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Abstract

Air pollution is the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. The industrialization of countries has increased the emission to the atmosphere that has significantly oplurid the air. Exposure to high levels of air pollution can cause a variety of adverse health outcomes. Hence, the study sought to examine the effects of air pollution on the development of respiratory diseases among residents in New Delhi, India. The study adopted the descriptive research design. The targeted population included the residents of New Delhi. The key respondents included health practitioners. The collection of the data was done using the questionnaires. The rationale for picking the health practitioners to respond to the research instruments is because they were more involved in the treatment and were more informed about the cases that have been reported from the residents due to the air pollution. The study found that air pollution positively influences the development of respiratory diseases. Air pollution can worsen lung function in people with breathing problems and decrease lung function in those with healthy lungs. Exposure to air pollution puts you at risk for lung cancer, heart attacks, stroke and, in extreme cases, premature death. The study concluded that air pollution is a danger to lung health, particularly for children, the elderly, people who work or spend time outdoors and people with heart or lung disease. The study recommended strict measures/initiatives should be taken by the government, industry and the private sector to reduce the burden of air pollution. It is further recommended that individuals should use clean fuels. Likewise, air cleansers that can enhance the air quality are suggested. Industrialization, urbanization, population growth and demand for transportation, mainly in the cities, need to be managed.

Keywords: *Air Pollution, Respiratory Health Complications, New Delhi, India*

1.0 Introduction

Air pollution is the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere (Healy, Munoz-Wolf, Strydom, Faherty, Williams, Kenny & Cloonan, 2021). The industrialization of countries has increased the emission to the atmosphere that has significantly oplurid the air. Exposure to high levels of air pollution can cause a variety of adverse health outcomes. Artificial urban air pollution is a complex blend with several hazardous components. Vehicular, industrial, household, and soil resuspension are significant sources of air contamination in Delhi (Sridharan, Kumar, Singh, Bolan & Saha, 2021). Air pollution is acknowledged as a significant hazard to human health. The United Nations Environment Program has approximated that 1.1 billion people breathe unhealthy air worldwide. Epidemiological studies have shown that focus on ambient air particles is related to many impacts on human health, specifically on the cardio-respiratory system. An expanding body of evidence suggests that particulate pollution enhances day-to-day deaths and medical facility admissions worldwide. Gaseous co-pollutants, seasonal patterns, or climate did not confound the relation between particulate pollution and cardiopulmonary mortality (Singh, Mhawish, Banerjee, Ghosh, Singh & Mall, 2021). Likewise, it was not modified significantly by race, sex, and socioeconomic conditions. Thus, the relation between particulate air pollution exposures and cardio-pulmonary deaths appeared causal.

Air pollution in most cities is relatively connected to levels and patterns in economic and social advancement (Jerrett, Burnett, Ma, Pope III, Krewski, Newbold & Thun, 2020). Besides, rapidly increasing automation, urbanization, population growth, demand for transport, and meteorological conditions affect air pollution in many Indian cities. Currently, India is experiencing rapid development and economic development reflected by automation, urbanization, the surge in revenue and motor vehicle usage. Presently around two-thirds of Indians reside in rural areas. But the pattern is transforming quickly as more individuals are relocating to the cities for employment. Epidemiological research worldwide has developed a close relationship between urban air contamination and human diseases (Ayres & Buehler, 2019). Air pollution combines numerous gases, particulates, hydrocarbons, and transition metals. The relation between air contamination and adverse health conditions is greatest and more persistent for respirable suspended particulate matter. The health risk from particulate pollution is more for a few susceptible groups like the small kids and the old and those with health conditions of the heart and lungs.

Diseases of the lungs and the airways are commonly identified by one or more signs which may be quickly noticed (Svanes, Sunyer, Plana, Dharmage, Heinrich, Jarvis & Antó, 2018). Hence, identifying a particular sign or several signs can confirm the existence of an underlying illness in the top or lower airways. Respiratory symptoms are placed into two big groups: upper respiratory system signs, which consist of running and stale nose, sinus problems, aching throat, cold head, high temperature, and burning or red eyes, and lower respiratory signs, which consist of hissing, wet cough, dry cough, and phlegm, shortness of breath, and chest pain (Johansson & Kirsebom, 2021). Many of these respiratory conditions underlying these signs are triggered by bacterial, fungal, or viral infections or structural or functional damage to the respiratory tract. The symptoms of respiratory disease are mainly intensified due to direct exposure to air pollutants.

