ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF PEDIATRICS AND CHILD HEALTH

CLINICAL PROFILE AND DETERMINANTS OF CHILDHOOD EPILEPSY AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA, 2024/2025

BY: Dr. MEKONNEN ASMARE (MD, PEDIATRICS AND CHILD HEALTH RESIDENT)

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, DEPARTMENT OF PEDIATRICS AND CHILD HEALTH IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE SPECIALTY CERTIFICATE PROGRAM IN PEDIATRICS AND CHILD HEALTH

APRIL 2025

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BY: Dr. MEKONNEN ASMARE (MD, PEDIATRICS AND CHILD HEALTH RESIDENT)

ADVISOR:

Dr. SISAY LEMA, ASSISTANT PROFESSOR OF PEDIATRICS AND CHILD HEALTH

CO-ADVISORS:

Dr. AYALEW MOGES, PEDIATRIC NEUROLOGIST, ASSOCIATE PROFESSOR OF PEDIATRICS AND CHILD HEALTH AT ADDIS ABABA UNIVERSITY

Dr. BEHAYLU YIBE, PEDIATRIC NEUROLOGIST, ASSISTANT PROFESSOR OF PEDIATRICS AND CHILD HEALTH AT ADDIS ABABA UNIVERSITY

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ADDIS ABABA, ETHIOPIA

Approval Form

I, the undersigned pediatric and child health resident, declare that I have submitted my original thesis entitled Clinical Profile and Determinants of Childhood Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2024/2025

Submitted by:

Name…… ……Signature……Date…….

This thesis work has been submitted with my approval as an advisor

Approved By:

1. Dr. Sisay Lemma

   Advisor name: ……Signature: ..... Date

2. Dr. Ayalew Moges

   Advisor name: ----------Signature----------Date

3. Dr. Behaylu Yibe

   Advisor name: ----------Signature---------Date

Head of Department Committee: _____

Signature: _____

Table of Contents

Acknowledgment

First, I would like to thank Addis Ababa University College of Health Science, especially the Department of Pediatrics and Child Health, for giving me this great opportunity.
I would like to express my deepest gratitude to my advisor, Dr. Sisay Lema, for his guidance and invaluable comments throughout the development of this proposal.

Last but not least, I am profoundly grateful to Dr. Ayalew Moges and Dr. Behaylu Yibe for their unwavering support and guidance throughout the development of this research proposal. Your insights, patience, and encouragement have been invaluable, and I truly believe I would not have reached this point without your mentorship. Your dedication to helping me has been a constant source of inspiration, and I am deeply thankful for the countless hours you have invested in helping me.

Abstract

Background: Childhood epilepsy is a significant public health concern globally, particularly in low- and middle-income countries (LMICs) like Ethiopia. In Ethiopia, the burden of childhood epilepsy is intensified by several factors, including a lack of awareness, cultural stigmas, limited healthcare access, and a shortage of specialized medical resources.

Objective: This study assessed the clinical profile and determinants of childhood epilepsy at TASH, a major referral center in Ethiopia.

Methods: A hospital-based cross-sectional study with prospective data collection was conducted among infants and children aged 1 month to 18 years diagnosed with epilepsy at a pediatric neurology clinic in TASH.

Result: Generalized epilepsy was the most predominant type (59.8%), followed by focal epilepsy (20.3%), combined generalized and focal epilepsy (6.2%), and unknown types (6.6%); additionally, 7.1% had epilepsy syndromes. Children with comorbid neurological complications were approximately 3.77 times more likely to develop generalized epilepsy compared to those without comorbid neurological complications (AOR = 3.770, 95% CI: 2.057-6.908, $p<0.001$).

Children with a family history of epilepsy were 3.67 times more likely to develop generalized epilepsy compared to those without a family history (AOR = 3.674, 95% 95% CI: 1.260-10.716, $p=0.017$). Similarly, children who experienced perinatal complications had 4.76 times the odds of having generalized epilepsy compared to those without perinatal complications (AOR = 4.756, 95% CI: 1.330-17.011, $p=0.016$).

Conclusion: Generalized epilepsy is the most common type. Comorbid neurologic complications, family history, perinatal complications, and infections significantly increase the likelihood of generalized epilepsy. Developmental delays, intellectual disabilities, and neurobehavioral issues are common comorbidities

List of Acronyms

AAU.....Addis Ababa University

DPCH.....Department of Pediatrics and Child Health

ETB.....Ethiopian Birr

GP. ..... General Practitioner

ILEA. ..... International Legue Against Epilepsy

IRB.....Institutional Board Review

LMIC ..... Low and Middle- income Countries

PI.....Principal Investigator

REC.....Research and Ethics Committee

SPSS ..... Statistical Package for Social Sciences

TASH..... Tikur Anbesa Specialized Hospital

WHO.....World Health Organization

1. Introduction

1.1 Background

Epilepsy is a widespread neurological condition that causes repeated seizures, impacting people of all ages across the globe. Many individuals develop this disorder early in life, often during childhood [1]. According to the World Health Organization, approximately 7.60 per 1000 individuals experience epilepsy during their lifetime, with the condition affecting approximately 70 million people of all ages worldwide [2]. The incidence of epilepsy in children aged 11–17 years is 21–24 per 100,000 cases [3]. Epilepsy in children can be incredibly difficult, not just for the kids themselves but also for their families who support them. In sub-Saharan Africa, epilepsy affects far more children than in wealthier nations [4]. This gap stems from multiple challenges, like limited healthcare access, inconsistent diagnosis methods, and deep-rooted cultural beliefs about the condition [5-8].

In Ethiopia, childhood epilepsy hasn't been studied enough, leaving a significant gap in our knowledge of its causes and trends. Childhood epilepsy can have severe implications for the developing brain, affecting cognitive function, educational attainment, and overall quality of life. Furthermore, the social stigma associated with epilepsy can lead to social marginalization and discrimination, further complicating the management and care of affected children and their families.

Many different factors can play a role in why children develop epilepsy and how the condition changes over time. Many factors can contribute to childhood epilepsy, including family history (genetic risks), birth complications, illnesses like infections, lack of proper nutrition, and exposure to environmental hazards.

A child's epilepsy care is deeply affected by their family's income, education level, and ability to get medical help. Despite the known significance of these determinants, few studies have explored their specific impacts within the Ethiopian context, which can hinder the development of targeted interventions.

Tikur Anbessa Specialized Hospital, one of Ethiopia's leading medical centers, sees many children with epilepsy. Yet, despite the high number of cases, we still lack detailed information about their symptoms, backgrounds, and which factors might be shaping their condition, information that could lead to better care. Understanding these patterns is crucial for developing effective management strategies and tailoring interventions that address the specific needs of children with epilepsy and their families.

