

Original Article

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Respiratory Problems and Work-Related Factors among Jute Mill Workers

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Abstract:

Background: Occupational exposure to jute dust and airborne contaminants is a health concern in low-resource settings where workplace safety practices are inadequate. This study assessed the prevalence of respiratory problems and associated factors among jute mill workers in Bangladesh.

Methods: A cross-sectional study was conducted in 2023 among 323 workers at Janata Jute Mills Ltd. in Narsingdi, Bangladesh. Workers aged 18 years or older with at least one year of job experience were included. Data were collected through face-to-face interviews using a pretested questionnaire covering socio-demographic, behavioral and work-related characteristics, along with respiratory symptoms. Respiratory problems were defined as the presence of at least one of the following symptoms: cough, phlegm, wheezing, breathlessness, or chest tightness. Descriptive statistics and chi-square tests were used for analysis, with $p < 0.05$ considered statistically significant.

Results: In this study, more than one-third (38.4%) of workers reported at least one respiratory problem. The most common symptoms were cough (26.6%), breathlessness (25.1%), chest tightness (22.0%), phlegm (17.3%) and wheezing (12.1%). Many symptomatic workers reported symptom duration of more than 6 weeks. Respiratory problems were significantly associated with age ($p=0.048$), educational status ($p=0.020$), smoking habit ($p=0.035$) and tobacco chewing ($p=0.003$). No significant association was observed for gender, work experience, working section, overtime work, overtime duration, or personal protective equipment use. Notably, more than half (62.2%) of workers reported not using personal protective equipment or face masks.

Conclusions: Respiratory problems were common among jute mill workers. The findings suggest that occupational exposure and behavioral factors contribute to poor respiratory health. Improved dust control, health screening, worker education, protective equipment use and tobacco cessation support are needed to reduce respiratory morbidity in this population.

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Introduction:

One of the most important and preventable causes of work-related respiratory illness is occupational exposure to airborne dust.

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The World Health Organization has noted that dust, inhaled in the workplace environment, has been associated not only with the classic occupational lung diseases but also with asthma, irritation and other chronic respiratory diseases. Prolonged exposure to organic dust in the textile industry has been linked to chronic respiratory symptoms, significant worsening of lung function and disease patterns that overlap with both asthma and chronic obstructive pulmonary disease (COPD).¹⁻²

Jute processing is an important occupational environment in Bangladesh because workers are always exposed to plant dust generated in the process of handling and processing fibres

mechanically. The statistics of jute mills show that the proportion of airborne jute dust is substantial, and endotoxin infection can cause airway inflammation and acute and chronic ventilatory dysfunction. Symptoms like chest tightness, dyspnoea, post-shift losses in forced expiratory volume in one second (FEV 1) and chronic functional impairment associated with byssinosis-like respiratory morbidity were reported in previous epidemiological studies of jute mill workers.³

In Bangladesh where jute manufacturing is a major industrial activity, available data reveal that respiratory disease among the jute workers is high yet poorly defined. A 2019 Bangladeshi study reported that respiratory illnesses and reduced ventilatory function were highly prevalent among jute mill workers, but a later cross-sectional study found chronic respiratory symptoms in more than half of the workers and obstructive spirometric abnormalities in a large proportion. All these facts indicate that respiratory problems in this workforce are not unique or restricted to historical records.³⁻⁴

The risk of respiratory complications in fiber-processing companies is unlikely to be based on dust exposure only. Studies in dusty factories and textile mills suggest that long term employment, working in high-dust zones, inadequate use of personal protection equipment (PPE), lack of occupational safety and health training, and long working hours are associated with respiratory symptoms or poor lung functioning. In addition, it is possible that smoking can contribute to and increase lung damage because exposure to tobacco and organic dust can produce overlapping symptoms and cumulative functional impairment.⁵⁻⁶

These issues are especially important because several related factors are potentially modifiable. In a recent cluster-randomized trial conducted in textile mills in Pakistan demonstrated that an implementation package that comprised of occupational health education, work-related committees, improved housekeeping, increased dust disposal, and face-mask distribution was a viable intervention to reduce respiratory symptoms and lung functioning. This finding suggests that simple work-based interventions can

deliver measurable respiratory health benefits to dust-exposed textile settings.⁷

