



Research Paper

## Systematic Review : Respiratory Problems Due to Dust Exposure in Textile Industry Workers

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### Abstract

The textile industry is a significant contributor to the economy, especially in developing countries. However, exposure to cotton dust in textile industry workplaces can lead to respiratory disorders among workers, such as asthma, chronic bronchitis, and byssinosis. This study employs a Systematic Literature Review (SLR) approach by analyzing scientific journals published in the last five years (2020-2025). Data sources were obtained from Scopus, Science Direct, PubMed, and Elsevier. Several studies indicate that textile industry workers are at high risk of respiratory disorders due to cotton dust exposure. About 34% of textile workers experience respiratory issues, with symptoms such as chronic cough, shortness of breath, and chest pain. Major risk factors include prolonged work duration, high dust levels in the work environment, and a lack of worker protection systems. Respiratory disorders due to cotton dust exposure are a serious health concern in the textile industry. Preventive measures, such as improved ventilation, the use of personal protective equipment, and monitoring air quality in the workplace, are essential to reduce health impacts on workers.

### Keywords

*cotton dust, respiratory disorder, stextile industry, workers*

## 1. INTRODUCTION

Industry is one of the important sectors in supporting a country's economy. Based on Law No. 35 of 2014 of the Republic of Indonesia concerning Industry, industry is defined as the activity of processing semi-finished goods into finished goods or goods that have higher utility value to obtain profit. One of the industries that plays a significant role in the economy, especially in developing countries, is the textile industry. This industry provides many job opportunities for the community, making it a strategic sector in economic development (Sangeetha et al., 2013).

However, behind its contribution to the economy, the textile industry also has a negative impact on the health of its workers. One of the main issues that often occurs is respiratory disorders due to exposure to cotton dust. Workers in the textile industry are at risk of developing various respiratory and lung diseases due to exposure to dust originating from cotton fibers and other materials used in the production process (Islam, 2022). Respiratory disorders due to dust exposure are a common issue often encountered in developing countries, where the level of worker protection against air pollution in the workplace is still relatively low (Singh et al., 2019).

Exposure to cotton dust in the textile industry can cause

various respiratory disorders such as pneumoconiosis, asthma, and chronic bronchitis (Subramaniam et al., 2024). Inhaled dust particles can cause irritation and inflammation in the respiratory tract, which in the long term can lead to more serious health issues (Umaiyah et al., 2022). Common symptoms experienced by workers exposed to cotton dust include cough, shortness of breath, productive cough, chest tightness, byssinosis, and chronic bronchitis (Wami et al., 2018).

The issue of respiratory disorders in the textile industry becomes more complex with the presence of other factors such as exposure duration and inadequate working conditions. The longer a worker is exposed to cotton dust, the higher the risk of health issues they may experience (Asgedom, 2023). In low- and middle-income countries, this risk increases due to inadequate working conditions and the lack of worker protection systems against pollutant exposure in the workplace (Sriwahyuningsih et al., 2020) (Subramaniam et al., 2023). In addition, poor working conditions can exacerbate health impacts, increasing the likelihood of developing long-term respiratory disorders (Adhikari et al., 2024).

Exposure to cotton dust can also contain endotoxins that have the potential to cause lung diseases, especially if

inhaled over a long period. Several studies have shown that endotoxins in cotton dust can trigger chronic inflammation and increase the risk of chronic obstructive pulmonary disease (Paudyal et al., 2011). In the textile production process, there are several stages that are at high risk of generating cotton dust exposure, such as cotton fiber separation (ginning), spinning, weaving, dyeing, and printing (Subramaniam et al., 2023). Cotton dust particles measuring between 1 to 100  $\mu\text{m}$  can be easily inhaled by workers, causing symptoms such as chronic cough, shortness of breath, pain while breathing, wheezing, nasal congestion, and chest pain (Desdiani et al., 2024).

