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Perceived Air Pollution and Health Risks: A Cross-Sectional Study in Pakistan

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Abstract

Air pollution poses a significant global health risk, yet public awareness remains limited. This study examines perceptions of air pollution and its health effects among adults in Multan, Pakistan. A cross-sectional survey was conducted using simple random sampling, with 145 participants completing a structured questionnaire adapted from Egondi et al. (2013). Data were analyzed using SPSS, applying descriptive statistics. Findings reveal that 47% of participants had a low perception of air pollution levels, while 27% rated it as average and 26% as high. Similarly, 40% had a low perception of air pollution-related health risks, with 30% perceiving them as average and 30% as high. The most commonly identified sources were industries (24%), cooking fuel (23%), dust (17%), and vehicle emissions (14%). Reported health effects included cough/cold (46%), asthma (20%), and breathing difficulties (14%), while only 2% linked air pollution to cancer. The study highlights low public awareness of air quality and its health implications, despite a highly educated sample. The findings emphasize the need for targeted awareness campaigns to improve understanding and encourage preventive actions. Policymakers and healthcare professionals can use these insights to design interventions promoting environmental responsibility. Stronger regulations and community engagement are essential to mitigate air pollution's adverse effects and enhance public health in Pakistan.

Keywords: air pollution, public perception, health risks, Pakistan, environmental awareness

Introduction

91% of the worldwide population lives in locations that outstrip the World Health Organization (WHO) guideline principles for ambient air quality, with low- and middle-income nations suffering the extreme health problem (Taunia et al., 2021). In Pakistan air pollution problem is not being noticed due to the lack of awareness among stakeholders. This lacking of awareness among stakeholders is the main reason of air pollution as well as the related adverse effects on health (Anjum et al., 2021). The rate at which urbanization and industrialization are growing has led to an increase in the amount of pollutants released into the atmosphere, which has deteriorated the quality of the air we breathe (Anwar et al., 2021). In recent decades, human beings are facing air pollution one of the most significant challenge. Air contamination has its detrimental effects on people well-being living

in polluted environment (Dastoorpoor et al., 2019). Various gases discharge and solid particles are the causes of the contamination of the indoor and outdoor air (Anwar et al., 2021). Air quality of the city area is effected by multiple sources e.g. from local sources traffic, oil smoke as well as from outside city border sources (Nawaz & Chafe, 2023). Pakistan's current air quality status is terrible since the country's air is becoming more and more burdened with dangerous toxins due to rapid urbanization and vehicle traffic (Anjum et al., 2021). Air pollution is strongly related to the cardiovascular disease (CVD) as well as respiratory tract infection (RTI) also play a role to hospitalization and deaths of the people who are suffering from cardiovascular diseases (Chen & Goldberg, 2013; Eze et al., 2014). Living in air polluted environment for long period of time is dangerous for cardiovascular system as well as it is associated to cardiovascular mortality (Bai et al., 2019). Exposer of air pollution for long time period is linked to the lungs, prostate cancer as well breast cancer (Cohen et al., 2019: Sarfraz et al., 2022). According to the World Bank (2016) and the Health Effects Institute (2019), air pollution is regarded as the fourth or fifth most significant global risk factor for death (Ahmed et al., 2023). According to WHO (2018), air haze might have contributed to about 4.2 million deaths globally in 2016. From a met analysis review of air pollution states that seven million deaths caused by all sources of air pollution in 2016, 8.8 million deaths caused by all sources of air pollution in 2019 while 8.7 million deaths caused by all sources of air pollution in 2021.The broad range of published estimates of the death toll from air pollution. Every year, between 3 million to nearly 9 million deaths are linked to outdoor air contamination. Furthermore, a countless agreement of fatalities is associated to indoor air contamination (Roser, 2023). Air pollution consists of outdoor air quality and indoor air quality which is associated with road traffic, wildfire smoke and dust (Vardoulakis et al., 2020). (Purohit et al., 2013; Bilal et al., 2021) predicts that in Pakistan with present emission control principles, air pollution will decrease human life expectancy by 2030. (Nasir & Colbeck, 2015) investigate that poverty play a significant role in indoor air pollution. Gender has significant contribution to have willingness to protect their environment. In Pakistan female are more engage in protecting environment behavior than male (Shahzad & Zaman, 2022; Sawangchai et al., 2022). Air pollutants are not only sources of health effects but it is also contributor for haze formation, smog and visibility problems in South Asia (Cohen et al., 2017). According to Kanawade et al., air pollution is not a big problem for developed countries as their economic status manage the hostile effects of air contamination as well as to adopt the new strategies for controlling air contamination. In contrast of developed countries for developing countries air pollution is a big and severe problem that not only have adverse effects on health also cause death (Kanawade et al., 2020; Anwar et al., 2021). Long time exposure of high level air pollutant increases the risk of acute and chronic diseases such as cardiovascular diseases, cancer, respiratory problems (Anwar et al., 2021). 70% of the population in Pakistan lives in rural areas, they use wood as well as agriculture waste for household fuel. The incomplete combustion of biomass fuels and the smoke resulting from these combustions are major threat for health (Colbeck & Ali, 2010). The residue of crops such as wheat, cotton, rice and sugarcane can be used for other alternate ways (rural roofing, cattle food and bioenergy) instead of burning. Burning of crops residue are main sources of air pollution, a study in Delhi reveals that after monsoon weather (October-November) crop residue burning or nonlocal fire emission is a dangerous contributor of air pollution (Kulkarni et al., 2020; Porichha et al., 2021). Therefore, the purpose of this study is to evaluate the public perception toward air pollution as well as its associated health risks. So that a plan could be formulated to increase the awareness of people about air pollution and adverse effects of the air contamination.