Urbanization raised traffic levels and subsequent vehicle emissions, and commercial lifestyle are associated with an increase in the regularity of asthma exacerbations and respiratory infections,

particularly in residents who stay in cities as contrasted to those that reside in rural places (Paciência & Rufo, 2020). Taking in air pollutants can irritate your breathing track and might lead to shortness of breath, coughing, wheezing, bronchial asthma episodes, and chest pain. Exposure to air pollution puts one in jeopardy of lung cancer, cardiovascular disease, stroke, and sudden death in extreme instances. Many respiratory complications are due to excessive oxidative burden on the lungs that bring about persistent respiratory disease, emphysema, and fibrosis (Healy, Munoz-Wolf, Strydom, Faherty, Williams, Kenny & Cloonan, 2021).

1.1 Research Objective

The study's objective was to examine the effects of air pollution on respiratory health complications among residents in New Delhi, India.

2.0 Literature Review

A study by Arbex, de Souza Conceição, Cendon, Arbex, Lopes, Moyses and Braga (2020) reported substantial epidemiological proof showing that air pollution has negative impacts on humans' health and is relatively associated with breathing diseases consisting of chronic obstructive pulmonary disease (COPD). These effects, which can be split into short- and long-lasting results, can be noted as worsening current signs, impaired lung function, and high hospitalization and mortality rates. Long-term direct exposure to air with an increased number of toxins might likewise enhance the occurrence of COPD. The combined effects of various contaminants may become a lot more complex in the future; therefore, there is a need for even more extensive study on specific at-risk populations, and creating matching protective approaches is important. It is targeted to evaluate the epidemiological proof on the impact of air contamination on COPD, the possible pathophysiological mechanisms underlying this effect, in addition to safety procedures against the impacts of air pollutants in patients with COPD.

Brajer and Mead (2019) argued that urban air pollutants led to a vast array of severe and persistent impacts on the respiratory system of children which can be ravaging. In this research, breathing health of kids was examined in the Wenzhou city in China where the degree of air pollution is relatively high. The research was conducted in Wenzhou. The frequency of respiratory signs was established via an organized respiratory symptomology survey and individual interviews. Air quality information was gathered from the Central and State Pollution Control panel and likewise obtained by straight measurements making use of a portable aerosol monitor. According to the information gathered on the cohort of kids taking part in the research, 41.2 % of kids in Wenzhou experienced respiratory issues as compared to 15.1% of country kids. The respiratory signs were most common in females than in males' kids. A strong, substantial considerable favorable relation was noted between PM10 level in Wenzhou's air and the frequency of lower respiratory system signs.

Fortoul, Rojas-Lemus, Rodriguez-Lara, Cano-Gutierrez, Gonzalez-Villalva, Ustarroz-Cano and Gonzalez-Rendon (2018) conducted a research to explore the possible relation in between air contaminants and respiratory system conditions. Generalized additive designs were utilized to evaluate the result of air toxins on deaths or outpatient visits. The average concentration of air toxins in Hangzhou (HZ) was 2.4-3.5times more than those in Zhoushan (ZS), with the exception of O3. In a one contaminant design, the enhanced concentrations of PM2.5, NO2, and SO2 were highly related to fatalities triggered by RD in HZ, while PM2.5 as well as O3 was connected with

deaths triggered by RD in ZS. All air contaminants were highly related with outpatient visits for RD in both HZ and ZS. In several contaminant designs, a substantial relationship was only noted between PM2.5 and the death rate of RD people in both HZ and in ZS. Additionally, strong organizations between SO2, NO2, as well as outpatient visits for RD were noted in HZ and ZS. The research has given proof that both the mortality rates and outpatient visits for RD were substantially related with air contaminants. Moreover, the outcomes revealed that various air toxin levels bring about regional disparities in between mortality rates and outpatient visits.

