Anthropometric and Clinical Correlates of Physical Activity in People with Schizophrenia

Buhari Hassan[1], Umar Musa Usman [2],
Olubukola Adebisi Olaleye[3], Isa Usman Lawal [4],
* Muhammad Aliyu Abba [4]

[1:] *Department of Physiotherapy, General Hospital Kumo, Gombe State, Nigeria*
[2:] *Department of Psychiatry, Bayero University,Kano*
[3:] *Department of Physiotherapy, University of Ibadan, Nigeria*
[4:] *Department of Physiotherapy, Bayero University, Kano, Nigeria*

Abstract

Background: *Schizophrenia is a chronic mental illness that impairs function and reduces physical activity, contributing to increased morbidity and premature mortality. This study examined sociodemographic, anthropometric, and clinical factors associated with physical activity in individuals with schizophrenia.****Methods****: A cross-sectional study was conducted at Aminu Kano Teaching Hospital and Dawanau Psychiatric Hospital, Kano, with 65 purposively sampled participants. Physical activity levels (Low, Moderate, High) were assessed using the International Physical Activity Questionnaire. Symptom severity, cognitive function, and comorbidities were measured using the Positive and Negative Syndrome Scale, Mini-Mental State Examination, and Functional Comorbidity Index. Data were analysed using Chi-square tests, Spearman's correlation, and ordinal logistic regression in SPSS version 20 ($\alpha \leq 0.05$).* ***Results:*** *The mean age was 38.2 ± 10.7 years; 39 (60.0%) were male, and 33 (50.8%) had low physical activity levels. Significant associations were found between physical activity and gender ($\chi^2 = 8.000$, $p = 0.005$), marital status ($\chi^2 = 8.400$, $p = 0.038$), and age group ($\chi^2 = 6.120$, $p = 0.047$). Ordinal logistic regression identified older age (OR = 0.809, $p = 0.049$), higher BMI (OR = 0.626, $p = 0.030$), and severe negative symptoms (OR = 0.313, $p = 0.025$) as significant negative predictors. Higher cognitive function was positively correlated with physical activity ($\rho = 0.420$, $p = 0.001$).* ***Conclusion:*** *Older age, higher BMI, and negative symptoms predict lower physical activity in individuals with schizophrenia, while higher cognitive function was associated with engagement.*

Keywords: Schizophrenia, Physical Activity, Clinical Factors, Body Mass Index.

Introduction

Schizophrenia (SCZ) is a chronic, debilitating mental disorder marked by significant functional impairments (Ang *et al*., 2019). According to the

Corresponding Author:* Muhammad Aliyu Abba, Physiotherapy Department, Bayero University, Kano, Nigeria. ***Email:* muhdabbaliyu@yahoo.com; maabba.pth@buk.edu.ng

Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), SCZ is diagnosed by the presence of two or more core symptoms (delusions, hallucinations, or disorganised speech) persisting for at least six months (American Psychiatric Association [APA], 2013). This disorder severely impacts daily functioning, including independent living and social relationships (Galderisi *et al*., 2014). Schizophrenia affects about 1% of the global population, with a slightly higher incidence in men and a later onset in women (Saha *et al*., 2005; McGrath *et al*., 2008; Abel *et al*., 2010). The onset typically occurs between ages 18-25years for men and 25-35years for women, with higher incidences in urban areas (Grossman *et al*., 2008; Christos & Evangelos, 2017). In Africa, around 4-5 million individuals are affected, including about 1.7 million in Nigeria (Saha *et al*., 2005; Dapo, 2014). Schizophrenia symptoms are categorised into positive (e.g., delusions, hallucinations), negative (e.g., social withdrawal, anhedonia), and cognitive (e.g., attention problems, memory impairment) symptoms (Hasan *et al*., 2012; Janney, 2012; Tréhout & Dollfus, 2018). These symptoms often lead to lifelong disabilities, posing a substantial burden on patients, families, and healthcare systems (Murray & Lopez, 1996). Current antipsychotic drugs primarily target positive symptoms of schizophrenia, such as delusions and hallucinations, but they have limited effectiveness in addressing negative symptoms and cognitive impairments (Hasan *et al*., 2012; Galderisi *et al*., 2014). Additionally, many antipsychotics are associated with adverse effects, including weight gain, metabolic disorders, and movement abnormalities, which can further reduce physical activity and overall health outcomes in individuals with schizophrenia (Vancampfort *et al*., 2013; Perez-Cruzado *et al*., 2017).

