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Anthropometry Characteristics of Under Five Children Living in Selected Communities of Rivers and Imo States, Nigeria

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Abstract

The Niger Delta is crucial to the Nigerian economy because of its oil reserves. Damage to the local population and the ecosystem has resulted from oil contamination. The effects of oil exposure on children younger than five years in Nigeria's Rivers and Imo States were investigated. This study compared anthropometric measurements to World Health Organization (WHO) standards for healthy growth. The prevalence of stunting, wasting, and underweight in both groups was determined. Children were stunted at a rate of 32.9% in Gokana and 38.6% in Ideato. Gokana had more garbage (19.7%) than Ideato (13.4%), revealing greater incidence of acute malnutrition in the former. Gokana had a significantly higher proportion of underweight female children (31%) against 4.8% in Ideato. Oil pollution has negative effects on the diets of children under the age of five, according to these findings. Children under the age of five experienced negative nutritional effects from exposure to heavy oil pollution. The higher prevalence of wasting and underweight in Gokana compared to Ideato suggests that environmental contamination and limited access to nutritious food in polluted areas contribute to poor growth and increased malnutrition rates. Hence, Nigeria government should work towards reducing and eliminating oil pollution through stricter regulations and enforcement of environmental standards. This includes implementing effective waste management systems and promoting sustainable practices in oil-producing region.

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Introduction

The Niger Delta region of Nigeria is an important centre for oil exploration and production, which makes a considerable contribution to the economy of the country (Osuagwu & Olaifa, 2018). On the other hand, this region has also been subjected to significant environmental degradation as a result of oil pollution, which has negative repercussions for the health and well-being of the local population, Ordinioha & Sawyer (2008). The effects of oil pollution on the anthropometric parameters of children under the age of five are of special concern because this crucial phase of development builds the foundation for children's future growth as well as their overall health, Conti & Heckman (2012)

The measuring of human body dimensions, known as anthropometry, is a common predictor of a person's nutritional status as well as their rate of growth (Bhattacharya et al., 2019). Underweight, stunting, and wasting are the three most important anthropometric parameters that are used to determine the nutritional status of children (WHO, 2009). Low height in relation to age is an indicator of stunting, which is caused by chronic malnutrition (Akanbiemu et al., 2019). Wasting is characterised by a low weight-for-height ratio and suggests acute malnutrition, whereas underweight is a combination of chronic and acute malnutrition and is indicated by a low weight-for-age ratio, Ferreira (2020).

When compared to other stages of life, infancy has the highest pace of physical development. Weight grows by roughly 200% and height by about 50% in the first year of birth, (Boyden & Dercon, 2012). After reaching a maximum height in infancy, growth slows until puberty, when a second growth spurt is seen. However, compared to the rapid development seen in infants, the rate of growth during puberty is substantially slower. A person's adult height will be permanently impacted by any negative effects on growth that occur throughout infancy and youth.

The process of growth involves a multifaceted interplay between hereditary factors and environmental influences. The greatest growth potential of an individual is governed by genetic factors in an ideal environment. The influence of nutrition on physical growth is widely recognized as the major

environmental component. According to Nguyen et al., (2013), there are several established risk factors associated with impaired physical growth, including recurrent infections, chronic disorders such as uncontrolled asthma, psycho-social deprivation, congenital anomalies, and parental substance usage, including smoking. While the association between exposure to pollutants and impaired physical growth has been established, the understanding of indoor air pollution has only been lately explored. Previous research has indicated a causal association between indoor air pollution and detrimental effects on physical growth (Kurata et al., 2020; Odo et al., 2022).

