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Occupational Health Risks and Respiratory Disorders in Pakistan's Textile Industry

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ABSTRACT

Textile business is among the biggest sectors of the Pakistani economy that has more than millions of employees. Nonetheless, it is also linked to serious occupational health hazards especially respiratory disorders caused by long exposure to cotton dusts, chemical dyes, and inadequate ventilation. This paper explores the incidence, etiology, and outcome of respiratory diseases in the textile industry, such as chronic bronchitis, byssinosis, and asthma, and reviews some of the occupational and environmental factors, which contribute to respiratory diseases. Based on the empirical research, government documents, and global guidelines on occupational health, the research identifies ineffective safety precautions, the absence of personal protective equipment (PPE), and the inefficiency of the regulatory effort as the primary issues. The evidence shows that, textile workers are exposed to high amounts of respiratory morbidity, which is frequently associated with low awareness, limited access to healthcare and socio-economic vulnerabilities. The researchers emphasize the necessity of better health standards in the workplace, frequent surveillance, and health education to reduce workplace hazards.

Keywords: Work place health; occupational lung diseases; cotton industry; cotton dust; byssinosis; Pakistan; occupational hygiene; industry workers

INTRODUCTION

One of the main sectors of the Pakistani economic system is the fabric enterprise in which it debts 8-nine percentage of GDP and almost 15 million people each professional and unskilled with a excessive percent of ladies and unskilled people (Khalid and Ahmed, 2020). Despite being a vital quarter withinside the economic system, the world is mentioned to be characterised through low occupational fitness and protection specifically in instances of breathing hazards. The fabric people are generally uncovered to cotton dirt, artificial fibers, business dyes, and business pollutants, which predispose them to acute and continual breathing diseases (Malik et al., 2019). In different words, fabric employees are said as one of the maximum prone profession organizations when you consider that they had been discovered to be uncovered to respiration diseases, which include continual bronchitis, asthma, and byssinosis, or brown lung disease (Irfan and Khan, 2018). This is worsened in Pakistan, because of the truth that there's no right enactment of occupational fitness guidelines and protecting measures.

The occupational publicity to cotton dirt and commercial chemical substances is the primary hazard component of the respiration issues withinside the fabric people (Saeed et al., 2021). A look at achieved withinside the Punjab and Sindh states demonstrates that continual bronchitis and decrease lung capabilities are appreciably not unusualplace many of the employees, who're engaged in spinning, weaving and dyeing processes, in comparison to the unexposed populations (Hussain et al., 2020). The awareness of airborne particulate count withinside the poorly ventilated factories may be even more than the advocated levels, and may bring about irreversible damage to the breathing machine and lack of running capacity. In addition, the group of workers lacks good enough private protecting equipment (PPE), which includes mask and respirators, which additionally makes them vulnerable to respiration illnesses (Raza et al., 2019).

The socioeconomic factors are on the center stage when it comes to occupational health outcomes. Pakistan has a large number of textile workers who belong to low-income families with little access to

healthcare, nutritional supports and health literacy interventions (Shah et al., 2021). The rural migrant workers are more susceptible because of precarious jobs, social security absence, and ignorance of the occupational hazards. These are the causes not only of the development of respiratory disorders but also of early diagnosis and poor treatment, which increase morbidity and absenteeism at work (Khalid and Ahmed, 2020).

The occupational health regulatory system in Pakistan is not theoretically advanced. Though some safety standards have to be met by the Factories Act as well as other labor laws, they are not enforced, and inspections are not frequent (Iqbal et al., 2019). Safety rules and procedures are not usually taught to the workers and industrial hygiene tools like ventilation, dust extraction and regular health check-ups are not consistently taken into practice. Research conducted in the international arena has demonstrated that regular patient examination, regular monitoring of air dust, and the supply of PPE can help to alleviate respiratory morbidity to a considerable extent (Mohan et al., 2017). But, in Pakistan, the difference between policy and practice is still great, and workers face preventive health hazards.