This study aimed to fill this critical gap by providing a comprehensive overview of the clinical profile of childhood epilepsy at Tikur Anbessa Specialized Hospital. The findings will potentially contribute to the formulation of evidence-based strategies to improve diagnosis, treatment accessibility, and support for affected families, ultimately enhancing the quality of life of children with epilepsy in Ethiopia.

1.2 Statement of the Problem

Childhood epilepsy is a serious health challenge in Ethiopia, affecting many children and creating difficult burdens for families [9-11]. While proper treatment can control epilepsy, many kids struggle to get the care they need due to limited diagnostic tools and poor access to antiepileptic drugs and limited awareness among healthcare providers and the public. This reality is particularly evident in resource-

limited settings like Ethiopia, where healthcare infrastructure struggles to meet growing demands for neurological care [12].

Despite the challenges associated with childhood epilepsy, there is a substantial gap in research investigating both the clinical profile and underlying determinants in the Ethiopian context.

We still don't know enough about childhood epilepsy in Ethiopia. Current research doesn't give us the full picture of what causes it, which children are most affected, what seizure types they experience, or how well treatments work. Without this crucial information, doctors struggle to properly diagnose and care for these children, which can lead to serious lifelong consequences like learning difficulties, thinking problems, and social isolation.

Making matters worse, Ethiopia's unique social and cultural beliefs about epilepsy often create additional challenges for affected children and their families. Stigma, misinformation, and traditional beliefs can influence how families perceive and respond to epilepsy, affecting their willingness to seek timely medical attention. Consequently, many children may experience delayed diagnosis and inadequate treatment, further complicating their health status and quality of life [11].

In a centralized referral hospital like Tikur Anbessa Specialized Hospital, the complexities of childhood epilepsy demand a thorough examination of its patterns and contributing factors. A deeper understanding of these elements is essential for developing targeted interventions that address the unique challenges faced by children with epilepsy in this region. Without focused research on this topic, we'll keep playing catch-up with epilepsy care instead of preventing problems before they start. This means many children will continue suffering needlessly from epilepsy complications that could have been avoided [13-15]. By identifying specific clinical features, sociodemographic factors, and barriers to care, our findings will provide a foundation for future research and a basis for improving clinical approaches and public health strategies in reducing the burden of childhood epilepsy in Ethiopia.

1.3 Significance of the Study

This research could make a difference in several important ways:

Improved care: Uncovering key details about childhood epilepsy like risk factors, and underlying causes it can help to recognize and treat the condition more effectively. With a better understanding of the local context, clinicians can better diagnose, treat, and manage pediatric epilepsy effectively.

Guiding Future Research: This study will establish valuable baseline information that can inspire further research into childhood epilepsy in Ethiopia and other similar contexts.

1.4 Objectives

1.4.1 General Objective

The general objective of this study is to assess the clinical profiles and determinants of childhood epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

1.4.2 Specific Objectives

- To describe the clinical profile of childhood epilepsy cases presented at Tikur Anbessa Specialized Hospital.
- To assess the demographic characteristics of children diagnosed with epilepsy in the study population.
- To identify determinant factors associated with childhood epilepsy at Tikur Anbessa Specialized Hospital.

2. Literature Review

2.1 Introduction

Epilepsy is one of the most common neurologic conditions affecting children, with about 10.5 million kids worldwide living with this disorder [16]. What makes epilepsy particularly challenging is that it can stem from many different causes, show up in various ways, and create heavy burdens for families both medically and financially [5, 6, 8]. In Ethiopia, specifically at Tikur Anbessa Specialized Hospital, the patterns and determinants of childhood epilepsy require thorough investigation to enable effective management and intervention strategies. This literature review explores the prevalence and clinical profiles of childhood epilepsy, focusing on epidemiological and clinical aspects and socioeconomic determinants that influence the condition.

2.2 Patterns of Childhood Epilepsy

2.2.1 Epidemiological Patterns of Childhood Epilepsy

Research shows that childhood epilepsy affects communities very differently around the world. While globally, about 2 to 3 children out of every 1,000 will develop epilepsy, these numbers jump significantly in poorer areas where nearly 1 in 300 children may be affected [17, 18]. This troubling gap highlights how economic hardship puts kids at greater risk. Research has indicated that childhood epilepsy affects approximately 10.5 million children globally, with a notable prevalence of 38% among those with cerebral palsy [16]. Some types of epilepsy affect children more than others. Take childhood absence epilepsy (CAE), for example; it makes up nearly 1 in 5 of all epilepsy cases diagnosed in school-aged children [19].

In a study conducted at Minia University Hospital, 76.6% of childhood epilepsy cases involved generalized convulsions, with a mean age of onset reported at 19.7 months [20]. Moreover, a study in Sardinia reported a prevalence of 2.67 per 1000 children, with higher rates (4.21 per 1000) in the 5-14 age group, highlighting a predominance of focal seizures and genetic etiology [21]. In Africa, childhood epilepsy affects about 17.3 out of every 1,000 children, with 6.8 per 1,000 experiencing active seizures. These numbers show a clear pattern: kids in low- and middle-income countries bear a heavier epilepsy burden than those in wealthier nations [22]. These results show why catching epilepsy early and treating it quickly matters so much, it can protect a child's ability to learn, grow, and connect with others as they get older.

2.2.2 Clinical Patterns of Childhood Epilepsy

Childhood epilepsy shows up in many different ways. Some children experience generalized epilepsy, while others have focal seizures. There are also specific patterns, like infantile spasms. Generalized seizures are predominant, accounting for approximately 55% of cases, whereas focal seizures account for approximately 37% [22]. Understanding these clinical patterns is essential for tailoring treatment approaches because they directly influence the management strategies required to achieve optimal outcomes [23]. Furthermore, the mean age at seizure onset is typically 15.4 to 19.7 months, with a noticeable incidence of seizures within the first year of life. Research shows epilepsy affects boys slightly more often than girls, a small but interesting difference that deserves further exploration. In one study, 46.7% of patients were male, whereas 53.3% were female, suggesting potential biological or environmental influences on the prevalence of the condition [24].

2.3 Determinants of Childhood Epilepsy

2.3.1 Socioeconomic Factors

A family's income and resources play a major role in both how common childhood epilepsy is and how well it can be treated. Families facing socioeconomic hardships tend to experience higher healthcare utilization, primarily due to the exacerbation of health issues linked to poor living conditions and a lack of access to healthcare. Research has identified several socioeconomic

factors that impact epilepsy prevalence, including family income, educational background, and access to healthcare services [25-28].

