Multidisciplinary

Chemistry of food waste and nutrition statistical analysis amongs students of Federal University Lokoja

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Abstract
Chemistry of waste is the understanding regarding waste. Disadvantage of food wastage, nutrition analysis at Federal University Lokoja is the target of this study. Food wastage is a global issue with social, environmental, and economic implications, particularly in institutional settings like universities where meals are regularly served to a large population. This research investigates the nature, causes, and extent of food waste and how it can be reduced within the campus cafeterias of Federal University Lokoja. Through surveys, observational studies, and laboratory analyses, this study provides actionable recommendations for cafeteria management to reduce waste and enhance nutritional quality. findings confirm that food waste at the institution is driven by a combination of situational, sensory, and behavioral factors, with time pressure emerging as the most critical concern, study consistently point to large portion sizes as a key structural contributor to food waste within the university's food service system. Findings also identify poor food quality as a critical and systemic driver of food waste as well as incomplete meal consumption is a deeply ingrained behavioral pattern throughout the student population. Food temperature and poor taste/quality are the primary causes of food wastage among students. Overall, the meals may be considered moderately adequate but not fully satisfactory in terms of nutritional quality and food safety, pointing to the need for deliberate improvements in meal planning and cafeteria food management at the institution, hence food wastage has nothing to do with wealthy parents but more with habit and management.

Keywords: Food, Wastage, Nutritional balance, Management and Temperature

1. Introduction

Some students actually waste food while many needed foods to survive. Food waste and nutrition are increasingly significant global issues, posing challenges to environmental sustainability, economic efficiency, and public health. The World Food Programme (2021) [17] estimates that over one-third of all food produced globally is wasted each year, translating to approximately 1.3 billion tons of food. This waste has far-reaching implications, including the depletion of natural resources, the economic burden of food production and disposal, and the exacerbation of global food insecurity. At the same time, malnutrition whether due to undernutrition or overnutrition remains a persistent problem worldwide, undermining health and productivity. In institutional settings like universities, these issues intersect uniquely, as they involve a concentrated population that relies heavily on organized food services. This study focuses on the dual challenges of food waste and nutrition within the context of campus cafeterias at Federal University Lokoja, Nigeria.

Universities are microcosms of society, reflecting the broader issues faced by the world while presenting unique opportunities for intervention. Campus cafeterias serve as vital hubs for students, providing meals that support their physical health, cognitive performance, and overall well-being. However, these facilities often grapple with significant levels of food waste due to inefficiencies in planning, preparation, and consumption. At the same time, ensuring that meals meet the nutritional needs of students is a critical, yet often overlooked, aspect of campus food services. The juxtaposition of these two issues wastage of food on the one hand and the need to ensure nutritional adequacy on the other demands an integrated approach that addresses both challenges simultaneously.

Food waste in university cafeterias can take various forms, including plate waste (food left uneaten by students), kitchen waste (unused or spoiled ingredients), and operational waste (excess food prepared but not served). Each of these forms of waste has distinct causes and implications. For instance, plate waste may arise from students being served portions that exceed their appetites, dissatisfaction with menu options, or time constraints that limit their ability to finish meals. Kitchen waste, on the other hand, often results from overestimating demand or improper storage practices. Operational waste can be attributed to inefficient meal planning or lack of coordination between food vendors and students. These forms of waste not only represent a loss of valuable resources but also contribute to environmental problems such as greenhouse gas emissions from decomposing organic matter in landfills. Nutrition, meanwhile, is a cornerstone of student health and

academic success. University students are often at a transitional stage of life, marked by increased independence and the development of lifelong dietary habits. Ensuring that meals provided in campus cafeterias meet their nutritional needs is therefore essential for fostering a healthy and productive student body. Poor nutrition can have far-reaching consequences, including diminished cognitive function, increased susceptibility to illness, and long-term health risks such as obesity and chronic diseases. Despite its importance, nutrition is often overshadowed by other priorities in campus food services, such as cost efficiency and operational convenience. This oversight can lead to imbalanced meals that fail to provide adequate levels of essential nutrients, thereby undermining students' health and well-being. The situation at Federal University Lokoja exemplifies these challenges. As a growing institution in Nigeria, it faces the dual pressures of managing limited resources and catering to a diverse student population with varying dietary needs and preferences. Anecdotal evidence suggests that food waste is a persistent issue in campus cafeterias, with significant amounts of leftover food being discarded daily. At the same time, there is little data on the nutritional quality of meals provided, raising concerns about whether students are receiving the balanced diets necessary for their physical and academic performance. Addressing these issues requires a comprehensive understanding of the factors contributing to food waste and the adequacy of meal nutrition within the university's unique context.

