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Perceptions and Awareness of Air Quality and Its Health Impacts in Agbarho Community, Ughelli North, Delta State

Gospel Effiong Isangadighi[1]; & Blessing Ukudo[2]

[1]Ahmadu Bello University, Zaria, Kaduna, Nigeria. [2]Department of Environmental Management and Toxicology, Federal University of Petroleum Resources, Effurun.

Corresponding Author: isangadighi.pub@gmail.com

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Abstract

Developing nations face a severe problem with air pollution since they struggle with poor levels of awareness and ineffective air pollution control approaches. Air quality in the Nigerian town of Agbarho shows rising deterioration because of the town's evolving urban and industrial sectors and growing vehicular traffic. This study evaluated community members' understanding of air pollution and their understanding of pollution origins, health implications, and reduction methods. The study employed a descriptive survey that combined questionnaire responses from randomly picked 200 residents and purposeful interviews with 10 stakeholders. The researchers used descriptive statistics in combination with correlation analysis of the chi-square tests and thematic analysis to analyse the obtained data. 82.5% of the respondents recognized air pollution, though their understanding of environmental pollution was incomplete. Open waste burning and vehicular emissions proved to be the two principal sources of air pollution. Out of all health effects reported, respiratory diseases were most commonly diagnosed (85%). Education proved to be a factor that raised awareness ($p < 0.05$), while gender distribution did not show a correlation with awareness. The high level of awareness did not eliminate existing misinterpretations between the public and policymakers, which shows that special educational campaigns with strict regulatory supervision are required. The research closes information gaps by

evaluating how the public views air quality rather than depending exclusively on measurement data. For Agbarho to reduce air pollution, the community requires enhanced environmental education services, better waste management, and stricter environmental laws.

Keywords: Air Pollution, Awareness, Perception, Health Impacts, Waste Management, Vehicular Emissions, Environmental Education, Regulatory Enforcement, Agbarho, Nigeria.

Introduction

The universal concern about environmental health and public welfare centres on air quality, as the atmosphere's poor condition directly causes respiratory infections, cardiovascular diseases and multiple severe medical problems. The World Health Organization (WHO) reports that environmental contamination ranks among the main factors leading to premature death worldwide, especially within developing countries with minimal air quality regulations (Redi, 2024). Air pollution in Nigeria keeps rising as the nation experiences fast urban growth combined with industrial progress and rising vehicle exhaust emissions. Environmental degradation arises from these elements, which negatively affects air quality and causes health problems alongside environmental deterioration (Imarhiagbe *et al*., 2024). The rapidly developing town of Agbarho within Ughelli North, Delta State, faces mounting environmental issues due to its advancing urban zones, industrial activities and increasing automotive emissions.

Air pollution is a primary environmental problem in numerous Nigerian communities. Very little research exists about how individuals in Agbarho view air quality issues and their reactions to such matters in their community. Unclear knowledge of pollution sources and their effects results in elevated human contact with hazardous substances, leading to dangerous health, respiratory and cardiovascular issues. A significant percentage of the population living in Agbarho does not understand that environmental pollution triggers basic health difficulties, including asthma, persistent cough and lung infectious diseases. Local efforts to reduce air pollution exposure are marginal because residents exhibit low environmental understanding and substandard environmental education programs. Understanding hazards leads to proper prevention measures and policy advancement initiatives. The paper studied community understanding and knowledge of air pollution conditions within Agbarho.

Research findings discovered what people know about air quality awareness while suggesting ways to improve these understanding levels and their effects on environmental and public health results. Public health officials, environmental agencies, and policymakers must utilise knowledge about resident air quality attitudes to establish specific intervention programs that minimise people's contact with dangerous pollutants. The results enhance existing research on environmental consciousness and public health practices in Nigeria. Research repeatedly assesses atmospheric pollution through contamination measurements but lacks sufficient examination of human perception towards environmental poisons and their associated consequences. The findings of this research support the creation of awareness programs and community initiatives which strive to improve air pollution management behaviour.

Objectives of the Study

The specific objectives of this study were:

i. To assess public awareness of air quality issues in Agbarho.
ii. To examine the community's perceived health effects of air pollution.
iii. To explore public attitudes and responses to air pollution and its risks.

