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Eating difficulties among Nigerian community-dwelling stroke survivors: prevalence, correlates, and association with quality of life

Adekola B. Ademoyegun[1,2*], Adebukola G. Ibitoye[3], Wasiu A. Rasaq[1,2], Oluwafunmilayo A. Adeniyi[1], David O. Fabuluje[1,3], Israel A. Ojo[1,4], Taofeek O. Awotidebe[2] and Chidozie E. Mbada[5]

Abstract

Background Eating ability is central to human existence and survival, societal acceptance, life satisfaction, and social participation. Although eating difficulties (EDs) are common after stroke, few studies are reporting their impact on the quality of life (QoL) of stroke survivors. This study aimed to assess the prevalence, correlates, and association of EDs with QoL among stroke survivors.

Methods A cross-sectional study on 233 (Mean age: 59.6 ± 10.9 years; 52.8% female) Nigerian community-dwelling stroke survivors attending rehabilitation at three public hospitals was conducted. The Minimal Eating Observation Form– version II and WHOQOL-BREF were used to collect data on EDs and QoL respectively. Socio-demographic, stroke-related, and clinical characteristics of patients were assessed using structured questionnaires. The association of EDs with each domain of WHOQOL-BREF (physical health, psychological health, social relationships, environmental health, perceived health status, and overall QoL) was assessed with hierarchical regression analyses.

Results The majority (60.9%) of stroke survivors had at least one form of ED. Among the three types of EDs assessed, difficulty with energy/appetite (45.1%) was the most prevalent, followed by difficulty with ingestion (43.8%) and deglutition (40.8%). The results showed that EDs were associated with haemorrhagic stroke ($r = 0.158$; $p = 0.016$), right-sided hemiplegia ($r = 0.172$; $p = 0.008$), increasing stroke severity ($r = 0.466$; $p < 0.001$), increasing co-morbidity ($r = 0.384$; $p < 0.001$), poor oral health ($r = 0.511$; $p < 0.001$), poor mental health ($r = 0.260$; $p < 0.001$), poor affected grip strength ($r = -0.157$; $p = 0.016$), poor nutritional status ($r = -0.362$; $p < 0.001$), low functional ability ($r = -0.415$; $p < 0.001$), and low social support ($r = -0.257$; $p < 0.001$). After adjustments, EDs independently explained 10.7% of the variance in psychological health (β= -0.467; $p < 0.001$), 4.7% in social relationships (β= -0.308; $p < 0.001$), 2.4% in perceived health status (β= -0.221; $p = 0.002$), and 7.4% in overall QoL (β= -0.383; $p < 0.001$). However, the variance accounted for by EDs in physical and environmental health domains was insignificant.

*Correspondence:
Adekola B. Ademoyegun
aademoyegun@gmail.com

Full list of author information is available at the end of the article

Conclusion The prevalence of EDs among Nigerian community-dwelling stroke survivors is high, which is associated with many stroke-related and clinical factors. Meanwhile, increasing in EDs is independently associated with reduced QoL among stroke survivors using WHOQOL-BREF. Emphasis on screening and management of EDs in stroke rehabilitation protocols may assist in improving survivors' QoL.

Keywords Food, Health status, Daily activity, Dysphagia, Malnutrition

Introduction

Stroke is one of the most common causes of death and contributors to disability globally [1]. The recent epidemiological data shows a global increase in stroke burden from 1990 to 2021, notably in low-and medium-income countries, including Sub-Saharan African countries [1]. In Nigeria, stroke accounts for up to 65% of adult neurological hospital admissions [2], with Adeloye et al. [3] estimating a pooled crude prevalence of 6.7% (95% CI: 5.8–7.7) per 100,000 of stroke among the Nigerian population. The stroke-related motor deficits have a profound negative impact on activities of daily living in many patients with stroke [4, 5], including the ability to eat.

Eating difficulties (EDs) are defined as a complex problem that inhibits the ability of an individual to consume an adequate or necessary amount of food or to experience eating pleasure [6–9]. EDs are different from the related concepts of dysphagia and eating disorders. While dysphagia is the inability or difficulty to swallow food or liquids [10, 11], eating disorders, according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), are behavioural and mental health eating disorders such as anorexia nervosa, binge eating disorder, rumination, pica, etc. that are related to excessive body weight concern leading to impaired physical and psychosocial functioning [12]. Eating difficulties, though often neglected in stroke rehabilitation [6], are common consequences attributed to stroke [7]. Eating difficulties, which may occur alone or in combination, are problems with ingestion (e.g., food manipulation on the plate or transporting food to the mouth), deglutition (e.g., chewing ability or swallowing of food), and energy and appetite (e.g., staying alert during meal or quantity of meal consumed) [8, 9]. Regarding prevalence, depending on contexts, EDs are reported to affect every 3–8 stroke survivors out of 10 [7–9, 13–15]. Apart from the high prevalence of EDs post-stroke, the problems of EDs persist long after stroke event [15, 16]. Furthermore, several deleterious outcomes have been linked with EDs in stroke and other chronic diseases [17], including higher risk of aspiration pneumonia, longer hospital stay, low nutritional status, higher functional dependency, higher rates of being institutionalized or a poorer quality of life (QoL) [7–11, 13–15, 18–20]. Studies have shown that among all self-care functions, eating ability is the most profound because it is central to human existence, and survival, and it is important to self and societal acceptance, life satisfaction, and social participation [21–23]. Ability to eat or enjoy a meal is also vital to enduring physiological and mental development [21, 23].

