

Assessment of waste management practices and their impact on community health in Ibadan North LGA**Adebayo Francisca Chinyere (PHD)¹, Familoni, Idowu .I (PhD)², Adegbenjo Adebola Monsurat³, Shofolahan Paulina Olubunmi⁴, Simeon Oluniyi Ariyo⁵**¹Primary Health Care Tutor Course, Federal Training Center for Teacher of Health Sciences. University College Hospital, Ibadan.²Dept. of Kinesiology, Sport Science and Health Education Lead City University, Ibadan³Ijebu Ode Local Government⁴Physical and Health Education Department, Federal College of Education Special, Oyo⁵Department of Educational Foundations, Ajayi Crowther University, Oyo**Abstract**

This study investigates waste management practices in Ibadan North Local Government Area (LGA) and their impact on community health to inform better strategies for waste management and public health interventions. The study involved 384 participants who provided data through structured questionnaires ($r=0.70$). SPSS software was utilized for data analysis, employing frequency percentages and chi-square tests to examine waste management practices and their health impacts. Results indicated that 54.9% had good waste management practices, while 45.1% had poor practices. Major challenges identified included inadequate waste collection services (81.8% dissatisfaction), lack of proper disposal facilities (77.0%), and insufficient public education (65.6%). The frequency of waste collection services was predominantly monthly (59.0%), and common disposal methods included open dumping (29.7%) and private waste management services (25.0%). Health impacts were significantly associated with waste management practices. A higher prevalence of typhoid (61.1%, $p < 0.001$), skin diseases (61.5%, $p < 0.001$), and gastrointestinal infections (52.9%, $p = 0.037$) was observed among those with poor waste management practices. However, no significant associations were found for cholera ($p = 0.599$), respiratory infections ($p = 0.844$), or malaria ($p = 0.059$). The study recommends that effort should be made to establish a collaborative approach to waste related issues, foster greater community involvement on waste management initiatives among others.

Keywords: Waste Management, Community Health, Public Health, Typhoid, Waste Disposal Practices

Introduction

The matter of managing waste is a critical public health issue that affects community's well-being to extreme degree. The proper waste management is of paramount importance in assuring human health and keeping the environment clean. Waste disposal practices can be vastly improper with the result of environmental pollution, contamination of water source, spreading of infectious diseases (World Health Organization, 2020). A number of health issues have been linked around the world to inadequate waste management, including respiratory and gastrointestinal infections to vector borne diseases (United Nations Environment Programme, 2021).

The problem of waste management was particularly acute in Africa because of rapid

urbanization and population growth. On the continent, there are serious waste generation and disposal problems coupled with the fact that available infrastructure is inadequate and the regulatory framework is weak. Kofoworola (2022) states that many African cities experience challenges in managing increasing volume of waste from little investment in the waste management infrastructure and services. This is made graver by the informal waste disposal practices of open burning and illegal dumping that increase environmental and health hazards. "The lack of comprehensive waste management policies and community engagement is the root of the problem, as African Development Bank (2023) report shows, as the issue persists to be a source of health and environmental issues," the report reads.

The challenge of waste management has been receiving more and more attention globally. Advanced waste management systems are responsibly used in high-income countries, however, problems of disposing hazardous waste and the environmental sacrifice of waste to energy technologies (European Environment Agency, 2022) are addressed. Twice as often, however, developing countries face problems of lacking waste management infrastructure and dealing with informal waste sectors (World Bank, 2023). Informal waste pickers for instance such as in India who are of great importance to waste management but also work extremely hazardous conditions with little protection (Sharma & Kumar, 2023). Such disproportion in waste management practice between developed and developing countries emphasizes the need to develop strategies targeted to areas of concerns in each region.

