

## Self-reported Fracture History and Osteoporosis Indicators Among Postmenopausal Women in Nigeria: A Community-Based Cross-Sectional Study

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### ABSTRACT

**Background:** Osteoporosis is a progressive skeletal disorder that increases fracture risk, especially among postmenopausal women. In low- and middle-income countries, including Nigeria, limited data exists on osteoporosis prevalence, fractures and associated knowledge, attitudes and practices (KAP), particularly in rural areas. This study aimed to assess self-reported fracture history, osteoporosis-related indicators and their associations with sociodemographic and behavioural factors among postmenopausal women in rural Southeast Nigeria.

**Methods:** A community-based cross-sectional survey was conducted between August 2024 and May 2025 across ten randomly sampled rural communities in five southeastern states. A total of 587 postmenopausal women aged  $\geq 45$  years were recruited using a multistage sampling approach. Data were collected using the Osteoporosis Prevalence, Knowledge, Attitude and Practice Questionnaire (OPKAPQ), capturing information on fracture history, lifestyle behaviors, perceived osteoporosis risk and KAP. Descriptive statistics summarized participant characteristics and chi-square tests assessed associations between fracture history and sociodemographic or behavioral factors.

**Results:** Seventy-two percent (72.1%) of participants reported at least one lifetime fracture. Higher fracture prevalence was observed in women aged  $\geq 60$  years, those without tertiary education, informal employment, alcohol consumption and insufficient osteoporosis-related knowledge or preventive practices. Perceived osteoporosis risk was significantly associated with self-reported fractures ( $p = 0.022$ ), while attitudes did not show a significant association.

**Conclusion:** The high fracture prevalence among rural postmenopausal women in Southeast Nigeria underscores the need for targeted education, screening and preventive interventions, with an emphasis on improving osteoporosis awareness and practices.

**Keywords:** Osteoporosis, Fracture History, Postmenopausal Women, Rural Health, Nigeria

## 1. Introduction

Osteoporosis is a chronic, progressive skeletal disorder characterized by reduced bone mineral density (BMD) and deterioration of bone microarchitecture, which leads to an increased susceptibility to fragility fractures<sup>1</sup>. The condition globally affects an estimated 200 million women, with postmenopausal women being particularly vulnerable due to estrogen deficiency-related acceleration of bone loss<sup>2</sup>. Although osteoporosis awareness and management have improved in many high-income countries, the disease remains underdiagnosed and undertreated in low- and middle-income countries (LMICs), especially in sub-Saharan Africa<sup>3</sup>. In these regions, epidemiological data is often derived from non-random community samples and self-reported data, reflecting persistent structural barriers to diagnosis and the methodological limitations of low-resource settings.

Postmenopausal women in rural areas of developing countries face an elevated risk of osteoporosis, exacerbated by intersecting sociodemographic vulnerabilities, including low educational attainment, informal or subsistence-based employment, limited healthcare access and poor health literacy<sup>4</sup>. These disadvantages are often compounded by modifiable lifestyle behaviours such as tobacco and alcohol use, inadequate dietary calcium intake and physical inactivity, which are linked to adverse bone health outcomes and increased fracture risk<sup>5</sup>. Despite these concerns, population-level data on osteoporosis prevalence and fracture burden in sub-Saharan Africa remains scarce, with fractures occurring outside formal healthcare systems likely underreported or misclassified<sup>6</sup>.

Evidence from countries like Nigeria highlights substantial gaps in osteoporosis-related knowledge among older women, which can negatively influence health-seeking behaviour and the adoption of preventive practices<sup>7</sup>. In addition, cultural norms, occupational demands and religious or social practices play a significant role in shaping dietary patterns, physical activity and healthcare utilization, which in turn indirectly influence fracture risk<sup>8,9</sup>. However, the generalizability of studies from Nigeria and similar LMICs is often limited by the frequent reliance on purposive or convenience sampling, which can inflate risk estimates due to the overrepresentation of higher-risk subgroups<sup>10</sup>.

Fracture prediction tools such as the Fracture Risk Assessment Tool (FRAX) are widely used internationally,<sup>1</sup> but their applicability in African contexts is constrained by differences in risk factor profiles and the limited availability of diagnostic technologies, including dual-energy X-ray absorptiometry<sup>11</sup>. As a result, self-reported fracture history and perceived osteoporosis risk are often used as pragmatic, though imperfect, proxies in these settings.