However, data on the prevalence of EDs in Sub-Saharan Africa are limited, as studies on EDs are mainly from Western nations and focused mainly on hospitalized and institutionalized patients and not those in the community. The available studies on EDs do not consider the different socio-cultural norms and support systems faced by stroke survivors from Sub-Saharan Africa. For instance, the cultural norm of eating with the hand and societal eating practice in Nigeria may exacerbate the psychosocial problems that are associated with EDs among the Nigerian stroke population [24]. Meanwhile, one of the core principles and objectives of stroke management is to promote the QoL of the survivors [25–27]. Evidence shows that stroke survivors in Western countries [25, 26] and Sub-Saharan African nations [28], including Nigeria [29, 30], have reduced QoL compared to the general population. Thus, identifying the potential impact of EDs on QoL of patients with stroke may help clinicians predict the QoL of stroke patients and plan appropriate intervention strategies to enhance QoL. Eating and meal choices are considered important aspects of measures of QoL in many societies [31]. However, the potential contribution of EDs to poor QoL in stroke patients has not been fully examined, except in dysphagia. Studies have shown a reduction in the QoL of stroke patients with the problem of dysphagia [23, 32], however, EDs are complex, and multifaceted and thus encompass other contextual measures of eating ability other than dysphagia [31, 33, 34].

Perry and McLaren [35] investigated the association between eating disabilities and QoL of stroke survivors six months after discharge. However, this study was conducted among stroke survivors in the United Kingdom, whereas evidence has shown that due to differences in socioeconomic, cultural, and health system indices, the QoL of stroke survivors in high-income economy countries differ from those of low-and medium-income countries [36, 37]. For example, in the Nigeria context where eating with the hand is a norm, stroke-related motor impairment may result in a greater difficulty in maintaining societal eating practices leading to lower social participation and more isolation which may affect QoL. Similarly, findings have indicated that Nigerian stroke survivors face unique challenges related to poor nutrition, poor social networks, and social stigma which are

precursors for EDs and poor QoL [38–40]. While previous studies have explored EDs primarily in hospitalized populations in Western countries, this study examines community-dwelling stroke survivors in a Sub-Saharan African context, using validated tools to assess the prevalence, correlates, and association of EDs with QoL. Thus, the objectives of the present study are to: (1) assess the prevalence of EDs using the Minimal Eating Observation Form– version II (MEOF-II), (2) examine the socio-demographic, stroke-related, and clinical factors associated with EDs, and (3) evaluate the association of EDs with different domains of QoL using World Health Organization Quality of Life Brief Version (WHOQOL-BREF) among Nigerian community-dwelling stroke survivors.

Methods

Participants

This multicentre cross-sectional study, conducted between March and October 2024, involved community-dwelling patients with stroke who were attending rehabilitation in three hospitals. To minimize selection bias, participants were consecutively recruited from three Nigerian tertiary hospitals, namely the University of Medical Sciences Teaching Hospital, Ondo, State Specialist Hospital, Osogbo, and Osun State University Teaching Hospital, Osogbo, Nigeria. Stroke survivors, while attending rehabilitation in the three hospitals during the pendency of the study, were invited. The rationale and objectives of the study were explained to them while seeking their consent. Included were patients with stroke diagnosis attending physiotherapy clinics at the three health facilities during the period of the study, with first-ever unilateral stroke, who were 18 years and older, and able and willing to give consent. Stroke survivors with severe cognitive and communication impairments and those with other neurological conditions (e.g., Parkinson's disease) were excluded. With G*Power 3.1.9.4 software, a minimum of 179 samples is needed for a linear regression at 0.15 moderate effect size, considering the effect size of similar studies [41, 42], 5% error of probability, 90% power, and potential 17 predictors [43]. Out of 248 who met the inclusion criteria and gave consent, only 233 (93.9% response rate) with complete data were included in the present study. The Ethical Review Committee of the Osun State University Teaching Hospital, Osogbo, Nigeria approved the study (UTH/REC/2024/03/923). All participants gave written informed consent.

Assessments

Eating difficulties

The EDs of the participants were assessed by MEOF-II. The MEOF-II is a tool that evaluates eating abilities in three domains, namely ingestion, deglutition, and energy/appetite[44]. Each of the three MEOF-II domains has three items scored from 0 (no difficulty) to 1 (some form of difficulty). The ingestion, deglutition, and energy/appetite each have a maximum score of 3 with obtainable total MEOF-II score being 9 for all nine items. A higher total and domain scores of MEOF-II indicate higher EDs [44]. The psychometric properties of MEOF-II have been established, with a robust validity and inter-rater reliability [17, 20, 21, 45–47] and a good internal consistency among observers of varying degrees of training [45]. Furthermore, the instrument demonstrates acceptable convergent and discriminate validity among populations of diverse patients, including patients with stroke [17]. In this study, Cronbach's alpha was 0.84 while inter-rater reliability was 0.81. To ensure ethical compliance, participants identified as having severe EDs were referred for appropriate care.

Quality of life

The WHOQOL-BREF was employed to assess the QoL of the participants. The WHOQOL-BREF tool assesses QoL in terms of overall QoL, health status, physical health, psychological health, social relationships, and environmental health [48, 49]. The instrument contains 26 items, with one item each assessing overall QoL and health status domains, while the remaining 24 items assess four other domains, including physical health (seven items), psychological health (six items), social relationships (three items), and environmental health (eight items) QoL [49, 50]. The WHOQOL-BREF items are scored on a five-point Likert scale and transformed to a 0-100 scale using the WHO scoring guidelines, with a higher score indicating higher QoL [49]. The WHOQOL-BREF Yoruba-Nigerian version has good validity in assessing QoL among stroke survivors [51]. The Cronbach's alpha for the overall QoL, health status, physical health, psychological health, social relationships, and environmental health domains of WHOQOL-BREF in this study were respectively 0.84, 0.89, 0.78, 0.80, 0.84, and 0.79.

