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The Inhaling Danger: How Air Pollution Affects Asthma Patients - A Phenomenological Study

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ABSTRACT

Asthma is a chronic respiratory condition characterized by episodes of airway construction, inflammation and mucus production. It affects millions of people worldwide and is influenced by various environmental factors such as air pollution. The objective of the article is to determine how asthmatic student health is impacted by air pollution, how asthma affects students' daily tasks and the awareness among asthma students about the risks caused by air pollution. The results presented were obtained through a qualitative phenomenological study. The study was conducted on university students who are asthma patients. The sample consisted of 30 students patients with asthma experiences. The findings revealed that effects of air pollution is one of the leading cause of asthma; triggering asthma and other respiratory health conditions. People with asthma especially students and young patients, will be further exposed to the threat of air pollution, and suffer from more serious health consequences. There have to be detailed assessments connected to the main air pollutants particulate matter (PM) and their causal relationship with respiratory disease, more in each country.

INTRODUCTION

In the current world air pollution is a crucial issue, which is most likely to impact people with asthma heavily. In this composition, we will bandy the principal pollution-related causes of asthma the adulterants that are involved and their mechanisms. In addition, we will also bandy the long-term goods on asthma victims as well as the operation. Asthmatics, especially scholars are more exposed to air pollution. Particulate matter (PM) is one of the major pollutants in the air, having heavy metals and elemental carbon as its constituents [1]. Exposure to state adulterants like nitrogen oxide (NO2), carbon dioxide (CO2) and the ozone(O3) subcaste can lead to serious asthmatic problems. In addition, long-term air pollution has been associated with the adding and worsening of the condition of asthma in scholars making it delicate to identify the issue to cover their respiratory health. In the following composition, we will examine how air pollution affects the scholars, its long-term goods and its operation and forestallment. People of all ages suffer from asthma, a long-term lung disorder. It's caused by inflammation and muscle tensing around the airways, which makes it harder to breathe. Symptoms can include coughing, gasping, briefness of breath and casket miserliness. These side effects can be mellow or serious and can come and go over time.

Although asthma can be a serious condition, it can be overseen with the right treatment. Another study mentions that asthma symptoms can be induced by contact with outdoor pollutants [2]. It can cause shortness of breath, suffocation, coughing and many other symptoms. Indeed, though the exact cause of asthma isn't completely understood, environmental factors including air pollution can be linked as serious triggers for asthma symptoms.

Asthmatic students are particularly sensitive to air pollution's dangerous influence on their health, education and their diurnal life. Being daily exposed to air pollution can worsen their asthma symptoms, affecting their diurnal conditioning, and the focus on their academic performance. Worsening of asthma can lead to their missed university days, which can poorly affect their overall educational attainment. Asthma can be touched off by colorful factors, both outside and outdoors combined with respiratory posture according to the task of the voice and the phonation, causing hyperventilation of the case, and the condition of the nose, among other frequent systemic pathologies. The terrain in which they perform all academy conditioning generally has high attention to atmospherically suspended patches of PM, allergens, and adulterants similar to pollen, spores, diminutives, contagions, and bacteria, among others acting contaminations. Multitudinous factors are manipulated by the operation of physical education, music, and art, and environmental variables similar to climatic conditions have the strength or absence of these variables and their impact of similar annoyances on the quality of air that reflects the educational centers in the country. This plays a crucial part in the impact on pedagogical work because its unrecoverable consequences include the decline in the mood of students, itching of the throat, and respiratory pattern, frazzling, and low academic performance, therefore hindering literacy.

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Long-term exposure to air has a great impact on both student's health and studies. Studies have shown that students who are more exposed to air pollution are at high risk and are most likely to get their asthma symptoms to increase and get even worse [3]. Prolonged exposure to air pollution can lead to more respiratory issues. Air pollutants like CO2, NO2, SO2, and O3 etc. have a great impact on students' health and day-to-day tasks.