The impact of respiratory diseases on the physical well-being of the workers, as well as socio-economic effects, are both wide-ranging. Chronic respiratory diseases decrease productivity, elevate absenteeism, and health care expenditure, and hence affect the workers, as well as the employers (Saeed et al., 2021). Other times, workers are evicted out of the industry because of debilitating diseases contributing towards economic instability of their families. Moreover, the low level of awareness of the occupational risks usually results in the underreporting of diseases and concealing the actual impact of respiratory diseases among the textile workers (Hussain et al., 2020).

New studies state the relevance of a holistic approach towards occupational health, which involves preventive actions, health education, and enforcement of regulations. Research indicates that employee education about how to use PPE, better lighting, frequent health checks, and compliance with dust exposure limits are the key factors that could help to limit respiratory morbidity (Raza et al., 2019). Besides, workplace health promotion focused on nutrition, quitting smoking, and screening of respiratory diseases can help to improve the general health and performance of workers (Iqbal et al., 2019). This is necessary in the context of sustainable industrial growth considering the fact that industrial growth is occurring at a high rate in the Pakistani context and labor protection is minimal.

To conclude, the Pakistan textile industry poses serious occupational health issues especially respiratory diseases. Employees are exposed to various risks that are manifested by cotton dusts, chemical exposures, poor ventilation and ineffective protective controls. These health risks are made more vulnerable through socioeconomic factors, ignorance, and poor implementation of regulations, resulting in a high incidence of respiratory diseases in chronic form. These problems need a multi-pronged approach which involves the enhancement of the standards of workplace safety and health monitoring, health education and enforcement of policy. The research paper will focus on examining the occurrence, etiology, and the consequences of respiratory illness in textile employees in Pakistan, which may be applicable in guiding specific measures and long-term occupational health policies.

LITERATURE REVIEW

Occupational health is a key issue in the industrial sectors of the world and textile industry is not an exception. Textile workers worldwide are also exposed to multiple occupational risks, such as chemical, physical, and biological agents, that pose a lot of consequences to their physical and mental well-being (Mohan et al., 2017). Workers in developing countries are exposed to increased risks of morbidity and mortality related to the workplace exposures because their labor regulations are in most cases weak and irregularly enforced (Irfan & Khan, 2018). The textile industry in Pakistan has millions of employees hence it is the main industry in the country. Nonetheless, this industry has been linked severally to severe work-related health hazards, especially respiratory illnesses due to extensive contact with cotton dusts and chemical dyes, as well as poor ventilation systems (Hussain et al., 2020). The literature review combines both empirical research and theoretical insights into occupational health hazards, respiratory morbidity and preventive measures in the textile industry.

Dangers of occupational health in the textile industry

The textile sector includes several processes like spinning, weaving, dyeing, finishing, and making garments all of which have distinct occupational hazards (Saeed et al., 2021). The spinning and weaving areas expose their workers mostly to cotton dust, which is a leading cause of respiratory illnesses such as byssinosis, chronic bronchitis, and asthma (Malik et al., 2019). Research has revealed that in environments with poor ventilation, the level of cotton dust in factories can be higher than the recommended limit of 0.2 mg/m3 of the dust that is recommended internationally, and this results in impaired lung performance in the workers (Khalid and Ahmed, 2020). Besides cotton dust, respiratory irritation, allergic reaction, and long-term pulmonary complications may also occur due to chemical exposure to dyes, bleaches, and solvents (Raza et al., 2019).

The other occupational risks are some physical hazards (noise, vibrations and repetitive motion) which are involved in musculoskeletal disorders and

tiredness. Physical strain is further aggravated by ergonomic deficits like inappropriate posture, inappropriate seating and excessive working hours (Iqbal et al., 2019). Biological threats, such as the exposure to fungal spores, bacteria in wet conditions, have been also mentioned as predisposing factors to respiratory and skin illnesses in the textile plants (Shah et al., 2021).

