

Seizure Impact on the School Attendance in Children with Epilepsy: Prospective Study in the Pediatrics Neurology Clinic at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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Abstract

Abstract Background: Epilepsy is the most common chronic neurological disease seen in Pediatrics Neurology Units in developing countries and like other chronic disorders it has been found to negatively affect school attendance and academic performance influencing school life of children. An educational underachievement can also be due to comorbid learning and behavioral problems in these children. The impact of epilepsy on school attendance may also contribute to the academic difficulties of children with epilepsy. The purpose of this study is to assess school absenteeism and determine which factors influence school absenteeism in school aged children and adolescents with epilepsy. **Methods:** A hospital based prospective study was conducted among school aged children and adolescents with epilepsy between the ages of 7-18 years attending at the Paediatric Neurology Clinic and their primary caretakers. A sample of 183 children and adolescents were included in the study. The participants (children and their parents/caregivers) gave information concerning the socio-demographic data, primary caregiver's information like educational status, information concerning child's seizure and epilepsy status disclosures to teachers and peer. And medical cards were thoroughly reviewed. Descriptive statistics and bi-variate logistic regression analysis was done to assess determinants of school absenteeism. **Results:** The prevalence of school absenteeism among children aged 7-18years at PNC follow up was 69.4%. Among other factors female sex with AOR 2.19(95% CI 1.03-4.84), having symptomatic seizure AOR 2.51(95% CI 1.09-5.86), having seizure at school and having longer duration of seizure were statistically significant association with school absenteeism. **Conclusion:** This study demonstrated the school absenteeism is very common among children aged 7-18 years at PNC follow up (69.4%) and that seizure has a significant impact on children's school attendance. **Keywords:** Epilepsy; School; Childhood; Absenteeism; Ethiopia Trial registration: N/A

Background

A seizure is a transient occurrence of signs and/or symptoms resulting from abnormal excessive or synchronous neuronal activity in the brain. The International Classification of Epileptic Seizures divides epileptic seizures into 2 large categories: In focal (formerly known as partial) seizures, the first clinical and electroencephalographic (EEG) changes suggest initial activation of a system of neurons limited to part of 1 cerebral hemisphere.(1) Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition and clinical diagnosis of epilepsy usually requires the occurrence of at least 1 unprovoked epileptic seizure with either a second such seizure or enough EEG and clinical information to convincingly demonstrate an enduring predisposition to develop recurrences. For epidemiologic and commonly for clinical purposes, epilepsy is considered to be present when 2 or more unprovoked seizures occur in a time frame of longer than 24 hr.(1)

Epilepsy is one of the most frequently diagnosed neurological disorders affecting children.(2, 3) With population based study between 0.3 and 0.6 percent of Canadian children under the age of 18 are

affected by epilepsy (4), it is likely educators will work with this population at some point in their career. Epilepsy is consistently linked to academic underachievement and social difficulties.(5)

Epilepsy is the most common chronic neurological disease seen in Pediatrics Neurology Units in developing countries(6) and has prevalence of 5–10/1000 in developing countries.(7) In another study aimed to describe the patterns of neurologic morbidities among patients attending the pediatric neurology clinic of TASH in 2013 seizure disorders (both idiopathic and secondary) alone or as co-morbidity, were found in 45.6 % of all cases (104 of 228 cases) among which 28.8 % (30 of 104) were idiopathic and 71.2 % (74 of 104) were secondary to other disorders which shows that nearly half of the children at follow up in pediatric neurology clinic have seizure disorders. (8)

In a community-based study which was performed in a rural area of central Ethiopia shows one-hundred thirty-nine incident cases were identified, corresponding to an annual incidence of 64 in 100,000 inhabitants [95% confidence interval (CI)]. And the highest age-specific incidence occurred in children.(9) The prevalence of epilepsy in developing countries, particularly in Latin America and Africa, is thought to be considerably higher than that in developed countries, with rates ranging from 10 to 15 per 1000.(10, 11)

Epilepsy, like other chronic disorders such as sickle cell disease, diabetes mellitus and bronchial asthma has been found to negatively affect school attendance and academic performance.(12) While academic under-achievement and poor school attendance in children with other chronic conditions are due to recurrent morbidity, the effect of epilepsy is thought to be due to relatively reduced intelligence, psychosocial problem, anti-epileptic medication and the influence of seizure variables such as seizure type, age at onset, EEG findings and seizure control.(13) However, there is a controversy regarding the relative importance of these factors.(14, 15)

Children with epilepsy are prone to educational underachievement as a result of co-morbid learning and behavioral problems. Other factors that may contribute to poor school performance amongst epilepsy patients may include overprotective parental attitudes, a lack of academic motivation, and low self-esteem. The impact of epilepsy on school attendance may also contribute to the academic difficulties of children with epilepsy.

Although most studies addressing academic performance in school-aged children with epilepsy are focused on academic achievement and quality of life of children with epilepsy, there were only few on the impact of seizure on school attendance. However, the prospective study in Brazil which was conducted at the University of Campinas, in the pediatric epilepsy clinic, from January 2005 to August 2006 which enrolled only 50 children diagnosed with epilepsy addressed this topic. The study showed 88 % of patients in the study missed at least one day of school due to seizures. And almost half of the parents (46%) believed that if the child had a seizure at school he/she should leave school immediately.(16)

In Ethiopia, the official primary school entrance age is 7. According to Ethiopian national education the system is structured so that the primary school cycle lasts 6 years, lower secondary lasts 4 years, and

upper secondary lasts 2 years. Despite this opportunity, there is a lack research that specifically focuses on the School attendance in children with epilepsy which has directly affecting the school achievements in this group. Any chronic illness in childhood carries risks to development physical, psychic and cognitive aspects of the child, increasing psychosocial morbidity.[16, 17] However, epilepsy, as a disease chronic disease seems to affect the child more than other diseases such as asthma or diabetes.[18], with repercussions on the behavior and in the learning of epileptic children and adolescents.[19]

Children with epilepsy constitute a vulnerable educational group at high risk to develop specific learning disorders and consequently impairments in academic achievement, in addition to psychosocial adjustment poor, which can result in dropping out of school.[20] The literature shows that in childhood epilepsy the academic difficulties are linked to organic factors directly related to the disease itself such as the underlying neurological disease and its physical and cognitive limitations, age the frequency of seizures, type of epileptic syndrome and etiology, degree of and the frequency of crises and the risk of accidents, in addition to the effects of side effects of drug and surgical therapies. However, variables that may be involved in the schooling process as low parents and teachers about the success of the child, possibility of rejection of the teachers and classmates and changes in the child's self-esteem are also important factors that can promote a lower school performance of the child with epilepsy [21] At the same time, some international research points to the fact that the variables of epilepsy can interfere in academic performance, in addition to be significantly related to the educational institution (school regular or special) that epileptic children attend.[22-26]

According to Fernandes (2005), different variables may be related to the appearance of these problems, such as the type of epilepsy and its severity, age of the onset of crisis, but also the vision and beliefs of the general population including parents, teachers, school friends, who believe that children epileptics present more behavioral problems even when have educational repertoire and intelligence similar to those of other children healthy. Some authors point out that cognitive and social presented by children with epilepsy are not only related to intellectual deficit, but also with the possibility of the presence of stigma. [27]

It is hoped that the findings from this study will aid in formulating a suitable educational program for these children and can help teachers understand how to the best support, accommodate, and prepare for these children in their classes. And the study also contributes to the existing literature by filling gaps seen in the paucity of research on a topic from developing word. This study will determine the impact of epilepsy on children school attendance and find out possible reasons of absenteeism from school. The result of the study will be used to show the magnitude of the impact of epilepsy on school attendance which is one of factor which determines the overall school performance. It will also be used literature data source for further study on the related topics.

