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A Breath of Concern: Unveiling the Landscape of Respiratory Diseases and Influencing Factors Among Industrial Workers: A Literature Based Narrative Review

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Abstract

This narrative review delves into the prevalence of respiratory diseases among factory workers in industrial areas and elucidates the contributing factors that exacerbate these conditions. Using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, this study synthesizes existing literature to provide insights into the respiratory health challenges faced by factory workers and suggests interventions to mitigate occupational hazard By synthesizing existing literature and evidence, this review seeks to provide insights into the respiratory health landscape within industrial settings and underscore the importance of proactive measures to safeguard the well-being of factory workers.

Major Findings: 1. High Prevalence of Respiratory Diseases: Factory workers face a significantly higher prevalence of respiratory diseases such as occupational asthma, chronic obstructive pulmonary disease (COPD), and interstitial lung diseases (ILDs) compared to the general population. Key Contributing Factors: 1. Airborne Particulate Matter: Fine particles (PM2.5) generated during manufacturing processes exacerbate respiratory issues. 2. Chemical Exposures: Volatile organic compounds (VOCs), hazardous gases, and prolonged chemical exposure are linked to respiratory irritation and sensitization. 3. Allergens: Dust, molds, and animal dander contribute to allergic respiratory conditions. 4. Poor Ventilation: Inefficient ventilation systems heighten indoor pollutant levels. 5. Workplace Practices: Inadequate use of personal protective equipment (PPE) and unsafe handling of materials increase vulnerability. 6. Smoking: Amplifies the risk of occupational respiratory diseases.

Keywords: Industrial Workers, Occupational Health, Respiratory Diseases, Workplace Exposure and Environmental Factors

1. Introduction

The industrial landscape, while vital for economic growth and development, often comes with a significant health burden for its workforce. Among the myriad of occupational hazards, respiratory diseases stand out as a prominent concern among industrial workers. This introduction sets the stage for understanding the prevalence and impact of respiratory diseases within industrial settings. Industrial workers are routinely exposed to a multitude of airborne pollutants, chemicals, and particulate matter inherent in manufacturing processes, leading to a heightened risk of respiratory ailments. From the inhalation of fine particulate matter generated during manufacturing and processing activities to the exposure to hazardous gases and fumes, the respiratory system of factory workers is constantly challenged. Respiratory diseases encompass a spectrum of conditions, ranging from acute afflictions like occupational asthma and pneumonitis to chronic disorders such as Chronic Obstructive Pulmonary

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Disease (COPD) and Interstitial Lung Diseases (ILDs). Epidemiological evidence consistently highlights an elevated prevalence of these respiratory conditions among industrial workers compared to the general population, emphasizing the occupational risk factors endemic to factory environments.

Understanding the contributing factors behind the prevalence of respiratory diseases among industrial workers is paramount for devising effective preventive strategies and interventions. Factors such as poor ventilation systems, inadequate respiratory protection, exposure to allergens, and the synergistic effects of smoking further compound the respiratory health challenges faced by factory workers.

1.1 Contributing Factors

1. Airborne Particulate Matter: Factories often generate airborne Particulate Matter (PM) through processes like manufacturing, grinding, and combustion. Inhalation of PM, especially fine particles (PM2.5), can penetrate deep into the respiratory system, causing inflammation, oxidative stress, and respiratory symptoms.

2. Chemical Exposures: Exposure to various chemicals, including Volatile Organic Compounds (VOCs), solvents, and hazardous gases like ammonia and sulfur dioxide, is common in industrial settings. Prolonged exposure to these substances can lead to airway irritation, sensitization, and the development of occupational asthma.

3. Allergens: Factory environments may harbor allergens such as dust mites, molds, and animal dander, exacerbating respiratory conditions like allergic rhinitis and asthma among susceptible individuals.

4. Poor Ventilation: Inadequate ventilation exacerbates indoor air pollution, trapping pollutants within the factory premises and increasing workers' exposure to harmful airborne contaminants.

