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Quality of care and associated factors among patients with epilepsy at public hospitals in Arba Minch Town: a facility-based cross-sectional study

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Abstract

Background Epilepsy is one of the most common neurologic disorders affecting approximately 51 million people globally and is associated with significant cases of age-standardized DALYs (182.6 per 100 000 people). The quality of health care services offered to people suffering from epilepsy often fails to meet standards in Ethiopia or internationally. This study was designed to assess the quality of care and associated factors among patients with epilepsy at public hospitals in Arba Minch Town, 2024.

Method A facility-based cross-sectional study was conducted among 392 adult epileptic patients attending public hospitals in Arba Minch Town. Data entry was performed via Epi-data 3.1 software, and the data were analyzed via SPSS version 24 software. Binary logistic regression analysis was used to evaluate the associations between quality of care and sociodemographic, disease-related, and treatment-related factors. Multivariate logistic regression analysis was applied to identify factors independently associated with quality of care.

Results Three hundred ninety-two adults with epilepsy participated in this study, for a response rate of 92.7%. More than one-half of the 237 (60.5%) patients were males, with a median age of 31 ± 12 years (interquartile range). Fewer than one-half (44.1%) of the patients adhered to antiepileptic medicines. The overall proportion of patients receiving quality care was 213 (54.3%). The seizure control rate was also low, at 130 (33.2%). Patients aged 18–29 years [AOR = 30.8 (95% CI, 8.22–35.616, $p < 0.000$)] and aged 30–39 years [AOR = 18.4 (95% CI, 5.016–67.613, $p < 0.000$)], and a seizure frequency of less than three [AOR = 2.318 (95% CI, 1.028–5.225, $p < 0.043$)] were positively associated with quality of care. Whereas, having poor knowledge about epilepsy [AOR = 0.107 (95% CI, 0.0.057–0.202, $p < 0.000$)] was negatively associated with quality care.

Conclusion The quality of care provided to adult epilepsy patients at Arba Minch was low. In addition, patient knowledge, medication adherence, and the seizure control rate were also suboptimal. Therefore, addressing identified factors by involving all relevant stakeholders (health professionals, hospitals, zonal health departments, regional

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health bureaus, and patients) is critical for improving the quality of care. In addition, researchers willing to study this topic should use strong designs that can determine causal determinants of quality care.

Keywords Epilepsy, Epilepsy treatment, Quality of care, Epilepsy management, Arc Minch Town

Background

The quality of healthcare is the application of medical science and technology in a manner that maximizes its benefit to health without correspondingly increasing risk [1, 2]. Institute of medicine defines quality care as safe, effective, patient-centered, timely, efficient, and equitable care. From the context of epilepsy, quality epilepsy care can be defined as early detection and identification of types of seizures, and any associated conditions, providing evidence-based treatment for seizure control and consulting specialist in case of uncontrolled seizures and engaging the patient during diagnosis, treatment and follow-up [3]. It can also be defined as consistently discerning the patient by providing efficacious, effective, and efficient healthcare services according to the latest clinical guidelines and standards, which meet the patient's needs and satisfy providers [4].

Epilepsy is a disease of the brain characterized by at least two unprovoked (or reflex) seizures occurring > 24 h apart; one unprovoked (or reflex) seizure and a probability of further seizure recurrence (at least 60%) occurring over the next 10 years; and a diagnosis of epilepsy syndrome [5]. An epileptic seizure can also be classified as unilateral (retained consciousness or impaired consciousness), bilateral (motor with all motor components or nonmotor with all of its components), or unilateral to bilateral (motor or nonmotor) [6].

Epilepsy is one of the most common neurologic disorders affecting approximately 51 million people globally and is associated with a significant number of age-standardized DALYs (182.6 per 100 000 people) [7]. A strategy for performance measurement and quality improvement in epilepsy care should involve people with epilepsy and their families, relevant professionals, researchers, health and human services professionals, and experts in terms of performance metrics and healthcare quality improvement [8]. The World Health Assembly also recommended coordinated action against epilepsy and its consequences [9].

Ongoing efforts are made to improve the lives of people with epilepsy and their families through sustained and coordinated care, ranging from increasing the understanding of the biomedical mechanisms of the disorder to enhancing clinical treatment and community services [10, 11]. People with epilepsy have relatively high rates of psychiatric comorbidities and may experience adverse psychosocial outcomes. Compared with people who do not have seizures, those who do have seizures have an approximately threefold increase in mortality [12].

Despite the importance of accessing timely coordinated care and early and accurate diagnosis, studies have indicated many gaps and unmet needs in the care and treatment of people with epilepsy (PWE) [13]. The treatment gap (the proportion of people with active epilepsy who are not receiving appropriate therapy). This is a significant issue in low- and middle-income countries, such as Ethiopia, where lack of healthcare resources compounds the problem and requires urgent action [14].

