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Exploring the Health Impacts of Handloom Weavers in Sirajganj District, Bangladesh

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Abstract: The handloom weaving industry is an important traditional activity and a major source of employment in Bangladesh. To explore the association between health problems, socio-demographic characteristics and workplace exposures among handloom weavers, we conducted a cross-sectional survey in Ullapara Upazila, Sirajganj District, Bangladesh. Methods: We used a structured questionnaire to inquire about self-reported workplace exposures, including working posture, dust, noise, and hazardous chemicals, and health outcomes, including malnutrition, hearing problems, respiratory and musculoskeletal issues, in a random sample of 88 handloom weavers. We analyzed the relationship between workplace hazards and health issues using descriptive statistics and multinomial logistic regression. Results: Male handloom weavers tended to have lower odds of malnutrition than female weavers, although the association was statistically significant ($p = 0.004$), and workers aged 30–55 years reported neck pain more frequently than younger workers ($p = 0.003$). Working 11–15 years as a hand loomer was associated with an excess risk of shoulder pain (OR = 3.4, 95% CI 2.0–11.5) compared to those with lesser seniority; weavers who worked 20–30 days per month reported knee pain (OR = 6.4, 95% CI 1.2–34) more frequently than those who worked 15–19 days. Working 11–14 hours daily was associated with hearing issues (OR = 5.5, 95% CI 1.4–22.4). A prolonged standing posture was associated with knee pain (OR = 19.3, 95% CI 3.6–103). Exposure to hazardous chemicals and dust was associated with respiratory symptoms. Conclusion: Although estimates were imprecise, this study highlights a high prevalence of malnutrition, hearing problems, respiratory issues, and musculoskeletal pain among Bangladeshi handloom weavers.

Keywords: handloom weavers; malnourishment; hearing loss; knee pain; occupational health; epidemiology

1. Introduction

Handloom weaving is a traditional craft that involves the creation of textiles by hand using a loom. The handloom industry is one of the largest handicraft sectors and the second-largest source of rural employment after agriculture. It plays a vital role in Bangladesh's economic and social development [1]. Across the country, there are over 116,000 handloom units and approximately 300,000 handloom weavers, with more than 50% of them being female workers [2]. Bangladesh produces about 620 million meters of handloom fabric annually, which accounts for two-thirds of the country's total fabric production. The fabrics are designed for home consumption and

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meet 40% of the local fabric demand [3]. According to the Bangladesh Bank the broader textile and apparel sector, which includes industrial textile, garment, handloom and power loom activities, contributed approximately 10–12% to the country's GDP in the fiscal year 2022–2023 [4].

Handloom weaving is a skilled and artistic profession. Handloom weavers often face various health impacts due to their working environment, working status, and tools. Most of the rural handloom industries are treated as informal activities, without proper monitoring by Government agencies. In this informal sector, weavers work for prolonged hours, receive extremely low wages, lack job security, and do not have social security benefits, along with poor working and living standards [5]. Handloom weaving consists of several activities, including collecting raw materials (yarn), winding, denting, and the continuous action of sitting in a static posture to create fabric [6]. The rural and unregulated handlooms are traditional and typically operated manually, without any electrical connection, and run through hand-and-foot coordination [7]. The weaving process includes various activities that require repetitive motions of both the arms and legs to control treadles and throw shuttles, with arms extending outwards [8].

Traditional handloom industries are low-cost and labor-intensive. The working environment is poorly maintained, and the working hours are long. Moreover, weaving operations require workers to sit without back support and maintain a head-tilted forward position. Some occupational hazards faced by workers in this industry include awkward postures, restricted range of motion, prolonged exposure to noise, densely arranged machinery set-ups, poor ventilation, and airborne particulate contamination [9]. Such a poor working environment and long working hours may lead of long-term physical and mental health disorders.

In one study, 82.4% of handloom weavers experienced musculoskeletal pain, primarily in the lower back (50%), followed by the shoulders (48.4%) and knees (46.4%) [10]. In another study of 230 male Bangladeshi weavers, 27.4% of respondents reported musculoskeletal pain, primarily in the shoulder, hip, and lumbar regions. The pain was significantly associated with age and job seniority [11]. Handloom weavers experience various health issues, including weakened eyesight, early cataracts, visual deterioration, irregular blood pressure, cardiovascular disorders, respiratory problems, filariasis, and chronic joint pain. Research indicates that they also tend to appear older than their actual age due to malnourishment and prolonged constrained movements [12]. Employees in small-scale enterprises often face health issues such as workplace stress, musculoskeletal disorders, and irritation of the mucosal tissues, headaches, skin diseases, respiratory problems, hearing problems, and eye strains [13].

A comprehensive review of the existing research on this topic was performed to gain insights, identify knowledge gaps, and effectively guide the design and execution of experiments. Several relevant studies were evaluated for the study [11,14,15]. A cross-sectional study on work-related back and lower extremity musculoskeletal disorders among barbers in Ethiopia found that knee and ankle pain and back pain are strongly related to working posture, length of employment, and working safety [14,16–18].