Globally, the study of food waste and nutrition in universities has gained traction in recent years, driven by the broader agenda of sustainable development. Researchers have identified several key factors influencing food waste in campus settings, including portion sizes, menu preferences, dining habits, and operational inefficiencies. Studies in developed countries such as the United States, Germany, and Sweden have highlighted the scale of the problem, with food waste accounting for up to 30% of meals served in some universities (Beretta *et al*., 2019; Silvennoinen *et al*., 2015) [3, 14]. In many cases, interventions such as improved portion control, better menu planning, and awareness campaigns have been shown to reduce waste levels significantly.

In contrast, research on food waste in African universities is relatively sparse, reflecting a broader gap in the literature on food systems in low- and middle-income countries. The available studies often focus on household or market-level food waste, with limited attention to institutional settings. Similarly, while nutrition research in Africa has largely centered on issues of undernutrition and food security, there is a lack of data on the nutritional quality of meals in universities. This gap is particularly pronounced in Nigeria, where rapid population growth and increasing university enrollment have placed additional pressure on campus food services. As a result, there is an urgent need for localized research that addresses the unique challenges of food waste and nutrition in Nigerian universities.

This study seeks to fill this gap by examining food waste and nutrition in the cafeterias of Federal University Lokoja. It builds on the existing body of literature while incorporating a localized perspective that takes into account the specific cultural, economic, and operational factors influencing food systems in Nigeria. By combining quantitative and qualitative methods, the study aims to provide a comprehensive understanding of the extent and causes of food waste, as well as the nutritional adequacy of meals served to students. The findings will not only contribute to academic knowledge but also inform practical interventions aimed at promoting sustainability and health within the university community.

The significance of this research extends beyond Federal University Lokoja. As a case study, it offers insights that can be applied to other universities in Nigeria and similar contexts, where the challenges of food waste and nutrition are equally pressing. The study also aligns with global efforts to achieve the United Nations Sustainable Development Goals (SDGs), particularly Goal 12 (Responsible Consumption and Production) and Goal 2 (Zero Hunger). By addressing food waste and improving nutrition, universities can play a pivotal role in advancing these goals, fostering a more sustainable and equitable food system.

Compounding the problem of food waste is the need to ensure that meals provided in campus cafeterias meet the nutritional needs of students. Adequate nutrition is crucial for cognitive function, physical health, and overall well-being, especially for university students who are often in a critical stage of development. However, little is known about the nutritional quality of meals offered in the cafeterias of Federal University Lokoja. This lack of information hampers efforts to improve meal planning and address potential deficiencies. Together, these challenges highlight the need for a comprehensive study to assess food waste and nutrition in campus cafeterias, providing data-driven recommendations for sustainable and health-conscious practices.

This study aims to contribute to this effort by providing data-driven insights and actionable recommendations, ultimately promoting sustainability, health, and well-being within the university community.

2. Literature review

The literature review examines existing research on food waste and nutrition in institutional settings, focusing on global perspectives and narrowing down to studies relevant to Nigeria. By synthesizing findings from 50 scholarly sources, this section highlights the scale of food waste, its contributing factors, and the significance of nutritional analysis in universities, emphasizing gaps in knowledge that this study aims to address.

Global perspective on food waste. Food waste is a global issue, with approximately one-third of all food produced globally being wasted annually (FAO, 2011) [7]. Institutions such as universities significantly contribute to food waste due to the high volume of meals served daily. Studies conducted in Europe, the United States, and Asia have consistently shown that institutional food waste arises primarily from overproduction, large portion sizes, and mismatched demand and supply dynamics. For example, Beretta *et al*. (2019) [3]

quantified food waste in Swiss universities, identifying overproduction as a primary cause, accounting for nearly 40% of total waste. Similarly, a study in the United States by Gunders (2017) [8] found that portion sizes directly influenced plate waste, with students discarding up to 25% of their served meals.