The quality of health care services offered to people suffering from epilepsy often fails to meet standards in Ethiopia or internationally. Studies have indicated that health professionals do not comprehensively address essential elements of care with PWE. A recent systematic review of unmet needs identified challenges that PWE experience in the availability, accessibility, and acceptability of services. Regarding availability, a lack of specialist services, long waiting times, and insufficient consultation time were reported [15]. In response, the American Academy of Neurology (AAN) identified eight performance metrics that could be used for quality improvement. The eight metrics include documentation in the medical records of "seizure type and current seizure frequency"; documentation of the etiology of epilepsy or epilepsy syndrome; EEG or computed tomography scan results reviewed, requested, or test ordered; querying and counseling about side effects of [seizure medication]; surgical therapy referral consideration for [refractory] epilepsy; counseling about epilepsy-specific safety issues; counseling for women of childbearing potential with epilepsy; and comorbidity management [16] (Fig. 1).

Despite efforts made to improve the quality of epilepsy care through different strategies including physician performance metrics [17], the gap in epilepsy care is still an important issue contributing to morbidity and mortality in low and middle-income countries like Ethiopia [7, 18]. This calls for efforts to ensure affordable access to quality care for patients with epilepsy [19], and identifying country-specific efficient methods to improve the quality of care [20].

An evidence-based recommendations and performance metrics are provided to improve the quality of epilepsy care [21]. However, very little is known about epilepsy in Ethiopia, and evidence concerning the quality of care provided to patients with epilepsy is lacking. This study determined the quality of care provided to patients with epilepsy and the determinants of good-quality care at public hospitals in Arba Minch Town. The findings of this study could provide relevant information to government