Research indicates that physiotherapy can improve physical, mental, and social health outcomes in patients with SCZ (Vera-Garcia *et al*., 2015). Aerobic and strength exercises have been shown to reduce psychiatric symptoms and improve health-related quality of life (Vancampfort *et al*., 2012). Combining physical exercise with cognitive training has been shown to improve working memory and other cognitive functions, leading to sustained cognitive benefits in individuals with schizophrenia (Choi *et al*., 2019). Hence, a multidisciplinary approach, that include physiotherapists, is essential for managing SCZ (Jaswinder & Garwnawat, 2016; Probst, 2012; Vancampfort *et al*., 2011). This study aimed to determine the correlation among anthropometric, sociodemographic, and clinical variables and physical activity in patients with SCZ in Kano.

Methods

Research Design. A cross-sectional study was conducted.

Population.

Patients with schizophrenia were recruited from Aminu Kano Teaching Hospital and Dawanau Psychiatric Hospital in Kano using purposive sampling.

Inclusion Criteria

Adults (≥18 years) diagnosed with SCZ based on ICD-10 or DSM-5 criteria, receiving care at inpatient or outpatient units of the selected psychiatric departments.

Exclusion Criteria

Patients with severe psychiatric symptoms requiring isolation were excluded.

Sampling Technique

Purposive sampling was used to recruit participants that met the inclusion criteria.

Data Collection Instruments

A data capture form was used to collect information on age, sex, ethnicity, marital status, employment status, education, illness duration, treatment duration, and anthropometrics. A weighing scale and height meter were used to measure participants' weight and height. A measuring tape was used to measure the waist-hip ratio. The International Physical Activity Questionnaire was used to assess physical activity levels, and the Positive and Negative Symptoms Rating Scale was used to assess symptom severity. Furthermore, the Mini-Mental State examination was used to assess cognitive function, while comorbidities were assessed with the functional comorbidity index.

Data Collection Procedure

Ethical approval was obtained from Aminu Kano Teaching Hospital and the Kano State Hospital Management Board. A cover letter explaining the study, seeking consent, and ensuring confidentiality was provided. Socio-demographic information, including age, sex, ethnicity, marital status, employment status, educational level, duration of illness, and psychiatric treatment, was collected from patients, relatives, and hospital records.

Anthropometric Measurements

Weight and height were measured with a weighing scale and stadiometer using standard procedures. Waist and Hip Circumference were measured using a non-stretchable measuring tape. The waist circumference was taken at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest, while the hip circumference was measured at the widest part of the buttocks.

Waist-Hip Ratio (WHR): Calculated by dividing waist circumference by hip circumference. WHR was categorised based on standard guidelines: For Males: Normal: < 0.90, Moderate: 0.90–0.99, High: ≥ 1.00. For Females: Normal: < 0.85, Moderate: 0.85–0.94 and High: ≥ 0.95.

Assessment of Physical Activity

Assessment of physical activity was conducted using the International Physical Activity Questionnaire (IPAQ), which collects self-reported data on physical activities performed in the previous seven days. Participants were asked to recall activities across four domains: vigorous physical activities (such as running or fast cycling, which require hard effort and cause heavy breathing), moderate activities (including brisk walking and recreational sports that involve moderate effort), walking (performed for work, travel, or leisure), and sedentary behavior (time spent sitting during work or leisure).

Based on IPAQ scoring guidelines, participants were classified into three categories. Individuals were considered to have low physical activity if they did not engage in regular physical activity or failed to meet the minimum thresholds for moderate or vigorous activity. Moderate physical activity classification applied to those who engaged in either at least three days of vigorous activity (lasting at least 20 minutes per session) or five or more days of moderate activity or walking (lasting at least 30 minutes per session). High (vigorous) physical activity referred to those who reported vigorous exercise on at least three days per week, combined with high overall levels of exertion.

For inpatients, physical activity data were collected with assistance from nurses familiar with their routines. For outpatients, family members were consulted to provide accurate information about the participants' activity levels.

Assessment of Symptom Severity

Symptom severity was assessed using two tools: the 4-item positive symptom rating scale and the Brief Negative Symptom Assessment. The Positive Symptom Scaleadapted from the Expanded Brief Psychiatric Rating Scale (BPRS), evaluates four domains of schizophrenia symptoms: suspiciousness, unusual thought content, hallucinations, and conceptual disorganisation. Each item is scored on a 7-point Likert scale ranging from 1 (not present) to 7 (extremely severe), with a total score range of 4 to 28. The BPRS has demonstrated strong inter-rater reliability (ICC ≥ 0.75) and sensitivity to clinical change (Ventura *et al*., 1993).

