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ORIGINAL ARTICLE | EPILEPSY CONTROL

Correlates of Seizure Control Among Patients with Epilepsy at Two Referral Hospitals in Zambia

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ABSTRACT

Background and Objective: Epilepsy is a neurological condition that has proven to be a major public health challenge worldwide, including Zambia. Despite the availability of many treatment alternatives, people with epilepsy still experience seizures. There is paucity of information on the control of seizures and associated factors in Zambia. The purpose of this study was to examine the factors associated with seizure control in people with epilepsy in two tertiary hospitals in Zambia.

Methods: A cross-sectional study was conducted among epileptic patients at Kitwe and Ndola Teaching Hospitals, two referral hospitals in Northern Zambia, from September 2 to September 23, 2019. A multivariate logistic regression analysis was performed using SPSS to identify independent predictors of seizure control. Adjusted odds ratios (AOR) and their 95% confidence intervals are reported.

Results: A total of 220 epileptic patients were enrolled in the study. Of these, 23.6% had controlled seizures, while 76.4% had uncontrolled seizures. Occupation (p value=0.018), level of education (p value<0.001), clinic attendance (p value<0.001), drug adherence (p value<0.001), beliefs about drugs (p value=0.006), and having friends (p value=0.025), were significantly associated with seizure control. A higher level of education (AOR:0.243, CI:0.080-0.738), regular clinic attendance (AOR:8.578, CI:3.327-22.112) and age at first seizure of 3-6 years (AOR: 1.035, CI:0.240-4.454) were predictors of controlled seizures.

Conclusion and Implications for Translation: It was shown that there was a low prevalence of controlled seizures among the study population. However, in this study, controlled seizure can be associated with a positive response to medication, regular clinic attendance, employment, having friends, having a higher level of education, and being 3-6 years old when a first seizure occurs. Risk factors should be taken into consideration such as alcohol consumption and drug compliance to better manage seizures.

Keywords: • Seizure • Control • Epilepsy • Zambia • Healthcare

1. Introduction

Epilepsy is defined as a condition of recurrent spontaneous seizures due to a primary disturbance of brain function.[1,2] It is not regarded as a single condition, but a broad spectrum of disorders that increase an individual's predisposition to seizures. It is characterized by history of at least one seizure, causing a change in the brain that increases the likelihood of future seizures and associated cognitive, psychological or social disturbance.[3] Epilepsy is known to affect individuals of all ages and across all socioeconomic classes worldwide.[4] It is estimated that approximately 50 million people have epilepsy globally, with an estimated proportion with active epilepsy of 6.38 per 1,000 individuals and an annual cumulative incidence of epilepsy of 67.77 per 100,000 individuals. A total of 80% of those affected with epilepsy live in developing countries.[5]

People with epilepsy have a high rate of suicide, depression, accidental and unexplained deaths.[6] Despite being on medication, seizures still persist in an estimated 20-35% of cases,[7] justifying the need to identify factors that can be modified and hence lead to improved seizure control if targeted effectively. The control of seizures can be influenced by several factors such as compliance to medication, adjustments in dosage, and complexity of the drug regimens, which can affect adherence.[8] Compliance to Anti-Epileptic Drugs (AEDs) can help control seizures. There are still high rates of noncompliance to AEDs, which is associated with factors such as the patients' belief about the medication, side effects, illiteracy, poverty, ignorance, poorly developed health services, duration of the disease, cost, medical barriers, and the patients' understanding of the disease.[9] On the other hand, well-informed patients tend to have seizure control as they are more able to avoid seizure precipitants, have AED compliance, and visit the clinic regularly. However, even with regular clinic attendance and AED compliance, about 20% to 30% of patients continue to have uncontrolled seizures.[10]

In developing countries, many predisposing factors to epilepsy have been reported.[11-13] However, failure of healthcare givers to identify and control these factors has been a major reason for failure of many epilepsy treatment programs to achieve seizure control in patients.[6] Many patients believe that their seizures are triggered by external or internal factors such as physical exhaustion, psychological stress, sleep deprivation, prolonged fasting, premature awakening, playing musical instruments, excessive intake of alcohol, and menstruation.[1] Evaluation of treatment outcomes and their predictors is important in developing treatment optimization strategies.[14] The epilepsy treatment gap is defined as the proportion of people with epilepsy who require treatment but do not receive it.[15] Despite the availability of Anti-Epileptic Drugs, a huge portion of people living with epilepsy in many limited resources countries do not receive treatment. The treatment gap is over 75% in low-income countries, with a huge difference in the care of epilepsy patients between high- and low-income countries.[16] Epilepsy confers a social and economic burden in Zambia and remains a public health concern.[17]

Our study investigated factors associated with seizure control in people with epilepsy at Kitwe Teaching Hospital (KTH) and Ndola Teaching Hospital (NTH), two tertiary hospitals in Zambia, as to our knowledge, this has not been previously studied.