2.3.2 Genetic and Clinical Determinants

Genetic factors also play a crucial role in the etiology of childhood epilepsy. Studies have found that approximately 31% of epilepsy cases can be attributed to identifiable genetic causes, reinforcing the importance of genetic testing in understanding the condition [18]. Moreover, other clinical determinants such as neonatal seizures, family history of epilepsy, and perinatal brain damage are associated with increased risks of developing childhood epilepsy [27-30].

2.3.3 Healthcare Access and Cultural Influences

Access to healthcare is critical for the effective management of childhood epilepsy. In Ethiopia, healthcare disparities are evident, with many families facing barriers that prevent them from seeking timely medical assistance. Cultural misconceptions about epilepsy significantly hinder treatment-seeking behavior, leading to delayed diagnosis and management [31-33]. Cultural education and awareness programs are essential to reduce stigma and improve the overall care and support available to affected families.

2.4 Conclusion

Patterns and determinants of childhood epilepsy exhibit significant complexity and are influenced by epidemiological, clinical, genetic, socioeconomic, and cultural factors. Understanding these elements is crucial for developing effective management strategies and targeted interventions tailored to the specific challenges faced by children with epilepsy in Ethiopia. Increased awareness, early diagnosis, and improved access to health care services are essential for enhancing outcomes for affected children and their families. Future research in this area is critical for bridging knowledge gaps and providing evidence-based insights that can inform public health policies and practices.

2.5 Conceptual Framework

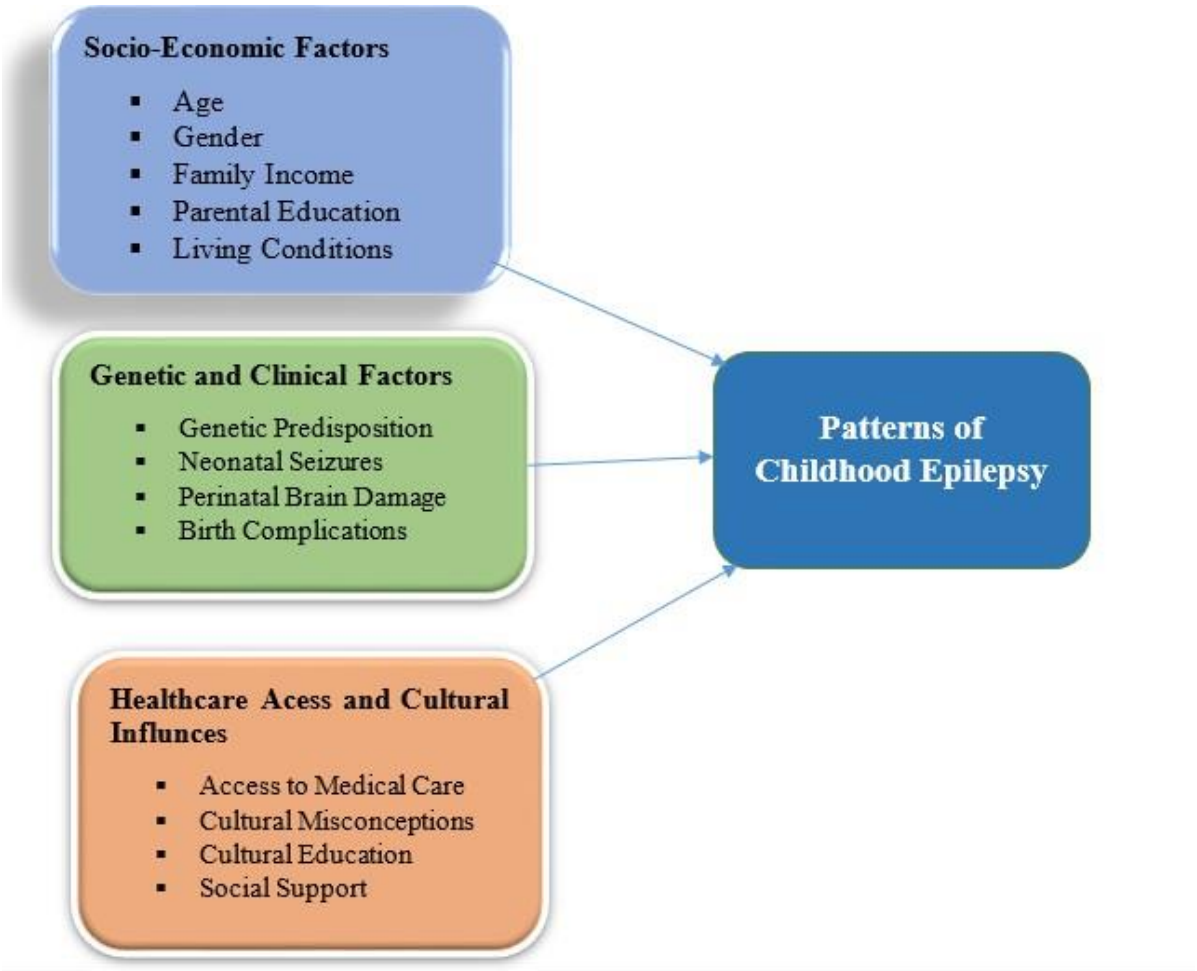

Fig- 1 A conceptual framework for the patterns and determinants of childhood epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2024

3. Methodology

3.1 Study Design

This study utilized a cross-sectional study design to assess the patterns and determinants of childhood epilepsy among pediatric patients with a diagnosis of epilepsy who are being followed-up at a pediatric neurology clinic, TASH, Addis Ababa, Ethiopia.

3.2 Study Setting

The study was conducted at Tikur Anbessa Specialized Hospital, the largest teaching and referral hospital in Ethiopia. The hospital caters to a diverse patient population and provides medical care for various health problems. The Pediatric Neurology Clinic in the Department of Pediatrics and Child Health serves a total of 500 to 600 children with various neurological diagnoses each month, of which approximately 60% of children seen in this clinic have a diagnosis of epilepsy (clinical audit of pediatrics department 2016 E.C). The clinic is open on each working day and is managed by 2 pediatric neurologists, 1 pediatric neurology fellow, 4-6 pediatric residents on monthly rotation, and 3-5 nurses.

3.3 Population

3.3.1 Source Population

The source population comprises all pediatric patients diagnosed with epilepsy who seek treatment at Tikur Anbessa Specialized Hospital.

3.3.2 Study Population

The study population comprised children aged 1 month to 18 years with a diagnosis of epilepsy who attended the hospital's outpatient pediatric neurology clinic during the study period.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

- Patients aged 1 month -18 years with a diagnosis of epilepsy.
- Children whose parents/guardians provide informed consent to participate in the study.

3.4.2 Exclusion Criteria

- Children who were actively convulsing during the follow-up appointment were excluded from the study.
- Children whose parents/guardians refused to provide consent.
- Neonates

3.5 Sample Size Determination and Technique

3.5.1 Sample Size Determination

The sample size is determined using the single population proportion formula ($n = Z^2 P (1-P)/d^2$). The proportion of generalized epilepsy in a previous study conducted at TASH to assess multiple antiseizure medication use and seizure control pattern was 82.8% [34].

