	36.21	0.578	10	6.6	37.50	0.699	12	3.9	41	0.528
Rangpur	11	5.4	58.62		10	5.2	30.61		11	5.9	40	
Sylhet	8	4.9	43.55		10	6.3	40.54		8	2.9	42	
Mymensingh									8	2.4	30	
Place of Residence												
Urban	22	4.5	55.81		26	4.3	52.34		27	2.6	47	0.288
Rural	78	5.8	36.34	<.001	74	5.7	34.12	0.001	73	3.2	40	
Wealth Index												
Poorest	23	7.2	30.15		23	6.6	25.47		21	4.48	36.84	
Poorer	20	5.4	36.84		19	6.3	39.08		20	3.26	39.29	
Middle	19	5.9	34.09		19	5.2	38.37		19	2.53	42.86	
Richer	19	4.7	51.85	<.001	20	5.1	41.67	<.001	21	2.74	43.48	0.436
Richest	18	5.1	63.10		19	3.3	63.46		19	1.92	55.26	
Height for Age												
Normal	59	5.1	43.35		64	4.8	43.48		31	2.94	42	
Stunted	48	6.6	38.03	0.578	36	6.5	33.73	0.054	69	3.54	40	0.928
Mother's Education												
No Education	20	6.8	30.48	0.001	16	4.5	25.81	0.058	7	1.79	46	0.057
Primary	31	5.9	36.48		28	7.3	36.99		29	3.55	30	
Secondary	42	5.1	48.11		46	5.1	44.19		49	3.15	49	
Higher	7	5.4	62.86		10	2.8	47.83		16	2.13	46	

Father's Education												
No Education	30	6.7	29.14	0.002	26	5.9	25.71	0.001	15	3.69	35.56	0.418
Primary	29	4.9	44.12		30	6.4	37.34		34	3.29	38.71	
Secondary	29	6.1	46.94		30	5.2	51.89		32	3.18	48.84	
Higher	12	4.5	55.10		14	2.8	47.06		17	1.69	41.94	

P values are associated with bivariate chi square test of independence

According to the BDHS 2011, mothers of age group 30-34 and 35-39 were more likely to seek care for their child with ARI from qualified personnel 48% and 44% as compared to the other age groups. Whereas according to BDHS 2017-2018 mothers of younger age group (up to 24 years) were more likely (50%) to seek care for their children's.

There is a rise observed in healthcare seeking among male children from 44% to 47%. Health care seeking among female children was decreased in 2017 compared to 2014. Among educated mother there was an increase in health care seeking in 2017-2018 compared to 2011.

The trend of taking care seeking from qualified personnel for children of poorest has increased in 2017 (37%) compared to 2011 (30%). On the other hand, the tendency to seek care among richest people in 2014 and 2017 has decreased as compared to 2011.

In 2011 and 2014 the people of Khulna division received more treatment (58%) for their ARI affected children than other divisions but in 2017 the people of Chottogram division took more treatment (53%). However, it was noted that those living in rural communities are getting more care seeking from qualified doctors in 2017 (40%) than 2011 (36%). Improvement is seen in them. But children of urban areas as compared to rural (55.8% vs 36.34%) were more likely to seek care in 2011 with a similar trend in 2017-2018 (47% vs 40%). Within the level of mother education in 2011 higher education group has highest seek care that is (62.86%) and the no education group have the lowest seek care (30.48%) and same in 2014. But in 2017 the secondary education group has highest seek care from qualified personnel that is 49% and no education group and higher education group received same that is (46%) care seeking from qualified personnel. In case of father education in 2011 same as mother education. But in 2014 and 2017 secondary education group has highest seek care from qualified doctors.

Table – 2 also represents the results obtained from the bivariate analysis for care seeking from qualified personnel with all independent variables. In 2011 Out of all independent variables

five appears significant as p-value is less than 0.05 at 5% level of significance, the highest education level of mother & father can be considered as a significant factor for care seeking from qualified doctors. Place of residence, wealth index and age of children also is significant in population and also a notable factor for care seeking because the p value is less than 5% level of significant.