Prevalence of work-related musculoskeletal disorder in Malaysian glove manufactory workers [19], Long Working Hours and the Co-Occurrence of Work-Related Musculoskeletal Symptoms in China and Northwest Ethiopia [20,21], daily working hours and occupational mental health in Nigerian remote workers [22] have been assessed with primary data and various statistical techniques found work relevant health issues severe impacts of mental and physical health. A number of studies conducted on econometrics of handloom industry and workers with various statistical techniques [23,24]. Only a limited number of studies have specifically addressed the health problems experienced by handloom weavers in rural and unregulated areas such as the Sirajganj District. This study aims to identify the health issues of handloom weavers, including musculoskeletal, respiratory, and hearing problems. The objective of this study is to identify the health issues and evaluate their prevalence in handloom weavers.

2. Materials and Methods

2.1. Study Area

The study area is Ullapara Upazila, Sirajganj district, located in the north-central region of Bangladesh. The area covers 409.06 km^2 and is situated between latitudes 24°12′ N and 24°26′ N and longitudes 89°24′ E and 89°38′ E. Figure 1. shows the geographical location of the study area. According to the Handloom Census 2018, the Sirajganj district ranks first in Bangladesh in the number of handloom establishments. The Upazila is characterized by a significant presence of weaving households and small-scale handloom industries, providing an appropriate context for examining the occupational health challenges faced by weavers. Over the whole district, there are 9796 handloom establishments, of which 255 are industry-based and 9541 household based, and 44,236 males and 16,107 females are engaged in the handloom sector [2]. In Ullapara Upazila, a total 734 people are engaged as handloom weavers [25]. A large proportion among them are women, illiterate and socio-economically marginalized. The female salary is comparatively lower, which acounts for their relatively high prevalence among

handloom weavers compared to Bangladeshi standards. The highest number of weavers is concentrated in the Durganagar, Salap, and Panchakroshi unions. In recent years, socio-economic challenges and occupational health problems have led to a decline in the handloom sector [26]. The study area's accessibility enabled efficient data collection within the constraints of available time and resources. Consequently, Ullapara Upazila was selected as a relevant study site for identifying health problems exprienced by handloom weavers.

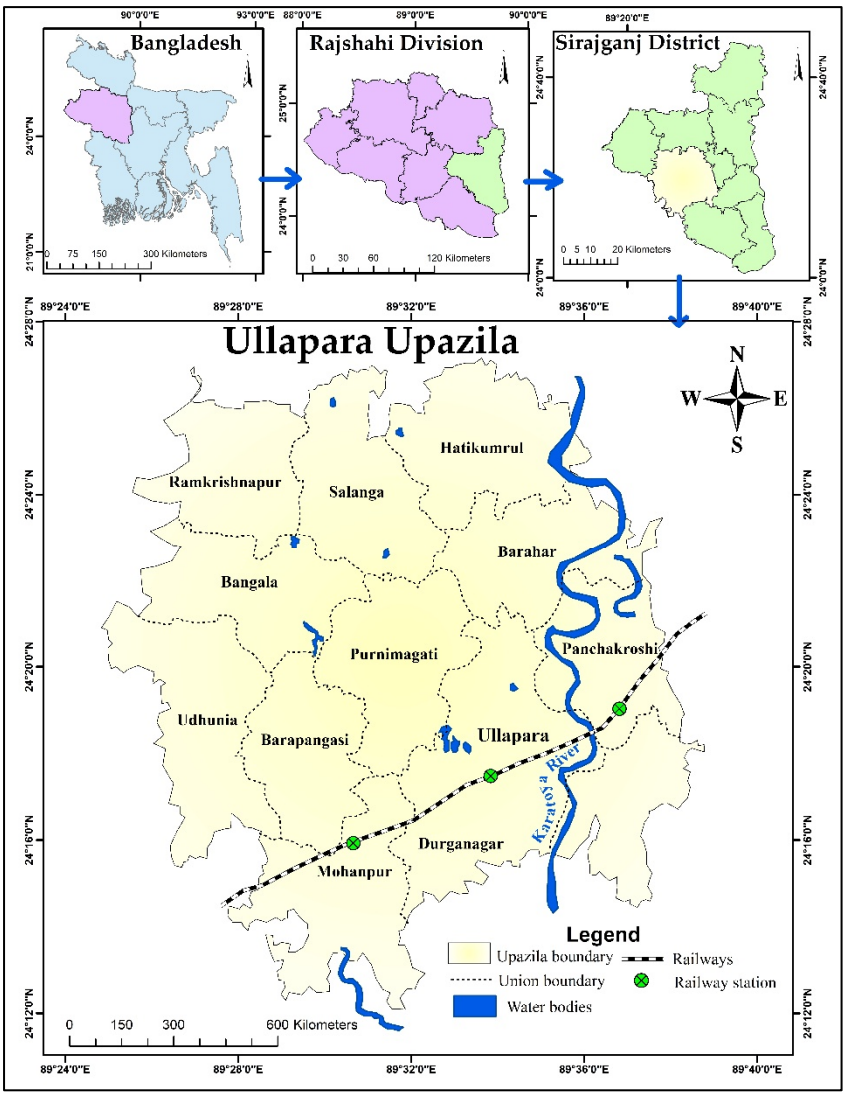


Figure 1. Map of the Ullapara Upazila area in the Sirajganj District (Prepared by authors from Natural Earth maps data by using ArcGIS 10.8 Software).