Overview of Air Pollution

Air quality refers to the state of the air in a given environment, measured by the concentration of pollutants such as particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), nitrogen oxides (NO_2), sulphur dioxide (SO_2), and volatile organic compounds (VOCs). When these pollutants exceed safe levels, air quality deteriorates, harming human health and the environment. Air pollution is the introduction of harmful substances into the atmosphere, resulting from human activities and natural processes. In urban areas, major sources of air pollution include industrial emissions, vehicle exhaust, open waste burning, and deforestation. Poor air quality is a major contributor to respiratory diseases, heart conditions, and environmental degradation (Redi, 2024; Imarhiagbe *et al*., 2024).

Broadly, sources of air pollution are categorised into natural and man-made sources. The natural causes include volcanic eruptions, wildfires, dust storms and plant emissions. Human-made pollution sources dominate the air pollution levels compared to natural sources in metropolitan areas (Abulude *et al*., 2024 & Choksi *et al*., 2024). Natural sources cannot compete with the pollution level generated by activities that humans create through industry regulations and the management of agricultural operations, domestic waste releases, and vehicle transportation activities. Nigeria's air pollution sources include gas-flaring, road traffic movements, and open waste-burning practices (Saxena, 2025 & Zhu *et al*., 2025).

Exposure to air pollution leads to multiple adverse health problems that appear quickly and develop slowly (Chen *et al*., 2024). Air pollution causes short-term effects, producing eye discomfort, coughing, wheezing, breathlessness, dizziness, and headaches (Nguyen *et al*., 2024; Krismanuel & Hairunisa, 2024). People who remain exposed to air pollution face an increased probability of developing bronchial diseases along with lung cancer and cardiovascular conditions, which shorten their expected lifespan (EL-Pateh, 2024 & Chavan *et al*., 2024). Understanding air quality at the public level consists of how well people grasp pollution origins alongside the related health problems and proper solutions to prevent them. Anokye *et al*. (2024) & Frazenburg *et al*. (2024) established that nations in the developing world, including Nigeria, do not understand air pollution risks. Scarce environmental education programs, weak regulatory supervision, and minimal government-sponsored public awareness programs typically cause this situation.

Theoretical Frameworks

The theoretical framework for this study is based on Environmental Perception Theory and Risk Perception Theory, which explain how individuals understand and respond to environmental risks such as air pollution.

Environmental Perception Theory: According to the Environmental Perception Theory, human perspectives about environmental issues derive from their life experiences, cultural context, and information they encounter (Landwehr, 2024). Direct contact with environmental pollutants, such as inhalation of waste, fire, smoke, or dust from roads without pavement, allows people to understand pollution as a serious issue better (Penumantra *et al*., 2024 & Fang *et al*., 2024). Educational levels jointly determine perception through their ability to raise environmental awareness, leading people to support improved air quality standards. This explanation offers intuitive insights into understanding the factors determining how the residents of Agbarho can recognise pollution in their environment. Direct contact with pollution generated by industrial activities, vehicular emissions and waste-burning activities creates heightened concern about air quality among affected individuals. The research explores how educational background, occupational type, and personal exposure to pollution affect the awareness and reception of air quality in Agbarho.

Risk Perception Theory: According to the Risk Perception Theory, people determine environmental risks by considering their personal safety concerns, information from media outlets and their faith in government institutions rather than scientific data alone. People who experience respiratory problems, eye irritation, and health conditions related to pollution usually view air pollution risks seriously (Tanveer *et*

al., 2024). In contrast, others who do not observe direct health consequences tend to undervalue its effect. People become more likely to make pollution demands when direct threats are experienced and when they doubt political entities are actively responding to the problem. The psychological interaction test explains the divergent views of Agbarho residents concerning severe air pollution responding differently. The research examines if people who experience health problems because of pollution show a greater understanding of air quality conditions. The research investigates both environmental policy distrust and the impact of limited informational media on public understanding of air pollution issues.