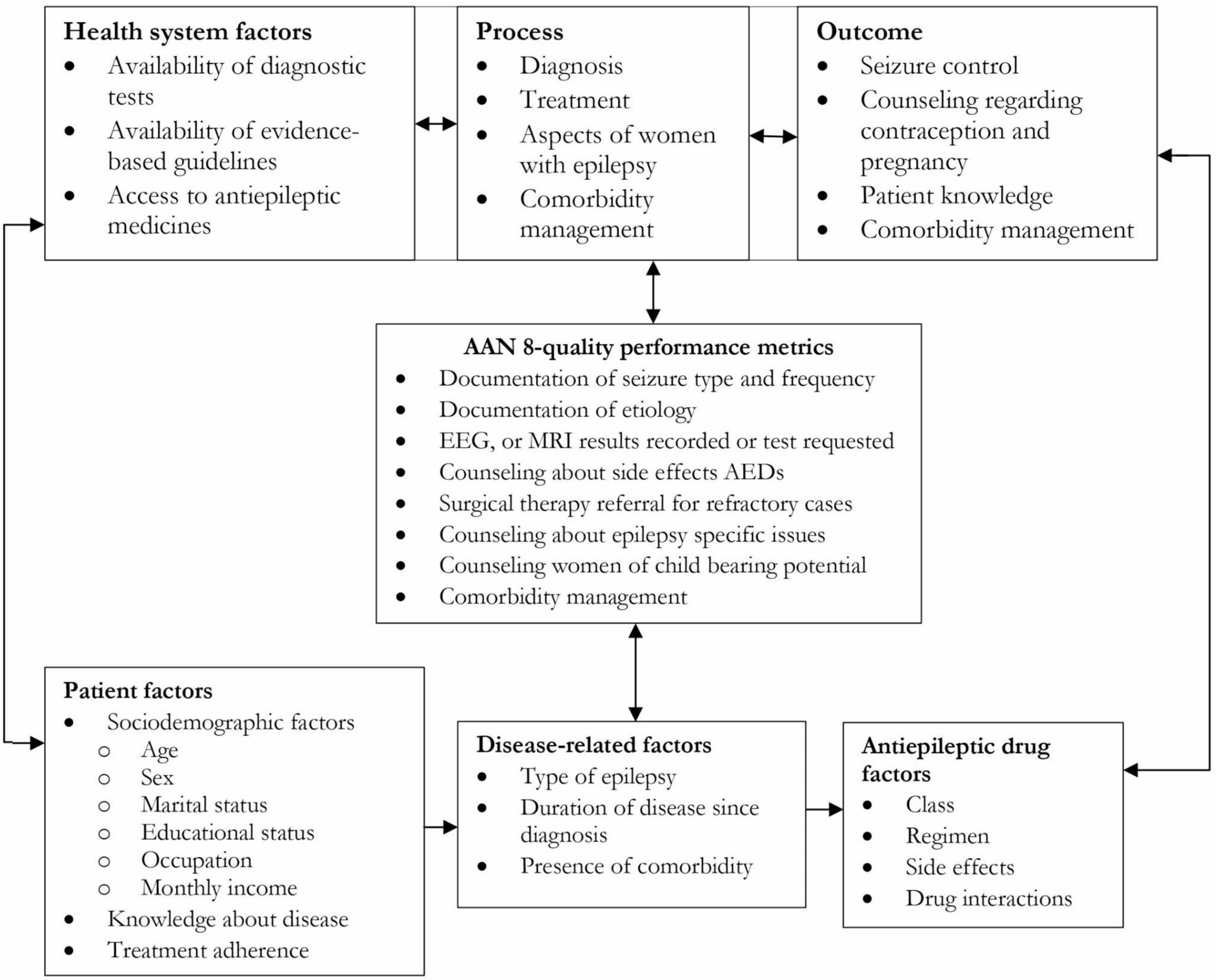

Fig. 1 Conceptual framework indicating quality of care-associated factors on the basis of evidence-based guidelines and eight metrics and contributing factors adapted from a review of the literature. AAN = American Academy of Neurology; AEDs = Antiepileptic Drugs

offices and stakeholders for future planning and interventions to promote and maintain appropriate knowledge and quality care for patients with epilepsy in Arba Minch Town.

Methods and materials

Study area and period

The study was conducted in two hospitals in Arba Minch Town, Ethiopia. The southern Ethiopian region is one of the largest regions in Ethiopia, accounting for more than 10% of the country's land area and an estimated population of 20,768,000 (May 2018), almost one-fifth of the country's population. In 2008, less than one-tenth of its population (8.9%) lived in urban areas in the region. The southern Ethiopian region has twelve administrative zones. Wolaita Sodo is the region's political and administrative center. Six regional bureaus were established in Wolaita Sodo, Dilla, Arba Minch, Sawla, Karati, and Jinka [22]. One general hospital and one district hospital with experience in providing epilepsy care were included. The selected public hospitals included Arba Minch General Hospital and Dile Fana Primary Hospital. The study was conducted from October 1, 2023, to November 30, 2023.

Study design

A facility-based cross-sectional study was conducted among adult epileptic patients at public hospitals in Arba Minch Town.

Population

Source populations

The source populations for this study were all adult epileptic patients who were followed up at public hospitals in Arba Minch Town and whose follow-up records were available.

Study populations

The study population included epileptic patients who were followed up at public hospitals in Arba Minch Town and whose follow-up records in two public hospitals fulfilled the inclusion criteria.

Eligibility criteria

Inclusion criteria

All adults (18 years and older) with epilepsy had at least 4 months of follow-up visits before data collection (to ensure adequate time for adherence) and received care during the study period from the selected hospitals and their respective follow-up records.

Exclusion criteria

Patients who were unwilling to participate, patients who had less than 4 months of follow-up, patients with incomplete patient records (those without diagnostic imaging records and refill medications, laboratory requests, and results), and those who were illegible were excluded. Finally, patients with provoked seizures (metabolic disturbances, drug intoxication, withdrawal, stroke, intracerebral hemorrhage, trauma, or malignancy) were also excluded from the study. This is because the management of provoked seizures is different from unproved seizures. For example, seizures in patients with newly diagnosed brain tumors do not respond to anticonvulsant medications. Prevention of seizures from alcohol withdrawal syndrome requires thiamine and anticonvulsant medications (diazepam or lorazepam). Similarly, a seizure in renal failure is provoked by metabolic disturbances or drugs that require correction of the triggering factors. In addition to this, for patients with tuberculosis meningitis long-term antiepileptic drug treatment is not needed.

Study variables

Dependent variables

- Quality of care.

Independent variables

Patient-related variables included sociodemographic characteristics, treatment adherence, and knowledge. *Disease-related variables* included duration of epilepsy, type of epilepsy, cases of epilepsy, and presence of comorbidities. *Drug-related variables* (type of antiepileptic medication, regimen, dose, and medications for commodities). ***Health system-related variables***(availability of diagnostic tests, availability of evidence-based guidelines, and access to antiepileptic medicines) were also included.

Sample size and sampling technique

Sample size determination

The sample size was determined by using a single population proportion formula and taking the level of quality of care provided as 50%, since there are no studies on the quality of care for patients with epilepsy in Ethiopia, and the Z value was 1.96, with a 95% confidence interval. We calculated the sample size by using 50% quality of care provided to epileptic patients to obtain the maximum sample size. After a 5% nonresponse rate was reached, 403 adults with epilepsy who were receiving follow-up care were included

$$
\begin{aligned}
n = \frac{(Z\alpha/2)^2 P\,(1-P)}{d^2} &= 384 \\
= 384 + (384 * 10\%) &= 423
\end{aligned}
$$

Where: n = is the sample size.

