

Poor Respiratory Health is a Consequence of Dhaka's Polluted Air: A Bangladeshi Perspective

Authors: Dibya, Trishul Basak, Proma, Amrin Yeasin, and Dewan, Syed Masudur Rahman

Source: Environmental Health Insights, 17(1)

Published By: SAGE Publishing

URL: <https://doi.org/10.1177/11786302231206126>


BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Poor Respiratory Health is a Consequence of Dhaka's Polluted Air: A Bangladeshi Perspective

Trishul Basak Dibya, Amrin Yeasin Proma and Syed Masudur Rahman Dewan 

Department of Pharmacy, School of Medicine, University of Asia Pacific, Dhaka, Bangladesh.

Environmental Health Insights
Volume 17: 1–4
© The Author(s) 2023
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/11786302231206126



ABSTRACT: Dhaka, which is the capital and largest metropolis of Bangladesh, has seen an increase in the number of documented cases of respiratory disorders. Every day in Dhaka city, a remarkable number of patients are being diagnosed with poor respiratory conditions. The majority of these patients have no other severe disease history and mostly need to be exposed to outdoor air to meet their occupational requirements, indicating that the ailment may be associated with polluted air. As this is the most pressing issue that must be addressed in order to safeguard public health, we have made an effort to focus on the current situation surrounding the sources of air pollution in the city. Since this is a viewpoint article, we gathered data from various published articles, national dailies, and international reports generated by WHO, CDC, BBC, or other environmental news/report portals to highlight the public health issue related to respiratory health. Poor respiratory health is one of the main consequences of Dhaka's contaminated air, as determined by our analysis.

KEYWORDS: Air pollution, Bangladesh, Dhaka, public education, respiratory health, respiratory diseases

RECEIVED: May 12, 2023. **ACCEPTED:** September 20, 2023.

TYPE: Perspective

FUNDING: The author received no financial support for the research, authorship, and/or publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: Syed Masudur Rahman Dewan, Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A Green Road, Dhaka 1205, Bangladesh. Email: gobeshok.d@gmail.com

Background

Air pollution refers to the presence of any substance—chemical, physical, or biological—that alters the normal functioning of the atmosphere. According to the daily newspaper “The Business Standard,” Dhaka, the capital of Bangladesh, is often regarded as one of the most polluted cities in the world, with air pollution being the prime concern. The current air quality in Dhaka demonstrated the air pollution level to be unhealthy among sensitive groups.¹ According to the US AQI (Air Quality Index), the value is 160 for Dhaka, and the particulate matter 2.5 (PM_{2.5}) level in Dhaka is 8.1 times higher than that of the World Health Organization (WHO) recommendation for air quality every year.² Brick kilns, surface dust, and vehicle emissions are responsible for roughly 85% of the city's air pollution, while artificial sources are more distributed and actually contribute more.³ By 2020, the 4500 brick kilns around the nation are anticipated to grow by 50%.⁴ Around 2.2 million tons of coal and wood are burned for this purpose around the Dhaka district.⁵ This results in the emission of greenhouse gases, carbon monoxide, volatile organic compounds, and other toxic chemicals like dioxins and furans. In this case, gaseous pollutants are dangerous chemicals that are put into the air by a variety of activities, like factories and cars. Ozone, sulfur dioxide, and nitrogen dioxide are all examples of chemicals that are often used. They are regulated to cut down on the bad effects of air pollution, which hurts both people and the environment. Moreover, plastic trash incineration, unlined landfills, and heavy industry also contribute to unhealthy air quality. A whopping 58% of Dhaka's air pollution is caused by these.⁶

Besides, the majority of vehicles in Bangladesh are either reconditioned or old and poorly maintained. Bangladesh runs

around 40 power plants, 80% of which are gas-based and 20% of which are coal, liquid, or furnace oil-based. Environmental issues are of the utmost importance in power generation. Because of emissions, such dependence has adverse consequences. Carbon dioxide (CO₂), nitrogen oxides (NO_x), sulfur oxides (SO_x), chlorofluorocarbons (CFCs), and airborne particles are all released by coal-fired power plants, which contribute to air pollution and global warming.⁷ Due to Bangladesh's impressive economic growth, a plethora of crucial construction projects, such as those involving roads, rail, bridges, and enormous structures, have been completed. Thus, dust is produced and the environment is deteriorated due to these efforts.⁸ During the dry months especially in winter, the dust from the roads and soil from these building projects is a major contributor to air pollution, especially PM. Bangladesh is plagued by cross-border pollution from neighboring countries like India and Nepal. Unfortunately, transboundary particulate matter from India's coal burning contributes to 40% of Bangladesh's air pollution.⁹