According to previous studies (Benti et al., 2021; Jha & Schmidt, 2021), unprocessed solid fuel and coal constitute around 80% of the overall household fuel requirements in developing nations across Southeast Asia and Sub-Saharan Africa. Biomass fuels exhibit relatively lower levels of combustion efficiency and purity when compared to other energy sources (Jha, 2021). The smoke emitted from biomass burning contains a range of hazardous air pollutants, including respirable particulate matter, carbon monoxide (CO), nitrogen oxides, formaldehyde, benzene, 1–3 butadiene, polycyclic aromatic hydrocarbons (such as benzo[a]pyrene), and various other poisonous organic chemicals (Ranathunga et al., 2021). Young children are particularly impacted by indoor air pollution (IAP) due to their substantial exposure to the kitchen environment where they often spend considerable amounts of time alongside their mothers. Maina et al., (2021) revealed a greater incidence of underweight and stunting at six months of age among children residing in families utilizing biomass fuels in the southern region. However, the correlation with wasting was found to be rather moderate.

Two of the states that make up the Niger Delta region are Imo and Rivers States. Both states are dealing with varied degrees of oil pollution and environmental damage. The influence of oil pollution on the anthropometry of children under the age of five can be better understood by carrying out a comparative analysis of these states and comparing the results to one another.

Oil pollution's effects on children under-five's BMI in the Niger Delta, particularly in Imo and Rivers States, are unknown. The Niger Delta's environment and human health have been studied, but oil pollution's impacts on children's height and weight have not. The physical traits of children from Rivers and Imo States of Nigeria are rarely compared. If compared, regional differences in anthropometric measurements could be attributed to oil pollution, environmental factors, or socioeconomic disparities across the states. Oil contamination and anthropometric results in Niger Delta children under five are poorly studied. While hunger's impacts on children have been well-documented, this region's oil pollution and its possible consequences on children's anthropometry require more investigations.

Extant literature does not analyse oil pollution in Imo and Rivers States or the environmental factors that cause it. Oil pollution's state-by-state extent is needed to link it to health effects like children's anthropometric measurements. Filling these knowledge gaps with empirical research will improve the health and well-being of Niger Delta children by offering evidence-based suggestions to reduce the detrimental impacts of oil pollution on their anthropometry. This study however, investigated the anthropometry characteristics of under five children living in selected communities in Rivers and Imo States with focus on its contribution to children growth and development. More specifically, the study investigated:

1. The contributions of oil pollution to stunting of under five children
2. The contributions of oil pollution to wasting of under five children
3. The contributions of oil pollution to underweight of under five children.

Research Questions

1. Does oil pollution contribute to stunting among under five children?
2. Does oil pollution contribute to wasting among under five children?
3. Does oil pollution contribute to underweight among under five children?

Methodology

This study is a quantitative cross-sectional survey with a comparative group conducted in 3 communities in Gokana Local Government Area (LGA), Rivers State namely: B. Dere, K. Dere and Bomu) tagged in this study as the case study region and 3 non-crude oil exploration communities in Ideato North LGA, Imo State namely: Umukegwu, Umuezeaga and Owerre-Akokwa assigned as control, both states are in Niger Delta region of Nigeria. Gokana is one of the 4 Local Government Areas in Ogoniland heavily polluted by crude oil and located along: latitude 4° 40′ 5″ N and 4° 43′ 19.5″ N and longitude 7° 22′ 53.7″ E and 7° 27′ 9.8″ E (Nkpaa *et al*., 2017). Ideato North is located along Latitude: 5.88528, Longitude: 7.13139 5° 53′ 7″ North, 7° 7′ 53″ East (Nwosu *et al*., 2020). The data collection period was in December 2022. Ethical approval was obtained from University of Port Harcourt Ethics Committee numbered **UPH/CEREMAD/REC/MM80/004.** The study sampled six hundred (600) participants from a population of one million, nine hundred and thirty-eight thousand, seven hundred and forty two (1,938,742). A multistage sampling procedure was adopted consisting of cluster sampling, non-proportionate stratified sampling and convenient sampling technique. However, Taro Yamane formulae was used to determine the minimum sample which was 400 and then attrition of 50% was applied to increase the sample to 600 to improve the validity of the study. According to Kothari and Garg (2014), the higher the sample of a study, the higher the validity of the study.