Shah, Langrish, Nair, McAllister, Hunter, Donaldson and Mills (2021) discovered that air pollution remains to be the main public health problem affecting nine out of ten people staying in the cities all over the world. Direct exposure to air contamination is ranked 9th risk aspect for cardiopulmonary mortality. The goal of evaluation is to determine the existing literary works for the most current updates on health impacts of particular air contaminants and their effect on bronchial asthma, persistent obstructive lung disease, lung cancer and respiratory disease. An overall of 43 articles were evaluated to develop the association as to how air contamination is connected with pulmonary deaths. Specific past incidences recommends that air contamination is a vital variable which improves lung disease, thereby additionally leading to more damage in vulnerable people, like kids, the old and those of reduced socioeconomic standing globally. Asthma, COPD, lung cancer and breathing diseases all of them seem to be worsened due to direct exposure to a range of environmental air contaminants with the biggest impacts due to particulate matter (PM), ozone and nitrogen oxides. New studies assessed confirmed these outcomes. Persisted caution will certainly be vital to decrease the impacts of air contamination on people health and pulmonary condition. Collaboration at a multi-national level will be needed on the side of state, industry, energy-related business and the public working together to fix our air quality problems at the regional, nationwide and worldwide.

Harris, Viliani and Spickett (2021) argued that the health impacts of air contamination are a public health problem worldwide. Direct exposure to air contamination has a lot of significant unfavorable impacts on human health. Around the world, 7 million fatalities were associated to the combined impacts of household and ambient air contamination. Studies with persistent respiratory system diseases like chronic obstructive lung diseases and asthma are particularly susceptible to the destructive impacts of air contaminants. Air contamination may bring in the acute exacerbation of COPD and bringing in bronchial asthma, enhance the breathing morbidity and mortality. The health results of air contamination relied upon the elements and sources of toxins that differed with nations, periods, and times. Burning of hard fuels was the main source of air contaminants in growing nations. To minimize the unfavorable impacts of air contamination, individuals, particularly those with COPD or asthma ought to understand the air quality and take added steps like minimizing the time outside and putting on masks when needed. To low the air contaminants indoors, individuals need to utilize good fuels and enhance the stoves so as to burn fuel much more effectively and vent exhausts to the exterior. Air cleaners which can enhance the air quality successfully are advised.

Haque and Singh (2018) performed a study to check out health effect of vehicle pollution of Kolkata, a cross-sectional research was done within the period of 2012-2015 amongst 1000 men non-smoking citizens in the urban and 910 age- and gender-matched rural subjects as control. The city team consisted of 550 men that were occupationally revealed to automobile contamination:

60 traffic police officers, 188 road hawkers, 78 car rickshaw vehicle drivers, 85 bus motorists and 60 vehicle mechanics. The remainder of 512 individuals from the urban area was office workers. Contrasted to control, city subjects had actually enhanced frequency of breathing system signs, bronchial asthma, headache and decreased lung operation, persistent obstructive lung illness and high blood pressure. The adjustments, even more persistent amongst occupationally revealed subjects, were favorably connected with PM10 level in ambient air. The city subjects again revealed raised degrees of pro-inflammatory cytokines and chemokine's in plasma, cytological modifications recommending inflammation in the air track, decreased immunity, leukocyte activation in regards to expression of CD11b/CD18 and production of myeloperoxidase and elastase, together with up-regulation of platelet P-selecting expression and increased soluble P-selecting in plasma, suggesting platelet attention deficit disorder. City individuals' shows more production of responsive oxygen types concomitant with exhaustion of superoxide dismutase and overall antioxidant condition, recommending oxidative anxiety. Furthermore, it was revealed enhanced chromosomal breakage and DNA damage and raised level of expression of γ-H2AX healthy protein. Regardless of the expressions of DNA destruction fixing healthy proteins Mre-11 and Ku70 was just modestly up-regulated, suggesting not enough DNA repair. Furthermore, pro-survival signaling by protein kinase B was triggered and metaplasia and dysplasia of air passage cells were enhanced recommending triggering of the carcinogenesis procedure in the lung. Basically, chronic direct exposure to automotive contamination of Kolkata decreases lung function, enhances blood pressure, lowers immunity, and improves cancer cells danger in the lung.