To address these gaps, research focused on postmenopausal women in rural communities of Southeast Nigeria offers valuable insights into the prevalence of self-reported fracture history and osteoporosis-related indicators. It also examines associations with lifestyle behaviours, knowledge, attitudes and sociodemographic characteristics. Although these findings are intended to be hypothesis-generating rather than providing population-level prevalence estimates, they highlight the need for contextually relevant community-based interventions. Strengthening osteoporosis screening, education and prevention

strategies tailored to aging rural women in Southeast Nigeria is essential to addressing the growing burden of osteoporosis in these underserved regions<sup>10,12</sup>.

## 2. Materials and Methods

### 2.1. Design and setting

A community-based cross-sectional survey design was employed between August 2024 and May 2025. The study was conducted in ten randomly sampled rural communities across the five states of Southeast Nigeria, Anambra, Abia, Enugu, Imo and Ebonyi. The communities are known for demographic heterogeneity, sufficient population density to identify postmenopausal women with osteoporosis-related concerns and logistical feasibility for fieldwork. The local economies of the study areas are predominantly supported by subsistence farming, trading, artisanal activities and low-level civil service employment. Family structures are typically characterized by high parity and relatively low levels of formal education. Consequently, the study setting reflects a specific rural subpopulation within Southeast Nigeria and does not claim representativeness of all rural Nigerian or sub-Saharan African communities. In the absence of routine osteoporosis screening services in the sampled communities, the study relied on self-reported experiences and behavioural risk indicators rather than clinically confirmed diagnoses. Owing to the cross-sectional nature of the design, temporal relationships between exposures and outcomes cannot be established and all observed associations should be interpreted within this methodological constraint.

### 2.2. Participants and sampling

The target population consisted of postmenopausal women aged 45 years and above, with a mean age of 59.8 years. Inclusion criteria were: (i) age  $\geq 45$  years; (ii) self-reported history or symptoms suggestive of bone-related problems, included to enrich the sample with higher-risk women and enable exploration of fracture experiences and osteoporosis-related awareness; (iii) residency in one of the selected communities; (iv) provision of written informed consent; (v) adequate cognitive and psychological capacity to complete the survey; and (vi) availability during the data collection period. This purposive inclusion of women with perceived bone health concerns intentionally overrepresents higher-risk individuals and may have inflated the observed fracture prevalence relative to the general population.

A multistage sampling strategy was adopted. The five southeastern states served as geographic clusters, from which two rural communities were randomly selected per state. Within each community, eligible women were recruited randomly with the assistance of community leaders and local health workers. Of the 600 women approached, 587 completed the survey and were included in the final analysis. Thirteen participants (2.2%) were excluded due to incomplete questionnaires or withdrawal prior to interview completion, primarily as a result of time constraints, fatigue or loss of interest. Review of field records revealed no systematic differences between excluded and included participants with respect to age group or community of residence, suggesting a low likelihood of meaningful attrition bias. Because recruitment prioritized feasibility and depth within a resource-constrained rural setting, the sample is not statistically representative and findings should not be generalized beyond similar rural contexts in Southeast Nigeria.

### 2.3. Sample size calculation and power considerations

Sample size estimation was informed by a previously reported osteoporosis prevalence of 73.8% among older Nigerian women<sup>13</sup>. Given the exploratory and community-based nature of the study; a pragmatic prevalence-based approach was adopted to guide recruitment feasibility rather than to generate population-level prevalence estimates. The formula  $n = 35PR/Q^2$ , previously applied in questionnaire-based public health studies in comparable low-resource settings, was used. However, this formula is not a standard epidemiological method and should be regarded as an approximation rather than a definitive statistical approach. Using  $P = 73.8\%$ ,  $R = 26.2\%$  and  $Q = 11.07$  (representing 15% precision of  $P$ ), the minimum required sample size was estimated at 552 participants. Allowing for a 10% non-response rate, a target of 600 participants was set, of which 587 were ultimately analysed. No formal a priori power calculation based on effect sizes, multivariable modelling requirements or clustering effects was conducted. Although the achieved sample size was adequate for descriptive analyses and bivariate association testing, the study may be underpowered for subgroup analyses and multivariable effect estimation and effect sizes should therefore be interpreted with caution.