5. Smoking: While not directly related to the workplace, smoking prevalence among factory workers tends to be higher compared to other occupations. Smoking synergistically amplifies the risk of respiratory diseases in conjunction with occupational exposures.

6. Work Practices: Certain work practices, such as improper handling of chemicals, lack of Personal Protective Equipment (PPE) compliance, and inadequate training on respiratory health and safety measures, contribute to increased susceptibility to respiratory ailments among factory workers.

1.2 Need of the Study

Respiratory diseases among industrial workers have broader public health implications. These workers often reside in communities surrounding industrial zones, raising concerns about the spread of respiratory illnesses beyond the workplace and these workers are exposed to a myriad of respiratory hazards in their workplace, ranging from airborne pollutants to chemical fumes and dust particles. These exposures can significantly impact their respiratory health, leading to a higher prevalence of respiratory diseases compared to the general population, there is a significant knowledge gap regarding the specific respiratory diseases prevalent among industrial workers. Conducting research in this area will fill this gap by providing empirical data on disease prevalence, types, and influencing factors. This will not only contribute to our understanding of occupational health hazards but also inform evidence-based policies and guidelines aimed at protecting industrial workers and promoting their well-being

1.3 Aim

This narrative review aims to delve into the prevalence of respiratory diseases among industrial workers, elucidating the underlying factors contributing to their occurrence

1.4 Objective

Provide an overview of the spectrum of respiratory diseases prevalent among factory workers, including acute conditions such as occupational asthma and pneumonitis, as well as chronic disorders like Chronic Obstructive Pulmonary Disease (COPD) and Interstitial Lung Diseases (ILDs).

2. Methodology

2.1 Search Strategy Method

A systematic search was conducted across electronic databases, including PubMed, Google Scholar, and Web of Science, using relevant keywords such as "respiratory diseases," "factory workers," and "occupational hazards." Studies published between 2019 and 2024 were included,

and data were extracted and synthesized following the PRISMA guidelines.

2.1.1 Search strategy

PubMed, Web of Science, Scopus, and Google Scholar

- "Respiratory diseases" OR "lung diseases" OR "respiratory disorders"
- "Factory workers" OR "industrial workers" OR "occupational workers"
- "Prevalence" OR "incidence" OR "frequency"
- "Contributing factors" OR "risk factors" OR "determinants"
- "Occupational hazards" OR "workplace exposures"
- "Industrial area" OR "factory settings" OR "manufacturing environment"

2.1.2 Types of study

- Cross-sectional Studies
- Cohort Studies**:** Case-Control Studies
- Longitudinal Surveillance Studies
- Intervention Studies
- Qualitative Studies
- Systematic Reviews and Meta-Analyses

2.1.3 Types of participants

The primary participants of the study were factory workers employed in industrial facilities within the target area. These workers involved in a variety of occupations within the factory, including production, assembly, maintenance, machine operation, and handling of materials or chemicals.

2.1.4 Setting

The study focus on specific types of factories or industries, such as textile mills, chemical plants, metalworking facilities, construction sites, or food processing plants.

2.1.5 Outcome

The outcome of the study would provide valuable insights into the prevalence, contributing factors, health impact, and interventions related to respiratory diseases among factory workers in the industrial area, with implications