Since the Ethiopian government has embarked on a transformational agendum of achieving an economic development of a middle income country and universal health care access to all of its citizens by the year 2035 and Federal Ministry of Health (FMoH) has developed a national strategic framework on

the prevention and control of non-communicable diseases (NCDs) and their risk factors, significant achievements have been documented across potential health service coverage and health related millennium development goals (MDGs). In addition; in Ethiopia, evidence suggests a raising burden of NCDs like epilepsy. A number of separate small scale studies, and the situational analysis done by the FMOH in 2008 supported the above conclusion on the situation of NCDs and their risk factors in Ethiopia. Accordingly, in 2010 the Federal Ministry of Health has developed a national strategic framework on the prevention and control of NCDs and their risk factors. In spite of these; scientific researches on the impact of seizure on children's school attendance and their contributing factors are lacking here in PNC of TASH.

Though affordable, feasible and cost-effective public health solutions for reducing the impact of NCDs like epilepsy are now available, in our country (as in TASH), there is still a lack of research on the impact of seizure on children's school absenteeism and academic achievement.

In reality, it is expected that health facilities should provide children and their families a regular schedule on seizure management. Yet, not all of children with epilepsy had seizure management plans and in some cases the adequate description of the factors leading to school absenteeism is not available. In fact; the parents, school staff and classmates should be informed about the status of child's seizure, so that they can socialize and care for him/her in times of attack. However, in our setup such group of people sometimes struggle with understanding the manifestation of the child's seizures and what to do when a child experiences active seizure. The young people, parents, and teachers struggle to understand the role of epilepsy and seizures with respect to the student's learning and behavioral problems.

Another concern is the scarce number of publications on the subject of child epilepsy and education, as well as discussions about the impact of the disease and its variables on development of these children. There were only few international studies but national study that focused directly on this issue is lacking. Though a number of parents expressed a need for more support with respect to understanding their child's condition, the impact of parents understanding on school attendance and learning and is still not investigated. Hence, there is lack of research to facilitate evidence-based decision in PNC at TASH.

Epilepsy is one of the most frequently diagnosed neurological disorders affecting children. It is likely educators will work with this population at some point in their career. Epilepsy is consistently linked to academic underachievement and social difficulties. Children with epilepsy are prone to educational underachievement as a result of comorbid learning and behavioral problems. Other factors that may contribute to poor school performance amongst epilepsy patients other may include overprotective parental attitudes, a lack of academic motivation, and low self-esteem. Research is needed to identify how best to support the informational and emotional needs of parents and families affected by the factors influencing the condition. The impact of epilepsy on school attendance may also contribute to the academic difficulties of children with epilepsy and there is no study done in our setup making this study significant.

2. Objectives

2.1. General Objective

- To assess the impact of seizure on school absenteeism and associated factors among childhood epilepsy in school age children and adolescents between the ages of 7 and 18 years who are attending follow up at the Pediatric neurology clinic in Tikur Anbessa Specialized Hospital (TASH).

2.2. Specific Objectives

- To describe the impact of seizure on school attendance in children with epilepsy
- To identify factors associated school attendance in children with epilepsy

3. Literature Review

In one study at Brazil fifty patients were evaluated, 34 boys and 16 girls; age ranged from 6 to 18 years old). Eighty-eight percent of patients in the study missed at least 1 day of school due to seizures and the same study shows the reason given by parents for a school absence was seizure in 75%.(16)

Academic achievement can also be significantly impacted by many aspects of epilepsy including seizure activity, coexisting cognitive deficits, side effects of antiepileptic drugs, absenteeism, peer acceptance, and teacher understanding and expectations (17, 18)

The literature indicates that children with epilepsy have increased rates of school absenteeism.(19) But there were few studies on the factors associated with absenteeism and there are no data about the impact of seizure on school performance internationally.

It is unclear whether some conditions may predispose a child to particularly high rates of school absence. It is also unknown whether demographic factors associated with school absenteeism in general school populations (such as socioeconomic status, maternal education, and maternal disability days) correlate with school functioning among children with epilepsy.

An epidemiological investigation conducted at community-based level which was performed in a random sample of villages with 61,686 inhabitants in a rural area of central Ethiopia showed one-hundred thirty-nine incident cases were identified, corresponding to an annual incidence of 64 in 100,000 inhabitants [95% confidence interval (CI) 44-84] corresponding rate for males was 72 (CI 42-102); for females, it was 57 (CI 31-84). The highest age-specific incidence occurred in the youngest age groups (0-9 years); the next highest was in the group aged 10-19 years.(9)

A 2015 CDC study, based on 2009–2010 national data, found that 36% of students aged 6 to 17 years with epilepsy were more likely to have missed 11 or more days of school in the past year, compared with 18% of students with other health concerns. Students with epilepsy were also more likely to have difficulties in school (such as problems communicating), use special education services, and have

activity limitations (such as less participation in sports or clubs) compared with students with other medical conditions, such as autism or intellectual disability.(20)

In study with objective to compare functional difficulties and school limitations of a national sample of US children with special health care needs (CSHCN) with and without epilepsy. Among CSHCN with comorbid conditions, 36% of children with epilepsy missed 11 or more days in the past 12 months compared to 18% of children without epilepsy ($p < 0.001$). Among, CSHCN without comorbid conditions, there was a similar pattern. A higher percentage of children with epilepsy, compared to children without epilepsy missed 11 or more days of school (21% vs. 15%) and 35% of children with epilepsy, compared to 25% of children without epilepsy, were reported to have a health condition that interfered with the child's ability to participate in sports and clubs ($p < 0.01$). (21)

In recent study done in Sierra Leone to assess the impacts of epilepsy on child education in Sierra Leone (SL), they carried out a cross-sectional descriptive study examining its effects on school attendance, participation in physical activities, and social acceptance among classmates. The data were collected at various epilepsy clinics and school in Freetown, SL. In which a total of 50 patients were interviewed and questionnaires administered to their caregivers and teachers, making a total of 150 respondents. Fifty-one percent of the children were absent from school for >5 days per month and the commonest reason being fear of occurrence of seizures. In same study regarding the caregivers about forty-eight percent were apprehensive about sending their children to school, with 83% of these caregivers stating fear of seizures and potential injuries. Only 8% of the caregivers did not prevent their children from taking part in any physical activity at school. Totally, 20% of the children ceased attending school permanently; daily occurrence of seizures ($p < 0.05$), negative attitude of classmates ($p < 0.001$), and having an illiterate caregiver ($p < 0.02$) all showed a significant association with permanent cessation of schooling. The study demonstrates significant negative impacts of epilepsy on child education.(22)

In another prospective study conducted from January 2005 to December 2005 at the pediatric epilepsy clinic of University Hospital in which parents were interviewed about the impact of epilepsy in the life of the siblings of children with epilepsy of one hundred and twenty-seven children, siblings of 78 patients with epilepsy were evaluated. From, 127 siblings of children with epilepsy, 60 were girls and 67 were boys. Age ranged from 5 to 18 years old (mean=11.7 years). After the diagnosis of epilepsy, the siblings had only negative feelings toward the disease, mostly sadness and fear(23).

