Pollution Levels and Knowledge, Attitudes, and Practices (KAP) on Air Pollution among Residents of Ebocha and Obrikom, Rivers State, Nigeria

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ABSTRACT

Air pollution is a major environmental health concern in Nigeria's Niger Delta, where gas flaring and oil-related activities heighten community exposures. This study assessed both ambient air quality and the knowledge, attitudes, and practices (KAP) of residents in Ebocha and Obrikom, Rivers State. Over seven weeks during the rainy season (April–May 2025), concentrations of $PM_{2.5}$, PM_{10}, O_3, CO, NO_2, and SO_2 were measured using portable air quality monitors and compared with World Health Organization (WHO, 2021) guidelines. Mean concentrations were $PM_{2.5}$: 8 µg/m³, PM_{10}: 25 µg/m³, O_3: 35 µg/m³, CO: 317 µg/m³, NO_2: 30 µg/m³, and SO_2: 5 µg/m³—all well within permissible limits and lower than values commonly reported in Nigerian urban centers. Alongside monitoring, a structured KAP survey was conducted among 187 respondents (98 in Ebocha and 89 in Obrikom). Awareness of air pollution was high (84%), and all respondents acknowledged health and environmental consequences. However, only 42% considered it a serious threat, and just 58% expressed willingness to act. Gender differences were evident: women reported higher daily exposure, while men were more likely to consider relocation or activism. These findings point to a gap between awareness and effective action, shaped by socioeconomic and cultural factors. Sustained year-round monitoring and community-based interventions are needed to reduce long-term risks in the Niger Delta.

Keywords: Air pollution, Niger Delta, Gas flaring, Knowledge, Attitudes, and Practices (KAP), Environmental health

INTRODUCTION

Air pollution is now recognized as one of the most serious global health risks, responsible for millions of premature deaths annually. According to the World Health Organization (WHO, 2024), pollutants such as fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), and carbon monoxide (CO) are strongly linked to respiratory and cardiovascular diseases. In Nigeria, the Air Quality Life Index (AQLI, 2025) ranks air pollution as the third leading external threat to life expectancy, underscoring its national importance.

The Niger Delta presents a unique case where environmental and social risks intersect. Communities such as Ebocha and Obrikom in Ogba Egbema Ndoni Local Government Area host multinational oil operations and continuous gas flaring. While oil extraction offers limited economic benefits, it has long contributed to visible and felt environmental degradation: black soot coating homes, reduced farm yields, and contamination of rivers and streams. For residents who depend on farming and fishing, the combination of industrial emissions and weak adaptive capacity makes exposure especially severe.

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Most Nigerian air quality research has focused on major cities, documenting frequent exceedances of WHO guidelines (Odubanjo et al., 2024; Arifalo et al., 2025). Studies in smaller towns have highlighted links between indoor and outdoor pollution, poor waste management, and heavy reliance on biomass fuels (Basil *et al*., 2024; Lala *et al*., 2025). Yet relatively little is known about rural oil-producing areas and how communities perceive and respond to pollution risks. This study addresses that gap by combining direct air quality measurements with a KAP survey in Ebocha and Obrikom.

LITERATURE REVIEW

Air quality studies across Nigeria consistently show dangerous levels of pollutants. Odubanjo *et al.* (2024) reported persistent exceedances of WHO $PM_{2.5}$ thresholds in Lagos, Abuja, and Benin. Arifalo et al. (2025) found that even semi-urban Ekiti State experienced indoor and outdoor conditions that posed health risks. Industrial activity in manufacturing zones has been highlighted as a key driver of particulate emissions (Lala *et al*., 2025). Basil *et al*. (2024) further demonstrated how seasonal variation plays a role, with higher pollution in the dry season than during rains.

Although monitoring data provide important baselines, they say little about how people perceive pollution or act in response. KAP studies help fill this gap, revealing that awareness of risks does not always translate into protective behavior. Atuyambe *et al*. (2024) noted that in rural African settings, households may understand pollution sources yet continue harmful practices due to economic necessity. In the Niger Delta, residents often witness visible smoke or gas flares but lack information on long-term health effects, leading to a normalization of pollution. Weak regulatory enforcement, despite policy reforms such as the adoption of ECOWAS fuel standards (Reuters, 2024), contributes to a sense of powerlessness.

Most air quality studies in Nigeria emphasize urban contexts, while rural oil-producing communities remain understudied. Without understanding both measured exposure and local perceptions, interventions risk being ineffective. This study therefore combines objective monitoring with KAP analysis to provide a fuller picture of air pollution risks in Ebocha and Obrikom.

METHODOLOGY

The study took place in Ebocha and Obrikom, two communities about 10 km apart, both hosting AGIP oil facilities and continuous gas flaring. Ebocha is mainly a settler community, while Obrikom is predominantly indigenous.

Air quality monitoring was conducted for seven weeks during the rainy season (April–May 2025). Portable devices measured $PM_{2.5}$, PM_{10}, O_3, CO, NO_2, and SO_2 in line with WHO (2021) guidelines. Daily averages were calculated for 24-hour pollutants, and maximum daily values were used for 1- and 8-hour limits.

