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Prevalence Of Chronic Respiratory Diseases In Industrial & Non-Industrial Areas Of Guwahati, Assam

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ABSTRACT

Air pollution which is a mixture of various gaseous and suspended particulate matter (SPM) affects health of the people severely. Different diseases such as cardiovascular diseases, respiratory diseases, occupational lung diseases are caused due to exposure of air pollution. In India, large percentage of population resides and works in the industrial areas, thus exposing themselves to the harmful emissions of the industries daily. The present cross-sectional study has been designed to determine the health status & prevalence of chronic respiratory diseases in both the areas. It was a questionnaire-based study where the survey was conducted among 70 (Industrial area) & 70 (Non-Industrial area) residents and workers of Guwahati, Assam. It has been seen that out of total 140 participants, 25% had Running Nose, 22% had Eye Irritation, 16% had cough for 3 consecutive months or more during the year, 15% had Phlegm, 17% had Wheezing & 11% had Hay Fever. The prevalence rate of chronic respiratory disease symptoms was higher in participants from Industrial areas than Non-Industrial areas. Participants who had symptoms of Asthma, COPD, Bronchitis, Occupational Lung Diseases such as Asbestosis, Silicosis etc were referred to visit Pulmonologist so that they get themselves treated before their symptoms get worse.

Keywords *– Suspended particulate matter (SPM), Wheezing, Phlegm, Hay fever, Chronic Obstructive Pulmonary Disease (COPD), Bronchitis, Asbestosis, Silicosis.*

INTRODUCTION

Air pollution which is a mixture of various gaseous and suspended particulate matter (SPM) affects health of the people severely. Different diseases such as cardiovascular diseases, respiratory diseases, occupational lung diseases are caused due to long and short exposure of air pollution (Bergstra D Arnold, 2018). United States Environment Protection Agency (EPA) has identified "six criteria" for air pollutants. The six criterias are – PM_{10} (particulate matter with ≤ 10µm), $PM_{2.5}$ (particulate matter with ≤ 2.5µm), carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), Ozone (O_3), lead (Pb) (Nautiyal Jyoti, 2007).

Different studies have been done on air pollution but focus has been put mostly in air pollutions due to road traffic, urban / regional differences in air pollution, smog etc. The effect of respiratory health or lung function due to air pollution from heavy industries has often been explored less. (Pascal Laurence, 2013) (Smargiassi Audrey, 2014) (Nirel Ronit, 2015) (Gotschi Thomas, 2008). Air pollution by industries and its effect on health has become a major concern in most of the areas of the country (Bergstra D Arnold, 2018).

Air pollution has an adverse effect on the respiratory health of the people. Respiratory diseases range from mild to severe. The diseases of the airways and other structures of the lung are known as chronic respiratory diseases. Different types of common chronic respiratory diseases are – Chronic Obstructive Pulmonary Diseases (COPD), Asthma, Occupational Lung Diseases etc (Chronic Respiratory Diseases - WHO).

Asthma is one of the common lung diseases which often starts in early childhood and often causes difficulty in breathing. (Asthma) Chest tightness, coughing, breathlessness, wheezing are some of the common symptoms of Asthma. (Globe Gary, 2015) Chronic Obstructive Pulmonary Diseases (COPD) is an umbrella term which is used in describing the different chronic lung diseases that causes lung airflow limitations. (Devereux, 2006) The different symptoms of chronic respiratory diseases are breathlessness, coughing, wheezing, whistling, excessive sputum production, hay fever etc. (Shukla D Shakti, 2020) Occupational lung diseases are another type of chronic respiratory diseases which occurs due to the exposure of harmful chemicals and substances in the workplace. Silicosis, Asbestosis, hypersensitivity pneumonitis are some of the common occupational lung diseases (Arlene, 2009).

Global estimate on external environmental pollution (outdoor pollution) has been suggested to cause a total of 1.15 million deaths worldwide and has been responsible for a total of 8.75 million Disability Adjusted Life Years (DALY). On the other hand, a total of 2 million premature deaths has been due to air pollution inside homes and has been responsible for a total of 41 million Disability Adjusted Life Years (DALY). (Goryakin Yevgeniy, 2017) (About Chronic Respiratory Diseases - WHO) (Chronic Respiratory Diseases - WHO)

In India, large percentage of population resides and works in the industrial areas and industries of the Industrial towns, thus exposing themselves to the harmful emissions of the industries daily, which in turn has affected the health of the population adversely. (Nautiyal Jyoti, 2007)

Keeping this in view, the present cross-sectional study "To determine the prevalence of chronic respiratory diseases in industrial & non-industrial areas of Guwahati, Assam" has been designed to monitor the levels of PM2.5 and PM10 in the industrial and non-industrial areas of Guwahati, Assam and determine the health status & prevalence of chronic respiratory diseases in both the areas.

