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Prevalence and Predictors of Medication Non-Adherence Among Patients with Epilepsy in Maiduguri

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ABSTRACT

Introduction: *Despite the fact that pharmacotherapeutic intervention with anti-epileptic drugs (AEDS) remains the cornerstone in the treatment of Seizure Disorders, non-adherence to the medications constitutes a huge impediment to better clinical and prognostic outcomes, especially in low- and middle-income countries (LMICs).*

Aim: *This study assessed the prevalence, as well as the socio-demographic, and clinical predictors of non-adherence to AEDs in Federal Neuropsychiatric Hospital (FNPH), Maiduguri, North-East, Nigeria.*

Method: *It was a cross-sectional descriptive study in which 378 patients with epilepsy (PWEs) were randomly recruited and interviewed at the Epilepsy Clinic of FNPH. Data were collected using socio-demographic and clinical proformas designed by the authors, and non-adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS).*

Results: *The prevalence of non-adherence to AEDs was 35.2 % and no sociodemographic variable had statistically significant relationship with non-adherence. The independent clinical predictors associated with AED-nonadherence were: costs of medications (OR=9.776, 95% C.I = 5.985-15.771, P<0.001), polytherapy (OR=5.125, C.I= 2.730-9.622, P<0.001), multiple dosing frequency (OR= 2.991, C.I= 2.027-4.413, P<0.001), presence of side effects (OR= 17.401, 95% C.I = 8.966-33.733, P<0.001), and comorbid conditions (OR=4.693, 95% C.I=2.240-9.830, P<0.001).*

Conclusion: *Based on this study, over one third of patients with Epilepsy were found to be non-adherent to their medications and certain clinical predictors were associated with medication non-adherence.*

Keywords

Prevalence, Medication non-adherence, Patients with Epilepsy (PWEs).

Introduction

Epilepsy is a chronic disease of the brain that is characterized by recurrent unprovoked seizures, while a seizure is defined as an abnormal, repetitive and hypersynchronous activity of a group

of cortical neurons which has motor, sensory, autonomic and psychic manifestations [1]. Epilepsy, is only second to stroke as a disease of the nervous system [2], and has been estimated to affect about fifty million people worldwide [3]. It does not segregate on the basis of age, sex, social class, nationality or geographical location [4]. Among patients who have epilepsy, 85 per cent are found in developing countries and an estimated 40 million people worldwide do not receive appropriate treatment [3,5]. The worldwide prevalence of epilepsy is inconsistent and diversified among countries but, it is estimated that the overall prevalence is 10/1,000 people [6]. Lower epilepsy prevalence is reported in developed regions (United States and Europe) in comparison to developing regions (Latin America and Africa), with Asia reporting the lowest frequency of epilepsy. The prevalence of epilepsy ranges from 3.3 to 6.8/1,000 in Europe and North America [7], 5.1-57.0/1,000 in Latin America, 2.4-10.7/1,000 in Asia, and 4.3-74.4/1,000 in sub-Saharan Africa [8]. The pooled prevalence of active epilepsy in Nigeria is 9.8/1000 (95% CI: 8.6–11.1), 17.7/1000 (14.2–20.6) in Gwandu, in Kebbi state of NorthWest Nigeria, 4.8 (3.4–6.6) in Afikpo in Ebonyi state of South East Nigeria, and 3.3 (2.0–5.1) in Ijebu-Jesa in Osun State of South West Nigeria [9]. Besides these studies, another Nigerian study reported a prevalence of active epilepsy of 20.8/1,000 and 4.7/1,000 in Izzi, rural Southeast Nigeria, and Ogobia, semi-rural North-central Nigeria, respectively [10].