We all know about the serious environmental problem in the Metropolitan Area air pollution! But this has an indeed lesser impact on students diagnosed with asthma, who are constantly exposed to this problem, especially if within this group are students and teenagers who daily carry out their class planning in the academy. Hence, the significance of exploration in chancing effective answers to the problem and determining the profile of students with asthma in the educational centres of the metropolitan area. The study allowed determining the age, gender, and academic position of students suffering from asthma. A high frequency of students was observed, with a more significant number of aged cases having been diagnosed with the condition of asthma. Recent studies from 2023 suggest a need for systems to monitor air pollution, awareness among public and execution of sustainable policy actions to coupe the environmental health problems [4].

LITERATURE REVIEW

The literature reviewed in the provided summaries focuses on the impact of air pollution. A study from 2022 explains that asthma is likely to be worsened by heavy metals and particulate matter (PM) which induce inflammation, airway sensitivity to stimulation, and impairment of immune capabilities in macrophages [1]. PM exposure leads to the changing of macrophage polarization, phagocytosis, and cytokine synthesis which results in the promoting of pro-inflammatory and allergic responses in respiratory tracts. Lead, vanadium and cadmium in particular, influence the state of patients' respiratory health and macrophages. However, extended accumulation of macrophages results in dysfunction and susceptibility in the respiratory system; however, they are critical in the immune system and in combating environmental irritants. Another article concluded that Researchers from Taiwan collected data and focused on CO2 levels, weather changing factors, and their connections with asthma ER visits [5]. Speciality, the daily ER visits due to asthma had a direct relationship with the 48 h moving averages of air pollution concentrations and also between pollutants and weather parameters. Indeed, there is a relationship when it comes to the link between accidents and PM 2. 5 levels refer to the ER visits for asthma attacks and it is found that the asthma attacks frequent in spring and winter. Outdoor air pollution increases the risk of asthma flare in children, especially the younger female. In the context of improving population health and reducing concerns, particular emphasis is placed on the need to investigate climate and air quality variables in the aggravation of conditions in asthma patients. A study shows that Indoor and outdoor air pollution is analyzed as it relates to the effects on asthma severity and ways to decrease pollutant exposure [2].

Especially sulfur dioxide, and particulate matter as they are proven to cause worsening asthma in kids who are playing outside. A relationship is looked for between air quality and childhood eczema, allergic rhinitis and asthma. It is caused by smoking, wood, and smoke, which aggravates the symptoms of asthma. Worsening of the state of asthma is expected where there is oxidation and inflammation due to pollution. International interventions to reduce air pollution remain crucial because of improving general asthmatic results. Recent studies showed that the serious impacts of PM 2. 5 including respiratory and cardiovascular diseases, diabetes, COPD, infections and complications for newborns are given by the studies on air pollution in Pakistan [4]. Because of the growth of population, motorization, and energy intensity, more than half of the country's population is exposed to high levels of pollution and Lahore tops with this problem. Concerning the mentioned issues about environmental health, the studies suggest the adoption of clean and sustainable policies, enhancing the monitoring systems, and increasing public awareness. An article reviewed literature cons concerning the effort to monitor the effects of emissions from brick kilns on the health of the people of Pakistan, especially in Northern regions [6].

The studies estimated high concentrations of particulate matter (PM) and other pollutants originating from the brick kilns that were above the set legal limits that can have adverse health effects on the local people. Hence, the study underscores the importance of policy actions and air pollution control to ensure the standards of health and the environment for people residing in close vicinity of brick kilns. Other studies showed that outdoor air pollution was widely found to increase asthma in children whereby traffic exhaust and wood-smoke particulate air pollution produced symptoms in the respiratory tracts and poor lung capacities [7]. The literature has highlighted the lack of clear criteria and the issues with assessing the sure to air pollution in order to investigate the effects of air pollution on children's asthma. A study conducted in Delhi, India described those higher levels of SPM in residential and village areas of asthmatic children as compared to industrial areas [8]. Some of the elements that were correlated with childhood asthma include duration of breastfeeding, quality of air, family history and kind of cooking fuel. The study suggested that industry is responsible for rise in indoor air pollution and asthma in developing nations of the world such as India. An article focuses on genetic susceptibility with reference to pediatric asthma patients and their increased sensitivity to air pollution; oxidative stress pathways. Subtypes that diminish the capacity to counteract oxidative stress make asthma more sensitive to pollution; the genes such as GST, CAT, MPO, and HMOX-1 have been associated with children's increased risk of asthma due to pollution [9].