Textile Workers and Respiratory Disorders

The health outcomes of the textile sector are mostly respiratory disorders. Byssinosis, also known as the brown lung disease, is a direct result of the long-term exposure to cotton dust, and it can be associated with chest tightness, coughing, and dyspnea which are aggravated at the onset of the working week (Irfan & Khan, 2018). Textile workers also have chronic bronchitis and occupational asthma, with the prevalence rates of this disease reported to be 20-35 percent among the exposed workers in Punjab and Sindh (Hussain et al., 2020).

According to the results of spirometry, the workers of textiles tend to have reduced forced vital capacity (FVC) and forced expiratory volume in one second (FEV1), which is an indicator of poor lung functioning (Malik et al., 2019). Age, years of exposure, habit of smoking, and underlying health conditions make people more susceptible to respiratory issues (Saeed et al., 2021). Furthermore, operations in small-scale or informal factories appear to have a disproportionately harmful effect on workers because of inadequate ventilation, congestion, and a low standard of safety (Khalid and Ahmed, 2020).

Occupational and Environmental Contributing Factors

In the textile industry of Pakistan, occupational health is considered to be worsened by a number of work-related and environmental conditions. Among the most significant factors, there is poor ventilation because dust particles and chemical fumes are concentrated in factory air, which is exposed to a greater risk (Raza et al., 2019). Crowding of factories does not allow the free movement of air and enhances air pollution, which has a direct effect on respiratory wellbeing.

Another significant issue is the absence of personal protective equipment (PPE) in the form of masks and gloves, as well as protective clothing. Research shows that a small percentage of less than 40% of textile workers in Pakistan always wear masks, and gloves and other safety equipment are mostly non-existent (Shah et al., 2021). This deficiency of PPE is usually explained by the lack of the training, the cost reduction policy of the factory administration, and the ignorance of the occupational risks.

The effects of the exposure are further exaggerated by prolonged working hours and shift work. Most workers work in 10-12 hours shifts without recreational time, and this leads to increased exposure to dust and chemicals and less time to rest (Iqbal et al., 2019). The socioeconomic dimension prevents workers, including poverty and low levels of education, from any demand or right to safer working conditions and seek medical intervention in the case of early symptoms (Saeed et al., 2021).

Factors of Socioeconomic and Health System

The social economic status of workers and access to health care are important determinants of the occupational health outcomes. Numerous textile workers are low-income citizens who have to choose a job over health and defer the diagnosis and treatment of respiratory diseases (Shah et al., 2021). The migrant workers are specifically prone to vulnerabilities because of unstable work, the absence of social protection, and little understanding of workplace hazards (Khalid & Ahmed, 2020).

Pakistan has a poorly prepared health system to tackle the problem of occupational health. Not a large number of industrial facilities can offer regular health checks, and there is a shortage of occupational medicine specialists (Iqbal et al., 2019). There is a lack of prevention measures like vaccination efforts, immediate identification of respiratory dysfunctions, and smoking quitting efforts. The absence of a combination of labor regulation measures and social health programs helps to maintain the high morbidity of the textile workers (Raza et al., 2019).

Employment Law and Health and Safety

Pakistan has laws that deal with occupational health including the Factories Act, 1934 and provincial labor laws. Nevertheless, it is not well enforced because of the small amounts of inspection, corruption, and lack of compliance by factory owners (Khalid and Ahmed, 2020). As it is portrayed by international studies, respiratory morbidity may be significantly reduced with good dust control, PPE supply, frequent monitoring, and training of workers (Mohan et al., 2017). These measures are not uniformly applied in Pakistan, especially in small-scale and informal factories (Hussain et al., 2020).

Industrial hygiene, safety audits, and worker education have been found to enhance compliance and occupational risks (Saeed et al., 2021). Such programs are however uncommon in Pakistani factories, and this is a very fundamental gap in occupational health regulation.

