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Assessment of Health Risk Implications of Air Quality Among Industrial Workers in Idu Industrial Area of Abuja, Nigeria

Abstract

The study assessed the health risk implications of air quality among industrial workers in Idu industrial area of Abuja, Nigeria. A cross-sectional survey research design was conducted among industrial workers within the Idu industrial area located in the Abuja Municipal Area Council (AMAC). With a sample size of 376, a questionnaire was used to source information among the respondents, and descriptive statistics such as frequency and percentage were used for data analysis. The finding revealed that industrial discharge (37.2%), burning of fossil fuel and coal (33.4%), driving automobiles (8.6%) and other activities (20.8%) are the major contributing activities to air pollution in the study area. The finding deduced that the industrial workers perceived the overall air quality of the area to be good (34.8%), and they were moderately concerned (31.9%) regarding the air quality around the industrial area. The industrial workers perceived the overall air quality of the area to be good (34.8%), and they were moderately concerned (31.9%) regarding the air quality around the industrial area. Providing accurate and understandable information concerning the spatial and temporal distribution of air pollution locally will allow people to make behavioural choices. There is a need to improve environmental engagement by human-related activities.

Keywords: Air Pollution, Health Risk, Work Safety, Industrial Activities, Abuja

Introduction

Air pollution is the introduction of chemicals, particulate matter or biological materials that cause harm and discomfort to humans and other living organisms (Bhatia, 2009; Alani et al., 2021). It is a major environmental problem confronting growing cities and is currently the challenge faced by many developed and developing countries; its effects on human lives are grave as it causes diseases which can result in chronic illness and even death. Besides the health risk, it influences climatic conditions, potentially threatening local and international communities (Alani et al., 2021). In the urban environment, the most common air pollutants include carbon monoxide (CO); sulphur dioxide (SO₂); oxides of nitrogen (NO_x) such as nitrogen oxide (NO) and nitrogen dioxide (NO₂); volatile organic compounds (VOCs); ozone (O₃); suspended particulate matter (SPM) also called particulates; and lead (Pb) (Alani et al., 2021). When the concentrations of these molecules/particles in the air exceed the regulatory standard for air quality, the air is considered polluted.

The drive towards industrialisation has led to the establishment of many heavy and light industries that generate high air pollution in the country (Nwanakwere & Oyedokun, 2020). Air pollution is presently of great global concern due to its transboundary spread and link to adverse human health effects relating to all parts of the human body, eventually leading to immune system hyper-activation and respiratory and lung diseases (Alani et al., 2021). Long-term exposure to air pollutants causes respiratory and cardiovascular diseases. The risk of respiratory illnesses such as allergies, asthma, chronic obstructive pulmonary disease, and lung cancer increases

with exposure to atmospheric air pollutants (Alani et al., 2021). Research has shown that children and the elderly are particularly vulnerable to the health effects of air pollutants such as particulate matter and other airborne toxicants (Andersen *et al.*, 2011; Liu *et al.*, 2013). The recently updated estimates by the Health Effects Institute (HEI) and Institute for Health Metrics and Evaluation (IHME) attributed over 114,000 deaths in Nigeria in 2017 (the highest in all of Africa) to air pollution (IHME, 2019).

Possible health implications of ambient particulate pollution in Nigerian cities include cough, catarrh, eye infection, asthma, chronic bronchitis and other cardiovascular diseases (Nwanakwere & Oyedokun, 2020). A total of 30,435 cases of air pollution-related diseases were reported in Rivers State between 2003 and 2008. Kano, Uyo and Calabar recorded urban air emissions beyond the safe limits, which resulted in respiratory disorders, cardiovascular diseases, impairment and other debilitating air pollution-related illnesses within these cities (Ajayi *et al.*, 2002; Nwanakwere & Oyedokun, 2020). Increases in environmental urban air pollution and associated public health effects have been linked to population growth and artificial environmental pressures resulting from increased population density that stems from mass rural-urban migration, uncoordinated spatiotemporal development clusters, unpredictable consumer behaviour, and consumerism, heavy reliance on fossil fuel-based operations, and weak environmental regulations (Ezeonyejiaku et al., 2021). The cumulative risk of air pollution in residential and commercial areas, where potential exposure is high, is increasing, leading to a widespread ecosystem service disruption at both local and regional levels (Ezeonyejiaku et al., 2021).