2.2. Data Collection

This cross-sectional study was conducted with 10 respondents in June 2025 to assess clarity and feasibility; these data were not included in the analysis. After approval from the Institutional Ethics Board (IEB) on, the main cross-sectional survey was conducted through face-to-face interviews using a structured questionnaire. All participants provided informed consent, and responses were anonymized. The questionnaire is provided as Supplementary Material A. Further socio-demographic data were obtained from the Bangladesh Handloom Census, published by the Bangladesh Bureau of Statistics (BBS). Additional information was obtained from the Bangladesh Handloom Board (BHB), academic journals, and newspapers.

Based on Yamane's formula for calculating the required sample size n given the population size N 734 and a margin of error [27].

$$n = N/(1 + Ne^2).$$

We deemed a sample size of 88 subjects as sufficient to detect true proportions with a 10% margin of error. We considered a 10% margin of error acceptable due to the homogenous nature of this population. We encountered an elevated number of refusals because previous studies did not result in action to address their problems, or

because of social barriers for female workers. Therefore, we applied a simple random sampling method to select 6 handloom weavers from each factory and continued until achieving the desired sample size. Overall, participants were selected from 17 handloom factories, reaching a total of 102 weavers. The refusal rate was 14%, which is not included in the overall sample size. Due to time constraints and lack of the necessary instruments, we did not take any physical measurements.

2.3. Statistical Methods

2.3.1. Variables

The selected independent variables were classified into three categories: socio-demographic factors, work status, and the working environment. Socio-demographic factors included sex (male or female), age group (18–29, 30–44, or 45–55) family size (4; 5 or more members), educational status (illiterate, primary education, or secondary education or higher). Work status variables included years of employment (5–10, 11–15, or 15 or more), working hours per day (8–10, or 11–14), working days per month (15–19, or 20–30), and working posture (sitting or standing). Exposure to dust, excessive noise, unsuitable flooring, inappropriate tools, and hazardous chemicals was recorded as 'Yes' or 'No'. Unsuitable flooring means irregular, uneven, damp, poorly maintained, or cluttered flooring containing yarn waste, wooden debris, scrap materials, or other obstacles that could impede movement or increase the risk of slips, trips, falls, and musculoskeletal strain. Moreover, the inappropriate tools referred to non-ergonomic, worn, poorly maintained, or improvised hand tools, including loom accessories requiring excessive force, awkward hand positioning, or repetitive contact with rough or potentially irritating materials. Longtime use of such tools may contribute to musculoskeletal discomfort, skin irritation, allergic reactions, and accidental injury.

The dependent variables represented specific health outcomes, including malnutrition, poverty-related health, musculoskeletal pain (including shoulder, neck, upper-back, lower-back, ankle, and knee pain), respiratory problems, hearing loss, skin and respiratory allergic symptoms, cardiovascular problems, and psychological stress. The presence of these health issues was assessed on the basis of symptoms self-reported by the weavers during the survey.

2.3.2. Health Impact Assessment Tools

We used the World Health Organization (WHO) Health Strategic Tool for Assessing Risks (STAR) tool [28] to evaluate the health impact of the reported risk factors. The tool assesses the outcomes' severity and probability associated with each risk factor. Severity refers to the consequences or impacts of a health event if it occurs. It measures potential harm to the health of handloom weavers on a three-step scale: low, medium, and high. Probability indicates the chance that a specific health impact will occur, also classified as low, medium or high. It estimates the likelihood that weavers will be exposed to a hazard and subsequently develop a health problem. We combined the three levels of severity and probability into a single category for each proportion. This reduced the number of small groups and improved the stability of the multinomial logistic regression analysis. Respondents without the relevant symptoms were assigned a code of 0, indicating asymptomatic [29]. For each health outcome, asymptomatic participants were considered the reference category STAR outputs were classified into three outcome categories: no symptom, severity, and probability. In the multinomial logistic regression model, the 'no-symptom' category was the baseline. Any probability of occurrence above null and any severity level, if the outcome occurred, above null were considered indicative of potential health risk.