Regarding the effects of drug therapy in children with epilepsy some authors point out that antiepileptic drugs decrease excessive neuronal excitability to reduce or extinguish the occurrence of seizures, but effects of this process are psychomotor slowness, attention and concentration, and memory problems leading to learning and other impairments in academic functioning.(24)

In Brazil, the study by Aguiar et al. (2007) aimed to evaluate the impact of epileptic seizures in school absenteeism have shown that fifty children who participated in the study, 80% had already lost by least one day at school because of crisis; 46% of parents believed that the child should leave school

immediately after a crisis has occurred; 60% of families allowed their children to miss school even if they did not have occurred on the respective day.(16)

Another important aspect concerns the scarce number of publications on the subject of child epilepsy and education, as well as discussions about the impact of the disease and its variables on development of these children. There were few international studies and national study that focused directly on this issue is lacking.(16, 25-28)

The high frequency of attacks and; therefore, the greater severity of epilepsy have also been seen as a factor with a significant relationship academic performance of children with epilepsy. The negative impact of seizure frequency on intellectual performance is great resulting in low academic performance and difficulties in learning and adapting to the school environment. According with the authors, the condition may worsen when epilepsy remains active for periods of time.(29)

Regarding the organic factors related to epilepsy, some authors indicate that educational failure is related to the early onset of the disease, the frequency, and severity of epilepsy which can be mediated by a decrease cognitive.(5, 28, 30)

For Kenee et al. (2005), the early onset of epilepsy is associated with cognitive problems. The results of some studies have shown that epilepsy in the first years of life is a significant risk factor for development of problems related to intellectual functioning.(28, 31, 32) as compared to those Longitudinal studies that show adults with epilepsy tends to have a lower educational level, higher dropout rates school and need to attend special schools or special education, resulting in higher rates of unemployment or underemployment and increased incidence of psychiatric disorders.(33-35)

Sulzbacher et al. (1999) showed that children on a monotherapy for a long time have significant cognitive impairments in relation to reading, learning, and writing. The results also showed that the drug therapy had long-term effects, because even after three years without the use of medication the children continued to present cognitive deficits.(36)

In addition, the diagnosis of epilepsy, its undesirable effects and its psychosocial connotations significantly affect personal life of the child and family.(23, 37, 38) These authors also point out that these variables may lead to over protection behavior by parents and other family members, leading to lower academic achievement, commitment to activities daily life and independence, as well as difficulties in relating to friends within and outside the school environment, regardless of cognitive level.

Additionally, it is observed that such characteristics (early onset, severity, frequency of epilepsy, drug therapy and negative psychosocial connotation) may make epileptic children attending special schools or using special education services, although studies addressing this issue are scarce.(39, 40)

The prevalence of the use of special education services by children with epilepsy and frequency of epilepsy 30 times higher in patients with children attending special schools or special classes within schools than regular school students.(27)

Berg et al. (2005) verified through a longitudinal study, which followed 613 children over five years after being that 525 (85%) children were in school and that of these 315 (60%) had already used some service related to special education as classes regular schools or resource rooms or attended special.(26)

In a recent study aimed to assess and understand the social and the demographic determinants of knowledge, attitude, and practice of teachers towards people with epilepsy in Addis Ababa, Ethiopia which involved 820 teachers showed ninety percent of the teachers knew epilepsy as a disease and the most common source of information was acquaintances with PWE (51.3 %) and among those who had acquaintances with PWE, they had come across PWE in person (67.2 %), and had a student with epilepsy in class (28.6 %). The same researchers showed although 89.2 % of the teachers would allow PWE into their class, the majority (76.7 %) of them preferred that the epilepsy be cured or controlled before attendance, accounting for 21.6 and 19.1 % of the responses respectively. PWE were perceived insane more than infectious explaining 9.4 and 0.2 % of the responses respectively.(41)

Of the 231 children aged between 5 and <15 years, school attendance habits had been recorded on 162(70%) and 92 of these were definitely attending school and 70 were definitely not. A significantly higher proportion of girls were at school compared with boys [47/71 (66%) and 45/91 (49%) respectively; $\chi^2 = 17.8$ with Yates correction]. In this same study the proportion of all children attending school were significantly lower in older children (percentage attendance in age groups 5 to <10 to and 10 to <15 yrs being 60% and 52% respectively).(42)

In a community-based study in rural area of Ethiopia showed among the 139 persons with epilepsy identified, 49% were below the age of 10 years and 79% below 20 years and the ratio of males to females was 1.2 to 1.0.(9)

Methods

4.1. Study Setting

The study was conducted in Addis Ababa, Ethiopia at TASH. TASH was established in 1974. It is the Teaching Hospital of the Addis Ababa University, College of Health Sciences, and School of Medicine, located in Lideta sub-city. It is also the largest referral hospital in Ethiopia with a number of specialties and subspecialties. The hospital has totally around 600 beds and serves about 250,000 patients as outpatients annually.

The PNC is follow up clinic for an outpatient follow up of pediatric patients with neurologic problems. Most of the patients are children with seizure disorder. The clinic works half day (morning) in working days of the week. It is run by trained nurses, a general practitioner, Pediatric and Child Health Residents, and a pediatric neurologist. It is attended by children and adolescents in the age ranges of 0-18 years. The average number of patients attending the clinic on monthly basis is around 600 of which more than 60% are children with seizure disorder. Clinically stable patients with good seizure control are appointed to come every 2-3 months.

4.2. Study Population

School age children and adolescents account for the majority of the children attending the pediatrics neurology clinic. The source population for the study is school age children and adolescents aged 7-18 years, and their primary caretakers attending the PNC during study period (between April and July 2018).

4.3. Study Design and Study Period

The study is a facility based cross-sectional study that was conducted at the PNC in TASH between April and July 2018.

4.4. Sample size determination

Sample size is calculated using the EPI info statistical package for sample size and power calculation. The predicted school absenteeism among children with seizure based on Brazil study was 88% (ref). Taking an assumption of school absenteeism among children with seizure 88% to obtain a confidence level of 95% and a power of 80%, a total of 162 children had to be considered. Taking an additional 20% non-responders means at least 178 children and adolescents were supposed to be recruited.

Alternate sample size calculation using formula:

$n = Z_{\alpha/2}^2 P (1-P)/d^2$ [where: n= sample size, $Z_{\alpha/2}$ significance level for 95% CI = 1.96, P (expected proportion) = taken as 88 % (0.88), d (margin of error) =0.05]

n= 162

Taking additional 10% non-responder caregivers, the final sample size calculated will be 183.

4.5. Sampling Technique

All school aged children and adolescents with seizure disorder aged between 7 and 18 years of age attending the PNC during the study period fulfilling the inclusion criteria stated below were asked to participate in the study. Willing study subjects were included in the study until the minimum sample size was attained and more children were also recruited until the study period is finalized.

4.6. Inclusion and Exclusion Criteria

Inclusion criteria

- Age 7-18 years and attending school at least the past 6 months in an academic year.
- Diagnosed with seizure disorders.
- On follow up at a neurologic clinic.

Exclusion criteria

- Not started school
- Those with physical disability who can't walk by themselves.
- Those whose parent or caretaker doesn't consent.

4.7. Data collection

Study Questionnaire

For study participants who fulfilled the inclusion criteria stated above, a confidential written informed consent (**Annex I**) form was given. A structured, pre- tested study questionnaire (**Annex II**) was administered to collect data on the socio- demographic characteristics, primary caregiver's information; seizure related and school related characteristics, seizure disclosure status of participant child/ adolescent/caregiver to school teachers and peers. Medical charts of all children attending follow up at PNC during the study period were reviewed to retrieve information regarding other medical illness, type of seizure, and check how well seizure is controlled. All other items on the study questionnaire were clearly discussed with data collectors before data collection is started, to enhance their awareness on the instrument.

After nurses took consent from parents/guardians, data was collected by 4 pediatric residents who were trained on recruiting and filling of the questionnaire at the PNC. The Primary investigator regularly supervised the data collection process, to assure quality and completeness of the data collected by the pediatrics resident at the clinic.