People are exposed to air pollutants (indoors and outdoors), and this depends on their activities. Among the different population groups, children, the elderly, and chronically ill people are susceptible to exposure to air pollution. It is important to note here that health impact assessment combines population exposure estimates with information on the pollutant's toxicity or the relationship between exposure and response (Henry et al., 2019). Air quality monitoring is crucial in assessing the extent of population exposure to air pollutants. Exposure and resulting public health effects vary and depend mainly on the type of pollutant, its severity, period and frequency of exposure, and pollutant toxicity

(Ezeonyejiaku et al., 2021). Studies such as Wambebe and Duan (2020), Ekoh (2020), Ishaya and Omede (2022), Chukwu et al. (2022), and Ishaya et al. (2023) considered the air quality of Abuja, but none considered the health-related implication among the exposed individuals. Therefore, the study assessed the health risk implications of air quality among industrial workers in Idu industrial area of Abuja, Nigeria.

Materials and Method

Abuja is Nigeria's capital city, located in the centre of Nigeria. Abuja is bounded by four states: Kaduna in the north, in the west by Niger state, in the east and southeast by Nasarawa state and the southwest by Kogi state. Abuja became the capital of Nigeria on 12th December 1991 (Wambebe & Duan, 2020). Abuja is also Nigeria's administrative and political centre, with GPS coordinates 9°5' N 7°32' E (Figure 1). It has a total land area of 7315 km² (2824 sq. mi). Abuja has more than 2.5 million people (Wambebe & Duan, 2020). The city population has grown by almost 140%, making Abuja the fastest-growing city in Africa and one of the fastest-growing in the world (Wambebe & Duan, 2020).

Research Design and Study Population

A cross-sectional survey research design was conducted among industrial workers within the Idu industrial area located in the Abuja Municipal Area Council (AMAC). The study involved thirteen (13) companies randomly selected within the industrial area, with a population size of 2336. With the aid of Taro Yamane, a sample size of 376 respondents was involved in the study, which was distributed based on the percentage contributed by individual companies to the total population. Respondents were selected through a simple random sampling technique.

Data Collection Procedure

The questionnaire was used to elicit information from respondents (industrial workers). The questionnaire for the study will make use of open-ended and closed-ended formats and was divided into sections: *Section A*: the section captured the demographic details of the respondents (employees of the selected companies in the Idu industrial area) to be able to describe respondents in terms of gender, age, rank, state origin, income, ethnicity and religion. *Section B*: The section provided answers to the research questions concerning the individual perceptions of the health implications of air quality among industrial workers in the Idu industrial area.