2.3.3. Statistical Analysis

Descriptive statistics were used to summarize handloom weavers' socio demographic characteristics, workplace conditions, and health outcomes. We used Pearson's chi-square to test whether the distribution of categorical health outcomes varied across categories of independent variables. Multinomial logistic regression was used to assess the odds of each health outcome's severity or probability category associated with the independent covariates with reference to the asymptomatic category. In the multinomial logistic regression models, asymptomatic participants served as the reference category for each health outcome Independent covariates included age, family size, education, monthly income, work seniority, and workplace risk factors, including dust, excessive noise, poorly maintained work-floor conditions, non-ergonomic or hazardous hand tools, and hazardous chemicals. These predictors were selected a priori based on the study objectives and previous findings from the literature. Reference categories were age 18–29 years, family size of four and five or more members, literate status, 5–10 years of work seniority, 8–10 working hours/day, sitting posture, and no exposure to workplace hazards. The analysis was conducted using SPSS® version 21.

2.3.4 Ethics Approval Statement (if Relevant)

The study was conducted in accordance with the World Medical Association's Declaration of Helsinki, as revised in 2013, and was approved by the Institutional Review Board of the Research Ethics Committee, Pabna University of Science and Technology, Pabna, Bangladesh (Ethics Approval Certificate No. PUST_ET-2025–0011; approved 31 July 2025). Written informed consent was obtained from all participants before data collection.

3. Results

3.1. Socio-Demographic and Occupational Profile of the Respondents

Table 1 shows the socio-demographic and occupational profile of the respondents. The majority of the participants were male (78.4%). Age distribution, family size, and educational did not vary by sex. A large proportion of weavers were illiterate, 28.4% had received primary education, and 40.9% had completed secondary or intermediate education.

Also, job seniority, working days per month, and daily working hours were similar between male and female respondents. Approximately 78.4% of weavers reported working primarily in a standing posture, which may increase the risk of musculoskeletal problems. 87.5% weavers experienced exposure to dust or airborne particles, excessive noise, poorly maintained work-floor conditions, non-ergonomic or hazardous hand tools, and hazardous chemicals during working hours.

Table 1. Socio-demographic and work-related variables in study participants.

Variables	Category	Men (No = 69)		Women (No = 19)		Total (No = 88)		*p* Value
		N	%	N	%	N	%	
Age	18–29	22	31.9	6	31.6	28	31.8	0.936
	30–44	30	43.5	9	47.4	39	44.3	
	45–55	17	24.6	4	21.1	21	23.9	
Family size	Four	23	33.3	6	31.6	29	33.0	0.885
	Five and more members	46	66.7	13	68.4	59	67.0	
Education	Illiterate	21	30.4	6	31.6	27	30.7	0.974
	Primary	20	29.0	5	26.3	25	28.4	
	High school or higher	28	40.6	8	42.1	36	40.9	
Job seniority	5–10 year	15	21.7	4	21.1	19	21.6	0.935
	11–15 year	42	60.9	11	57.9	53	60.2	
	>15 year	12	17.4	4	21.1	16	18.2	
Working days per month	15–19 days	5	7.2	2	10.5	7	8.0	0.640
	20–30 days	64	92.8	17	89.5	81	92.0	
Working hours per day	8–10 h	15	21.7	4	21.1	19	21.6	0.949
	11–14 h	54	78.3	15	78.9	69	78.4	
Work posture	Sitting	15	21.7	4	21.1	19	21.6	0.948
	Standing	54	78.3	15	78.9	69	78.4	
Dust	Yes	60	87.0	17	89.5	77	87.5	0.769
	No	9	13.0	2	10.5	11	12.5	
Unhygienic floor	Yes	60	87.0	17	89.5	77	87.5	0.768
	No	9	13.0	2	10.5	11	12.5	
Hazardous chemicals	Yes	63	91.3	17	89.5	80	90.9	0.806
	No	6	8.7	2	10.5	8	9.1	
Excessive noise	Yes	62	89.9	17	89.5	79	89.8	0.961
	No	7	10.1	2	10.5	9	10.2	
Inappropriate tools	Yes	9	13.0	2	10.5	11	12.5	0.769
	No	60	87.0	17	89.5	77	87.5	
Sanitation facilities	Yes	10	14.5	2	10.5	12	13.6	0.656
	No	59	85.5	17	89.5	76	86.4	

3.2. Association of Occupational Exposure on Different Health Outcomes

The results of the multinomial logistic regression analysis are difficult to interpret because of the small sample size and the cross-sectional study design. The extremely large or small OR and wide confidence intervals suggest that pointing at the direction of the associations would be more profitable than looking at the effect size. Therefore, Table 2 shows the observed significant associations, along with the adjusted *p*-values. The strength and direction of these associations varied according to the outcome and explanatory variable. The results for the adjusting covariates are shown in the Supplementary Table as (Table S1, and S2) Supplementary Material B.

Table 2. Results of the multinomial Logistic Regression analysis examining the associations between occupational risk factors and the reported health outcomes.