### 2.4. Data collection instrument

Data were collected using the Osteoporosis Prevalence, Knowledge, Attitude and Practice Questionnaire (OPKAPQ), a structured instrument adapted from previously validated tools<sup>7,14</sup>. The questionnaire comprised seven sections covering: sociodemographic characteristics, fracture history, lifestyle behaviours, self-reported osteoporosis-related symptoms and perceived risk (operationalized as “osteoporosis prevalence”), knowledge, attitudes and preventive practices. Section D did not include objective clinical measures such as DEXA or radiographic confirmation; instead, osteoporosis prevalence was treated as a proxy construct based on participant-reported symptoms and prior health information. Psychometric evaluation demonstrated good overall internal consistency (Cronbach’s  $\alpha = 0.84$ )<sup>15</sup>. However, subscale reliability coefficients for knowledge, attitudes and practices were not estimated, representing a limitation of the measurement assessment. Content validity was established through expert review by seven specialists in public health and orthopedics.

### 2.5. Data collection procedures

Data collection was carried out through face-to-face interviews conducted in participants’ homes by twenty trained community-based assistants, including two healthcare extension workers per community. Interviewer training was standardized, supervised by the principal investigator and lasted approximately 30 minutes. Assistance was provided to participants with literacy or comprehension difficulties to ensure accurate understanding of questionnaire items. Face-to-face interviewing was employed to maximize participation in this low-literacy rural setting but may have introduced social desirability bias, particularly regarding alcohol and tobacco use. To mitigate this risk, interviewers were trained to maintain neutrality, conduct interviews privately where possible and reassure participants of strict confidentiality. Ethical approval was obtained from the Research Ethics Committee of the University of Nigeria Nsukka [REC/FE/2024/00054], in accordance with established

ethical principles<sup>16,17</sup>. Written informed consent was obtained from all participants. Community entry and mobilization were facilitated through engagement with traditional rulers (“Igwe”) and community leaders and participants were informed that their decisions would not affect their community standing.

### 2.6. Statistical analysis

Data entry and analysis were performed using IBM SPSS Statistics version 22.0<sup>18</sup>. Double-entry verification and random cross-checking of 10% of questionnaires were conducted to minimize data entry errors. Descriptive statistics summarized categorical variables, while chi-square tests ( $\chi^2$ ) assessed associations between self-reported fracture history and relevant variables. Odds ratios with 95% confidence intervals were calculated for significant associations, with statistical significance set at a two-tailed  $p$ -value  $\leq 0.05$ . Multivariable logistic regression was not conducted; therefore, potential confounding factors could not be controlled. No adjustment for multiple testing or clustering was made and findings should be interpreted as exploratory and hypothesis-generating.

### 2.7. Reporting standards

The study was designed and reported in accordance with the STROBE guidelines for cross-sectional observational studies<sup>19</sup>, ensuring transparency and methodological rigor, particularly in relation to measurement limitations and potential sources of bias.

## 3. Results

### 3.1. Sociodemographic profile of participants

A total of 587 postmenopausal women from rural Southeast Nigeria participated. Most respondents were aged  $\geq 60$  years (60.0%), lived with others (68.8%), had no tertiary education (59.3%) and reported high parity (63.9% with  $\geq 5$  pregnancies). Regarding occupation, 52.3% were informally employed (e.g., farming, trading, artisanal work) and 46.7% were civil servants. More than half were widowed, divorced or single (57.9%). Religious affiliation was 55.0% non-Christian, reflecting community heterogeneity and purposive sampling rather than regional population patterns. Tobacco use was reported by 23.5% and alcohol consumption by 68.3%. Overall, 72.1% reported at least one lifetime fracture. This proportion reflects targeted recruitment of women with perceived bone health problems and should not be interpreted as population-level fracture prevalence (**Table 1**).

Perceived osteoporosis risk was significantly associated with self-reported fracture history ( $\chi^2 = 6.044$ ,  $df = 1$ ;  $p = 0.022$ ). Women with high perceived risk more frequently reported fractures (81.7%) than those with low perceived risk (51.6%). Osteoporosis-related knowledge was also significantly associated ( $\chi^2 = 5.946$ ,  $df = 1$ ;  $p = 0.010$ ), with more fractures among women with inadequate knowledge (78.4%) compared with adequate knowledge (55.8%). Preventive practices followed a similar pattern ( $\chi^2 = 6.858$ ,  $df = 1$ ;  $p = 0.030$ ). In contrast, attitudes toward osteoporosis were not significantly associated ( $\chi^2 = 7.693$ ,  $df = 1$ ;  $p = 0.481$ ). These findings describe behavioral and perceptual correlates of fracture experience rather than determinants of clinically confirmed fracture risk (**Table 2**).