Covariates

Sequel to the findings of previous related studies [11, 17, 28, 33, 35, 37, 50, 52, 53], many important covariates, including socio-demographic (age, gender, years of education, income, and marital status), stroke-related (stroke type, stroke duration, laterality, and stroke severity), and clinical (affected grip strength, number of co-morbidity, oral health, nutrition status, functional independence, social support, and mental health) characteristics, were assessed. Based on the Nigerian minimum wage, income was categorized as low or high, and stroke severity was assessed with the 11-item National Institute of Health Stroke Scale (NIHSS), with the maximum score being 42. A higher NIHSS score indicates more stroke severity

[54]. The affected grip strength of the participants was assessed with the CAMRY Digital Hand Dynamometer (MODEL: EH101; Zhongshan Camry Electronic Co. Ltd., Zhongshan, China). This device has been employed to assess grip strength among stroke survivors in previous studies [52, 55]. The Cronbach's alpha of CAMRY Digital Hand Dynamometer was 0.91 in this study. Three trials were performed and the mean grip strength value was recorded [52]. The number of co-morbidity, including hypertension, diabetes mellitus, cigarette smoking, alcoholism, hyperlipidemia, coronary heart disease, respiratory infection, cancer, arthritis, obesity, and urinary tract infection, was assessed as well.

The revised oral assessment guide (ROAG) was employed to assess the oral health of the participants. The ROAG assesses oral health in terms of voice, lips, mucous membranes, tongue, gums, teeth/dentures, saliva, and swallowing and is rated from 1 (normal) to 3 (very bad) with scores ranging from 8 to 24 [56]. Higher ROAG scores > 8 were considered as poor oral health [56, 57]. The inter-rater reliability and validity of ROAG is established, including among non-dental health professionals [56, 58]. The Mini Nutritional Assessment (MNA) was used to assess the nutritional status. The 18-item MNA has minimum and maximum scores of 0 and 30, with a higher score meaning better nutritional status [59]. The test-retest reliability and minimal detectable change of MNA is excellent among stroke survivors [53]. The MNA scores of ≥ 24, 17–23.5, and < 17 are considered as good nutritional status, risk of malnutrition, and being malnourished, respectively [60]. The functional ability of the participants was assessed with a modified Barthel index (MBI), which evaluates 10 items of activities of daily living on the level of assistance needed and scored on a five-point scale with a maximum total score of 100 [61, 62]. Higher scores of MBI indicate an increase in independency in daily activities [61, 62]. MBI has excellent psychometric properties in assessing the functional independence of stroke survivors [61, 62]. To assess social support, patients were asked to rate their perceived social support available from family and friends on a five-point scale, with maximum and minimum obtainable scores being five and one. The higher scores suggest more available social support. The Cronbach's alpha for this item question was 0.89 in this study. The mental health was evaluated with item 26 on WHOQOL-BREF, "How often do you have negative feelings, such as blue mood, despair, anxiety, depression"?. This item was scored on a five-point scale from "never" (one point) to "always" (five points), with higher scores suggesting more mental health problems. In this study, the Cronbach's alpha for this single item was 0.83.

Data analysis

The socio-demographic, stroke-related, and clinical characteristics of participants were summarized in mean, standard deviation, median, interquartile range, frequency, and percentage. Spearman rho correlation analyses were performed to assess the associations of MEOF-II total and domain scores with socio-demographic, stroke-related, and clinical characteristics. Similar correlation analyses were performed between WHOQOL-BREF domain scores and MEOF-II total scores, socio-demographic, stroke-related, and clinical characteristics. To examine the relative contribution of EDs on each domain of WHOQOL-BREF of participants, hierarchical linear regressions were performed. The socio-demographic, stroke-related, and clinical variables that were significant ($p < 0.05$) in the correlation analyses for each domain of WHOQOL-BREF were entered in the first step (model 1) while the MEOF-II total score was entered in the second step (model 2). The independent contribution of EDs on each domain of WHOQOL-BREF was estimated by the changes in R^2 from models 1 to 2. The predictors in the regression models were tested for multicollinearity using variance inflation factor (VIF) values. The VIF values in the regression models were below 5. The alpha level was set at $p < 0.05$. IBM SPSS (Version 21) was used for the analyses.

Results

The general features of the participants are presented in Table 1. The mean age of the participants was 59.6 ± 10.9 years, with the majority being female (52.8%), aged above 60 years (46.8%), had tertiary education (58.8%), having low income (86.7%), had an ischaemic stroke (76.8%), and with left-sided hemiplegia (53.6%). The mean affected grip strength, MNA, ROAG, and MEOF-II scores were 7.61 ± 8.72 kg, 18.5 ± 4.5, 9.53 ± 1.95, and 2.19 ± 2.35, respectively. The majority of the participants had poor oral health (58.8%) while 47.6% and 37.8% were at risk of malnutrition and malnourished. Out of 233 participants, 142 (60.9%) had at least one form of ED. Of all the three types of EDs assessed, the problem of energy/appetite (45.1%) was the commonest ED observed, followed by difficulty with ingestion (43.8%) and deglutition (40.8%). Table 1 shows that the environmental health domain of WHOQOL-BREF has the highest mean score (57.1 ± 11.7) while perceived health status has the lowest (50.5 ± 25.0).