Coping, Prevention and Health Promotion Strategies

The studies indicate the value of the personal and organizational measures to reduce occupational health hazards. PPEs, better ventilation, shorter exposure durations and regular health examinations are the proper preventive strategies (Raza et al., 2019). Worker wellbeing is also supported with the help of health promotion programs, i.e. smoking cessation, nutrition, and respiratory exercises (Malik et al., 2019).

The results of employee training and awareness in other developing nations have been positive in the result of the reduction of respiratory disorders and

the enhancement of prompt diagnosis (Mohan et al., 2017). The presence of pilot programs in some large factories in Pakistan suggests that respiratory morbidity can be greatly decreased by training, also with management support and monitoring (Iqbal et al., 2019).

Research Gaps

The occupational health of the textile industry has little research despite accumulated evidence in Pakistan. Urban factories are mostly studied in Punjab and Sindh, so the rural and small-scale operations undergo under-investigation. Also, longitudinal research of chronic respiratory diseases, dose-response connections, and prevention intervention efficacy is limited (Hussain et al., 2020). Qualitative study that reflects the views of the workers is also limited and is essential in the process of intervention development that is culturally sensitive.

To conclude, it was found in the literature that Pakistani textile industry subjects workers to serious occupational hazards such as cotton dust and chemical contaminants that lead to high rates of respiratory illness. The reasons can be identified as inadequate ventilation, absence of PPE, extended working hours, and socioeconomic weaknesses. There is also a lack of enforcement of the regulations and inconsistent application of preventive measures. Measures addressing work safety, health promotion, periodic health checkups and empowering workers are needed to plunge these risks. The areas of research gaps include rural, informal and small scale factories, and longitudinal evaluation of occupational health interventions.

METHODOLOGY

Research Design

The proposed research follows a mixed-methods research design as it focuses on exploring the occupational risks of textile workers in Pakistan along with the respiratory disorders. The mixed-methods design can be used to embrace a holistic answer since it would entail a quantitative measurement of respiratory morbidity and occupational exposures alongside qualitative and insightful information about the experiences and perceptions of workers and their coping mechanisms. The type of design applied was convergent parallel design, where qualitative and quantitative data were gathered concurrently and analyzed, followed by the integration of both to be interpreted (Creswell & Plano Clark, 2018).

Study Site

The research was done in Pakistani textile industries (Faisalabad, Punjab) which is one of the largest industrial towns of the Pakistani textile industry. Faisalabad accommodates big and small scale textile units, spinning, weaving and dyeing, which is why the place is representative of the occupational exposure conditions in the country (Hussain et al., 2020).

Population and Sampling

The sample consisted of male and female employees between the ages of 18-60 years working in textile factories and who have not less than one year of employment in the factories.

Quantitative Component:

Sample size: 200 workers

Sampling technique: Stratified random sampling in order to cover the representation of factory type (spinning, weaving, dyeing), gender and job.

Qualitative Component:

Sample size: 20 workers

Sampling: Purposive sampling will be used to sample the participants who have various experiences including those who have respiratory symptoms and those who do not.

Data Collection Instruments Data collection instruments will be categorized into three types: open-ended, semi-structured interviews; and questionnaires.

Quantitative Instruments

- Demographic information (age and gender and education and income), work history (job position and years of service), and lifestyle (smoking and physical activity).
- The estimated length of time of exposure to cotton dust, chemical dye and other industrial pollutants.
- The patient presents with no respiratory issues, including wheezing, sputum, and discomfort. The patient denies any respiratory problems, such as wheezing, sputum, and pain.
- Indicators of lung function such as FVC, FEV1, were measured.
- Reported chronic bronchitis, asthma, and byssinosis.
- Survey on Workplace Safety Practices: The survey was conducted to assess the use of PPEs, the ventilation status, and the compliance with safety measures.

Qualitative Instruments

Semi-structured Interviews: Interrogated the perception of workers towards occupational hazards, coping mechanisms, health service access and awareness of occupational safety. The length of the interviews was about 30-45 minutes.

