



IMPACT OF AIR POLLUTION ON CHILD HEALTH IN INDIA

Dr. P. Yarram Reddy

Faculty, Department of Business Mangement
Royal School of Information and Management Sciences
Chandragiri, Tirupati, Andhra Pradesh, India

Abstract : *Air pollution is a global public health crisis, and air pollution levels in India are among the highest in the world, posing a heavy threat to the country's health and economy. According to the 2019 World Air Quality Report, India is home to 21 of the 30 most polluted cities in the world. In these cities, air quality can be as much as 10 times over the safe limits of air pollution recommended by the WHO. Recent research in epidemiological modelling reveals that air pollution affects child health in various ways resulting in low birthweight, stillbirth, preterm birth, developmental delay, growth failure, poor respiratory and cardiovascular health, and a higher risk of anemia. India has embarked on the national clean air program, but a much stronger coordinated multi-sectoral approach is required to minimize the child health burden caused by air pollution. Air pollution should be treated as a public health crisis that can only be managed with policy backed by science, gradual transition to clean energy use, emission reduction supported by clean air technologies, long-term commitment from the Government and cooperation of the citizens.*

Key Words : *Air Pollution, Child Health, Industries, Disease*

INTRODUCTION

Air pollution can be human-made or occur naturally in the environment. Human-made pollutants are caused by fossil fuel combustion, industrial manufacturing, waste-burning, dust from traffic, smoke, and exhaust from vehicles, ships and airplanes, for example. Fires from brush/forest clearing are also a major source of pollution in the form of smoke and black carbon. There are also a variety of natural causes, including volcano eruptions that emit large amounts of sulphur and other gases, and dust storms that contribute considerably to airborne particulate matter. Weather patterns can transfer pollutants, both humanmade and natural, over long distances and across regions.

Air pollution is a global health threat with 7 million deaths attributable to the joint effects of household and ambient air pollution in 2016. About 94% of these deaths occur in low- and middle-income countries. In addition, air pollution causes acute respiratory infections, blindness, heart diseases, low birth weight and stillbirth. In economics, a large body of literature attempts to document the causal impacts of pollution on different health outcomes. An overwhelming share of these studies focuses on the developed world, exploring the link between pollution and mortality or respiratory and heart-related hospitalizations. Air pollution is expected to affect child growth and development



through its impact on respiratory diseases and the loss of nutrients when fighting infectious agents. The existing literature has so far focused on estimating the correlation between child stunting and air pollution, in particular household air pollution. When assessing the link between air pollution and health outcomes, OLS estimates are likely biased due to measurement errors and omitted variables. Households are usually not randomly exposed to different levels of air pollution, in particular indoor pollution, and their exposure correlates with a multitude of factors that are also likely to impact child health. For example, the use of specific fuel types for cooking, which directly impacts air pollution levels, correlates highly with household wealth and education. Poorer households may be more likely to have both stunted children and choose free or cheap fuel sources.

OBJECTIVE

- ❖ To know the attributable major air pollutants
- ❖ To understand that many human actions cause air pollution.
- ❖ Be aware of the key terms associated with air pollution.

METHODOLOGY

The paper is solely based on secondary data. The different sources of data are journal articles, websites, e-books, reports of various organization and commission, articles published in international, national and local papers etc. This paper will give a brief description of the effect of air pollution on child health in India.

CHILD HEALTH BURDEN ATTRIBUTABLE TO AIR POLLUTION

The Global Burden of Disease (GBD) India study led by the Indian Council of Medical Research (ICMR) and the Public Health Foundation of India (PHFI) has estimated the U5MR of male and female children at the state level from 1990 to 2019. In the earlier GBD exercises, the child mortality burden attributable to air pollution was only estimated in terms of acute respiratory infection, while low birthweight was added later as another manifestation. As per records, the under-five deaths per 100,000 population attributable to air pollution in 2019. The top three states with the highest burden were Uttar Pradesh, Rajasthan and Madhya Pradesh. The states with the least burden were Kerala, Goa and Tamil Nadu. If the trends from 2000 to 2017 were to continue. India would be on track to meet the United Nations Sustainable Development Goal 3.2 target of reducing the U5MR below 25 deaths per 1000 live births by 2030. But will fall short of meeting the National Health Mission target of reducing the U5MR below 23 deaths per 1000 live births by 2025.