The KAP survey included 187 respondents (98 in Ebocha, 89 in Obrikom), selected using Yamane's formula at 95% confidence. Structured questionnaires captured socio-demographic data and KAP responses. Literate respondents self-administered questionnaires, while trained assistants interviewed non-literate participants. Ethical approval was granted by the Rivers State Ministry of Environment.

Data were analyzed using descriptive statistics and chi-square tests, with significance set at $p < 0.05$.

RESULTS

Ambient air monitoring showed pollutant levels well within WHO guidelines (Table 1). $PM_{2.5}$ averaged 8 $\mu g/m^3$, PM_{10} averaged 25 $\mu g/m^3$, O_3 averaged 35 $\mu g/m^3$, CO averaged 317 $\mu g/m^3$, NO_2 averaged 30 $\mu g/m^3$, and SO_2 averaged 5 $\mu g/m^3$.

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Table 1. Air Pollutant Concentrations and Comparison with WHO Guidelines

Pollutant	Mean ± SD (µg/m³)	WHO Guideline	Interpretation
$PM_{2.5}$	8 ± 1.8 (24h)	15 (24h)	Safe
PM_{10}	25.3 ± 5.1 (24h)	45 (24h)	Safe
O_3	34.6 ± 6.6 (8h)	100 (8h)	Safe
CO	316.7 ± 104.1 (8h)	4000 (8h)	Very low
NO_2	29.7 ± 23.5 (1h)	200 (1h)	Safe
SO_2	5.4 ± 1.1 (24h)	40 (24h)	Very low

Table 2. Demographic characteristics of respondents in Obrikom and Ebocha (n=187)

Variable	Total %	Male %	Female %	Chi-square (p)
Age (yrs)				
18–29	27.0	58.0	42.0	
30–39	31.0	62.0	38.0	
40–49	20.0	61.0	39.0	p>0.05
50–59	9.0	45.0	55.0	
≥60	13.0	70.0	30.0	
Education				
Primary	17.0	42.0	58.0	
Secondary	44.0	61.0	39.0	p>0.05
Diploma	19.0	59.0	41.0	
Bachelor+	14.0	67.0	33.0	
Occupation				
Student	18.0	65.0	35.0	
Employed	29.0	66.0	34.0	p<0.05
Self-employed	32.0	55.0	45.0	
Others	21.0	52.0	48.0	
Fuel type				
Gas	30.0	62.0	38.0	
Variable	Total %	Male %	Female %	Chi-square (p)

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Electricity	32.0	45.0	55.0	p<0.05
Firewood/Stove	12.0	60.0	40.0	
Multiple	26.0	68.0	32.0	
Religion				
Christianity	96.0	59.0	41.0	
Islam	4.0	52.0	48.0	p>0.05

Table 3. Respondents' knowledge of air pollution (n=187)

Knowledge Indicator	Total %	Male %	Female %	Chi-square (p)
Heard about air pollution (Yes)	84.0	60.0	40.0	p>0.05
Could explain meaning (Yes)	55.0	58.0	42.0	p>0.05
Main perceived causes				
– Gas flaring	51.0	57.0	43.0	p<0.05
– Firewood	23.0	38.0	62.0	p<0.05
– Vehicular emissions	15.0	72.0	28.0	
Believe air pollution has consequences	100.0	100.0	100.0	–
Consider air pollution a serious problem	42.0	63.0	37.0	p<0.05

Table 4. Respondents' attitudes and practices toward air pollution (n=187)

Indicator	Total %	Male %	Female %	Chi-square (p)
Concerned about air pollution (Yes)	51.0	60.0	40.0	p<0.05
Daily exposure to air pollution	28.0	45.0	55.0	p<0.05
Reported health effects (respiratory)	18.0	47.0	53.0	p<0.05
Consider relocation due to pollution (Yes)	31.0	49.0	51.0	p<0.05
Believe it's important to reduce pollution	96.0	59.0	41.0	NS
Waste disposal methods				
– Burning	22.0	67.0	33.0	
– Collection	26.0	62.0	38.0	p>0.05
– Landfilling	25.0	54.0	46.0	
Sign of worsening pollution: visible smoke	70.0	61.0	39.0	p>0.05

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Indicator	Total %	Male %	Female %	Chi-square (p)
Willing to take personal action (Yes)	58.0	62.0	38.0	$p<0.05$
Main precautions				
– Protests/activism	44.0	57.0	43.0	
– Avoid burning	16.0	50.0	50.0	
– Awareness creation	13.0	62.0	38.0	

Survey results (Tables 2–4) highlighted key demographic and KAP patterns. Respondents were mostly young adults (18–39 years), with secondary education as the most common attainment. Men accounted for 58% of the sample. Gas and electricity were the main household fuels, but 12% still used firewood.

Awareness of air pollution was high (84%), though only 42% considered it a very serious problem. Gas flaring (51%), firewood cooking (23%), and vehicle emissions (15%) were identified as the main causes. All respondents recognized pollution's consequences, but only 58% were willing to take personal action.