Causes and Effects of Air Pollution in Dhaka City

Respiratory health, the health conditions of the respiratory system such as the airways, including the lungs and the passages that carry air from the mouth and nose to the lungs, is a prime concern to live healthy. The complex mix of air pollutants is released by households, industries, and vehicles; many of which are hazardous to human respiratory health. The most harmful of these contaminants to human health is fine PM.¹⁰ The finest PM comes from the burning of fossil fuels, either from stationary sources like power plants, factories, and homes, or the burning of organic matter, or from moving sources like



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without

cars. These pollutants may damage the lungs of any individual extensively. The way that particles hamper respiratory health by affecting the lungs is influenced by their chemical composition. Depending on their size and shape, particles generated from the same material might produce varied consequences.¹¹ For a variety of purposes, the nanotechnology sector produces incredibly small particles of different materials, notably carbon. Smaller than 100 nanometers are nanoparticles and ultrafine particles. In order to compare, one human hair has a diameter of roughly 100 000 nanometers, thus it would need 1000 nanoparticles to have the same thickness.¹² Studies on animals and in the lab have demonstrated the dangers of excessive nanoparticle and ultrafine particle concentrations.¹³ Some employees who are unintentionally exposed to extremely high amounts get lung injuries and fluid buildup around their airways.¹⁴ Pollutants in the air of workplace can aggravate one's respiratory health and result in "occupational asthma," coal workers' pneumoconiosis, chest pain, asthma spasms, coughing, and shortness of breath. One incurs the danger of developing lung cancer, having a heart attack or stroke, and in the worst circumstances, dying too soon from exposure to air pollution. A study by the Center for Air Pollution Research (CAPS) found that 30% of the air pollution in the nation's capital is caused by road building and excavation that is not planned or managed. Brick kilns and factories (29%) contribute to air pollution, as do vehicles (15%), transboundary air pollution (10%), household cookstoves (9%), and municipal incineration (7%). Since a crackdown on black smoke started in 2003, the amount of smoke from old cars has gone up, making people worry about how much they contribute to air pollution.¹⁵ There are several health impacts caused by air pollution. Even on days with moderate air pollution, vulnerable and sensitive people (Children, Elderly Individuals, People with Respiratory Conditions, Cardiovascular Patients, Pregnant Women, People with Allergies, People Engaging in Outdoor Activities, and Genetically Predisposed Individuals, etc.) can experience respiratory health problems.¹⁶ Chronic obstructive pulmonary disease (COPD), coughing, shortness of breath, pneumonia, asthma, wheezing, respiratory illnesses, and high hospitalization rates (a measure of morbidity) are all directly associated with short-term exposure to air pollution. The long-term impacts of air pollution include cardiovascular illnesses, cardiovascular mortality, pulmonary insufficiency, chronic asthma, and other respiratory conditions.¹⁷ Chronic obstructive pulmonary disorder (COPD) is one of the leading causes of death and disability in poor and middle-income nations like Bangladesh. Presently, COPD affects 12.5% of adult Bangladeshis with substantially higher prevalence among smokers, consumers of biomass fuel, and the elderly. The risk of developing COPD is thought to be elevated by low birth weight, frequent infections, and environmental exposures to ashes, silica, and coal dust.¹⁸ Depending on their size and chemical composition, the contaminants in the air

can either settle in the lung tissues or go through them. Larger PM_{10} particles are able to penetrate the proximal airways, where they are removed by the action of the mucociliary system. There is a substantial danger to one's health posed by $PM_{2.5}$ because it can travel deeper into the lungs.¹⁹

According to recent studies, including one from the Harvard T.H. Chan School of Public Health, inhaling more contaminated air over time may actually exacerbate COVID-19's effects. Moreover, it was found from studies at Harvard, that COVID-19 mortality is impacted by air pollution. A substantial link between air pollution and COVID-19 infection was discovered by researchers studying 120 Chinese cities, and 78% of the coronavirus deaths across 66 locations in Italy, Spain, France, and Germany, which had been reported as 5 of the most polluted areas. Additionally, there is convincing evidence that inhaling more polluted air raised the risk of dying from past epidemics like SARS, which was also caused by a coronavirus, as well as many other respiratory illnesses like influenza. According to research by Wu et al, a $1 \mu\text{g}/\text{m}^3$ increase in pollution levels is associated with an 11% increase in COVID-19 mortality over the long run.²⁰ The data shows that lung disease caused by viral infections can be exacerbated and spread by air pollution. Apart from that, more than 132 000 premature deaths a year can be attributed to the epidemiology of chronic air pollution. According to the World Bank, urban air pollution may be responsible for as much as 10% of respiratory illnesses and disorders in Bangladesh.²¹ During the winter, $PM_{2.5}$ (particles with an aerodynamic diameter of 2.5 μm) concentrations averaged 165 to 175 g/m^3 , whereas during the monsoon they dropped to 30 to 35 g/m^3 . This information comes courtesy of the United States Embassy in Dhaka.²²