Health Outcomes	WHO STAR Variable	Risk Factor	No. Exposed/Unexposed	OR (95% CI)	*p* Value
Malnutrition	Severity	Sex (male vs. female weavers)	Females: 12/19 Males: 57/69	1.1 (1.04-5.43)	0.004
Mental disorder	Severity	Education (high school vs. primary/illiterate)	High school: 24/36 Primary/illiterate: 44/52	1.2 (1.9–16.0)	0.030
Allergies	Severity	Inappropriate tools	Yes: 49/77; No: 6/11	4.3 (4.0–27.5)	0.001
	Probability	Cluttered flooring	Yes: 25/78; No: 7/10	27.9 (1.2–520)	0.040
Respiratory disorders	Severity	Dust	Yes: 22/77; No: 9/11	1.4 (1.1–11.5)	0.006
		Hazardous chemicals	Yes: 23/80; No:5/8	34.0 (2.1–520)	0.007
	Probability	Hazardous Chemicals	Yes: 53/80; No: 6/8	23.5 (2.4–225)	0.005
Hearing loss	Severity	Working hours/day (11–14 vs ≤ 10 h/day)	11–14: 36/69; ≤10: 3/19	5.5 (1.4–22.4)	0.011
		Excessive noise	Yes: 65/79; No: 6/9	5.3 (5.1–113)	0.005
	Probability	Inappropriate Tools	Yes:11 /77; No: 5/9	1.7 (1.02–16.85)	0.007
Neck pain	Severity	Sex (male vs. female weavers)	Females:13/19 Males: 53/69	1.12 (1.01–1.08)	0.010
		Age (30–55 vs. 18–29 years)	30–55: 46/60 18–29: 20/28	18.7 (1.3–279)	0.002
		Posture at work (standing vs, sitting)	Standing: 59/69; Sitting:8 /19	1.8 (1.3–10.3)	0.010
	Probability	Age (30–55 vs. 18–29 years)	30–55: 10/60 18–29: 2/28	18.7 (1.3–10.3)	0.003
Shoulder pain	Severity	Job seniority (≥11 vs. 5–10 years)	≥11: 52/69 5–10: 12/19	3.4 (2.0–11.5)	0.002
Knee pain	Severity	Age (30–55 vs. 18–29 years)	30–55: 34/60 18–29: 16/28	6.5 (2.4–36.1)	0.003
		Working days/month (20–30 vs. 15–19 days)	20–30: 60/81 15–19: 4/7	6.4 (1.2–34.0)	0.010
		Posture at work (standing vs, sitting)	Standing:53/69; Sitting: 11/19	19.3 (3.6–103)	0.030
	Probability	Sex (male vs. female weavers)	Females:6 /19 Males: 12/69	10.1 (2.8–120)	0.001
		Age (18–29) vs. 30–55 Year	30–55: 10/60 18–29: 8/28	1.68 (1.10–4.44)	0.020

Male sex showed a significant inverse relationship with severity of malnutrition, and participants with high-school education had lower odds of poor mental-health compared with those with primary education (OR = 1.2; $p = 0.030$).

Use of inappropriate tools was associated with increased odds of severe allergies ($p = 0.001$), while a cluttered floor was linked with their probability category.

Exposure to dust and airborne particles, such as yarn dyes, was significantly associated with severe respiratory disorders ($p = 0.006$). Use of these chemicals also increased the odds of probable respiratory outcomes.

Workers who worked 11 hours per day or more and those reporting exposure to excessive noise more frequently reported severe hearing problems compared to those who worked less prolonged hours. For probability, inappropriate tools were associated with an OR of 1.7 ($p = 0.007$), indicating lower estimated odds relative to the reference category; however, the very wide CI indicates substantial uncertainty.

As it regards musculoskeletal symptoms, female sex, ageing, and awkward posture at work increased the odds of severe and probable neck pain. Severe shoulder pain was significantly associated with job seniority, which was also a significant predictor of probable low back pain as it was the case for prolonged daily working hours. Ageing, awkward posture at work, and working more than 20 days per month were predictors of severe and probable knee pain.

4. Discussion

This study confirmed that handloom workers from the Bangladeshi Sirajganj district come from disadvantaged socioeconomic backgrounds and are exposed to various work-related strains and hazardous conditions, including excessive noise, dust particles, cluttered flooring, and hazardous chemicals, and frequently use inappropriate tools. A range of self-reported health problems, such as malnutrition, hearing loss, and respiratory and musculoskeletal problems, appear in association to such hazardous conditions [12]. These findings are in agreement with previous studies that showed that textile and weaving activities imply exposure to unsafe ergonomic conditions, chemicals, dust, and noise.

Male handloom weavers showed reduced odds of malnutrition in comparison to females (OR = 1.1), whereas education was protective against mental-health problems (OR = 1.2). Gender-related disparities in workload, family responsibilities, and access to healthcare may explain our findings. Besides, education could contribute to increased health awareness and better coping mechanisms. Evidence from recent studies conducted among the Bangladeshi handloom weavers also supports the contributions of prolonged working hours, economic hardship, gender inequalities, and physical discomfort to a higher incidence of health and mental-health issues [30].