Institutional food waste is particularly critical as it contributes to economic losses and environmental harm. The disposal of food waste in landfills generates methane, a potent greenhouse gas that exacerbates climate change (Gustavsson *et al*., 2011) [9]. Research by Thyberg and Tonjes (2016) [15] highlighted the environmental consequences of institutional food waste, urging stakeholders to adopt sustainable waste management practices.

Food waste in African institutions, In Africa, food waste research has primarily focused on households and markets, with limited studies addressing institutional settings like universities. However, recent efforts have started to shed light on this issue. For instance, Oelofse and Nahman (2013) [11] reported that South African universities experience significant food waste due to poor meal planning and lack of awareness among students and staff. This study also emphasized the role of cultural practices in influencing food preferences and waste generation.

In the Nigerian context, few studies have explored food waste in institutional settings. A study by Ojekunle *et al*. (2020) [12] examined food waste in secondary schools and highlighted factors such as poor portion control and meal dissatisfaction. While this research provides useful insights, it does not extend to universities, which have unique challenges, including a more diverse population and larger-scale operations.

Nutritional quality of meals in universities. The nutritional quality of meals provided in institutional settings is critical for students' health and academic performance. Numerous studies emphasize the importance of balanced diets, particularly for young adults in universities. Larson *et al*. (2008) [10] reported that fruit and vegetable intake positively correlated with better academic outcomes among college students in the United States. Similarly, Peterson *et al*. (2010) [13] found that inadequate nutrition was linked to reduced cognitive performance and increased stress levels.

In Africa, nutritional studies have predominantly focused on undernutrition and food security, with limited attention to the dietary quality of meals in universities. In Nigeria, research by Adebayo *et al*. (2019) [2] assessed the nutritional composition of meals in secondary schools, revealing significant deficiencies in essential nutrients like iron and vitamin A. Although this study underscores the importance of dietary quality, it does not address the university setting, where dietary needs and consumption patterns may differ.

Intersection of food waste and nutrition. Few studies have explored the relationship between food waste and nutrition in universities, although the two issues are interconnected. For example, research by Betz *et al*. (2015) [4] in Germany found that improving meal satisfaction through better menu planning reduced both food waste and nutritional deficiencies. Similarly, a study in Sweden by Eriksson *et al*. (2017) [6] demonstrated that increasing the variety of healthy options on the menu led to lower waste levels and higher nutritional adequacy.

In the Nigerian context, such integrated studies are lacking. While food waste and nutrition have been studied independently, their combined implications for campus operations remain unexplored. This gap underscores the need for comprehensive research addressing both food waste and nutritional quality in Nigerian universities.

Despite the growing body of literature on food waste and nutrition, several gaps remain, particularly in the Nigerian context. Most studies have focused on either food waste or nutrition, with few addressing their intersection. Additionally, there is limited data on the specific causes and patterns of food waste in Nigerian universities. By addressing these gaps, this study aims to contribute valuable insights that can inform policy and practice in Federal University Lokoja and similar institutions.

3. Methodology/Materials

This study adopts descriptive analysis approach, combining data collection techniques to provide a holistic understanding of food waste and nutrition in Federal University Lokoja's cafeterias. Data was collected through a waste audit conducted over eight weeks, measuring both plate waste and kitchen waste daily. This will involve weighing and recording all food disposed of, categorized by type and source. Concurrently, food samples from the cafeterias will be collected for laboratory analysis, assessing macronutrient and micronutrient content using established methods such as spectrophotometry. These analyses will evaluate the nutritional adequacy of the meals provided, comparing them to dietary guidelines and recommendations.

Data was gathered through surveys and interviews with students and food vendors. The surveys will focus on dining habits, meal satisfaction, and reasons for food waste, while interviews with cafeteria managers will provide insights into operational challenges and waste management practices. The data will be analyzed using statistical tools for quantitative data and thematic coding for qualitative responses. This comprehensive methodology ensures that the study captures both the scope and underlying causes of food waste, as well as the nutritional quality of meals offered.

Statistical analysis (demographic analysis)

Gender	Frequency	Percent
Male	82	59.4
Female	56	40.6
Total	138	100.0

A total of 138 students participated in the study, of whom 82 were male, representing 59.4% of the sample, and 56 were female, accounting for the remaining 40.6%. The distribution reflects a higher proportion of male respondents, though the female representation remains substantial and sufficient to support meaningful analysis of the study's objectives.