Moreover, only a small amount of research has examined routine work-related factors, such as work section, length of employment, overtime working, and PPE use, in combination with worker factors and respiratory symptoms in the same analytical framework.⁴⁻¹¹

Though there is growing awareness of occupational respiratory illnesses in the textile and textile processing industries, the existing data in Bangladeshi jute mills is limited and mostly obtained through a limited set of single-site studies.^{4,8} An extensive knowledge of these characteristics is critical to the reinforcement of surveillance, the focus of prevention, and the guidance of successful workplace responses in the jute industry. Therefore, the present study aimed to assess respiratory problems and their association with selected work-related factors among jute mill workers.

Materials and Methods:

This cross-sectional study was carried out between January and December 2023 among employees of Janata Jute Mills Ltd. in Narsingdi, Bangladesh. They included workers aged 18 years and above with 1 year of working experience and excluded those with a previously diagnosed chronic respiratory disease, including asthma, chronic obstructive pulmonary disease and lung cancer. The single population proportion formula was used to calculate the sample size, with a 95 percent confidence level. The prevalence was assumed to be 25.7 percent based on past literature,³ and the margin of error was 5 percent; when the sample size was adjusted to include 10 percent non-response, the actual sample size was 323 participants. The study location was chosen by purposive sampling technique and the workers were selected using convenience sampling in production sections because they are directly involved with jute processing. The data were collected by face-to-face interviews with the help of a pretested semi-structured questionnaire on socio-demographic factors, work-related factors and respiratory symptoms. The questionnaire was prepared in English form and was translated into Bengali and pretested on 32 workers in a different jute mill. Respiratory problems were categorized

as the occurrence of at least one of the following symptoms: cough, phlegm, wheezing, breathlessness and chest tightness. IBM SPSS Statistics version 27 was used to analyze the data, the variables were summarized with descriptive statistics, and the chi-square test was conducted to determine associations with $p < 0.05$ taken as statistically significant. Informed consent was taken from all participants, and ethical approval was obtained from the Institutional Review Board of the National Institute of Preventive and Social Medicine, Dhaka, Bangladesh (NIPSOM/IRB/2023/06).

Result

Table 1 shows that most of the respondents were young adults between the ages of 31-40 years old (29.7%) and between 41-50 years old (29.4%). Male workers (61%) were more than the female workers (39%). A good number of workers had no formal education (32.8%) and a small number had secondary education or higher (9.3%), suggesting a generally poor educational level for respondents. Most workers were married (70.6%). In terms of household size, most (58%) had 4-6 members in their family. A large number of workers (84.5%) had a monthly income of less or equal to 9000 Taka, indicating low socioeconomic status. About behavioral factors, 68.1% were non-smokers followed by current smokers (16.1%) and ex-smokers (15.8%). Almost half (49.85%) of the respondents reported tobacco chewing habits.

Table I. Socio-demographic characteristics of respondents (n=323)

Socio-demographic characteristics (N=323)		Frequency (%)
Age category (in years)	≤ 20	14 (4.3)
	21-30	52 (16.1)
	31-40	96 (29.7)
	41-50	95 (29.4)
	51-60	51 (15.8)
	> 60	15 (4.6)
Gender	Male	197 (61)
	Female	126 (39)
Educational Qualification	No formal education	106 (32.8)
	Primary	91 (28.2)
	Lower Secondary	96 (29.7)
	Secondary and above	30 (9.3)
Marital Status	Single	95 (29.4)
	Married	228 (70.6)
Household Members	1-3	126 (39)
	4-6	188 (58)
	> 6	9 (2.8)

Monthly Income (In Taka)	≤ 9000	273 (84.5)
	9001-10000	42 (13)
	> 10000	8 (2.5)
Smoking Habit	non-smoker	220 (68.11)
	smoker	52 (16.09)
	ex-smoker	51 (15.80)
Tobacco Habit	non-chewer	162 (50.15)
	chewer	161 (49.85)

