**Epilepsy Treatment Gap in Nigeria: A Prospective Cross-Sectional Study of Socio-Demographic and Cultural Determinants**

**Abstract**

**Introduction**: Epilepsy is a chronic neurological condition described by unprovoked repeated seizure episodes. In the developing countries of Africa, people with epilepsy suffer increased morbidity and mortality compared to their counterparts in high-income countries, and many do not receive treatment due to socioeconomic and cultural barriers. The treatment gap of epilepsy in Nigeria is high, and there is a paucity of data on the magnitude and causes of the epilepsy treatment gap in our environment. We aimed to study the Socio-Demographic and Cultural Determinants of the Epilepsy treatment gap in our region.

**Methods**: We conducted a prospective cross-sectional study with 147 participants aged ≥16 years. The subjects were enrolled consecutively from the Neurology Clinic of University College Hospital, Ibadan, for a 6-month period, and met the inclusion criteria. They had clinically confirmed diagnoses of epilepsy based on the International League against Epilepsy (ILAE) criteria. Participants were scheduled and interviewed with a structured questionnaire.

**Results**: A total of 147 subjects were studied, comprising 79 males (53.7%) and 68 females (46.3%), with a male-to-female ratio of 1.2:1. Treatment adherence was poor, as 88.4% missed their medication at least once within the 6 months, and only 25.9% restricted themselves to only Orthodox treatment. We found a significant association between newly recruited patients (p value =0.0001), age (p value 0.034), gender (p value 0.027), educational status (p value 0.0001), monthly income (p value 0.01), clinic attendance (p value 0.0001), and the pattern of treatment of epilepsy in our environment. However, freshly recruited male patients who were non-defaulters and attended tertiary education were found to be likely predictors of adherence to orthodox treatment.

**Conclusion**: We found the Treatment Gap as high as 88.4%, as the majority of our patients missed their medication, and only very few restricted themselves to Orthodox treatment. There is a positive correlation between the Socio-demographic characteristics of epilepsy patients with their pattern of treatment. Socio-economic, cultural, and religious factors can be improved through patient and community education, increasing access to quality and affordable drugs, and improving adherence to Epilepsy treatment.

**Keywords**: Epilepsy treatment, Gap, Socio-demographic, Cultural, Determinant.

**Introduction**

Epilepsy is a neurological disease typified by recurrent seizures. Its periodic and impulsive nature often disrupts daily activities, negatively impacting the normal routine of the affected individuals. It is the most frequent central nervous system condition in Africa, caused by an abnormal, excessive, and synchronized electrical discharge in the cerebral neurons of brain cells [1, 2]. Due to abnormal electrical discharges in the brain, its activities can vary from brief and nearly undetectable periods to long periods of vigorous shaking of different parts of the body. [1]. Consequently will result in various types of injuries, either directly, such as broken bones, or through causing mishaps [1]. Epilepsy is a common chronic neurologic condition that affects over fifty million people worldwide [3]. In developing countries, where about 80% of people with epilepsy reside and constitute a major public health problem, not because of its health implications alone, but also because of its social, cultural, psychological, and economic connotations [1]. It is also significant to observe that about sixty percent of people with Epilepsy receive no anti-epileptic treatment [4]. Also majority of the people living with epilepsy on the African continent have been reported to not receive appropriate care. [5]. The sickness is further worsened in the zone by shortages of qualified health personnel, inadequate diagnostic and treatment tools, sociocultural beliefs, and people who are living with Epilepsy are grossly discriminated against; it is understood that the humiliation associated with the disease kills even faster than the disease itself[6]. Learning about epilepsy in Africa strengthens our understanding of the disease, inspires health interventions, and supports healthcare in the region[7]. Such understandings can help cultivate culturally appropriate and efficient interventions to improve the quality of life of people with epilepsy in our environment. The prevalence of epilepsy in Europe and North America is low, with about 8 per 1000 people compared to Sub-Saharan Africa and Latin America, which is particularly high with 15 and 18 per 1000 people [8]. Epilepsy is linked with significant medical, psychological, economic, and social concerns for the affected persons and their families, as well as their communities. Certainly, the socio-cultural consequences of epilepsy, with taboo, stigma, and exclusion, are well documented [9]. Furthermore, persons with epilepsy (PWE) are challenged with socio-cultural and health obstacles, leading to inadequate access to treatment, particularly anti-epileptic medications (AEM) [10, 11]. Due to misconceptions and cultural beliefs, epilepsy is frequently stigmatized and misinterpreted in many African populations [12]. Individuals with epilepsy are seen as being controlled by evil spirits or witches, which can result in discrimination and rejection from society [13]. This stigma can also inhibit persons with epilepsy from looking for appropriate medical treatment, resulting in further health complications [14]. Owing to these socioeconomic, sociocultural barriers, Gaps in epilepsy care range from lack of access to care and delayed diagnosis, to delayed treatment and lack of treatment optimization (Figure 1)