4.8. Study variables

Independent variables

- Socio-demographic data – Age, sex, address, residence, religion, family size, child's level of education and school performance, primary caregiver's relation with study participant, primary caregiver's level of education and income were collected.
- Seizure related data – age at seizure onset, duration, seizure type, seizure frequency, and therapy.
- Parental or primary caregivers' disclosure status of epilepsy to the teachers or peers.

Dependent variables

- School absenteeism

4.9. Data Quality Assurance

As stated above, during the time of data collection, regular supervisions was made by the primary investigator in the data collection procedures. Timely feedbacks were given to data collectors to maintain data quality.

4.10. Data analysis and Interpretation

After data cleaning and entry, analysis was done using the Statistical Package for Social Sciences (SPSS) version 22. Variables will be defined, categorized and recoded. Descriptive statistics is used to summarize the data. Mean (standard deviation) or median (range) was used to summarize continuous variables, while frequency and percentage was used to summarize categorical variables. Binary logistic regression analysis was used to determine the associations between independent variables with the dependent variable one by one. Variables which showed significant association with school attendance in binary logistic analysis were included at once in logistic regression analysis to calculated adjusted odds ratios with the 95% confidence interval. For all statistical analysis a p value of < 0.05 is considered statistically significant.

4.11. Operational definitions

- School-age children: defined as those children with the cognitive skills and emotional maturity of normally developing child of age 7-12 years.
- Seizure: a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain.(1)
- Epilepsy: Clinical diagnosis of epilepsy usually requires the occurrence of at least 1 unprovoked epileptic seizure with either a second such seizure or enough EEG and clinical information to convincingly demonstrate an enduring predisposition to develop recurrences.(1)
- Complete seizure control: Defined as complete remission of seizure for six months or more.(43)
- Partial seizure control: Defined as more than fifty percent reduction of frequency of seizure.(43)
- Poor seizure control: One or more seizure per month over period of 6 months or more and who had experienced trials of at least two different AEDs at optimum doses alone or in combination with adequate compliance.(43)

Results

5.1 Socio-demographic findings

This study included 183 children with epilepsy, more than half (55.7%) of these patients were male. and the majority (72.7%) of these children were in the age group of 7 to 12 years (Table 1).

As presented in Table 1, majority of the study participants 118(64.5%) reside in Addis Ababa and about 44(24.0%) were from Oromia region. Regarding the birth order 82(44.8) were first, 42(23.0%) second, 26(14.2%) third and the remaining 33(18.0%) were above third birth order.

The mean family size was 4.8 and 94(53.7%) had family sizes of five or more members. Two hundred twenty three (67.2%) of the children with epilepsy attended primary schools. Some, 56 (30.6%) were attending below primary school which is not age appropriate, while 84(45.9%) repeated grades.

Selected socio-demographic characteristics of primary caregivers are presented in **Table 2**. Mothers were primary care givers for 71(38.8%) study participants. Study participants who were raised by single fathers and both parents accounted for 34(18.6%) and 68(37.2%) respectively. The majority of the primary caregivers are currently married (80.9%).

One hundred twelve (61.9%) of the primary caregivers completed secondary school education and more. Only 140 (76.5%) of the care givers disclosed their income, among whom only 75(53.6%) earned >1500 Birr/month and one hundred nineteen (65%) of primary caregiver perceived the income to be inadequate.

5.2 Seizure characteristics

The mean age at onset of seizure was 4.6 years while the median age at onset of seizure being 5.0 years and 36(19.7%) of them have onset during infancy period. On the other hand the mean and median of duration of seizure were 5.7 and 5.0 years respectively and in 113(61.7%) of them had seizure 5 year and more. When we see the seizure type majority of patients 132(72.1%) have generalized onset, 49(26.8%) have focal onset type and the remaining 2(1.1%) have unclassified seizure type.

When we see the frequency of seizure most patients 104(56.8%) had less than or equal to one seizure episode per month and the remaining 79(43.2%) had more than one seizure per month. Regarding treatment given most patients 130(71.4%) got mono-therapy and others 46(25.3) got poly-therapy.

Of the total 183 study subjects About 44(24.0%) had symptomatic seizure; on the other hand the rest 139(76.0%) do not have symptomatic seizure. When we see level of seizure control; complete control was observed in 92(50.3%), partial control in 57(31.1%), poor control in 33(18.1%) and not documented in one patients.

Regarding impact of seizure on school absenteeism 127(69.4%) children miss school days because of the seizure effect and most(90) of them miss between 1 to 10 days(Table.4) and only 4 ceased there school during this year. The mean number of missed school days is 12.6 days; the range being between 1 and 120 missed school days in the last 6 months.

There are several reasons mentioned by Primary care givers of those who missed school days why their children miss school days. Majority students 102(80.3%) miss school days for medical appointment, 64(50.4%) children miss school days because of having seizure before school and the remaining 27(121.3%) miss school because of having seizure at school (Figure 7).

From the study participants 88(48.1%) of them had seizure at school from which 81(92%) of them went home immediately while the rest seven stayed at school after feeling better.

Teachers had expressed apprehension to the primary care giver regarding the diagnosis of epilepsy only in 71(38.2%) of the cases. The teachers are mainly concerned because they fear that other students could be disturbed and the school performance of affected children may decline.

The teacher informed the caregivers that the children with epilepsy should stay at home in 17% of the cases. On the other hand the primary care givers claimed that they allowed 19.2% of their children to miss school days even when there is no illness. The main reason the parents mentioned is fear that children might have seizure at school in 75% of cases.

Binary logistic regression analysis was used to assess the association between selected background covariates independent variables (Socio demographic variables, seizure related variables and schooling variables) against dependent variable (school absenteeism) of study participants is shown in **Table 5**.

The results of binary logistic regression analysis of relevant predictors on absenteeism individually, shows that among the factors tested the older age group, female sex, duration of seizure ≥ 5 , status of repeating grades, having seizure at school, having frequent seizures and having seizures for longer duration or disclosing seizure to teachers, were associated with school absenteeism.

Logistic regression analysis including all the above stated factors which are significantly associated with school absenteeism was run to calculate adjusted odds ratios. The results show that only female sex, having symptomatic seizure, having seizure at school or having longer duration of seizure were identified as independent determinants of poor attendance.

Discussion

In an endeavor to assess the impact of seizure on school absenteeism in school age children and adolescents between the ages of 7 and 18 years who were attending follow up at the PNC in Tikur Anbessa Specialized Hospital (TASH), 183 children with epilepsy were recruited. To our knowledge this study is the first of its kind in Ethiopia which is set to determine the prevalence of epilepsy among school aged children and to identify factors affecting school attendance among children with epilepsy. In order to design future interventions to improve school attendance, identifying the factors affecting school absenteeism in children with epilepsy is very important

From our study the prevalence of school absenteeism among children aged 7-18 years at PNC follow up were 69.4%. The prevalence of poor attendance is lesser in our study than reported in a research done in

the Brazil (88%) but higher than in reported by a study conducted in Sierra Leone (50%) and a study by CDC (36%) (16, 20, 22). The differences in estimated prevalence of poor school attendance could be attributed to the difference in sample size used, the demographic characteristics, seizure duration, and the varying definition of poor attendance.

More children with epilepsy within the age group of 13-18 years (82%) missed school. The higher proportion of absenteeism in this age group may reflect, the difficulty of coping with epilepsy among older children due to possible longer duration of the disease since onset and fear of dealing with the stigma associated with the illness.