Research conducted by Zele, Y.T., et al. (2021) shows that 34% of textile industry workers experience respiratory disorders due to dust exposure in the workplace. This indicates that respiratory disorders due to cotton dust exposure are a serious health issue and require more attention in efforts to prevent and protect workers in the textile industry. Therefore, further understanding of the health impacts of cotton dust exposure is essential to reduce risks and improve the well-being of workers in this industry (Zele et al., 2021).

## 2. METHOD

The type of research is the Systematic Literature Review (SLR) method. This study aims to analyze respiratory disorders due to dust exposure among workers in the textile industry. The data for this research will be obtained from various searches of scientific articles on the internet using databases such as Scopus, Science Direct, PubMed, and Elsevier over the past 5 years, specifically from 2020 to 2025, as well as the official WHO website. For the keywords or search terms for the research articles, the keywords used are textile industry, cotton dust, respiratory problems, and worker. The inclusion criteria for the research are journals that study respiratory problems in industrial workers. Whereas the exclusion criteria are studies that do not involve workers in the textile industry.

## 3. RESULTS

Based on the search results using the keywords cotton dust, respiratory problem, and textile worker. several research articles were found as follows.

## 4. DISCUSSION

Dust exposure in the textile industry work environment has been proven to significantly contribute to health disorders among workers. The textile industry has various units in processing its products, starting from fiber separation (Ginning). Spinning, weaving, printing, and other processing steps to convert raw cotton fibers into fabric (Subramaniam et al., 2024). Exposure to cotton dust among workers during processing becomes a major health issue

for workers in the textile industry, with high rates of byssinosis and progressive respiratory diseases characterized by symptoms such as shortness of breath, chest pain, and cough (Desdiani, 2023). Based on the Regulation of the Minister of Manpower of the Republic of Indonesia Number 5 of 2018, the threshold value for cotton dust or cotton dust is 0.2  $\text{mg}/\text{m}^3$ , and if it exceeds the threshold, it can cause bronchitis, decreased lung function, and byssinosis. In the study by Berlian et al. (2023), the dust concentration at several measurement points in their research exceeded the established standard, reaching 3.93  $\mu\text{g}/\text{m}^3$ . This resulted in approximately 57% of workers experiencing respiratory symptoms. The most significant variables in this study include PM2.5, PM10, total dust, respirable dust, and length of work, which indicate a relationship with the causes of respiratory disorders in textile industry workers (Berlian et al., 2023).

In the study conducted by Sadia et al. (2023), textile workers exposed to cotton dust had a prevalence of COPD at 10%, asthma at 17%, and byssinosis at 2%. The research shows that workers with longer work durations also experience a decrease in forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) (Sadia et al., 2023). The decrease in FVC and FEV1 can be an indication of the onset of obstructive and restrictive pulmonary disorders, thus regular examinations are necessary to determine whether recovery is possible or not (Langan and Goodbred, 2020). This condition is worse in workers with high dust exposure and placement in certain divisions such as machine operators and cotton handlers.

In the study by Elshaer et al. (2023), workers experienced chronic cough, excessive sputum production, shortness of breath levels I-III, and byssinosis among workers exposed to cotton dust, reaching a rate of 22.8% (Elshaer et al., 2023). Byssinosis, more commonly known as brown lung, is a chronic lung disease in textile workers who handle unprocessed cotton, caused by dust from cotton processing, characterized by shortness of breath and chest pain (Desdiani, 2023). Workers with byssinosis have a prevalence rate of 22.8%, leading to a significant decline in lung function compared to those who are not exposed to cotton dust. (Elshaer et al., 2023)

A study in Vietnam by Ha et al. (2021) confirmed that approximately 7.4% of textile workers were diagnosed with asthma due to cotton dust exposure. The main risk factors include being overweight, a history of asthma or allergic rhinitis, and exposure duration of more than one hour per day (Ha et al., 2021). This is also supported by the research of Subramaniam et al. (2024) and Oo et al. (2021), which found that an average of 50.7% of workers exposed to respirable dust at 3.3  $\text{mg}/\text{m}^3$  in textile factories experienced significant lung function decline, especially among workers who had been employed for more than five years. The group of workers in the twisting section has the highest level of dust exposure, which contributes to the decline in