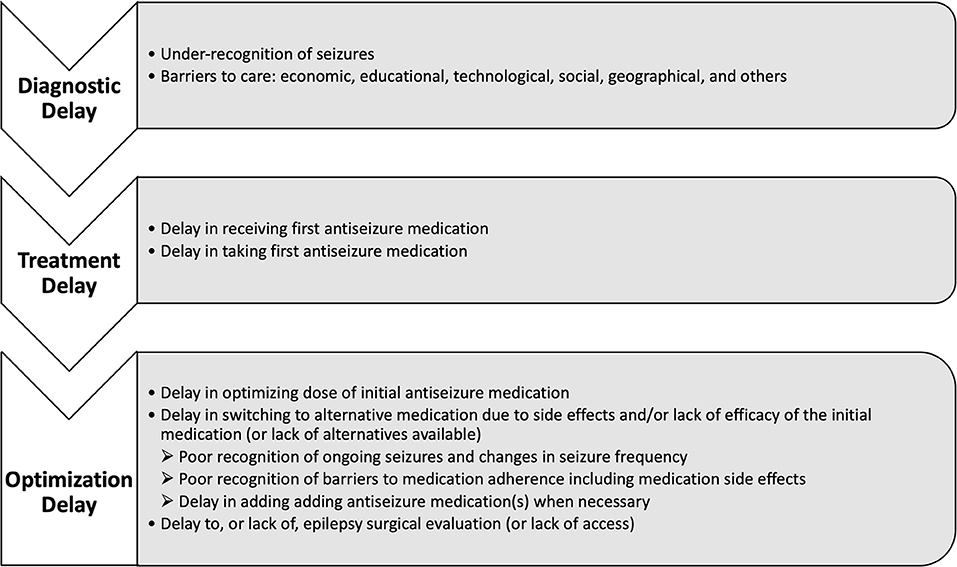


Figure 1: Conceptual framework for the timeline of diagnostic delay in epilepsy and specific barriers at each stage [32].

Recurrent epileptic seizures are the greatest demanding hurdle that people with epilepsy confront, making these people unemployed, divorced, marginalized, isolated, and celibate[15]. They are often faced with low self-esteem, overprotective parents, and decreased school attendance, with a lack of academic ambition. Subsequently, with poor performance in classes, as majority struggle academically [16]. All these difficulties or challenges met by these people with epilepsy bring about a low quality of life. It is essential to execute a variety of policies to increase awareness and lessen the stigma surrounding epilepsy. These include providing Health education to those who have the condition and their families, by increasing awareness of the medical causes of epilepsy and existing remedies, encouraging inclusion, and supporting the rights of persons with epilepsy in schools and workplaces. Encouraging people with epilepsy and their families to participate in clinical research studies and surveys. Partnerships with the entertainment industry to ensure that accurate information about epilepsy is spread [5] should be sustained. Collaboration and training of traditional healers is vital, as they are greatly respected within their communities and frequently address the spiritual issues of health [7]. Implementing these policies will reduce the stigma linked with epilepsy, help people with epilepsy and their families cope with the disorder and its effects. Promoting the inclusivity of these people in society is a clarion call so that they will be able to participate and play their part fully. We should adopt the WHO Inter-sectoral Global Action Plan on Epilepsy and Other Neurological Disorders goals to guarantee that 80 % of nations deliver essential drugs and technologies for the treatment of neurological disorders at the primary care level by 2031[7]