In 2014 three appears significant which is place of residence, wealth index and father education and in 2017 only age of children appears statistically significant as p-value is less than 0.05.

Determinants of health care seeking behavior

Table 3 present the multiple logistic regression models are used to determine the contribution of factors to ARI of under five years' children along with corresponding p-values and odds ratios. Very few variables are found to be significantly associated with seeking care from qualified doctors.

In 2017-2018 A higher probability of seeking care from qualified doctors was observed among less than 6 months old child (AOR: 3.065, CI: 1.020, 9.20). Since p value is 0.04. It is significant for population. It implies that the child age less than 6 months is a significant factor for care seeking.

In these 10 years the economic status of households was identified as an important predictor, with care from medical providers being sought by households who belonged to the richest quintile. Additionally, the findings revealed that the probability of receiving treatment from qualified providers increased gradually with improving economic status.

In case of division adjusted logistic regression analysis also indicates that in 2011 the children of Barishal (0.9074(0.393, 2.094) Chittagong (0.4871(0.229, 1.032) & Rajshahi division (.8063(.352, 1.843) has less likely to seeking healthcare from qualified personnel compare to Sylhet division. has more likely to seeking healthcare from qualified personnel compare to Sylhet division. In 2014 all the division has less likely to seeking healthcare from qualified personnel, compared to Sylhet division. But in 2017-2018 the children of Barishal, Chattogram division has more likely to seeking healthcare from qualified personnel compare to Sylhet division. Multivariate analysis also shows that in 2011 and 2014 adolescent mother has less likely to seeking healthcare from qualified personnel compare to as compared to children of mothers aged 30-34 years. However, children living in rural areas were less likely to seeking healthcare from qualified personnel compare to urban children. In 2011 and 2014 stunted

children less likely to seeking healthcare from qualified personnel compare to normal children. But in 2017-2018 stunted children 1.12 times seek care from qualified doctors.

Table 3: Multiple logistic regression of care seeking from qualified personnel

Variables	BDHS 2011	BDHS 2014	BDHS 2017-2018
	Adjusted OR(95%CI)	Adjusted OR(95%CI)	Adjusted OR(95%CI)
Sex of Child			
Male	1.328(0.867, 2.035)	0.8215(0.519, 1.299)	1.515(0.804, 2.851)
Female(ref)	1	1	1
Child Age (in months)			
<6 m	1.851(0.725, 4.726)	1.762(0.653, 4.753)	3.0647(1.020, 9.205)*
6-11 m	2.656(1.155, 6.109)*	1.517(0.620, 3.711)	2.843(0.958, 8.437)
12-23 m	2.259(1.091, 4.678)*	1.939(0.840, 4.476)	1.801(0.666, 4.869)
24-35 m	2.104(0.991, 4.465)	1.716 (0.754, 3.905)	1.862(0.596, 5.819)
36-47 m	1.282(0.595, 2.763)	0.907 (0.363, 2.265)	0.990(0.313, 3.127)
48-59 m(ref)	1	1	1
Age of Mother			
15-19	0.603(0.268, 1.358)	0.361(0.150, 0.869)*	1.870(0.677, 5.167)
20-24	0.538(0.269, 1.075)	0.439(0.199, 0.965)*	2.1759 (0.834, 5.676)
25-29	0.578(0.287, 1.165)	0.521 (0.232, 1.166)	1.042(0.406, 2.674)
30-34(ref)	1	1	1
35-39	1.059(0.359, 3.126)	1.176(0.398, 3.468)	0.847 (0.185, 3.868)
39+	0.506(0.089, 2.856)	2.091(0.246, 17.751)	2.929 (0.126, 67.570)
Division			
Barisal	0.9074(0.393, 2.094)	0.427(0.157, 1.158)	1.371(0.510, 3.682)
Chottogram	0.4871(0.229, 1.032)	0.765 (0.361, 1.620)	1.412(0.522, 3.821)