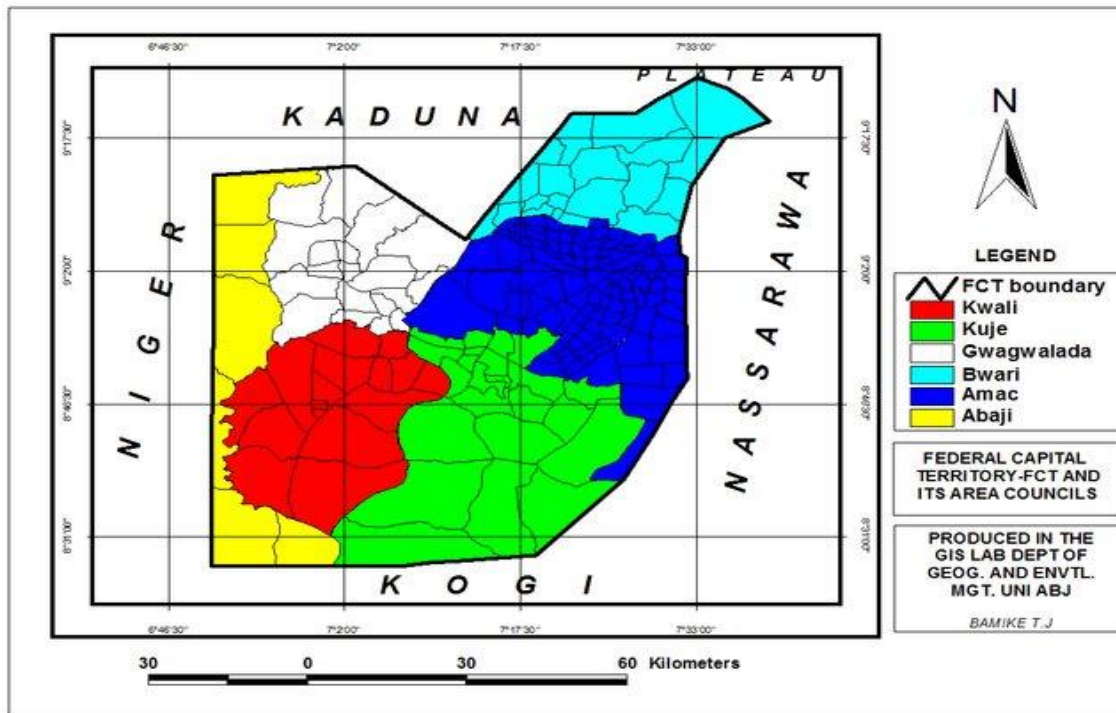


Figure 1: Overview of the Study Area

Data Analysis

The retrieved questionnaires were coded and subjected to Statistical Package for the Social Sciences (SPSS v.21) for proper analysis. The retrieved questionnaire coding was done with MS Excel before being transferred to the Data entry of the SPSS window (Version 22). Descriptive mean and standard deviation statistics were adopted, and findings were presented through tables and charts. Using such statistics allows the researcher to present the evidence of the study in a way that can be understandable and make a conclusion concerning the study variables.

Result and Discussion

Socio-Demographic Details of the Respondents

The socio-demographic details of the respondents are presented in Table 1. The finding revealed that 65.1% of the respondents were male, while 34.9% were female. The age group of the respondents indicated that 24.8% of

the respondents are within the age below 30 years, 42.7% of the respondents are in the age group of 30-40 years while 22.8% and 9.7% of the respondents are in the age group of 41-50 years and 51 years above respectively. 24.5% of the respondents indicated possessing a diploma certificate, 38.0% of the respondents noted possessing a bachelor's degree certificate, 24.2% of the respondents indicated possessing a master's degree certificate, while 10.1% and 3.2% of the respondents noted possessing a doctorate degree and professional certificate respectively. From the analysis, 19.0% of the respondents have attained the position of supervisor, 20.2% attained middle-level management, 23.9% attained top-level management, 16.1% of the respondents are dealers, while 12.7% and 8.1% of the respondents are general workers and others form of ranks respectively. 19.0% of the respondents revealed below 5 years of experience, 29.4% have 5-10 years, while 29.4% and 21.9% indicated 11- 15 years and 16 years of experience.

Table 1: Socio-Demographic Details of the Respondents

Variable	Frequency (n=347)	Percentage (%)
Sex of Respondents		
Male	226	65.1
Female	121	34.9
Age (years)		
Below 30 years	86	24.8
30-40 years	148	42.7
41-50 years	79	22.8
51years and Above	34	9.7
Level of Educational		
Diploma Certification	85	24.5
Bachelor Degree	132	38.0
Master Degree	84	24.2
Doctorate Degree	35	10.1
Professional Certification	11	3.2
Current Rank/Position		
Supervisory	66	19.0
Middle level managerial	70	20.2
Top-level managerial	83	23.9
Dealer	56	16.1
General Workers	44	12.7
Others (Please Specify)	28	8.1
Years of Experiences		
Below 5years	66	19.0
5-10years	103	29.7
11-15years	102	29.4
16years above	76	21.9