There are few studies conducted so far in Nigeria on Epilepsy Treatment Gap, and this is a common problem where religious, socio-cultural views, stigma, and high cost of antiepileptic medications can stop people from taking their treatments correctly. We hope to explore the possible sociodemographic determinants of the Epilepsy treatment gap and, in so doing, to contribute to achieving the global goal of reducing the burden of epilepsy. Our Findings will guide epilepsy care in these parts of the world with few resources. It will also provide options available to be integrated in our health programs and government policies to break the socio-cultural barriers negatively impacting Epilepsy care.

**SUBJECTS AND METHODS**

We conducted a prospective cross-sectional study of adult (≥16 years) patients with epilepsy seen at the neurology clinic of the University College Hospital, Ibadan, Nigeria. Epilepsy was defined procedurally as two or more non-febrile seizures unconnected to acute metabolic disorders, and alcohol or drug withdrawal. The features of the seizures were obtained from the patients and a witness. The participants were enrolled consecutively from May 2008 to March 2009, who met the inclusion criteria:- Patients who were 16 years and above, who were not febrile, who were unconnected with acute metabolic disorders, nor under the influence of alcohol or drug withdrawal syndrome. We excluded: - patients with questionable diagnoses or who did not give consent. Those who missed any of their monthly clinic appointment were regarded as defaulters. Poor medication adherence was considered as a separate but continuous period of drug abstinence or failure to take the recommended dosage correctly [17]. The pill counting method was not used as drugs were not provided by us. There was no means to determine serum drug levels. We enrolled 150 patients, of whom three were unable to complete the study.

The sample size of this study was calculated by using the formula:

**N**= **[Z2 PQ/D2]11**

Where **N** is the desired sample size.

**Z** is the standard normal deviate, generally set at 1.96 (or more simply at 2), which agrees to the 95% confidence level;

**P** is the proportion in the target population projected to have a particular characteristic (here p=0.10 as the overall prevalence of epilepsy in Nigeria was 100/1000 (10.0%) [18];

**Q** is 1-P = 0.9; and

**D** is the Degree of accuracy desired, usually set at 0.05.

The sample size was calculated to be 138, with 10% attrition, about a total of 147 participants were enrolled for the study.

Ethical clearance was obtained from the University College Hospital Ibadan Ethical Committee.

**Study Protocol**: After each recruitment, the patient was allocated to be seen monthly for the succeeding six months. Data was collected using a questionnaire that included: - Socio-demographic information, transportation cost, estimated distance of the patient`s residence from the clinic, different treatment Modalities of respondents**,** types of treatment received by patients, whether orthodox or alternative medicines, or combined, and Predictors of adherence to Orthodox treatment were determined. Direct interviews of the patients with epilepsy and/ or their parents/ relatives were conducted, and answers were obtained and documented. The reason for the questioning was elucidated to the patients, and local languages were sometimes used through a translator for those who could not understand English. Each interview took about 10-20 minutes, and any unclear answers were cross-checked carefully.

**Definitions**

The several terms applied in the study were defined as follows:

**Epilepsy treatment gap (ETG):** The difference between the total number of persons with active epilepsy and the total number of those whose seizures are being appropriately treated in the population at the time of the study is stated as a percentage. [27, 35].

**Diagnostic gap:** The total number of persons with epilepsy who have not been diagnosed in a health Institution as having epilepsy at the time of the study [27, 35].

**Therapeutic gap:** The proportion of people with epilepsy who were correctly diagnosed but incorrectly treated and still have active epilepsy [27, 35].

**Active Epilepsy:** The incidence of two or more unprovoked seizures on different days in the prior year [27. 35].

**Appropriate treatment:** Regular use of AED for treatment of recurrent seizures, irrespective of the type of AED, regarding seizure classification [27].