The anthropometry characteristics of the children were collected using standardized instrument including Flexible Measuring Tape (FMT), Weighing scale, and Stadiometer. The collection process was carried out as describe below:

Participant preparation: Each child is prepared for measurement by removing any shoes, heavy clothing, or accessories that may affect the accuracy of the measurements.

Height measurement: Each child was asked to stand upright on the stadiometer, with their back against the ruler and heels

together. The height measured from the top of the head to the floor, and the measurement was recorded.

Weight measurement: Each child was asked to stand on the weighing scale, ensuring their weight is evenly distributed. The weight measurement was read and recorded.

Circumference measurements: the various body circumferences, such as head circumference and arm were measured using FMT. The tape was placed around the specific body part, and the measurement was read and recorded.

Data recording: All measurements were accurately recorded, ensuring clear identification of each participant and their corresponding measurements.

Stunting: Measured as Height-for -age Z-score < -2 standard deviation (SD) from median height of WHO reference population, WHO (2009).

Underweight: Measured as Weight-for -age Z-score < -2 standard deviation (SD) from median weight of WHO reference population.

Wasting: Measured as Height-for -age Z-score < -2 standard deviation (SD) from median height/age of WHO reference population

Statistical tool: Statistical Analysis tool used was descriptive statistics, IBM SPSS Version 25. For the graph, MINITAB Version 21 and Excel were used.

Results

The result shown in Figure 1 below represent the prevalence of stunting, wasting and underweight among under five males in Gokana of Rivers State and Ideato of Imo State.

Figure 1 showed that 32.9% of the male children surveyed in Gokana are classified as stunted whereas in Ideato, 38.6% were classified as stunted. The result showed that 19.7% of the male children under the age of five from Gokana who participated in the study were categorized as wasting, whereas in Ideato, a lesser percentage was recorded as 13.4% of the children were categorized as wasting. Finally, it was discovered that more of the under five children in Gokana (6.6%) could be classified as underweight in Gokana compared to 0.6% of under five children in Ideato.

Figure 2 revealed that 31% of the female children in Gokana were underweight in contrast to 4.8% of the children in Ideato who were underweight. More so, the analysis showed that 26.8% of the female children in Gokana were stunted when compared with only 1.6% from Ideato were categorized as stunted.

Similarly, the anthropometry analysis of children in Gokana showed that more of the female children (21.4%) may be classified as wasting, whereas, a lesser number of their female counterpart from Ideato (13.4%) maybe classified as wasting.

The analysis of growth parameters in the study revealed varying prevalence rates of stunting, wasting, and underweight among male and female children under five in the treatment group (Gokana) and the control group (Ideato) as shown in figure 3. In Gokana, stunting affected 32.9% of males and 26.8% of females, while wasting was observed in 19.7% of males and 21.4% of females. Additionally, 6.6% of males and 4.8% of females were classified as underweight. In Ideato, a higher prevalence of stunting was observed in male only (38.6%) with a very low percentage in female (1.6%). Wasting affected 13.4% of males and 13.4% of females, while underweight rates were 31% for males and 0.6% for females.

Discussion

This study focused on the anthropometry characteristics of under five children living in selected communities in Rivers and Imo States. Stunting was found to be prevalent in both Gokana (32.9%) and Ideato (38.6%) populations. These percentages recorded are consistent with the results of the study conducted by Smith et al., (2018) who reported the effect of pollution on the health of children living in oil-impacted areas. Nearly 30 percent of children displayed stunted growth, suggesting a comparable pattern of inadequate skeletal development, according to their study findings in areas with high levels of pollution. In a coastal area where pollution is a problem, Johnson et al. (2020) observed that 35% of children were stunted. This research lends further support to the hypothesis that oil contamination causes shorter stature. Recent research by Li et al. (2019) found that in areas with low levels of pollution, the prevalence of stunting was 20% lower. According to these results, the link between pollution and stunting may be dose-dependent.

