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## **Role of air quality and pollution in the exacerbation of pulmonary diseases in type 2 diabetes**

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**Abstract**--Background: This study aimed to investigate the role of air quality and pollution in pulmonary diseases exacerbation among 100 patients with type 2 diabetes. The study included data on air quality parameters such as PM10 and SO2 concentrations, disease comorbidities such as COPD, respiratory tract infection, and asthma collected over a period of 12 months from January 2020 to January 2021. The results of the study indicated that the prevalence of exacerbations of pulmonary diseases was significantly higher in patients with poor air quality ( $P < 0.001$ ). Moreover, patients with comorbid respiratory tract infection and COPD had higher rates of exacerbations in comparison with those without such diseases ( $P < 0.001$ ). In conclusion, this study demonstrated that air pollution is associated with increased exacerbations of pulmonary disease in type 2 diabetes. Thus, air quality should be taken into consideration when treating type 2 diabetes patients, especially those with comorbid respiratory disease. Objectives: To study the role of air quality and pollution in pulmonary diseases exacerbation in type 2 diabetes. And

identify the air quality parameters associated with pulmonary diseases exacerbation in type 2 diabetes. And explain the relationship between comorbid respiratory diseases and air quality in patients with type 2 diabetes. And determine effective prevention and management strategies to reduce pulmonary diseases exacerbation in type 2 diabetes. Methodology: This was a retrospective cohort study conducted among 100 patients who were diagnosed with type 2 diabetes and were under regular follow-up at Hayatabad Medical Complex Peshawar from January 2020 to January 2021. Air quality data, obtained from the relevant authorities, was included as an objective measure of pollution, while patient data such as age, sex, comorbid respiratory diseases, and adherence to prescribed treatment was collected through direct interviews and medical records. Data analysis was conducted using STATA software version 12.1. Results: the prevalence of exacerbation of pulmonary diseases was significantly higher in patients with poor air quality ( $P < 0.001$ ). Further, patients with COPD and respiratory tract infections had higher rates of exacerbations in comparison with those with no such diseases ( $P < 0.001$ ). Conclusion: The study revealed that a correlation exists between air quality and exacerbation of pulmonary diseases in type 2 diabetes. Air pollution was significantly associated with increased exacerbation of pulmonary diseases. Moreover, patients with COPD and respiratory tract infections had higher rates of exacerbations. Therefore, when treating type 2 diabetes, special attention should be given to air quality and comorbid respiratory diseases.

**Keywords**—type 2 diabetes, pulmonary diseases, air quality pollution, COPD, asthma.

## Introduction

Type 2 diabetes is a chronic and progressive condition characterized by elevated levels of blood sugar and insulin resistance in the body. It is often compounded by comorbidities such as obesity, metabolic syndrome, and cardiovascular disease. Recent research has suggested that there may be associations between type 2 diabetes and exposure to air pollution<sup>1</sup>. Air pollution, consisting of dust, gases, and chemical particles, is a major public health concern around the world<sup>2,3</sup>. In addition to affecting lung function, air pollution has been linked to the development and exacerbation of pulmonary diseases, such as COPD, bronchitis, and asthma. The current study aimed to examine the role of air quality and pollution in the exacerbation of pulmonary diseases among patients with type 2 diabetes<sup>4</sup>. It was hypothesized that poor air quality would be associated with an increased rate of pulmonary disease exacerbation in diabetic patients.

Data on air quality parameters such as PM<sub>10</sub> and SO<sub>2</sub> concentrations, patient data such as age, sex, comorbid respiratory diseases, and adherence to prescribed treatment was collected over a period of 12 months from January 2020 to January 2021<sup>5,6</sup>. Data analysis was conducted using STATA software version 12.1. The findings of the study indicated that air pollution was significantly

associated with increased exacerbation of pulmonary diseases among type 2 diabetes patients. Moreover, patients with COPD and respiratory tract infections had higher rates of exacerbations in comparison with those without such diseases. It is clear that air pollution has an adverse effect on type 2 diabetes patients with comorbid respiratory diseases, increasing their risk of exacerbations<sup>7</sup>. Therefore, when treating type 2 diabetes, special attention should be given to air quality and comorbid respiratory diseases. Preventative measures such as using air filters and limiting exposure to polluted environments can help to reduce the risk of pulmonary exacerbations in these patients<sup>8</sup>.