**Table 1:** Sociodemographic Profile of Postmenopausal Women (n = 587).

Sociodemographics	Categorical variables	Frequency (f)	Percentage(%)
Age	≥60 years	352	60.0
	45-59 years	235	40.0
Living status	Alone	183	31.2
	Others (with family, relatives, friends)	404	68.2
Educational status	Tertiary education	239	40.7
	Others (non formal, primary, secondary)	348	59.3
Number of pregnancies	≥5 pregnancies	375	63.9
	≤5 pregnancies	212	36.1
Occupation	Civil servant	274	46.7
	Others (Artisan, self-employed, Trading, Farming)	313	52.3
Marital Status	Married	247	42.1
	Others (divorced, widowed, single)	340	57.9
Religious Affiliation	Christianity	264	45.0
	Others (African Traditional Religion, Paganism, Islam)	323	55.0
Tobacco Intake	Yes	138	23.5
	No	449	76.5
Alcohol Consumption	Present	401	68.3
	Absent	186	31.7
Fracture History	Present	423	72.1
	Absent	164	27.9

**Keys:** n = sample size, () = bracket sign, ≥ = greater than sign, ≤ = less than sign, f = frequency, % = percentage  
Fracture History and Osteoporosis Characteristics

**Table 2:** Associations between fracture history and osteoporosis among postmenopausal women.

Osteoporosis profile	Indices	n	Present f(%)	Absent f(%)	X <sup>2</sup>	P - value
Osteoporosis Prevalence	High	399	326(81.7)	73(18.3)	6.044	0.022
	Low	188	97(51.6)	91(48)		
Osteoporosis knowledge	Adequate	165	92(55.8)	73(44.2)	5.946	0.010
	Inadequate	422	331(78.4)	91(21.6)		
Attitudes toward Osteoporosis	Positive	372	265(71.2)	107(28.8)	7.693	0.481
	Negative	215	158(73.5)	57(26.5)		
Practices relating to Osteoporosis	Desirable	118	69(58.5)	49(41.5)	6.858	0.030
	Undesirable	469	354(75.5)	115(24.5)		

**Keys:** n = sample size, () = bracket sign, f = frequency, % = percentage.

### 3.2. Sociodemographic predictors of fracture history

Bivariate analyses (Table 3) identified several significant correlates of fracture history. Age ≥60 years ( $\chi^2 = 8.033$ , df = 1; p = 0.021), lack of tertiary education ( $\chi^2 = 5.465$ , df = 1; p = 0.011) and informal employment ( $\chi^2 = 4.848$ , df = 1; p = 0.003) were associated with higher fracture prevalence. Religious affiliation and alcohol consumption were also significant at the bivariate level. These associations may reflect unmeasured confounding rather than direct biological effects on bone health. Parity, marital status, tobacco use and living arrangements were not significantly associated with fracture history (p > 0.05). Inverse or unexpected associations observed for tobacco use, solitary living and some marital categories may reflect survivor bias, under-reporting of stigmatized behaviors, residual confounding or contextual factors such as nutrition and physical workload. Because multivariable adjustment was not performed, all associations should be interpreted cautiously. Odds ratios and confidence intervals were deemed internally inconsistent in some cases and were thus deemphasized in interpretation. Overall, older age, lower educational attainment, informal employment, religious affiliation and alcohol use emerged as contextual correlates of self-reported fracture experience in this purposively selected rural cohort. Given the cross-sectional design, reliance on self-reported outcomes and absence of objective fracture or bone health verification, these variables represent context-specific associations rather than definitive predictors of osteoporosis-related fracture risk (Table 3).

**Table 3:** Fracture history and participants' sociodemographic and lifestyle predictors (N=587).

Sociodemographics	Categorical variables	N	Present (%)	Absent f(%)	Odds	Odds Ratio	95% CI	Chi- square	P value
Age	≥60 years	352	296(84.1)	56(15.9)	5.29	4.27	4.303,7.418	8.033	0.021
	45-59 years	235	130(55.3)	105(44.7)	1.24				
Living status	Alone	183	97(53.0)	86(47.0)	1.13	0.27	0.207,0.363	7.488	0.474
	Others	404	326(80.7)	78(19.3)	4.18				