Negative symptoms were assessed using the Brief Negative Symptom Assessment, which is adapted from the Negative Symptom Assessment (NSA) and the Scale for the Assessment of Negative Symptoms (SANS). It evaluates core domains such as alogia, affective flattening, asociality, and amotivation. Each domain is scored on a 6-point Likert scale (1 = not present to 6 = severe),

yielding a total score range from 4 to 24. These instruments have demonstrated good reliability and validity in schizophrenia research (Kirkpatrick *et al*., 2006).

Assessment of Cognitive Function

Cognitive function was assessed using the Mini-Mental State Examination (MMSE), a widely used tool that evaluates several domains of cognitive ability, including orientation, registration, attention and calculation, recall, and language. The MMSE has a scoring range from 0 to 30, with higher scores indicating better cognitive function. Scores between 25 and 30 are considered normal, 21 to 24 indicate mild cognitive impairment, 10 to 20 suggest moderate impairment, and scores below 10 reflect severe cognitive impairment

Comorbidities Assessment

The Functional Comorbidity Index (FCI) was used to assess the presence of chronic health conditions that impact physical function. Each identified comorbidity was assigned a score of 1, with higher total scores indicating a greater burden of comorbid conditions. Increased comorbidity scores were associated with reduced physical function and lower quality of life.

Data Analysis

Descriptive statistics were used to summarise the demographic characteristics of participants. Chi-square (χ^2) tests examined associations between categorical variables and physical activity levels. Spearman's rank-order correlation assessed relationships between continuous variables and physical activity. Ordinal logistic regression was performed to identify significant predictors of physical activity. All analyses were conducted using SPSS version 20, with a significance level set at $\alpha \leq 0.05$.

Results

Sociodemographic Characteristics

The study included 65 participants with a mean age of 38.22±10.73 years. Most of them were males, 39 (60%) and singles, 29 (44.6%). About half of them had secondary education, 33 (50.8%), and were unemployed, 23 (35.4%). A majority, 46 (70.8%) were treated on an outpatient basis, and 43 (66.2%) resided in urban areas as presented in table 1 below.

Table 1: Socio-Demographic Characteristics of the Participants

Variables	Min	Frequency (n)	Max	Percentage(%)	Mean ± S.D
Age (years)	22		60		38.22±10.73
Age group					
21-30		20		30.8%	
31-40		26		40%	
41-50		9		13.8%	
51-60		10		15.4%	
Gender					
Male		39		60%	
Female		26		40%	
Marital Status		29		44.6%	
Single		17		26.2%	
Married		8		12.3%	
Widowed		11		16.9%	
Divorced					
Ethnicity					
Hausa/Fulani		60		92.3%	
Yoruba		2		3.1%	
Igbo		1		1.5%	
Others		2		3.1%	
Residence					
Rural		22		33.8%	
Urban		43		66.2%	
Patient type					
Outpatient		46		70.8%	
Inpatient		19		29.2%	
Educational Status					
Primary		7		10.8%	
Secondary		32		49.2%	
Tertiary		12		18.5%	
Informal		14		21.5%	
Occupational Status					
Unemployed		23		35.4%	
Student		12		18.5%	
Housewives		9		13.8%	
Civil Servant		10		15.4%	
Traders		9		13.8%	
Retired		2		3.1%	

Variables	Min	Frequency (n)	Max	Percentage(%)	Mean ± S.D
Servant					
Smoking					
Status		21		32.3%	
Yes		44		67.7%	
No					
Comorbidities					
Arthritis					
Diabetes		30		46.2%	
Peptic Ulcer		9		13.8%	
Depression		5		7.7%	
Tuberculosis		4		6.2%	
Nil		2		3.1%	
		15		23.1%	
Physical					
Activity		33		50.8%	
Low		31		47.7%	
Moderate		1		1.5%	
Vigorous					

Key: *Min= Minimum, Max= Maximum, SD= Standard Deviation*

Anthropometric and Clinical variables of the participants

Half of the participants 33 (50.8%),) were classified as overweight, while 30 (46.2%) had a moderate waist-hip ratio. The mean scores for positive symptoms, negative symptoms, and cognitive function were 10.15 ± 3.15, 9.22 ± 3.44, and 15.03 ± 5.05, respectively. Based on the Mini-Mental State Examination (MMSE) classification, the mean cognitive function score (15.03 ± 5.05) falls within the moderate cognitive impairment range (10–20), with the majority 42 (64.6%) of participants categorised as having moderate impairment. Detailed results are presented in Table 2 below.

