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RESPIRATORY PROBLEMS AND ASSOCIATED FACTORS AMONG RURAL WOMEN IN BANGLADESH: A COMMUNITY BASED STUDY

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ABSTRACT

Children and women in rural Bangladesh are more vulnerable to respiratory diseases. The current study aimed to investigate the factors that contribute to the occurrence of respiratory illnesses among rural women. A cross-sectional community-based study was carried out among rural women. Initially, households (HH) were selected by systematic random sampling. From 1232 selected HHs, a total of 1232 women who matched the criteria were included as the respondents. Using a questionnaire on respiratory illnesses, data was collected from the respondents. Out of 1232 participating women, 551(44.7%) were found to suffer from respiratory illnesses. Higher age (45 years and above), primary education, joint family, habit of chewing tobacco, and exposure to second-hand smoking were found to be significantly (<.05) associated with the occurrence of respiratory illnesses among women. Higher mean (20.34±11.54) years of cooking, use of traditional stoves and biomass fuel were also found to be significantly(<.05) associated. However, logistic regression analysis revealed that living in a joint family, primary education, use of traditional stoves, and chewing tobacco (1.5 times, 1.4 times, 1.4 times, and 1.1 times respectively) individually had a significant(<.05) ability to develop respiratory illnesses. The respiratory illnesses were nasal block (43%) and nasal discharge (37%), chronic cough (33%). asthma (22%), chest tightness (21%), dyspnoea (21%) and cough with mucus (19%). The study revealed that a higher proportion of rural women suffered from respiratory disorders and a number of factors were found responsible for the occurrence of these problems.

KEYWORDS: Respiratory disease, Asthma, Tobacco chewing, Biomass fuel, Rural women.

INTRODUCTION

Respiratory diseases are regarded as the major contributors to mortality and morbidity globally. It is estimated that each year about 4 million pre-mature deaths occur as a result of chronic respiratory diseases. In 2017, about 545 million people worldwide were reported to be suffering from chronic respiratory diseases, and 3.9 million died, which increased by about 39.8% and 17.8% respectively from 1990 and became the 3rd leading cause of death.[1,2] A recent report revealed that every year, about 235 million people in the world suffer from asthma and 65 million from COPD (Chronic Obstructive Pulmonary Diseases). More than 3 million people worldwide die from COPD every year. On the other hand, in children, asthma is reported to be a common chronic respiratory disease globally with 14% of all children suffering from it. About 180,000 people worldwide die every year as a result of asthma. Over the last few decades, mortality and morbidity due to asthma have been increasing rapidly, particularly in developing countries, and there has been a sharp rise in the occurrence of asthma as a result of urbanization in recent years.[3-6]

Worldwide, respiratory diseases are a major public health burden. In low and middle-income countries, like Bangladesh, the burden of respiratory diseases is

higher.[2] According to Global Asthma Report in 2018, among the major causes of the global burden of disease, asthma was 28th and 27th in low-middle countries.[7] In Bangladesh, recently, it has been reported that asthma and breathing problems are on a steady rise among low-income people. The overall prevalence of asthma has been reported to be 10.7%.[2] In 2018, the number of deaths due to lung diseases was 64,762, which was 8.34% of the total deaths in Bangladesh and ranked 7th in the world. The number of deaths due to asthma was 662 in 2018, which was 0.76% of the total deaths.[8] According to a report, in five years' duration, in Bangladesh, asthma patients increased almost 24% from 2015 to 2019, which was 3326 to 78806 respectively, and in the same period, deaths due to asthma increased about 10 fold. It was estimated that around 200,000 people might die from respiratory diseases in Bangladesh by 2019.[9]

Several factors have been reported to cause respiratory diseases, and in Bangladesh, most of these factors are evident in different studies.[2,5,10,11] Air pollution, both indoors and outdoors, is the major risk factor for the causation of respiratory diseases.[4,12,13] Motor vehicles, industrial emissions, and construction are the major causes of outdoor air pollution in urban areas of Bangladesh.[14,15] On the other hand, burning biomass fuels and cigarette smoking are the main contributors to indoor pollution and are responsible for respiratory diseases.[15-17] In terms of air pollution, Bangladesh is one of the most polluted countries in the world, having the exposure to the highest levels of PM-2.5. It was estimated that in 2019, PM-2.5 would be responsible for 74,000 deaths in Bangladesh and 79/100,000 deaths attributable to indoor air pollution. Every year, around 4 million people die prematurely as a result of illnesses attributable to household air pollution due to poor cooking practices.[15,17,18] It was observed that in Bangladesh the prevalence of respiratory diseases among women was almost same as in men.[2,6,12] However, asthma was found to occur significantly more frequently among women than in men.[12] Factors associated with the occurrence of respiratory diseases among rural people, especially among women, were evident in a few studies.[2,12] Thus, this study was aimed to carry out in the community to investigate respiratory problems and the risk factors responsible for causing such problems among women in rural areas..