Research Methodology

The research used descriptive survey methods to investigate how residents of Agbarho in Ughelli North, Delta State, view air quality levels. The study used questionnaires and semi-structured interviews as its data collection methods. Semi-urban Agbarho in Delta State was chosen as the study area because the town experiences growing air pollution from car emissions, industrial activities, and open waste disposal practices. The research population consisted of adults who exceeded 18 years of age, and the sample dimensions were calculated using Yamane's formula. Random sampling methods were adopted in the selection of 200 respondents. At the same time, interviews were conducted with 10 key informants, including community leaders, health officials, and environmental officers. The professional questionnaire included a demographic section followed by an air quality awareness assessment, health-related perceptions, and respondents' air quality management attitudes. Additional data collection through Key Informant Interviews completed the research findings. The research instruments received expert evaluation from public health and environmental specialists before a pilot test involving 20 participants to test clarity and consistency. The study analysed reliability through Cronbach's Alpha measurement, confirming sufficient consistency when the score reached 0.7 or higher. The research analysis used descriptive statistics, including frequencies, percentages, and mean values, alongside standard deviation results in combination with Chi-square tests to investigate relationships between different variables. Thematic analysis was performed to interpret qualitative interview results. The Chi-square statistic was evaluated. The study followed ethical procedures by obtaining consent, protecting respondents' confidentiality, and allowing individuals to participate freely while obtaining proper community authorisations. This combination of methodological techniques delivered thorough information about Agbarho residents' understanding and interpretations of air quality, thus serving as a conceptual foundation for epidemiological and environmental regulatory plans.

Results

A. Socio-Demographic Characteristics of Respondents

Table 1: Demographic Characteristics of Respondents

Variable	Category	Frequency (n = 200)	Percentage (%)
Gender	Male	105	52.5%
	Female	95	47.5%
Age (Years)	18 – 30	58	29.0%
	31 – 45	75	37.5%
	46 – 60	42	21.0%
	Above 60	25	12.5%
Education Level	No Formal Education	15	7.5%
	Primary School	35	17.5%
	Secondary School	80	40.0%
	Tertiary Education	70	35.0%
Occupation	Civil Servant	40	20.0%
	Trader	60	30.0%
	Artisan	55	27.5%
	Student	30	15.0%
	Unemployed	15	7.5%

B. Awareness of Air Quality Issues

Table 2: Awareness of Air Quality Issues

Question	Yes (%)	No (%)	Unsure (%)
Have you ever heard of air pollution?	165 (82.5)	25 (12.5)	10 (5.0)
Do you know the major causes of air pollution?	140 (70.0)	45 (22.5)	15 (7.5)
Do you believe air pollution affects health?	180 (90.0)	10 (5.0)	10 (5.0)

C. Perceived Sources of Air Pollution in Agbarho

Table 3: Major Sources of Air Pollution

Source of Air Pollution	Frequency	Percentage (%)
Open Waste Burning	150	75.0%
Industrial Emissions	95	47.5%
Vehicular Emissions	120	60.0%
Dust from Unpaved Roads	80	40.0%
Gas Flaring	65	32.5%

D. Perceived Health Effects of Air Pollution

Table 4: Perceived Health Effects of Air Pollution

Health Effect	Frequency	Percentage (%)
Respiratory Problems (Cough, Asthma)	170	85.0%
Eye Irritation	110	55.0%
Skin Irritation	80	40.0%
Headaches & Fatigue	90	45.0%

Table 5: Chi-Square Test Results

Variable	Chi-Square Value (χ^2)	df	p-value
Awareness vs. Education Level	10.245	3	0.016*

(Significant at $p < 0.05$)

Table 6: Correlation Analysis (Awareness vs. Perception of Air Pollution Effects)

Variables	Pearson Correlation (r)	p-value	Significance
Awareness vs. Perception	0.231	0.0206	Significant ($p < 0.05$)

Table 7: Regression Analysis (Education Level → Awareness of Air Pollution)

Predictor	Beta (β)	Standard Error	t-value	p-value
Education Level	Positive	-	-	$p < 0.05$ (Significant)

Table 8: Independent T-test for Awareness Differences by Gender

Gender	Mean Awareness Score	t-statistic	p-value	Significance
Male	2.79	-0.810	0.420	Not Significant
Female	2.93			

Table 9: Thematic Analysis of Interview Responses

Theme	Key Findings	Representative Quotes
Air Quality Concerns	Many respondents expressed concerns about increased air pollution from waste burning, traffic emissions, and industrial activities.	*"We burn waste daily because there is no proper waste disposal system."* – Community Member.
Health Effects	Health officials noted a rise in respiratory issues, particularly among children and the elderly.	*"We have seen more cases of asthma and chronic cough in recent years."* – Health Officer.
Lack of Government Regulation	Community leaders mentioned the absence of strict policies to regulate air pollution.	*"There is no serious enforcement of environmental laws here."* – Community Leader.
Public Awareness Gap	Some residents lacked detailed knowledge about air pollution sources and effects.	*"I know pollution is bad, but I do not understand how it affects my health."* – Resident.
Call for Action	Respondents suggested awareness campaigns and stricter environmental policies.	*"We need government intervention to stop indiscriminate waste burning."* – Local Activist.