**PWEs:** People with Epilepsy

**ASMs:** Anti-seizure medications

**AED:** Anti-epileptic drug

**SSA:** Sub-Saharan Africa

**Statistical analysis:** The data was analyzed using a statistical package for social sciences (SPSS) version 25.0.1. Qualitative data were calculated as frequencies and percentages. Continuous data were described as mean-value (standard deviation). Association was tested using the chi-square test and by calculating the odds ratio with a 95% confidence interval. A p-value less than 0.05 was considered statistically significant. Multivariate Logistic regression analysis was applied to find out the significant independent predictors predicting adherence to Orthodox treatment only.

**Results**

**Socio-demographic characteristics of Respondents**

We studied about 147 participants, comprising 79 males (53.7%) and 68 female patients (46.3%) with a male-to-female ratio of 1.2:1. Their ages were between 16-88 years, with a mean of 33.89(16.45) years. The majority of the participants were young male adults below forty years of age. Twenty-eight of them (19.0%) completed primary school education, eighty patients (54.4%) completed secondary school, 35 (23.8%) participants completed tertiary education, and four (2.8%) had no formal education. Many (81.6%) were residents of urban settings, and the rest came from nearby rural communities. Most of the participants belonged to the low-income group. Unemployed school children (students) predominated and accounted for 36.0 % (Table 1)

Table 1: Socio-Demographic Information on Respondents

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| Socio-demographic information n=147(%) |
| Ages (Years)  Mean 33.89±16.45  Range 16-88  Age group  <20 33(22.4)  20-39 68(46.3)  40-59 31(21.1)  60-79 14(9.5)  >80 1(0.7)  Age group1  <40 101(68.7)  >40 46(31.3)  Gender  Male 79(53.7)  Female 68(46.3)  Educational Status  No Formal 4(2.8)  Primary 28(19.0)  Secondary 80(54.4)  Tertiary 35(23.8)  Educational Status1  Poorly Educated 112(76.2)  Tertiary Educated 35(23.8)  Occupation  Students 53(36.0)  Apprentice 32(21.8)  Traders 25(17.0)  Civil Servants 15(10.2)  Farmers 8(5.4)  Self-employed 8(5.4)  Housewife’s 3(2.1)  Others 3(2.1)  Residence  Urban 120(81.6)  Rural 27(18.4)  Monthly Income(naira)  No Income 29(19.7)  0-10,000 14(9.5)  10,001-25,000 34(23.1)  25,001-50,000 45(30.6)  50,001-100,000 18(12.2)  100,001-150,000 4(2.7)  150,001-300,000 2(1.4)  >300,001 1(0.7)  Monthly Income1(naira)  ≤50,000 122(83)  >50,000 25(17)  Monthly Cost of Medication(Naira)  ≤3,500 116(78.9)  >3,500 31(21.1)  Cost of Transportation to the clinic(naira)  ≤200 109(74.1)  >200 38(25.9)  Estimated Distance to the Clinic  ≤10Km 85(57.8)  >10Km 62(42.2) |

**Different Treatment Patterns of Patients**

About 76.2% of participants were placed on carbamazepine, and a majority (85%) of them were on monotherapy for less than 10 years (77.6%). Treatment adherence was poor as 88.4% missed their medication at least once within the 6 months, and only 25.9% restricted themselves to only Orthodox treatment (Table 2).

**Table 2. Different treatment Patterns of respondents**

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| --- |
| Treatment approach n=147(%) |
| Antiepileptic drugs Prescribed  Carbamazepine 112(76.2)  Phenytoin 23(15.6)  Phenobarbitone 8(5.4)  Sodium Valproate 3(2.1)  Pregabalin 1(0.7)  Number of Antiepileptic Drug Combinations  One 125(85.0)  Two 21(14.3)  > Two 1(0.7)  Duration of treatment(years)  ≤10 114(77.6)  >10 33(22.4)  Adherence to treatment  Is the dose taken appropriately?  Yes 136(92.5)  No 11(7.5)  Is the pill count correct?  Yes 139(94.6)  No 8(5.4)  Were you given information/Counseling on adherence?  Yes 137(93.2)  No 10(6.8)  How many times did you miss your medication in the last 6 months?  None 17(11.6)  ≥ One 130(88.4)  Types of Treatment  Herbal and Orthodox 12(8.2)  Spiritual Healing and Orthodox 53(36.1)  Herbal, Spiritual healing and Orthodox 44(29.9)  Orthodox Only 38(25.9)  Orthodox and Alternative treatment  Orthodox only 38(25.9)  Alternative treatment 109(74.1)  Patients  New 37(25.2)  Old 110(74.8) |