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Studies carried out on patients have shown that genetic factor have contributions to make in development of asthma. The researches also describe the effects of air pollution in asthma, genetics of risks, and the evidences of oxidative stress genes including GSTM1 and GSTP1. A 2019 study in Taiwan showed that exposure of air pollution such as PM2. PM10, 5, O3, SO2, and NO2: these five air pollutants are explained to have a relationship with childhood asthma hospitalization; SO2 is the riskiest factor [10]. High pollution increased the risk for children and males compared to other classes of people. The study states that more research is required on modifying factors of asthma management and identification of pollutant thresholds according to the region. A study in Xi'an discovered positive correlation where air pollutants (PM 2.5, PM10, SO2) affect elevation of children's outpatient visits due to asthma [11]. Thus, the management of particulate matter is recommended as a way of decreasing the asthma impact. PM Higher density was significantly related to visitation rates for asthma and called for intervention for air pollutant sources for pediatric asthma. Literature pertains to several points concerning asthma incidence in the region, which include but are not limited to tree cover, air quality, and greenery [12].

Investigations have been conducted in relation to the link between the availability of greenspaces and the occurrence of asthma among children and adolescents to explain environmental factors influencing asthma rates. The result of research indicated that prevalence of asthma was low in areas that had large greenspaces; high levels of air pollutants such as PM 2.5, SO2, and NO2 had positivity to have an association with prevalence of asthma. Further, the study highlighted the aspects of timing of exposure, nature of greenspace, air quality, diversity, physical activity, stress levels in case of greenspaces and asthma. More study needs to be done so as to get into more details of this relationship. Some studies showed that the various works carried out show that a multifaceted approach is used in childhood asthma control through the use of drugs, environmental changes, and the use of education [13]. The outlined multifaceted approach fits well the task of dealing with the issues related to asthma and main tenancy of healthier lifestyles for children and their caretakers. Asthma if left unmanaged can have these or other long-term effects, thus it is crucial for health care professionals observing that patients experience them. The pillars of childhood asthma management include education, formal interventions, alterations in the environment, and routine follow-up appointments in order to address the impact of asthma on the life of a child with asthma. A literature review focuses on children and adolescents' knowledge and attitude towards air pollution, physical activity, and asthma [14]. It revealed that students do have knowledge regarding the impacts of air pollution and health but there some level of confusion that exist for instance, between indoor and outdoor pollution. There is a need to develop interventions that would assist the youth in decision-making process regarding physical activity practice while at the same time reducing exposure to air pollution. Public education and information activities can eliminate misunderstandings and contribute to better decisions about exercising and general health.

METHOD

The results presented were obtained through a qualitative phenomenological study. This research was used in the qualitative analysis, by developing questionnaires using in-depth interviews which refers to the patterns and relationships in the data collection. Gathered data in detail and observed participant analysis of the collected data to identify. Descriptive reporting presents the findings with rich descriptions that convey the experiences of participants. The study was conducted on university students who are asthma patients. The sample consisted of 30 student patients with asthma experiences which were selected based on a qualitative phenomenology study.

The data was collected through interviews forms in university from different departments including both males and females through conversational phenomenological interviews.

The total student range was 30. The ages were included from 19 to 25. 21.4% of students are in their first year, 28.5% of students are in their second year, 14.2% of students are in 3rd year and 21.4% are in their master's. 73.3% of students are unemployed and 26.7% are employed. 6.7% are students are engaged 93.3% of students are unmarried while 80% of students live in a nuclear family, 13.3% live in a big family and 6.7% of students live single. As shown in the table in data collection.