MATERIALS AND METHODS

This was a cross-sectional community-based study carried out to find out the respiratory illnesses and associated factors among rural women. The women who had a history of cooking for more than three years, aged 20 years or more, and resided in the study community for at least five years were the study population. Initially, using systematic random sampling, the households were selected. From the 1232 selected households, the women who met the criteria and agreed to take part in the study were included as the respondents. Ultimately, 1232 rural women were the respondents of this study. The respondents were interviewed face to face using a pretested questionnaire to collect data on socio-demographic characteristics, personal habits, and cooking practices. To assess the respiratory illnesses, a pre-tested questionnaire on respiratory illnesses was used for data collection. Based on the questionnaire, the participant women were asked regarding suffering from any respiratory illness in the previous six months. During data collection to ascertain the respiratory illness, two physicians who were the investigators of this study collected related information from the participants.

The collected data was inputted into a computer and analyzed by using Windows SPSS. The analysis was done based on study objectives and variables. For descriptive analysis, frequency, percentage, mean and standard deviation were performed. Student's t-test was performed for quantitative variables and to find out associations between respiratory problems and socio demographic and other factors, chi-square test was conducted. Binary logistic regression analysis was done to find out the predictors of respiratory disorders.

Ethical approval: The Institutional Ethical Review Committee gave ethical permission for the study. The participant women were briefed before data collection regarding the purpose of the study and the process for data collection. The respondents were also told about their voluntary participation and were free to withdraw themselves from the study and there would be no penalty for withdrawal. The respondents were also assured of the confidentiality of the study and their identity would not be disclosed

RESULTS

Out of 1232 participating women in this study, 551 (44.7%) were found to suffer from respiratory illnesses. The mean age of the respondents was 35.7±11.07 years, and the respondents who suffered from respiratory illnesses had a mean age of 36.7 (±11.259) years, which was significantly **(**t=-2.895; p=0.004 **)** higher than the women who did not suffer. There was significantly **(**t=-2.895; p=0.004) an increased tendency for the occurrence of respiratory illnesses with age. The respondents with up-to primary level of education (56.1%) were found to suffer more than the respondents with education above the primary level and the difference was highly significant (χ^2=14.210; p=0.000**).** Further, respiratory illnesses were found to occur significantly in a higher proportion among the respondents who lived in joint family. However, the occurrence of respiratory problems did not differ significantly with mean income and type of house. (Table-1).

Table 1: Socio-demographic characteristics and respiratory problems of participating women.

Characteristics		Respiratory Problems		Total n=1232	Test of significance
		No = 681 (55.3%)	Yes = 551 (44.7%)		
Age (years)	Upto 24	160 (23.5)	110 (20.0)	270 (21.9)	**χ2=10.764; p=0.013**
	25- 34	187 (27.5)	122 (22.1)	309 (25.1)	
	35-44	178 (26.1)	157 (28.6)	335 (27.2)	
	45 and Above	156 (22.9)	162 (29.4)	318 (25.8)	
	Mean±SD	34.8±10.865	36.7±11.259	35.7±11.07	**t=--2.895; p=0.004**
Education	Non formal	152 (22.3)	141 (25.6)	293 (23.8)	**χ^2=14.210; p=0.000**
	Upto Primary	345 (50.7)	311 (56.4)	656 (53.2)	
	SSC	120 (17.6)	63 (11.4)	183 (14.9)	
	HSC & Above	64 (9.4)	36 (6.5)	100 (8.1)	
Family Size	Upto 4	428 (62.8)	364 (66.1)	792 (64.3)	χ^2= 1.289; p=0.198
	5 and Above	253 (37.2)	167 (33.9)	440 (35.7)	
Family Type	Nuclear	553 (81.2)	418 (75.9)	971 (78.8)	**χ2=5.206; p=0.023**
	Joint	128 (18.8)	133 (24.1)	261 (21.2)	
Monthly Expenditure	Mean±SD	10846±5832	10432±5523	10651±5585	t=1.289; p=0.198
House Type	Katcha	116 (17.0)	81 (14.7)	197 (16.0)	χ^2= 2.576; p=0.462
	Tin	185 (27.2)	170 (30.9)	355 (28.8)	
	Semi pucca	276 (33.2)	178 (32.1)	404 (32.8)	
	Pucca	154 (22.6)	122 (22.1)	276 (22.4)	

Percentage in Parenthesis

Table-2: Tobacco consumption by the participating women.