Level of study	Frequency	Percent
100 Level	25	18.1
200 Level	31	22.5
300 Level	26	18.8
400 Level	39	28.3
500 Level	17	12.3

The distribution of respondents by level of study spans all academic levels, reflecting a broad and inclusive sample. Students at the 400 Level constitute the largest group at 28.3%, followed by those at the 200 Level at 22.5%. The 300 and 100 Levels account for 18.8% and 18.1% respectively, while 500 Level students represent the smallest proportion at 12.3%. Overall, the spread across all academic levels ensures a reasonably balanced sample, capturing diverse perspectives that strengthen the validity of the study's findings.

Objective 1

To quantify the amount of food waste generated in Federal University Lokoja

Factors	N	Mean	Std. Deviation
Leaving food unfinished after eating	138	3.0072	1.12371
Food waste due to large portion size	138	3.2754	1.07912
Food waste due to poor taste or quality	138	3.2826	1.25558
Food waste due to loss of appetite	138	2.9783	1.18054
Food waste due to time constraints	138	3.3551	1.20098

The descriptive analysis reveals that food waste among students at Federal University Lokoja occurs at a moderate to high level across all identified factors. Time constraints recorded the highest mean score of 3.36, establishing it as the most significant driver of food waste, as students frequently abandon meals due to busy schedules and competing academic demands. Food waste attributable to poor taste or quality and large portion sizes followed closely, with near-identical mean scores of 3.28, indicating that dissatisfaction with meal quality and oversized servings are equally prominent contributors. Leaving food unfinished after eating returned a mean of 3.01, reflecting a persistent but comparatively moderate tendency among students, while loss of appetite recorded the lowest mean of 2.98, suggesting it plays the least influential role among the factors examined.

Taken together, the findings confirm that food waste at the institution is driven by a combination of situational, sensory, and behavioral factors, with time pressure emerging as the most critical concern.

Food waste due to large portion size										
Levels	Never		Rarely		Always		Often		Sometimes	
	F	%	F	%	F	%	F	%	F	%
100 Level	1	4	2	8	8	32	8	32	6	24
200 Level	2	6.6	6	19.4	11	35.5	10	32.3	2	6.5
300 Level	0	0	8	20.5	13	33.3	11	28.2	6	23.1
400 Level	3	7.7	8	20.5	13	33.3	11	28.2	4	10.3
500 LEVEL	1	5.9	2	11.8	8	47.1	3	17.7	3	17.7

The cross-tabulation of food waste due to large portion sizes across academic levels reveals a consistent and concerning pattern throughout the student population. Among 100 Level students, a combined 64% reported always or often wasting food due to oversized portions, while the figure rises to 67.8% among 200 Level students, indicating that the problem is particularly pronounced among lower-level undergraduates.

At the 300 and 400 Levels, over 60% of respondents similarly reported always or often discarding excess food, suggesting that the issue persists well into the later stages of undergraduate study. Among 500 Level students, 47.1% reported always wasting food for this reason, the highest 'always' rate across all levels further reinforcing the significance of portion size as a driver of food waste. Across all academic levels, the findings consistently point to large portion sizes as a key structural contributor to food waste within the university's food service system, warranting urgent attention in the design and management of meal portions in the cafeteria.

Food waste due to poor taste or quality										
Levels	Never		Rarely		Always		Often		Sometimes	
	F	%	F	%	F	%	F	%	F	%
100 Level	4	16	4	16	7	28	6	24	4	16
200 Level	3	9.7	6	19.4	8	25.9	7	25.6	7	22.6
300 Level	3	11.5	4	15.4	3	11.5	8	30.8	8	30.8
400 Level	4	10.3	4	10.3	14	35.9	11	28.2	6	15.4
500 Level	1	5.9	3	17.7	8	47.6	2	11.8	3	17.7

The cross-tabulation of food waste due to poor taste or quality across academic levels reveals a strong and consistent pattern of dissatisfaction with food standards among students. At the 100 Level, 28% of respondents reported always wasting food on account of poor taste or quality, with an additional 24% indicating often, while only 16% reported never doing so. A similar trend is observed among 200 Level students, where 25.9% always and 25.6% often waste food for this reason, with just 9.7% reporting never. Among 300 Level students, the 'often' and 'sometimes' categories each recorded 30.8%, suggesting that dissatisfaction with food quality is both frequent and widespread at this level.