Data collection and analysis

The data were collected through qualitative phenomenological interviews that were conducted face-to-face between the author and the asthma patients from the Karachi University of Pakistan. At the start of the interviews, the sociodemographic data of the student patients were collected (as shown in the Table) sociodemographic refers to the functional class and time since asthma diagnosis. The interviews began with an open question similar to "How long have you been diagnosed with asthma? ". In the questionnaire, the author feels free to ask questions about their experiences how they experience asthma, which weather affects them most and one more important question how they visited their doctor in six months. Mostly student patients share their experiences of how they managed their study along with asthma, and also share information about the effects of air pollution which is the biggest cause of asthma. Air pollution has significant and well-documented effects on asthma patients. These effects are mediated by various pollutants, each affecting respiratory health in different ways. Exposure to high levels of pollutants like PM2.5 particulate matter less than 2.5 micrometer ozone (O3) and nitrogen dioxide (NO2) can have extreme effects on asthma

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attacks. Pollutants can irritate the airways, leading to increased inflammation in asthma patients which causes more frequent and severe symptoms due to increased hospital and doctor visits.

Table 1. Symptom status

No of Respondents	Age	Gender	Marital status	Educational status	Job status	Cause	Findings/result
1	22	F	single	master	Unemployed	Live near busy roads and dust	Diagnosed with asthma after 16. Using mask when go outside using doctor prescribed medications.
2	23	F	Unmarried	Graduate	Un employed	Dust and air pollution	Not only dust and air pollution effects but cold weather also worsen asthma. Use inhaler when need.
3	19	F	Single	intermediate	Employed	Live near busy roads, high pollution levels.	Diagnosed with asthma 8 years ago, high pollution level and winter effects more. Also, use nebulizer to control asthma.
4	19	F	Single	Bs 1st year	Unemployed	Dust, live near busy roads	Diagnosed with asthma 4 years ago. Summer also effects on asthma, using doctor prescribed medicines to control asthma.
5	21	M	Single	Bs 2nd year	Un employed	Dust and smoke	Also have other respiratory diseases. Going out with mask and avoid dusty and smokey places
6	24	M	Single	Masters	Employed	Smoke and dust but dust worsen more.	Using mask and medications. Winter also increases asthma attacks.
7	21	F	Single	Bs 3rd year	Unemployed	Live near busy roads air pollution	Days with high pollution levels worsen asthma. Use air purifier in home. Usually cover face with niqab when go outside. Use inhaler and medications to control asthma.
8	24	M	Engaged	Master	Unemployed	Dust	Diagnosed with asthma when 17 yrs. Old. Using mask and helmet. summer effects asthma but also sometimes in winter it also effects asthma.
9	19	F	Single	Bs first year	Un employed	Live near busy roads	Diagnosed with asthma 5 years ago. Summer season effects so mostly visit doctor in summer, using medication and mask in pollution areas.

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No of Respondents	Age	Gender	Marital status	Educational status	Job status	Cause	Findings/result
10	22	M	Single	Bs 2nd year	Un employed	dust and smoke also Live near busy roads	Diagnosed with asthma when 13. Using inhaler and medications. Cover face with mask when go outside.
11	19	F	Single	Bs first year	Unemployed	Dust	Summer also effects visit doctor once a month. Use inhaler. Exposed to outside with mask and niqab.
12	20	F	Single	Bs 2nd year	Unemployed	Live near busy roads and dust	Diagnosed with asthma and other respiratory conditions when 9. using medications and mask. Also use air purifier at home. And inhaler when need.
13	25	M	Single	Master	Unemployed	Dust and smoke	Also have other respiratory diseases smoke effects more and summer weather. Using medication for asthma.
14	23	M	Single	Bs 3rd year	Employed	Dust, live near busy roads	Have asthma since college. Notice changes in asthma when exposed to high pollution areas. Visit doctor to manage asthma.
15	21	M	Single	Bs second year	Employed	Dust	Diagnosed with asthma in childhood summer and winter also effects also use air purifiers in home also visit doctor.
16	24	F	Single	Bs 3rd year	unemployed	Live near busy roads	Also suffering from another respiratory condition along with asthma, due to which sometimes asthma condition worsen more.
17	21	F	Unmarried	Bs 3rd year	Unemployed	Dust and smoke	Diagnosed with asthma 2 years ago, dry weather also effects. Use precautions to avoid consequences.
18	22	F	Single	Bs 2nd year	Unemployed	Dust	Diagnosed with asthma when 12, Summer effects also, mostly use mask when go outside, avoid dusty places.
19	19	M	Single	Bs 1st year	Unemployed	Live near busy roads, also dust and smoke	Have asthma from last 2 years, summer also effects, use inhaler when need also use air purifier.