Having established the prevalence of EDs, we now explore their association with demographic, stroke-related, and clinical characteristics. As shown in Table 2, EDs (MEOF-II total score) were positively correlated with stroke type, paretic side, NIHSS score, number of co-morbidity, oral health, and mental health disorders. There was also a negative correlation between MEOF-II

Table 1 General characteristics of participants ($N = 233$)

Variable	Mean ± SD/ *n* (%)
Socio-demographics	
Age (years)	59.6 ± 10.9
Age group	
18-40 years	17 (7.3)
41-50 years	27 (11.6)
51-60 years	80 (34.3)
> 60 years	109 (46.8)
Gender	
Male	110 (47.2)
Female	123 (52.8)
Marital status	
Married or cohabiting with someone	194 (83.3)
Single[a]	39 (16.7)
Years of education	13.7 ± 4.2
Educational level	
No formal education	8 (3.4)
Primary education	20 (8.6)
Secondary education	68 (29.2)
Tertiary education	137 (58.8)
Level of income	
Low	202 (86.7)
High	31 (13.3)
Stroke-related characteristics	
Type of stroke	
Ischaemic	179 (76.8)
Haemorrhagic	54 (23.2)
Paretic side	
Left	125 (53.6)
Right	108 (46.4)
Duration of stroke (months)	10.2 ± 8.38
Stroke severity (NIHSS) [b]	4.0 (4.0)
Clinical characteristics	
Number of co-morbidity	1.88 ± 1.02
Affected grip strength (kg)	7.61 ± 8.72
Nutritional status (MNA)	18.5 ± 4.5
Normal	34 (14.6)
Risk of malnutrition	111 (47.6)
Malnourished	88 (37.8)
Functional independence (MBI)	70.3 ± 17.0
Social support	3.24 ± 0.98
Mental health	2.52 ± 0.97
Oral health (ROAG)	9.53 ± 1.95
Good oral health	96 (41.2)
Poor oral health	137 (58.8)
Eating difficulties	
MEOF-II Total score	2.19 ± 2.35
MEOF-II Ingestion score	0.73 ± 0.93
MEOF-II Deglutition score	0.68 ± 0.95
MEOF-II Energy/Appetite score	0.78 ± 1.03
Presence of at least one form of eating difficulty, Yes	142 (60.9)
Presence of Ingestion problem, Yes	102 (43.8)
Presence of Deglutition problem, Yes	95 (40.8)
Presence of Energy/Appetite problem, Yes	105 (45.1)

Table 1 (continued)

Variable	Mean ± SD/ *n* (%)
Quality of life	
Physical health	55.0 ± 13.9
Psychological health	56.2 ± 16.6
Social relationships	56.9 ± 16.5
Environmental health	57.1 ± 11.7
Health status	50.5 ± 25.0
Overall quality of life	56.0 ± 28.5

[a] included the unmarried, divorced, widowed, and separated; [b] value expressed in median and interquartile range; NIHSS National Institute of Health Stroke Scale; MNA Mini Nutritional Assessment; MBI Modified Barthel Index; ROAG Revised Oral Assessment Guide; MEOF-II Minimal Eating Observation Form– version II

Table 2 Correlation between socio-demographics, stroke-related characteristics, clinical features, and eating difficulties among stroke survivors

Variable	MEOF-II Total score *r* (*p*-value)	MEOF-II Ingestion score *r* (*p*-value)	MEOF-II Deglutition score *r* (*p*-value)	MEOF-II Energy/Appetite score *r* (*p*-value)
Age	0.046 (0.481)	0.055 (0.401)	0.010 (0.876)	0.055 (0.400)
Gender[a]	-0.050 (0.452)	0.033 (0.619)	-0.051 (0.442)	-0.087 (0.187)
Marital status[b]	-0.080 (0.225)	0.007 (0.915)	-0.034 (0.603)	-0.108 (0.100)
Years of education	0.045 (0.497)	0.007 (0.917)	0.124 (0.059)	0.015 (0.819)
Income[c]	-0.084 (0.200)	-0.178 (0.006)*	0.045 (0.495)	-0.085 (0.197)
Stroke type[d]	0.158 (0.016)*	0.100 (0.127)	0.126 (0.055)	0.172 (0.008)*
Paretic side[e]	0.172 (0.008)*	0.228 (< 0.001)*	0.078 (0.236)	0.079 (0.232)
Stroke duration	0.070 (0.289)	-0.031 (0.636)	0.107 (0.104)	0.109 (0.096)
Stroke severity (NIHSS)	0.466 (< 0.001)*	0.295 (< 0.001)*	0.410 (< 0.001)*	0.447 (< 0.001)*
Affected grip strength	-0.157 (0.016)*	-0.090 (0.172)	-0.078 (0.236)	-0.168 (0.010)*
Number of co-morbidity	0.384 (< 0.001)*	0.264 (< 0.001)*	0.360 (< 0.001)*	0.357 (< 0.001)*
Oral health (ROAG)	0.511 (< 0.001)*	0.370 (< 0.001)*	0.451 (< 0.001)*	0.460 (< 0.001)*
Nutritional status (MNA)	-0.362 (< 0.001)*	-0.248 (< 0.001)*	-0.288 (< 0.001)*	-0.326 (< 0.001)*
Functional independence (MBI)	-0.415 (< 0.001)*	-0.400 (< 0.001)*	-0.297 (< 0.001)*	-0.326 (< 0.001)*
Mental health disorder	0.260 (< 0.001)*	0.276 (< 0.001)*	0.153 (0.020)*	0.151 (0.021)*
Social support	-0.257 (< 0.001)*	-0.214 (0.001)*	-0.218 (0.001)*	-0.241 (< 0.001)*

NIHSS National Institute of Health Stroke Scale; MNA Mini Nutritional Assessment; MBI Modified Barthel Index; ROAG Revised Oral Assessment Guide; MEOF-II Minimal Eating Observation Form– version II; [a]coded as 0 (female), 1 (male); [b]coded as 0 (single), 1 (married or cohabiting with someone); [c]coded as 0 (low income), 1 (high income); [d]coded as 0 (ischaemic stroke), 1 (haemorrhagic stroke); [e]coded as 0 (left-sided paresis), 1 (right-sided paresis); *indicates significant correlation; r indicates Spearman rho correlation coefficient

total score and affected grip strength, nutritional status, functional independence, and social support. Each of the three MEOF-II domain scores also showed similar correlation patterns. In all the socio-demographic, stroke-related, and clinical covariates assessed, ROAG had the strongest correlation with the MEOF-II total score ($r = 0.511$; $p < 0.001$), showing that poor oral health is associated with EDs. The correlation between WHOQOL-BREF domain scores and socio-demographic, stroke-related, and clinical characteristics are shown in Table 3. The domains showed varied correlations with participants' characteristics. Meanwhile, all WHOQOL-BREF domains showed significant negative correlations with EDs ($p < 0.001$), with the psychological health domain showing the strongest correlation with MEOF-II total score (r = -0.662; $p < 0.001$).