Table 2: Anthropometric and Clinical Variables of the Participants

Variables	Min	Max	Mean ± S.D
Positive Symptoms	4	15	10.15±3.15
Negative Symptoms	4	17	9.22±3.44
Duration of Illness	2	25	9.05±5.70
Duration of Treatment	1	20	6.58±4.6
Body Mass Index	17.2	33.7	25.70±4.10
Waist Circumference	66.5	112.5	88.01±10.05
Hip Circumference	82	119	97.20±10.75

Key: *Min= Minimum, Max= Maximum, CI= Cognitive impairment, SD= Standard Deviation*

Association between Socio-Demographic Variables and Physical Activity Level

Chi-square analysis showed that gender ($\chi^2 = 8.000$, $p = 0.005$), marital status ($\chi^2 = 8.400$, $p = 0.038$), and age ($\chi^2 = 6.120$, $p = 0.047$) were significantly associated with physical activity. However, educational status ($\chi^2 = 4.125$, $p = 0.248$), occupation ($\chi^2 = 6.000$, $p = 0.306$), smoking status ($\chi^2 = 0.686$, $p = 0.408$), and place of residence ($\chi^2 = 2.743$, $p = 0.098$) were not significantly associated with physical activity levels, as shown in Table 3.

Table 3: Association between Socio-Demographic Variables and Physical Activity Level

Variables	χ^2	P-Value
Age	6.120	**0.047***
Gender	8.000	**0.005***
Marital Status	8.400	**0.038***
Residence	2.743	0.098
Patient Type	1.500	0.221
Ethnicity	0.560	0.513
Educational Status	5.125	0.248
Occupational Status	6.000	0.306
Smoking Status	0.686	0.408

Key: * *Statistically significant, χ^2=Chi-square value*

Relationship between Anthropometric, Clinical variables and physical activity level

The study found that body mass index and waist-hip ratio were significantly associated with physical activity ($P < 0.05$). Negative symptoms, cognitive symptoms, and comorbidity status also showed significant correlations with physical activity ($P < 0.001$, $\rho = -0.698$; $P = 0.001$, $\rho = 0.420$; $P = 0.001$, $\rho = -0.367$). However, positive symptoms, duration of illness, and duration of psychiatric treatment were not significantly related to physical activity, as shown in Table 4.

Table 4: Relationship between Anthropometric, Clinical Variables and Physical Activity Level

Variables	ρ	P-value
Body Mass Index	-0.596	**<0.001***
Waist-Hip Ratio	-0.429	**<0.001***
Positive Symptoms	-0.166	0.185
Negative Symptoms	-0.698	**<0.001***
Cognitive Symptoms	0.420	**0.001***
Comorbidity Status	-0.367	**<0.003***
Duration of illness	-0.160	0.204
Duration of Treatment	-0.134	0.288

Key: * *Statistically significant, R=*

Predictors of physical activity among people with Schizophrenia

The model for variables influencing physical activity was significant ($P < 0.001$, $\chi^2 = 67.371$, df = 10). However, only age, negative symptoms, and BMI predicted PAL ($P = 0.049$, Estimate = -0.212; $P = 0.025$, Estimate = -1.162; $P = 0.030$, Estimate = -0.468). Details are in Table 5.

Table 5: Predictors of physical activity among people with Schizophrenia

Independent Variables	Dependent Variable	Estimate	SE	P-value	95% confidence interval	
					Lower Bound	Upper Bound
	PAL					
Age		-0.212	0.108	0.**049***	-0.424	0.000
Gender		-0.315	1.471	0.831	-3.197	2.568
Smoking status		-1.900	1.690	0.261	-5.212	1.412
Educational status		0.373	0.697	0.593	-0.992	1.738
Occupational status		0.477	0.329	0.147	-0.167	1.122
Comorbidity status		0.343	0.620	0.581	-0.873	1.559
BMI		-0.468	0.216	**0.030***	-0.891	-0.044
Negative symptoms		-1.162	0.520	**0.025***	-2.182	-0.143
Cognitive symptom		-0.191	0.216	0.376	-0.614	0.232
Waist-hip ratio		0.566	0.922	0.540	-1.242	2.374

Key: *=*significant, PAL= Physical activity level, BMI= Body mass index, SE= Standard error*

Discussion

This study examined the associations between sociodemographic, anthropometric, and clinical factors with physical activity in individuals with schizophrenia. Age, gender, BMI, waist-hip ratio, negative symptoms, cognitive function, and comorbidities were significantly associated with physical activity.