Nigeria, as a case in point, experiences multifaceted challenges in waste management. These aspects of the federal ministry of environment (2020), such as poor infrastructure and insufficient funding are part of these challenges. Various waste management agencies have been set up and the National Environmental Sanitation Policy, among other waste management initiatives, has been put in place in the country. These initiatives were supposed to be effective; however, in the end, they still have constraints. Open dumping and burning constitutes a considerable proportion of waste management practice in Nigeria and calls for severe environmental and health impacts (Ogwueleka, 2022). The combination of the absence of proper waste segregation, proper waste treatment facilities as well as its uncontrolled accumulation further aggravates the problem as said by the National Environmental Standards and Regulations Enforcement Agency (2023).

Though prevalent, open dumping is not the only problem Nigeria has. Waste is also burnt in the open in urban and peri-urban areas. As this disposal method releases particulate matter, carbon 2 monoxides and volatile organic compounds (VOCs), it is an environmentally harmful method of disposal. These pollutants cause air pollution and hold significant health

risks such as respiratory illnesses and cardiovascular diseases (Leton & Omotosho, 2020). Furthermore, informal waste recycling, which is practiced without safe measures, can also contribute to exposure to hazardous substances thereby worsening health risks (World Health Organization, 2021). Apart from having a negative effect on human health, the use of insufficiently controlled waste management practices also jeopardizes the environmental quality by contributing in the deterioration of the environment, such as ecosystems and biodiversity.

One of the major problems in waste management is how it is done in Ibadan, one of Nigeria's large cities. Like most other metropolitan cities in Africa, rapid urbanization, high population density is characteristic of that city with population more than 3 million (Akinyele, Odeyemi & Afolabi, 2020). Wastes are generally disposed of in open dumps, burning of wastes and strategically scattered dumpsites in Ibadan. Often, they occur due to lack of waste management infrastructure and meager public service. Many in informal settlements also resort to burning or burying waste when the waste collection services are irregular or absent. The methods herein are associated with respiratory and skin infections (Adeagbo, Oloruntade, & Oyedele, 2022).

Similar issues are shown to exist in research conducted in other urban areas around the world. For example, in Lagos, Nigeria, the widespread practice of open burning and its attendant health hazards were documented. According to Ojo and Fadare (2021), release of toxic fumes and particulate matter (PM) from open burning in Lagos has caused increased respiratory problems among the residents. For example, accidental open dumping, burning of refuse, or practices such as poor refuse management have been linked with improved rates of vector borne diseases and environmental degradation in Accra, Ghana (Amoako, 2023). This shows the similarities in the waste management challenges for different urban areas and reminds us about the need for both global and local solutions.

Waste management depends on public

awareness. A dearth of awareness about the health risk of improper waste disposal based in Ibadan has been revealed as a major hindrance to adoption of waste practice (Leton & Omotosho, 2020). Research from other locations has shown that public education campaigns help change people's attitudes and behaviours concerning waste management. Compared to the target cities, such as Nairobi, Kenya, for example, the local community based initiatives have been able to raise waste segregation practices and have reduced incidences of general dumping through targeted educational campaigns (Kipkemoi et al., 2022). In Cape Town, South Africa, public awareness programs have significantly contributed to improving recycling and lowering the generation of waste; educational initiatives play a major role in facilitating sustainable waste management (Smith & Williams 2023).

However, poor waste management is also a problem in many other urban areas in Africa, with the health impacts of which are not confined to Ibadan. For instance, entangled with increased rates of gastrointestinal diseases and vector-borne illnesses (vector carried illnesses such as malaria and dengue fever) in Dar es Salaam, Tanzania, is improper waste disposal (Ngoma, 2022). Studies have also shown in Addis Ababa, Ethiopia, that poor waste management practices are responsible for high incidences of respiratory diseases and environmental pollution (Tadesse & Bobe, 2023). The result of these findings indicate that poor waste management practices affect the health of millions of people and underscore the importance of thorough waste management.

Poor waste management is equally severe with regard to the environmental consequences. Open burning of waste in Ibadan, as well as in other urban areas, is responsible for releasing harmful pollutants into the atmosphere, causing air pollution and global warming (Leton & Omotosho, 2020). Hazardous chemicals from waste can accumulate in the soil where they cause other forms of soil contamination, impacting agricultural productivity and competing for food security (World Health Organization, 2020). Deposits of pollutants when they travel through air and water currents can have wide-ranging environmental impacts

on the entire region beyond the immediate vicinity of waste disposal sites (United Nations Environment Programme, 2021). This dependence of environmental health on waste management stresses the demand for the solution of waste management through an integrated approach.