- $\mathbf{Z}^{2}$= standard normal deviation, set at 1.96, corresponds to the 95% confidence interval.
- **d** = is the desired level of precision/margin of error (0.05).
- **p**= Estimated level of quality of care (p=50%), and q is 1-p.

The sample size for the second objective was determined by using the proportion of factors affecting the quality of care, taking the prevalence of patient knowledge about epilepsy from a study conducted at Jimma University Specialized Hospital as 25.5% and 60% of the respondents knew the cause and treatment of epilepsy, respectively [23]. Using a 60% proportion, the estimated sample size was 368, and treatment adherence was 32% according to a study conducted at Yigalem General Hospital [24]. Similarly, when a 32% proportion was used, the estimated sample size was 335. Therefore, the sample size based on the first objective [43] was selected for this study.

Sampling techniques

Two hundred fourteen and 178 adult epilepsy patients from Arba Minch General Hospital and Dil Fana Hospital, respectively included. Consecutive sampling was employed, where every eligible patient presenting during the study period was recruited.

Data collection tools and procedures

The data collection tools used were developed through a rigorous review of the scientific evidence and evidence-based clinical guidelines for epilepsy management. Concerning measuring performance and improving quality in epilepsy care, the American Academy of Neurology (AAN) identified eight performance metrics [16, 25]. Based on these eight metrics and the QUIET (QUality

Indicators in Epilepsy Treatment), we developed a tool containing 22 questions. The contextualized tool contains information on epilepsy diagnosis, treatment and follow-up, and aspects of care for women with epilepsy and managing comorbidities. We adapted the Donabedian model for quality care from another study [26]. We assessed the quality of care from the structure-process and outcome perspectives for each domain. The overall quality is reported as good if all the domains are rated as quality otherwise poor [27]. Patient knowledge was assessed via questionnaires designed for this purpose. Patients who answered 75% or above correctly were considered to have good knowledge and were otherwise considered poor [28]. Adherence to treatment was evaluated via modified Hill-bone self-reports for measuring adherence to medication [29]. The scale has 14 items with a four-point response format: [4] all the time [3], most of the time [2], some of the time, and [1] never (Table 1). The items are assumed to be additive, and when summed, the total score ranges from 14 (minimum) to 56 (maximum). Patients who had a mean score of 28 or above on the questions were considered adherent to treatment and were otherwise considered nonadherent. We modified the bone-Hill medication compliance scale to address our disease context. The tool was originally developed for assessing medication adherence in patients with CVD. It contains questions related to salt consumption. This approach is used to address salt consumption-related blood pressure increases. In patients with epilepsy, salt consumption has no significant effect, and we replaced these questions with questions about alcohol consumption and drug use since they affect the treatment outcome of patients with epilepsy, including seizure control. Health system-related variables, mainly the availability of diagnostic tests, availability of evidence-based guidelines, and access to antiepileptic medicines, were assessed via interviews with health professionals treating epilepsy patients via a questionnaire.

Table 1 Sociodemographic characteristics of adult patients with epilepsy admitted to public hospitals in Arba Minch Town, January 2024

		Frequency	Percent
Sex	Male	237	60.5
	Female	155	39.5
Age group	18–29 years	184	46.9
	30–39 years	134	34.2
	40–49 years	27	6.9
	50 years and above	47	12.0
Religion	Orthodox	142	36.2
	Protestant	171	43.6
	Muslim	41	10.5
	Catholic	38	9.7
Ethnicity	Gamo	212	54.1
	Amhara	113	28.8
	Wolaita	35	8.9
	Konso	10	2.6
	Gurage	22	5.6
Marital status	Married	231	58.9
	Widowed	31	7.9
	Divorced	8	2.0
	Single	122	31.1
Level of education	Illiterate	199	50.8
	Primary school complete	115	29.3
	Secondary School complete	35	8.9
	College and above	43	11.0
Occupation	Merchant	246	62.8
	Unemployed	52	13.3
	Farmer	52	13.3
	Others	5	1.3
	Employed	37	9.4

Data quality control, processing, and analysis

Data quality control

The questionnaires were prepared in English, and the patient interview part of the questionnaire was translated into Amharic and translated back into English to check its consistency. The Amharic version of the patient interview questionnaire and the English version of the data abstraction form were used for data collection. The questionnaire was pretested on 30 adults with epilepsy in Chencha District Hospital to ensure that the respondents could understand the questions and to check for consistency, and possible amendments were made based on the findings. Three professional nurses (BSc.) for data collection and one senior professional working in the respective health facilities for supervision were oriented before data collection about principles to follow during data collection and the contents of the data collection format for one day by the principal investigator. The principal investigator throughout the data collection period conducted continuous follow-up and supervision. The collected data were checked daily for completeness and consistency by the principal investigator.