2. Methods

2.1. Study Setting

The study was conducted at KTH, as well as NTH, on the Copperbelt Province in Zambia. NTH has a bed capacity of 851 patients, and is the second largest hospital in Zambia, with a catchment population of 503,649 people. KTH has a bed capacity of 664 patients, and a daily patient population of 1,300. These hospitals have psychiatry sections where psychiatric and epileptic patients attend. The psychiatry department at KTH operates on an outpatient basis, while NTH has provision for admission; each department attends to approximately 50 patients a day. The two tertiary hospitals serve catchment populations that are similar, with some patients being referred between the two institutions.

2.2. Study Design and Time Frame

This was a hospital-based cross-sectional study using a structured questionnaire. The study was conducted

from September 2 to September 23, 2019. Seizure control was the dependent variable, and was graded as controlled if a seizure was experienced a year or more ago. Any seizure in less than a year was defined as an uncontrolled seizure. Independent variables investigated included age, gender, level of education, knowledge level, clinic attendance and years at first seizure.

2.3. Sample Size and Sampling

The sample size was not calculated as the target population was limited. A non- probability convenience sampling method was used in which participants were selected based on their willingness and availability to participate in the study. The study included both in-patients and out-patients attending the Kitwe and Ndola Teaching Hospital psychiatry departments. All participants were confirmed epileptic patients through a prior diagnosis obtained from patient files. All participants were above 18 years old, had regular follow-ups for at least one year, and were on at least one AED. Primary caregivers were also included in the study. Epileptic patients with less than a year of follow-up, less than 18 years of age, and those who were not attended to at either KTH and NTH were excluded. Non-epileptic patients were also excluded.

2.4. Data Collection

All patients who met the inclusion criteria were included in the study following the signing of the informed consent. Data were collected through the administration of a questionnaire. For participants who could not understand English, the questionnaire was administered in the local language of their choice.

The questionnaire had seven parts which included socio-demographic information, knowledge and attitude towards epilepsy, frequency of seizures and seizure precipitants, availability of anti-epileptic drugs, accessibility to anti-epileptic drugs, compliance to anti-epileptic drugs, and the patient's belief on anti-epileptic drugs.

The patient's knowledge level of epilepsy was scored out of 4 questions, with each correct answer being awarded a 1 whereas a wrong answer or no answer was awarded a 0. The scores were graded as follows: 0-2 poor knowledge, and 3-4 proper knowledge of epilepsy. The patient's attitude level towards having epilepsy was scored out of 6 questions, with each correct answer being awarded a 1 whereas a wrong answer or no answer was awarded a 0. The scores were graded as follows: 0-3 poor attitude, and 4-6 proper attitude. Drug adherence and belief was measured by querying compliance, and was defined as irregular if one or more doses were missed, and as regular if no doses were missed. Additional questions were asked on the actual doses missed and possible reasons for the irregular drug compliance in those reporting missing some doses.

Seizure control was defined based on the frequency of a patient's seizures. If a patient experienced either daily, weekly, or monthly seizures, their seizure control was denoted as uncontrolled seizure. A patient's seizure control was denoted as controlled seizure when the patient did not have a seizure for a year or for more than year. Controlled epileptic seizures were regarded as seizures that had stopped completely. Seizures which continue, even after trying medication, are uncontrolled seizures, even if they occur once a year.[18]

2.5. Data Analysis

Data were processed and analyzed by the Statistical Package for Social Sciences version 21 (IBM Corp, 2012). Frequency distributions were used for demographic characteristics. Descriptive cross tabulation analysis was done on the selected variables. A stepwise forward multivariable binary logistic regression model was used to determine correlates of seizure control. A threshold of $p<0.1$ in cross tabulations was used to select variables to include in the model. A p-value of <0.05 was considered statistically significant.

2.6 Ethical Approval

Ethical approval was obtained from the Tropical Diseases Research Center (TDRC) ethics committee (IRB number 00002911).

3. Results

3.1. Socio-demographic Characteristics of Study Participants

We enrolled 220 epileptic patients wiht a history of epileptic seizures in the study. More than half of

the participants were male (58.2%). The participants' age range was 18 to 65 years old, with the mean age being 28.7 years old and standard deviation of 9.9. years. A total of 94 (42.7%) of the participants were aged 18-24 years old while 24 (10.9%) were aged between 30-34 years old. The study showed that 80% of the participants were single, 15.5% were married, 3.6% were divorced, and 0.9% were widowed. A total of 71.4% had no children, and only 12.3% of the participants were employed. It was also found that 13.2% of participants had not attained any education level at all, while less than half (40.5%) had attained primary education. About a quarter of the participants (23.6%) had controlled seizures (Table 1).