METHODOLOGY

The study was a cross-sectional mix-method study conducted among a total of 140 adult participants which comprised 70 residents and workers of Industrial areas and 70 residents and workers of Non-Industrial areas of Guwahati, Assam. Residents and workers who have been residing and working in Industrial areas for more than 5years were considered for the study. Different locations of Guwahati, Assam were chosen according to the Particulate Matter PM2.5 and PM10 in the locations. These data sets were taken beforehand from the website of Central Board of Pollution Control (CBPC). Tuberculosis patients were excluded from the study. For the estimation of prevalence of different Chronic Respiratory Diseases in Industrial and Non-Industrial areas of Guwahati, Assam, the questionnaire, framed both in English language and Assamese language, was filled out by the residents and workers of the respective areas. The questionnaire comprised of two sections, section 1 contained questions on socio-demographic and background characteristics of the participants, whereas, section 2 contained questions on the surrounding environment and respiratory health of the participants. The study was conducted according to the current version of the Declaration of Helsinki and incompliance to the current ICMR Guidelines for Biomedical Research on Human Subjects, Schedule Y, ICH-GCP Guidelines and other applicable regulatory guidelines. This Protocol along with corresponding Informed Consent Form (ICF) used to obtain informed consent of study subjects and study specific documents was reviewed by the EC. The study was commenced only after a written approval is obtained from the EC. All modifications or subsequent amendments to the protocol, which might interfere with the patient's interest or study objectives, prior to commencement of the study, was implemented after written approval of the EC.

RESULT

This study assessed the prevalence and distribution of chronic respiratory diseases (CRDs) among the residents and workers of industrial and non-industrial areas of Guwahati, Assam. A total of 140 participants were enrolled, with equal representation from both areas. The results reveal a higher burden of respiratory symptoms among individuals residing or working in industrial regions compared to those in non-industrial areas.

Prevalence of Key Respiratory Symptoms

Among the respiratory symptoms evaluated, the most common were recurring nasal block or running nose, frequent eye irritation, and wheezing or whistling in the chest. Additional symptoms included chronic cough, persistent phlegm, and hay fever.

Recurring Block / Running Nose

Out of 140 participants, 35 (25%) reported experiencing frequent nasal block or running nose. Of these, 94% (n = 33) were from industrial areas, while only 6% (n = 2) were from non-industrial areas. A Chi-square test demonstrated a statistically significant difference between the two groups ($\chi^2 = 35.000$, $p < 0.001$), indicating a strong association between industrial exposure and the symptom.

Eye Irritation

A total of 31 participants (22%) reported frequent eye irritation, with 97% (n = 30) from industrial areas and only 3% (n = 1) from non-industrial areas. The association was found to be statistically significant ($\chi^2 = 43.457$, $p = 0.001$), suggesting environmental irritants as a likely contributing factor.

Persistent Cough

Cough persisting for three or more consecutive months was reported by 23 participants (16%), of whom 91% (n = 21) belonged to industrial areas and 9% (n = 2) to non-industrial areas. Statistical analysis confirmed a significant difference between groups ($\chi^2 = 63.114$, $p = 0.001$).

Among those reporting chronic cough (n = 23), the duration varied:

Duration of Cough	Percentage (%)	Industrial Area	Non-Industrial Area
<1 year	22%	5	0
1–2 years	26%	5	1
2–3 years	30%	6	1
3 years	22%	5	0

- **<1 year:** 22% (n = 5), all from industrial areas;
- **1–2 years:** 26% (n = 6), including 5 from industrial and 1 from a non-industrial area;
- **2–3 years:** 30% (n = 7), with 6 from industrial and 1 from a non-industrial area;
- **3 years:** 22% (n = 5), all from industrial areas.