Jerrett, Arain, Kanaroglou, Beckerman, Potoglou, Sahsuvaroglu and Giovis (2020) reported that air contamination has several unfavorable impacts on the people's health, particularly children, old and those who have pre-existing respiratory issues. The goal of the research was to examine the relationship between urbanization and huge levels of automobile emissions and high frequency of breathing infections in individuals staying in metropolitan places as contrasted to those in remote places. The testimonial was performed in PubMed and Cochrane collection data sources utilizing a search string. It consisted of articles connected to the Italian region, evaluating the impacts of air contamination on frequency of breathing system illness on hospital admissions for breathing illness and lung functioning. It got an overall of 145 articles, after selection only 15 posts were considered. The outcomes verify the organization in between the impact of air contamination exposure and respiratory infections. Increased focus of all climatic toxins, specifically of airborne particles, have actually been linked in 60% of the researches to cough and phlegm, in 25% to bronchial asthma signs, in 20% to decrease of quantities and respiratory flows, in 20% to boost of healthcare facility keep days during hospitalization for exacerbation of pre-existing breathing diseases. Urbanization, increasing levels of traffic and consequent automobile exhausts, and industrial way of life are associated to a rise in the frequency of asthma exacerbations and breathing infections, particularly in individuals who reside in city locations as contrasted to those who reside in rural locations, Along with a rise in insensitivity to pollen-induced allergies. The outcomes recommend that environmental regulation may be critical for avoidance of COPD and other severe and persistent respiratory illness.

A study by Menezes, Perez-Padilla, Jardim, Muiño, Lopez, Valdivia and Platino (2021) discovered that within the last 250 years since the Industrial Revolution increased the process of contaminant emission, whereby up until after that, had actually been restricted to the residential utilization of fuels and recurring volcanic emissions air contamination has actually existed in different ways.

Presently, around 60% of individual's worldwide stay in the metropolitan places and are revealed to have persistent higher levels of air contaminants. This is a non-systematic evaluation on the various kinds and sources of air contaminants, and on the breathing system impacts credited to direct exposure to those pollutants. Aggravation of the signs of infection, along with more need for emergency treatment, the number of hospitalizations, and the number of fatalities, can be credited to particulate and gaseous contaminants, released by different sources. Chronic exposure to air contaminants does not only lead to decompensation of pre-existing infections, it again enhances the variety of new issues of bronchial asthma, COPD, and lung cancer, even in remote places. Air contaminants currently rival tobacco smoke as the heading danger aspect for these infections. We really hope that we can impress upon pulmonologists and clinicians the relevance of exploring direct exposure to air toxins and of regarding this as a threat variable which must be put into consideration in the usage of finest practices for the control of the severe decompensation of breathing system diseases and for maintenance treatment between exacerbations.

Lawin, Ayi Fanou, Hinson, Stolbrink, Houngbegnon, Kedote and Mortimer (2018) conducted research to evaluate the breathing health impact of urban ambient air contaminants on transit and non-transit employees and contrast those impacts by transportation mode, job-related direct exposure and socio-demographic characteristics of respondents. A two main healthcare center study in 2014/2015 in North Korea were utilized. Of the 300 men individuals hired, 200 (70 cab driver, 85 motorcyclists and 45 government employees) satisfied the addition criteria. They consist of 20 - 40 years old, a men transportation employee or government employee who had actually functioned within the resource's city for the past year before the research, and had no background of breathing complications/impairment or any other devastating diseases. To determine details occupation-dependent respiratory feature disability, a contrast was made in between the ORs for breathing problems in the three occupations. Changes were made for some market factors like age, BMI or location of living. Direct exposure to ambient air contamination by profession and transport setting was individually connected with breathing system features problems and incident breathing signs amongst respondents. Motorcyclists had the biggest possible influence, and anticipated making use of GOLD and NICE standards. Additionally, uneducated, presently smoking transit employees who had actually done job for more than 1 year, with 3 journeys daily and greater than 1 h transportation time per journey were considerably connected with more odds for breathing system feature problems. Results of the research lend much concern to the present literary works on the unfavorable respiratory health result of ambient air contamination on urban transit employees worldwide. The duty of other confounders acting synergistically to create an extra unhealthy result is noticeable. All in all, the impact relies on the means and time of exposure.

A study by Ghorani-Azam, Riahi-Zanjani and Balali-Mood (2019) revealed that air contamination is related with a significant concern on people health; nevertheless, the very vital contaminants might differ with place. Appropriate management is essential to examine the result of these contaminants on breathing health. The research was made to review the role of outside, indoor and individual exposure to combustion-associated toxins NO2 and O3 on breathing health of kids in a non-affluent city location of Delhi, India. Presence of NO2 and O3 were persistently gauged in outdoor and interior air, in addition to individual exposure, for thirty days utilizing easy dimension monitors. Complete information was offered from 80 kids, 7-12 years old. Breathing morbidity was high, where 35 reported to have had hissing at any moment, 18 wheezing in the past month, 9 asthma at any time and 30 pneumonia any time. Relationships in between degrees of NO2 and O3

determined in the 3 areas assessed were of low quality. Degrees of NO2 in indoor air and individual direct exposure to O3 was separately related to bronchial asthma, pneumonia and wheezing at any time. No organization was viewed between exterior NO2 and O3 and breathing system health. Direct exposure to greater levels of NO2 and O3 was connected with enhanced danger for bronchial asthma and pneumonia in children. The area where the contaminants are determined affects the outcomes. The dimensions absorbed indoor and individual exposure was one of the most accurate.