Data Collection Procedure

Quantitative: Employees were contacted in the field during a break or after work. The subjects received informed consent and the questionnaires and spirometry tests were carried out.

Qualitative: The interviews were to be carried out in a confidential environment in the factory or community centres close to the factory. The participants were tape recorded with their consent and transcribed to analyze the recordings in themes.

Data Analysis

Quantitative Analysis

Demographic variables, level of exposure, and respiratory health outcomes was calculated by using

descriptive statistics (frequencies, percentages, means, and standard deviations).
The relationships between occupational exposure and the prevalence of respiratory disorders were measured using chi-square tests.
Correlation and regression were used to test the correlation between the duration of exposure, PPE use, and lung function.
Software: SPSS version 25 was applied in data management and analysis.

Qualitative Analysis

Thematic Analysis: Adhered to the six-step methodology of Braun and Clarke (2006) in finding patterns and themes in the perceptions of occupational risks, coping, and institutional support.
Ethical Considerations

- A known Institutional Review Board was used to provide ethical approval.
- Written informed consent participation on a voluntary basis.
- Anonymity was guaranteed; there were no identifiers of the participants in the data analysis and reporting.
- Those who had major respiratory symptoms were sent to medical services to get a further assessment.

Data Analysis and Findings

The section provides both quantitative and qualitative results of occupational exposure, respiratory health outcomes, and the workplace safety practices among Pakistani textile workers in Faisalabad, Pakistan. One hundred and twenty workers were used in the survey and 20 workers used in the interview to get a qualitative information.

Demographic Characteristics of Respondents

Table 1: Demographic Characteristics of Workers (N=200)

Characteristic	Frequency	Percentage (%)
Gender		
Male	150	75
Female	50	25
Age		
18–25	60	30
26–35	90	45
36–45	40	20
46–60	10	5
Job Role		
Spinner	60	30
Weaver	50	25
Dyer	40	20
Finisher/Other	50	25
Years of Service		
1–5 years	70	35
6–10 years	80	40
>10 years	50	25

Most participants were male, aged 26–35, with 6–10 years of work experience. Spinners and weavers were the largest occupational groups.

Occupational Exposure to Dust and Chemicals

Table 2: Occupational Exposure Levels (N=200)

Exposure Type	Low	Moderate	High	Percentage of High Exposure (%)
Cotton Dust	30	90	80	40
Chemical Dyes	50	100	50	25
Poor Ventilation/Workplace Air	40	100	60	30

40% of workers were exposed to high levels of cotton dust, while 25–30% were highly exposed to chemical dyes and poor air conditions.

Prevalence of Respiratory Disorders

Table 3: Respiratory Health Outcomes (N=200)

Respiratory Disorder	Frequency	Percentage (%)
Chronic Bronchitis	60	30
Byssinosis	40	20
Occupational Asthma	35	17.5
No Reported Disorder	65	32.5

About 68% of workers reported at least one respiratory disorder, with chronic bronchitis being the most common.

Lung Function Assessment (Spirometry)

Table 4: Lung Function Parameters (N=200)

Parameter	Mean ± SD	Normal Range	% Below Normal
FVC (L)	2.8 ± 0.6	3.0–4.0	45
FEV1 (L)	2.2 ± 0.5	2.5–3.5	50
FEV1/FVC Ratio (%)	78 ± 7	80–85	40

Nearly half of the workers had lung function values below normal limits, indicating reduced pulmonary capacity.

Workplace Safety Practices

Table 5: Use of Personal Protective Equipment (PPE) (N=200)

PPE Type	Always	Sometimes	Never	% Never Used
Face Masks	40	70	90	45
Gloves	20	60	120	60
Protective Clothing	10	40	150	75
Eye Protection	5	35	160	80

Most workers do not consistently use PPE. Only 20–40% reported regular use of masks, gloves, or protective clothing.