Workplace-related factors were previously associated with allergic conditions among carpet weavers; poor ventilation and exposure to dust and fibers were suggested as the cause of allergies and respiratory tract disorders [5,31]. In our study, poorly arranged tools also contributed to allergy severity. Overall, these findings suggest that the quality of the workplace environment has a considerable impact on the development of allergic diseases among weavers. In the present study, exposure to hazardous chemicals was elated to both severe and probable respiratory disorders. Similar results were reported among Ethiopian carpet weavers, where exposure to cotton dust was linked to increased prevalence of respiratory symptoms and reduced pulmonary function [31]. The odds of severe respiratory problems were also significantly associated with workplace exposure to dust, which was reported by 87.5% of weavers.

Hearing problems were significantly associated with prolonged working hours and occupational noise exposure. Prolonged working-hours in a noisy environment is a known causative factor of occupational hearing loss, and y the association between textile manufacturing, occupational noise exposure, and hearing loss has been documented in previous studies among textile workers in Myanmar, India, and Bangladesh [10,12,32]. Therefore, it is important to periodically monitor the level of noise and hearing ability of textile mill workers [25,33].

Musculoskeletal pain, including neck, shoulder, lower-back, and knee pain, was associated with age, job seniority, working days per month, and awkward posture at work. These associations have been previously described among weavers in earlier studies. In particular, long working hours, repetitive motions, awkward postures, and limited working space contribute to MSDs in weavers [5,20].

Handloom weavers face physical challenges, such as maintaining elevated arm positions for extended periods, static contractions, and repetitive movements, which can lead to neck and shoulder pain. This health risks associated with weaving are compounded by long working hours, the use of hazardous chemicals, poor ventilation, and insufficient lighting [33].

Handloom workers in the Ullapara Upazila of Sirajganj District most frequently operate in makeshift setups within their homes, and this tradition has been passed down through generations. They do not have occupational health and safety protections nor are entitled to occupational health and safety provisions. Their poor socioeconomic status and inadequate housing conditions further increase their health risks.

Study Limitations

The present research has several limitations that should be noted while analyzing its results. Firstly, the small study size and the recruitment from a restricted area might have reduced the generalizability of findings to the whole population of Bangladeshi handloom weavers. Given the relatively small sample size, several odds ratios had wide confidence intervals, indicating limited precision. Therefore, the estimated associations should be interpreted with caution and considered hypothesis-generating rather than conclusive. Secondly, the collection of self-reported data carries the danger of recall bias affecting the results. Thirdly, our study had a cross-sectional design, which allows establishing associations between variables but not cause-effect relationships. Fourthly, no measurements of potential workplace hazards were taken because of lack of resources, and we had to rely on self-reported questionnaire information. Still, despite the limitations we identified and acknowledged, our study provides valuable and unique information about the health hazards of a poorly studied working population, such as handloom weavers, who are numerous in Bangladesh and in many other low-income countries. Our study connected the described workplace circumstances with workers' self-reported health status, which increases its value in terms of occupational health assessment. Our results can serve as a valuable foundation for further

extensive and longitudinal studies aimed at analyzing occupational health hazards in handloom weavers and comparing them to power loom operators.

To reduce the occurrence of health problems, particularly musculoskeletal disorders (MSDs), in the population studied, it would be important to educate weavers about MSDs, clarifying that they are not inevitable but can be prevented by implementing the necessary occupational hygiene provisions and reduced through regular physical activity and stretching. Healthcare providers can help reduce the burden of MSDs by educating individuals about early signs and emphasizing the importance of physical exercise for relieving pain. Many study participants from low socioeconomic backgrounds may have struggled with healthcare. It is crucial to inform them about the available central and state-sponsored schemes and promote their effective use, as access to better healthcare facilities and proper health education can help reduce disease burden. Additionally, the work environment should be improved by ensuring proper lighting, maintaining clean floors, and providing adequate seating arrangements. Working hours should also be limited, and workers should avoid prolonged static postures.

5. Conclusions

This study examined the health hazards affecting handloom weavers, including high rates of malnutrition, hearing and respiratory problems, and musculoskeletal pain. The reported health problems were associated with age, job seniority, longer daily working hours, awkward working posture, and exposure to dust, noise, and hazardous chemicals. These findings underscore the urgent need for targeted public health interventions. Long working hours, uncomfortable postures, unhealthy work environments, and physically demanding tasks emerge as key risk factors, while higher income, fewer working hours, regular breaks, physical activity, and improved maintenance and preventive measures may help mitigate the health burden.

Supplementary Materials

The additional data and information can be downloaded at: https://media.sciltp.com/articles/others/2611171555500564/WAH-26040222-SM.zip. Table S1: Prevalence and incidence of different diseases and disabilities (based on socio-demographic issues); Table S2: Results of Multinomial Logistic Regression analysis examining the effects of socio-demographic condition on various diseases.