Discussion and Future Recommendations

Reducing air pollution is important for saving lives and protecting the environment. According to the survey conducted by the "Power and Participation Research Center (PPRC)," day labor is one of the main occupations for both urban poor men and women who work outside the office environment such as building or road construction workers, hawkers (sell goods or foods on the footpath or railway/bus stops, and so forth. in an open environment. Several health risks are connected to these works, among them lung disease is from silica dust exposure through air inhalation.²³ According to a recent study by the Dhaka Tribune, an English daily in Bangladesh, inappropriate transportation is to blame for 15% of the air pollution in Dhaka. To combat smog and dust from outdoor air "Air-and-Water Spraying Systems" can be implemented in Dhaka City. The purpose of the spraying systems, which are an essential component of longwall shearers, is to lower airborne dust concentrations in order to avoid methane explosions. The quantity of dust in the air can be significantly reduced with the use of air-and-water spraying systems.²⁴ Besides all these, due to

individual affordability and adaptability, passenger buses have become one of the most popular modes of transportation in Dhaka. Buses have the capacity to carry numerous passengers across a variety of routes at one time. Research has been conducted on outdoor air pollution caused by buses. The results showed that a lot of work needs to be done to protect public health and reduce outdoor air pollution.²⁵ With the goal of preserving environmental health, the government has been issuing regulations based on The Bangladesh Environment Protection Act, 1995. The key goal of this regulation is to reduce, control, and limit air pollution.²⁶ The possible measures that could be taken to combat air pollution in Bangladesh are—decreasing the number of times people drive, minimizing or stop using wood stoves and fireplaces, being careful not to burn rubbish, leaves, or other items in open space. Using electric or battery-powered lawn and garden tools can be an alternative choice.²⁷ Besides, tree plantation is one of the best interventions in reducing the air pollution that affects human respiratory health. Trees may improve air quality absorbing odors and pollutant gases such as nitrogen oxides (NO), ammonia (NH₃), sulfur dioxide (SO₂) and ozone (O₃) and filter particulates out of the air by trapping them on their leaves and bark. At the same time, planned urbanization may also take part in reducing air pollution, which is mostly absent in Dhaka city. Reducing unplanned daytime construction works, watering the existing trees/plants regularly, cleaning the residential and city-roads regularly should be taken under the laws, and implement strictly. In Bangladesh, what we notice is laws exist, but they are not enforced probably due to inadequate law enforcement agents or lack of willingness to implement the law or the propensity to take bribes by the law enforcement agents. “The Clean Air Bill” needs to be executed, which was created by the “Department of Environment (DoE) and the Bangladesh Environmental Lawyers Association” (BELA), where it says not to exempt public sector leaders and holds them accountable for punishment if their organization violates the law governing air pollution, with the maximum penalty being 10 years in prison, a fine, or both.²⁸ Economic incentives can be adjusted to support private-sector solutions, taking into account distributional implications, and taking advantage of how climate change policies might work together. Generating trading of emission permits may also be used during this period to maximize abatement between companies and jurisdictions.²⁹ Now-a-days, 90% of cancer cases are brought on by environmental or dietary causes. Given that the harmful health consequences of tobacco smoke and haze (smohaze) will not be preventable for billions of individuals in the coming days, the fact that >90% of deaths from lung cancer are prompted by smohaze clearly demonstrates that smohaze-induced lung carcinogenesis is the key to developing effective preventive and therapeutic strategies to tame lung cancer.³⁰ Moreover, two-thirds of the world’s population, which is already half of the population, is expected

to live in city areas by 2050. As which result, urban areas have both poverty and environmental damage, which are 2 of the most important problems the world is facing right now. It worsens poor water and air quality, a lack of water supply, waste disposal issues, and high energy use. As metropolitan areas around the world expand, effective city planning will be crucial for handling these issues as well as others in cities like Dhaka.³¹ Green technology can be a focal point in the effort to reduce air pollution. The isolation of pollutants rather than their elimination is overly emphasized by conventional approaches. For the management and remediation of contaminants in polluted locations, using genetically modified organisms for bioremediation would be a cost-effective and environmentally friendly alternative. Using recombinant DNA and RNA technology, several genetically modified microbes have been developed in recent years. These bacteria can be used to remove heavy metals and harmful compounds from contaminated locations.³² Without them, we can take other measures, like protecting our faces with masks or planting more trees. As a result of their greater exposure to these air contaminants, low-income persons are more likely to suffer from respiratory illnesses.