Data processing and analysis

Data entry was performed via Epi-data 3.1 software. After data processing, the analysis was performed via SPSS version 24.0. A summary descriptive statistic was computed for most variables, such as sociodemographic factors, disease-related factors, and treatment-related factors. A multicollinearity test was performed, and all the variables had a variance inflation factor (VIF) of less than 10. Binary logistic regression analysis was used to evaluate the associations between quality of care and sociodemographic factors, disease-related factors, and treatment-related factors. To avoid many variables and unstable estimates in the subsequent model, only variables that reached a p-value less than 0.25 in the binary analysis were used in the multivariate logistic analysis. Multiple logistic regression analysis was applied to identify predictors of quality of care. A point estimate of the odds ratio (OR) with a 95% confidence interval (CI) was determined to assess the strength of the association between the independent and dependent variables. For all the statistically significant tests, a p value<0.05 was used as the cutoff point.

Operational definition

Medication adherence was determined via modified Hill-bone self-reports for measuring adherence to medication [29]. Patients who had a mean score of 28 or above on the questions were considered adherent to treatment and were otherwise considered nonadherent.

Quality care If diagnosed, treated, or followed up, aspects of care for women with epilepsy and comorbidity management are per evidence-based guidelines (i.e., structure-process and outcome) [26, 30]; otherwise, they are considered poor.

Results

Sociodemographic characteristics

Three hundred ninety-two adults with epilepsy participated in this study, with a response rate of 92.7%. More than one-half of the 237 (60.5%) were males, and 155 (39.5%) were females, with a median age of 31 ± 12 (interquartile range) years ranging from 18 to 76 years. The majority (184, 46.9%) of patients were 18–29 years old, and 134 (34.2%) were 30–39 years old. More than one-half of patients (212, 54.1%) were of Gamo ethnicity, and 171 (43.6%) were protestant. One-half (50.8%) of the patients were illiterate, followed by 115 primary school-aged patients (29.3%). More than six out of the ten (62.8%) were merchants (Table 1).

Patient knowledge

Approximately two-thirds (67.9%) of the patients had good knowledge about epilepsy, and 126 (32.1%) had poor knowledge. The mean knowledge score of the patients was 10.25 ± 1.88, ranging from five to 14. Among the 14 questions, 374 (95.4%) address the impact of epilepsy on quality of life and academic performance. Similarly, 325 (82.9%) patients reported that epilepsy was not caused by an ancestor's sin, 278 (70.9%) said that the disease was not contagious, and 177 (45.2%) knew it was a mental illness. However, very few people have adequate knowledge of the role of allopathic and Ayurveda/traditional treatments for epilepsy. Fewer than one-third of the 114 (29.1%) patients did not know the conditions that increase seizure risk. Patients' knowledge of what to do when they see a person experiencing an epileptic attack was also low, at 177 (45.2%) (Table 2; Fig. 3).

Medication adherence

We assessed medication adherence via a bone-Hill medication compliance scale modified for our disease context. Fewer than one-half (44.1%) of the patients adhered to antiepileptic treatment, and 219 (55.9%) were nonadherent. The mean patient adherence score was 26.4 ± 5.98, ranging from 15 to 42. Among the questions, 101 (25.8%) patients did not forget their medication when they were sick, and 71 (18.1%) patients did not stock out for medicine. However, 15 (3.8%) missing appointments and 31 (7.9%) not using recreational drugs were the least common practices requiring due attention (Table 3).

Quality of epilepsy care

We evaluated the quality of care via the Quality Indicators in Epilepsy Treatment (QUIET) tool. The overall quality of care (quality of diagnosis, quality of treatment and follow-up, quality of care, and comorbidity management) was 213 (54.3%). The seizure control rate was low (130 (33.2%)), as evidenced by the documented presence of seizures after the initiation of AEDs (262 (66.8%)). Just above one-half of 215 (54.8%) of the patients had a detailed history taken during the evaluation, and 293 (74.7%) received information on driving restrictions. Concerning the eight-quality metrics of the American Academy of Neurology (AAN), 238 (85.6%) had seizure types documented, and 335 (85.4%) had seizure frequency documented. Similarly, 178 (45.4%) had an etiology of epilepsy or an epilepsy syndrome documented, and 78 (19.9%) had EEG, MRI, or CT results or tests requested. Counseling about antiepileptic drug side effects was given to 343 patients (87.5%), and surgical therapy referral for intractable epilepsy was performed for 38 patients (80.9%). In addition, 87 (58.4%) of the women were receiving counseling during their childbearing years, and 109 (76.2%) had managed their comorbidities (Table 4). The quality of care for the diagnosis of epilepsy and for women's care was lower than that for the other components of care (226 (57.6%) and 86 (58.0%), respectively). However, 308 patients were treated and followed up (78.6%), followed by comorbidity management, and 109 (76.2%) were comparably good (Table 4; Fig. 2).