Sample size: $n=\frac{Z^2P(1-P)}{d^2}=\frac{1.96^2 * 0.828*(1-0.828)}{0.05^2}=$

Where: n = sample size, Z = Z value at 95% confidence level (standard 1.96), Proportion of generalized epilepsy, and d = tolerance of error 5% or (0.05). Therefore, $n = 1.96^2*0.828*(1-0.828)/ (0.05)^2=$ **219**

Adding 10% of the calculated value for missing and incomplete data yields a final sample size required of **241**

3.5.2 Sampling Technique

A systematic sampling technique was adopted to select participants from the eligible patient list. Patients were selected based on a predetermined interval (k), which is calculated as the total number of patients attending the clinic during the study period divided by the determined

sample size. Therefore, assuming the minimum number of patients with epilepsy to be seen over 3 months, every 4th patient was taken until the target sample size was reached.

3.6 Study Variables

3.6.1 Dependent Variables

- Pattern of childhood epilepsy as classified by a pediatric neurologist based on the ILEA 2017 classification.

3.6.2 Independent Variables

- Age, sex, socioeconomic status, type of seizure, age at seizure onset, family history of epilepsy, treatment history (including medication adherence and treatment duration), and environmental factors (educational level of parents and access to healthcare).

3.7 Operational Definitions

Epilepsy: The International League Against Epilepsy (ILAE) defines epilepsy as any of the following:

1. At least two unprovoked (or reflex) seizures occurring more than 24 hours apart.
2. One unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures occurring over the next 10 years.
3. Diagnosis of epilepsy syndrome

Childhood Epilepsy: Epilepsy as defined by ILAEA, with onset in childhood (1 month -18 years).

3.8 Data collection instruments and procedures

3.8.1 Data collection instruments and procedures

Data was collected through a structured questionnaire written in Amharic, Afan Oromo, and English. The questionnaire consisted of information on clinical features, demographic characteristics, sociocultural perceptions, and determinant factors of childhood epilepsy. Before the actual data collection, the format was pre-tested with 30 participants. The samples used for pre-testing will not be included in the main study. Patient details were extracted from the charts and supplemented by direct inquiry of the parents/guardians at the time of clinic visit. One trained nurse and one general practitioner (GP) were given a half day of training about the study and data collection. Oversight was provided by the primary investigator to confirm that all information was being recorded and collected correctly. The collected data were checked for completeness, accuracy, and clarity by the principal investigator. We collected data over 3 months to ensure a comprehensive intake of data.

3.9 Data Quality Assurance

To ensure data quality, the following measures were implemented:

- Training data collectors on the study protocol and data collection instruments.
- Pilot testing of the questionnaire to identify and resolve any ambiguities.
- Regular supervision of data collection to ensure adherence to the study protocol.
- Routine checks for completeness and accuracy of collected data.

3.1.0 Data Analysis

Data were coded and analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic and clinical characteristics. Chi-square tests were used to evaluate associations between independent and dependent variables. Multivariate logistic regression a

Multivariate logistic regression analysis was used to identify significant determinants of childhood epilepsy while controlling for confounding factors.

3.1.1 Ethical Considerations

Ethical approval was obtained from the Research and Ethics Committee (REC) of the DPCH. Informed consent, written in both Amharic and English, was obtained from the guardians. They were assured of confidentiality and informed of their right to withdraw from the study at any time without affecting the child's care. Additionally, age-appropriate assent was sought from children aged 12 and above. This study adhered to the principles of the Declaration of Helsinki.

3.1.2 Result Dissemination Plan

The result of the study will be shared with stakeholders, including healthcare providers and policymakers, through presentations, reports, and publication in peer-reviewed journals. Additionally, the findings will be disseminated to families and the public through community health forums to raise awareness of childhood epilepsy and its determinants.

4. Project work plan

S. No.	Activities	Responsible person	August	September	October	November	Dec	Jan	Feb
1	Writing proposal	PI							
2	Final proposal submission	PI							
3	Data collection	Trained GP/nurse							
4	Submission of 1st Result	PI							
5	Submission of final Result	PI							
6	Research defence								

5. Budget Breakdown

S. No.	Category	Material	Units	Unit price (ETH birr)	Total (ETH birr)
1	Stationery and Supplies	Paper	10	100	1000
		Pen	10	20	200
		Binder	2	100	200
		Printer ink	1	2000	2000
		Subtotal	3400		
2	Data collector	50 birr Per card	384	50/card	19200
3	Secretory work	Secretory	500	2	1000
5	Cell phone cards	Cell phone cards	100	10	1000
6	Contingency	3500			
	Grand total	28,100 ETB			

6. Results

6.1 Socio-Demographic Characteristics

The majority of children with epilepsy in this study were aged 6-10 years (40.7%), followed by 11-18 years (34.0%), and 1 month -5 years (25.3%). More than half of the children were male (63.1%). The primary caregiver was most often both parents (74.3%), followed by the mother alone (20.7%). A large proportion of families reported a monthly income of less than 5000 ETB (64.3%). The vast majority of participants resided in urban areas (94.2%). Regarding parental education, the most common level was secondary education (39.4%), followed by primary education (31.5%), higher education (19.9%), and no formal education (9.1%). The most common primary source of family income was business/private sector employment (65.1%). A significant

proportion of families described their financial situation as "somewhat difficult" (39.8%) or "very difficult" (27.0%), while 30.7% considered their situation "average," and only 2.5% reported being "comfortable."

Table 1: Socio-Demographic Characteristics of Children with Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variable	*Frequency (n)*	*Percentage (%)*
Child's Age		
1-5 years	60	24.9
6-10 years	98	40.7
11-18 years	82	34.0
<1 year	1	0.4
Child's Sex		
Male	152	63.1
Female	89	36.9
Child's Caretaker		
Mother	50	20.7
Father	2	0.8
Both Parents	179	74.3
Guardian	10	4.1
Family's Monthly Income (ETB)		
< 5000	155	64.3
5000-10,000	65	27.0
10,000-15,000	9	3.7
> 15,000	12	5.0
Residence		
Urban	227	94.2
Rural	14	5.8
Parental Education		
No formal education	22	9.1
Primary	76	31.5

Secondary	95	39.4
Higher education	48	19.9
Family's Income Source		
Business/Private Sector	157	65.1
Government Employee	44	18.3
Remittance	26	10.8
Farmer	13	5.4
Church Service	1	0.4
Family's Financial Situation		
Very difficult	65	27.0
Somewhat difficult	96	39.8
Average	74	30.7
Comfortable	6	2.5