Tobacco use		Respiratory Problems		Total= 1232	Test of Significance
		No=681	Yes=551		
Tobacco consumed by respondents	Yes	51 (7.5)	75 (13.6)	126 (10.2)	χ^2= 12.435; **p=0.000**
	No	630 (92.5)	476 (86.4)	1106 (89.8)	
Type of Tobacco consumption	Jarda	22 (36.1)	39 (63.9)	61 (48.4)	χ^2= .962; p=0.618
	Tamak	15 (44.1)	19 (55.9)	34 (27.0)	
	Gul	14 (45.2)	17 (54.8)	31 (24.6)	
Smoking in home by HH members	Yes	312 (45.8)	287 (52.1)	599 (48.6)	χ^2= 4.796; **p=0.029**
	No	369 (55.3)	268 (44.7)	633 (51.4)	

Percentage in Parenthesis

Table-3: Cooking practice by the participating women.

Cooking Practice		Respiratory Problems		Total= 1232	Test of Significance
		No=681	Yes=551		
Fuel Types	Biomass	588 (54.2)	497 (45.8)	1085 (88.1)	**χ^2= 8.304; p=0.016**
	Gas	55 (57.3)	41 (42.7)	96 (7.8)	
	Other	38 (74.5)	13 (25.5)	51 (4.1)	
Cooking Stove	Traditional	432 (52.2)	395 (47.8)	827 (67.1)	**χ^2= 9.399; p=0.002**
	Improved	249 (61.5)	156 (38.5)	405 (32.9)	
Length of Cooking	Mean±SD (Years)	18.32±11.265	20.34±11.542	19.23±11.475	**t=-3.080; p=.002**
	Mean±SD (Hours)	3.53±.714	3.59±.650	3.56±.688	t=-1.367; p=.172

Percentage in Parenthesis

This study revealed that none of the respondents were cigarette smokers. However, 10.2% of them used to chew tobacco. And those who had the habit of chewing tobacco, the occurrence of respiratory illnesses amongst them (13.6%) was highly significant (χ^2=12.435; p=0.000). The tobacco chewed by the respondents was *Jarda* (48.4%). *Tamak* (27.0%) and *Gul* (24.6%). (Table-2) Regarding cooking practice, the participant women were found to cook on average for almost 20 years and the respondents who suffered from respiratory illnesses, the mean age (20.34±11.542 years) was significantly **(**t=-3.080; p=.002**)** higher. Overall, the mean cooking time was 3.56±0.688 hours. However, the daily mean cooking hours did not differ significantly from the occurrence of respiratory illnesses. The women who used biomass fuels and traditional cooking stoves (TCS) for cooking purposes significantly **(**χ^2= 8.304; p=0.016 and χ^2= 9.399; p=0.002 respectively) a higher proportion of them

were reported to suffer (45.8% and 47.8% respectively) from respiratory illnesses. (Table-3) The respiratory disorders suffered by the participant women were nasal block (42.9%). nasal discharge (37.0%), chronic cough (33.0%), asthma (21.7%), chest tightness (21.2%), and cough and mucus (19.4%), (Table-4)

Table-4: Respiratory manifestations among the participating women.

Respiratory Manifestations	Frequency*
Asthma	267 (21.7)
Dyspnoea	252 (20.5)
Chest Tightness	261 (21.2)
Chronic Cough	406 (33.0)
Cough & Mucus	239 (19.4)
Nasal block	529 (42.9)
Nasal discharge	456 (37.0)

* Multiple Responses, Percentage in Parenthesis

Binary logistic analysis was performed to assess the impact of the factors which were found to be significantly associated with the occurrence of respiratory illnesses and the manifestations in univariate analysis. (Table-5) The analysis revealed that higher age (age more than 35 years) was a significant and stronger risk factor for asthma, dyspnoea, and chest tightness. Age 35 years and more had 2.2, 2.3, and 2.4 times ability to predict the development of these manifestations respectively, whereas age 45 years and above had 2.4, 2,5 and 2,6 times ability to predict respectively. Education did not show any significant impact except on the occurrence of respiratory illnesses as a whole.