**Relationship of Pattern of treatment with Socio-demographic characteristics, estimated distance, cost of transportation, and clinic attendance of the participants**

Ninety-nine (90.0%) of participants were old patients who used alternative treatment when compared with 10 (27%) of patients who were newly recruited and used alternative medicine. However, more newly recruited patients (73%) use orthodox medicine when compared with older patients (10%) who use orthodox medication. Association between new and old patients with a pattern of treatment was statistically significant (p-value 0.0001, 95%CI =9.34-63.23) (Table 3). Thirty-nine (84.0%) of patients whose ages were more than 40 years used alternative medicine compared to 69.3% of patients less than 40 years of age who used alternative medicine. Those who are less than 40 years (30.7%) used orthodox medicine when compared to those greater than 40 years (15.2%) who used orthodox medicine. The association between the age of the patients and the pattern of treatment was statistically significant (p-value 0.034, 95%CI =0.99-6.12) (Table 3). Fifty-six (82.4%) of female patients were treated with alternative medicine compared to 53(67.1%) of male patients. However, about 32.9 % of Men used orthodox medicine when compared with about 17.6% of females. The association between the sex of the patient and the pattern of treatment was statistically significant (p-value 0.027, 95%CI = 1.05-4.95) (Table 3). Ninety-three (83.0%) of patients with poor educational status used alternative treatment when compared with 16 (45.7%) of patients with tertiary educational status. Also about 54.3% of those who attended tertiary education used orthodox medicine when compared with 17.5% of those who were poorly educated. The association between educational status and pattern of treatment was statistically significant (p-value 0.0001, 95%CI = 0.075-0.39) (Table 3). Also fifty-one (82.3%) of patients who reside more than 10 kilometers from the clinic were treated with alternative medicine compared to 58 (68.2%) who reside less than 10 kilometers from the clinic. However 27 (31.8%) of patients who reside less than 10 kilometers received orthodox medicine when compared with 11 (17.7%) of those who resides 10km or more from the clinic. The association between distance from the clinic and the pattern of treatment was not statistically significant (p-value 0.06, 95%CI = 0.974.78) (table 3). Twenty-nine (76.3%) patients who spent more than ₦200 to transport themselves to the clinic used alternative treatment for their seizures when compared to 80 (73.4%) who spent less than ₦200 to reach the clinic who use the same alternative medicine for their treatment. About 29(26.6%) of patients spent less than ₦200 for transport who used orthodox medicine when compared to 9(23.7%) of patients who spent ₦200 or more for their transport and used orthodox medicine. The association between the cost of transport and the pattern of treatment was not statistically significant (p-value 0.83, 95%CI = 0.49-2.76) (Table 3). Ninety-six (78.7%) patients with low levels of income were treated with alternative medicine compared with 12 (48.0%) patients with high levels of income. While 52% of those who were high-income earners used orthodox medicine when compared with 21.3% of low-income earners who used orthodox medicine. The association between the income of patients and the pattern of treatment was statistically significant (p-value 0.01, 95%CI = 0.12-0.72)(Table 3). Seventy-seven (89.5%) patients who defaulted from clinic attendance used alternative medicine compared with 32 (52.5%) patients who were non-defaulters. But about 47.5% of non-defaulters used orthodox medicine when compared with 10.5% of defaulters who used orthodox medicine. The association between attendance at the clinic and the pattern of treatment was statistically significant (p-value 0.0001, 95%CI = 3.30-18.21)(Table 3).