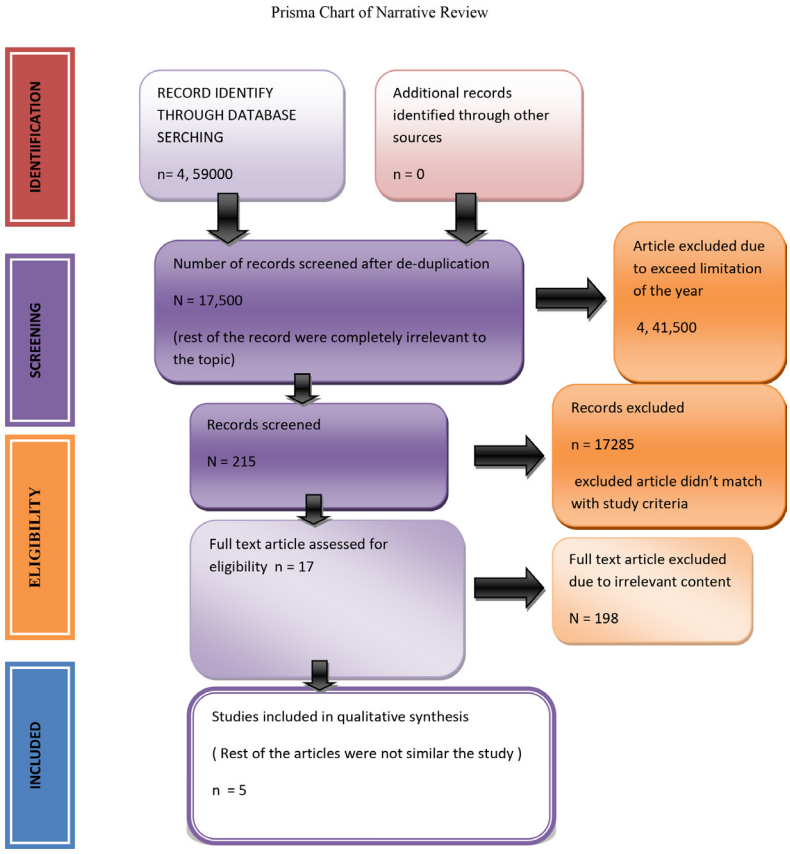


Figure 1. Prism chart.

Table 1. Depicted the data of all 5 research

S. No and Author	Sources and	Country	Variables	Instrument	Sample sampling technique	Design	Finding	Conclusion
[1]*Daryoush Pahlevan et al.*	Assessment of the changes of spirometric parameters and factors associated in tiles and ceramic factory workers	Iran	Demographic and occupational variables	The first questionnaire included demographic and occupational information, and the second questionnaire included spirometric parameters and chest radiographs	263 workers with	longitudinal study	there was a substantial decline (P<0.05) in the means of forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and FVC/FEV1 measures.	The current study shown that over the course of three years, workers in ceramic and tile factories had significant reductions in the majority of spirometric measures (FVC, FEV1, and FVC/FEV1)..
[2]*Farhad Malek et al.*	Effects of Chlorine Gas Exposure and Associated Factors on Spirometric Parameters in Detergent Industry Workers:	Iran	Demographic variable Age Sex Year of exposure Education Working area	The first questionnaire included demographic and occupational information, and the second questionnaire included spirometric parameters	100 Random sampling technique	Cross sectional study	significant association between chlorine gas exposure and all spirometric parameters; the beta-coefficients for the effect of exposure on FVC, FEV1, FEV1/FVC ratio, PEF, and PEF 25-75% were -4.51, -6.46, -4.27, -6.09, and -10.29, respective	The obtained results highlight the importance of implementing engineering control measures to reduce the concentrations of chlorine gas in different industries. Besides, by performing screening and active periodic examinations before confirming the effects of chlorine gas

[3]*Sajjad Mojaffari et al.*	Effect of occupational exposures on respiratory health in steel factory workers	Iran	Demographic variable age, height, weight, BMI, work history. Smoking	The data collection comprised of three parts: air sampling, an interviewer-administered questionnaire and spirometry measurements	133 workers	Cross sectional study	Lung function parameters were significantly reduced in the exposed group ($p < 0.001$). There was a dose–response relation between duration of occupational exposures and reduction in the predicted value of FEVî/FVC level (0.177,95% CI -0.198 to -0.156) in all models.	This study investigated the relations between occupational exposures in a steel factory and occurrence of respiratory symptoms and lung function deficits in workers of this industry.
[4]*Hina Dangar, Jayesh Parmar*	Analysis of the Pulmonary Function Status Among Brass Utensils Factory Workers	Saurashtra University Jamnagar, India	Sociodemographic variable	Pulmonary function test was performed	150 workers simple convenient sampling	Cross sectional study	The result shows significant difference in FVC%, FEV 1 %, FEV 1 /FVC, FEF25-75% and PEFR as the p value is <0.05 between Group A and Group B	The study concluded that there is significant reduction in pulmonary Functions
[5]*R. Rahamathnisha, V. Sarvanabavan*	Special reference to lug disease in petrochemical, metal & building material industrial worker	India	Demographic variable and clinical variable	Prepared questionnaire	100 participants Stratified random sampling	Survey method	Lack of use of PPE can cause the respiratory disease	This study concluded that Workers in metal and building material industries highly affected by respiratory infection than petrochemical industry.