Method

Study Design and Procedure

This study is designed as a cross-sectional study. The participants of this study are adults above 21 years of age living in Multan city and villages. The participants are selected through random sampling. The data collection duration is from 30 October to 10 November. The researcher collect data through survey by providing informed consent to each participant. The sample size is calculated to be 145 using G power. Inclusive criteria for this study is the adult age range, educated and residential of Multan city and villages.

Instrument

The questionnaire used in this study is adopted from the study of community perceptions of air pollution and related health risks in Nairobi Slums (Egondi et al., 2013). This questionnaire consists of six questions on air pollution perception, perceived related health risks. The reliability of this measure was generated using alpha STATA command. Demographic variables include gender, age, education, residence.

Results

SPSS has been used to analyze the collected data. Descriptive statistics (frequency and percentage) have been applied to evaluate the percentage of participant's perception. This study has been conducted on a sample of 145 residents of Multan (city and village), of which 105 are male and 40 are female. Most respondents are in late adulthood age range from 29 to 49 years. About 80% of the respondents are graduated only 20% of the participants are intermediate. The sociodemographic characteristics of sample distribution is summarized in Table 1.

Table 1

Frequency and percentage distribution of the study sample

Sociodemographic	frequency	percentage
Gender		
Female	40	27.6
Male	105	72.4
Age		
22 to 28	3	2.1
29 to 35	34	23.4
36 to 42	64	44.1
43 to 49	44	30.3
Education		
Inter	28	19.3
Gradation	92	63.4
Master	25	17.2
Residence		
City	72	49.7
Village	73	50.3

The first question of the scale investigates the outdoor air pollution perception (How would you rate the quality of air in the community where you live) the response format is 4-point Likert scale (Very low, Low, High, Very high). The respondents rate the outdoor air quality as shown in Figure 1.