Initially, epilepsy was thought to be an incurable disease, but since the discovery of the antiepileptic properties of Potassium Bromide by Sir Locock (1799-1875) [11] and the subsequent introduction of Phenobarbital by Hauptmann in 1912, several antiepileptic drugs were subsequently discovered [12]. They are broadly classified based on the time of their discovery into first generation antiepileptic drugs; e.g. Phenytoin, Carbamazepine, Phenobarbitone, Sodium Valproate, etc. and Second generation antiepileptic drugs, like, Retigabine, Lamotrigine, Levetiracetam, Vigabatrine, etc. They could also be classified based on their mechanisms of action as well as based on the type of epilepsy they exert their effects on. Poor seizure control remains major challenges among patients with epilepsy on treatment [13]; this may be linked to non-adherence to prescribed medication [14] and other psychosocial problems [15]. Hence, this research becomes necessary in order to determine the extent of non-adherence as well as the socio-demographic and clinical predictors that might lead to non-adherence to AEDs.

Adherence is the primary determinant of drug effectiveness and defined as “the extent to which an individual's behaviour regarding taking medications, following a diet, and performing lifestyle changes follows agreed recommendations from a health-care provider.” The current rate, especially for chronic illnesses with long-term therapy in developing countries is less than 50% and epilepsy is one of them. Non-adherence can be described as either incorrect dosage, forgetfulness, or discontinued medication which can interfere with disease progression and treatment and thus alter the improvement in patient's health [16].

The magnitude of antiepileptic drug non-adherence ranges from 26% in USA to 67% in Nigeria. A study conducted in North Carolina indicated, the prevalence of AEDs non adherence was 39% and it was higher (43%) in elderly accompanied with increased likelihood of hospitalization [17]. A primary care based study in UK showed that the prevalence of antiepileptic drug non adherence was 36.4% and those who were on multidrug treatment were more likely to be noncompliant with their treatment. A study conducted in Finland indicated the prevalence of AEDs non adherence as 34% and non-adherence was higher in individuals who smoke cigarette and drink alcohol [18]. In sub-Saharan African countries, prevalence of antiepileptic drug non adherence is significant which was about 67% in Nigeria, 54% in Kenya, and 37% in Ethiopia and financial factors were the significant predictors of non adherence [19].

Long-term antiepileptic drugs (AEDs) remain the mainstay of epilepsy treatment. AEDs eliminate or reduce seizure frequency in up to 67% of patients [20]. Medication treatment for chronic diseases, such as epilepsy, requires that patients incorporate complex medication regimens into their daily routines. Managing medication schedules may pose a significant burden in patients’ lives Non-adherence to medication treatment regimens is a worldwide health problem. Non-adherence rates among patients with epilepsy range from 30% to 50% [21]. Clinicians treating patients with epilepsy note that non-adherent patients report more difficulty in attaining seizure control compared to adherent patients. Uncontrolled seizures lead to major morbidity and mortality, including not only physical injury, such as head trauma, fractures and burns, but also psychosocial problems, such as depression, anxiety disorders, decreased quality of life, and sudden unexpected death. Even though educating patients to strictly follow medication regimens is key to epilepsy treatment intentional non-adherence may also interfere with seizure control.

Poor seizure control and poor quality of life still remain major challenges among patients with epilepsy on treatment [1]; this may be linked to non adherence to the prescribed medication. Hence, this research becomes necessary in order to determine the extent of non-adherence, the various factors that might lead to non adherence to AEDs, as well as the impact of non-adherence on the quality of life of patients with epilepsy (PWEs). Poor adherence to antiepileptic drugs is one of many reasons for pharmacological treatment failure and recurrence of seizure which consequently results in poor quality of life, decreased productivity, and seizure related social and economic crises. Despite these implications, there are relatively very few studies that address this subject matter in Nigeria.

This study assessed the level of non-adherence to treatment and the quality of life among patients with epilepsy in Federal Neuropsychiatry Hospital, Maiduguri. The objectives of this study include to determine the prevalence of non adherence to AEDs drugs, the socio demographic and clinical predictors of non-adherence, and the relationship between non adherence to AEDs and quality of life.

Methodology

Study Location

The study was carried out at Federal Neuropsychiatric Hospital-Maiduguri which is located in Maiduguri, the capital of Borno State, Nigeria. Patients are usually first seen in the assessment unit, from where they are either admitted into the Ward or are referred to the outpatient clinic for follow up and continued management. Based on data obtained from the Health Information Unit of the institution, the hospital currently has 7,658 patients who are being treated for epilepsy/seizure disorder. There is a functional electroencephalography (EEG) unit.