Attitudes and practices varied: Obrikom respondents expressed greater concern (65%) than those in Ebocha (36%). Women reported more daily exposure, while 18% of all respondents linked air pollution to respiratory health issues. Nearly one-third (31%) had considered relocating. Waste management practices were mixed, with burning (22%), collection (26%), and landfilling (25%) all reported. Protest and activism were the most common protective measures (44%).

DISCUSSION

The study revealed a significant paradox. Even though the pollutant levels measured during the rainy season fell below the WHO thresholds, the community's perceptions and reported experiences reveal ongoing concerns and a sense of vulnerability. This disconnect indicates that simply monitoring air quality isn't enough to capture the psychological and experiential aspects of pollution exposure in oil-producing communities.

Awareness of air pollution was notably high, with 84% of people acknowledging it, which aligns with findings from other Nigerian KAP studies (Oluoha *et al.*, 2023; Akinola *et al*., 2023; Odubanjo *et al*., 2024;). However, less than half of the respondents (42%) viewed air pollution as a very serious issue. This trend highlights how prolonged exposure in industrialized rural areas can lead to a normalization of risk, which in turn diminishes the perceived urgency for taking action (Atuyambe *et al.*, 2024).

Crucially, while knowledge about air pollution was sufficient, the translation of that knowledge into proactive behavior was lacking as only 58% of individuals expressed a willingness to take personal action. This gap between awareness and actual practice emphasizes the need for targeted, practical interventions. The KAP results provide a clear evidence base for designing locally relevant interventions. First, since knowledge of pollution sources was highest for gas flaring (51%) and firewood use (23%), education programs should focus on linking these recognized sources with tangible health risks and practical mitigation measures. For example, targeted community workshops could demonstrate how daily domestic activities, such as cooking with wood or burning waste contribute to indoor air pollution and respiratory illnesses.

Secondly, energy promotion efforts should leverage the finding that a significant proportion of households already use gas (30%) or electricity (32%), while 12% rely on firewood and 26% use multiple fuels. This mixeduse pattern suggests an opportunity for energy transition campaigns emphasizing affordability, safety,

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and availability of cleaner fuels. Subsidy schemes or microcredit for clean energy devices could make adoption sustainable, especially for lower-income and female-headed households.

In addition, since protest and activism were the most common protective actions (44%), interventions could build on this civic engagement by promoting community-led environmental monitoring and advocacy training. Empowering local groups to collect and report pollution data can strengthen accountability while translating awareness into organized, constructive action rather than confrontational resistance.

The KAP results offer a solid foundation for creating interventions that truly resonate with local communities. To start, since people are most aware of pollution sources like gas flaring (51%) and firewood use (23%), education programs should aim to connect these known sources to real health risks and practical ways to reduce them. For instance, community workshops could show how everyday activities like cooking with wood or burning waste can lead to indoor air pollution and respiratory issues.

Additionally, energy promotion initiatives should take advantage of the fact that a notable number of households are already using gas (30%) or electricity (32%), while 12% still depend on firewood and 26% utilize a mix of fuels. This blend of energy sources presents a great chance for campaigns focused on transitioning to cleaner energy, highlighting affordability, safety, and the availability of better fuel options. Implementing subsidy programs or microcredit for clean energy devices could help make this shift sustainable, particularly for lower income families and those led by women.

It's important to highlight the community differences between Obrikom and Ebocha. People from Obrikom showed a higher level of concern about environmental issues, with 65% expressing worry, compared to just 36% from Ebocha. This could be linked to the more noticeable flaring activity or different experiences with pollution. It really emphasizes the need for tailored messaging that resonates with local contexts. Environmental communication should tap into the lived experiences of these communities using visual signs like flares and smoke and weave in their stories that connect pollution to their health and livelihoods.

Waste disposal behaviors clearly demonstrate the disconnect between environmental knowledge and practical action. While an impressive 96% of respondents acknowledged the importance of reducing pollution, a significant number still resorted to open burning, at 22%. This isn't just a matter of ignorance; it points to deeper structural issues like the lack of formal waste collection services, unreliable electricity, and limited access to affordable alternatives. To make a real impact, interventions need to blend awareness campaigns with practical solutions like setting up community waste collection points and enforcing laws against burning waste.

The rise of activism and protests points to a deeper issue with governance. In the Niger Delta, environmental movements often stem from a lack of faith in regulatory bodies (Okafor & Etemire, 2024). While activism can shine a light on these issues, real progress hinges on the transparent enforcement of anti-flaring regulations, ongoing monitoring, and stronger partnerships among the government, industry, and local communities. Moreover, even though pollutant levels were found to be low during the rainy season, the ongoing and cumulative exposure particularly in the dry season poses a serious health risk (AQLI, 2025; Basil *et al.*, 2024). Therefore, it's crucial to implement continuous, year-round monitoring and health surveillance.

CONCLUSION

This study demonstrates that while air quality in Ebocha and Obrikom was within safe limits during the rainy season, community perceptions revealed deep concerns and limited protective practices. Bridging the gap between awareness and action requires both policy-level interventions and grassroots engagement. Continuous monitoring across seasons, enforcement of environmental standards, and gender-sensitive community programs are essential for reducing long-term health risks in oil-producing regions of the Niger Delta.

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