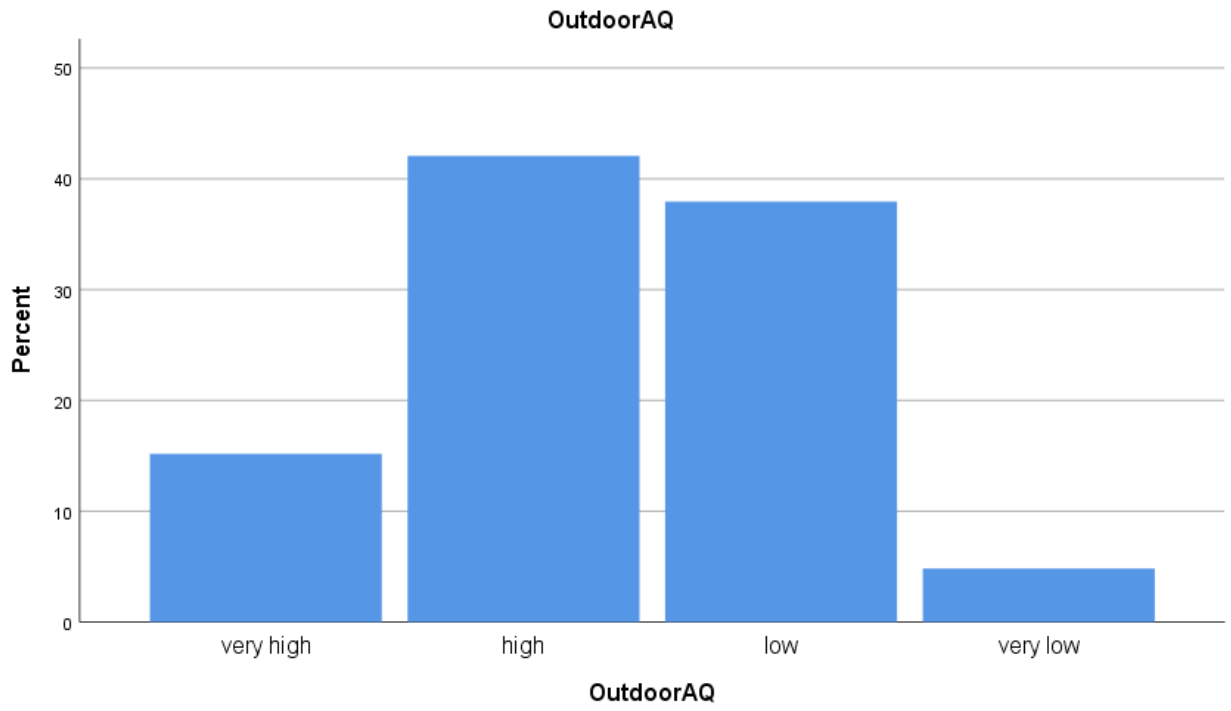

Figure 1

The Figure 1 illustrate 15% respondents perceive outdoor air quality very high, 42% participants perceived high while 38% report outdoor air quality low and 4% respondents perceive very low outdoor air quality. Indoor air quality perception is examined by (How would you rate the quality of air in your house).