Clinical Characteristics of Children With Epilepsy

The majority of children were diagnosed with epilepsy between the ages of 1 and 5 years (54.4%). The duration of illness was most commonly between 1 and 5 years (48.1%). The most frequent seizure occurrence was "rarely" (32.8%), followed by "daily" (22.4%) and "weekly" (21.6%). Seizure duration was most often between 1 and 5 minutes (45.6%). A family history of epilepsy or other neurological disorders was present in 12.4% of the children. Complications during pregnancy or birth were reported in 10.0% of cases. Over half of the respondents live 1-5 km from the nearest health facility. Almost all children (99.2%) were receiving treatment for epilepsy, with antiseizure medications (ASMs) being the predominant treatment modality (94.6%). The most common number of ASMs taken was either one (42.3%) or two (44.8%). Generalized epilepsy was the most frequent type of epilepsy (59.8%), and generalized onset seizures were the most common seizure type (63.5%). In the majority of cases, the cause of

epilepsy was unknown (73.9%). Fever-related triggers were the most commonly reported seizure triggers (60.2%).

Table 2: Clinical Characteristics of Children with Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variable	*Frequency (n)*	*Percentage (%)*
Age at Epilepsy Diagnosis		
1 month - 1 year	79	32.8
1-5 years	131	54.4
6-10 years	25	10.4
11-18 years	6	2.5
Duration of Illness		
< 1 year	8	3.3
1-5 years	116	48.1
6-10 years	82	34.0
11-18 years	35	14.5
Seizure Frequency		
Daily	54	22.4
Weekly	52	21.6
Monthly	24	10.0
Every 1-3 months	22	9.1
Every 3-6 months	10	4.1
Rarely	79	32.8
Seizure Duration		
< 1 minute	78	32.4
1-5 minutes	110	45.6
> 5 minutes	53	22.0
Family History of Epilepsy/Neurological Disorders		
No	211	87.6
Yes	30	12.4

Pregnancy/Birth Complications		
No	217	90.0
Yes	24	10.0
Distance to Nearest Health Facility		
< 1 km	20	8.3
1-5 km	138	57.3
> 5 km	77	32.0
No nearby facility	6	2.5
Current Treatment for Epilepsy		
No	2	0.8
Yes	239	99.2
Type of Treatment (Multiple Responses)		
Antiseizure medications (ASMs)	228	94.6
ASMs, Behavioral therapies	2	0.8
ASMs, L-thyroxine	1	0.4
ASMs, Physiotherapy	6	2.5
Herbal remedies	1	0.4
Number of ASMs Taken		
1 ASM	102	42.3
2 ASMs	108	44.8
3 ASMs	25	10.4
> 3 ASMs	3	1.2
Seizure Onset		
Generalized onset	153	63.5
Focal onset	50	20.7
Unknown onset	38	15.8
Cause of Epilepsy		
Unknown Causes	178	73.9
Structural Causes	38	15.8
Infectious Causes	14	5.8
Genetic Causes	7	2.9
Metabolic Causes	4	1.7

Seizure Triggers		
Fever-related triggers	145	60.2
Stress-related triggers	51	21.2
Sleep-related triggers	26	10.8
Environmental triggers	7	2.9
Other triggers	12	5.0

6.2 Type of epilepsy

The most common type of epilepsy diagnosed among the study participants was generalized epilepsy, accounting for 59.8% of the cases (n=144). Focal epilepsy was the second most prevalent type, observed in 20.3% of the participants (n=49). Combined generalized and focal epilepsy represented 6.2% of the cases (n=15), while unknown or other epilepsy types constituted 6.6% (n=16). Epilepsy syndromes were diagnosed in 7.1% of the participants (n=17).

Table 3: Distribution of Epilepsy Types Among Children at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Epilepsy Type	*Frequency*	*Percentage (%)*
Focal Epilepsy	50	18.7%
Generalized Epilepsy	145	54.8%
Combined Generalized and Focal Epilepsy	4	1.5%
Unknown	17	6.4%
Epilepsy Syndromes	22	8.4%

6.3 Prevalence of Epilepsy Based on Age of Diagnosis

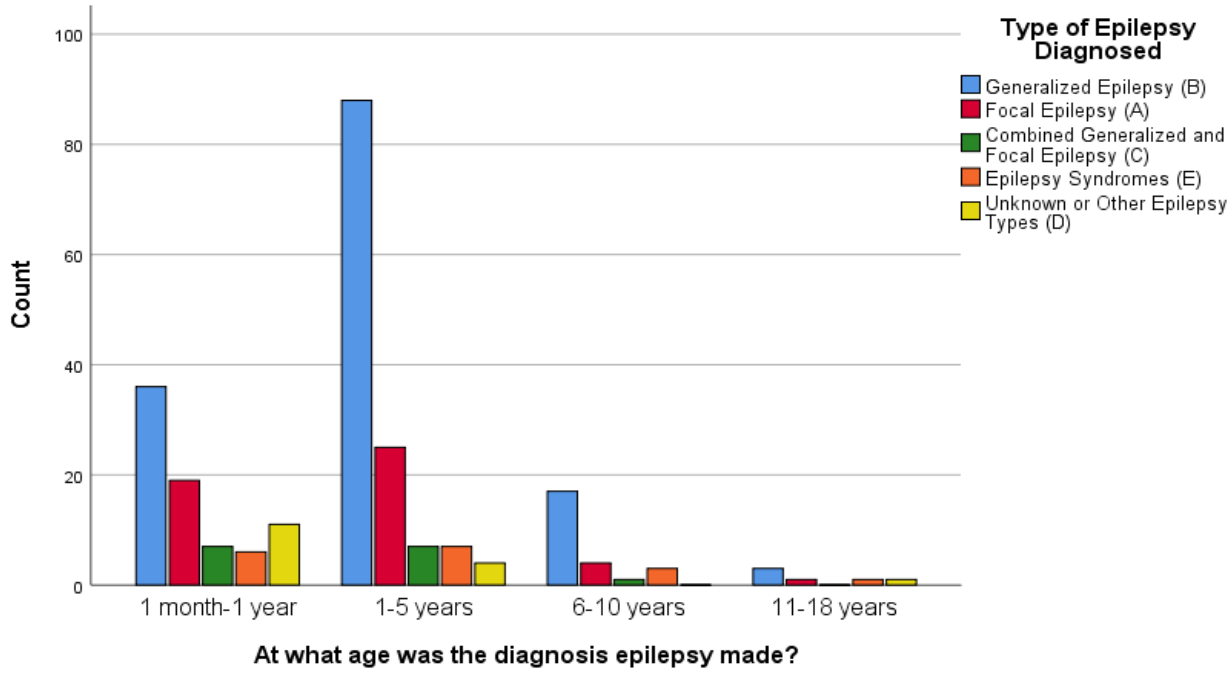

Fig 3: Age at diagnosis and type of Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2024(n=241)

Figure 2: Prevalence of Epilepsy Based on Age of Diagnosis Among Children at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

6.4 Comorbid Neurological Complications

Developmental Delay and Regression (36.5%): Developmental delays and regression are seen in over a third of the children. Intellectual Disabilities (19.9%): Nearly 20% of the children experience intellectual disabilities.