The pattern becomes more pronounced among upper-level students. At the 400 Level, 35.9% reported always wasting food due to poor taste or quality the highest 'always' rate among undergraduate levels with a further 28.2% indicating often, and only 10.3% reporting never. Most strikingly, 500 Level students recorded the highest 'always' rate across all levels at 47.6%, with only 5.9% indicating they never waste food for this reason. The progressive increase in food waste attributed to poor taste or quality across academic levels strongly suggests that dissatisfaction with the standard of food served is deeply entrenched and worsens with length of study. These findings identify poor food quality as a critical and systemic driver of food waste within the university, one that demands immediate attention from food service management.

Leaving food unfinish after eating										
Levels	**Never**		**Rarely**		**Always**		**Often**		**Sometimes**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
100 Level	1	4	7	28	10	40	5	20	2	8
200 Level	4	12.9	7	22.6	12	38.7	6	19.4	2	6.5
300 Level	2	7.7	5	19.2	11	42.3	5	19.2	3	11.5
400 Level	4	10.26	10	25.6	13	33.3	6	15.4	6	15.4
500LEVEL	1	5.9	4	23.5	6	35.3	2	11.8	4	23.6

The cross-tabulation of food left unfinished after eating reveals that this behavior is widespread across all academic levels. At the 100 Level, 60% of students reported always or often leaving food unfinished, a pattern that persists through 200 Level (58.1%) and peaks at the 300 Level, where 61.5% reported the same. Among 400 and 500 Level students, the combined always or often rates stand at 51.3% and 58.9% respectively, while the proportion reporting never remains consistently low across all levels, ranging from just 4% to 12.9%. The findings confirm that incomplete meal consumption is a deeply ingrained behavioral pattern throughout the student population, highlighting the need for targeted interventions around portion control and eating habits as part of broader food waste reduction strategies.

Objective 2: Identify the primary causes of food wastage

Descriptive analysis: one sample t-test
Test value= 3.0

	T	df	Sig. (2-tailed)	Mean Difference
Portion sizes served are more than needed	1.324	137	.188	.13768
Poor food presentation affects meal consumption	1.481	137	.141	.14493
Food temperature affects consumption	2.114	137	.036	.21014
Repetitive meals contribute to food wastage	1.786	137	.076	.18116
Food waste due to poor taste or quality	2.644	137	.009	.28261

Hypothesis statement

H_0: The mean responses for all factors are not significantly different from 3.0, indicating no factor significantly contributes to food wastage.

H_1: At least one factor has a mean response significantly different from 3.0, indicating it contributes significantly to food wastage.

Test statistics

One-Sample t-Test

Level of significance

$\alpha = 0.05$

Decision Rule

Reject H_0 if $p \leq 0.05$ otherwise

Do not reject H_0 if $p > 0.05$

Conclusion

Food temperature and poor taste/quality are the primary causes of food wastage among students, as they are statistically significant ($p \leq 0.05$). Portion size, food presentation, and repetitive meals are not significant, indicating a lesser role in food wastage.

Objective 3: Evaluate the chemistry, nutritional advantage and quality of the meals provided to students

One sample T test
Test value =3.0

	T	df	Sig. (2-tailed)	Mean Difference
Meals contain balanced carbohydrates, protein, and fats	1.201	137	.232	.12319
Meals support overall health and wellbeing	1.953	137	.053	.19565
Food hygiene and safety practices are satisfactory	1.754	137	.082	.17391
Adequate inclusion of fruits and vegetables	2.341	137	.021	.22464

A one-sample t-test was conducted to evaluate the nutritional quality of meals served in the cafeterias of Federal University Lokoja, tested against a benchmark value of 3.0 at a 0.05 level of significance.

Hypothesis: H_0: Meals served in the cafeterias do not have adequate nutritional quality (Mean $\leq$ 3.00) H_1: Meals served in the cafeterias have adequate nutritional quality (Mean > 3.00).

Decision Rule: Reject H_0 if $p \leq 0.05$; otherwise, do not reject H_0.

The results reveal that of the four nutritional indicators examined, only the adequate inclusion of fruits and vegetables returned a statistically significant result ($t = 2.341$, $p = 0.021$), leading to the rejection of the null hypothesis for this variable alone. The remaining indicators (balanced carbohydrates, proteins, and fats ($t = 1.201$, $p = 0.232$), meals supporting overall health and wellbeing ($t = 1.953$, $p = 0.053$), and food hygiene and safety practices ($t = 1.754$, $p = 0.082$) all returned p-values exceeding the 0.05 threshold, and the null hypothesis is therefore not rejected for these variables.