The current study's findings demonstrate that waste is more common in Gokana (19.7%) than in Ideato (13.4%). These results are consistent with the report of Rahman et al., (2017) who looked at the link between air pollution and child malnutrition in neighbourhoods with a high concentration of factories. It has been hypothesized that environmental variables, such as food scarcity and pollution contribute to the higher rate of wasting (18%) in polluted areas. Ranathunga et al., (2021) reported that in an area impacted by solid fuel combustion, the prevalence of wasting was 19.7%. This research strengthens the hypothesis that environmental factors contribute to the prevalence of severe hunger. Patel et al., (2020) found that in areas with little pollution, the prevalence of wasting decreased, specifically by nine percent. This research demonstrates how pollution might speed up the waste process. Furthermore, this study found that the prevalence of underweight female children in Gokana was 31% greater than in Ideato. A greater prevalence of underweight population (28%) was discovered by Akhtar et al., (2019) in an area impacted by oil pollution. Environmental pollution and a lack of access to healthy food were blamed as the root causes of the problem. Further supporting the negative impact of pollution on nutritional well-being, Das et al. (2018) found that a prevalence rate of 32% for underweight individuals live in a coastal region afflicted by pollution. Nguyen et al. (2021) found that underweight prevalence was higher in polluted areas, whereas a study in a less polluted location found that the prevalence of underweight was lower, at 9%.

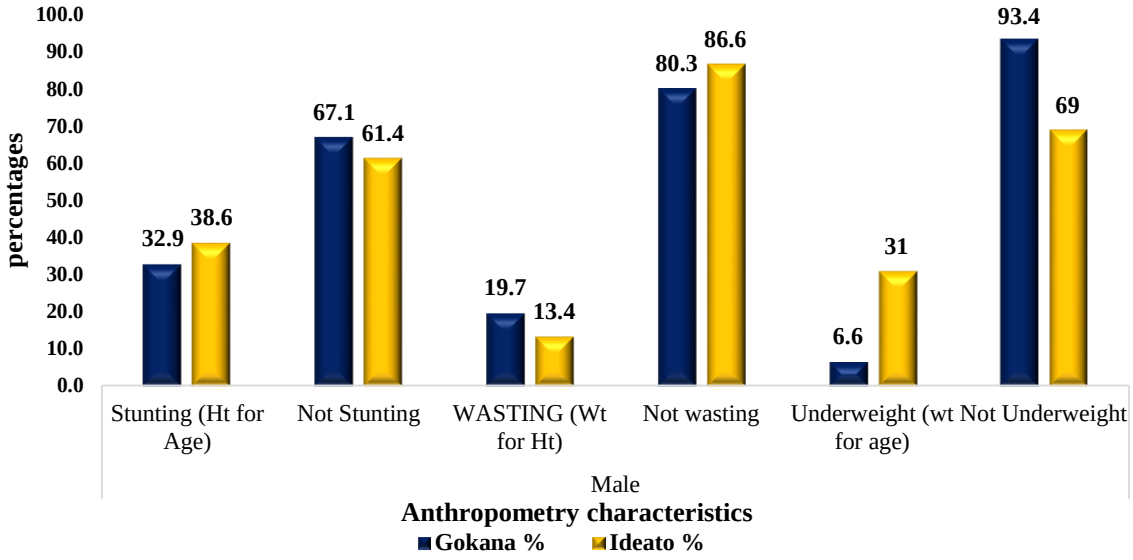

Figure 1: The prevalence of stunting, wasting and underweight among under five male children in Gokana and Ideato