Conclusion

In conclusion, it is without dispute that Dhaka’s air pollution has a detrimental effect on respiratory health in Bangladesh. It is essential to take immediate action, which includes strict air quality laws, environmentally friendly urban development, and a shared commitment to more ethical behavior. We can only protect public health and guarantee a livable future for future generations through determined action.

Acknowledgements

The authors always would like to pay tribute to all the healthcare professionals who are contributing to the development of a successful healthcare strategy in Bangladesh as well as in the world.

Authors’ Contributions

TBD and AYP conceptualized and wrote the manuscript. SMRD conceptualized, revised the manuscript, and supervised the project. All the authors agreed to submit the manuscript in its current form.

Data Availability

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Ethic Statement

Not applicable.

ORCID iD

Syed Masudur Rahman Dewan  <https://orcid.org/0000-0003-1443-7150>

REFERENCES

- Dhaka Ranks World's Most Polluted City This Morning. The Business Standard. Published May 28, 2023. Accessed August 28, 2023. <https://www.tbsnews.net/bangladesh/dhaka-ranks-worlds-most-polluted-city-morning-639250>
- Air Quality in Dhaka: Air Quality Index (AQI) and PM2.5 Air Pollution in Dhaka*. IQAir; 2023. Accessed March 25, 2023. <https://www.iqair.com/bangladesh/dhaka>
- Williams A. *Where Does Bangladesh and Dhaka's Air Pollution Come From?* Smart Air; 2020. Accessed March 25, 2023. <https://smartaifilters.com/en/blog/bangladesh-dhaka-air-pollution-sources/>
- Saha CK, Hosain J. Impact of brick kilning industry in peri-urban Bangladesh. *Int J Environ Stud*. 2016;73:491-501.
- Khandker S, Mohiuddin A, Ahmad SA, McGushin A, Abelsohn A. Air pollution in Bangladesh and its consequences. Published online May 16, 2023. doi: 10.21203/rs.3.rs-1184779/v2
- Begum BA, Hopke PK. Ambient air quality in Dhaka Bangladesh over two decades: Impacts of policy on air quality. *Aerosol Air Qual Res*. 2018;18:1910-1920.
- Arnab IZ, Ali T, Shidujaman M, Hossain MM. Consideration of Environmental Effect of Power Generation: Bangladesh Perspective. *Energy Power Eng*. 2013;05:1521-1525.
- Nahar N, Mahiuddin S, Hossain Z. The severity of environmental pollution in the developing countries and its remedial measures. *Earth*. 2021;2:124-139.
- Rana MM, Mahmud M, Khan MH, Sivertsen B, Sulaiman N. Investigating Incursion of Transboundary Pollution into the Atmosphere of Dhaka, Bangladesh. *Adv Meteorol*. 2016;2016:1-11.
- US EPA, REG 01. What is PM_{2.5}? | Air Quality Planning Unit | New England | US EPA. [www3.epa.gov](https://www3.epa.gov/region1/airquality/pm-what-is.html). Published 2019. Accessed March 25, 2023. <https://www3.epa.gov/region1/airquality/pm-what-is.html>
- US EPA O. Particle Pollution and Respiratory Effects. www.epa.gov. Accessed September 15, 2014. <https://www.epa.gov/pmcourse/particle-pollution-and-respiratory-effects>
- National Nanotechnology Initiative. Size of the Nanoscale | Nano. [Nano.gov](https://www.nano.gov). Published 2019. <https://www.nano.gov/nanotech-101/what/nano-size>
- Lehotska Mikusova M, Busova M, Tulinska J, et al. Titanium dioxide nanoparticles modulate systemic immune response and increase levels of reduced glutathione in mice after seven-week inhalation. *Nanomater*. 2023;13:767.
- Lara A. *Air Pollution-Related Illness*. MSD Manual Consumer Version. University of Colorado; 2020. Accessed March 25, 2023. <https://www.msmanuals.com/home/lung-and-airway-disorders/environmental-lung-diseases/air-pollution%E2%80%93related-illness>