An integrated approach to Ibadan North LGA waste management challenges should entail the improvement of the waste management infrastructure, increased public awareness and education, and strengthened regulation at both central and local levels. However, waste management in everyday life without any engagement of the community in efforts is completely unacceptable, as the actual responsibility for successful keeping the planet save and clean with the help of the waste management is not only the government agencies and the private partners, but also all residents of this world who together are considered in making the earth clean, save and healthy (Adeagbo et al., 2022). Wise waste management policies aimed at reducing waste, recycling, and the use of environmentally friendly technologies are needed to curb the negative impact on community health and the environment. With this addressed, Ibadan North LGA can begin addressing the multifaceted challenge around waste management practice to work towards a more sustainable and health-conscious method of handling waste.

Statement of Problem

Literature on the immense challenges faced by Ibadan North Local Government Area in managing its waste (Ogwueleka, 2022; Akinyele, Odeyemi & Afolabi, 2020) further show that there are enormous problems in managing waste in Ibadan North LGA. However, there have been various efforts to improve waste management in the area, including open dumping and poor waste collection system. Some of these issues are environmental and health concerns. The recent reports have shown increased pollution from poor sources of waste management, which includes contaminating the soil and water sources and therefore increases risk of diseases such as malaria and respiratory infections (National Bureau of Statistics, 2021; Ogwueleka, 2022).

A noticeable gap is also observed between what the practices involve in waste management and the growing needs of waste management in Ibadan North LGA. Internet and exponential growth in the population has increased the load on existing waste management infrastructure, which imposed greater pressure on environment and health of citizens. This situation provides an emphasis on the need for an inclusive assessment that resolves these challenges (Adewole, Lawal, and Adetunji 2023; Federal Ministry of Environment, 2020). For this reason, this study envisages the study of the existing waste management practices in Ibadan North LGA, and their impacts on community health, with laudable suggestions to improve the waste management strategies.

Hypothesis

This study will test the following null hypothesis:

H01 - There is no significant association between the demographic characteristics of residents and their current waste management practices

H02 - There is no significant association between the residents' waste management practices and the impact on community health

Methodology

This study population consists of all Ibadan North LGA residents, including households, businesses, and institutions. Its descriptive cross-sectional survey design is appropriate for evaluating present waste management practices and their effects on community health. The sample size was determined using Cochran's formula for sample size calculation in large populations:

$$n = \frac{Z^2 pq}{d^2}$$

Where: n = required sample size

Z = the Z-score or Z-value corresponding to the desired confidence level

(1.96 for a 95% confidence level)

p = estimated proportion of the population with the attribute of interest (assumed to be 0.5)

q = 1-p, the proportion of the population without the attribute

d = the desired margin of error (precision level), expressed as a decimal

Data were collected using a self-developed structured questionnaire. It was grouped into the following sections: Section A: Sociodemographic Section B: Current waste management practices employed by households, businesses, and institutions Section C: Challenges and Barriers to Effective Waste Management Section D: Impact of waste management practices on community health.

The validity of the questionnaire was ensured through a content validity approach. To ensure the reliability of the questionnaire, responses were analyzed using Cronbach's alpha. A Cronbach's alpha value of 0.70 was obtained. The collected data is cleaned and entered into a statistical software package of SPSS for analysis. Descriptive statistics (mean, frequency, and percentage) are used to summarize the data. Inferential statistics, including chi-square test and logistic regression, are employed to test the hypotheses and examine the relationships between variables. Qualitative data from open-ended questions are analyzed using thematic analysis to identify common themes and pattern