Similar to the other studies, our findings show that the major reason for missed school days was due to seizure (20, 22). Totally four children (3.2 %) ceased attending school in our study is fewer than reported in a study done in Sierra Leone which was about 20%. Education is very important for all children and especially for children with epilepsy as it could facilitate adaptive functionality and better integration in the society. Therefore cessation of education should not be an option in children with epilepsy.

The proportion of the two sexes in our study was similar to the proportion reported in a study that determined the incidence of epilepsy in rural central Ethiopia (9). In this study, there were statistically significant association between female sex and missed school days. More female (79%) than male (63%) children with epilepsy missed school days. Female children with epilepsy were 2.2 times more likely to miss school days than their male counterparts. In developing countries like Ethiopia where enrollment and retention of female children at school is poor, this result is expected. In addition female children with epilepsy are at increased risk of developing depression due to the illness which could perhaps affect school attendance negatively. Our finding, however, contradicts the finding of a study that showed higher proportion of school attendance among female than male children (42). The finding of this study shows the need to reach out for female children with epilepsy even more than the male children. Stronger social support to boost the confidence and better function of children with epilepsy are required.

More number of care givers has disclosed the condition of the children to the teachers (86.9%). As teachers could support children with epilepsy, it is encouraging to know that most of the caregivers willingly disclose the status of the children to their teachers. Unfortunately, more number of the children whose status is known by the teachers missed school day as opposed to children whose status was not disclosed to their teacher. The preference of the teachers to let the children stay at home till their seizure is cured before coming to school can be the reason for poor attendance (41). Therefore it is important to equip teachers with the knowledge and resources required to handle children with epilepsy to avoid more number of missing days. Furthermore, teachers and care takers could plan ways to make up for missed days of school to improve attendance of the children.

Having symptomatic seizure and longer duration of seizure identified as the independent determinants of missing school. This could be associated with the illness and potential fear of stigma associated with having the illness. Children who experienced seizure at school are less likely to miss school than those

who never had seizure at school. This could perhaps be due to a good collaboration of the care takers and teachers in reassuring the children with seizure.

Greater proportions of the primary caregivers of the children were married (80.9%) and more than half of had attended high school or higher education (59.6%) and have a secured monthly income (68.2%). These characteristics of caregivers are expected to affect school attendance of children with epilepsy positively. Though, more proportion of children raised by parents of lower education level missed school than those raised by parents of higher education level, our findings fail to demonstrate a statistically significant association between family size, marital status of parents, socioeconomic status and educational status of parent's with school absenteeism.

As shown in our results despite the absence of any illness the parents allowed 19.2% of their children to miss school days. Excessive fear and concerns of care takers of children with epilepsy need to be tackled through reassurance and education to improve school attendance.

In this study, though not statistically significant, children with more than one seizure per month have missed school more than those who had less frequent seizure but other studies suggest the negative impact of seizure frequency on intellectual performance resulting in low academic performance and difficulty in learning (29). Direct effect of seizure on wellness of the children and its indirect effect on cognition may both result in poor attendance among children with epilepsy (5, 28, 29, and 30).

More children who repeated grade (78.6%) missed more school days than those who never repeated their grade (61.6%). There is a statistically significant association between repeating grade and poor attendance. A possible inference from this is that repeating a grade could negatively school attendance. Children with epilepsy are likely to have associated learning difficulties, therefore each child learning abilities need to be assessed before commencement and during the learning process. Therefore, the schools need to identify trained personnel who could identify learning challenges of the child and who could suggest potential measures to be taken to improve progress of learning of the children with epilepsy to avoid repeating classes.

7. Limitations of the study

This study tried to highlight the impact of seizure on school absenteeism among school aged children. Nevertheless, it should be noted that the study has the following limitations.

- First, the study was conducted in one tertiary hospital, which could result in an under or over estimation of the actual burden of the problem on the society as a whole and our questioner were not validated questioner.
- Second, the absence of comparison group (control group) in the study makes it difficult to make definite conclusions.

- Third, though this study clearly showed the impact of seizure on school absenteeism it doesn't show the effect of school absenteeism on school performance.
- Finally, income disclosure among caregivers of the study participants was limited for use as a covariate in further statistical analysis.

8. Conclusion

This study demonstrated the school absenteeism is very common among children aged 7-18 years at PNC follow up (69.4%). Furthermore, female sexes, seizure duration, symptomatic are significantly associated with school absenteeism. Based on the findings identified by the current study it could be possible to conclude that seizure has a significant impact on children's school attendance. Therefore there is a need for collaborative action by clinicians, teachers, care takers and school administration to improve attendance.

9. Recommendations

1. It is important that TASH should involve the primary care takers and facilitate a regular neuropsychological assessment and continuous follow up and care in its Neurologic clinic or in any of its clustered health facilities for children and adolescents.
2. In order to curb increased rate of absenteeism, female children and adolescents having a longer duration of active epilepsy, longer duration of seizure and who previously repeated grade should be targeted
3. To reduce apprehension, training of the teachers and care takers on how to deal with these special groups of children and their mental health issues is important.
4. The importance of improving attendance and performance at school for better integration of the children in the society need to be communicated to the careers and the teachers.
5. Special support group should be established in schools which cater for the needs and limitations of children with epilepsy are needed to improve school enrolment, attendance and retention of children with epilepsy.
6. Documented seizure action plans individualized to each student with seizure must be available at the school.
7. Further population-based studies to determine other reasons of school absenteeism among children with epilepsy need to be conducted.

Abbreviations

ADHD Attention Deficit Hyperactivity Disorder

AOR	Adjusted Odds Ratio
CI	Confidence Interval
CWE	Children with Epilepsy
CSHCN	Children with Special Health Care Needs
EEG	Electroencephalography
FMoH	Federal Ministry of Health
ILAE	International League against Epilepsy
OR	Odds Ratio
MDG	<i>Millennium Development Goals</i>
NCDs	Non-Communicable Diseases
PNC	Paediatric Neurology Clinic
SPSS	Statistical Package for Social Sciences
TASH	Tikur Anbessa Specialized Hospital
WHO	World Health Organization
SSNPR	Southern Nations, Nationalities, and Peoples' Region

Declarations

1.1 Ethical approval and consent to participate:

Ethical clearance was obtained from the Department of Pediatrics and Child Health Research and Publications Committee of the School of Medicine, College of Health Sciences, Addis Ababa University.

1.2 Consent for publication:

Not required.

1.3 Availability of data and material

The datasets generated or analyzed during the current study are not publicly available due to intuitional policy but are available from corresponding author on reasonable request.

1.4 competing interests

The authors declare that they have no competing interests.

1.5 Funding

No funding was obtained for this study.

1.6 Authors' contributions

OH was responsible for overall conceptualization, writing most of the article and conduct of the study.

AM was a pediatric neurologist who contributed toward modifications and finalizing the article.