Dhaka	1.0146(0.448, 2.297)	0.466(0.208, 1.042)	0.439(0.128, 1.497)
Khulna	1.9169(0.836, 4.395)	0.806(0.346, 1.878)	0.998(0.276, 3.599)
Rajshahi	.8063(.352, 1.843)	0.722(0.317, 1.646)	0.730(0.244, 2.185)
Rangpur	1.959(.853, 4.502)	0.511 (0.210, 1.240)	1.077 (0.387, 2.996)
Sylhet(ref)	1	1	1
Mymensingh			0.529 (0.151, 1.850)
Place of Residence			
Urban(ref)	1	1	1
Rural	0.779(0.466, 1.303)	0.571 (0.321, 1.015)	0.813(0.382, 1.729)
Wealth Index			
Poorest	0.399(0.175, 0.916)*	0.462(0.161, 1.322)	0.417(0.129, 1.343)
Poorer	0.630(0.279, 1.425)	0.611(0.227, 1.645)	0.399(0.127, 1.248)
Middle	0.448(0.209, 0.959)*	0.513(0.202, 1.303)	0.499 (0.167, 1.492)
Richer	0.724(0.348, 1.507)	0.523 (0.215, 1.273)	0.664 (0.236, 1.870)
Richest(ref)	1	1	1
Height for Age			
Normal(ref)	1	1	1
Stunted	0.977(0.629, 1.518)	0.809(0.495, 1.323)	1.120(0.593, 2.114)
Mother's Education			
No Education	0.763(0.220, 2.646)	0.638 (0.148, 2.738)	2.055(0.343, 12.307)
Primary	0.705(0.221, 2.243)	1.1389(0.304, 4.254)	0.672 (0.221, 2.046)
Secondary	0.968(0.333, 2.809)	1.312(0.382, 4.502)	1.429 (0.559, 3.649)
Higher(ref)	1	1	1
Father's Education			
No Education	0.837(0.291, 2.407)	0.707(.2190, 2.286)	1.724 (0.448, 6.628)
Primary	1.177(0.429, 3.226)	1.042 (0.354, 3.067)	1.673 (0.553, 5.064)
Secondary	1.062(0.421, 2.675)	1.704 (0.598, 4.857)	1.779(0.622, 5.081)

Higher(ref)	1	1	1
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*=p <0.05, OR=Odds ratio, CI= confidence interval

Discussion:

Using nationwide representative data from Bangladesh, this study aimed to explore the trends of healthcare seeking for ARI among Children under 5 and prevalence of ARI, socio-demographic factors, and socio-economic differentials. It was observed that various socioeconomic and demographic factors, such as sex of child, age of child, parental education, the age of the mother, residence, wealth index and child malnutrition were associated with the care seeking for ARI among under five children over a decade.

In my study shows that ARI prevalence has been decreased gradually for last 10 years. ARI prevalence was 5.8% in 2011 which decreased to 3% in 2017-18. In comparison to the previous BDHS round, the prevalence of ARI peaked in 2004 (21%) [43], then reduced considerably before stabilizing at 5% from 2007 to the 2014 demographic health survey. In comparison to studies from other countries such as Pakistan, Ethiopia, and Indonesia [44], the prevalence was found to be lower. In a survey of 40 developing countries, the average prevalence of ARI was determined to be 13% [45]. The introduction of the Hib and pneumococcal conjugate vaccine into the national immunization program, as well as improvements to the health care system and infrastructure at the community level, could explain the lower prevalence compared to other developing countries. From this study it is found that in these 10 years almost 60% of under five children do not get treatment from any qualified doctors even though they have ARI.