Neurobehavioral disorders like ADHD and ASD were seen in 5.0% and 2.9% of the cases, respectively.

Movement Abnormalities like dystonia and ataxia were seen in 2.9% of the cases.

Other Neurological Issues (18.7%): This category includes diverse issues such as microcephaly, hydrocephalus, and MELAS, affecting a notable portion of the cohort seen in 2.9% of the cases

Table 4: Comorbid Neurological Complications Among Children with Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Category		*Frequency*	*Percentage*
Developmental Delay and Regression		88	36.5%
Neurobehavioral disorders	*ADHD*	12	5.0%
	ADD	7	2.9
Intellectual disabilities		48	19.9%
Movement Abnormalities		7	2.9%
Others		45	18.7%

6.5 Crosstabulations between various factors and the type of epilepsy (Generalized vs Focal)

Neurological Complications and Type of Epilepsy: Neurological complications were present in 40.5% of children with focal epilepsy, whereas 71.6% of children with generalized epilepsy experienced these complications.

Family History of Epilepsy and Type of Epilepsy: The majority of children with both focal (93.7%) and generalized (84.6%) epilepsy had no known family history of epilepsy.

Birth Complications and Type of Epilepsy: Birth complications were reported in 16.7% of children with generalized epilepsy, in contrast to only 3.8% of children with focal epilepsy. Birth-related events such as perinatal asphyxia, prematurity, or other complications could have contributed to the development of generalized seizures, which are often more diffuse in origin.

Epilepsy Causes and Types of Epilepsy: A predominant number of both focal and generalized epilepsy cases had unknown causes (73.4% and 64.8%, respectively). This high percentage of

unknown causes highlights a gap in understanding the underlying etiology of childhood epilepsy in the study population. It may also point to the complex, multifactorial nature of epilepsy, where no single cause can be definitively identified.

When analyzing known causes, infectious causes were more frequently seen in children with generalized epilepsy (14.8%) than in those with focal epilepsy (2.5%).

Structural causes were observed in 20.3% of children with focal epilepsy, a higher proportion compared to the 15.4% seen in children with generalized epilepsy.

Table 5: Comparison of Clinical Factors Between Focal and Generalized Epilepsy in Children at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variable	*Type of Epilepsy (Focal)*	*Type of Epilepsy (Generalized)*
Neurological Complications		
No	47 (59.5%)	46 (28.4%)
Yes	32 (40.5%)	116 (71.6%)
Family History of Epilepsy		
No	74 (93.7%)	137 (84.6%)
Yes	5 (6.3%)	25 (15.4%)
Birth Complications		
No	76 (96.2%)	135 (83.3%)
Yes	3 (3.8%)	27 (16.7%)
Epilepsy Cause		
Genetic Causes	2 (2.5%)	5 (3.1%)

Metabolic Causes	1 (1.3%)	3 (1.9%)
Infectious Causes	2 (2.5%)	24 (14.8%)
Structural Causes	16 (20.3%)	25 (15.4%)
Unknown Causes	58 (73.4%)	105 (64.8%)

6.6 Determinants of childhood epilepsy

Children with neurological complications were approximately 3.77 times more likely to develop generalized epilepsy compared to those without neurological complications (AOR = 3.770, 95% CI: 2.057-6.908, p<0.001). Children with a family history of epilepsy were 3.67 times more likely to develop generalized epilepsy compared to those without a family history (AOR = 3.674, 95% 95% CI: 1.260-10.716, p=0.017). Similarly, children who experienced birth complications had 4.76 times the odds of having generalized epilepsy compared to those without birth complications (AOR = 4.756, 95% CI: 1.330-17.011, p=0.016). Among the different causes of epilepsy, infectious causes were significantly associated with increased odds of generalized childhood epilepsy (AOR = 4.869, 95% CI: 1.060-22.359, p=0.042) compared to unknown causes.

Table 6: Bi-variable and multivariable Logistic Regression Analysis of Factors Associated with Childhood Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

	Type of Epilepsy				
Variable	Focal n (%)	Generalized n (%)	COR (95% CI)	AOR (95% CI)	P-value
Neurological Complications					
No	47 (59.5%)	46 (28.4%)		1	
Yes	32 (40.5%)	116 (71.6%)	3.704(2.107-6.512)	3.770(2.057-6.908)	<0.001
Family History of Epilepsy					
No	74 (93.7%)	137 (84.6%)	1	1	
Yes	5 (6.3%)	25 (15.4%)	2.701(.993-7.348)	3.674(1.260-10.716)	0.017
Birth Complications					
No	76 (96.2%)	135 (83.3%)	1	1	
Yes	3 (3.8%)	27 (16.7%)	5.067(1.488-17.256)	4.756(1.33017.011)	0.016
Epilepsy Cause					
Genetic Causes	2 (2.5%)	5 (3.1%)	1.381(.260-7.342)	0.869(0.139-5.420)	0.881
Metabolic Causes	1 (1.3%)	3 (1.9%)	1.657(.169-16.295)	1.164(0.115-11.725)	0.898
Infectious Causes	2 (2.5%)	24 (14.8%)	6.629(1.512-29.052)	4.869(1.060-22.359)	0.042
Structural Causes	16 (20.3%)	25 (15.4%)	.863(.427-1.746)	0.822(0.385-1.752)	0.611
Unknown Causes	58 (73.4%)	105 (64.8%)	1	1	

AOR = Adjusted Odds Ratio, CI = Confidence Interval

Table 6: Multivariable Logistic Regression Analysis of Factors Associated with Childhood Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variable	***AOR***	***95% CI***	***p-value***
Neurological complications	3.770	2.057-6.908	<0.001
Family history of epilepsy	3.674	1.260-10.716	0.017
Birth complications	4.756	1.330-17.011	0.016
Epilepsy cause			0.317
- *Genetic causes*	0.869	0.139-5.420	0.881
- *Metabolic causes*	1.164	0.115-11.725	0.898
- *Infectious causes*	4.869	1.060-22.359	0.042
- *Structural causes*	0.822	0.385-1.752	0.611

AOR = Adjusted Odds Ratio, CI = Confidence Interval

7. Discussion

The findings of this study revealed that generalized epilepsy was the predominant type (59.8%), followed by focal epilepsy (20.3%), epilepsy syndromes (7.1%), and combined generalized and focal epilepsy (6.1%).