Concerning physician response to uncontrolled seizures or seizures after initiating antiepileptic treatment, 59 (30.7%) compliance assessment, Patient education on lifestyle modification 52 (27.1%), followed by increase in AED dose 36 (18.8%), referral to higher level facility 25 (13.3%) and changing AED 20 (10.4%) (Fig. 3).

Health system for epilepsy care

Concerning the health system for epilepsy care, we interviewed 16 professionals working in epilepsy clinics at public hospitals in Arba Minch Town. Nine (56.3%) professionals reported a shortage of diagnostic facilities and

Table 2 Knowledge of adult epilepsy patients attending public hospitals in Arba Minch Town, January 2024

		Frequency	Percent
Ever heard about a disease called epilepsy	Yes	315	80.4
	No	77	19.6
Epilepsy is a mental illness	No	215	54.8
	Yes	177	45.2
Epilepsy is a hereditary disease	No	99	25.3
	Yes	293	74.7
Epilepsy is a contagious disease	No	278	70.9
	Yes	114	29.1
Epilepsy is caused by an ancestor's sin	No	325	82.9
	Yes	67	17.1
Epilepsy is a hindrance to happy life	No	18	4.6
	Yes	374	95.4
Conditions that can increase the risk of seizure	Stress	79	20.2
	Drinking alcohol	36	9.2
	Stroke	25	6.4
	Traumatic brain injury	64	16.3
	Trauma during birth	51	13.0
	Illegal Drugs	23	5.9
	I don't know	114	29.1
Epilepsy can be treated with antiepileptic medicines	No	18	4.6
	Yes	374	95.4
Epilepsy patients can be employed	No	130	33.2
	Yes	262	66.8
Pregnant women should discontinue Antiepileptic medicines	Yes	36	9.2
	No	356	90.8
Allopathic treatment is beneficial for epilepsy	No	142	36.2
	Yes	250	63.8
Ayurveda/traditional treatment is beneficial for epilepsy	No	9	2.3
	Yes	383	97.7
Allow your child to play with an epileptic child	No	45	11.5
	Yes	347	88.5
What would you do if you happened to see a person getting an epileptic attack?	Give water	33	8.4
	Light matches	182	46.4
	Take to Hospital	95	24.2
	Protect from injury	82	20.9
Overall knowledge	Good knowledge	266	67.9
	Poor knowledge	126	32.1

a lack of access to evidence-based medicines. However, 10 (75.0%) professionals reported that general treatment guidelines were available. However, there are no epilepsy-specific guidelines in either facility (Table 5).

Factors associated with quality of care

According to our bivariate analysis, age 18–29 years [COR = 0.043 (95% CI = 0.013–0.144, p = < 0.000)], age 30–39 years [COR = 0.048 (95% CI = 0.014–0.160, $p <$ 0.000)], age 40–49 years [COR = 0.03 (95% CI = 0.007–0.127, $p<$ 0.000)], and seizure frequency less than three [COR = 2.431 (95% CI = 1.199–4.929, $p <$ 0.014)] were associated with the quality of epilepsy care. Similarly, poor knowledge [COR = 9.988 (95% CI, 5.663–17.614; $p <$ 0.000)] and treatment adherence [COR = 1.458 (95% CI, 1.075–2.182; $p <$ 0.047)] were associated with the quality of epilepsy care. After these variables were subjected to multivariate logistic regression via the backward elimination method to control for confounding variables, patients aged 18–29 years [AOR = 30.8 (95%, CI, 8.22-35.616, $p <$ 0.000)], aged 30–39 years [AOR = 18.4 (95%, CI, 5.016–67.613, $p <$ 0.000)] were more likely to have good-quality care than were those aged 50 years and above. Patients with a seizure frequency less than three were two times (AOR = 2.318; 95% CI, 1.028–5.225; $p <$ 0.043) more likely to have quality care than patients with five or more seizures. Patients with poor knowledge about epilepsy were 10% less likely [AOR = 0.107 (95%, CI, 0.0.057–0.202; $p <$ 0.000)] to have quality care than were those with poor knowledge (Table 6).