My study indicates that higher ARI prevalence among children aged less than 24 months. corresponded with these findings, a wide range of studies in developing countries reported older age being associated with a reduced ARI prevalence, with children under the age of two being the most vulnerable [45,46]. These trends could be due to young children's inadequate immune systems, as well as other reasons such as receiving care from multiple caregivers or playing with other children, which could increase infection risk at an early age. [42, 47]

Male children had higher risk of being developing ARI. Similar findings were also found in relevant studies conducted in Pakistan and Iraq [48, 49] that male children had higher ARIs than female children. The explanation for male children's high vulnerability could be genetic,

or it could be related to gender bias, which encourages mothers to notice symptoms because of their preference for boys. [50].

Children from younger mothers were also observed to be at higher risk of ARIs. If the mother was under the age of 24, then the children had a higher chance of suffering from ARI. It's possible that younger mothers focused primarily on their own happiness, devoting more time to their partners, less awareness about their child's health, less knowledge of how to take care of their child. Similar observations were obtained in previous studies [51]. Furthermore, household poverty may be a common influencing factor behind maternal age and poor nutrition, since poverty leads to early marriage among women, which subsequently that leads to early pregnancy, a weakened immune system and a subsequently increased vulnerability to disease. Earlier studies revealed that household poverty, adolescent motherhood, and child malnourishment are significant ARI risk factors among children in Bangladesh [52, 53].

Parental education has been related to long-term benefits in children's health and life expectancy. Uneducated mother received more care seeking from qualified doctors for their children in 2017 than 2011. That's mean in 2017 there have been many improvement in mother education and knowledge about child health. It is found that in 2017 children who lived in Rangpur region were at higher risk of developing ARI. This is consistent with previous studies from Bangladesh [54] that also found similar findings in relation to the regional differences in the prevalence of ARI.

This results also show that there has been an improvement in health care seeking among under five children in some of the variables from 2011 to 2017-2018. According to the DHS, care-seeking behavior from health care facilities was only 20% in 2004 [43], the study found that care-seeking behavior from health care facilities was increased gradually to 35%, 44% and 54% for 2011,2014 and 2017-2018 respectively compared to the combined findings reported from other developing countries sub-Saharan Africa (48%) [55].

The decision-making process to seek care is influenced by additional factors. In countries with low socioeconomic development, such as Bangladesh, relatively high levels of care seeking are inspiring. The high percentage of people seeking treatment might be explained by the availability of pharmacies and the development of various health centers (public, private, and NGO) and improved health system infrastructure in recent years and even disease severity. The type of care seeking was found to be highly related to the income quintiles, with parents in the highest quintile seeking care from skilled providers (private or public facilities). Previous

research has also confirmed these findings [42]. It is known that the cost of healthcare plays a massive part in decision making, with out-of-pocket spending accounting for the majority of care received in developing countries, as those in the higher wealth quintiles can generally afford costs of healthcare. [56]. Additional factors affecting care seeking behaviors were children's age and sex, household type, parental education level, and the mother's age.

The results show that unqualified doctors are preferred over qualified doctors for the care seeking of children with pneumonia. Another study reveals that in 2006 Over 60% of the population relied on unqualified health workers, such as kabiraj, totka, faith healers, traditional birth attendants, palli chikitsoks homoeopaths, and drug sellers [57].

Sex differential in care seeking has been reported in previous studies [58]. My study also revealed that female babies are much less possibly to be taken for qualified medical care compared to male babies. Care seeking is higher educated parents than uneducated parents. It is obvious that parental education appreciably contributed to the seeking suitable care and to the prevention and manipulate of morbidity. Maternal age acted as a strong predictor of health care seeking after 35 year of age, before 2017 younger mother were less likely to seek health care for their children. It may well be attributed to the availability of opportunity in terms of additional financial area and awareness relating to utilization of health services. This points to improvement in woman's autonomy that has been discovered to more among working women [59]. It had been also evident that in comparison among the varied socioeconomic categories in each surveys, health care seeking behavior was improved more within the lower and middle socioeconomic class as compared to the higher class. This is because the income of the people has increased more than before and the awareness of health among the people is increasing.