Werner, Vink, Watt and Jagals (2020) discovered that air contamination has a lot of adverse health outcomes on the basic population, specifically youngsters, subjects with underlying chronic disease and the old. The purposes of the research was to examine the impacts of traffic-associated air contamination on the exacerbation of asthma and growth of respiratory diseases in Russian youngsters ailing from bronchial asthma or wheezing contrasted to healthy subjects and to evaluate the organization in between incremental increases in primary contaminants and the incidence of respiratory signs. The potential research registered 888 kids aged 3 to 16 years. Over one year, parents completed a day-to-day scientific journal to report information regarding breathing signs, kind of medication used and healthcare use. Medical information was brought together with the outcomes gotten making use of an air contamination tracking system of the 5 most typical contaminants. Amongst the 435 kids with reoccurring wheezing or asthma and 364 healthy topics that finished follow-up, kids with persistent hissing or bronchial asthma noted substantially a lot more days of high temperature and cough, episodes of rhinitis and tracheitis, asthma strikes, episodes of pneumonia and hospitalizations. In the wheezing/asthma group, staying near the areas with a high number of traffic was a threat variable for asthma exacerbations and staying close to environment-friendly places was discovered to be good. There is a substantial organization between traffic-associated air contamination and the growth of bronchial asthma exacerbations and breathing diseases in kids birthed to atopic parents and in those ailing from persistent hissing or bronchial asthma. The results recommend that environmental regulation might be essential for breathing health in kids with underlying breathing illness.

Eisner, Anthonisen, Coultas, Kuenzli, Perez-Padilla, Postma and Balmes (2019) noted that there is uniformity in the results which connect the severe increases in city air contamination (generally the particulate issue) and the short-period health results (i.e., death and medical facility admissions) on sick people experiencing chronic obstructive pulmonary condition. Apart from the acute impacts, a relevant public health and clinical concern is to what degree persistent exposure to air contamination is associated with lung role impairment and growth of COPD. Cross-sectional research revealed a boost of self-reported diagnosis of chronic respiratory disease and emphysema, shortness of breath, mucous active secretion and reduced levels of lung role in the much more contaminated locations. The two mate researches in young kids have actually discovered a retardation of lung role development, and the only cohort in grownups a more decrease of lung role. Offered the innate constraints of cross-sectional research studies to distant the timing between direct exposure and impacts, and the weak points of the friends (i.e., couple of locations, brief follow-up, only one retest, lack of specific measuring of air contamination procedure) there is a demand for new prospective research studies. They are required to be executed in a great deal of geographical locations and with a critical follow-up to evaluate the effect of long-lasting air contamination on lung function development and decrease, and on occurrence, period, seriousness, and survival of persistent obstructive pulmonary disease.

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3.0 Research Methodology

The study adopted the descriptive research design. The targeted population included the residents of New Delhi. The key respondents included health practitioners. The collection of the data was done using the questionnaires. The rationale for picking the health practitioners to respond to the research instruments is because they were more involved in the treatment and were more informed about the cases that have been reported from the residents due to the air pollution.

4.0 Research Findings and Discussion

The research findings and discussion are presented in sections.

4.1 Correlation Analysis

The study results of the correlation analysis that show the association between the variables are presented in Table 1

Table 1: Correlation Analysis

		Development of Respiratory Diseases	Air pollution
Development of Respiratory Diseases	Pearson Correlation	1.000	
	Sig. (2-tailed)		
Air pollution	Pearson Correlation	.425**	
	Sig. (2-tailed)	0.000	0.000

The correlation results from Table 1 depict that air pollution is positively and significantly related to the development of respiratory diseases (r=.425, p=.000). This concurs with, Paciência and Rufo (2020) who articulated that urbanization raised levels of traffic and subsequent vehicle emissions, and commercial lifestyle are associated to an increase in the regularity of asthma exacerbations and respiratory infections, particularly in residents who stay in cities as contrasted to those that reside in rural places.