Author Contributions

M.S.K.: Conception and design, Material preparation, data collection, software analysis and writing-original draft preparation; K.F.: Data collection; S.M.S.H.T.: Data analysis, writing-reviewing and editing; S.M.S.H.T.: Data curation, Formal Analysis, Editing the draft, and M.R.I.: conceptualization, methodology development, writing-reviewing and editing, supervision. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the guidelines of the Declaration of Helsinki and was reviewed and approved by the Institutional Review Board of Research Ethics Committee, Pabna University of Science and Technology, Pabna, Bangladesh (Certificate No. PUST_ET-2025-0011; approval date: 31 July 2025). All participants provided explicit informed consent, and the collected data were anonymized. Participants were informed of their right to withdraw from the study at any time without penalty.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Data will be available upon request to the corresponding author.

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Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used Grammarly and ChatGpt to grammertical suggestion and language quality enhancement. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

References

1. Akber, S.M.; Shabnam, S.; Roy, A. Present Condition & Contribution of SME Financing in the Economy of Bangladesh: A Study on Three Selected Banks. *J. Financ. Econ.* **2023**, *11*, 183. https://doi.org/10.12691/jfe-11-4–1.
2. Ministry of Planning (MoP). *Handloom Census 2018*; Ministry of Planning: Dhaka, Bangladesh, 2018.
3. Hossain, M.K.; Islam, M.E. An Analysis of Present Scenario of Handloom Industry of Bangladesh. *Rabindra J.* **2012**, *03*, 1–14.
4. Bangladesh Bank. *Quarterly Review on Readymade Garments (RMG)*; Bangladesh Bank: Dhaka, Bangladesh, 2021.
5. Siddiqui, L.A.; Banerjee, A.; Chokhandre, P.; et al. Prevalence and predictors of musculoskeletal disorders (MSDs) among weavers of Varanasi, India: A cross-sectional study. *Clin. Epidemiol. Glob. Health* **2021**, *12*, 100918. https://doi.org/10.1016/j.cegh.2021.100918.
6. Koiri, P. Occupational health problems of the handloom workers: A cross sectional study of Sualkuchi, Assam, Northeast India. *Clin. Epidemiol. Glob. Health* **2020**, *8*, 1264–1271. https://doi.org/10.1016/j.cegh.2020.04.025.
7. Rahman, M.; Haque Khan, M.; Hossain, I.; et al. Musculoskeletal Problems among Handloom Workers. *Texila Int. J. Public Heal.* **2017**, *5*, 1–15.
8. Nag, A.; Vyas, H.; Nag, P. Occupational health scenario of Indian informal sector. *Ind. Health* **2016**, *54*, 377–385. https://doi.org/10.2486/indhealth.2015-0112.
9. ArulJothi, K.N.; Irusappan, S.; Amarnath, G.; et al. A Descriptive Study to Assess the Occupational Health Hazards and the Knowledge, Attitude, and, Practice Regarding the Prevention of Occupational Health Hazards among Workers in Selected Handloom Weaving Industries, Kerala. *IJSR-Int. J. Sci. Res.* **2020**, *9 I*, 63–65.
10. Jamil, S.; Mukul, M.E.H.; Bari, Q.I.; et al. Prevalence and Factors Associated with Musculoskeletal Pain among Rural Handloom Weavers in Sirajganj, Bangladesh. *Bangladesh Pharm. J.* **2022**, *25*, 188–198. https://doi.org/10.3329/bpj.v25i2.60970.
11. Hossain, A.; Kamrujjaman, M.; Maleque, A. Associated Factors & Pattern of Musculoskeletal Pain among Male Handloom Weavers Residing in Belkuchi, Shirajganj: A Cross Sectional Study Garment Workers View Project Speech and Language Pathology View Project Associated Factors & Pattern of Musculoskele. *Int. J. Sci. Eng. Res.* **2018**, *9*, 1447–1451.
12. Ps, J. A Study on Health Issues of Handloom Weavers in Lakshmiyapuram, Sankarankovil, Tenkasi District, Tamilnadu, India. *J. Xi'an Shiyou Univ. Nat. Sci. Ed.* **2022**, *18*, 207–218.
13. Bradshaw, L.M. Provision and perception of occupational health in small and medium-sized enterprises in Sheffield, UK. *Occup. Med.* **2001**, *51*, 39–44. https://doi.org/10.1093/occmed/51.1.39.
14. Haftu, D.; Kerebih, H.; Terfe, A. Prevalence of work-related musculoskeletal disorders and its associated factors among traditional cloth weavers in Chencha district, Gamo zone, Ethiopia, an ergonomic study. *PLoS ONE* **2023**, *18*, e0293542. https://doi.org/10.1371/journal.pone.0293542.
15. Talukdar, M.M.U. Influencing Factors of Workers' Migration from Loom Industries to Other Professions: Evidence from Sirajganj District of Bangladesh. *SSRN Electron. J.* **2025**, *26*, 1–13. https://doi.org/10.2139/ssrn.5379826.
16. Mekonnen, T.H. The magnitude and factors associated with work-related back and lower extremity musculoskeletal disorders among barbers in Gondar town, northwest Ethiopia, 2017: A cross-sectional study. *PLoS ONE* **2019**, *14*, e0220035. https://doi.org/10.1371/journal.pone.0220035.
17. Durlov, S.; Chakrabarty, S.; Chatterjee, A.; et al. Prevalence of low back pain among handloom weavers in West Bengal, India. *Int. J. Occup. Environ. Health* **2014**, *20*, 333–339. https://doi.org/10.1179/2049396714y.0000000082.
18. Geto, A.K.; Daba, C.; Desye, B.; et al. Prevalence of work-related musculoskeletal disorder and its associated factors among weavers in low- and middle-income countries: A systematic review and meta-analysis. *BMJ Open* **2025**, *15*, e093124. https://doi.org/10.1136/bmjopen-2024-093124.
19. Rajendran, A.K.; Supramaniam, R.K.; Selvaraj, M.D. Prevalence of Work-Related Musculoskeletal Disorders and Their Associated Ergonomic Risk Factors among Glove Manufacturing Industry Workers in Malaysia. *Work. Health* **2026**, *2*, 8. https://doi.org/10.53941/wah.2026.100008.