Fire-events and pollution

India has a substantial amount of land under cultivation (60%) and under forest cover (25%), with majority biomass burning events taking place in these areas. Over the past few decades, Indian agriculture has been marked with expansion of irrigation facilities, adoption of high yield variety seeds and increased mechanisation (like use of combine harvester). A combination of these factors led to adoption of multi-cropping system by farmers which leaves little time in between the harvest of one crop and sowing of another. In this scenario, crop residue burning thus emerged as the quickest and cheapest way to get the farm ready for the next crop. Cereals are the



prime contributor to crop burning activity in India, with rice and wheat crop residue burning forming the major chunk of residue burning process. Two major residue burning seasons are thus related to crop harvest seasons. Kharif crop harvest (rice stubble burning) which takes place in the months of October and November and rabi crop harvest (wheat straw burning) which happens in the months of March to May.

Biomass burning in India is not limited to just crop residue burning, it covers forest fires as well. Forest fires or wildfires are caused by various factors acting in conjunction with each other. These factors include availability of biomass (dry vegetation) and appropriate climatic conditions (high temperature, low pressure, windy conditions). Forest Survey of India lists vulnerable months for each state when forest fires are most likely to happen, which mainly span the high temperature months from March to June. Wildfires happen due to both intentional and unintentional human activity. In Northeastern states and in states along the Eastern Ghats, slash and burn activity is rampant wherein vegetation in forests is cut and then burned to clear the piece of land for human use. In a lot of cases unintentional human activities like leaving active cigarette butts behind in open forests lead to forest fires. Other natural factors which cause forest fires include lightening which produces a spark to start a fire in dry vegetation.

Air Quality

Air quality indicates to the condition of air surrounding us. It tells us how clean the air we breathe is. If there are more harmful things in the air, air quality is said to be bad. If there are less

harmful things in the air, we can say that the air quality is good. Air quality helps us decide whether the air is healthy or not.

Air Pollution

- ❖ Air pollution is caused when harmful gases, dust, smokes, odours or any toxic substance adversely affecting environment and health is introduced in the air.
- ❖ These harmful substances that cause air pollution are called air pollutants.
- ❖ Air pollution is generally understood in two types- indoor and outdoor.
- ❖ Indoor air pollution can be defined as the contamination of indoor air by sources like cooking fuel, construction material etc.
- ❖ Outdoor or ambient air pollution is the contamination of the air outside by “potentially harmful pollutants emitted by industries, households, cars and trucks.”

How is Air Quality Measured?

Now that the experiment is done, ask the students if it shifted their perception about air quality and pollution (especially in their immediate surroundings). Ask the students if they can think of other ways in which they "see" air pollutants.

Pose this question to them

- Just because they cannot always see the pollutants, does it mean they are not there?
- Do the students think that if the air looks clean, they are pollutant free?
- Ask them if they can use other senses besides "sight" to check for pollutants.

Now guide them through the discussion and draw their attention to the fact sometimes they may smell pollutants. Ask the students if they can smell pollutants.



Home Activity for Students

Before wrapping up the lessons on air quality and air pollution, tell the students to conduct the following experiment at home. You have already demonstrated to the students that unseen pollutants pollute the air around them. Now, draw their attention to the fact that in general the dirt around makes outside dirty and causes difficulty in breathing. Explain the following activity to them.

- ❖ The students need a damp cloth or wet tissue
- ❖ With this damp cloth/tissue they need to go out of their homes and wipe any surface. This could be a swing in your playground, your door, window glass, or anything.
- ❖ Tell them to look at this cloth and tell them to note what they noticed on the cloth. □ Tell them to repeat the exercise on some other object.
- ❖ Tell them to observe what they see on the cloth now?
- ❖ Tell them that may notice dirt on the cloth, the same dirt that is suspended in the air and pollutes it, has adverse effect on our health.