Discussion

The study involved 52.5% male and 47.5% female participants, thus demonstrating balanced gender inclusion. The findings revealed that the 31–45 age bracket comprised 37.5% of respondents, with 18–30 years (29.0%) and less than 12.5% of those over 60 years. The findings align with Ojo *et al*. (2025), who concluded that the population structure of Nigerian semi-urban communities shows that young working people constitute most of the population because older residents migrated from rural areas to seek economic possibilities. The survey participants possessed secondary education levels at 40%, with 35% having completed tertiary education. The population's literacy levels are acceptable, as 40% have secondary education, but gaps in knowledge exist because 17.5% ended their education at the primary level, and 7.5% did not attend school. A Port Harcourt and Lagos-based study by Azunwo (2025). confirms that people with higher educational attainment demonstrate better environmental knowledge. The study findings align with Brahma (2025), who reported that the ability to read and understand enables people to fully comprehend environmental problems, which leads them to take proactive actions for protection. Among the respondents, 30% worked as traders, while artisans comprised 27.5% and civil servants constituted 20%. Air pollution in the region stems from the overwhelming presence of informal jobs such as trading and artisanal work since these activities include roadside vending

and small-scale manufacturing processes, both of which create pollution and are affected by it.

According to the study findings, 82.5% of people understood the presence of air pollution, yet 70% could correctly identify its fundamental sources, and 90% believed it had health consequences. The observed awareness level of air pollution contrasts rural Nigerian areas such as those studied by Nassikas *et al*. (2025) and Faherty *et al*. (2025) because it is higher in this community. People in Agbarho display high environmental pollution awareness because the community is close to industrial zones and encounters direct pollution through motor vehicle exhausts and trash fires. The public requires more educational programmes because 22.5% of the respondents did not recognise pollution sources, and 5% did not link pollution to health implications. People living in urban cities like Lagos have higher awareness levels when directly encountering air pollution emission points (Abulude *et al*., 2024 & Umunna, 2024). Despite their strong knowledge base about air quality, Agbarho residents need specific awareness programmes to correct misunderstandings about invisible air pollutants, including PM2.5, along with misconceptions.

People measured open waste burning as the leading cause of air pollution at 75%, vehicular emissions at 60%, and industrial emissions at 47.5%. The results confirm findings from EL-Pateh (2024), Hassan (2024), Ajayi *et al*. (2025), and Abulude (2024) that waste incineration alongside traffic pollution generates the most severe air quality problems in Nigerian cities. The high number of residents conducting open waste burning reveals inadequate waste disposal infrastructure since it forces citizens to burn their waste, leading to harmful pollution involving CO, SO_2, and PM_{10} particulate emissions. Agbarho displays a different air pollution pattern from Port Harcourt since its pollution sources combine industrial emissions with local waste disposal practices and transport-related emissions. The dust from unpaved roads represents a major pollution source, demonstrating the need for improved infrastructure since urban planning programmes must address this challenge to decrease air pollution.

Most survey participants linked respiratory issues to air pollution at an 85% rate, while eye irritation occurred in 55% of respondents and headaches and skin irritations registered at 45% and 40%, respectively. Research studies worldwide demonstrate that continuous contact with air contaminants can make people more susceptible to asthma, bronchitis, and various respiratory illnesses (Chen *et al*., 2024 & Nguyen *et al*., 2024). The lower percentage of reported respiratory issues in Agbarho compared to the 90% observed in Port Harcourt indicates that air pollution so far does not affect residents to the same extent, yet the dangers persist. The research findings support Frazenburg *et al*. (2025), Krismanuel & Hairunisa (2024) and Chavan *et al*. (2024), who reported that vulnerable groups, including children and elderly persons, bear the most

consequences from contaminated air. According to eye and skin irritation reports such as Choksi *et al*. (2024), the combination of gaseous and particular air pollutants in Agbarho demands stronger pollution regulations.