**Table 1.** Summary of Previous Studies Related to Cotton Dust and Respiratory Disorders

No.	Researcher (Year)	Title	Sample Size	Result
1	Berlian, A., et al. (2023) (Berlian et al., 2023)	The Relationship of Dust Exposure with Respiratory Disorders Symptoms Among Textile Industry Workers	161	The research results show that the average dust concentration exceeds the quality standards, with PM2.5 and PM10 total dust exceeding the standards in several locations. Respirable dust exposure reached $3.93 \mu\text{g}/\text{m}^3$ , and 57% of workers experienced respiratory disorders.
2	Sadia, A., et al. (2023) (Sadia et al., 2023)	Effect of Cotton Dust Exposure On Respiratory Health Outcomes Among Textile Workers	498	The prevalence of COPD (10%), asthma (17%), and byssinosis (2%) among workers. Cotton dust exposure reached $0.33 \text{ mg}/\text{m}^3$ . Duration of work is associated with decline in lung function.
3	Elshaer, N., et al. (2023) (Elshaer et al., 2023)	Respiratory Symptoms and Pulmonary Function Impairment Among Textile Industry Workers in Alexandria, Egypt	364	Workers exposed to dust more frequently experience chronic cough, excessive mucus production, and shortness of breath. The prevalence of byssinosis reaches 22.8%.
4	Ha, T.T.T., et al. (2021) (Ha et al., 2021)	The Cotton Dust-Related Allergic Asthma: Prevalence and Associated Factors among Textile Workers in Nam Dinh Province, Vietnam	1082	The prevalence of asthma symptoms (11.9%), asthma (7.4%), and allergic asthma due to cotton dust (4.3%).
5	Subramaniam, S., et al. (2024) (Subramaniam et al., 2024)	Assessment of Pulmonary Function and Respiratory Symptoms among Indian Textile Sizing Mill Workers	75	Workers experienced significant decreases in PEFR, FVC, FEV1/FVC ratio, and FEV1 due to prolonged exposure to cotton dust.
6	Oo, T.W. et al. (2021) (Oo et al., 2021)	Assessment of Respiratory Dust Exposure and Lung Functions Among Workers in Textile Mill (Thamine), Myanmar	207	Workers exposed continuously to dust for more than five years experienced decreased lung function.
7	He, W. et al. (2022) (He et al., 2022)	Workers' Occupational Dust Exposure and Pulmonary Function Assessment: Cross-Sectional Study in China	2045	The prevalence of pneumoconiosis-like changes and abnormalities in FEV1, FVC, and FEV1/FVC increased with age and dust exposure duration.

lung function such as FVC and FEV1 (Subramaniam et al., 2024). Another study conducted by He, W. et al. (2022) in China observed that older workers with longer exposure durations showed an increased risk of lung changes resembling pneumoconiosis and exhibited abnormalities in FEV1 (4.25%), FVC (12.81%), and FEV1/FVC (1.47%). Factors such as age, company size, and dust exposure levels contribute to pulmonary function abnormalities (He et al., 2022).

## 5. CONCLUSION

Based on the results of the literature analysis, it can be concluded that respiratory disorders due to cotton dust exposure are a significant health issue for workers in the textile industry. As many as 34% of textile workers experience respiratory disorders with symptoms such as chronic cough, shortness of breath, and chest pain. The main risk factors contributing to this condition include high exposure to cotton dust, long working hours, and inadequate workplace

protection. Therefore, preventive measures such as the use of personal protective equipment, improvement of ventilation systems, and monitoring of air quality in the workplace are essential to reduce the health impacts caused. With the right interventions, the risk of respiratory disorders among textile industry workers can be minimized, thereby maintaining the health and productivity of the workers.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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