**Table 3: Relationship of Pattern of treatment with Socio-demographic characteristics, estimated distance, cost of transportation, and clinic attendance of the participants**

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| Variables Treatment status(%)n=147 chi-square Pvalue 95% CI  Orthodox only Alternatives |
| Patients  New 27(73) 10(27) 57.28 0.0001 (9.34-63.23)  Old 11(10) 99(90)  Age(years) 3.95 0.034 (0.99-6.12)  ≤40 31(30.7) 70(69.3)  >40 7(15.2) 39(84.8)  Gender 4.44 0.027 (1.05-4.95)  Male 26(32.9) 53(67.1)  Female 12(17.6) 56(82.4)  Educational status 19.38 0.0001 (0.075-0.39)  Poorly Educated 19(17) 93(83)  Tertiary Educated 19(54.3) 16(45.7)  Monthly Income(naira) 7.71 0.01 (0.12-0.72)  ≤50,000 26(21.3) 96(78.7)  >50,000 13(52) 12(48)  Cost of transport to the clinic(naira) 0.12 0.83 (0.49-2.76)  ≤200 29(26.6) 80(73.4)  >200 9(23.7) 29(76.3)  Clinic default 25.59 0.0001 (3.30-18.21)  Non defaulters 29(47.5) 32(52.5)  Defaulters 9(10.5) 77(89.5)  Estimated Distance to the clinic 3.68 0.06 (0.974.78)  ≤10km 27(31.8) 58(68.2)  >10km 11(17.7) 51(82.3) |

**Predictors of adherence to Orthodox treatment**

The significant predictors of adherence to orthodox treatment from the logistic regression model were gender (p-value 0.03, OR=0.17), educational Status (p-value 0.002, OR=8.56), non-defaulters (p-value 0.005, OR=0.062), and new patients (p value0.001, OR=0.03. Therefore, newly recruited male patients who are tertiary educated are likely to attend the clinic regularly and adhere to orthodox treatment (Table 4)

**Table 4: Predictors of** **adherence to Orthodox treatment**

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| Variables B(regression coefficient) p-value odd ratio 95%CI for odd ratio  Lower Upper |
| Age(years)  ≤40 -1.62 0.07 0.20 0.04-1.14  >40 1  Gender  Male -1.77 0.03 0.17 0.04-0.84  Female 1  Educational Status  Poorly Educated 2.15 0.002 8.56 2.17-33.70  Tertiary Educated 1  Monthly Income(naira)  ≤50,000 0.95 0.23 2.60 0.54-12.39  >50,000 1  Cost of transport to the clinic  ≤200 -1.01 0.18 0.37 0.09-1.57  >200 1  Cost of drug per month  ≤3,500 0.28 0.73 1.32 0.27-6.49  >3,500 1  New and Old Patients  New -3.51 0.001 0.03 0.01-0.14  Old 1  Clinic Attendance  Non-defaulters -2.77 0.005 0.062 0.01-0.43  Defaulters 1  Estimated Distance to the Clinic(km)  ≤10 0.68 0.43 1.97 0.36-10.82  >10 |