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No of Respondents	Age	Gender	Marital status	Educational status	Job status	Cause	Findings/result
20	24	M	Single	Bs 3rd year	Unemployed	Live near busy roads, and smoke	Diagnosed with asthma when 5 years old, also have other respiratory diseases, winter also effects, use mask when go out, use inhaler and other medication, also visit doctor to manage asthma.
21	24	F	Single	Masters	Employed	Dust and smoke, also live near busy areas.	Autumn and winter also effects, visit doctor to manage asthma, use inhaler when needed, exposed outside with niqab.
22	20	M	Single	1st year	Unemployed	Live near busy roads, also dust worsen more	Diagnosed with asthma when 9, summer also effects on condition, visit doctor and use doctor's prescribed medicine to manage asthma. Use mask when go outside.
23	22	M	Unmarried	Bs 2nd year	Employed	smoke	Also have other respiratory conditions along asthma, autumn and winter also effects. Use inhaler and use mask when go outside. Also visit doctor after every 3 months.
24	24	F	Engaged	Masters	Unemployed	Dust and smoke, live near busy roads	Diagnose occur after 17, summer and winter effects. Rarely use inhaler. Use mask and avoid dusty places.
25	18	F	Single	Bs 1st year	Unemployed	Smoke	Have asthma since childhood, also have other respiratory diseases, dry weather and summer also effects on health, also cold drinks worsen asthma, use inhaler when need and use nebulizer, visit doctor. Use mask and niqab when go outside.
26	23	M	Single	Bs 3rd year	Employed	Live near industrial areas, dust	Recently diagnosed with asthma, summer effects more on condition, use mask on dusty areas.

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No of Respondents	Age	Gender	Marital status	Educational status	Job status	Cause	Findings/result
27	22	F	Single	Bs 2nd year	Unemployed	Dust, live near industrial areas	Diagnosed with asthma 4 years ago, autumn season effects more, use air purifier in home, use nebulizer when needed also go to the doctor to manage asthma.
28	21	M	Single	Bs 2nd year	Unemployed	Dust and smoke	Diagnosed with asthma when 15, summer effects more, mostly use inhaler, use mask when go outside.
29	24	F	Single	Final year	Unemployed	Live near busy roads	7 years ago, diagnosed with asthma, smoke effects more, use inhaler and other medicines, use niqab or mask when go outside/
30	20	F	Single	Bs 1st year	Unemployed	Dust and smoke, live near busy roads	Have asthma since childhood along with other respiratory diseases, high pollution level worsen condition more, dry weather also effects, also use air purifier at home, also visit doctor, use inhaler and other prescribed medicines, use mask when go outside.

RESULT

Based on our data analysis, we found out that female students suffer more from asthma than male students while 40% of the students also suffer from another respiratory disease like dry cough or shortness of breath. Students residing near busy roads and industrial areas are more affected because of the smoke and dust. Mostly all of the students are exposed to the outdoor environment with masks whereas a lot of female students cover their faces with niqab, but still high pollution levels worsen asthma problems among all students. A large percentage of students are affected by summer weather 56.75%, whereas 30.05 % are affected by winter and 13.4% are from autumn, due to which they can't cope with their syllabus and are left behind in their classes, and also causes a long-term effect on them. 26.7% of the students use air purifiers in their homes while 73.3% don't use them. Moreover, 20% of the students are allergic to smoke while 80% of the students are allergic to dust. 46.7% of the students use inhalers whereas 53.5% don't use them. Mostly all of the students visit to doctor at least once a month. Lastly, 93.3% of the students notice changes in their routine due to air pollution whereas 6.7% don't.

FINDINGS

This article outlines several key findings on the impact of air pollution on students with asthma. Air pollution is a crucial problem for asthma student patients, the main source of air pollution is traffic-related pollutants like nitrogen (NO2), carbon dioxide (CO2) and ozone (O3) can lead to serious asthmatic problems. Particulate matter like (PM2.5) from industrial emission, road water, power plant and indoor pollutants such as smoke and heating sources. Exposure of these pollutants leading to increased coughing, wheezing and shortness of breath. Indoor air pollutants can also aggravate asthma like cooking, heating, smoking and other building materials. Weather significantly impacts on asthma patients by affecting air quality and increasing the presence of pollutants. Phenomena like "thunderstorm asthma" which increase air bone pollen level, main cause of asthma attacks even in those not previously diagnosed with asthma. To reduce or overcome the impact, the suggestion is to use inhaler during high pollution days, staying indoors and wearing protective masks which is the basic need for asthma patients.