3.2. Drug Adherence and Patient Belief

More than half (54.5%) of the participants had proper medication adherence, 26.4% missed 2 to 3 doses, and 14.5% missed more than 3 doses; 13.6% of the participants that missed their medication reported that it was due to them feeling well, and the other 13.6% reported that it was due to them not being able to afford their medicine (Table 2).

Table 1: Characteristics of study participants

Variable	Group	Frequency (N)	Percentage (%)
Age range (years)	18-24	94	42.7
	25-29	44	20.0
	30-34	24	10.9
	35 and above	58	26.4
Sex	Male	128	58.2
	Female	92	41.8
Marital status	Single	176	80.0
	Married	34	15.5
	Divorced	8	3.6
	Widowed	2	0.9
Children	No	157	71.4
	Yes	63	28.6
Level of education	None	29	13.2
	Primary	89	40.5
	Secondary	55	25.0
	Tertiary	47	21.4
Occupation	None	83	37.7
	Self employed	44	20.0
	Employed	27	12.3
	Pupil/student	66	30.0

3.3. Factors Associated with Seizure Control

On univariate analysis, employment (p value=0.02), higher level of education (p value<0.00), regular clinic attendance (p value<0.001), drug compliance (p value<0.001), positive patient belief about AEDs (p value=0.01), and having friends (p value=0.03), were significantly associated with controlled seizures. In contrast, drinking alcohol (p value = 0.12), change in drugs (p value=0.21), and the distance to the hospital (p value=0.36), were not significantly associated with seizure control (Table 3).

We performed a multivariate logistic regression analysis to ascertain any association between the dependent variable and independent variables. Those with a higher level of education [adjusted Odds Ratio (aOR):0.24, confidence interval (CI):0.08-0.74)], regular clinic attendance (aOR:8.58, CI:3.33-22.11), and were aged 3-6 years old when they experienced their first seizure (aOR: 1.04, CI: 0.24-4.45), were more likely to have controlled seizures (Table 4).

4. Discussion

Our findings showed that out of a total of 220 patients, only 23.6% had controlled seizures; this is consistent with literature. Many studies indicate that alcohol causes an increased risk of epileptic seizures and that it is a predictor of uncontrolled seizures.[14,19] Alcohol intake may affect a person's adherence to treatment, as they may forget to take their medication, or prefer not to buy their medicine in preference for alcohol.[20] Contrary to these prior findings, the present study found that frequent alcohol intake did not have a significant effect on the control of seizures. This variance in findings could be due to the differences in sampling within the study having few participants who consumed alcohol.

Poor drug compliance was significantly associated with uncontrolled seizures. This is reported in other studies which suggest that non-compliance to epilepsy medications can interfere with treatment and may affect the clinical outcome altogether.[10,21,22] This study found that the number of drugs that the patient had to take and the number of times drugs were taken in a day, affected

Table 2: Drug adherence and beliefs

Variables	Group	Frequency (N)	Percentage (%)
Drug Compliance	Irregular	99	45.0
	Regular	120	54.5
If irregular, how many doses missed	Never miss	121	55.0
	Once	9	4.1
	2 to 3 times	58	26.4
	More than 3 times	32	14.5
Reason for irregular drug compliance	Never miss	120	54.5
	I forget	22	10.0
	I feel well	30	13.6
	No money to buy medicine	30	13.6
	Medication doesn't work	8	3.6
	The drugs I have to take are too many	7	3.2
	Drugs finished	3	1.4
Do AEDs Work?	No	22	10.0
	Yes	198	90.0
Have your drugs ever been changed?	No	147	66.8
	Yes	73	33.2
How many times do you take your medicine?	Once a day	41	18.6
	Twice a day	166	75.5
	Three times a day	12	5.5
	More than three times a day	1	0.5
Duration on medication	Days	1	0.5
	Weeks	2	0.9
	Months	83	37.7
	Years	134	60.9

adherence, which also agreed with prior studies.[23] There were more seizures experienced in patients with negative beliefs towards medication, than those with positive beliefs. This is consistent with findings by other studies.[14,24]

Patients who had proper knowledge about their condition had more controlled seizures than those with poor knowledge. Similarly, among those with a proper attitude were more prone to experiencing controlled seizures than those with poor attitude, although the association was not statistically significant. This can be attributed to the fact that those with proper knowledge would have a better attitude of adherence to their medication and a better understanding of how to take care of themselves. However, there are no studies indicating whether increased knowledge improves self-care.[25]

Those who received in secondary or tertiary education, and those who were employed, were more likely to have controlled seizures. This finding agrees with prior literature.[10]

Our findings showed that a higher level of education, regular clinic attendance, and were aged 3-6 years old when they experienced their first seizure, were predictors of controlled seizures. Those who had their first seizure between ages 13-