Study Design

The study was a cross sectional descriptive study. It was carried out over a period of 4 weeks. The study examined the association between adherence and seizure control and also the socio-demographic factors and clinical predictors to non-adherence.

Study Population

The study population consisted of all patients with clinical diagnosis, as well as those with EEG-supported diagnosis of epilepsy attending the epilepsy clinics of the hospital. Clinical diagnosis of epilepsy is defined by the presence of two or more unprovoked seizure attacks while EEG-supported diagnosis is characterized by the presence of epileptiform discharges on inter-ictal recording lasting for at least 30 minutes. The Inclusion criteria included a clinical diagnosis of epilepsy, adults between the ages of 18 and 65 years, and those that granted informed consent. Those excluded are the children and older adults outside the age bracket, patients with intellectual disability or established cognitive deficits, and diagnosis of epilepsy of doubtful significance.

Sample Size Estimation

The sample size was calculated using the Kish Leslie formula for descriptive studies which is as follows: $n= Z^2pq/d^2$ [22]where: n = sample size,

Z = the standard deviation at a 95% confidence interval, which is 1.96

P = proportion of the population with the desired factor = 0.5

q = 1-p = 1-0.5 = 0.5

d = maximum allowable error of 5% = 0.05

$$n = \frac{z^2 p\,(1-p)]}{d^2}$$

$$n = \frac{1.96^2\,[0.5\,(1-0.5)]}{0.05^2}$$

$$n = \frac{3.842 \times 0.5\,(0.5)}{0.0025}$$

$n = 384.16$ (approx. 400)

Sampling Method

All clients who met the inclusion criteria of the study were selected through simple random sampling by balloting. Ballots were cast and the prospective study participants were picked. A participant who picks a ballot marked "yes" will be eligible for the interview.

Study Tools

A pre-designed socio-demographic questionnaire that solicited for the gender, age, occupational status, marital status, average monthly income, source of funding for treatment; whether self-sponsored, by a relative, employer, National Health Insurance Act (NHIA), or Non-Governmental Organizations (NGO)'s and belief about the cause of epilepsy.

Clinical Questionnaire was divided into three sub-sections: Disease related, Medication-related, and Co-morbid conditions. Disease-related are that will ask for diagnosis of epilepsy, years lived with the disease, type of epilepsy (focal, generalized or unclassified). Medication related: Type of AED i.e Carbamazepine, Phenytoin, etc. Was the patient on more than one medication? (polytherapy) and how many times does the patient take his/her medications. This questionnaire also assessed the side effects of the medications, and the cost of medications. Co-morbid conditions: such as hypertension, diabetes mellitus, psychiatric conditions such as depression, anxiety, etc.

Morisky Medication Adherence Scale (MMAS - 8):

This is an 8-item instrument developed by Donald Morisky which was used to assess medication adherence among the study participants. Each item was scored either as 'Yes' or 'No'. Each 'Yes' is scored as one, while 'no' is scored zero, thus giving a score range of between 0 and 8. According to the author, the scores are graded as follows; less than 6 = low adherence, 6 to less than 8 = medium adherence, while 8 is scored as high adherence. For the purpose of this study, non-adherence is defined as MMAS score of less than 8, while score of 8 is considered adherent.

Statistical Analysis

The Statistical Product and Service Solutions (SPSS version 27) was used for data entry and analysis. Codes were used for data entry and analysis. After that, data cleaning was done. Both descriptive and inferential statistics were used. Proportions were used to present prevalence rates, while bivariate analysis such as χ^2 was used to demonstrate factors that have significant associations with non-adherence, and multiple logistic regressions was used to determine the independent predictors of non-adherence among patients with epilepsy.

Ethical Considerations

Ethical clearance was obtained from the ethical review board of the Federal Neuropsychiatric Hospital Maiduguri. Written informed consent was obtained from the study participants. To ensure confidentiality, codes were used for data entry and analysis. All questionnaires were anonymized.