The independent contribution of EDs to QoL of the participants using WHOQOL-BREF was evaluated with hierarchical regression models (Table 4). Model 1 of the linear regression for each domain of WHOQOLBREF was adjusted for by the variables that were significant in the correlation analyses for each domain. The inclusion of EDs to model 1 increased the explained variance in physical health by 0.1% (change in $R^2 = 0.001$; β = -0.042; $p = 0.575$), in psychological health by 10.7% (change in $R^2 = 0.107$; β = -0.467; $p < 0.001$), in social relationships by 4.7% (change in $R^2 = 0.047$; β = -0.308; $p < 0.001$), in environmental health by 0.1% (change in $R^2 = 0.001$; β = -0.029; $p = 0.723$), in perceived health status by 2.4% (change in $R^2 = 0.024$; β = -0.221; $p = 0.002$), and in overall QoL by 7.4% (change in $R^2 = 0.074$; β = -0.383; $p < 0.001$) (Table 4). As shown in Table 4, EDs were significantly associated with psychological health, social relationships, health status, and overall QoL, with the strongest impact of EDs being on psychological health, explaining 10.7% of the variance. However, EDs had no significant impact on physical and environmental health domains. Furthermore, social support was significantly and positively

Table 3 Correlation between socio-demographics, stroke-related characteristics, clinical features, eating difficulties, and domains of World Health Organization quality of life-brief questionnaire among stroke survivors

Variable	Physical health *r* (*p*-value)	Psychological health *r* (*p*-value)	Social relationships *r* (*p*-value)	Environmental health *r* (*p*-value)	Health status *r* (*p*-value)	Overall quality of life *r* (*p*-value)
Age	-0.008 (0.902)	0.034 (0.604)	-0.402 (0.520)	0.008 (0.907)	0.105 (0.109)	0.070 (0.287)
Gender[a]	0.146 (0.026)*	0.027 (0.679)	0.077 (0.244)	0.185 (0.005)*	0.139 (0.035)*	-0.012 (0.855)
Marital status[b]	-0.003 (0.960)	0.014 (0.835)	0.152 (0.021)*	-0.043 (0.509)	-0.125 (0.056)	0.023 (0.726)
Years of education	0.094 (0.152)	0.060 (0.362)	0.099 (0.132)	0.144 (0.028)*	-0.058 (0.381)	-0.059 (0.367)
Income[c]	0.037 (0.574)	0.052 (0.434)	0.183 (0.005)*	-0.063 (0.337)	-0.019 (0.773)	0.162 (0.013)*
Stroke type[d]	-0.037 (0.571)	-0.223 (0.001)*	-0.017 (0.795)	-0.050 (0.446)	-0.167 (0.011)*	-0.128 (0.050)
Paretic side[e]	-0.036 (0.582)	-0.128 (0.051)	-0.071 (0.283)	-0.008 (0.906)	-0.118 (0.072)	-0.046 (0.487)
Stroke duration	0.007 (0.911)	-0.036 (0.583)	-0.009 (0.897)	0.070 (0.288)	0.018 (0.785)	-0.041 (0.537)
Stroke severity (NIHSS)	-0.350 (< 0.001)*	-0.387 (< 0.001)*	-0.418 (< 0.001)*	-0.168 (0.010)*	-0.389 (< 0.001)*	-0.407 (< 0.001)*
Affected grip strength	0.243 (< 0.001)*	0.275 (< 0.001)*	0.223 (0.001)*	0.016 (0.809)	0.224 (0.001)*	0.186 (0.004)*
Number of co-morbidity	-0.189 (0.004)*	-0.257 (< 0.001)*	-0.275 (< 0.001)*	-0.044 (0.499)	-0.245 (< 0.001)*	-0.266 (< 0.001)*
Oral health (ROAG)	-0.314 (< 0.001)*	-0.413 (< 0.001)*	-0.376 (< 0.001)*	-0.177 (0.007)*	-0.342 (< 0.001)*	-0.381 (< 0.001)*
Nutritional status (MNA)	0.362 (< 0.001)*	0.291 (< 0.001)*	0.329 (< 0.001)*	0.325 (< 0.001)*	0.292 (< 0.001)*	0.284 (< 0.001)*
Functional independence (MBI)	0.363 (< 0.001)*	0.390 (< 0.001)*	0.373 (< 0.001)*	0.294 (< 0.001)*	0.409 (< 0.001)*	0.466 (< 0.001)*
Mental health disorder	-0.411 (< 0.001)*	0.415 (< 0.001)*	0.376 (< 0.001)*	-0.168 (0.010)*	-0.366 (< 0.001)*	-0.416 (< 0.001)*
Social support	0.392 (< 0.001)*	0.335 (< 0.001)*	0.443 (< 0.001)*	0.314 (< 0.001)*	0.469 (< 0.001)*	0.458 (< 0.001)*
Eating difficulties (MEOF-II total score)	-0.382 (< 0.001)*	-0.662 (< 0.001)*	-0.549 (< 0.001)*	-0.253 (< 0.001)*	-0.495 (< 0.001)*	-0.599 (< 0.001)*

NIHSS National Institute of Health Stroke Scale; MNA Mini Nutritional Assessment; MBI Modified Barthel Index; ROAG Revised Oral Assessment Guide; MEOF-II Minimal Eating Observation Form– version II; [a]coded as 0 (female), 1 (male); [b]coded as 0 (single), 1 (married or cohabiting with someone); [c]coded as 0 (low income), 1 (high income); [d]coded as 0 (ischaemic stroke), 1 (haemorrhagic stroke); [e]coded as 0 (left-sided paresis), 1 (right-sided paresis); *indicates significant correlation; r indicates Spearman rho correlation coefficient

associated with all the domains of WHOQOL-BREF in all regression models.