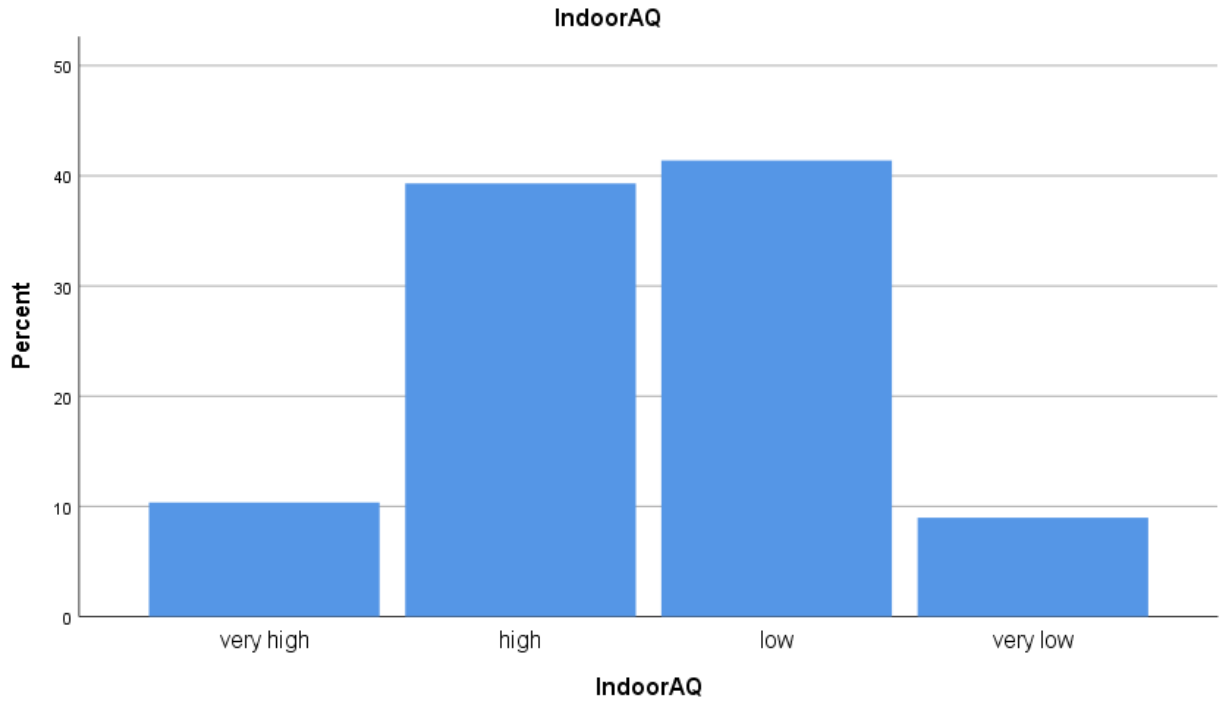

Figure 2

Figure 2 shows 10% respondents perceive indoor air quality very high, 39% reports high, 42% reports low and 9% perceive quality of air in their homes very low.

Table 2

Frequency and percentage distribution of the respondents perceived sources of air pollution and health risks

	frequency	percentage
Perceived sources of air pollution		
Outdoor air pollution sources		
Dust	25	17.2
Vehicles	20	13.8
Industries	35	24.1
Burning of trash	23	15.9
Indoor air pollution		
Cooking fuel	34	23.4
Cigarettes smoking	8	5.5
others	0	
Perceived health risks		
Cough/cold	67	46.2
Difficulty breathing	21	14.5
Eye problem	8	5.5
Asthma	29	20.0
Cancer	3	2,1
Heart problem	6	4.1
Headache	10	6.9
others	0	0

Table 2 showed that major of the people 71% perceived outdoor sources of air pollution. 24% of people perceived industries as a basis of air pollution, 17% of people perceived dust as a cause of air pollution, 15.9% report burning of trash, and 13.8% consider vehicle as outdoor sources of air pollution. 29% of people perceived indoor sources of air pollution. In which 23% perceived cooking fuel as a basis of air pollution. Participants perceived Cough/cold, asthma, breathing problems and headache as common health risk of air pollution. Only 2% of the participants perceived cancer as health risk of air pollution.

Table 3

Percentage and frequency of Perception level of air pollution

	Frequency	Percentage
Low	68	46.9
Average	39	26.9
High	38	26.2

Table 3 states that 47% of the participants have low level of perception of air pollution. 27% of the participants have average level of air pollution perception. While 26% of the participants have high level of air pollution perception.

Table 4

Percentage and frequency of perceived level of health risks

	Frequency	Percentage
Low	58	40.0
Average	44	30.3
High	43	29.7

Table 4 showed that only 40% of the participants have low level of perception of health risks of air pollution. 30% of the respondents have average level of perception of health threats of air pollution. 30% of the participants have high level of perception of air pollution associated health risks.