Table II presents the work-related factors. About one - third of respondents (29.4%) had less than 5 years of work experience, while 27.9% had 15 - 24 years of experience. The largest proportion of workers were employed in the spinning section (30%), followed by drawing (18.3%) and weaving (15.8%). More than half of the respondents (57.9%) reported working overtime beyond regular hours. Among them, 26.2% worked ≥ 16 hours of overtime in the last four weeks. Importantly, the majority (62.2%) of workers did not use PPE or face masks, which may increase their vulnerability to occupational respiratory hazards.

Table II: Work - related factors of jute mill workers

Work-related factors (n=323)		Frequency (%)
Work experience (in years)	< 5	95 (29.4)
	5-14	87 (26.9)
	15-24	90 (27.9)
	≥ 25	51 (15.8)
Working section	Spreader and batching	32 (9.9)
	Carding	49 (15.2)
	Drawing	59 (18.3)
	Spinning	97 (30)
	Winding	4 (1.2)
	Weaving	51 (15.8)
	Bagging	26 (8)
Overtime beyond regular work hour	Dyeing	5 (1.5)
	Yes	187 (57.9)
Overtime duration in last four weeks (in hour)	No	136 (42.1)
	< 16 hr	138 (73.79)
Use of PPE/face mask	≥ 16 hr	49 (26.21)
	Yes	122 (37.8)
	No	201 (62.2)

Table III shows that more than one-third (38.4%) of respondents reported at least one respiratory problem. Cough was reported by 26.6% of workers, and among them, more than half (54.65%) experienced cough for more than 6 weeks, indicating chronic

symptoms. Phlegm was present in 17.3% of respondents, with more than half (57.14%) reporting symptoms lasting more than 6 weeks. Wheezing was reported by 12.1% of workers, and most (61.54%) of them had symptoms persisting beyond 6 weeks. Breathlessness affected 25.1% of respondents, and most of them (77.78%) experienced it for more than 6 weeks, suggesting a high proportion of chronic respiratory distress. Chest tightness was reported by 22% of workers, with most of them (74.65%) having it lasting longer than 6 weeks.

Table III. Distribution of respondents by respiratory Problems and their characteristics

Respiratory problems and their characteristics		Frequency
Cough		
Complaints of cough (n=323)	Yes	86(26.6)
	No	237(73.4)
Duration of cough (n=86)	Less than or equal to 6 weeks	39 (45.35)
	More than 6 weeks	47 (54.65)
Phlegm		
Complaints of phlegm (n=323)	Yes	56(17.3)
	No	267(82.7)
Duration of phlegm (n=56)	Less than or equal to 6 weeks	24 (42.86)
	More than 6 weeks	32 (57.14)
Wheezing		
Complaints of wheezing (n=323)	Yes	39(12.1)
	No	284(87.9)
Duration of wheezing (n=39)	Less than or equal to 6 weeks	15(38.46)
	More than 6 weeks	24(61.54)
Breathlessness		
Complaints of breathlessness (n=323)	Yes	81(25.1)
	No	242(74.9)
Duration of breathlessness (n=81)	Less than or equal to 6 weeks	18 (22.22)
	More than 6 weeks	63 (77.78)
Chest tightness		
Complaints of chest tightness (n=323)	Yes	71(22)
	No	252(78)
Duration of chest tightness (n=71)	Less than or equal to 6 weeks	18 (25.35)
	More than 6 weeks	53 (74.65)

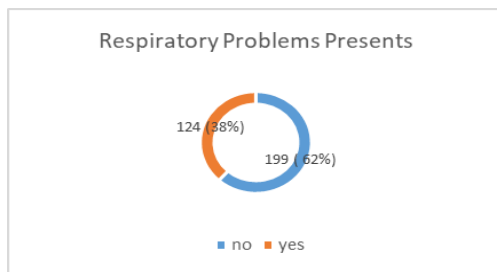


Figure 1: Distribution of Respiratory problems among jute mill workers

Figure 1 illustrates the overall prevalence of respiratory problems among jute mill workers. Out of 323 respondents, 124 workers (38.4%) reported having respiratory problems, while 199 workers (61.6%) did not report any respiratory problems.