Results

At the end of the study, 378 participants responded, yielding a response rate of 94.5%, and their data were analyzed.

Sociodemographic Characteristics of the Respondents

The participants consisted of 213 (56.3%) males and 165 (43.7%) females. The mean age was 30.71 ± 12.5 years. of the occupational

class, over 67.9% were either unemployed or were engaged in unskilled labour. About 232 (56.1%) of the respondents had no formal educatio. Majority of the respondents 199 (52.6%) were unmarried. These details are found on table 1.

Table 1: Sociodemographic Characteristics of the Respondents.

Variables (N = 378)	Focal Freq (%)	Generalized Freq (%)	Unclassified Freq (%)	Total Freq (%)
Sex				
Male	39 (72.2)	165 (52.7)	9 (81.8)	213 (56.3)
Female	15 (27.8)	148 (47.3)	2 (18.2)	165 (43.7)
Age				
≤27	18 (33.3)	158 (50.5)	0 (0.0)	176 (46.6)
28 – 37	20 (37.0)	83 (26.5)	8 (72.7)	111 (29.4)
38 – 47	9 (16.7)	40 (12/8)	0 (0.0)	49 (13.0)
48 – 57	7 (13.0)	18 (5.8)	0 (0.0)	25 (6.6)
≥ 58	0)0.0)	14 (4.5)	3 (27.3)	17 (4.5)
Educational Level				
No formal	18 (33.3)	76 (24.3)	5 (45.5)	99 (26.2)
Primary	4 (7.4)	36 (11.5)	0 (0.0)	40 (10.6)
Secondary	14 (25.9)	85 (27.2)	3 (27.3)	102 (27.0)
Tertiary	2 (3.7)	22 (7.0)	0 (0.0)	24 (6.3)
Qur'anic	16 (29.6)	94 (30.0)	3 (27.3)	113 (29.9)
Marital status				
Single	28 (51.9)	165 (52.7)	6 (54.5)	199 (52.6)
Married	23 (42.6)	113 (36.1)	3 (27.3)	139 (36.8)
Divorced	3 (5.6)	16 (5.1)	2 (18.2)	21 (5.6)
Widowed	0 (0.0)	19 (6.1)	0 (0.0)	19 (5.0)
Occupational Class				
Class I	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Class II	7&91 (3.0)	41 (4.5)	3 (27.3)	24 (6.3)
Class III	16 (29.6)	120 (38.3)	3 (27.3)	139 (36.8)
Class IV	3 (5.6)	31 (9.9)	0 (0.0)	34 (9.0)
Class V	28 (51.9)	148 (47.3)	5 (45,5)	181 (67.9)

Diagnosis of Seizure Disorders

In terms of the diagnoses of the study participants, almost 83% of them had generalized seizure disorders, while over 14.1% had focal seizure disorders, and the remaining 2.9% had unclassified seizure disorders. This is as shown in Figure 1.

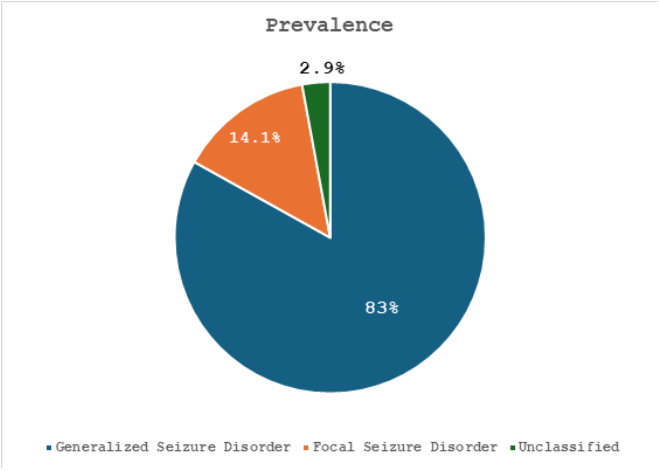

Figure 1: Prevalence of Seizure Types.

Sociodemographic correlates of non-adherence

Overall, two hundred and forty five of the respondents (64.8%) were adherent, while the remaining 133 (35.2%) were non-adherent based on the MMAS-8 cut-off score of 8 adopted for this study. These are as shown on Table 2.