- Study: Unfit vehicles responsible for 15% of air pollution in Dhaka. The Dhaka Tribune. Published September 24, 2021. Accessed August 30, 2023. <https://www.dhakatribune.com/bangladesh/dhaka/259448/study-unfit-vehicles-responsible-for-15%25-of-air>
- Jiang XQ, Mei XD, Feng D. Air pollution and chronic airway diseases: what should people know and do? *J Thorac Dis*. 2016;8:E31-E40.
- Manisalidis I, Stavropoulou E, Stavropoulos A, Bezirtzoglou E. Environmental and health impacts of air pollution: A review. *Front Public Health*. 2020;8:14-13.
- Sutradhar I, Das Gupta R, Hasan M, Wazib A, Sarker M. Prevalence and risk factors of chronic obstructive pulmonary disease in Bangladesh: a systematic review. *Cureus*. 2019;11:e3970.
- Kim D, Chen Z, Zhou LF, Huang SX. Air pollutants and early origins of respiratory diseases. *Chronic Dis Transl Med*. 2018;4:75-94.
- Bernstein A. Coronavirus and Air Pollution. C-CHANGE | Harvard T.H. Chan School of Public Health. Published May 19, 2020. Accessed July 02, 2023. <https://www.hsph.harvard.edu/c-change/subtopics/coronavirus-and-pollution/>
- Khawaja M, Umer F, Shaheen N, Sherazi A, Shaheen F. Air Pollution Reduction and Control in South Asia. Sustainable Development Policy Institute; 2012. Accessed March 25, 2023. <http://www.jstor.com/stable/resrep00582.3>
- Sarwar G, Hogrefe C, Henderson BH, et al. Characterizing variations in ambient PM_{2.5} concentrations at the U.S. Embassy in Dhaka, Bangladesh using observations and the CMAQ modeling system. *Atmos Environ*. 2023;296:119587.
- Shameem N. Understanding the Plight of Day Laborers in Dhaka. Power and Participation Research Centre (PPRC); 2020. Accessed March 25, 2023. <https://www.pprc-bd.org/understanding-the-plight-of-day-laborers-in-dhaka/>
- Prostański D. Use of Air-and-Water spraying systems for improving dust control in mines. *J Sustain Min*. 2013;12:29-34.
- El Husna I, Rizal Unzilalirizqi D YE, Karyanto Y, Sunoko HR. Indoor Air Pollution in Non Ac Passenger Bus. Hadiyanto, Sudarno, Maryono, eds. *E3S Web Conf*. 2018;31:06012. doi:10.1051/e3sconf/20183106012
- SRO NO. 255-LAW/2022, ON "THE AIR POLLUTION RULES 2022", DATED 25 JULY 2022. VDB Loi; 2022. Accessed March 25, 2023. https://www.vdb-loi.com/bd_publications/sro-no-255-law-2022-on-the-air-pollution-rules-2022-dated-25-july-2022/#:~:text=SRO%20No.-
- US EPA R 01. Actions You Can Take to Reduce Air Pollution | Ground-level Ozone | New England | US EPA. www3.epa.gov. Published September 27, 2018. Accessed July 02, 2023. <https://www3.epa.gov/region1/airquality/reduce-pollution.html#:~:text=Reduce%20the%20number%20of%20trips>
- Lee D. *Bangladesh's Draft Clean Air Bill Includes Jail Time and Fines*. BreatheLife is a Climate and Clean Air Coalition Initiative; 2019. Accessed March 25, 2023. <https://www.ccacoalition.org/en/news/bangladesh%E2%80%99s-draft-clean-air-bill-includes-jail-time-and-fines#:~:text=Drafted%20by%20the%20Department%20of>
- Bangladesh Needs Urgent Actions to Curb Air Pollution. World Bank. Accessed July 02, 2023. <https://www.worldbank.org/en/news/press-release/2023/03/28/bangladesh-needs-urgent-actions-to-curb-air-pollution>
- Zhou G. Tobacco, air pollution, environmental carcinogenesis, and thoughts on conquering strategies of lung cancer. *Cancer Biol Med*. 2019;16:700-713.
- Urban Threats: Urbanization Spurs a Unique Set of Issues to Both Humans and Animals*. National Geographic; 2009. Accessed March 25, 2023. <https://www.nationalgeographic.com/environment/article/urban-threats>
- Azad MAK, Amin L, Sidik NM. Genetically engineered organisms for bioremediation of pollutants in contaminated sites. *Chin Sci Bull*. 2014;59:703-714.