20. Wang, Z.; Hu, B.; Song, X.; et al. Long Working Hours and the Co-Occurrence of Work-Related Musculoskeletal Symptoms and Occupational Stress among Ride-Hailing Drivers in Beijing, China. *Work. Health* **2026**, 2, 22. https://doi.org/10.53941/wah.2026.100022.
21. Zinabu, F.S.; Getie, K.; Takele, M.D.; et al. Lower back pain and associated factors among weavers working in Bahir Dar City, Northwest Ethiopia: A cross-sectional study. *Front. Public Health* **2024**, *12*, 1–12. https://doi.org/10.3389/fpubh.2024.1400312.
22. Omosebi, T.E.; Okurame, D.E. Daily Work Hours, Work-Life Balance and Occupational Mental Health of Remote Workers in Nigeria. *Work. Health* **2026**, *2*, 16 https://doi.org/10.53941/wah.2026.100016.
23. Mukherjee, R.; Banerjee, T.; Roy, M. An analysis of production loan and future expansion plan of handloom weavers from West Bengal, India. *Res. J. Text. Appar.* **2026**, 1–17. https://doi.org/10.1108/rjta-11-2025-0267.
24. Lekharu, H.; Nath, S.K. Financial health of handloom micro-entrepreneurial units in Assam: A composite financial health index approach. *Res. J. Text. Appar.* **2026**, 1–19. https://doi.org/10.1108/rjta-03-2026-0068.
25. Bangladsh Handloom Board (BHB). *Annual Report 2017-18*; Bangladsh Handloom Board (BHB): Dhaka, Bangladesh, 2024; Volume 2.
26. Banglapedia. *Sirajgonj District and Upazillas Map*; Asiatic Society of Bangladesh: Dhaka, Bangladesh, 2012.
27. Madow, W.G. Elementary Sampling Theory. *Technometrics* **1968**, *10*, 621–622. https://doi.org/10.1080/00401706.1968.10490610.
28. Pope, S.; Rhodus, J.; Fulk, F.; et al. The Health Impact Assessment (HIA) Resource and Tool Compilation. 2016. Available online: https://www.epa.gov/sites/production/files/2017-07/documents/hia_resource_and_tool_compilation.pdf (accessed on 02 September 2026).
29. Rahaman, M.A. Mental health of handloom weavers in Bangladesh: A call for culturally adapted interventions. *Camb. Prism. Glob. Ment. Health* **2025**, *12*, 1–9. https://doi.org/10.1017/gmh.2025.10081.
30. Wani, K.; Khan, R.; Evaluation of occupational exposure of carpet weavers in northern province of Madhya Pradesh (India) during different seasons. *Indian J. Occup. Environ. Med.* **2015**, *19*, 110. https://doi.org/10.4103/0019-5278.165331. (accessed on 02 September 2026).
31. Terfe, A.; Jemal, T.; Waqkene, T. Prevalence of low back pain and its associated factors among traditional cloth weavers in Gulele sub-city, Addis Ababa, Ethiopia. *Front. Public Health* **2023**, *11*, 1181591. https://doi.org/10.3389/fpubh.2023.1181591.
32. Zaw, A.K.; Myat, A.M.; Thandar, M.; et al. Assessment of Noise Exposure and Hearing Loss Among Workers in Textile Mill (Thamine), Myanmar: A Cross-Sectional Study. *Saf. Health Work.* **2020**, *11*, 199–206. https://doi.org/10.1016/j.shaw.2020.04.002.
33. Blåder, S.; Barck-Holst, U.; Danielsson, S.; et al. Neck and shoulder complaints among sewing-machine operators. *Appl. Ergon.* **1991**, *22*, 251–257. https://doi.org/10.1016/0003-6870(91)90228-a.