4.2 Regression Analysis

The section consisted of model fitness, analysis of variance and regression of coefficient. The results presented in Table 2 shows the model fitness

Table 2: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.457a	0.254	0.152	0.00000

The result from Table 2 shows that air pollution was found to be satisfactory in explaining the development of respiratory diseases among the residents of India. This was supported by the coefficient of determination, also known as the R square of 0.254. This showed that air pollution

explains 25.4% of the variations in the cases of respiratory diseases among residents in the city of Delhi, India.

Table 3: Regression of Coefficient

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.5424	0.2457		5.162	0.045
Respiratory Diseases	0.3125	0.2651	0.291	4.054	0.027

According to the results presented in Table 3, it was found that air pollution is positively and significantly related to the development of respiratory diseases (β=.3125, p=0.027). This was supported by a calculated t-statistic of 4.054, larger than the critical t-statistic of 1.96. The results implied that when the air pollution increases by one unit, the cases of respiratory disease among the residents in India will increase by 0.3125 units while other factors that influence the respiratory diseases are held unchanged. Harris, Viliani and Spickett (2021) noted that persistent respiratory system diseases like chronic obstructive lung diseases and asthma are particularly susceptible to the destructive impacts of air contaminants. Air contamination is related to significant concern for people's health.

5.0 Conclusion and Recommendations

The research concluded that air pollution is positively and significantly related to the development of respiratory diseases. Air pollution is the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. The industrialization of countries has increased the emission to the atmosphere that has significantly oplurid the air. Exposure to high levels of air pollution can cause a variety of adverse health outcomes. Air pollution can worsen lung function in people with breathing problems and can decrease lung function in those with healthy lungs. Exposure to air pollution puts you at risk for lung cancer, heart attacks, stroke and, in extreme cases, premature death. Air pollution is a danger to lung health, particularly for children, the elderly, people who work or spend time outdoors and people with heart or lung disease.

The study recommended strict measures/initiatives should be taken by the government, industry and the private sector to reduce the burden of air pollution. It is further recommended that individuals should use clean fuels. Likewise, air cleansers that can enhance the air quality are suggested. Industrialization, urbanization, population growth and demand for transportation, mainly in the cities, need to be managed. The study recommended that for lowering the air pollutants interior, people ought to utilize clean fuels and enhance the stoves so as to burn fuels a lot more effectively and vent discharges to the outside. Environmental protection may be vital for avoidance of chronic obstructive pulmonary disease and various other intense and chronic breathing diseases.

REFERENCES

Arbex, M. A., de Souza Conceição, G. M., Cendon, S. P., Arbex, F. F., Lopes, A. C., Moyses, E. P., ... & Braga, A. L. F. (2020). Urban air pollution and chronic obstructive pulmonary disease-related emergency department visits. *Journal of Epidemiology & Community Health*, *63*(10), 777-783. https://doi.org/10.1136/jech.2008.078360

Ayres, S. M., & Buehler, M. E. (2019). The effects of urban air pollution on health. *Clinical Pharmacology & Therapeutics*, 11(3), 337-371. https://doi.org/10.1002/cpt1970113337

Brajer, V., & Mead, R. W. (2019). Valuing air pollution mortality in China's cities. *Urban Studies*, 41(8), 1567-1585. https://doi.org/10.1080/00420980420002270l9

Eisner, M. D., Anthonisen, N., Coultas, D., Kuenzli, N., Perez-Padilla, R., Postma, D., ... & Balmes, J. R. (2019). An official American Thoracic Society public policy statement: Novel risk factors and the global burden of chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine, 182(5), 693-718. https://doi.org/10.1164/rccm.200811-1757ST*

Fortoul, T. I., Rojas-Lemus, M., Rodriguez-Lara, V., Cano-Gutierrez, G., Gonzalez-Villalva, A., Ustarroz-Cano, M., & Gonzalez-Rendon, E. S. (2018). Air pollution and its effects in the respiratory system. The Impact of Air Pollution on Health, Economy, Environment and Agricultural Sources. *Journal of Health* 3(2), 19-31

Ghorani-Azam, A., Riahi-Zanjani, B., & Balali-Mood, M. (2019). Effects of air pollution on human health and practical measures for prevention in Iran. *Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences,* 7(2),16-27.