Table 2: Sociodemographic factors associated with AED Non-adherence.

Variable (N = 378)	Adherence Freq (%)	Non-adherence Freq (%)	Total Freq (%)	Statistics
Sex				
Male	134 (54.7)	79 (59.4)	213 (56.3)	χ^2=0.776, df=1, p = 0.387
Female	111 (45.3)	54 (40.6)	165 (43.7)	
Age (in years)				
<27	123 (50.2)	53 (39.8)	176 (46.6)	χ^2=6.595, df=4, p = 0.159
28 – 37	62 (25.3)	49 (36.8)	111 (29.4)	
38 – 47	34 (13.9)	15 (11.3)	49 (13.0)	
48 -57	15 (6.1)	10 (7.5)	25 (6.6)	
≥ 58	11 (4.5)	6 (4.5)	17 (4.5)	
Educational Level				
No formal Education	62 (25.3)	37 (27.8)	99 (26.2)	χ^2=3.925, df=4, p = 0.416
Primary	28 (11.4)	12 (9.0)	40 (10.6)	
Secondary	60 (24.5)	42 (31.6)	102 (27.0)	
Tertiary	18.7.3)	6 (4.5)	24 (6.3)	
Qur'anic	77 (31.4)	36 (27.1)	113 (29.9)	
Marital Status				
Single	132 (53.9)	67 (50.4)	199 (52.6)	χ^2=6.360, df=3, p = 0.095
Married	87 (35.5)	52 (39.1)	139 (36.8)	
Divorced	10 (4.1)	11 (8.3)	21 (5.6)	
Widowed	16 (6.5)	3 (2.3)	19 (5.0)	
Occupational Classes				
Class 1 Class 2	0 (0.0) 11 (4.5)	0 (0.0) 13 (9.8)	0 (0.0) 24 (6.3)	χ^2=6.557, df=4, p = 0.087
Class 3	85 (34.7)	54 (40.6)	139 (36.8)	
Class 4	23 (9.4)	11 (8.3)	34 (9.0)	
Class 5	126 (51.4)	55 (41.4)	181 (47.9)	

Medication-related factors of AED non-adherence

Table 3 depicts the medication-related factors of AED non-adherence which included; Cost of medication, Drug combination, Dosing frequency, Side effects and Comorbid conditions. These factors all showed statistically significant relationship with AED non-adherence.

For the cost of medication, of the 133 non-adherent clients, eighty nine had the costs of their medications above N3,500 per month (equivalent to USD10 per month), while almost 83% of the clients who were adherent had the costs of their medications below that threshold (χ^2=94.3, df=1, p=<0.001). Similarly for drug combination, respondents on polytherapy were found to be more non adherent compared to their counterpart on monotherapy (χ^2 = 47.8, df =1, p=<0.001). For the dosing frequency, over 80% of the participants who took their AEDs more than once in a day were

non-adherent compared to almost 63% of those who took their AEDs once in a day that were adherent (χ^2=85.4,df=1,p=<0.001). For the side effects, over 72% of those who were non-adherent had experienced one form of side effects or the other, while almost 82% of those who were adherent never had any side effect (χ^2=100.1, df=1, p = <0.001). The final variable looked at was the presence or absence of comorbid conditions. About a third of the study participants had co-occurring disorders, of which almost 70% of them were non-adherent as against 89% of those without comorbidity that were adherent (χ^2=135.2, df=1, p= <0.001). Phenobarbital and Carbamazepine combination (57.7%) was the most common prescribed combination therapy. The remaining, 71 (36.6%), of the participants were on Monotherapy. Phenobarbital (19.6%) and phenytoin (10.8%) were the most common prescribed anti-epileptic medications as Monotherapy.

Table 3: Medication-related Factors of AED Non-adherence.