The Chi-square test ($\chi^2 = 10.245$, $p = 0.016$) found that education level demonstrates a vital connection to air pollution awareness. Research findings show that education helps create greater environmental knowledge, enabling people to detect pollution origins, consequences, and solutions (Lin et al., 2025 & Tunçay et al., 2025). The identification warrants implementing environmental education classes in educational programmes across schools to sustain awareness development. Despite being weak, a positive relationship existed between awareness and perception of air pollution effects ($r = 0.231$, $p = 0.0206$). Growing awareness about pollution demonstrates minimal impact on perception, while actual health problems due to pollution remain the main determining factor in perception accuracy. Research has proven that the perception of people living in polluted areas originates from their direct exposure instead of theoretical knowledge. The combination of educational training and real-life demonstrations should be used to build stronger knowledge about air quality. The statistical evaluation implied that education level predicted air pollution awareness at p less than 0.05 significance levels. These findings aligned with Anokye *et al*. (2024), & Obiagu *et al*. (2024), whose reports revealed that levels of education beyond secondary school help people better understand environmental issues and make proper decisions about them. Policymakers need to develop educational initiatives about air pollution knowledge because they should particularly target demographics with minimal formal education completion.

Research results demonstrated that awareness levels remained consistent between male and female participants ($p = 0.420$). The findings demonstrate gender equality in environmental education exposure according to urban Nigerian studies (Ekwesaranna et al., 2025 & Onyike, 2025). The researchers could not conduct the ANOVA test on age-related awareness distribution because certain age categories did not have enough participants. Researchers should conduct future assessments of air pollution awareness to determine age-related factors using a bigger sample pool that represents a wide range of ages.

Conclusion

The research conducted in Agbarho found that citizens demonstrated basic awareness of air pollution but lacked specific understanding regarding pollution origin points and medical consequences. Education influenced greater awareness levels among respondents, although gender disparities showed no meaningful statistical difference. Residents reported open waste fires, vehicular exhaust emissions, and industrial pollution as the dominant polluters, while respiratory issues stood as the leading health

problems. According to these results, knowledge levels about air pollution showed an insufficient association with public perception of air pollution-related risks. These results underline the critical requirement for superior environmental teaching methods, stronger policy implementation, and sustainable waste management practices to reduce air contamination and its health consequences.

Recommendations

Protective education about pollution origins and damage control methods must be increased through programmes across communities' schools and healthcare facilities. A combination of waste management policies featuring collection services and recycling protocols should be enforced to minimise open burning incidents. Regulatory agencies require enhanced authority to monitor vehicle and industrial emissions by requiring emissions tests followed by penalties for non-complying entities. Implementing road paving alongside afforestation projects must be recognised as a necessary investment to decrease dust pollution. The primary objective of health interventions must consist of identifying and treating pollution-induced medical conditions, particularly for those groups who need greater protection. Environmental policy development must actively involve communities because it leads to operations that preserve sustainable air quality standards.

Additional research must use actual measurements of $PM_{2.5}$ and PM_{10} particulates from the air to confirm residents' reported knowledge about air quality. Continuous tracking of pollution exposure effects throughout several years will strengthen public health policies. The analysis of rural and urban areas would reveal the differences in how people perceive and handle pollution situations. Permanent residents of Agbarho and similar areas need socio-economic assessments that show how pollution levels affect income and financial security. Agbarho's air pollution resolution needs governmental agencies, researcher support, industrial parties, and local community involvement. Plant-wide environmental regulations, broad public education initiatives, and sustainable waste management protocols will lead to major pollution risk reductions and health improvements. The protection of environmental cleanliness is necessary for the long-term maintenance of socioeconomic stability while ensuring quality lifestyles and sustainable environments, hence demanding immediate action over pieces of optional advice.

Ethical Clearance

The research adhered strictly to ethical guidelines and standards to maintain integrity and credibility. Participants were informed of the study's purpose, and written consent was obtained before data collection.

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Conflict of Interest
The authors declare that they have no conflict of interest.

Availability of Data and Materials
The datasets generated and analyzed during the current study are available upon reasonable request from the corresponding author. All materials used have been appropriately cited and referenced.

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