**Discussion**

Management of African patients with epilepsy is challenging due to several factors, including low socioeconomic status and limited access to appropriate medication. A total of 147 participants were studied, comprising 79 males (53.7%) and 68 females (46.3%), with a male-to-female ratio of 1.2:1, with a mean of 33.89 (16.45) years. Many of our patients were young male adults below forty years of age and belonged to the low-income (83%) group. The majority were poorly educated (76.2%), as only a few attended tertiary education. In another similar study conducted in Ethiopia [19], 61.1% were men, while 39.9% were female. The mean age of the patients was 29.36 ± 12, while 108 (61.7%) of the patients had a monthly income of less than 20 USD and belonged to the low-income group. In another recent retrospective study conducted among PWEs attending three hospitals in Western Nigeria, there were fewer male participants [445 (47.4%) vs. 495 (53.6%)] than females, with a higher mean age of onset (35.19 ± 21.10) [20]. In our study, about 76.2% of participants were placed on carbamazepine, and the majority (85%) were on monotherapy. This is consistent with the study [20] in southwestern Nigeria, where the bulk of participants receiving Anti-Seizure Medications (ASMs) were on monotherapy (73.2%), with Carbamazepine (79%) being the most frequently prescribed medication. This conforms to the guidelines of ASM use that favor monotherapy over polytherapy in achieving seizure control and improving the quality of life [ 33]. The studies of Ezeala-Adikaibe *et al*conducted in the eastern part of Nigeria and Sanya and Musa [30]conducted in the Ilorin middle belt of Nigeria showed that carbamazepine was also the most commonly prescribed drug for epilepsy in those areas. In the study of Al-Zakwani *et al*[30]in Oman (Arabian Peninsula), the most common AED refill was sodium valproate (35.4%), followed by carbamazepine (30.8%) and lamotrigine (9.7%). However, none of the newer AEDs, such as lamotrigine, levetiracetam, tiagabine, topiramate, and zonisamide, were used in our patients, probably because of the cost and their unavailability in the country at that time. In our study, treatment adherence was poor as 88.4% missed their medication at least once within 6 months, and only 25.9% restricted themselves to only Orthodox treatment (Table 2). The medication characteristics of the participants found in the previous study showed that 336 (35.7%) of the 940 PWEs recruited were not on medications, which raises questions about the therapeutic and diagnostic gaps in epilepsy in SSA countries [27]. Additionally, the scarcity of essential medicines contributes to this problem, leaving many patients without access to vital treatments. The reported size of the epilepsy Treatment Gap varies widely from 23% to 100%, though there has been a progressive decline in SSA countries generally [21],[22], [23]. They found, that nearly a third of the participants did not receive ASM prescriptions; an immediate explanation for this cannot be attributed to the serious Treatment Gap, which may be worsened by other determinants of non-adherence to medication. The Treatment Gaps documented in another study range from 23% to as high as 90% [24]. Delayed presentation and seeking of alternatives to medicines, such as healing homes, herbalists, and other spiritual mission houses, have been attributed to the high rates of Treatment Gaps witnessed in low- and middle-income countries [Table5] as witnessed in this Study where treatment adherence was poor as 88.4% missed their medication for at least once within the 6 months, and about 74.1% of them prefer Alternative medicine (Table 2). There are dramatic global differences in the care of epilepsy between high- and low-income countries, as well as between rural and urban dwellers [25][26], as many of our participants were poorly educated(76.2%) and with low monthly incomes (83%). There is a substantial epilepsy TG in Nigeria, as indicated by Owolabi et al. on this issue. In SSA countries, the shortage of trained healthcare specialists, especially in rural areas, has broadened the burden of TGs in epilepsy. However, a recent approximation of the TGs in SSA countries indicated that the total prevalence was about 68.5% (95% confidence interval (CI): 59.5%–77.5%). Studies conducted in various parts of Nigeria have revealed epilepsy TGs ranging from 12.2% to 96%, which are comparable to the average value of 68.5% obtained in general for SSA countries and in our study. Alternative traditional practices predominate in Africa as a form of Antiepileptic treatment, as shown in our study. The majority of participants were old patients (90%), females (82.4%), more than 40 years old (84.8%), who used more alternative treatment than orthodox treatment. This is similar to another study in Southeast East Nigeria [27], where TG was about 76 %, and the major contributors were mainly people who were never diagnosed and those who stopped medication of their own volition. There may be other reasons as observed in our findings that the treatment modalities used by the persons living with epilepsy (PWE) in the community at the time of the survey were traditional (herbal medicines) treatment (55%), spiritual (healing churches) treatment (66%), and orthodox (AED) treatment (24%). These modes of treatment were used either as lone therapy or in various combinations, therefore affecting their compliance rate with Orthodox therapy. Another study across 3 sites in Nigeria [28] supported this, they found that the possible factors associated with failure to access care include stigma, cultural beliefs, difficulty reaching a health facility, and non-acceptance of diagnosis. They found that factors associated with non-adherence include cultural beliefs, afternoon seizures, learning difficulty, and difficulty reaching a health facility [28]. About ninety-three (83.0%) of patients in our study with poor educational status used alternative treatment compared to 16 (45.7%) patients with tertiary educational status. The level of education has shown a significant variation in the mean score of quality of life in the Epilepsy scale-31 (QOLIE-31) in a previous study [29, 34]. This is similar to the survey conducted in Indonesia, South Korea, and Georgia, whereby the level of education was one of the predictors of quality of life in patients with epilepsy [29, 34] as seen in our study where male gender and tertiary educational status correlate well with the use of orthodox medicine. This could be due to the influence of education on individual perception of their disease condition and adherence to their medications. About seventy-seven (89.5%) patients in our study who defaulted from clinic attendance used alternative medicine compared with 32 (52.5%) patients who were non-defaulters (p-value 0.0001, 95%CI = 3.30-18.21). This appears to connect with the findings in another study [30] where the majority (57.1%) of the patients were not regular in their clinic attendance and, as such, practiced alternative medicine. Wilson C. Igwe, Esther N. Umeadi et al [31] concluded that it would appear that there is more to the apparent socio-demographic difference in epilepsy care than race and income per se: they suggested that there could be unmeasured clinical/personal patient features, such as caregiver's belief, perception, social, economic, and cultural setting often mitigate treatment choices regarding the high-quality of care. The shortage of resources in low and middle-income countries requires a crucial policy shift towards decentralizing epilepsy care to the community level. By executing low-cost, efficient diagnostic and management alternatives, we can improve the availability of drugs and improve treatment outcomes for persons living with epilepsy in these regions [7].