Discussion

This study assessed the prevalence and socio-demographic, stroke-related, and clinical correlates of eating difficulties (EDs) among Nigerian community-dwelling stroke survivors and determined its association with quality of life (QoL) using the generic World Health Organization quality of life-brief (WHOQOL-BREF) questionnaire. The prevalence of having at least one ED among Nigerian community-dwelling stroke survivors in this study was 60.9%. This rate is similar to the prevalence of eating disability (66%) obtained among stroke patients in the UK who were interviewed in their homes 6 months after stroke [63]. Although this prevalence falls within the range reported in the literature from Western settings (36–84%), [7–9], [13, 14, 15], [63] the rates still differ. While Poels et al. [7] found a 43% prevalence of EDs among patients admitted to a rehabilitation center in The Netherlands, Medin et al. [15] reported an 81.7% prevalence among Swedish acute stroke survivors. Meanwhile, the prevalence was 70% in a cohort of patients with stroke also in Sweden [14]. Studies assessing EDs were conducted mainly in Western countries and recruited acute/ hospitalized or institutionalized stroke patients [7–9, 13–15]. Thus, the differences in the prevalence of EDs observed in these studies could be attributed to study locations, sample size, time since stroke, and method of assessment. In the present study, the mean time since stroke of the cohort of patients recruited was 10.2 months, and the first study outside of developed countries. For instance, the available evidence suggests that the prevalence of EDs is impacted by time since stroke [14, 15]. Furthermore, the difference in prevalence rates may also be influenced by cultural eating practices and stroke care availability in Nigeria compared to Western settings.

Furthermore, the commonest ED observed in this study out of all the three types of EDs was the problem of energy/appetite (45.1%), which was followed by ingestion problem (43.8%) and then deglutition problem (40.8%). This result is similar to the findings of Westergren et al. [9] where elements of energy/appetite eating problem ('eat three-quarters or less of served food') (60%) was the most prevalent eating problem and ingestion problem ('manipulating food on the plate') (56%) was the second among stroke survivors. Another qualitative study involving 206 stroke survivors reported that 113 of the survivors with eating disability complained mostly of fatigue out of many eating-associated problems they encountered 6 months after stroke [63]. Generally, ingestion- and deglutition-related problems after stroke are common in the acute stage whereas fatigue/ energy and appetite-related problems seem to persist more than the other two even after discharge [20]. This

Table 4 Independent association of eating difficulties with domains of World Health Organization quality of life-brief questionnaire among stroke survivors