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Tables

Table1. Socio demographic characteristics of school age children and adolescents with seizure disorder attending follow up at PNC in TASH between April and July, 2018

Variables	Frequency	Percentage
Age groups		
7-12	133	72.7
<u>13-18</u>	50	27.3
Mean/ \pm SD =10.47/2.9		
Sex		
Male	102	55.7
Female	81	44.3
Birth order		
First	82	44.8
Second	42	23.0
Third	26	14.3
Greater than 3	33	18
Family size (n=175)		
<5	81	46.3
\geq 5	94	53.7
Mean/ \pm SD=4.85/1.8		
Address		
Addis Ababa	118	64.5
Oromia	44	24.0
Amhara	8	4.4
SSNPR	10	5.5
Other	3	1.6
Address		
Addis Ababa	118	64.5
Out of Addis Ababa	65	35.5
Religion		
Orthodox	113	61.7
Muslim	47	25.7
Protestant	21	11.5
Other	2	1.1

Childs level of education		
Nursery	56	30.6
Primary school	123	67.2
Secondary school	4	2.2
Repeated grade		
Never repeated	99	54.1
Repeated	84	45.9

Table2. Socio demographic characteristics of primary caregivers of school age children and adolescents with seizure disorder attending follow up at PNC in TASH between April and July, 2018

Variables	Frequency	Percentage
Primary caregivers		
Mother	71	38.8
Father	34	18.6
Both parent	68	37.2
Adult relative	9	4.9
Other	1	0.5
Marital status of parent		
Single	9	4.9
Married	148	80.9
Divorced	15	8.2
Widowed	11	6.0
Educational status of parents n=181		
Less than high school	73	40.3
High school	39	21.5
Collage level and above	69	38.1
Occupational status of parents		
Government	41	22.9
House wife	36	20.1
Private work	68	38.0
Merchant	13	7.3
Farmer	9	5.0
Other	7	3.9
Monthly income (n=140)		
<1500 birr	65	46.4
>1500 birr	75	53.6
Mean=2303 (standard deviation)		
Income		
Partially adequate income	64	35.0
Inadequate income	119	65.0

Table3. Frequency distributions of seizure related information of school age children and adolescents with seizure disorder attending follow up at PNC in TASH between April and July, 2018

Variables	Frequency	Percentage
Age group of seizure diagnosis		
<1 year	36	19.7
1-5 year	76	41.5
>5 year	71	38.8
Mean/ \pm SD=4.6/3.6		
Duration of seizure		
<5	70	38.3
\geq 5	113	61.7
Mean/ \pm SD=5.7/3.5		
Seizure type		
Focal onset	49	26.8
Generalized onset	132	72.1
Unknown onset	2	1.1
Focal onset (n=50)		
Focal clonic	10	20.0
Focal tonic	5	8.0
Focal myoclonic	7	14.0
Focal with impaired awareness	17	34.0
Focal to bilateral tonic clonic	13	24.0
Generalized onset (n=161)		
Generalized tonic clonic	118	73.0
Generalized tonic	4	2.5
Generalized clonic	–	–
Generalized Myoclonic	14	8.8
Generalized Atonic	13	8.2
Typical absence	12	7.6
Seizure frequency		
\leq 1 per month	104	56.8
>1per month	79	43.2
Type of therapy (n=182)		

Monotherapy	130	71.4
Monotherapy with side effects	3	1.6
Polytherapy	46	25.3
Polytherapy with side effects	3	1.6
Symptomatic seizure		
Yes	44	24.0
No	139	76.0
Seizure control		
Complete seizure control	92	50.3
Partial seizure control	57	31.1
Poor seizure control	33	18.0
Not documented	1	0.5

Table4. Frequency distributions of impact of seizure in school information of school age children and adolescents with seizure disorder attending follow up at PNC in TASH between April and July, 2018.

Variables	Frequency	Percentage
Ever miss a school day because of seizure		
Yes	127	69.4
No	56	30.6
Number of days missed (n=127)		
<10 days	90	70.9
10-30 days	33	25.9
>30 days	4	3.2
Mean/ \pm SD=12.6/31		
IF YES (n=127)		
Had a seizure before going to school	64	50.4
Had a seizure at school and needed to go home	27	21.3
Had a medical appointment	102	80.3
Had a test scheduled	1	0.8
Other	1	0.8
Seizure at school		
Yes	88	48.1
No	95	51.9
Go home before the end of classes (n=88)		
Yes	81	92
No	7	8
Should go home immediately		
Should go home immediately	58	31.7
Can stay at school if he/she feeling well	125	68.3
Apprehension regarding the diagnosis of epilepsy		
Yes	71	38.2
No	110	60.8
Type of apprehension (n=69)		
Fear of not being able to assist the child	14	17.7
Fear of decline in school performance	27	34.2
Fear that the patient could disturb the other	38	48.1

Teacher suggest that the child should be kept at home because of seizure		
Yes		
No	31	17.0
	151	83.0
Allow child to miss a day of school even if he/she in not sick		
Yes		
No	35	19.2
	145	80.8
Reason (n=35)		
Fear that he/she might have a seizure at school	27	75.0
No particular reason	3	8.3
Other	6	16.7
Another son/daughter, did he/she ever have to miss a school day due to his/her brother/ sister's seizures		
Yes		
No	12	6.6
	170	93.4
Guardians disclose epilepsy status of a child to teacher		
Yes		
No	159	86.9
	22	13.1
Guardians disclose epilepsy status of a child to peer		
Yes	105	57.4
No	78	42.6

Table5. Bivariate logistic regression analysis of associated covariates of school absenteeism of school age children and adolescents with seizure disorder attending follow up at PNC in TASH between April and July, 2018

Variables	School absenteeism		COR(95%CI)	AOD (95% CI)
	No (%)	Yes (%)	P value	P value
Age groups 7-12 years 13-18 years	47(35.3) 9(18)	86(67.7) 41(82)	2.49(1.1-5.6) 0.026*	2.01 (0.83-5.24) 0.130
Sex Male Female	39(38.2) 17(21.0)	63(61.8) 64(79.0)	2.33(1.2-4.6) 0.013*	2.19(1.03-4.84) 0.046*
Family size <5 members ≥5 members	24(29.6) 32(31.4)	57(70.4) 70(68.6)	0.89(0.45-1.70) 0.440	
Duration of seizure <5 ≥5	9(52.9) 47(28.3)	8(47.1) 119(71.7)	3.12(1.64-6.05) 0.0006*	2.36(1.09-5.15) 0.028*
Repeated grade Never repeated Repeated	38(38.4) 18(21.4)	61(61.6) 66(78.6)	2.28(1.19-4.49) 0.014*	1.57(0.73-3.42) 0.245
Marital status of parent Single, divorced and widowed parent Married	28(80.0) 98(66.2)	7(20.0) 50(33.8)	0.51 (0.19-1.19) 0.135	

Educational status of parents < high school High school College level and above	16(21.9) 12(30.8) 28(40.6)	57(78.1) 27(69.2) 41(59.4)	1.0 (0.5- 1.9) 0.940 1.31 (0.2- 27.4) 0.82	
Seizure frequency =<1 month >1 month	39(37.5) 17(21.5)	65(62.5) 62(78.5)	2.18(1.13- 4.34)	1.55(0.69- 3.55) 0.299
Seizure at school No Yes	42(44.2) 14(15.9)	53(55.8) 74(84.1)	4.19(2.1-8.4) 0.021*	0.39(0.17- 0.89) 0.024*
Symptomatic seizure No Yes	35(25.2) 21(47.7)	104(74.8) 23(52.3)	2.71(1.33- 1.55) 0.005*	2.51(1.09- 5.86) 0.038*
Guardians disclose epilepsy status of a child to teacher No Yes	13(54.2) 43(27.0)	11(45.8) 116(73)	3.19(1.33- 7.6) 0.009*	0.40(0.13- 1.18) 0.097