Table IV: Respiratory Problems of respondents by Socio-demographic characteristics

Characteristics	Respiratory Problems		significance
	No	yes	
Age group			
20 or less	10(71.4)	4 (28.6)	χ^2 =11.188 P= 0.048
21-30	35 (67.3)	17 (32.7)	
31-40	65 (67.7)	31(32.3)	
41-50	47(49.5)	48(50.5)	
51-60	35(68.6)	16(31.4)	
Above 50	7(46.7)	8(53.3)	
Gender			
Male	121 (61.4)	76 (38.6)	χ^2 =0.931 P= 0.531
Female	78 (61.9)	48 (38.1)	
educational qualification			
No formal education	56 (52.8)	50 (47.2)	χ^2 =9.841 P= 0.020
Primary	59 (64.8)	32 (35.2)	
Lower Secondary	69 (71.9)	27 (28.1)	
Secondary and above	15 (50)	15 (50)	
Marital Status			
single	63 (66.3)	32 (33.7)	χ^2 =1.260 P= 0.262
married	136 (59.6)	92 (40.4)	
Household Members			
1-3	79 (62.7)	47 (37.3)	χ^2 =0.218 P= 0.897
4-6	115 (61.2)	73 (38.8)	
> 6	5 (55.6)	4 (44.4)	
Monthly Income (In Taka)			
≤ 9000	83 (60.1)	55 (59.9)	χ^2 =0.859 P= 0.651
9001-10000	87 (64.4)	48 (35.6)	
> 10000	29 (58)	21 (42)	
smoking habit			
non-smoker	146 (66.4)	74 (33.6)	χ^2 =6.686 P= 0.035
smoker	26 (50)	26 (50)	
ex-smoker	27 (52.9)	24 (47.1)	
Habit of Tobacco chewing			
non-chewer	113 (69.8)	49 (30.2)	χ^2 =9.112 P= 0.003
chewer	86 (53.4)	75 (46.6)	
total	199 (61.6)	124 (38.4)	

Table IV shows that the age group was significantly associated with respiratory problems ($p = 0.004$). Workers aged 41-50 years and more than 50 years of age had a higher prevalence of respiratory problems than younger age groups. Gender was not significantly related to respiratory problems ($p = 0.531$), which means that there was no difference in prevalence for males and females.

Educational qualification was found to be significantly associated ($p = 0.020$). Workers with no formal education had a higher prevalence of respiratory problems than workers with greater educational attainment. Marital status, household size and monthly income were not significantly related to respiratory problems ($p > 0.05$). Smoking habit showed a significant association ($p = 0.035$), with a higher prevalence of respiratory problems (50%) among current smokers. Tobacco chewing was also significantly associated (chi-square = 9.112, $p = 0.003$) as the prevalence of chewers was higher (46.6%) than that of non-chewers.

Table V: Relationship of Respiratory Problems of respondents by Work-related factors

Work-related factors	Respiratory Problems		significance
	No	yes	
Work experience (in years)			
< 5	57 (60)	38 (40)	$\chi^2=0.991$ P=0.803
5-14	55 (63.2)	32 (36.8)	
15-24	58 (64.4)	32 (35.6)	
≥ 25	29 (56.9)	22 (43.1)	
Working section			
Spreader and batching	22(68.8)	10 (31.3)	$\chi^2=4.097$ p=0.769
Carding	28 (57.1)	21 (42.9)	
Drawing	40 (67.8)	19 (32.2)	
Spinning	56 (57.7)	41 (42.3)	
Winding	2 (50)	2 (50)	
Weaving	33 (64.7)	18 (35.8)	
Bagging	16 (61.5)	10 (38.5)	
Dyeing	2 (61.5)	3 (38.5)	
Overtime beyond regular working schedule			
Yes	117 (62.6)	70 (37.4)	P=0.678
No	82 (60.3)	54 (39.7)	$\chi^2=0.172$
Overtime duration in last four weeks (in hour) (n=187)			
< 16 hr	89 (64.5)	49 (35.5)	P=0.361
≥ 16 hr	28 (57.1)	21 (42.9)	$\chi^2=0.834$
Use of PPE/face mask			
yes	79 (64.8)	43 (35.2)	P= 0.365
no	120 (59.7)	81 (40.3)	$\chi^2=0.819$