Variable (N = 378)	Adherence Freq (%)	Non-adherence Freq (%)	Total Freq (%)	Statistics
Cost of Medications (N)				
≤3499	203 (82.9)	44 (33.1)	247 (65.3)	χ^2=94.28,
3500+	42 (17.1)	89 (66.9)	131 (34.7)	df=1,
				p = <0.001**
Drug combinations				
Monotherapy	181 (73.9)	50 (37.6)	231 (61.1)	χ^2=47.8,
Polytherapy	64 (26.1)	83 (62.4)	147 (38.9)	df=1,
				p= < 0.001**
Dosing frequency				
Once	154 (62.9)	24 (18.1)	178 (47.1)	χ^2=85.4,
Twice	63 (25.7)	46 (34.5)	109 (28.8)	df=2,
≥Thrice	28 (11.4)	63 (47.4)	91 (24.1)	p = <0.001**
Side effects				
Absent	200 (81.6)	37 (27.8)	237 (62.7)	χ^2=100.1,
Present	45 (18.4)	96 (72.2)	141 (37.3)	df=1,
				p =< 0.001**
Co-morbidity				
Absent	218 (89.0)	41 (30.8)	259 (68.5)	χ^2=135.2,
Present	27 (11.0)	92 (69.2)	119 (31.5)	df=1,
				p = <0.001**

Statistically significant findings.

Independent predictors of non-adherence to AEDs

Table 4 shows independent predictors of non-adherence to AEDs. Of all the predictors, a side effect of AEDs was the most significant, with a standardized odds ratio of 17.401. This means that a PWE on AED who experiences side effects while on treatment has seventeen times odds of non adhering to the treatment regimen compared to a client without any side effect. This followed by the cost of medications that had a standardized odds ratio of 9.776 and is in consonance with the outcome of prior studies conducted in sub-Saharan Africa. The other factors were drug combination (standardized odds ratio of 5.125), co-morbid conditions (standardized odds ratio of 4.693), and dosing frequency (standardized odds ratio of 2.991) respectively.

Table 4: Logistic Regression to Determine Independent Predictors of Non-adherence.

Variable	S.E	Wald	Df	Sig.	Exp (B)	95.0% C.I for EXP (B)	
						Lower	Upper
Cost classfication	0.605	5.914	1	<0.001**	9.776	5.985	15.971
Drug combination	0.321	25.861	1	<0.001**	5.125	2.730	9.622
Dosing frequency	0.198	30.476	1	<0.001**	2.991	2.027	4.413
Side effects class	0.338	71.288	1	<0.001**	17.401	8.966	33.773
Comorbidity	0.377	16.796	1	<0.001**	4.693	2.240	9.830

** Statistically Significant Findings

Discussion

In terms of the sex composition of the study participants, male constituted over 56% of the respondents. The male predominance reported in this study, is similar to the findings by Getachew et al., in Southwestern Ethiopia [23]. This is, however, in sharp contrast to the findings of a similar study conducted by Johnbull et al., in Kaduna, Northwestern Nigeria, that reported a higher number of females [24]. The reasons that could be adduced for the differences range from the sampling method adopted to the patriarchal nature of the setting in which the study was conducted.

The respondents' ages ranged from 18 to 65 years. The mean age was 30.71 ± 12.5 years. About 76% of the respondents were below 37 years of age. This is similar to the findings of Johnbull et al., reported that over 80% of subjects were below 45 years of age [24]. This could be accounted for by the fact that most cases of idiopathic epilepsies have an earlier age of onset usually before the end of the second decade of life and congenital infections such as the STORCH complex, severe birth asphyxia, and other pre- and intra-partum complications are common aetiological factors in sub-Saharan Africa.

About 232 (56.1%) of the respondents had no formal education and Qur'anic education only. This finding contrasts with a similar study by Johnbull et al., which reported that 90.7 percent had some form of formal education [24]. This observation could be as a result of the low level of Western education in the Northern part of the country. The low literacy level reported here, could therefore, be a reflection of the general low literacy level in the society. The fact that some PWEs suffer from some level of cognitive difficulties might also serve as a barrier to higher academic attainments.