The tendency to seek treatment for ARI from unqualified personnel has more than qualified doctors. Because it is very easy to get treatment from unqualified personnel. In developing countries like Bangladesh, people depend more on unqualified personnel due to expediency, shorter waiting time, cost reduction, easier and availability of credit and flexible opening hours [60, 61]. It's easier, but it's also riskier, because inexperienced informal healthcare practitioners perform improvised treatments and unreasonably prescribe the use of medicines, pharmaceuticals, and antibiotics.

Ease of access to the pharmacies was an important reason for seeking health care for ARI in Bangladesh. Distance from health facilities has also been an important barrier to health care access, including child health services, in other settings. A survey on health care-seeking

behaviors among slum dwellers within Dhaka city and a study in Nigeria reported close distance to one's home as a motivation for preferring pharmacies for primary source of health care [62]. In our study sample, the second most common reason for seeking health treatment from an unqualified person was cost. Patients in Bangladesh who seek medical treatment pay for their consultation and then again when they buy the drug that the physician recommends. Without asking remuneration for making a treatment advice, drug sellers/pharmacy personnel recommend and sell drugs for a disease episode. People frequently reported convenience of hours of operation as an important factor in seeking care at pharmacies rather than Clients did not want to take time off work to visit a clinic or medical office, thus physicians were hired. In Bangladesh, long wait times at government health institutions (57.14 minutes) are linked to dissatisfaction among health-care seeking [63]. Furthermore, people thought of ARI as a minor sickness that could be treated by pharmacy salesmen without the need for a doctor's appointment. The majority of mothers of pneumonic children lacked awareness about the disease [64]. The majority of them couldn't tell if their child had pneumonia or not. Majority of them did not have prior knowledge about the clinical features of pneumonia. In my study results also disclosed although similar findings were reported in previous studies from Nigeria [62] and Vietnam [65]. Bangladesh makes remarkable progress in socio-economic development in last 10 years and also improving educational attainment rates.

Methodological Strengths and Limitations:

This is the first analysis of 2011, 2014 and 2017-2018 Bangladesh Demographic and Health Surveys with an average response rate of 98%. The method increases the study power, predicts which risk factors for child deaths persist over time, and the findings can be safely generalized to cover populations with similar characteristics. Despite its strengths, this study contains a number of limitations. However, children were diagnosed with ARI only based on their mothers' reports of ARI signs and symptoms, with no medical corroboration. As a result, it's probable that some of the children were suffering from conditions that resembled ARIs. As a result, the findings should be interpreted with caution, as ARI symptoms may not be diagnostic of the illnesses. Another restriction is that some of the studies utilized for comparison employed a different duration of ARI signs and symptoms than the two weeks before to the survey. Another limitation to consider is the fact that respondents are asked about past events in a survey like the above. As a result, the impact of recall bias on our findings cannot be ignored.

Conclusions:

The observed lack of seeking Prevalence, determinants, and care seeking of childhood ARIs from medically qualified providers is a major concern, implying that policy efforts should pay more attention to care-seeking behaviors. Higher usage of formal health care services among educated and richer households revealed that effective mitigation measures should focus on interventions that specifically target households with low socioeconomic status and education. Based on the findings, policies for developing effective awareness/health education programs, poverty alleviation programs, and culturally acceptable interventions for improving care-seeking from medically trained providers, particularly for rural residents, would be influenced, and thus contribute to health system strengthening.

Recommendations:

ARIs continue to cause a high disease burden among Bangladesh's under-five children. Lack of appropriate health-seeking behavior is an important risk factor that should be paid attention to. The existing community based health care approach of the government can be further strengthened to enhance case detection and online care seeking from qualified professions. In addition, more research to find out reasons for poor care seeking and or the pathways of care seeking behavior should be carried out for better solutions.

Awareness must be created in everyone that seeking care by a qualified doctors greatly reduces the chances of children developing subsequent antimicrobial resistance. If symptoms of pneumonia appear, seek the care of a qualified doctors as soon as possible because respiratory infection if treated early and effectively can be completely cured in nearly all cases with normal life expectancy. Vaccinate children on time. The cost of private health care sector should be reduced.

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