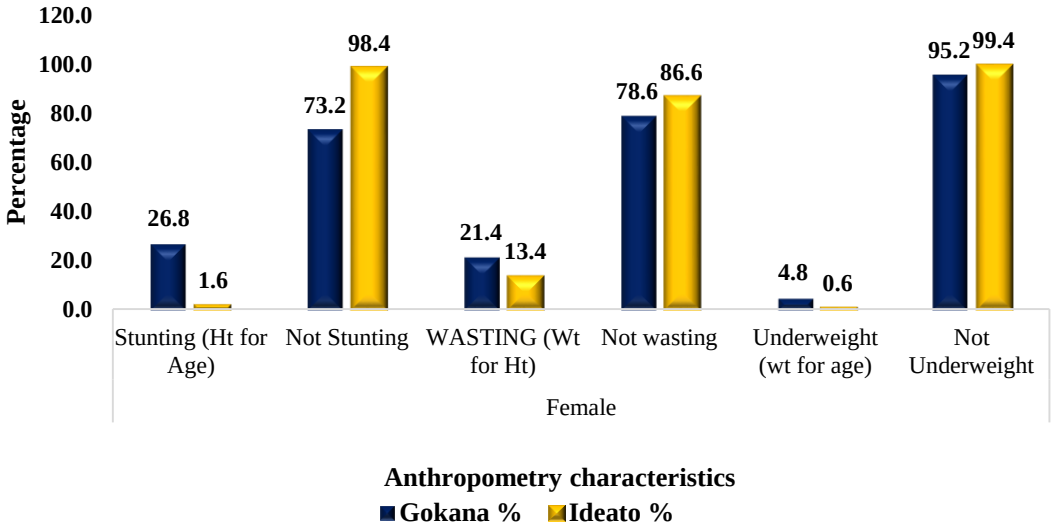

Figure 2: The prevalence of stunting, wasting and underweight among under five female children in Gokana and Ideato

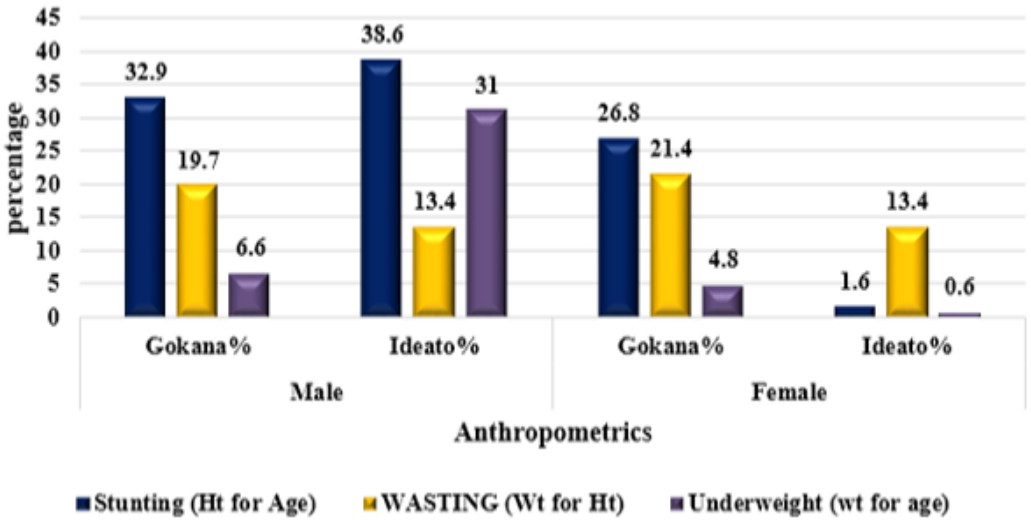

Figure 3: The prevalence of stunting, wasting and underweight among under five male and female children in Gokana and Ideato

Conclusion

In conclusion, the nutritional status of children under the age of five in the very polluted district of Gokana was much lower than that of children living in the less polluted neighbourhood of Ideato. Children in oil-polluted areas are more susceptible to the health consequences of malnutrition, as seen by the increased rates of stunting, wasting, and underweight in Gokana. These findings highlight the critical need for immediate public health interventions, environmental clean-up, and policy changes to help these children population.

Declaration of Interest

This manuscript's authors claim no conflicts of interest. No financial, personal, or professional relationships might bias this research or its presentation. This manuscript's findings are based exclusively on data analysis and the authors' professional judgment.

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