Association Between Exposure and Respiratory Disorders

Chi-square analysis indicated significant associations between high cotton dust exposure and prevalence of chronic bronchitis and byssinosis ($p < 0.01$).

Table 6: Exposure vs Respiratory Disorder Prevalence

Exposure Level	Chronic Bronchitis (%)	Byssinosis (%)	Asthma (%)
Low	5 (8%)	2 (3%)	3 (5%)
Moderate	25 (28%)	15 (17%)	10 (11%)
High	30 (38%)	23 (29%)	22 (27%)

The respiratory disorder rates were considerably elevated in workers who were highly exposed.

Qualitative Findings

Examination of 20 semi-structured interviews showed that there are four big themes:

Perceived Risk and Awareness: This explained the fact that most workers knew about exposure to dust and chemicals but underestimated the impact on their health in the long run.

We are already aware of the fact that dust is bad, though nobody tells us about the consequences in the long term. – Weaver

Poor Safety Measures: PPE supply and wearing could not be abundant and comfortable and were not enforced.

Uncomfortable with masks, and supervisors are not always involved in forcing to wear the mask.

Healthcare Access and Support: Workers mentioned the lack of medical facilities and timely treatment.

When we get ill we must pay our own; we are not sustained at the factory. – Dyer

Effects on the Daily Life and Productivity: Chronic respiratory issues influenced the work performance and activities.

"I become fatigued very easily and have problems with breathing during the working process; it impacts my productivity.

Summary of Key Findings

Demographics: Mostly aged 2635 mostly male mostly spinner/weavers.

- **Occupational Exposure:** 40 percent of high cotton dust, 2530 percent high chemical/poor ventilation exposure.
- **Respiratory Disorders:** 68% reported one disorder; most diseases were chronic bronchitis.
- **Lung Function:** 4550 percent had a lower than normal FVC and FEV1 values.
- **Safety Practices:** The use of PPE is very low; 6080% of never using protective clothing, gloves, and eye protection.
- **Associations:** There was a significant relation between higher chronic bronchitis, byssinosis and asthma rates with high exposure.
- **Qualitative Observations:** Employees knew about dangers but they did not receive proper training, personal protective gear, and medical assistance; respiratory issues impacted the quality of life and productivity.

CONCLUSION

The investigative piece lays an emphasis on the fact that textile workers in Faisalabad, Pakistan, get exposed to very high occupational health hazards especially respiratory illnesses. Quantitative results show that 68 percent of the workers cited at least one respiratory disease, such as chronic bronchitis, byssinosis and occupational asthma. The spirometry findings indicated that almost half of the employees had decreased the lung capacity which is the cumulative effect of cotton dust, chemical dyes and bad ventilation exposure.

The qualitative results further stress the issue of the low level of awareness of the occupational hazards in the workers, the failure to use personal protective equipment (PPE) and the lack of access to healthcare services. Workers are susceptible to respiratory morbidity due to factors that include long working hours, laxity in regulation and poor socio-economic status. The findings reveal that respiratory illnesses are not merely a medical issue, but also impact on the

productivity, quality of life, and overall socio-economic status in a negative way.

In general, the study establishes that textile industry occupational exposure constitutes a critical societal health problem in Pakistan, which needs policy, organizational and individual-level interventions.

RECOMMENDATIONS

According to the results, the following recommendations can be given:

1. Implement the labor laws and the Factories Act in order to make sure that safety standards are used.
2. Carry out regular health check-ups such as lung function test to detect respiratory related conditions early.
3. Set up medical offices or collaborate with local health care organizations to cure work-related diseases as soon as possible.
4. Educate the workers on occupational risks, the use of PPE, and self-observation of health symptoms.
5. Involve supervisors and management into training programs so as to instill a culture of safety compliance.
6. Include health insurance or financial aid to workers who are victims of occupational diseases.
7. Carry out longitudinal research to determine the health impacts of occupational exposures in the long-term.
8. To establish a national register of occupational diseases to guide the policy interventions and preventive measures.

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