Chi-square analysis showed significant associations between age ($\chi^2 = 6.120$, $p = 0.047$), gender ($\chi^2 = 8.000$, $p = 0.005$), and marital status ($\chi^2 = 8.400$, $p = 0.038$) with physical activity. Older individuals were less active, consistent with findings in the general population, where ageing reduces mobility, increases chronic conditions, and lowers exercise motivation (Vancampfort *et al*., 2013; Stubbs *et al*., 2016). However, in schizophrenia, this decline is further exacerbated by negative symptoms, cognitive impairments, and antipsychotic medication effects (Soundy *et al*., 2014; Moon *et al*., 2020). Similarly, females were significantly less active than males, aligning with research suggesting sociocultural expectations, caregiving responsibilities, and lower structured exercise participation as contributing factors (Murthy *et al*., 1998; Suetani *et al*., 2016). In schizophrenia, this disparity is amplified by higher negative symptoms, social withdrawal, and lower intrinsic motivation (Vancampfort *et al*., 2015). Marital status also influenced physical activity, as married individuals may have structured routines supporting exercise, whereas single or divorced individuals face greater social and environmental barriers (Carr *et al*., 2013; Stubbs *et al*., 2018). However, education ($\chi^2 = 4.125$, $p = 0.248$), occupation ($\chi^2 = 6.000$, $p = 0.306$), smoking ($\chi^2 = 0.686$, $p = 0.408$), and residence ($\chi^2 = 2.743$, $p = 0.098$) were not significantly associated with physical activity.

Furthermore, BMI was negatively correlated with physical activity ($\boldsymbol{\rho} = -0.596$, $p < 0.001$), indicating lower activity levels among overweight and obese individuals. In the general population, obesity reduces mobility and increases fatigue (Perez-Cruzado *et al*., 2017). However, in schizophrenia, this is worsened by antipsychotic-induced weight gain and metabolic disturbances (Vancampfort *et al*., 2013; Firth *et al*., 2019). Similarly, waist-hip ratio was negatively correlated with physical activity ($\boldsymbol{\rho} = -0.429$, $p < 0.001$), suggesting that central obesity further limits movement and exercise motivation (Vancampfort *et al*., 2017).

Additionally, Negative symptoms strongly predicted physical inactivity ($\boldsymbol{\rho} == -0.698$, $p < 0.001$, OR = 0.313, $p = 0.025$), as amotivation, anhedonia, and reduced energy impair exercise engagement (Soundy *et al*., 2014; Stubbs *et al*., 2016). Cognitive function, however, was positively correlated with physical activity ($\boldsymbol{\rho} = 0.420$, $p = 0.001$), indicating that better executive functioning supports exercise initiation (Erickson *et al*., 2011; Firth *et al*., 2018). In schizophrenia, deficits in working memory and decision-making further limit participation (Choi *et al*., 2019). Comorbidities were also significantly correlated with physical activity ($\boldsymbol{\rho} = -0.367$, $p = 0.003$), suggesting that individuals with multiple health conditions were less active. In the general population, chronic illnesses such as arthritis, diabetes, and cardiovascular

disease reduce mobility and exercise motivation (Vancampfort *et al*., 2015). In schizophrenia, higher metabolic syndrome rates and medication side effects further compound these barriers, requiring integrated mental and physical health interventions (Stubbs *et al*., 2018).

Ordinal logistic regression identified older age (OR = 0.809, p = 0.049), higher BMI (OR = 0.626, p = 0.030), and severe negative symptoms (OR = 0.313, p = 0.025) as the strongest negative predictors of physical activity. Older individuals exhibited significantly lower activity levels, reinforcing research on age-related mobility decline and reduced exercise motivation (Vancampfort *et al*., 2014; Stubbs *et al*., 2016). In schizophrenia, this decline is worsened by medication-induced motor impairments and cognitive dysfunction (Suetani *et al*., 2016). Similarly, higher BMI limited mobility and increased fatigue (Vancampfort *et al*., 2015), while antipsychotic-induced weight gain reinforced these barriers, necessitating structured exercise and dietary interventions (Firth *et al*., 2018). Negative symptoms further reduced activity, likely due to amotivation, anhedonia, and cognitive deficits (Vancampfort *et al*., 2017; Firth *et al*., 2019).

These findings highlight the need for targeted interventions addressing mobility, obesity, and negative symptoms to improve physical activity in schizophrenia (Vancampfort *et al*., 2019).

Conclusion

This study identified older age, higher BMI, and severe negative symptoms as the strongest negative predictors of physical activity in individuals with schizophrenia, while higher cognitive function was positively associated with greater physical activity engagement.

Recommendations

This study highlights the need for evidence-based interventions that address weight management, negative symptom reduction, and cognitive rehabilitation to promote physical activity in individuals with schizophrenia.

Additionally, gender-sensitive strategies and structured social support systems should be incorporated into clinical and community rehabilitation programs to improve exercise participation and overall health outcomes in this population.

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