Presence and Duration of Phlegm

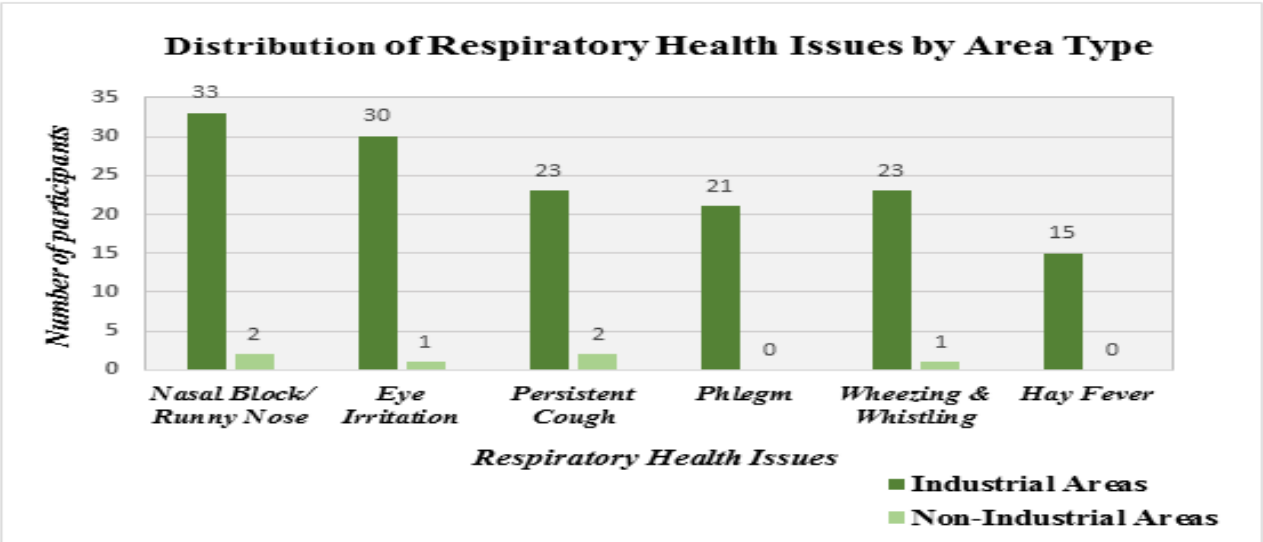
Phlegm present on most days for ≥3 consecutive months was reported by 21 participants (15%), all from industrial areas. Among them, 29% (n = 6) had symptoms for <1 year (3 each from industrial and non-industrial areas), and 71% (n = 15) had symptoms for >1 year (9 from industrial and 6 from non-industrial areas). The difference was statistically significant ($\chi^2 = 68.600$, $p < 0.001$).

Wheezing and Whistling in the Chest

Wheezing or whistling in the chest was reported by 24 participants (17%), 96% (n = 23) of whom were from industrial areas. The association was significant ($\chi^2 = 60.457$, $p < 0.001$), reinforcing the respiratory burden in industrial zones. Among those affected (n = 24), 71% (n = 17) reported <12 episodes annually, while 29% (n = 7) experienced >12 episodes. All participants reporting frequent episodes were from industrial areas.

Hay Fever

Symptoms of hay fever were reported by 15 participants (11%), all of whom were from industrial areas. None from the non-industrial group reported such symptoms. The result was highly significant ($\chi^2 = 86.429$, $p < 0.001$).



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PREVENTIVE AND PROTECTIVE BEHAVIOURS

Use of Face Masks

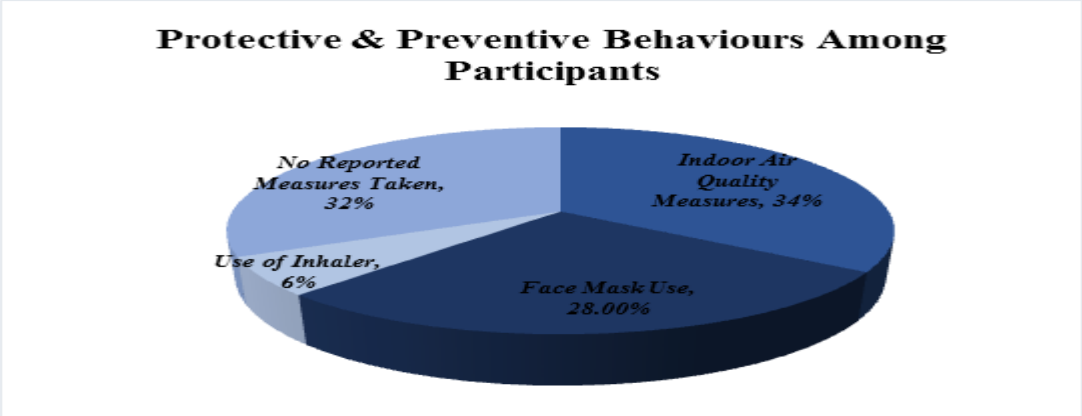
Only 39 participants (28%) reported using face masks as a protective measure against pollution. Among them, 12 (31%) were from industrial areas, while 27 (69%) were from non-industrial areas. The remaining 101 participants (72%) did not use any protective face coverings.

