Survey of Residents' Perceptions and Concerns of Air Pollution in Maharashtra, India

Siddharth Sanjeev, Junior at Livingston High School, Livingston, NJ, USA

EPH45

Background

- Air pollution is a major environmental risk factor and imposes a significant economic and health burden on countries, especially low-to-middle incomes countries (LMICs)[1].
- Particulate matter ($PM_{2.5}$) is defined as inhalable particles that are ≤ 2.5 micrometers in diameter[2].
- Research has shown that residents in LMICs are more significantly impacted by air pollution[3,4] and $PM_{2.5}$ exposure was higher in these countries relative to high-income countries[5].
- Perceptions and concerns with air pollution among residents in LMICs are important to help establish policy changes and appropriate local interventions to mitigate the negative impact of poor air quality.

Research Objective

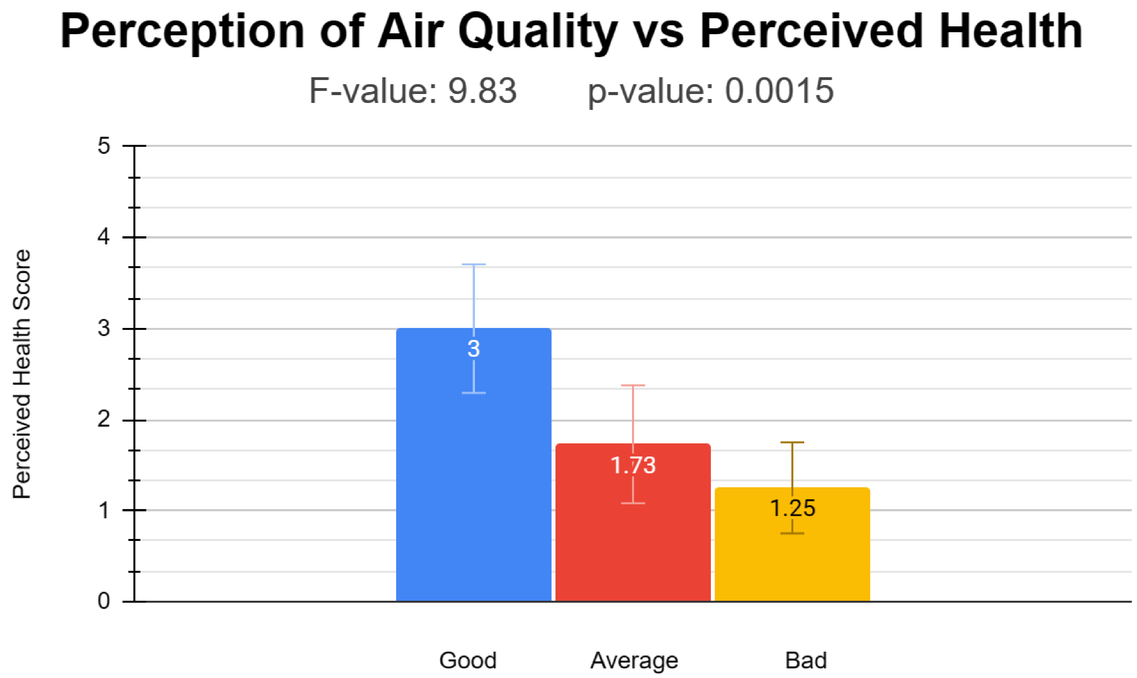
- To understand concerns and perceptions about the current air quality and pollution through a pilot survey of residents in the city of Pune, Maharashtra, India. The pilot data will be used to design studies on a larger scale in Pune and other cities in India.

Methods

- A cross-sectional study design using survey data (October 2023) on a random sample of residents in Pune, Maharashtra, India, was implemented.
- Participants' perceptions and concerns on air pollution were collected and reported descriptively using questionnaires asking about their demographics, rating of air quality, major source of air pollution, measures used to potentially reduce air pollution, current health status, and potential impact of air pollution on their health/disease and productivity.
- An ANOVA test was conducted to determine if there was a statistically significant difference between the perception of air quality (categorical) and the perceived health score (quantitative).

Results

- Most of the survey participants were greater than 60 years (n=11; 55%), predominantly male (n=16; 80%), married (n=14; 70%), and either homemakers or retired (n=10; 50%).
- Seventeen residents (85%) felt that the air quality was either average or bad and 9 residents (45%) reported air pollution to be high in summer.
- All the surveyed residents stated traffic emission to be the major source of air pollution.
- Majority of the surveyed residents perceived poor air quality to impact their productivity moderately or severely.
- Half of the residents (n=10) identified breathing difficulties as a potential impact of air pollution while lung cancer/asthma were also identified to be potentially exacerbated by 7 residents (35%).
- The graph below shows the relationship between perceived health (1=poor, 2=fair, 3=good, 4=very good, 5=excellent) and perception of air quality (good, average, bad). The numbers on the y-axis show the average score for each particular categorical group (Figure 1). A lower average health score was seen with a negative perception of air quality.



Discussion

- This pilot survey study in Pune, India, provides useful data that validates the growing issue of outdoor air pollution in LMICs.
- Outdoor air pollution has been shown to equally severe in non-urban regions similar to many urban areas in India[6].
- A systematic review in India showed short-term and long-term negative impact of ambient air pollution on health including respiratory disorders, higher rates of hospital visits, and mortality[7].
- With globalization and technological advancements, countries/regions that once were considered economically backward have started adopting policies and measures toward more industrialization and urbanization thereby providing opportunities for financial growth among the residents. This, in turn, needs to be balanced with policies and technologies to reduce smoke emissions from these industries/plants, better emission control from vehicles, and planned allocation of scarce resources toward detecting, measuring, and reducing air pollution risk factors.

Conclusions

- This survey research in a small city in India illustrates that air pollution was perceived to be either moderate or bad, traffic emission to be the major contributor to poor air quality, and impact of poor air quality on respiratory health conditions.
- Further research is warranted to educate the residents on impact of poor air quality and implement appropriate interventions to reduce air pollution.

References

1. Adekoya A, Tyagi SK, Duru CN, Satia I, Paudyal V, Kurmi OP. 2022. Effects of Household Air Pollution (HAP) on Cardiovascular Diseases in Low- and Middle-Income Countries (LMICs): A Systematic Review and Meta-Analysis. International Journal of Environmental Research and Public Health. 19(15):9298.
2. Particulate matter (PM) basics | US EPA. (n.d.). https://www.epa.gov/pm-pollution/particulate-matter-pm-basics.
3. Boogaard H, et al. Air pollution: the emergence of a major global health risk factor. Int Health 2019; 11: 417-421.
4. Gordon SB, et al. Respiratory risks from household air pollution in LMICs income countries. Lancet Respir Med 2014; 2(10): 823-860.
5. Lim S, et al. Comparing human exposure to fine particulate matter in low and high-income countries: A systematic review of studies measuring personal $PM_{2.5}$ exposure. Sci of the Total Environ 2022; 833: 155207.
6. Ravishankara AR, et al. Outdoor air pollution in India is not only an urban problem. Proc Natl Acad Sci USA 2020; 117(46): 28640-44.
7. Rajak R, Chattopadhyay A. Short and long term exposure to ambient air pollution and impact on health in India: A systematic review. Int J Environ Health Res 2020; 30: 593-617.