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DISCUSSION

Air pollution is a major problem in the environment that affects people's health. A large number of people most at risk from air pollution are asthma patients especially students and young patients. Students travel daily to go to their educational institution causing them daily exposure to the dust and smoke. Asthma is a chronic disease of the respiratory system, resulting in airway inflammation and hyper responsiveness, and certain amounts of pollutants present in the air like particulate matter (PM), nitrogen dioxide (NO2), sulfur dioxide (SO2) and ozone (O3) can worsen the disease and its consequences, therefore leading to bad effect on both their education and health causing higher mortality and lowering of the quality of life. A study also explains that these outdoor air pollutants were determined to cause the exacerbation of asthmatic symptoms [15]. Thus, calculations of the effects also revealed that the subgroup was even more influential in regards to children and other events like asthma symptoms, lung function, and medication.

Particulate Matter: when fine particles penetrate through the lungs, they can cause inflammation and worsen asthma symptoms. Studies showed that particles like PM2.5 and PM10 cause high effects on asthma symptoms. Studies also shows that air pollutants like SO2, PM2.5, NO2 has a great effect on children [16].

Ozone (O3): it is also very effective for asthma patients. it can also cause inflammation and other lung infections and increase asthma attacks.

Nitrogen Dioxide (NO2): (NO2) from vehicles and industries has a great impact on asthma patients. Students who live near busy roads and industrial areas are more exposed to dust and smoke results high asthma attacks which cause shortness of breath and in serve cases even go to hospitals.

Long-term health effects: Long exposure to air pollution can lead to more infectious lung diseases, which has a great impact on the students' daily tasks, their health and studies, leading to long-term health issues.

Outdoor activities: student who are exposed to more outdoor activities, experience increases in their asthma condition due to outdoor air pollutants. Students who travel on bikes face more traffic smoke and dust causing them hard to breathe.

Educational institution environment: education institutions located near busy areas also affect students' health due to high pollution levels which also have a huge impact on the students' studies.

Policy and Precautions: Planting more trees can help in reducing air pollution, providing healthier environment. Installing air purifiers in homes to avoid dust particles from the air can help asthma patients breathe more freely and also help them recover from their other respiratory disorders. Asthma patients should avoid those areas where air pollution is high, they should wear masks and also visit to doctor at least once a month and seek guidance about their condition from them. Follow their medication as prescribed by their doctor and for quick relief use inhalers during high pollution time. Supporting agencies aim to reduce air pollution by ensuring information about asthma among the people through seminars. Researchers also revealed that there is a certain need of measures use to eliminate the contact with indoor and outdoor air pollutants should be cooperative for individual, do proper preventive procedures to safeguard children who have very little or no say on the quality of air they inhale [16].

CONCLUSION

People with asthma, especially students and young patients, will be further exposed to the threat of air pollution, and suffer from more serious health consequences. There has to be a detailed assessment conducted of the main air pollutants particulate matter (PM), nitrogen dioxide (NO2), sulfur dioxide (SO2) and ozone (O3) and their causal relationship with respiratory diseases, and more in each country. This can help us create better tools to fight off these and work to reduce the negative impact on human health. It is the role of policymakers to ensure that laws, rules and policies aimed at checking emission of air pollution are set and followed to the letter while individuals, communities and educational institutions can get involved in the campaign to encourage people to observe instances such as clean air act and practicing Environmentally Friendly measures. Mankind possesses the ability to work towards lowering his impact on air pollution by taking the bus, utilizing public transport, and supporting causes aimed at enforcing clean air.

This is not only a question of disease and its prevention, but also the well-being of generations in the future. Hence, good strategies must be employed to ensure that measures are put in place to control air pollution thus enhancing the health of those people diagnosed with asthma and other respiratory diseases.

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