When compared to studies from other regions, variations in epilepsy patterns become evident, likely reflecting differences in underlying causes, diagnostic approaches, and healthcare systems. For

instance, in South Africa, focal epilepsy was more common (48%), with epilepsy syndromes accounting for 25% of cases [35]. Similarly, in Tanzania, focal motor seizures with secondary generalization were predominant (65.2%), while generalized convulsive seizures made up 16.9%[(37]. These findings contrast with data from Saudi Arabia, where generalized epilepsy was reported in 37% of cases and focal seizures in 22% [36], a distribution somewhat closer to our study's findings. The higher prevalence of focal epilepsy in sub-Saharan Africa (e.g., South Africa and Tanzania) may be linked to higher rates of infections (such as neurocysticercosis), perinatal complications, and traumatic brain injuries, which are known risk factors for structural epilepsy. In contrast, the predominance of generalized epilepsy in our study and Saudi Arabia could reflect genetic or idiopathic forms of epilepsy, possibly due to differing population genetics. Additionally, diagnostic practices and access to neuroimaging may influence these patterns, as focal epilepsies often require advanced diagnostics for accurate classification.

Understanding these regional disparities is crucial for tailoring public health interventions, improving diagnostic accuracy, and optimizing treatment strategies. Future research should explore the specific etiological factors contributing to these variations, ensuring that epilepsy management is adapted to the unique needs of different populations.

Our study also identified several significant risk factors for generalized epilepsy, including comorbid neurological complications (AOR = 3.770, 95% CI: 2.057-6.908, $p < 0.001$), family history of epilepsy(AOR = 3.674, 95% CI: 1.260-10.716, $p = 0.017$), perinatal complications(AOR = 4.756, 95% CI: 1.330-17.011, $p = 0.016$), and infectious causes such as meningitis or encephalitis, had significantly higher odds of developing generalized epilepsy (AOR = 4.869, 95% CI: 1.060-22.359, $p = 0.042$). These findings highlight that, in our setting, epilepsy is often linked to preventable or modifiable factors, particularly those related to early-life brain injuries and infections. The strong association with neurological comorbidities suggests that individuals with pre-existing neurological

conditions may require closer monitoring for seizure development, emphasizing the need for integrated healthcare approaches.

When comparing these findings to other regions, a striking pattern emerges. In South Africa, infectious causes and perinatal insults accounted for 33% of epilepsy cases, reinforcing the role of preventable risk factors in resource-limited settings [35]. Similarly, in Tanzania, perinatal complications (OR = 14.9) and family history of seizures (OR = 5.7) were strongly linked to epilepsy [37], further supporting the idea that adverse birth outcomes and genetic predisposition play a significant role in specific populations. In contrast, studies from Saudi Arabia reported a different risk factor profile, with genetic causes (28.7%) and structural brain abnormalities (27.3%) being more prominent [36]. This suggests that in settings with stronger healthcare infrastructure and lower burdens of infectious diseases, inherited and structural factors may dominate epilepsy aetiology.

These disparities underscore a critical global divide in epilepsy risk factors: In low-resource regions, preventable causes like infections and birth-related injuries drive the epilepsy burden, whereas in higher-resource settings, genetic and structural factors take precedence. This has profound implications for public health strategies. while some populations may benefit from improved maternal care, infection control, and neonatal interventions, others may require genetic counselling and advanced neurodiagnostic. Addressing these differences is essential to reduce the global burden of epilepsy in an equitable and context-specific manner. By prioritizing preventable causes in vulnerable regions, we can work toward a future where fewer lives are impacted by avoidable forms of epilepsy.

The multivariable analysis also explored various causes of epilepsy, including genetic, metabolic, infectious, and structural causes. Interestingly, while metabolic and genetic causes were not significantly associated with generalized epilepsy in this cohort ($p = 0.881$ and $p = 0.898$,

respectively), infectious causes (AOR = 4.869, p = 0.042) were a significant predictor. This suggests that in the studied population, infectious causes may be a more common and impactful trigger for generalized epilepsy compared to other etiologies. It is worth noting that structural causes did not reach statistical significance (AOR = 0.822, p = 0.611), which may be due to the smaller sample size or the distribution of structural causes in the study group.

This finding prompts further investigation into the prevalence and impact of various epilepsy etiologies in the Ethiopian context. Understanding the local epidemiology of epilepsy causes can inform targeted prevention and treatment strategies. Additionally, as the field of epilepsy research evolves, the exploration of emerging causes, such as environmental factors and their interaction with genetic predispositions, may provide a more comprehensive understanding of epilepsy's multifaceted nature.

8. Conclusion

This study has provided valuable insights into the patterns and determinants of childhood epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

The study identified several important risk factors for generalized epilepsy, including neurological complications, family history, birth complications, and infectious causes. These findings emphasize the need for early and comprehensive intervention to prevent or mitigate the development of generalized epilepsy, particularly in children who exhibit neurological abnormalities or have a family history of epilepsy.

The multivariable logistic regression analysis further underscores the significance of neurological complications, family history, and infectious causes as determinants for generalized epilepsy. Variations in epilepsy types across countries highlight how healthcare access, diagnostic limitations, and environmental risks influence who develops seizures and why. These results not only provide critical insights into the epidemiology of childhood epilepsy in Ethiopia but also underscore the urgent need for targeted public health initiatives. These initiatives should focus on improving healthcare infrastructure, raising awareness about epilepsy risk factors, and promoting early diagnosis and management, particularly in resource-limited settings.

9. Recommendations

Improve healthcare access and prioritize preventable causes in resource-limited settings: Policies should be implemented to enhance access to healthcare facilities, especially in rural areas, strengthening maternal and child healthcare to reduce birth injuries through better prenatal monitoring and skilled delivery assistance, preventing infections by expanding vaccination coverage.

Enhancing diagnostic capacity: Increasing access to EEG and neuroimaging in underserved areas to distinguish between the various types of epilepsy, ensuring correct treatment.

Comprehensive and Multidisciplinary Care: Comprehensive approach to epilepsy treatment, incorporating not only antiseizure medications but also adjunct therapies such as behavioural therapy, physiotherapy, and psychological support. Training healthcare professionals to work in multidisciplinary teams will help improve the holistic care provided to children with epilepsy.

Genetic Counselling and Education: Given the significant role of family history in the development of generalized epilepsy, the integration of genetic counselling services should be encouraged

Further Research: Ongoing research into the causes and triggers of childhood epilepsy in Ethiopia is needed to identify region-specific factors contributing to the high burden of epilepsy. Future studies should focus on understanding the role of genetic, environmental, and socio-cultural factors in

epilepsy's pathogenesis, as well as the development of local guidelines for managing childhood epilepsy effectively.