Variable	Physical health β(*p*-value)		Psychological health β(*p*-value)		Social relationships β (*p*-value)		Environmental health β (*p*-value)		Health status β(*p*-value)		Overall quality of life β(*p*-value)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Gender	0.051(0.367)	0.053(0.351)	------	--------	----------	----------	0.009(0.128)	0.101(0.124)	0.056(0.306)	0.063(0.240)	-----	-----
Marital status	----------	----------	------	-------	**0.109(0.046)**	0.075(0.155)	----------	----------	----------	----------	------	-----
Education	--------	-------	----	-----	---------	----------	0.045(0.499)	0.045(0.499)	-------	----------	---------	----------
Income	---------	---------	-----	-----	0.078(0.137)	0.095(0.062)	---------	---------	-------	---------	0.078(0.120)	0.091(0.052)
Stroke type	---------	----------	**-0.133(0.011)**	-0.073(0.130)	---------	----------	----------	----------	-0.078(0.137)	-0.050(0.338)	---------	----------
Stroke severity	-0.022(0.719)	-0.013(0.838)	**-0.147(0.014)**	-0.045(0.422)	**-0.179(0.003)**	-0.111(0.061)	0.071(0.322)	0.078(0.296)	-0.081(0.177)	-0.032(0.596)	-0.110(0.058)	-0.027(0.630)
Affected grip strength	**0.114(0.046)**	**0.114(0.046)**	**0.122(0.026)**	**0.126(0.011)**	**0.113(0.039)**	**0.119(0.024)**	---------	----------	0.100(0.066)	0.101(0.058)	0.065(0.212)	0.068(0.159)
# of co-morbidity	-0.066(0.250)	-0.057(0.340)	-0.085(0.121)	-0.015(0.778)	**-0.138(0.012)**	-0.074(0.175)	---------	----------	-0.028(0.609)	0.019(0.728)	**-0.115(0.031)**	-0.033(0.521)
Oral health	-0.086(0.146)	-0.071(0.275)	**-0.190(0.001)**	-0.024(0.664)	**-0.123(0.030)**	-0.004(0.947)	-0.099(0.123)	-0.088(0.225)	**-0.136(0.016)**	-0.058(0.334)	**-0.159(0.003)**	-0.018(0.739)
Nutritional status	**0.162(0.007)**	**0.156(0.011)**	0.051(0.364)	0.013(0.802)	**0.143(0.013)**	0.095(0.090)	**0.188(0.006)**	**0.184(0.008)**	0.040(0.487)	0.008(0.139)	-0.001(0.984)	-0.052(0.311)
Functional independence	0.108(0.096)	0.101(0.124)	0.118(0.055)	0.047(0.401)	0.055(0.370)	0.010(0.868)	**0.142(0.046)**	0.137(0.061)	**0.147(0.017)**	0.113(0.066)	**0.201(0.001)**	**0.141(0.012)**
Mental health disorder	**-0.245(0.001)**	**-0.242(0.001)**	**-0.249(0.001)**	**-0.224(0.001)**	**-0.171(0.003)**	**-0.151(0.006)**	-0.079(0.266)	-0.078(0.236)	**-0.146(0.010)**	**-0.134(0.016)**	**-0.224(0.001)**	**-0.196(0.001)**
Social support	**0.208(0.001)**	**0.208(0.001)**	0.111(0.061)	**0.122(0.022)**	**0.187(0.002)**	**0.196(0.001)**	**0.155(0.024)**	**0.155(0.024)**	**0.346(0.001**	**0.350(0.001)**	**0.247(0.001)**	**0.253(0.001)**
Eating difficulties	----------	-0.042(0.575)	----------	**-0.467(0.001)**	----------	**-0.308(0.001)**	----------	-0.029(0.723)	----------	**-0.221(0.002)**	----------	**-0.383(0.001)**
	$R^2=0.365$; Adjusted $R^2=0.339$; F = 14.228	$R^2=0.366$; Adjusted $R^2=0.337$; R^2 change= 0.001; F = 12.797	$R^2=0.419$; Adjusted $R^2=0.396$; F = 17.894	$R^2=0.527$; Adjusted $R^2=0.505$; R^2 change = 0.107; F = 24.694	$R^2=0.426$; Adjusted $R^2=0.400$; F = 16.480	$R^2=0.473$; Adjusted $R^2=0.447$; R^2 change = 0.047; F = 18.036	$R^2=0.201$; Adjusted $R^2=0.173$; F = 7.051	$R^2=0.202$; Adjusted $R^2=0.169$; R^2 change= 0.001; F = 6.257	$R^2=0.428$; Adjusted $R^2=0.402$; F = 16.615	$R^2=0.452$; Adjusted $R^2=0.425$; R^2 change = 0.024; F = 16.572	$R^2=0.464$; Adjusted $R^2=0.442$; F = 21.432	$R^2=0.538$; Adjusted $R^2=0.517$; R^2 change = 0.074; F = 25.857

Bold values indicate a significant association

phenomenon may be because physical deficits, which are often associated with ingestion and deglutition problems, are known to improve better after the acute stage. This implies that after the acute stage, stroke patients grapple more with intrinsic problems of eating than just extrinsic factors such as transporting food to the mouth or chewing/swallowing problems. Stroke patients with EDs often display a fear of suffocation while eating [14, 15]. Thus, fear of choking due to swallowing difficulty may precipitate patients to reduce the amount consumed, eat slowly, or even refuse food altogether. According to McLaren & Dickerson [8] and Westergren et al. [9], eating difficulties relating to energy or appetite include the inability to consider food, not staying alert during the meal, reduction in the quantity of meals consumed, or slow eating speed. Studies have shown that EDs are complex and interdependent and the imperceptible factors, including poor mental health, shame, change in taste and smell, fatigue, neglect, sensory disturbance, cognitive decline, etc. that often characterize stroke incidence, are major contributors to EDs [14, 15, 31]. Although ingestion and deglutition problems post-stroke are apparent eating difficulties, these perceptual, motor, and cognitive deficits singly or in combination may sometimes hamper the ability of stroke survivors to even consider the food itself or be willing to eat [31].

The findings of this study indicated that stroke type (haemorrhagic), stroke laterality (right-sided hemiplegia), an increasing stroke severity, poor affected grip strength, an increasing number of co-morbidity, poor oral health, poor nutritional status, reduced functional independence, poor mental health, and low perceived social support were associated with EDs. These findings are in line with the reports of earlier related research [6–9], [13–15], [31], [64]. For instance, studies have shown that stroke patients with any eating difficulty may suffer from malnutrition due to low intake of calories or present with mental health disorders, shame, or isolation because they cannot maintain societal-acceptable table manners or etiquette such as cleanliness due to EDs [31]. In this study, 47.6% of stroke survivors were at risk of malnutrition while 37.8% were malnourished. It is noteworthy that stroke survivors in this study with right-sided paresis and with concurrent poor affected grip strength present with more EDs. This indicates that individuals with right-handedness (which are in the majority in the general population) who suffer a stroke in the left hemisphere and then present with poor right grip strength are more likely to have problems with eating. In this study, 216 (92.7%) of stroke survivors had right-hand dominance. Good grip strength is needed for self-care activities, including eating, as it is useful in holding or grasping objects (e.g., forks, spoons, etc.) [52]. Thus, in a society like Nigeria, where eating with the right hand is a norm, inability to eat with the right hand or poor handling of food with the right hand due to poor grip strength may lead to EDs and subsequently malnutrition, isolation, and depression. Previous research reported that right arm weakness is a contributor to EDs [13]. Although gender was not significantly associated with EDs in this study, cultural norms around eating and caregiving roles may affect the experience of EDs among women.