Majority of the respondents 199 (52.6%) were unmarried; this is similar to the findings by Getachew et al., that reported 162 (61.1%) participants who were unmarried [23]. This could be accounted for by the fact that epilepsy is associated with a lot of social stigma and most persons with epilepsy (PWEs) encounter a lot of impediments that hinder them from getting married.

The study also showed that 67.9% were either unemployed

or were engaged in unskilled labour and this is similar to the findings in a study by Getachew et al., where 103 (48.9%) were either unemployed or were engaged in unskilled labour [23]. This could be attributed to the: (1) social stigma against PWEs (2) reflection of the general high level of unemployment in the society, and (3) low educational level among the participants, since getting skilled employment is directly correlated with ones' level of education, while over two-third of the study participants never had formal education. The reason for the predominance of those with generalized seizures could not be readily ascertained. However, based on anecdotal experiences in the study setting, the severity of presentation of generalized seizures over the partial seizures could be the main reason. Less severe forms, such as the simple partial seizures that do not involve impairment in the level of consciousness, are regarded mostly based on local beliefs to be a form of 'spiritual' or 'demonic' possession, hence, are seen mostly by traditional or spiritual healers.

The rate of non-adherence of 35.2%, reported in this study is in consonance to the range of 29% to 64% reported in the United States and Nigeria [25]. It is, however, lower than the rate of 67%, 54% and 37% reported in Nigeria, Kenya, and Ethiopia respectively. The relatively lower rate reported in this study could be attributed to financial support given to indigent clients by the World Health Organization in the institution and due to support by family members because of the extended family system practiced in the study setting.

Of all the factors analyzed namely: sex, age, educational level, marital and occupational statuses, none was found to have any statistically significant relationship with AED non-adherence among the study subjects. Even with higher male representation of 53.6% compared to 43.7% of females, there was no statistically significant relationship with AED non-adherence (χ^2=0.776, df=1, p=0.387). The male preponderance may be explained by the fact that most female clients are of low socio-economic status and therefore will hardly afford to buy their medications. Some studies showed that lower level of general education and poorer literacy impacts negatively on some patient's ability to adhere while in some higher level of education has a positive impact [23] but from this study, the educational status does not seem to have impact on the adherence rate to AEDs (χ^2=3.925,df=4,p=0.416). The actual reason may not be ascertained, but it might not be unconnected with the financial assistance rendered to the clients by many non-governmental organizations operating in the state under the auspices of the mental health and psychosocial support (MHPSS) programme.

Table 3 shows the medication-related factors of AED non-adherence which included the cost of medication, Drug combination, Dosing frequency, Side effects and Comorbid conditions. These factors all showed statistically significant relationship with AED non-adherence. For the cost of medication, of the 133 non-adherent clients, eighty nine had the costs of their medications above N3,500 per month (equivalent to USD10 per month), while almost 83% of the clients who were adherent had the costs of their medications below that threshold (χ^2=94.3, df=1, p=<0.001). This could be explained by the fact that since over two-third of the respondents belonged to the lower social classes, their ability to afford their AEDs to some extent depends on their purchasing powers. Earlier studies conducted in Africa, consistently showed financial strength to be a significant predictor of AED adherence [26]. Similarly for drug combination, respondents on polytherapy were found to be more non adherent compared to their counterpart on monotherapy (χ^2 = 47.8, df =1, p=<0.001). This could be attributed to the pill burden and the attendant side effects associated with multiple drug combinations. More so, the convenience of taking a single tablet is incomparable to that of taking multiple pills. For the dosing frequency, over 80% of the participants who took their AEDs more than once in a day were non-adherent compared to almost 63% of those who took their AEDs once in a day that were adherent (χ^2=85.4,df=1,p=<0.001). This finding is in consonance with the outcomes of prior studies that revealed clients that the fewer the dosing frequency, the more likely the level of adherence. For the side effects, over 72% of those who were non-adherent had experienced one form of side effects or the other, while almost 82% of those who were adherent never had any side effect (χ^2=100.1, df=1, p = <0.001). This is because the presence of side effects further impairs the quality of life of clients and negatively impacts adherence [27].