Figures

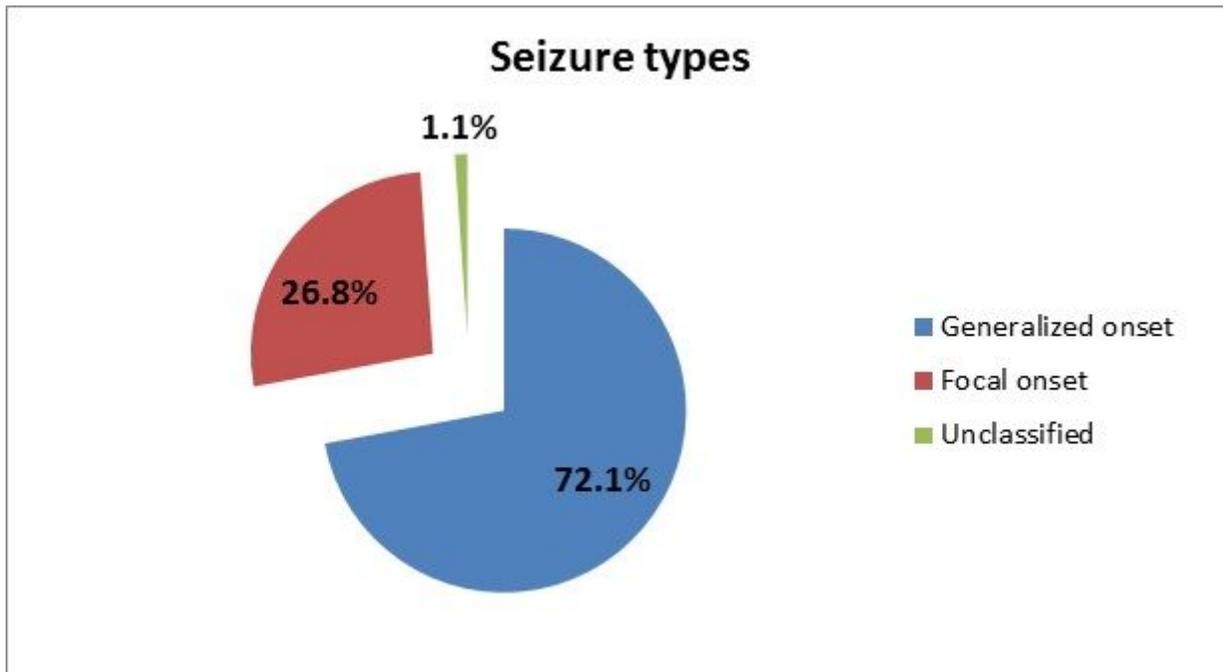


Figure 1

Different types of seizure

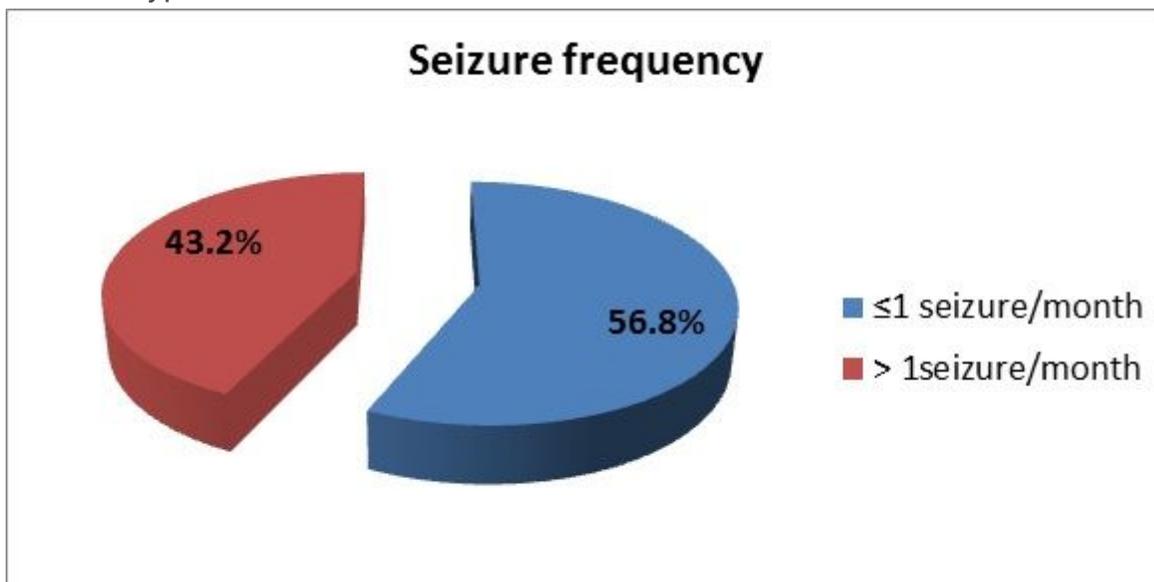


Figure 2

Seizure frequency per month

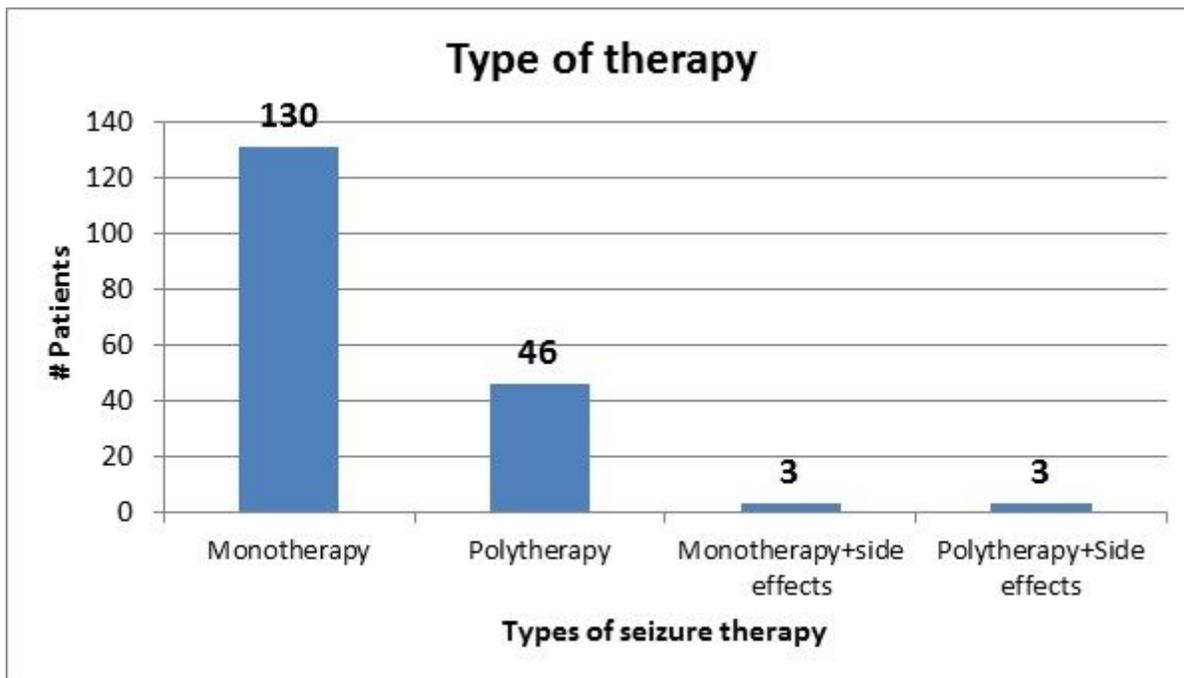


Figure 3

Different types of seizure therapy

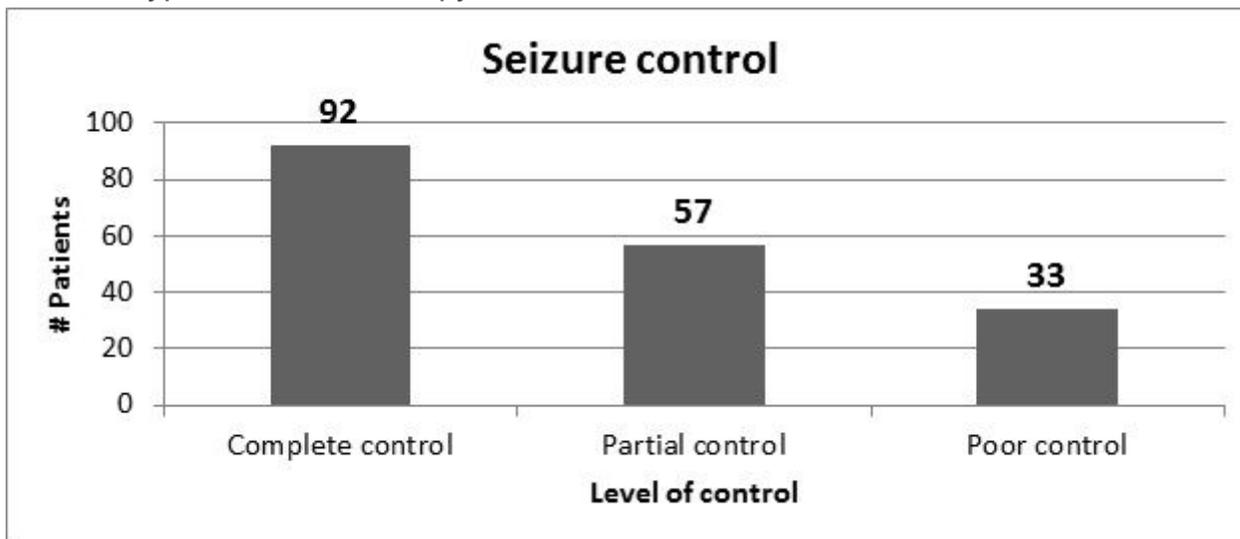