Table-5: Risk factors for respiratory illnesses among the participating women.

Risk Factors	Adjusted Odds Ratio (95% Confidence Interval) and p=value				
	Respiratory Problems	Asthma	Dyspnoea	Chronic Cough	Chest Tightness
Age (years) - Upto 24*					
25- 34	0.699 (0.363-1.346) p=.284	1.411 (0.852-2.337) p=.181	1.344 (0.790-2.285) p=.275	0.760 (0.510-1.133) p=.178	1.554 (0.926-2.609) p=.095
35-44	0.681 (0.399-1.163) p=.150	2.197 (1.238-3.837) **p=.007**	2.277 (1.270-4.083) **p=.006**	1.071 (0.666-1.720) p=.778	2.372 (1.329-4.232) **p=.003**
45 and Above	0.888 (0.590-1.337) p=.569	2.437 (1.116-5.321) **p=.025**	2.462 (1.104-5,499) **p=.028**	0.948 (0.475-1.893) p=.880	2.579 (1.165-5.711) **p=.019**
Education- Non-formal education*					
Upto Primary	1.383 (1.005-1.829) **p=.046**	1.543 (0.757-3.143) p=.233	1.319 (0.630-2.764) p=.463	0.808 (0.455-1.432) p=.465	1.713 (0.778-3.770) p=.181
SSC	0.779 (0.503-1.207) p=.264	1.417 (0.739-2.719) p=.294	1.375 (0.697-2.764) p=.359	1.390 (0.852-2.266) p=.187	1.905 (0.917-3.957) p=.081
HSC & Above	0.969 (0.571-1.645) p=.907	1.093 (0.521-2.295) p=.814	1.062 (0.490-2.301) p=.878	0.755 (0.425-1.339) p=.337	1.685 (0.754-3.769) p=.204
Tobacco Use- No tobacco*, No smoking in home*					
Smokeless Tobacco	1.687 (1.112-2.538) **p=.012**	1.202 (0.774-1.868) p=.413	1.576 (1.020-2.437) **p=.041**	1.979 (1.312-2.982) **p=..001**	1.791 (1.165-2.755) **p=.008**
Smoking in Home	1.202 (,951-1.518) p=.123	1.460 (1.099-1.940) **p=.009**	1.611 (1.201-2.159) **p=.001**	1.214 (0.948-1.555) p=.125	1.692 (1.266-2.261) **p=.000**
Cooking Practice- No Biomass fuel*, Improved stoves*					
Use Biomass Fuel	1.164 (0.795-1.70)2 (p=.435)	1.298 (0.787-2.148) p=.307	1.429 (0.840-2.430) p=.188	1.129 (0.748-1.705) p=.563	1.388 (0.832-2.316) p=.210
Traditional Stoves	1.392(1.078-1.799) **p=.011**	1.386 (1.007-.908) **p=.045**	1.397 (1.005-1.942) **p=.047**	1.326 (1.008-1.745) **p=.043**	1.215 (0.882-1.673) p=.233
Cooking Years	1.002 (0.981-1.024)	1.005 (0.981-1.030)	1.008 (.984-1.033)	1.014 (0.992-1.037)	1.006 (0.982-1.031)

	p=.840	p=.668	p=.523	p=.215	p=.624
Family Type- Nuclear Family*					
Joint family	1.454 (1.096-1.031) **p=.010**	1.195 (0.848-1.664) p=.309	0.894 (0.619-1.292) p=.552	1.693 (1.263-2.268) p=.015 times	1.243 (0.879-1.757) p=.219

* Reference Category

However, education up to primary level had 1.4 times ability to predict the development of respiratory illnesses. The habit of chewing tobacco was found to be a significant risk factor for the occurrence of respiratory illnesses as a whole, dyspnoea, chronic cough and chest tightness. Respondents with a chewing tobacco habit had 1.7, 1.6, 2.0, and 1.8 times more likelihood of developing these manifestations, respectively. Second hand smoking (smoking at home) was also found as a high risk factor for the causation of asthma, dyspnoea, and chest tightness, with 1.5, 1.6, and 1.7 times more likelihood of developing these manifestations, respectively. Use of TCS was also found to be a risk factor and had 1.4, 1.4, and 1.3 times ability to predict the likelihood of developing respiratory illnesses as a whole, asthma, dyspnoea, and chronic cough, respectively. Living in a joint family, on the other hand, was revealed to be a significant risk factor with 1.5 and 1.7 times more likely to develop respiratory illnesses and chronic cough respectively. (Table-5)