What are Air Pollutants?

Air Pollutants are present in the air as solid particles, liquid droplets or gases. These can be natural or man-made.

- ❖ If the presence of such substances is high, it can affect human health and environment. What is Particulate Matter (PM)?
- ❖ PM includes small solid or liquid matter in the earth's atmosphere.
- ❖ PM10 is particulate matter 10 micrometres or less in diameter.
- ❖ PM2.5 is particulate matter 2.5 micrometres or less in diameter.

- ❖ You can think of PM2.5 as fine particles. Human Hair is about 100 micrometres, so almost 40 fine particles could be placed on its width.
- ❖ When inhaled, particles narrower than 10 micrometres can be the most hazardous as they can enter deep into your lungs, and some can also get into your blood.

Human Action and Air Pollution

By now students should be able to recognise air pollutants and their source. To check whether students can recognise between man-made and natural sources of air pollution, pose the following quiz to them. Ask them to recognise which of these sources are the result of human action?

- Burning of fossil fuel
- Tobacco smoke
- Organic compounds from plants
- Pesticide
- Dust from Thar desert

Before wrapping up this session, ask the students to think of some daily activity they do or witness which contributes to air pollution? In this way, you can test if they can recognise local sources of pollution.

AIR POLLUTION AND HEALTH IMPACT

The students should have learnt: -

- Physiological factors that make them more vulnerable to air pollution
- Health impacts of air pollution on children's health

In the next two sections you will introduce the students to some facts and figures about outdoor and indoor pollutions, respectively.

These sections are data and information heavy. The aim of these sections is not to get the students to learn these figures. Instead, these lessons



should focus on getting the students to understand the gravity and extend to which air pollution affects people (especially children).

Some of the lessons as you proceed from here, including sections on health effects may be more difficult for students to follow or may cause them to worry excessively. Extra precaution should be taken to ensure that you do not get into too much details of these health effects. The children only briefly need to understand which parts of their body gets affected.

Why are children at higher risk?

According to a WHO report, every day around 93 percent of the world's children under the age of 15 years breathe air so polluted that it puts their health and development in serious danger. Children are at greater risk than adults from the many adverse health effects of air pollution owing to a combination of behavioural, environmental, and physiological factors. Some key reasons for this higher risk include:

1. Children are more susceptible because their lungs, brain, and immune system are still developing, and their respiratory tract is more permeable.
2. Children breathe more air per kilogram of body weight, so their exposure to air pollution is much greater than adults. The consequences of their exposure through inhalation, ingestion, or in utero can lead to illness and other lifetime health burdens.

How Air Gets Polluted?

The fossil fuel, firewood, and other things that we burn produce oxides of carbons which got released into the atmosphere. Earlier there happens to be

many of trees which can easily filter the air we breathe in. But with the increase in demand for land, the people started cutting down of trees which caused deforestation. That ultimately reduced the filtering capacity of the tree. Moreover, during the last few decades, the numbers of fossil fuel burning vehicle increased rapidly which increased the number of pollutants in the air.

Causes of Air Pollution

Its causes include burning of fossil fuel and firewood, smoke released from factories, volcanic eruptions, forest fires, bombardment, asteroids, CFCs (Chlorofluorocarbons), carbon oxides and many more. Besides, there are some other air pollutants like industrial waste, agricultural waste, power plants, thermal nuclear plants, etc.

WHAT SHOULD WE DO?

India has taken the first step in the right direction by acknowledging air pollution as a national problem, thus gathering momentum for implementing clean air action plans under the National Clean Air Program. However, this is not enough, given the magnitude of the problem. Evolve a hybrid monitoring approach for improved exposure assessment. Lack of institutional resources and financial constraints prevent India from expanding the ground-based reference grade monitoring network as per World Health Organization norms of having at least one monitor per million population. So, India can evolve a hybrid monitoring network including reference-grade monitors providing the benchmark data, satellites providing the required spatial coverage, portable sensors (after properly calibrated against reference-grade monitors) providing hyper-local information and measurements of (Particulate Matter) PM species at



strategically suited locations within air sheds. Include health as an integral part of the air pollution management system. Health, to date, is not included in the air Pollution Management plan as a core indicator. Given that children are more vulnerable to air pollution than adults, environmental policies should urgently be linked to the national health mission. Strengthen social awareness: General awareness about air pollution is still very poor outside major cities. Though the entire Indo-Gangetic plain, including the rural areas, has PM_{2.5} levels exceeding the national standards, citizens are not aware of their ill impacts. Physicians would be the ideal ambassadors for clean air advocacy. Unfortunately, most physicians in India are not aware of the multiple health hazards of air pollution beyond respiratory health.