The final variable looked at was the presence or absence of comorbid conditions. About a third of the study participants had co-occurring disorders, of which almost 70% of them were non-adherent as against 89% of those without comorbidity that were adherent (χ^2=135.2, df=1, p= <0.001). This could be accounted for by the fact that those with comorbid conditions, have higher tendency of taking multiple medications, which in turn may be associated with multiple side effects as well as the discomfort of higher pill burden. This is consistent with the findings of Hasiso et al., that revealed over 63% of his study participants were on polytherapy [28].

Phenobarbital and Carbamazepine combination (57.7%) was the most commonly prescribed combination therapy. The remaining 71 (36.6%) of the participants were on Monotherapy. Phenobarbital (19.6%) and phenytoin (10.8%) were the most common prescribed anti-epileptic medications as Monotherapy [28]. These findings were not in keeping with our findings as majority of the respondents were on Monotherapy 231 (61.1 %) and the most commonly prescribed AED was Carbamazepine. This study also showed that respondents who experienced side effects to medication adhered less 96 (72.2) compared to participants who did not 37 (27.8) this finding was in similar to the findings by Johnbull et al., [24].

Table 4 shows independent predictors of non-adherence to AEDs. Of all the predictors, side effect of AEDs was the most significant with a standardized odds ratio of 17.401. This means that a PWE on AED who experiences side effects while on treatment has seventeen times odds of non-adhering to the treatment regimen compared to a client without any side effect. This followed by the cost of medications that had a standardized odds ratio of 9.776

and is in consonance with the outcome of prior studies conducted in sub-Saharan Africa. The other factors were drug combination (standardized odds ratio of 5.125), co-morbid conditions (standardized odds ratio of 4.693), and dosing frequency (standardized odds ratio of 2.991) respectively. A similar study carried out by Hasiso et al., in Southern Ethiopia, reported that the most common reason for non-adherence was forgetfulness, 49 (75.4%) compared to other predictors of non-adherence [29]. This finding was also similar to that of Liu et al., which reported forgetfulness or not having medication at hand (69.6%), followed by a negative attitude (12.8%), a bad patient-prescriber relationship (9.5%), side effects (5.4%), inability to buy drugs (1.9%), and other reasons (0.8%) as the major predictors of non-adherence [30].

Conclusion and Recommendation

Epilepsy is a disease of the nervous system with a worldwide occurrence second only to stroke. It is characterized by recurrent unprovoked seizures and its occurrence has a very huge implication on the quality of life of sufferers most especially in sub-Saharan Africa where there is a very big treatment gap, hence the need for treatment modalities that completely abolishes seizure occurrence and were this is not achievable, reduction of the seizure frequency as much as possible. However, for the AEDs to be effective in seizure control, adherence to the treatment schedule has to be strictly followed. More than half of the patients with epilepsy have poor seizure control due to non-adherence to medications. The magnitude of antiepileptic drug non-adherence is 26 percent in USA, 67 percent in Nigeria, 54 per cent in Kenya, and 37 percent in Ethiopia and financial factors were the significant predictors of non adherence. In conclusion, over one-third of the study participants were found to be non-adherent to their AEDs and experience of side effects, multi-drug combination, comorbid conditions were the most significant predictors. It was also observed that AED non-adherence has significant negative impacts on the quality of life of the respondents.

We thereby recommend that since side effects and dosing frequency were significant predictors of non-adherence to AEDs, rational pharmacotherapy that considers the pharmacodynamics of the AEDs should be considered by the Clinicians prescribing AEDs. Also, comorbid conditions of the patients should be taken into consideration while prescribing AEDs as it can have a direct link to non-adherence due to the likelihood of multiple side effects, medication cost, pill burden and dosing frequency. Furthermore, monotherapy should be encouraged as patients are more likely to adhere if the pill burden is less. Finally, in prescribing AEDs, the purchasing power or the economic status of the patient should be considered as the patients are likely to adhere when they can easily afford the medications.

Ethical Considerations

The Federal Neuropsychiatric Hospital Maiduguri's ethical review board granted clearance. The study participants provided written informed consent. Codes were used for data entry and analysis to ensure confidentiality. All questionnaires were anonymized.

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