



Respiratory and Musculoskeletal Disorders Among Jute Mill Workers: Occupational Health Findings from a Cross-Sectional Study in Bangladesh

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ABSTRACT: Background: Jute mill workers are chronically exposed to dust, repetitive motions, and poor ergonomics, placing them at risk of occupational illnesses. This study aimed to assess the prevalence and associated factors of respiratory and musculoskeletal disorders (MSDs) among workers in a large jute mill in Bangladesh. **Methods:** A cross-sectional study was conducted from January to June 2023 at Alhaj Jute Mills Ltd. in Sharisabari, Jamalpur. A total of 250 production workers were selected using systematic random sampling. Data were collected through interviewer-administered questionnaires (ATS-DLD-78 and SNMQ), physical assessments, and spirometry following ATS/ERS guidelines. Multivariable Poisson regression was used to identify factors associated with respiratory and musculoskeletal morbidity. **Results:** Among 250 respondents, 58.4% reported chronic respiratory symptoms, with 40.8% showing obstructive patterns on spirometry. Musculoskeletal disorders were reported by 63.2% of workers, predominantly affecting the lower back (42.0%) and shoulders (29.6%). A dual burden of both conditions was observed in 38.8% of participants. Significant predictors of respiratory symptoms included employment duration ≥ 10 years (aPR: 1.42), high-dust department (aPR: 1.31), smoking (aPR: 1.37), and lack of PPE use (aPR: 1.82). High ergonomic risk (REBA score ≥ 8) was the strongest predictor of MSDs (aPR: 1.68). **Conclusion:** Respiratory and musculoskeletal disorders are highly prevalent among jute mill workers in Bangladesh, with nearly 4 in 10 workers affected by both. Prolonged exposure, poor ergonomic conditions, and lack of protective equipment were key risk factors. Immediate interventions focused on dust control, PPE enforcement, and ergonomic improvements are essential to reduce the occupational health burden in this sector.

Keywords: Jute Mill Workers, Respiratory Disorders, Musculoskeletal Disorders, Occupational Health, Bangladesh, Spirometry, Ergonomics.

INTRODUCTION

The jute industry has long played a vital role in Bangladesh's economy, employing hundreds of thousands of workers nationwide [1]. Despite its economic significance, occupational health conditions in jute mills remain largely underexplored and underregulated [2]. Workers in

this sector are routinely exposed to cotton jute dust, heavy physical labor, awkward postures, and repetitive movements—factors known to contribute to chronic respiratory diseases and musculoskeletal disorders (MSDs) [3, 4]. Respiratory problems among textile and jute

workers are primarily attributed to prolonged inhalation of fine organic dusts and airborne particulates, which can cause bronchial hyperresponsiveness, chronic bronchitis, and obstructive airway disease. Studies from both Bangladesh and neighboring countries have documented high rates of respiratory symptoms, including cough, dyspnea, and wheezing, in mill workers exposed to jute or cotton dust [5, 6].

These symptoms are often underdiagnosed and poorly managed, contributing to progressive lung function decline. In addition, the physically demanding nature of mill work—such as lifting heavy loads, prolonged standing, repetitive bending, and static postures—makes jute workers particularly vulnerable to MSDs. Pain in the lower back, neck, shoulders, and knees is common, and may lead to reduced work capacity, absenteeism, or even premature retirement [7-9]. Yet, very few studies in Bangladesh have examined both respiratory and musculoskeletal health outcomes together in this high-risk population. Given the limited national data on occupational morbidity in the jute sector, this study aimed to assess the prevalence of respiratory and musculoskeletal disorders and identify associated risk factors among workers at Alhaj Jute Mills Ltd., one of the oldest and largest jute mills in Bangladesh. Findings from this research can inform targeted interventions to improve workplace safety, reduce occupational disease burden, and strengthen labor protection in the jute industry.