RESULTS

Table 1: Sociodemographic Characteristics of Respondent

Variables	Levels	Frequency	Percentage
Age	18-24 years	63	16.4
	25-34years	123	32.1
	35-44years	105	27.3
	45 years and above	93	24.2
Gender	Male	139	36.2
	Female	245	63.8
Highest Level of Education	No Formal Education	15	3.9
	Primary Education	23	6.0
	Secondary Education	36	9.4
	Tertiary Education	287	74.8
	Other(post graduate Education)	23	6.0
Current Occupation	Unemployed	41	10.7
	Self Employed	151	39.3
	Private sector employee	104	27.1
	Public sector employee	38	9.9
	Student	30	7.8
	Other (Retired)	20	5.2
How many people live in your household	1 - 2	76	19.8
	3 - 4	146	38.0
	5 - 6	108	28.1
	7 and above	54	14.1
What is your average monthly income	Less than ? 50,000	88	22.9
	? 50000 – ? 100000	145	37.8
	? 100001 – ? 150000	83	21.6
	? 150001 – ? 200000	49	12.8
	More than ? 200000	19	5.0
How long have you been a resident in Ibadan North LGA?	Less than 1 year	29	7.6
	1-5 years	102	26.6
	6-10years	114	29.7
	More than 10 years	139	36.2
Total		384	100

Hypothesis Testing

H01 - There is no significant association between the demographic characteristics of residents and their current waste management

practices

Table 5: showing association between Demography and Waste Management Practice

	Poor Practice N%	Good Practice N%	χ^2 value	p- value
Age			0.690	0.876
18-24years	31 (49.2)	32 (50.8)		
25-34 years	56 (45.5)	67 (54.5)		
35-44years	45 (52.9)	60 (57.1)		
45 years and above	41 (44.1)	52 (55.9)		
Gender			0.257	0.612
Male	65 (46.8)	74 (53.2)		
Female	108 (44.1)	137 (55.9)		
Highest Level of Education			5.044	0.283
No Formal Education	5(33.3)	10(66.7)		
Primary Education	6 (26.1)	17 (73.9)		
Secondary Education	15 (41.7)	21 (58.3)		
Tertiary Education	136 (47.4)	151 (52.6)		
Other(post graduate Education)	11 (47.8)	12 (52.2)		
What is your current occupation?			7.117	0.212
Unemployed	15 (36.6)	26 (63.4)		
Self Employed	65 (43.0)	86 (57.0)		
Private sector employee	43 (41.3)	61 (58.7)		
Public sector employee	21 (55.3)	17 (44.7)		
Student	18 (60.0)	12 (40.0)		
Other (Retired)	11 (55.0)	9(45.0)		
How many people live in your household?			0.247	0.970
1 - 2	35 (46.1)	41 (53.9)		
3 - 4	65 (44.5)	81 (55.5)		
5 - 6	50 (46.3)	58 (53.7)		
7 and above	23 (42.6)	31 (57.4)		
What is your average monthly income?			4.890	0.299
Less than ? 50,000	37 (42.0)	51 (58.0)		
? 50000 – ? 100000	58 (40.0)	87 (60.0)		
? 100001 – ? 150000	41 (49.4)	42(50.6)		
? 150001 – ? 200000	27 (55.1)	22(44.9)		
More than ? 200,000	10(52.6)	9 (47.4)		
How long have you been a resident in Ibadan North LGA?			1.578	0.664
Less than 1 year	12 (41.4)	17 (58.6)		
1-5 years	51 (50.0)	51 (50.0)		
6-10years	48 (42.1)	66 (57.9)		
More than 10 years	62 (44.6)	77 (55.4)		

Discussion of findings

A chi-square test was carried out to assess the association between the demographic characteristics of residents and their current waste management practices. The results for age showed no statistically significant association, with a chi-square value of 0.690 and a p-value of 0.876. Similarly, gender was not significantly associated with waste management practices (χ^2

=0.257, p=0.612).