## Methods

This was a retrospective cohort study conducted at Hayatabad Medical Complex Peshawar, Pakistan from January 2020 to January 2021. The study population consisted of 100 patients who were diagnosed with type 2 diabetes and were under regular follow-up. Data collection included air quality parameters such as PM10 and SO<sub>2</sub> concentrations, patient data such as age, sex, comorbid respiratory diseases, and adherence to prescribed treatment. Data was collected through direct interviews, medical records, and from the relevant authorities. Data analysis was conducted using STATA software version 12.1. Descriptive and inferential statistics were used to analyze the data.

## Results

The results of the study indicated that the prevalence of exacerbations of pulmonary diseases was significantly higher in patients with poor air quality ( $P < 0.001$ ). Patients with COPD and respiratory tract infections were more likely to experience exacerbations of pulmonary diseases ( $P < 0.001$ ). Furthermore, the data revealed that the rate of compliance with the prescribed treatment for type 2 diabetes was significantly lower in patients with COPD and respiratory tract infections ( $P < 0.05$ ).

Table 1  
Descriptive analysis of air quality parameters

Parameter	Mean	Standard deviation
PM10	35.4	22.7
SO <sub>2</sub>	28.6	17.2

Table 2  
Descriptive analysis of pulmonary diseases exacerbations

Parameter	Yes	No
Respiratory tract infection	54	46
COPD	49	51

Table 3  
Descriptive analysis of adherence to prescribed treatment

Parameter	Yes	No
Respiratory tract infection	35	65
COPD	32	68

### Discussion

The current study determined that air pollution was significantly associated with the exacerbation of pulmonary diseases in type 2 diabetes patients<sup>9</sup>. Patients with COPD and respiratory tract infection had higher rates of exacerbations in comparison to those without such comorbid diseases. Moreover, compliance with the prescribed treatment for type 2 diabetes was significantly lower in patients with COPD and respiratory tract infection<sup>10,11,12</sup>. These findings are in line with previous studies, which have suggested that air pollution can exacerbate pulmonary diseases<sup>13</sup>. The link between air pollution and exacerbation of pulmonary diseases in type 2 diabetes can lead to difficulties in controlling their diabetes and the need for more frequent hospitalization and medical care<sup>14</sup>. Thus, air quality should be taken into consideration when treating type 2 diabetes patients, especially those with comorbid respiratory disease<sup>15</sup>.

### Conclusion

The study demonstrated that air pollution is associated with increased exacerbations of pulmonary diseases in type 2 diabetes patients. Moreover, patients with comorbid COPD and respiratory tract infections had higher rates of exacerbations compared to those without such comorbidities. It is therefore recommended that when treating type 2 diabetes, special attention should be given to air quality and comorbid respiratory diseases. Prevention measures such as the use of air filters and limiting exposure to polluted environments should be taken into consideration to reduce the risk of exacerbations in these patients.

### Limitations

A major limitation of this study was its reliance on self-reported data, which could introduce bias in the results and limit the accuracy of the findings. Additionally, the study was conducted in a single location and may not be representative of the general population. Future studies should therefore focus on a larger and more diverse population in order to generalize the results.

### Future Finding

Due to the adverse effect of air pollution on the exacerbation of pulmonary disease in type 2 diabetes patients, future studies should aim to identify effective prevention and management strategies to reduce the risk. This can include strategies such as using air filters, limiting exposure to polluted environments, making lifestyle changes, and adhering to the prescribed treatment. Further research should also focus on the economic and psychological impact of air pollution and pulmonary disease exacerbation. Furthermore, it is important to

investigate the long-term health effects of such exposure for a better understanding of the disease and its management.

Muhammad hussain afridi: Literature Review,

Atta Muhammad khan: Data collection statistical analysis.

Nowsherwan: Data Interpretation, Proof reading

Shah zeb: Manuscript drafting,

Muhammad abbas khan: Expert opinion and manuscript revision

Shahid wasim: manuscript drafting.

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