Efforts to Improve Indoor Air Quality

Only 48 participants (34%) reported actively taking measures to enhance the air quality of their homes or workplaces. Common strategies included keeping windows and doors open (73%), maintaining cleanliness (15%), and changing AC filters (4%).

Use of Inhalers

Nine participants (6%) reported using inhalation devices prescribed by a physician for respiratory problems. All were from industrial areas, and six of them were employed in factories or industries. The remaining 131 participants (94%) had never used inhalers.



DISCUSSION

This study was conducted among 140 participants (70 each from industrial and non-industrial areas of Guwahati, Assam) to evaluate the prevalence of chronic respiratory diseases (CRDs). The analysis revealed that recurring block or running nose, eye irritation, and wheezing/whistling in the chest were the most common symptoms, and these were significantly more prevalent among individuals from industrial areas.

The findings also indicated that 17 industrial workers who participated in the study were regularly exposed to harmful chemicals, and most of them reported worsened health conditions. Some were using doctor-prescribed inhalers to manage breathing difficulties. These results are consistent with previous studies conducted in other regions, which also demonstrated a higher incidence of respiratory symptoms (e.g., wheezing, chest tightness, breathlessness) among populations residing near industrial zones.

Furthermore, existing literature has established a strong association between air quality and respiratory health, particularly the impact of suspended particulate matter, such as PM10 and PM2.5. The current study aligns with those findings, further supporting the hypothesis that industrial emissions significantly contribute to poor respiratory outcomes.

Strengths of the Study: This is one of the first cross-sectional studies conducted in Guwahati that includes participants from all industrial and non-industrial areas, rather than selected localities. Moreover, it includes both residents and workers, unlike many prior studies which limited their scope to either residents or workers.

Limitations of the Study: Despite its strengths, the present study has certain limitations. The cross-sectional design of the study restricts the ability to establish causal relationships between exposure to industrial pollutants and chronic respiratory conditions. The findings represent a snapshot in time and do not account for temporal variations or long-term effects. Lastly, confounding factors such as smoking habits, occupational duration, socio-economic

status, and pre-existing health conditions were not comprehensively controlled, which could influence the observed associations.

Additionally, it was observed that most participants, especially those from industrial areas, did not use face masks or adopt preventive measures to improve indoor air quality. This suggests a lack of awareness regarding air pollution and its impact on respiratory health.

Recommendations: Government and public health authorities should initiate awareness campaigns at the community level to educate people about the health effects of air pollution. Individuals exhibiting symptoms of CRDs such as asthma, COPD, bronchitis, or occupational lung diseases should consult pulmonologists or respiratory physicians for timely diagnosis and treatment. Those already using inhalers or other medications should continue their treatment under medical supervision.

The findings underscore the urgent need for targeted interventions to reduce exposure risks and promote respiratory health, particularly in industrial zones.

CONCLUSION

The research on "To determine Chronic Respiratory Diseases in Industrial & Non-Industrial areas of Guwahati, Assam" focuses on estimating the quality and type of chronic respiratory diseases and its prevalence in Industrial & Non-Industrial areas. The levels of pollution of PM2.5 & PM10 were found to be more in Industrial areas than in Non-Industrial areas. Although the residents & workers from both the areas (Industrial & Non-Industrial areas) participated in the study, the prevalence rate of chronic respiratory disease symptoms were found to be higher in participants from Industrial areas than those in Non-Industrial areas.

In case of the preventive measures, it was seen that very few people wears mask for air pollution and majority of the people do not take any steps to control air pollution in their home/ office. This could be due to lack of knowledge regarding air pollution and this has resulted in a consequence effect in the respiratory health. Awareness campaigns should be initiated at each locality so that people from different areas could be a part of the campaigns and that they get a brief idea regarding air pollution and respiratory health.

In case of those participants who have signs and symptoms of different chronic respiratory diseases such as Asthma, Chronic Obstructive Pulmonary Diseases (COPD), Bronchitis, Occupational Lung Diseases such as Asbestosis, Silicosis etc were referred to visit Pulmonologist/ Respiratory Physician and should get themselves treated before their symptoms get worse.

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