Table V indicates that work experience was not significantly associated with respiratory problems ($p = 0.803$), although workers with ≥ 25 years of experience had a slightly higher prevalence (43.1%). The working section also showed no statistically significant association ($p = 0.769$), despite some variation in prevalence across sections. Overtime work beyond regular hours was not significantly associated with respiratory problems ($p =$

0.678). Similarly, overtime duration in the last four weeks showed no significant relationship ($p = 0.361$). Use of PPE/face mask was also not significantly associated with respiratory problems ($p = 0.365$), though workers who did not use PPE had a slightly higher prevalence (40.3%) compared to PPE users (35.2%).

Discussion:

This study found that more than a third (38.4%) of jute mill workers had at least one respiratory problem with cough and breathlessness being the most common symptoms. A significant proportion of the symptomatic workers reported symptoms persisting for more than 6 weeks, implying that the burden was not confined to transient irritation but may represent persistent airway morbidity related to chronic workplace exposure. These findings increase support for the ongoing vulnerability of the respiratory system health of workers employed in dust-generating fibre-processing industries.³⁻¹⁴

The overall prevalence of the respiratory problems in the present study (38.4%) was lower compared to 58.4% of jute mill workers in another study in Bangladesh⁸, 47.8% of cotton dust-exposed textile workers in northwest Ethiopia⁶ and 54% of textile workers in Ethiopia⁹ and 52.7% of textile workers in Myanmar.¹⁰ It was also lower than the combined estimates from two 2023 meta-analyses from Ethiopia, which reported the prevalence values of 54.96% and 51.6% among dust-exposed factory and industry workers, respectively.¹¹⁻¹² However, the symptom pattern of the current study was still broadly similar to other fibre processing settings. This study of jute mills in Bangladesh showed that the incidence of breathlessness, chest tightness, and persistent cough were 16.5%, 25.7% and 16.3%, respectively, whereas a study of textile industries in Ethiopia showed that cough was present in 23%, chest tightness in 33% and breathlessness in 37% of exposed workers.⁹ Similarly, the study in Myanmar revealed that the most common complaints were breathlessness (34.3%) and phlegm (21.3%).¹⁰ This is consistent with another study on Bangladesh.⁸ The lower prevalence found in the present study may therefore reflect differences in the definitions of symptoms, composition of the workforce, concentration

of dust, engineering control measures, and study design rather than the absence of a substantial occupational problem.

Age was significantly linked with respiratory issues in the current study with an increase in the burden of symptoms in older workers. This finding is plausible because cumulative exposure to organic dust is likely to increase with time and older workers may also have less physiological reserve. Similar evidence in cotton-processing environments has indicated that being older is related to respiratory problems and the Myanmar study of the textile industry showed that the longer workers have been in the industry and the more dust they have been exposed to the less lung function they have.^{6,7,10} The present findings therefore provide support for the view that the cumulative exposure is important in the development of respiratory morbidity in jute workers.

Educational status was also significantly found to be associated with respiratory problems, but the burden of symptoms was higher among workers with no formal educational attainment. This may reflect a poor awareness of occupational hazards, reduced access to health information and a lesser consistency of protective practices by those who are less educated. However, this finding should be interpreted with caution since in a recent systematic review by Ashuro et al. published in 2023 a statistically significant correlation between educational status and respiratory symptoms was not found in a population of Ethiopian factory workers.¹¹ The difference can be due to variations in context (literacy and safety culture), job assignment, and the influence of education on risk perception in varying industrial settings.