Education	Tertiary	239	132(55.2)	107(44.8)	1.23	0.24	0.428,0.515	5.465	0.011
	Others	348	291(83.6)	57(16.4)	5.11				
Parity Status	≥5 preg.	375	275(73.3)	100(26.7)	2.75	1.19	2.346,8.485	7.299	0.826
	≤5 preg.	212	148(69.8)	64(30.2)	2.31				
Occupation	Civil servant	274	186(67.9)	88(32.1)	2.11	0.68	0.374,0.436	4.848	0.003
	Others	313	237(75.7)	76(24.3)	3.12				
Marital Status	Married	247	134(54.3)	113(45.7)	1.19	0.21	0.167,0.228	3.904	0.823
	Others	340	289(85.0)	51(15.0)	5.67				
Religious Affiliation	Christianity	264	136(51.5)	128(48.5)	1.06	0.13	0.203,0.352	5.827	0.019
	Others	323	287(88.9)	36(11.1)	7.97				
Tobacco Intake	Yes	138	53(38.4)	85(61.6)	0.62	0.13	0.462,0.586	3.743	0.667
	No	449	370(82.4)	79(17.6)	4.68				
Alcohol Cons.	Present	401	328(81.8)	73(18.2)	4.49	4.32	3.174,6.283	6.365	0.005
	Absent	186	95(51.1)	91(48.9)	1.04				

**Keys:** n = sample size, () = bracket sign, ≥ = greater than sign, ≤ = less than sign, f = frequency, % = percentage, preg. = pregnancy, Cons. = consumption, Occupation: Others (Artisan, Trading, Farming), Educational status: Others (non-formal, primary, secondary), Occupation: Others (Artisan, self-employed, Trading, Farming), Marital Status: others (divorced, widowed, separated, single), Living status: Others (with family, relatives, friends), Religious affiliation: Others (Paganism, Islam, African Traditional Religion).

#### 4. Discussion

This study highlights a concerning high prevalence of osteoporosis-related fractures among postmenopausal women in rural Southeast Nigeria, with over 72% reporting a history of fracture. The data underscores a potent interplay between biological vulnerability, social determinants of health and behavioural risk factors, with significant implications for public health, policy-making and global efforts to address osteoporosis as a silent but debilitating disease. The relationship between low bone mineral density (BMD) and fracture risk is well-established<sup>2</sup>. Our findings corroborate this, revealing a significantly higher fracture rate among women with high osteoporosis prevalence (81.7%) versus those with low prevalence (51.6%), mirroring similar associations found in regional and global studies<sup>3,20</sup>. Osteoporosis-related knowledge also emerged as a critical protective factor. Women with inadequate knowledge had significantly higher fracture rates, echoing previous research emphasizing that awareness is foundational to prevention<sup>7</sup>. This reflects the broader global challenge where knowledge gaps continue to impede early detection and lifestyle modification<sup>21</sup>. In rural, lower-literacy populations, this gap becomes particularly pronounced<sup>14,22</sup>. Similarly, inadequate osteoporosis-related practices, such as insufficient calcium intake, lack of physical activity and alcohol consumption, were significantly linked to higher fracture prevalence. These findings are consistent with prior research underscoring the modifiability of lifestyle-related risk factors<sup>23</sup>.

Sociodemographic disparities, especially in age, education, employment and religion, were significantly associated with fracture risk. Women aged 60 and above were over four times more likely to have fractures, consistent with widespread evidence that aging accelerates bone loss post-menopause<sup>10,24</sup>. This age-related risk is well-documented globally and remains a key pillar in fracture risk prediction tools like FRAX<sup>1,25</sup>. Education stood out as a powerful predictor of fracture risk (OR = 5.11), reinforcing that health literacy plays a decisive role in preventive health behaviour, diagnosis and adherence to treatment<sup>26</sup>. Similar associations have been documented in various low- and middle-

income countries<sup>20,27</sup>, illustrating the structural barriers impeding women's access to bone health information. Employment type also influenced outcomes; informal workers had higher fracture rates than civil servants. This socioeconomic divide aligns with literature from Iran<sup>26</sup> and Iraq<sup>27</sup>, suggesting that informal employment may correlate with lower income, healthcare access and occupational physical stress, all of which negatively impact bone health<sup>28</sup>. Interestingly, religious affiliation also showed a significant relationship, with non-Christian women having higher fracture risks. While the underlying mechanisms are unclear, this could reflect differences in cultural norms, dietary habits or access to healthcare, warranting further qualitative investigation. Alcohol use emerged as a significant behavioural predictor (OR = 4.32), supporting prior findings from both high- and low-income settings that link alcohol consumption to reduced BMD and increased fracture risk<sup>5,6</sup>.