Table 3 Patient adherence to antiepileptic medications at public hospitals in Arba Minch Town, January 2024

	All of the time	Most of the time	Some of the time	None of the time
How often do you forget to take your AED medications?	197 (50.3%)	105(26.8%)	48 (12.2%)	42 (10.7%)
How often do you decide not to take your AED medicine?	215 (54.8%)	100(25.5%)	41 (10.5%)	36 (9.2%)
How often do you drink alcohol?	235 (59.9%)	59 (15.1%)	52 (13.3%)	46 (11.7%)
How often do you check the alcohol or aroma in local drinks before you drink at a social gathering?	191 (48.7%)	104 26.5%)	63 (16.1%)	34 (8.7%)
How often do you use recreational drugs?	223 (56.9%)	79 (20.2%)	59 (15.15)	31 (7.9%)
How often do you get the next appointment before you leave the clinic?	262 (66.8%)	49 (12.5%)	46 (11.7%)	35 (8.9%)
How often do you miss your scheduled appointments?	290 (74.0%)	38 (9.7%)	49 (12.5%)	15 (3.8%)
How often do you leave the dispensary without obtaining your prescribed pills?	179 (45.75)	94 (24.0%)	51 (13.0%)	68 (17.3%)
How often do you run out of AED pills?	63 (16.1%)	47 (12.0%)	211 53.8%)	71 (18.1%)
How often do you skip your AED medicine 1–3 days before you go to the clinic?	140 (35.7%)	71 (18.1%)	130 33.2%)	51 (13.0%)
How often do you miss your AED pills when you feel better?	231 (58.9%)	62 (15.8%)	65 (16.65)	34 (8.7%)
How often do you miss your AED when you feel sick?	197 (50.3%)	42 (10.7%)	52 (13.3%)	101 (25.8%)
How often do you take someone's AED pills?	301 (76.8%)	17 (4.3%)	12 (3.1%)	62 (15.8%)
How often do you miss taking your AED pills when you care less?	138 (35.2%)	198 (50.55)	21 (5.4%)	35 (8.9%)
Overall adherence	Good adherence		173	44.1%
	Poor adherence		219	55.9%

Discussion

General description of the study

In this study, we evaluated the quality of care provided to 392 adults with epilepsy at public hospitals in Arba Minch Town. The majority of patients were young (18–29 years; 46.9%), followed by those aged 30–39 years (134; 34.2%). This finding is in line with a study conducted at Mettu Karl Specialized Hospital, which revealed that a majority were in the age range 18–30 years [31]. This population is productive, and addressing epilepsy and its determinants in the study areas as well as the country is critical to improving the mental health of the young population.

In this study, 266 (67.9%) patients had good knowledge of epilepsy. Among the 14 questions, 177 (45.2%) and 374 (95.4%) concerned the cause (mental illness) and treatment of epilepsy, respectively. Fewer than one-third of 114 patients (29.1%) did not know the conditions that can increase seizure risk. Patients' knowledge of what to do when they see a person experiencing an epileptic attack was also low at 177 (45.2%). This percentage is relatively higher than that reported in a community-based study conducted to evaluate public and patient knowledge about epilepsy in different settings, which revealed that 56.4% [32] and 25.8% of the participants had good knowledge about epilepsy [33]. A similar systematic review and meta-analysis involving 12 studies revealed that 47.37% of the public has good epilepsy knowledge [34]. A similar study conducted at Jimma University Specialized Hospital among 180 epileptic patients revealed that 46 (25.5%) and 108 (60%) of the respondents knew the cause and treatment of epilepsy, respectively [23]. This could be due to differences in the study population. Our study evaluated knowledge about the disease among patients, and the claimed study evaluated public knowledge about epilepsy. In addition to this, variations in counseling practices, and healthcare infrastructure like diagnostic facilities could contribute to variation.

With respect to adherence to antiepileptic medications, 173 (44.1%) patients had good adherence to treatment. This is less than the findings from studies conducted in Jimma Medical Center, 212 (63.5% [35], Sudan, 62 (65.0%) [36], and India, 49.9% [37] of adults with epilepsy were adherent to antiepileptic drugs. This variation could be due to socioeconomic factors like monthly income, educational status, and attitude toward medication effectiveness. However, these findings are greater than those from Amanuel Mental Specialized Hospital which reported 16.38% adherence to epilepsy treatment [38], and among epileptic patients at Yirgalem General Hospital, 62 (32%) were treatment adherent [24]. The type of patients included in the studies and the variation in sociodemographic conditions can explain the variation. Amanuel Hospital is a mental illness-specialized hospital; patients with severe disease and comorbid mental illnesses such as depression are more likely to participate. However, in our study, patients with less severe conditions participated. Even though the reported adherence is comparable, it is still less than one-half. Therefore, it is important to design and implement strategies (education, counseling, and behavioral interventions [use of intensive reminders]) to improve medication adherence in this population [39].