The present study showed that EDs were associated with all domains of WHOQOL-BREF (physical health, psychological health, social relationships, environmental health, perceived health status, and overall QoL) in the correlation analyses. However, after adjusting for significant co-founding factors, only four (psychological health, social relationships, perceived health status, and overall QoL) were associated with EDs. This result resonates with the findings of Medin et al. [15] and Perry and McLaren [35] where stroke survivors with EDs had lower QoL. Medin et al. [15] assessed the QoL of acute stroke patients with Well-being Questionnaire-12 (WBQ-12) and observed lower scores in WBQ-12 total scores (general well-being) and all its domains (negative well-being, energy, and positive well-being). Furthermore, Perry and McLaren [35] observed that eating disability contributed 2.4% to the variance of QoL using the quality of Life Index assessed 6 months after stroke. Eating is not only a physiological process but also a psychosocial and cultural event [23, 31, 65], which when disrupted may lead to dehydration, malnutrition, isolation, poor life satisfaction, poor mental health, restricted community participation, etc., which are precursors of poor QoL [23, 31, 35].

Apart from the non-significant association of EDs with two domains of WHOQOL-BREF (physical and environmental health), the impact of EDs on the remaining four domains is not uniform. Among these four domains, EDs had the most impact on the survivors' psychological health, indicating their substantial role in influencing mental well-being and that psychological interventions may be critical in managing EDs among stroke survivors. This has been reported in related studies. Zeng et al. [23] observed that psychological disorders mediated the association between post-stroke dysphagia and reduced QoL (assessed by swallowing quality of life questionnaire). Chiba et al. [66] similarly reported that stroke patients with good dietary habits had better scores in psychosocial health and energy QoL domains than others using Stroke and Aphasia QOL Scale-39-J. This indicates that EDs seem to have a more negative impact on the survivors' psychosocial health/QoL than the physical component. The significant psychological impact of EDs may be mediated by social stigma and anxiety related to eating in public, which are particularly salient in communal cultures like Nigeria [24, 39]. As earlier stated, the eating concept has more meaning to life than just mere

ingestion or swallowing of food [23, 31, 65]. In the present study, EDs had no significant contribution to survivors' physical and environmental health, which may reflect the greater influence of physical impairments and external factors unrelated to eating difficulties.

Although many factors including marital status, stroke type, stroke severity, affected grip strength, co-morbidity, oral health, nutritional status, functional ability, and mental health are associated with at least one of the six domains of WHOQOL-BREF in the adjusted regression analyses, only social support was associated with all domains of WHOQOL-BREF. In this study, social support was positively associated with all domains of WHOQOL-BREF. Studies have earlier shown that social support is an independent predictor of QoL among stroke survivors [42, 67, 68]. Again, social support was also negatively correlated with total and all sub-scales of MEOF-II in the present study. Coupled with the negative association between EDs and QoL observed in this study, this indicates that the impact of EDs on QoL of stroke survivors may be moderated through social support. Since EDs promote loneliness, shame, social isolation, and reduction in community participation of stroke patients [23, 31], the provision of adequate and effective social support through family, friends, significant others, religious and community groups, etc. may reduce EDs and thereby improve their QoL.

In sum, judging by the high prevalence and independent association of EDs to reduced QoL of stroke survivors, screening and management of EDs in stroke rehabilitation protocols, which is often neglected, is important. The development of culturally adapted tools in the screening of EDs, training of community health workers in the identification and management of EDs, and implementation of targeted educational programmes such as nutritional and oral health education programmes for stroke survivors and caregivers, are recommended. This study has some limitations. The cross-sectional design of the study makes it difficult to infer causality between EDs and QoL and other factors assessed. Thus, longitudinal studies are needed to establish causal relationships. The exclusion of patients with repeat stroke, and severe cognitive and communication impairments ensured the validity of self-reported measures but may underestimate the prevalence of EDs and limit the generalizability of our findings to those categories of patients. Our samples consisted of community-dwelling stroke patients; therefore, our results may not apply to admitted or institutionalized patients. Furthermore, the use of self-rated instruments may be affected by response bias and social desirability. Social support and mental health were assessed using a single-item measure due to resource constraints, which may not fully capture their multidimensional nature. Though widely validated, MEOF-II was not culturally adapted to the Nigeria context, therefore future research should explore the cultural adaptation of MEOF-II to account for Nigeria-specific eating behaviors. The interaction effect of social support in EDs-QoL nexus was not further explored in this study necessitating the need for further research to understand the possible moderating effect of social support in this association.

Conclusion

There is a high prevalence of EDs among Nigerian community-dwelling stroke survivors, which was associated with stroke type, stroke laterality, stroke severity, affected grip strength, co-morbidity, oral health, nutritional status, functional ability, mental health, and social support. Even after adjusting for socio-demographic, stroke-related, and clinical factors, EDs were independently associated with reduced QoL, particularly in psychological and social domains, among community-dwelling stroke survivors, warranting longitudinal research to confirm causality. Our findings underscore the importance of addressing EDs in stroke rehabilitation to improve survivors' QoL.

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Author contributions

ABA was involved in the design and conceptualization of the study. ABA, AGI, WAR, OAA, DOF, IAO, TOA, and CM were involved in data collection, analysis and interpretation. ABA wrote the initial draft of the manuscript. ABA, AGI, WAR, OAA, DOF, IAO, TOA, and CM contributed to the written of the final draft of the manuscript. All authors read and approved the final manuscript.

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Data availability

The data generated in this study is available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted in line with the Declaration of Helsinki (as revised in 2013). Ethical clearance was obtained from the Ethical Review Committee of the Osun State University Teaching Hospital, Osogbo, Nigeria (UTH/REC/2024/03/923). All participants gave written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Physiotherapy, Osun State University Teaching Hospital, Osogbo PMB 5000, Nigeria
[2]Department of Medical Rehabilitation, Obafemi Awolowo University, Ile–Ife, Nigeria
[3]Department of Physiotherapy, University of Medical Sciences, Ondo, Nigeria
[4]Department of Physiotherapy, Redeemer's University, Ede, Nigeria
[5]Department of Health Professions, Manchester Metropolitan University, Manchester, UK

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