Table 3: Cross tabulation of factors associated with seizure control

Variables	Group	Seizure control		P value
		Uncontrolled seizures	Controlled seizures	
Age	18-24	76	18	0.147
	25-29	36	8	
	30-34	15	9	
	35 and above	41	17	
Sex	Male	96	32	0.574
	Female	72	20	
Occupation	None	73	10	0.018
	Self employed	31	13	
	Employed	18	9	
	Pupil/student	46	20	
Level of Education	None	27	2	<0.001
	Primary	76	13	
	Secondary	39	16	
	Tertiary	26	21	
Knowledge	Poor	70	15	0.097
	Proper	98	37	
Attitude	Poor	45	15	0.771
	Proper	123	37	
Drug Compliance	Irregular	88	11	<0.001
	Regular	80	41	
Do AEDs Work?	No	22	0	0.006
	Yes	146	52	
Have your drugs ever been changed?	No	116	31	0.207
	Yes	52	21	
How is your clinic attendance?	Irregular	105	10	<0.001
	Regular	63	42	
Age of first seizure	At birth	28	5	0.089
	1-2	17	7	
	3-6	18	9	
	7-12	35	10	
	13-19	34	3	
	20-34	21	11	
	35 and above	15	7	
Do you drink alcohol?	No	110	40	0.121
	Yes	58	12	
Do you have friends?	No	36	4	0.025
	Yes	132	48	
Is your home far from the hospital?	No	41	16	0.360
	Yes	127	36	

Table 4: Multivariable logistic analysis of factors associated with seizure control in epileptic patients

Predictor	Seizure control		AOR (95%CI)
	Uncontrolled	Controlled	
Education level			
None	27	2	1.00
Primary	76	13	0.149(0.23-0.969)
Secondary	39	16	0.122(0.041-0.363)
Tertiary	26	21	0.243(0.080-0.738)
Clinic attendance			
Irregular	105	10	1.00
Regular	63	42	8.578(3.327-22.112)
Age at first seizure (years)			
At birth	28	5	1.00
1-2	17	7	0.368(0.76-1.787)
3-6	18	9	0.850(0.190-3.797)
7-12	35	10	1.035(0.240-4.454)
13-19	34	3	0.299(0.067-1.322)
20-34	21	11	0.043(0.007-0.276)
35 and above	15	7	0.553(0.128-2.397)

19 years were less likely to have controlled seizures to this is in contrast to findings from a previous study where individuals who were above 20 years of age had better controlled seizures.[10]

Isolated patients have been known to experience more seizures than those with friends, colleagues or family.[26] This is in agreement with the present study where it was found report that having friends was significantly associated with controlled seizures when compared to those patients who did not have any friends. This could be because peer support may help the patients feel better about themselves, which is important in the treatment process.

4.1. Limitations

Even though the study presented important findings in the northern region of Zambia, it precludes other populations in the southern region of the country. This affects the generalizability of the findings to the entire country. The non-probability nature of our sampled population, and the limited period for data collection could have possible limitations on the generalizability of our findings. The study did not stratify participants based on in-patient status or outpatient status. This could affect findings as in-patients are more likely to be supervised during drug administration which may impact treatment outcomes.

4.2. Recommendations

Patients should be educated about their condition, the importance of their drugs, compliance and clinic attendance. Close associates, family and friends should be encouraged to be supportive of the patient and their condition altogether. Furthermore, the patients should be encouraged to engage in interactive activities. There is a need for more studies on seizure control in other regions of the country.

5. Conclusion and Implications for Translation

Our findings show that less than half of the epileptic patients had controlled seizures. Positive beliefs towards epilepsy medication, employment, and having friends, were significantly associated with controlled seizures. Higher level of education, regular

clinic attendance, and being 3-6 years old when they experienced their first seizure, were predictors of controlled seizures. Seizure control outcomes determine the success of patient management. The present findings may highlight the possible risk factors to the target population experiencing low seizure control.

Compliance with Ethical Standards

Conflicts of Interest: *The authors declare no conflict of interest.* ***Financial Disclosure:*** *Nothing to declare.* ***Ethics Approval:*** *Obtained from the Tropical Diseases Research Center (TDRC). IRB number 00002911.* ***Disclaimer:*** *None.* ***Funding/Support:*** *The study was supported by a student grant by the Higher Education Loans Board of the Government of the Republic of Zambia.* ***Acknowledgments:*** *The authors would like to acknowledge the support rendered by the management and staff at the psychiatry wards at both NTH and KTH.*

Key Messages

- Less than half of the study participants had controlled seizures.
- Higher level of education, regular clinic attendance, being 3-6 years old when they experienced their first seizure, were predictors of controlled seizures.
- Seizure control outcomes determine the success of patient management.

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