Figure 4

Level of seizure control

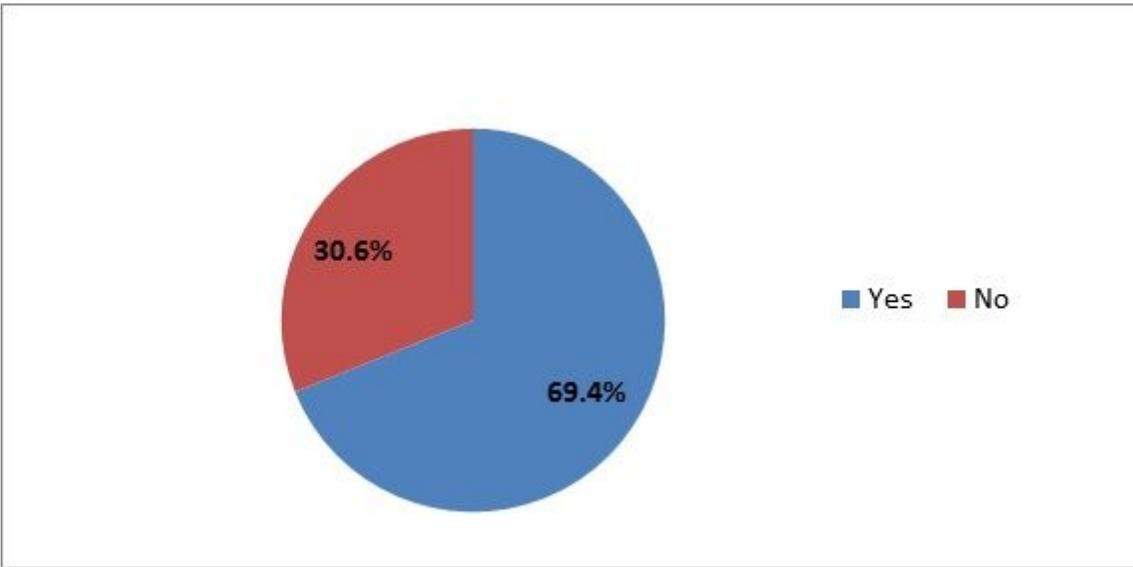


Figure 5

Percentage of students who miss school days

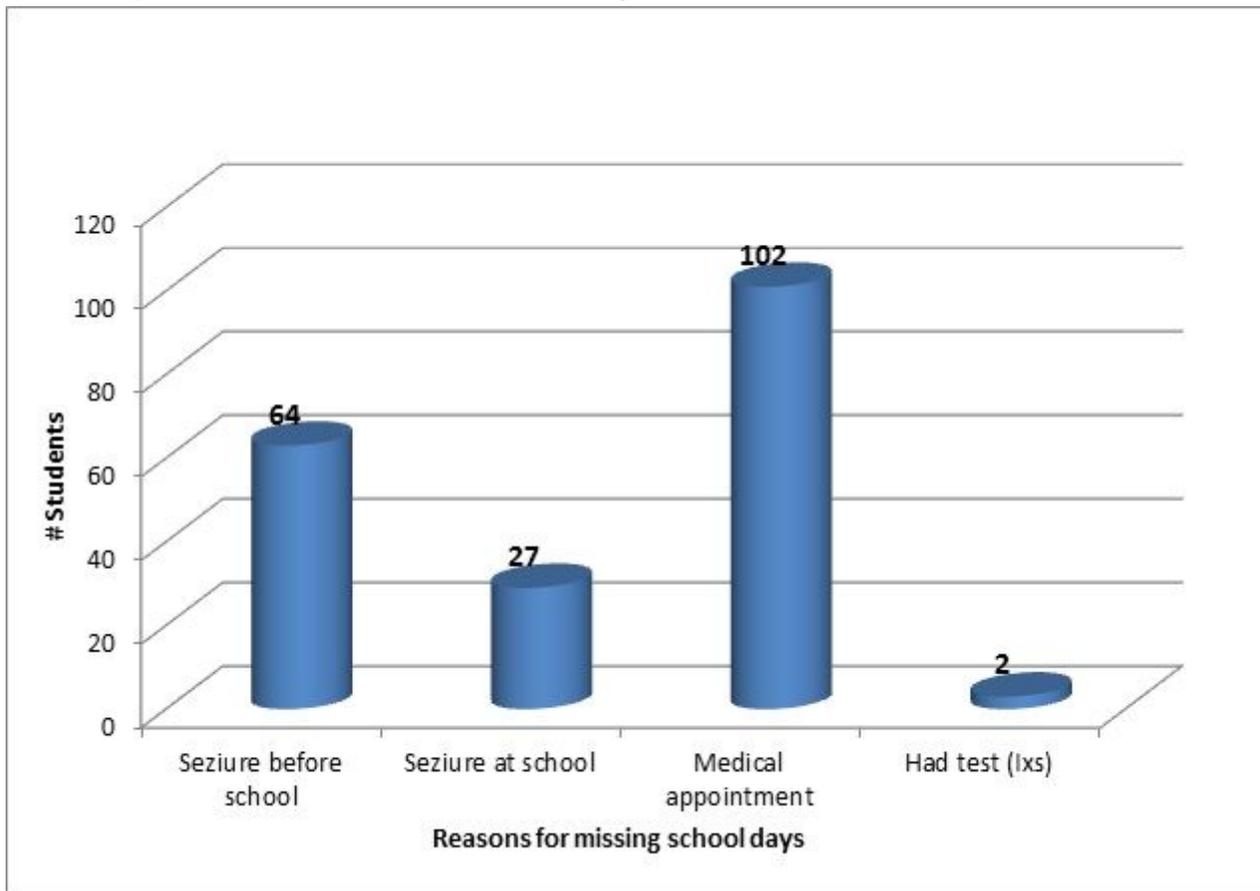


Figure 6

Reason why they miss school days

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