From a public health perspective, the study adds critical data to the sparse literature on osteoporosis in sub-Saharan Africa, where surveillance remains limited and fractures are underreported<sup>9</sup>. The high fracture prevalence, coupled with low education and poor health practices, presents a pressing call for comprehensive, community-level interventions. Given the growing elderly female population in Nigeria and similar LMICs<sup>13</sup>, failing to address osteoporosis could escalate the burden on already strained health systems. Fractures often lead to long-term disability, increased dependency and significant economic costs, both direct and indirect<sup>6,11</sup>. As such, early screening, especially for high-risk groups (age ≥60, low education, informal employment), should be prioritized in primary care. Policymakers must integrate osteoporosis awareness and screening into existing maternal and elderly health programs. Health education campaigns, delivered through religious, community and media platforms, could improve health literacy and encourage lifestyle changes such as exercise, smoking cessation and calcium/vitamin D supplementation<sup>12,30</sup>.

Stakeholders, including healthcare providers, community leaders, women's advocacy groups and government agencies, must align efforts to build sustainable osteoporosis prevention

frameworks. Health professionals should receive training to identify and counsel at-risk women early, especially in primary health centres. Local governments should subsidize diagnostic tools like DEXA scans and support accessible fracture liaison services. Community-based participatory approaches, which involve women in designing culturally relevant education programs, could enhance uptake and long-term impact. Faith-based organizations may also serve as critical allies in disseminating preventive messages, especially in culturally diverse settings.<sup>4,8</sup> Moreover, integrating osteoporosis into national non-communicable disease (NCD) strategies would enable coordinated funding and action, leveraging global partnerships such as the International Osteoporosis Foundation,<sup>30</sup> to provide technical and educational resources.

This study provides valuable insight into fracture prevalence, osteoporosis-related knowledge and behavioural correlates among postmenopausal women in rural Southeast Nigeria, a population often underrepresented in osteoporosis research. Strengths include the use of a structured, validated questionnaire and community-based face-to-face data collection, enhancing data completeness in a low-literacy setting. Limitations include reliance on self-reported fracture history and perceived osteoporosis risk without clinical confirmation, absence of multivariable adjustment and cross-sectional design, which precludes causal inference. Findings are exploratory and may not be generalized beyond similar rural contexts.

## 5. Conclusion

Postmenopausal women in rural Southeast Nigeria exhibit a high prevalence of self-reported fractures alongside limited osteoporosis-related knowledge and preventive practices. Older age, lower educational attainment, informal employment, alcohol use and inadequate osteoporosis awareness emerged as key contextual correlates of fracture experience. These findings underscore the urgent need for community-based interventions, including culturally tailored education, lifestyle modification programs and accessible screening initiatives, to mitigate osteoporosis risk in this vulnerable population. While the study provides valuable, hypothesis-generating insight into fracture patterns and behavioral risk factors, the reliance on purposive sampling and self-reported data limits generalizability. Future research integrating objective bone health assessments is recommended to inform evidence-based public health strategies.

## 6. Declaration

### 6.1. Acknowledgements

We sincerely thank the postmenopausal women from the ten rural Southeast Nigerian communities for their time, trust and willingness to share personal health experiences. We are grateful to community leaders, traditional rulers and local health workers for facilitating engagement and participant recruitment. Appreciation is extended to the field assistants and healthcare extension workers for their dedication during data collection. We also acknowledge the University of Nigeria Nsukka Research Ethics Committee for guidance and ethical oversight. Finally, we thank the experts who reviewed and supported the development of the OPKAPQ instrument, ensuring its relevance and validity.

### 6.2. Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by U.C.U., C.M.J., A.N.O. and O.C.E. The first

draft of the manuscript was written by U.C.U and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

### 6.3. Availability of data and materials

The data that support the findings of this study are available from the corresponding author [Ugwu, UC; [uchennacos.ugwu@unn.edu.ng](mailto:uchennacos.ugwu@unn.edu.ng); +2348037786068], upon reasonable request.

### 6.4. Financial support and sponsorship

No funding was received for conducting this study.

### 6.5. Competing interests

The authors have no conflicts of interest to declare that are relevant to the content of this article.

### 6.6. Ethics approval and consent to participate

The approval for the study was obtained from the Research Ethics Committee of the University of Nigeria Nsukka [Ethical Approval Reference Number: REC/FE/2024/00054]. This was in accordance with the tenets of the Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study.

### 6.7. Consent for publication

The participants consented to the submission of the original article to the journal.

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