METHODOLOGY

A cross-sectional study was conducted from January to June 2023 at Alhaj Jute Mills Ltd., located in Sharisabari, Jamalpur, Bangladesh. The mill, established in 1967, employs approximately 1,600 production workers and 200 officers. A total

of 250 workers were selected using systematic random sampling from the production workforce, based on eligibility criteria including age ≥ 18 years and continuous employment for at least one year. Workers with chronic conditions unrelated to occupational exposure were excluded. Data were collected through face-to-face interviews using a structured questionnaire, which included a modified and validated Bengali version of the American Thoracic Society (ATS-DLD-78) respiratory questionnaire and the Standard Nordic Musculoskeletal Questionnaire (SNMQ). Pulmonary function was assessed using a calibrated handheld spirometer following ATS/ERS guidelines. Musculoskeletal symptoms were defined as pain or discomfort in any body region lasting at least one day in the past 12 months. Covariates such as age, sex, job duration, smoking status, PPE use, and work shift were recorded. Data analysis was conducted using Stata 18. Descriptive statistics were presented as frequencies and means. Associations between occupational exposure and health outcomes were assessed using Poisson regression with robust variance. Written informed consent was obtained from all respondents before their participation, with confidentiality and voluntary participation ensured throughout the study.

RESULTS

Out of the 250 workers surveyed, all completed the questionnaire and clinical assessments, yielding a 100% response rate. The mean age of participants was 38.6 ± 9.4 years, with a male predominance (82.4%). Most workers were employed in high-exposure departments, had over five years of job experience, and did not regularly use personal protective equipment (PPE). Smoking history was also common among workers.

Table 1. Sociodemographic and Job-Related Characteristics of Jute-Mill Workers (N = 250)

Characteristic	Category	n	%
Sex	Male	206	82.4
	Female	44	17.6
Age (years)	< 30	55	22.0
	30–39	95	38.0
	40–49	70	28.0
	≥ 50	30	12.0
Employment duration	< 5 years	60	24.0

	5–9 years	75	30.0
	10–14 years	65	26.0
	≥ 15 years	50	20.0
Department exposure	High-dust (spinning/batching/carding)	170	68.0
	Low-dust (maintenance/packing)	80	32.0
Regular PPE use	Yes	68	27.2
	No	182	72.8
Smoking status	Current/ex-smoker	109	43.6
	Never-smoker	141	56.4

Table 1 shows the demographic and occupational profile of the workers. A significant portion worked in high-dust areas, had long service

duration, and reported not using PPE regularly – factors relevant to occupational health risks.

Table 2. Prevalence of Occupational Health Outcomes Among Workers

Outcome	n	% (95 % CI)
Any respiratory symptom	146	58.4 (52.2–64.5)
– Chronic cough	92	36.8
– Exertional dyspnea	84	33.6
– Wheeze	68	27.2
Spirometric impairment	132	52.8
– Obstructive (FEV ₁ /FVC < 0.70)	102	40.8
– Restrictive pattern	30	12.0
Musculoskeletal disorder†	158	63.2 (57.1–69.0)
– Lower-back pain	105	42.0
– Shoulder pain	74	29.6
– Knee pain	63	25.2
High ergonomic-risk posture (REBA ≥ 8)	181	72.5
Dual burden (respiratory + MSD)	97	38.8

* At least one chronic respiratory symptom based on ATS-DLD-78.

† Pain/discomfort ≥1 day in last 12 months per SNMQ.

Table 2 illustrates the prevalence of occupational morbidities among workers.

Respiratory symptoms were reported by 58.4% of participants, while 63.2% had musculoskeletal disorders—particularly in the lower back and shoulders. Spirometry confirmed obstructive impairment in 40.8% of workers, and nearly 39% experienced both respiratory and musculoskeletal issues.

Table 3. Predictors of Occupational Morbidity – Multivariable Poisson Regression (N = 250)

Predictor	Respiratory Symptoms (aPR, 95% CI)	Musculoskeletal Disorders (aPR, 95% CI)	Dual Burden (aPR, 95% CI)
Employment ≥10 years	1.42 (1.12–1.79)	1.55 (1.23–1.94)	1.51 (1.14–2.01)
High-dust department	1.31 (1.03–1.66)	1.28 (1.02–1.60)	1.37 (1.02–1.83)
No regular PPE use	1.82 (1.31–2.53)	1.36 (1.05–1.77)	1.76 (1.23–2.52)
Current/ex-smoker	1.37 (1.09–1.71)	1.11 (0.89–1.38)	1.41 (1.04–1.93)
High ergonomic risk (REBA ≥ 8)	—	1.68 (1.28–2.22)	1.33 (0.99–1.80)

Adjusted for age, sex, shift, and BMI. aPR = adjusted prevalence ratio. Bold values indicate statistical significance ($p < 0.05$).