DISCUSSION

This community based study revealed that about 45% of rural women had respiratory disorders. Education, age, family type and cooking experience were significantly associated with respiratory disorders of rural women. It was found that women who had primary education or no formal education suffered significantly more from respiratory illness. This study also found that the participating women with a higher average age suffered from respiratory illnesses in a higher proportion and had an increased tendency to occur with increased age. The participant women who lived in a joint family were also found to suffer significantly more than the women who lived in a nuclear family. This study further revealed that women with higher cooking experience suffered significantly more from respiratory disorders. The relationships between these factors and the occurrence of respiratory illnesses have also been found in different studies in Bangladesh and elsewhere.[6,12,19-21]

Regarding tobacco consumption, none of the participating women in this study had smoking habits. However, about 10% of them used to chew tobacco and the common tobacco they chewed was *Jarda* followed by *Tamak* and *Gul*. Consuming tobacco is known to cause a higher risk of occurrence of cancer and a variety of respiratory illnesses.[4,22-23] However, smokeless tobacco [chewing tobacco) users have a lower risk of mortality and the occurrence of diseases than smokers.[24] The current study showed that a higher proportion of the participating women who had the habit of chewing tobacco, suffered from respiratory illnesses and was highly significant (p=0.000). A study conducted in a rural community in Bangladesh also found a significant association with chewing tobacco.[12] Moreover, the women who had exposure to secondhand smoking (smoking in the home) significantly (p=0.029) over half of them (52.1%) suffered from respiratory diseases.

The participating women who used TCS, significantly (p=.002) a higher proportion of them were found to suffer from respiratory illnesses (71.1%) in comparison with those who used ICS. Studies have revealed that the use of ICS, the pollutant emission by the stoves, as well as the exposure of household members, especially women and children, are reduced, thus preventing the occurrence not only of respiratory illness but other diseases, including cancer.[16,25] Biomass smoke is a major source of indoor air pollution and has been recognized as a major risk factor for the occurrence of various diseases in developing countries. According to a WHO report, biomass smoke is a major environmental risk factor and one of the top ten global risk factors for disease, which accounts for 2.7% of the global disease burden.[17,26,28] Studies from Bangladesh and elsewhere[17,25-28], revealed an association between the pollutants emitted by cooking smoke and the occurrence of various illnesses, including acute respiratory infection, asthma, tuberculosis, chronic bronchitis, chronic obstructive pulmonary disease (COPD), cardio-vascular diseases, burning eyes, and low birth weight. The current study found that the participating women who used biomass fuels, significantly (p=0.016) a higher proportion of them suffered from respiratory illnesses.

The respiratory illnesses suffered by the participating women were nasal block (44%), nasal discharge (37%), chronic cough (33%), asthma (22%) and dyspnoea (21%). The adjusted Odds ratio analysis showed that the risk of occurrence of all these manifestations (except chronic cough) increased (more than 2 times) with increasing age (35 years and above); except for asthma, the risk increased (more than 1.5 times) with chewing tobacco, and except for chronic cough, the risk increased (1.5 times and more) with exposure to second-hand smoking at home. However, the risk of occurrence of chronic cough was found to be higher (1.7 times) among women who lived in joint families. The factors which were found independently responsible for the increased risk of developing overall respiratory disorders were chewing smokeless tobacco (1.7 times), living in a joint family (1.5 times) and the use of traditional stoves (1.4 times).

Limitation**:** This study was carried out among rural women at the village level. The women were frightened of doing the spirometry test and could not perform it properly even after repeated orientations. For this, the spirometry test of the women was not possible. To ascertain the respiratory diseases, the study physicians collected the necessary information from the women.

CONCLUSION

The current study revealed that a higher proportion of rural women suffered from respiratory illnesses. The respiratory illnesses included nasal block, nasal discharge, chronic cough, asthma and dyspnoea. The factors which were found to increase the risk of respiratory disorders independently were higher age, education up to primary level, habit of chewing tobacco, exposure to second-hand smoking, use of a traditional stove and living in a joint family.

CONFLICT OF INTEREST: The authors do not have any competing interests.

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