for public health, occupational safety, and policy development.

3. Results

3.1 Delivery of Interventions

In order to conduct the systematic review, a PubMed search was conducted utilizing the keywords and search synonyms from all previously published articles. Five articles were discovered. After removing duplicates and manually selecting 17500 items from the initial search's 459000 results, 215 articles were evaluated for eligibility. Because 17285 articles were duplicated in two databases, they were excluded. A total of 198 studies were omitted because the complete text was not available. As a result, five articles, including quantitative research, were screened.

3.2 Summary of Finding

Addressing the complex interplay of occupational hazards, individual risk factors, and workplace practices is essential for effectively managing and preventing respiratory diseases among industrial workers.

4. Importance in Education

Education on respiratory diseases and influencing factors among industrial workers is essential for preventing illness, promoting occupational health and safety, reducing healthcare costs, ensuring regulatory compliance, enhancing quality of life, and fostering long-term well-being in the workplace.

4.1 In Nursing Education

Nursing research contributes to the development of evidence-based policies and practices aimed at protecting the respiratory health of industrial workers. Findings from research studies can inform the implementation of workplace regulations, guidelines, and interventions designed to minimize respiratory hazards and promote a safer work environment.

4.2 Nursing Administration

Nursing administrators oversee quality improvement initiatives aimed at enhancing patient care and employee well-being. Research on respiratory diseases among industrial workers can inform quality improvement efforts by identifying areas for enhancement in occupational health practices, employee support services, and preventive measures.

4.3 Nursing practice

Nursing practice requires ongoing learning and professional development to stay updated on best practices and emerging trends in respiratory care. Research serves as a valuable source of knowledge for nurses to enhance their clinical skills, critical thinking abilities, and evidence-based decision-making processes related to respiratory diseases among industrial workers.

4.4 Future Significance

In light of global health challenges, such as the COVID-19 pandemic, respiratory health has gained even more prominence. Factories need to implement measures to prevent the spread of infectious respiratory diseases among workers, including proper ventilation, personal protective equipment (PPE), and vaccination programs. Assessing respiratory health among factory workers can help identify vulnerabilities and implement strategies to mitigate the spread of contagious diseases in industrial settings.

4.5 Limitation

- Computerized data bases were limited to English language
- Was limited to only in factory workers
- Was limited to last 4 years.

4.6 Strength

- Articles werefinalized by Selecting specific parameters.
- Review reviled the high incidence rate of respiratory disease among factory workers

4.7 Weakness

- Due to limitation, only five quantitative publications were included in the data synthesis.

5. Conclusion

The systematic review provides compelling evidence of the adverse impact of occupational exposures on respiratory health among factory workers. Implementation of preventive measures and PPE usage, Future research should focus on longitudinal studies and intervention trials to further evaluate the effectiveness of preventive strategies in reducing respiratory disease burden among industrial workers because the prevalence of respiratory diseases among factory workers in industrial areas underscores the urgent need for proactive measures to safeguard their respiratory health. By addressing the underlying occupational risk factors and implementing comprehensive preventive strategies, stakeholders can mitigate the burden of respiratory ailments and cultivate safer and healthier work environments for industrial workers.

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