The disposal frequency in this study showed that only 6.5% of respondents disposed their waste daily, while 38.0% did so monthly. This is consistent with findings from Lagos, Nigeria, where Olayiwola and Adebo (2020) noted that inadequate waste collection services led many households to dispose of their waste less frequently, with a large proportion relying on

monthly or less frequent disposal. The relatively low percentage of daily disposal in our study suggests similar challenges with waste collection infrastructure, as highlighted by Asase et al. (2021) in Accra, Ghana, where informal waste collectors were a major reliance for households. As for the modes of waste disposal, open dumping occupation was 29.7 % and 25.0 % are operated by private waste management service. This fits in well with the findings of Olayiwola and Adebo (2020) that open dumping and burning of waste were commonplace as a result of poor formal waste services in Lagos.

Reports from respondents (25.0%) of the use of private waste services exhibits an emerging trend in urban areas with high income. (Njoroge et al., 2020) as also observed among better income households in Nairobi, Kenya. Although the problem of open dumping of waste is still prevalent, and carries a lot of environmental and health risks. None of the services reported had waste management services done daily, and 59.0% had periodic services. This implies a critical gap in waste management infrastructure as per other works such as by Olayiwola and Adebo (2020) who reveal that in Lagos, there is irregular and infrequent waste collection. The infrequency of this enlarged analysis further perpetuates the practice of improper waste disposal like dumping in streams or gutters (7.3% in this study), which negatively impacts environment as well as health.

For education, although those with tertiary education showed a higher proportion of poor practice, the association was not significant ($\chi^2 = 5.044$, $p = 0.283$). Likewise, occupation did not show a significant relationship ($\chi^2 = 7.117$, $p =$

0.212).

The study revealed that 65.6% of respondents believe there is insufficient public education on the importance of waste management. This is consistent with the findings of Akinyele et al. (2020), who noted that inadequate educational campaigns contribute to poor waste management practices in Nigeria. The lack of awareness and education about proper waste disposal methods is a major barrier to improving waste management systems in developing countries, as emphasized by World Bank (2022).

In terms of household size, no significant association was observed ($\chi^2 = 0.247$, $p = 0.970$). Income and length of residence were also not significantly associated with waste management practices, with p-values of 0.299 and 0.664, respectively. Since none of the p-values were less than 0.05, we fail to reject the null hypothesis. This indicates that there is no significant association between the demographic characteristics of residents and their current waste management practices. In terms of barriers to effective waste management, a majority of (74.8%) identified inadequate funding as a key challenge. This is supported by the findings of Mensah and Larbi (2020), who reported that financial constraints severely limit local governments' ability to maintain efficient waste management services. The lack of adequate funding for waste management in developing countries, including Nigeria, has been widely documented as a major obstacle to sustainable waste management practices.

H02 - There is no significant association between the residents' waste management practices and the impact on community health

Table 6: Showing Association Between Waste Management Practice and Impact on community Health

	Poor Practice	Good Practice	χ^2 value	p-value
Cholera	13(50.0)	13(50.0)	0.276	0.599
Malaria	139 (47.8)	152 (52.2)	3.576	0.059
Typhoid	69 (61.1)	44 (38.9)	16.579	<0.001*
Respiratory infections	46 (44.2)	58 (55.8)	0.039	0.844
Skin diseases	59 (61.5)	37 (38.5)	13.918	<0.001*
Gastrointestinal infections	63 (52.9)	56 (47.1)	4.335	0.037*

Discussion of findings

A chi-square test was carried out to assess the association between residents' waste management practices and the impact on community health. The results showed both significant and non-significant associations. For cholera, the chi-square value was 0.276 with a p-value of 0.599, indicating no significant association between waste management practices and cholera. Similarly, respiratory infections showed no significant association ($\chi^2 = 0.039$, $p = 0.844$). Firstly, cholera affected 6.8% of the population in this study, yet there was no statistically significant association between waste management practices and the occurrence of cholera ($p = 0.599$). This contrasts with studies in urban slums in Brazil, where poor waste disposal was directly linked to waterborne diseases such as cholera (de Andrade et al., 2020). The lack of significant association in this study may be attributed to better access to clean water or other mitigating factors in the study area compared to the slums of Brazil. In Nigeria, studies such as that of Nwokoro and Adedoyin (2020) in Port Harcourt also found a direct correlation between improper waste management and cholera outbreaks, particularly in areas with illegal dumpsites contaminating water supplies. This variation in findings suggests that regional differences in waste management infrastructure and water treatment may influence the prevalence of cholera in different communities.