Haque, M., & Singh, R. B. (2018). Air pollution and human health in Kolkata, India: A case study. *Journal of Climate*, 5(4), 77-81. https://doi.org/10.3390/cli5040077

Harris, P., Viliani, F., & Spickett, J. (2021). Assessing health impacts within environmental impact assessments: an opportunity for public health globally which must not remain missed. *International Journal of Environmental Research and Public Health*, *12*(1), 1044-1049. https://doi.org/10.3390/ijerph120101044

Healy, C., Munoz-Wolf, N., Strydom, J., Faherty, L., Williams, N. C., Kenny, S., ... & Cloonan, S. M. (2021). Nutritional immunity: the impact of metals on lung immune cells and the airway microbiome during chronic respiratory disease. *Respiratory Research*, 22(1), 31-44. https://doi.org/10.1186/s12931-021-01722-y

Holdgate, M. W. (2019). *A perspective of environmental pollution*. Cambridge University Press.

Jerrett, M., Arain, A., Kanaroglou, P., Beckerman, B., Potoglou, D., Sahsuvaroglu, T., ... & Giovis, C. (2020). A review and evaluation of intraurban air pollution exposure models. *Journal of Exposure Science & Environmental Epidemiology, 15(2), 185-204. https://doi.org/10.1038/sj.jea.7500388*

Jerrett, M., Burnett, R. T., Ma, R., Pope III, C. A., Krewski, D., Newbold, K. B., ... & Thun, M. J. (2020). Spatial analysis of air pollution and mortality in Los Angeles. *Epidemiology*, 727-736. https://doi.org/10.1097/01.ede.0000181630.15826.7d

Johansson, C., & Kirsebom, F. (2021). Neutrophils in respiratory viral infections. *Mucosal immunology*, 14(4), 815-827. https://doi.org/10.1038/s41385-021-00397-4

Lawin, H., Ayi Fanou, L., Hinson, A. V., Stolbrink, M., Houngbegnon, P., Kedote, N. M., ... & Mortimer, K. (2018). Health risks associated with occupational exposure to ambient air pollution in commercial drivers: a systematic review. *International Journal of Environmental Research and Public Health*, 15(9), 2039-2046. https://doi.org/10.3390/ijerph15092039

Menezes, A. M. B., Perez-Padilla, R., Jardim, J. B., Muiño, A., Lopez, M. V., Valdivia, G., ... & PLATINO team. (2021). Chronic obstructive pulmonary disease in five Latin American cities (the PLATINO study): a prevalence study. *The Lancet*, 36(95), 1875-1881. https://doi.org/10.1016/S0140-6736(05)67632-5

Paciência, I., & Rufo, J. C. (2020). Urban-level environmental factors related to pediatric asthma. *Porto Biomedical Journal*, *5*(1), 18-25. https://doi.org/10.1097/j.pbj.0000000000000057

Shah, A. S., Langrish, J. P., Nair, H., McAllister, D. A., Hunter, A. L., Donaldson, K., ... & Mills, N. L. (2021). Global association of air pollution and heart failure: a systematic review and meta-analysis. *The Lancet*, *38*(91), 1039-1048. https://doi.org/10.1016/S0140-6736(13)60898-3

Singh, N., Mhawish, A., Banerjee, T., Ghosh, S., Singh, R. S., & Mall, R. K. (2021). Association of aerosols, trace gases and black carbon with mortality in an air pollution hotspot over central Indo-Gangetic Plain. *Atmospheric Environment*, 24(6), 118-126. https://doi.org/10.1016/j.atmosenv.2020.118088

Sridharan, S., Kumar, M., Singh, L., Bolan, N. S., & Saha, M. (2021). Microplastics as an emerging source of particulate air pollution: A critical review. *Journal of Hazardous Materials*, 41(8), 126-134. https://doi.org/10.1016/j.jhazmat.2021.126245

Svanes, C., Sunyer, J., Plana, E., Dharmage, S., Heinrich, J., Jarvis, D., ... & Antó, J. M. (2018). Early life origins of chronic obstructive pulmonary disease. *Thorax*, *65*(1), 14-20.

Werner, A. K., Vink, S., Watt, K., & Jagals, P. (2020). Environmental health impacts of unconventional natural gas development: a review of the current strength of evidence. *Science of the Total Environment*, 50(5), 1127-1141. https://doi.org/10.1016/j.scitotenv.2014.10.084