The medical curriculum could be more inclusive of environmental health risks. Invest in air pollution epidemiology research. In the last decade, a plethora of studies came out showcasing the systemic impacts of air pollution on child (and adult) health in India. However, prospective multicentric cohorts with multi-year follow-ups are the need of the hour with a sustained funding commitment from the government. Focused capacity building promoting interdisciplinary skills. Advancing air pollution epidemiology research in India requires adequately trained human resources. To cater to the need for a focused capacity-building exercise in air pollution epidemiology.

CONCLUSIONS

The detrimental effects of air pollution on children's health are becoming increasingly salient, particularly in India, where the bad air

quality is a constant problem, exacerbated by the high prevalence of solid fuel combustion. Although the level of air pollution has reached a critical point. But there are still ways by which we can reduce the number of air pollutants from the air. The quality of air can be improved by planting more and more trees as they clean and filter the air. Strict policy for industries related to the filter of gases should be introduced in the countries. So, we can minimize the toxins released from factories. We must adopt the usage of Eco-friendly fuels such as LPG (Liquefied Petroleum Gas), CNG (Compressed Natural Gas), biogas, and other eco-friendly fuels. So, we can reduce the amount of harmful toxic gases. To sum it up, we can say that the air we breathe is getting more and more polluted day by day. The biggest contribution to the increase in air pollution is of fossil fuels which produce nitric and sulphuric oxides. But humans have taken this problem seriously and are devotedly working to eradicate the problem that they have created.

REFERENCES

1. Sagnik Dey (2022): "Impact of Air Pollution on Child Health in India and the Way Forward" *Indian Pediatr.* 2022: 59(6): 447-450. Published online 2022 Jul 5.
2. The effect of air pollution on body weight and obesity: Evidence from China *J. Dev. Econ.* (2020).
3. Brauer M. *et al.* Examination of monitoring approaches for ambient air pollution: A case study for India *Atmos. Environ.* (2019).
4. Currie J. *et al.* Air pollution and infant health: Lessons from New Jersey *J. Health Econ.* (2009).



5. Prachi Singh, Sagnik Dey, Sourangsu Chowdhury and Kunal Bali *et al.*, (2019): “Early Life Exposure to Outdoor Air Pollution: Effect on Child Health in India”. July 2019.
6. Reddy KRBK, Gupta N, Bhattacharya BG, et al. Impact of air pollution on allergic rhinitis and asthma: consensus statement by Indian Academy of Pediatrics. *Indian Pediatr.* 2021;58:765–70.
doi: 10.1007/s13312-021-2288-1.
7. De S. Long-term ambient air pollution exposure and respiratory impedance in children: A cross-sectional study. *Respir Med.* 2020;170:105795.
doi: 10.1016/j.rmed.2019.09.015.
8. Dandona R, Anil Kumar G, Henry NJ, et al. Subnational mapping of under-5 and neonatal mortality trends in India: The Global Burden of Disease Study. 2000–2017.
9. <https://idronline.org/article/health/the-impact-of-air-pollution-on-child-health/>
10. <https://www.ncdc.gov.in/WriteReadData/linkimages/IEC/TrainingManualEnglishChildren.pdf>.
11. <https://hal.science/hal-03662124/document>.
12. <https://www.sciencedirect.com/science/article/abs/pii/S0095069622000122>.
13. <https://www.toppr.com/guides/essays/essay-on-air-pollution/#:~:text=It%20is%20the%20cause%20of,cells%20in%20the%20respiratory%20system>.