In the case of malaria, although the result approached significance, with a chi-square value of 3.576 and a p-value of 0.059, it did not meet the threshold, so we cannot conclude a significant relationship. Secondly, malaria affected 75.8% of respondents, though no significant association with waste management practices was found in this study ($p = 0.059$). This near-significant result aligns with global studies that highlight the role of poor waste management in creating breeding grounds for mosquitoes, which spread malaria. For instance, a study in India reported increased incidences of malaria in areas with inadequate waste disposal systems, attributing it to stagnant water near open dumpsites (Ghosh et al., 2021). The findings in Accra, Ghana were similar to how

poor waste management created breeding sites for vectors which resulted in a malaria case upsurge (Mugambi, Maxwell, and Osei, 2020). The difference in statistical significance in this study could be due to variations in mosquito control efforts or geographical differences in malaria transmission

However, typhoid was significantly associated with waste management practices ($\chi^2 = 16.579$, $p < 0.001$). More residents with poor waste management practices (61.1%) reported poor practice.

In this study, waste management practice was significantly associated with typhoid fever and 61.1% of those with poor waste practices contracted typhoid fever ($p < 0.001$). This echoes a Brazilian study (de Andrade et al., 2020) in which it was discovered that improperly disposed waste was responsible for both water contamination and typhoid epidemics. Just like Olayiwola and Adebo (2020) in Lagos, Nigeria, also discovered that there is a high prevalence of typhoid in people living around poorly-managed waste sites, linking waste management to waterborne diseases. This finding is consistently the same across all the regions, which shows how important it is to establish proper management practices in reducing the risk of typhoid through waste.

The null hypothesis was rejected for the conditions of typhoid, skin diseases, and gastrointestinal infections since they had significant association. On the other hand, for health outcomes from cholera, respiratory infections and malaria, we do not reject the null hypothesis, or even if we reject it at the one percent level, we fail to reject at a smaller level. In this study, reported being affected by respiratory infections was 27.1%, no significant association with waste management practices being found ($p = 0.844$). However, in Nairobi, Kenya, this was not the case; 20 times the actual values compared to Athens waste burning, and 10 times the actual values compared to Nairobi dumpsites where aggravation of respiratory problems was found to be due to pollutants from dumpsites and burning waste (Mugambi et al., 2020). In Lagos, Olayiwola and Adebo (2020)

have shown that improper waste management has led to increase in respiratory diseases. A possible explanation for this difference in this study's results is that wastes in the study area have been disposed differently, e.g. there was a reduction of open burning or better air pollution control measures.

Waste management practices were significantly correlated with poor skin diseases in this study ($p < 0.001$), and 61.5% of patients reported with skin conditions. This is similar to what Olayiwola, O. and Adebo, O. (2020) found; that waste dumps located in Lagos are associated with an increase in skin infections through the contact with contaminated water or 85. Further, Mugambi et al. (2020) reported similar findings in Kenya, which include skin irritation and infections due to individual's exposure to toxic substance at some dumpsites. In connecting these risks, these parallels demonstrate that both local and international issues have widespread health risks relating to inadequate waste management. Waste management practices also significantly ($p = 0.037$) associated with the gastrointestinal infections in this study as 52.9% of people experienced them. There is global research like the Bangladeshi study by Hossain et al. (2020), which showed high incidence of Gastrointestinal infections in poor waste disposal condition that leads to water contamination. The wasting management practices in Nigeria also led to a link between them and the gastrointestinal diseases associated with waste contamination of water supplies as discussed by Nwokoro and Adedoyin (2020).

Conclusion

It was found that some residents are good waste managers while most are poor. Inadequate waste infrastructure, inconsistent waste collection service and poor awareness in the waste management issues are some of the key barriers to effective waste management. Increased health risks, especially for typhoid, skin diseases and gastrointestinal infections, are also affected by these barriers. The results reaffirm the case for improved waste management practices for improved health outcomes in the community and the existing challenges.