Health Risk Implications of Air Quality

The perception of industrial workers among companies in the study area regarding the health risk implications associated with air quality was examined, and the outcome was presented in Table 2. According to the study findings, the major contributing activities to air pollution in the study area include industrial discharge (37.2%), burning of fossil fuel and coal (33.4%), driving automobiles (8.6%) and other activities (20.8%). Furthermore, some industrial activities occasionally and frequently disturbed the breathing of the workers (49.8%). The outcome share supports the assertion of Ishaya & Omede (2022), which indicates that industrial emissions and vehicular traffic can have an adverse effect on air quality. Xu *et al.* (2016) opined that although industrial emissions and vehicle exhaust are considered the foremost sources of air pollution, urban land use patterns and changes are closely related to urban air quality. The findings share similarities with the study conducted by Abaje et al. (2020), which suggested similar human activities impact air quality in their study area. A

similar outcome was indicated by the study conducted by Mabahwi et al. (2014), which suggested similar sources of air quality impact and stated the connection between air quality and human health. The finding deduced that the industrial workers perceived the overall air quality of the area to be good (34.8%), and they were moderately concerned (31.9%) regarding the air quality around the industrial area. The outcome indicated most workers are former smokers (37.2%), with no family history of asthma (56.8%), rarely have a cough (46.1%), never feel short of breath (45.0%) or chest pain (38.0%) and rarely feel headache (35.1). The outcome is supported by the study conducted by Ranzani et al. (2022), which deduced the association between ambient air pollution and lung function among their respondents. Similarly, Mabahwi et al. (2014) suggested that human health and well-being can be influenced by air pollution. The finding shares similarities with the study conducted by Kampa and Castanas (2008), which asserted that air pollution has acute and chronic effects on human health, affecting several systems and organs. It ranges from minor upper respiratory irritation to chronic respiratory and heart

disease, lung cancer, acute respiratory infections in children and chronic bronchitis in adults, aggravating pre-existing heart and lung disease, or asthmatic attacks.

Table 4.8: Perception of the Health Risk Implications of Air Quality

Variable	Frequency (n=347)	Percentage (%)
Activities Contributing to Air Pollution		
Driving Automobiles (cars, trucks, buses)	30	8.6
Manufacturing Chemical	19	5.5
Burning of fossil fuel, coal	116	33.4
Industrial Discharge	129	37.2
Others (Please Specify)	53	15.3
Activities Disturbed the Breathing		
Never	29	8.4
Rarely	36	10.4
Occasionally	173	49.8
Frequently	109	31.4
Overall Air Quality Around the Industrial Area		
Excellent	54	15.6
Good	121	34.8
Average	87	25.1
Poor	44	12.7
Very poor	41	11.8
Concern About the Air Quality Around the Industrial Area		
Not concerned at all	35	10.1
Slightly concerned	63	18.2
Moderately concerned	111	31.9
Very concerned	83	23.9
Extremely concerned	55	15.9
Smoking Status Among Respondents		
Never Smoke	75	21.6
Former Smoker	129	37.2
Current Smoker-Regularly	107	30.8
Current Smoker- Occasionally	36	10.4
Family History of Asthma		
Yes	22	6.3
No	197	56.8
Don't Know	128	36.9
How Often Do You Have Cough		
Never	87	25.1
Rarely	160	46.1
Occasionally	75	21.6
Frequently	25	7.2
How Often Do You Feel Short of Breath?		
Never	156	45.0
Rarely	71	20.5
Occasionally	29	8.4
Frequently	27	7.8
How Often Do You Feel Chest Pain?		
Never	67	19.3
Rarely	132	38.0
Occasionally	118	34.0
Frequently	30	8.6
How Often Do You Have Headache		
Never	84	24.2
Rarely	122	35.1
Occasionally	91	26.2
Frequently	40	11.5

Conclusions

There is a significant concern about air pollution in the human environment, coupled with the fact that human activities, in most cases, cause pollution. Providing accurate and understandable information concerning the spatial and temporal distribution of air pollution locally will allow people to make behavioural choices. Work safety requires that safe working conditions not create a significant risk of people being unfit to work. Safe working conditions affect the habits of workers, which in turn impacts efficiency. This implies that employees working in a safe condition will likely perform in a way that will not cause them harm. Therefore, environmental engagement needs to be improved by human-related activities.