Smoking was found to be significantly related to respiratory problems in this study and symptom prevalence was highest among current smokers. This is consistent with the wider occupational evidence. The 2023 meta-analysis of Ethiopian industry workers showed that smoking was an important associated factor and the 2017 Greek study of the cotton industry showed that smoking and its duration of employment contributed to worse spirometric indices, and that smokers had a higher prevalence of respiratory symptoms and

reduced lung function than non-smokers.^{5,11} Taken together, these findings indicate that smoking could enhance the negative respiratory effects of organic dust exposure in the jute and textile environment. Tobacco chewing was also significantly related to respiratory problems in the present study. Direct comparisons are limited as most similar work with textile studies were done on smoking versus smokeless tobacco, but this finding may be indicative of tobacco-related behaviours clustering with other exposures that negatively impact respiratory health.^{13-14,16}

Gender was not significantly linked with respiratory problems in the present study. This finding is consistent with the meta-analysis report on the same topic conducted by Ashuro et al. in 2023, which showed no statistically significant result between gender and respiratory symptoms among factory workers from Ethiopia.¹¹ However, it contrasts with the 2018 study of cotton textiles in Ethiopia, in which the male workers had increased odds of respiratory symptoms.⁶ Such variation may be explained by differences in task allocation, dust intensity between different departments and sex composition of the workforce. In the current mill, although men were the majority of workers, there could be no association, which implies that the risk of respiratory diseases may be more a function of exposure circumstances rather than sex alone.

In contrast to a number of previous studies work-related characteristics such as duration of employment, working section, overtime work, overtime duration, PPE use were not significantly associated with respiratory problems in the present analysis, although a higher prevalence of symptoms was observed among workers with longer experience, among non-users of PPE, and among some production sections. This is in contrast to the Ethiopian study on cotton textiles, where years of service, the division of work and poor ventilation were significant predictors of symptoms and the study in Myanmar on textile workers, where the department of work, duration of service greater than 5 years and dust exposure predicted decreased lung function. It also differs from the 2023 meta-analytic evidence that work experience for more than 5 years, absence of occupational safety and health training, not using PPE, and

working for more than 8 hours per day were associated with an increased burden of respiratory symptoms.^{4-11,15-16} Several explanations are possible. First, the current study did not use objective lung function outcomes, instead relying on self-reports of symptoms, and this could have decreased sensitivity to exposure gradients. Second, workers in all selected sections were exposed to environments of jute processing, which might have had the effect of reducing contrast between departments. Third, there may have been dilution of measurable associations due to worker rotation, the healthy worker effect, and inconsistent or poor-quality PPE use. Nonetheless, the very high percentage of workers not using PPE and the large percentage working overtime are occupationally important findings and should not be ignored just because statistical significance was not achieved.^{18,21-23}

Overall, the present study provides recent data that indicate that respiratory problems are still prevalent among jute mill workers in Bangladesh and are influenced by individual as well as occupational vulnerabilities. The large associations with age, low education, smoking, and tobacco chewing suggest that prevention will need to involve engineering for dust control, as well as worker-focused controls, such as health education, periodic respiratory screening, smoking cessation support, and greater enforcement of respiratory protection. At the same time, the lack of significant associations for a number of work-related variables should be interpreted with caution as cross-sectional design, measuring symptoms as outcome measures and the lack of direct dust or spirometric assessment might have limited the possibilities to find exposure-response relationships. Even so, the pattern of findings is consistent with the wider literature to show that dusty fibre-processing industries remain a substantial health risk to workers in their current forms in low- and middle-income settings

Conclusion:

The study found that respiratory problems were common among jute mill workers, with more than one-third reporting at least one symptom, most notably cough and breathlessness. Older age, lower educational

attainment, smoking, and tobacco chewing were significantly associated with respiratory problems. Although work-related factors were not statistically significant, the high prevalence of inadequate PPE use and prolonged working hours suggests ongoing occupational vulnerability. These findings underscore the need for strengthened occupational health measures, including improved dust control, regular health screening, worker education, consistent use of PPE, and tobacco cessation interventions, to reduce respiratory morbidity among jute mill workers.

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Competing interests:

All the authors declared no competing interests.

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