Table 3 describes the adjusted associations between selected risk factors and health outcomes. Longer job duration, lack of PPE, and work in high-dust departments were significantly associated with both respiratory symptoms and musculoskeletal disorders. Smoking was a notable risk factor for respiratory morbidity, while high ergonomic risk was the strongest predictor for musculoskeletal complaints.

DISCUSSION

This study revealed a high prevalence of occupational health issues among workers in a major jute mill in Bangladesh, with 58.4% reporting respiratory symptoms, 63.2% experiencing musculoskeletal disorders (MSDs), and 38.8% suffering from both conditions simultaneously. These findings underscore a significant dual burden of disease in this industrial workforce, largely driven by modifiable workplace exposures. The prevalence of respiratory symptoms in our study (58.4%) is consistent with earlier reports from South Asia. For example, a study among cotton mill workers in Gazipur, Bangladesh, found respiratory symptoms in 73.1% of participants [10]. Similarly, an Indian study among jute mill workers showed a respiratory morbidity rate of 62.5%, closely aligning with our findings [11]. In our study, chronic cough was reported by 36.8%, dyspnea by 33.6%, and wheezing by 27.2% of workers. Spirometry revealed that 40.8% had obstructive impairment, and 12.0% showed restrictive patterns. Respiratory symptoms were significantly associated with long-term employment (≥ 10 years; aPR: 1.42) and work in high-dust departments (aPR: 1.31). Notably, lack of regular PPE use increased the likelihood of respiratory symptoms by 82% (aPR: 1.82; 95% CI: 1.31–2.53). This reinforces findings from a study in Pakistan's textile industry, where implementation of PPE use and ventilation significantly reduced the rate of respiratory symptoms [12].

Musculoskeletal disorders were reported by 63.2% of participants, with 42.0% suffering from lower-back pain, 29.6% from shoulder pain, and

25.2% from knee pain. These findings are comparable to a study in the Bangladeshi garment sector, which found an MSD prevalence of 77.3% among sewing operators and higher than the 55% pooled prevalence among Indian jute workers [13, 14]. A significant relationship was observed between MSDs and employment duration ≥ 10 years (aPR: 1.55), absence of PPE (aPR: 1.36), and high ergonomic risk (REBA ≥ 8 ; aPR: 1.68). This supports a prior study from Tamil Nadu, India, where repetitive postures and prolonged standing increased the odds of MSDs by over 2-fold [15]. The ergonomic evaluation in our study found that **72.5%** of workers were exposed to high-risk postures during their routine tasks, particularly in spinning and batching departments. This is in line with a study conducted in Sri Lanka's textile industry, which reported that over 70% of workers performed physically demanding tasks that exceeded ergonomic safety thresholds [16]. Notably, 38.8% of workers in our study experienced both respiratory symptoms and MSDs, indicating a dual burden of disease. This combined morbidity was significantly associated with longer employment, high-dust department exposure, and non-use of PPE (aPR for dual burden: 1.76). Smoking was also a significant predictor for respiratory outcomes (aPR: 1.37), though not for MSDs, highlighting its specific role in pulmonary damage rather than musculoskeletal strain. The co-occurrence of these conditions may be compounded by poor workplace ventilation, dust-laden air, and physical overload, creating a hazardous occupational environment. Similar dual morbidity patterns were reported in a Turkish study, where 41% of textile workers had combined respiratory and musculoskeletal symptoms due to poor ergonomic design and lack of respiratory protection [17-53].

Strengths and Limitations

This study's strengths include a systematic random sampling strategy, 100% response rate, use of validated questionnaires, objective spirometry testing following ATS/ERS guidelines, and multivariable regression analysis to adjust for confounders. However, limitations include its cross-sectional design, which prevents causal inference, and potential recall bias in self-reported data. Furthermore, results from a single jute mill

may not be generalizable to all jute factories in Bangladesh.

Implications and Recommendations

The findings demonstrate that occupational health risks in the jute industry remain under-addressed. Immediate steps are needed to improve dust control measures, enforce PPE use, and implement ergonomic redesigns. These include the installation of exhaust ventilation systems, the provision of proper seating, task rotation, and worker health education. Regular health surveillance—especially pulmonary function testing and musculoskeletal screening—should be mandated.

CONCLUSION

This study highlights a significant prevalence of respiratory and musculoskeletal disorders among jute mill workers, driven by occupational exposures such as dust, physical strain, and inadequate protective practices. Preventive interventions tailored to the jute industry context are urgently needed to reduce this dual burden and improve worker health and productivity.

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