**Conclusion**

A tremendous treatment gap bedevils epilepsy treatment globally [35] as well as in Nigeria and will require a multi-dimensional approach. We found treatment adherence to be poor, as the majority of our patients missed their medication and only very few restricted themselves to Orthodox treatment.

There was a significant association between the socio-demographic characteristics of our patients and their pattern of treatment. We found that the newly recruited male patients who were tertiary educated are likely to attend the clinic regularly and adhere to orthodox treatment. To mitigate such TGs, healthcare providers should prioritize eliminating stigma and increasing public awareness of the condition, improving accessibility to healthcare services, and ensuring affordability and availability of ASMs. We should sustain the epilepsy awareness program in the country through different indigenously developed projects, in tandem with our sociocultural and religious beliefs, which will be acceptable to us with the cooperation of the Federal Ministry of Health, civil societies, and traditional and religious leaders. We may be able to change the mindset of our people through this collaborative campaign on a long-term basis. We advocate for the establishment of epilepsy clinics, increase awareness at the rural level, which will lessen the stigma surrounding epilepsy care, and bridge the treatment gap.



**Table 5**. Examples of barriers to epilepsy diagnosis and treatment [32].

**Recommendations**

1. Government and healthcare professionals, over time, should move toward working with traditional healers to build an alliance to support people with epilepsy and to develop models to improve pathways to comprehensive epilepsy care.
2. Health education plans are pivotal in enhancing the management of epilepsy in Nigeria. Dismantling misunderstandings and stigmas connected with epilepsy, leading to improved early diagnosis.
3. Health education programs can also propagate information concerning the available treatment options in the community for epilepsy, thereby ensuring adherence to Medications
4. Establishment of support groups for epilepsy in Nigeria should be encouraged. This is crucial in improving the management and care of people with the condition.
5. Mobile health clinics (MHCs) are necessary, especially in rural areas, and have shown a promising strategy to improve the management and care of people living with epilepsy. It offers a range of benefits, including improved access to diagnostic tools, treatments, and care coordination.
6. Action plan to prioritize “easy-to-use,” well-tolerated medications that are affordable in our community health-based system.
7. National health insurance schemes are recommended, especially for Low and middle-income countries, to ensure access to quality and inexpensive epilepsy care for their population

**Study limitations**

1. The definition of appropriate treatment used in this study limited further evaluation of factors such as sub-therapeutic dosage and use of AEDs for appropriate epilepsy syndrome/specific seizure types, as possible causes of the epilepsy treatment gap.
2. The outdated dataset may be a limitation to this study, and there is a need for a current review of the Epilepsy treatment gap in the same environment.
3. This is a hospital-based study and may not be proper to generalise findings made from the study and the results may lack reproducibility. Selection bias is also a concern, as we excluded the paediatric age group.
4. We did not use the pill counting method or serum drug levels to establish the compliance rate of the patient with drug use

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