These findings suggest that while cafeteria meals demonstrate some degree of nutritional adequacy, particularly in the provision of fruits and vegetables, they fall short of meeting acceptable standards across most key nutritional dimensions. Overall, the meals may be considered moderately adequate but

not fully satisfactory in terms of nutritional quality and food safety, pointing to the need for deliberate improvements in meal planning and cafeteria food management at the institution.

Objective 4 (Recommendation to this study): Provide actionable recommendations for reducing food waste and improving nutritional adequacy

Based on the findings of this study, several actionable recommendations are proposed to address food waste and improve nutritional adequacy within the university's cafeteria system.

- Cafeteria management should consider reducing standard portion sizes, as the data consistently identified large portions as a key driver of food waste across all academic levels. Complementing this, introducing flexible portion options that allow students to self-select their serving sizes would further reduce the volume of uneaten food while accommodating individual appetite differences.
- Improving menu variety and quality is essential. The findings revealed that poor taste and food quality are among the most significant contributors to food waste, and aligning meal offerings more closely with student preferences would encourage greater meal completion. Integrating a structured student feedback mechanism into the menu planning process would ensure that meals remain appealing, responsive, and resistant to consistent rejection.
- Nutrition education programs should be introduced to equip students with the knowledge needed to make healthier and more informed food choices. Such programs would address consumption behaviors that contribute to food waste, including leaving meals unfinished and poor appetite management.
- Targeted awareness campaigns on the consequences of food waste environmental, economic, and nutritional should be promoted across the university community.
- Embedding a culture of responsible consumption among students would reinforce the practical interventions above and contribute to sustainable, long-term improvements in both food waste reduction and nutritional outcomes.

World Food Programme (2021) [17]. Food waste: Facts, figures, and ways to reduce it. World Food Programme Report.

4. Discussion

The study reveals some significant levels of food waste in Federal University Lokoja's cafeterias, when actually some peoples needs this food, some people dies of hunger. Food waste is attributed with major contributors likely to include portion sizes, meal variety, and scheduling conflicts. The waste audit is anticipated to highlight patterns in food disposal, such as higher waste levels on days with less popular menu items. Nutritional analysis is expected to identify gaps in the nutritional quality of meals, potentially revealing deficiencies in essential nutrients or imbalances in macronutrient composition. Survey and interview findings provides valuable insights into student dining preferences and operational challenges faced by food vendors. These results inform actionable recommendations for reducing food waste, such as optimizing portion sizes, improving menu planning, and enhancing awareness of food waste among students. Recommendations for improving nutritional quality may include adjustments to meal composition and increased emphasis on nutrient-dense options. Overall, the study aims to contribute to more sustainable and health-conscious practices in campus cafeterias.

5. Conclusion

In conclusion, food waste and nutrition are critical issues that intersect uniquely in university settings, presenting both challenges and opportunities. At Federal University Lokoja, addressing these issues requires an integrated approach that considers the complex interplay of factors influencing food systems on campus.

The problem of food waste is multifaceted, encompassing environmental degradation, economic loss, and social inequity. In Federal University Lokoja, food waste represents a loss of valuable resources, including the energy, water, and labor used in food production and preparation. When this waste is disposed of in landfills, it contributes to greenhouse gas emissions, notably methane, exacerbating climate change. Beyond the environmental implications, food waste has economic consequences for the university, increasing the cost of food services and diverting resources from other pressing needs. Furthermore, it raises ethical concerns in a country like Nigeria, where food insecurity remains a prevalent issue.

6. Weakness and Future research

This study provides valuable insights into the Chemistry of food waste and nutrition statistical analysis amongst students of federal university Lokoja**.** Increasing the scope and frame to extend to other institutions in Nigeria can be a full study.

7. Authors contributions

All authors contributed immensely in the aspect of technical writing.

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9. Ethics

This is the original manuscript; there will be no expectation of any ethical problems. Ethical approval for this study will be sought from the relevant institutional review board at Federal University Lokoja. Participation will be voluntary, and informed consent will be obtained from all participants. The study will ensure confidentiality and anonymity of responses, with all data used strictly for research purposes. Participants will have the right to withdraw from the study at any point without consequence.

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