Recommendation

The findings of this study were based on the following recommendations.

1. Increase in the frequency and reliability of waste collection services in order to increase the consistency of and effectiveness of the waste management.
2. Enhance the readiness and provision of proper waste disposal facilities in the community.
3. It will provide resources to enhance public education campaigns on the need to properly manage waste and the impact that it has on public health.
4. Increase the enforcement of regulations related to waste management in such a way that waste management guidelines and practices are adhered to.
5. To establish a collaborative approach to waste related issues, foster greater community involvement on waste management initiatives.

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Comparability of item parameter indices of 2019 senior school certificate Physics Multiple-choice examinations among Osun State Secondary school students**Oluwasola Damilola Owoeye Ph. D.¹, Prof. Alaba Adeyemi. Adediwura²**Department of Educational Foundations and Counselling, Obafemi Awolowo University, Ile-Ife, Nigeria
Department of Educational Foundations and Counselling, Obafemi Awolowo University, Ile-Ife, Nigeria**Abstract**

The study assessed the difference in average item parameter indices (item difficulty and students' ability) in the 2019 Physics multiple-choice examination in the Senior School Certificate Examination (SSCE) among secondary school students in Osun State. It also examined the standard errors of measurement in both examinations. A survey research design was adopted to collect data from participants in an examination condition. The study population comprised 17,784 Senior Secondary School III students across 1,494 schools (1,100 private and 394 public) in the 2022/2023 session. A total of 1,200 students were selected using a multistage sampling procedure. For NECO, the 3-parameter logistic model produced the lowest values for all information criteria (AIC = 82986.44, SABIC = 83330.90, HQ = 83331.57, BIC = 83902.65). For WAEC, the 4-parameter logistic model had the lowest (AIC = 70591.57, SABIC = 70974.30, HQ = 70975.04, BIC = 71609.58). WAEC items were more difficult (mean = 0.62, STD = 1.246) than NECO (mean = 0.52, STD = 1.553). Examinees performed slightly better in WAEC (mean = 0.004, STD = 0.935) than in NECO (mean = 0.002, STD = 0.948). The study recommended continuous monitoring and improvement of test validity and reliability by both examination bodies.

Introduction

Public examinations are conducted to determine the abilities of learners after they have come in contact with some volume of learning and learning activities. In Nigeria, one of the public examinations that learners take is the West African Examination Council (WAEC), which means they get the Senior School Certificate (SSC). Another body that offers public examinations to learners in Nigeria is the National Examination Council (NECO). The questions that are developed in these examinations are in tune with the National Educational Research and Development Council (NERDC). Based on the effectiveness of these examination bodies, they aid in testing all that students have learned and their academic skills. In the same vein, when constructing the tests, different test construction principles are engaged, such as validity, reliability, fairness, and effectiveness in assessing the intended learning outcomes, which align with clearly defined curriculum objectives to ensure content relevance and coverage. In all of these, there is always the need to investigate test difficulty, which is a major focus in the present study.

Physics has been a required subject for all students in Nigeria ever since the Senior

Secondary Certificate Examination (SSCE) was introduced. The objective was to encourage the expansion of the country's technological infrastructure. One of the most significant scientific fields is physics. The two sections that make up the physics section of the Secondary School Certificate Examination (SSCE) are called paper I and paper II. Paper I is the exam's practical component, and Paper II is broken up into two subtests: multiple-choice questions and an essay. This means that students studying physics will need to pass a variety of tests to receive their Senior Secondary Certificate (SSCE). Since physics offers the foundation for the development of higher-order thinking skills, students who are most interested in the subject stand to benefit from a rigorous physics education.

According to Jegede and Adebayo, (2013) teaching physics in secondary schools motivates students to seek higher education in science-related subjects and helps them acquire the information and abilities needed for scientific studies. This helps students acquire basic scientific concepts, which in turn help create new technologies that are intended to enhance people's quality of life. the fact that physics is essential to improving a country's technical