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11. Annexes

11.1 Consent form

A. Information Sheet

Title of the Research: Clinical Profiles and Determinants of Childhood Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia: from August 2024 -February 2025.

Name of the Investigator: Dr. Mekonnen Asmare

Objective of the study: To assess the clinical profiles and determinants of childhood epilepsy at TASH.

Selection criteria: Your child has been selected among patients with epilepsy who are being followed up at the Pediatric Neurology clinic at TASH, Addis Ababa**,** Ethiopia. If you decide to participate in the study, you will be asked questions based on the attached checklist

Possible harm - There is no risk that your child will be exposed by participating in this study. It will take about 20 minutes of your time for the Interview.

Confidentiality- Your name and Personal identification will not be asked or included in the interview or study. Any part of the data collected in this study is confidential and will not be used for purposes other than this study. All information will be coded, and data collection tools will be locked and will not be accessed by any individual.

Autonomy- You have the right to decide to participate or not participate in this study. You can also withdraw from participating at any point in the study. Deciding not to participate in the study or withdrawing does not affect your child's treatment.

Funding of the research- The research grant will be from Addis Ababa University, College of Health Sciences postgraduate office. The research proposal will be reviewed by the Research and Ethics Committee of the Department of Pediatrics and Child Health.

If you have questions, complaints, or concerns about this study, you can contact the principal investigator, Dr Mekonnen Asmare

Phone number: +251932790609

Email: mekonnenasmare1@gmail.com

B. Informed written consent form

We kindly ask you to participate in this study by answering the questions listed in the check list, letting as review your medical chart and laboratory results.

All the information you give is confidential and you have the right to not participate or withdraw from the study at any point. We are delighted to answer any of your questions.

I have read (was read to me) and clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, and the right of participating and withdraw from the study at any time.

I hereby confirm the above statement with my signature (Signature of interviewer certifying that respondent has given informed consent verbally)

Participant: Signature: _____

Data collector: Name _____ Signature: _____

11.2 Data Collecting Questionnaire

Addis Ababa University College of Health Sciences, School of Medicine Department of Pediatrics and Child Health

Study title: Clinical Profiles and Determinants of Childhood Epilepsy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia: A Cross-Sectional Study from August 2024 - February 2025.

Data collection date: _____ Name of Data collector _____
Signature_____ Serial No _____ Card No_____

Section 1: Socio-Demographic Information

1. Age of the child
    a. 29 days -1 year
    b. 2-5 years
    c. 6-10 years
    d. 11-18 years
2. Sex of the child
    a. Male
    b. Female
3. Child education level
    a. Not started yet
    b. Kindergarten
    c. Primary
    d. Secondary
4. Who is the care taker of the child?
    a. Mother
    b. Father
    c. Both

d. Other (specify):_____

5. Average monthly income of the family (ETB)
    a. < 5000
    b. 5000-10,000
    c. 10,000- 15,000
    d. > 15,000
6. Residence
    a. Urban
    b. Rural
7. Parental educational status
    a. No formal education
    b. Primary education
    c. Secondary education
    d. Higher education

Section 2: Childhood Epilepsy characteristics

1. What type of seizure does the child have?
    a. Focal
    b. Generalized(1)
    c. Uknown onset
    d. Unclassified
2. If focal, which type?
        a. Focal aware
        b. With impaired awareness
3. How do you describe the seizure (select all that apply)
        a. Tonic

b. Clonic

c. Tonic- clonic

d. Absence seizures

e. Myoclonic seizures

f. Atonic seizures

g. Infantile spasm

h. Other (please specify): _____

4. Type of epilepsy diagnosed (if known)

a. Generalized epilepsy

b. Focal epilepsy

c. Combined generalized and focal epilepsy

d. Epilepsy syndrome(specify):_____

e. Unknown

5. What caused the epilepsy (if known)?

a. Structural

b. Genetic

c. Infectious

d. Metabolic

e. Immune

f. Uknown

6. At what age was the diagnosis epilepsy made?

a. 1 month -1 year

b. 2-5 years

c. 6-10 years

d. 11-18 years

7. How long is the duration of illness?
    a. < 1 year
    b. 1- 5 years
    c. 6- 10 years
    d. 11-18 years
8. How often do the seizures occur most frequently?
    a. Daily
    b. Weekly
    c. Monthly
    d. Every 1-3 months
    e. Every 3-6 months
    f. Rarely
9. What is the average duration of the seizures most frequently ?
    a. Less than 1 minute
    b. 1-5 minutes
    c. More than 5 minutes
10. Are there known triggers for the child's seizures? (Select all that apply)
    a. Stress
    b. Lack of sleep
    c. Flashing lights or patterns
    d. Fever
    e. Drug discontinuation
    f. Other (please specify): _____

Section 3: Determinant Factors

1. What is the primary source of family income?
    a. Farmer
    b. Government employee
    c. Business/Private sector
    d. Remittances
    e. Other (please specify): _____
2. How would you describe your family's financial situation?
    a. Very difficult (often struggle to meet basic needs such as food, housing, and healthcare.)
    b. Somewhat difficult (be able to cover essential expenses but face difficulties with unexpected costs or saving for the future.)
    c. Average (can generally meet their daily needs and manage occasional extra expenses without significant stress)
    d. Comfortable (can easily cover their needs and wants, save for the future, and handle unexpected expenses without financial strain.)
3. Is there a history of epilepsy or other neurological disorders in any first-degree relatives?
    a. Yes
    b. No
4. Has the child experienced any complications related to pregnancy or birth?
    a. Yes
    b. No
    c. If yes, please specify: _____
5. How far is the nearest hospital or health facility from your home?
    a. Less than 1 km

b. 1-5 km

c. More than 5 km

d. No health facility nearby

6. Have cultural beliefs influenced your views or actions regarding epilepsy?

   a. Yes

   b. No

   c. If es, please describe: _____

7. Do you believe that epilepsy is a disorder that can be treated effectively?

   a. Yes

   b. No

   c. Not sure

Section 4: Treatment and Management

1. Is the child currently receiving any treatment for epilepsy?

   a. Yes

   b. No

2. If yes, what type of treatment is being used? (Select all that apply)

   a. Antiseizure medications (ASMs)

   b. Herbal remedies

   c. Behavioral therapies

   d. Other (please specify): _____

3. If on ASMs, how many medications does the child take?

   a. 1 ASM

   b. 2 ASMs

   c. >=3 ASMs

4. How often does the child visit the hospital or clinic for treatment?
    a. Monthly
    b. Every 3 months
    c. Every 6 months
5. Any other comorbid neurological complications?
    a. Yes
    b. No
6. If yes, please specify:_____