Discussion

Numerous studies demonstrate the opposing effects of air contamination exposure on health outc omes, which are frequently quantified as hospital admissions and fatalities (Aguilar-Gomez & Neidell, 2022). The negative consequences of air pollution is not only deaths but more than millions of people are suffering from poor health (Roser, 2023). This study aims to evaluate the level of public awareness of air quality and its associated health risks so that a plan to increase the awareness of air pollution and related health risks could be formulated (Fang & Mustique, 2024). More than half of the participants have average (27%) and high level (26%) of air quality perception. (47%) respondents have low level of perception which is supported by another study of perception of air pollution in China only 10% of the respondents identify air contamination as a problem in their city (Peng & Yang, 2019). In Columbia study 63% people perceive local air quality as fair, 20% good and 17% perceive bad (Ramirez & Franco, 2017). Qian et al., (2016) investigate that 65% of the respondents have awareness in respect to air quality and its correlated negative effects on health. 81% of the respondents are highly qualified but (47%) respondents have low level of perception of air pollution that is investigated in another study of Europe that people having high education were not aware of the actual sources of air pollution (Maione & Fuzzi, 2021). In this study above 50% of the participants reports very high and high indoor and outdoor air quality of their area, similar results have been found in a study of Nairobi Slums the participants rate indoor and outdoor air quality high (Egondi et al., 2013). Results shows that 24% of the participants perceive industries, 16% burning of trashes, 17% dust and 14% vehicles as major sources of air pollution. Similar results have been found in a study of China that investigates three major sources of air pollution are vehicles, waste burning and industries (Liao et al, 2015). A study of Europe investigate that industries and traffic are perceived as major sources of air pollution, household activities and agriculture are as the minor sources of air pollution (Maione et al, 2021). Hence, participants of this study are aware from the sources of air pollution. This study examines that 46% of the participants reports cough and cold as effects of air pollution. Another study on the students reports 40% coughing and wheezing is associated with air pollution effects (Ullah & Li, 2021). The adverse effects of air pollution breathing problems reported in this study is 14% while the study of China reports respiratory illness (95.90%) the most frequently described by the respondents (Li & Folmer, 2023). In Columbia study 90% respondents' reports respiratory disease as main health effect of air pollution. Whereas study of Malakand investigate 15%% of the students reports respiratory problems as the effect of air pollution (Ullah & Li, 2021). This study investigates that 20% of the respondents perceive asthma as adverse effect of the air pollution while (Ilyas et al., 2010) investigate that asthma, allergy and respiratory diseases are significant health effects caused by air pollution. Only 4% of the participants reports cardiovascular as the adverse heath effect of poor quality while the developed countries reports the strong significant relationship between the poor air quality and cardiovascular deaths (Khawaja et al,. 2013).

This study aligns with previous research indicating that public perception of environmental hazards, including air pollution, is often shaped by personal experiences and socio-economic factors (Batool et al., 2024) . Additionally, increasing concerns about eco-anxiety and environmental grief have been linked to climate-related changes, emphasizing the need for greater public awareness of air quality issues (Batool & Batool, 2024) . The findings highlight low public awareness of air quality and its health implications, despite a highly educated sample. Policymakers and healthcare professionals can use these insights to design interventions promoting environmental responsibility. Stronger regulations and community engagement are essential to mitigate air pollution's adverse effects and enhance public health in Pakistan.

Conclusion

A huge percentage of participants are highly educated but are not aware about the air quality in their community as they report air quality high and very high. These results show the unawareness of participants about the adverse health effects of air pollution. Anyhow, participants are aware about the sources of air pollution. Therefore, this study suggests that there is need to educate people about air pollution and its related health risks.

Implication

The results of this study might help policymakers to understand there is an urgent need for comprehensive strategies to mitigate pollution levels and promote wellbeing of people. By enhancing people's understanding of the perception of air pollution and related adverse effects, policymakers and healthcare professionals can conduct targeted interventions and campaigns to elevate awareness and collective actions. This study also enhance people's understanding about the significance of environmental policies.

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