References

- Abaje, I B., Bello, Y. and Ahmad, S. A. (2020). A Review of Air Quality and Concentrations of Air Pollutants in Nigeria. *Journal of Applied Science and Environmental Management*, 24 (2), 373-379. DOI: <https://dx.doi.org/10.4314/jasem.v24i2.25>
- Ajayi, S. A., Adams, C. A., Dumedah, G., Adebajji, A. O. and Ackaah, W. O. (2023). The impact of traffic mobility measures on vehicle emissions for heterogeneous traffic in Lagos City. *Scientific African* 21. <https://doi.org/10.1016/j.sciaf.2023.e01822>
- Alani, R., Ehiwario, H., Bello, O., Akinrinade, O., Okolie, O., Seyinde, D. and Daramola, O. (2021). Air Quality Assessment In Lagos, Nigeria (ed) Ayejuyo et al., (2021) for *Natural and synthetic substances in the environment: a compendium on policy assessment, insights and implications*
- Bhatia, S. C. (2009). Environmental pollution and control in chemical process industries. Khanna publishers. 163p.
- Chukwu, T. M., Morse, S., & Murphy, R. J. (2022). Spatial Analysis of Air Quality Assessment in Two Cities in Nigeria: A Comparison of Perceptions with Instrument-Based Methods. *Sustainability*, 14(9), 5403. <https://doi.org/10.3390/su14095403>
- Ekoh, H. C. (2020). Spatial Variation of Air Quality in Mpape Area of Abuja, Nigeria. *World Scientific News*, 140; 79-112
- Ezeonyejiaku, C. D., Okoye, C. O., Ezeonyejiaku, N. J. and Obiakor, M. O. (2022). Air Quality in Nigerian Urban Environments: A Comprehensive Assessment of Gaseous Pollutants and Particle Concentrations. *Current Applied Science and Technology*, 22 (5). DOI: 10.55003/cast.2022.05.22.011
- Institute for Health Metrics and Evaluation [IHME] (2019). Global study published in 2018 by the research University of Washington in Seattle. <http://www.healthdata.org/>
- Ishaya, S., Esiaba, C. U. and Ikediashi, T. (2023). Diurnal Assessment of Air Quality at Zuba Motor Park, Abuja of Nigeria. *Annals of Ecology and Environmental Science*, 5(1), 54-63. <https://doi.org/10.22259/2637-5338.0501005>
- Ishaya S. and Omede, E. (2022). Assessment of air quality across different land uses in Gwagwalada town, FCT Abuja, Nigeria. *FUDMA Journal of Sciences (FJS)*, 6 (1), 377 – 386. <https://doi.org/10.33003/fjs-2022-0601-909>
- Kampa, M. and Castanas, E. (2008). Human health effects of air pollution *Environmental Pollution* 151 (2008) 362e367 doi:10.1016/j.envpol.2007.06.012
- Mabahwi, N. A. B., Leh, O. L. H. and Omar, D. (2014). Human Health and Wellbeing: Human health effect of air Pollution. *Procedia - Social and Behavioral Sciences* 153; 221 – 229
- Nwanakwere, J. T. and Oyedokun, J. I. (2020). Community perception on air pollution and public health: a case of Ewekoro and Remo-north communities in Ogun state, Nigeria. *International Journal of Environment and Pollution Research*, 8(1), 1-16
- Ranzani, O. T., Bhogadi, S., Mila, C., Kulkarni, B., Balakrishnan, K., Sambandam, S., Garcia-Aymerich, J., Marshall, J. D., Sanjay Kinra, S. and Tonne, C. (2022). Association of ambient and household air pollution with lung function in young adults in an peri-urban area of South-India: A cross-sectional study. *Environment International*, 165: 107290
- Wambebe, N. M., & Duan, X. (2020). Air Quality Levels and Health Risk Assessment of Particulate Matters in Abuja Municipal Area, Nigeria. *Atmosphere*, 11(8), 817. <https://doi.org/10.3390/atmos11080817>
- Xu, G., Jiao, L., Zhao, S., Yuan, M., Li, X., Han, Y., Zhang, B. and Dong, T. (2016). Examining the impacts of land use on air

quality from a spatio-temporal perspective in Wuhan, China. *Atmosphere*, 7, 62; doi: 10.3390/atmos7050062