Generally, about 70% of patients are estimated to have controlled seizures when they are properly diagnosed and treated [10]. In this study, about one-third of 130 (33.2%) of patients had controlled seizures. This is greater than findings from a study conducted in Zambia, which

Table 4 Quality of care provided to people with epilepsy at public hospitals in Arba Minch Town, January 2024 (*n* = 392)

ANA 8-quality metrics: QUIET tool		Frequency	Percent
Diagnosis of seizure			
A detailed history was taken (physical & neurological, Lab investigations) during the initial evaluation.	Yes	215	54.8*
	No	177	45.2
The patient received information on driving restrictions,	Yes	293	74.7*
	No	99	25.3
The patient received information on safety and injury prevention	Yes	199	50.8*
	No	193	49.2
Diagnosis included the best estimation of seizure types	Yes	278	70.9*
	No	114	29.1
Type of seizure (*n* = 278)	Generalized Tonic-clonic	204	73.4
	Focal	32	11.6
	Absence seizure	2	0.7
	Not classified	40	14.5
Seizure frequency documented	Yes	335	85.4*
	No	57	14.6
Number of Seizures in previous three months	None	135	34.4
	One	153	39.0
	More than one	47	12.0
	Not documented	57	14.5
EEG, MRI, or CT results documented or requested	Yes	78	19.9*
	No	314	80.1
Documented Etiology of epilepsy or the epilepsy syndrome	Yes	178	45.4*
	No	214	54.6
Duration of the disease since diagnosis	< 3 years	55	14.0
	3 to five	110	28.1
	6 to 10 years	185	47.2
	Above 10 years	40	10.2
Diagnosis quality (7 variables) mean		**226**	**57.4%**
Treatment and follow-up			
Did the patient start treatment with monotherapy?	Yes	332	84.7*
	No	60	15.3
Please list the AED drugs that the patient was taking	Phenobarbitone	160	40.8
	Carbamazepine	150	38.3
	Sodium Valproate	71	18.1
	Sodium Valporate + Phenobarbitone	11	2.8
Is there documentation of seizure after initiation of AEDs?	Yes	262	66.8*
	No	130	33.2
If yes, did the physician consider interventions (*n* = 262)	Yes	192	73.3*
	No	70	26.7
Counseling about antiepileptic drug side effects documented	Yes	343	87.5*
	No	49	12.5
Surgical therapy referral for intractable epilepsy considered (*n* = 47)	Yes	38	80.9*
	No	9	19.1
Treatment quality (five variables) mean		**308**	**78.6%**
Aspects of Care to Woman with Epilepsy			
Is the woman with epilepsy in childbearing age? (*n* = 155)	No	6	3.9
	Yes	149	96.1
Women receive information on contraception and family planning (*n* = 149)	Yes	86	57.7*
	No	63	42.3
Did she receive daily supplemental folate at a dose of at least 400 mcg? (*n* = 149)	Yes	92	61.7*
	No	57	38.3
Counseling about the impact of menopause on epilepsy (*n* = 6)	Yes	4	66.7*
	No	2	23.3

Table 4 (continued)

ANA 8-quality metrics: QUIET tool		Frequency	Percent
Did the current oral contraceptive taking status documented ($n = 149$)	Yes	72	48.3*
	No	77	51.7
Did the physician considered the decreased effectiveness of oral contraceptives ($n = 77$)	Yes	43	55.8*
	No	34	44.2
Interventions taken to manage OCP and AED interaction ($n = 43$)	Higher doses of OCP	16	37.2
	Alternative birth control	17	39.5
	Change AED	10	23.3
Aspects of women's care quality (five variables) mean		***86***	***58.0%***
Care for epilepsy patients with comorbidity			
Presence of comorbidity along with Epilepsy ($n = 392$)	Yes	143	36.5
	No	249	63.5
Comorbidities included in patient chart ($n = 143$)	Depression	34	23.8
	Anxiety	37	25.8
	Autism spectrum disorder	4	2.8
	Hypertension	46	32.2
	Diabetes	17	11.9
	Peptic ulcer diseases	5	3.5
Is the patient taking medications for comorbidities ($n = 143$)	Yes	109	76.2*
	No	34	23.8
Medications taken for comorbidities? ($n = 109$)	Amitriptyline	33	30.3
	Diazepam	22	20.2
	Amlodipine	36	32.0
	Metformin	13	11.9
	Omeprazole	5	4.6
Comorbidity management quality (one variable)		**109**	**76.2**

Note * variables used for mean percentage calculation for subquality (diagnosis, treatment, and follow-up, aspects of women care, and care for patients with comorbidity

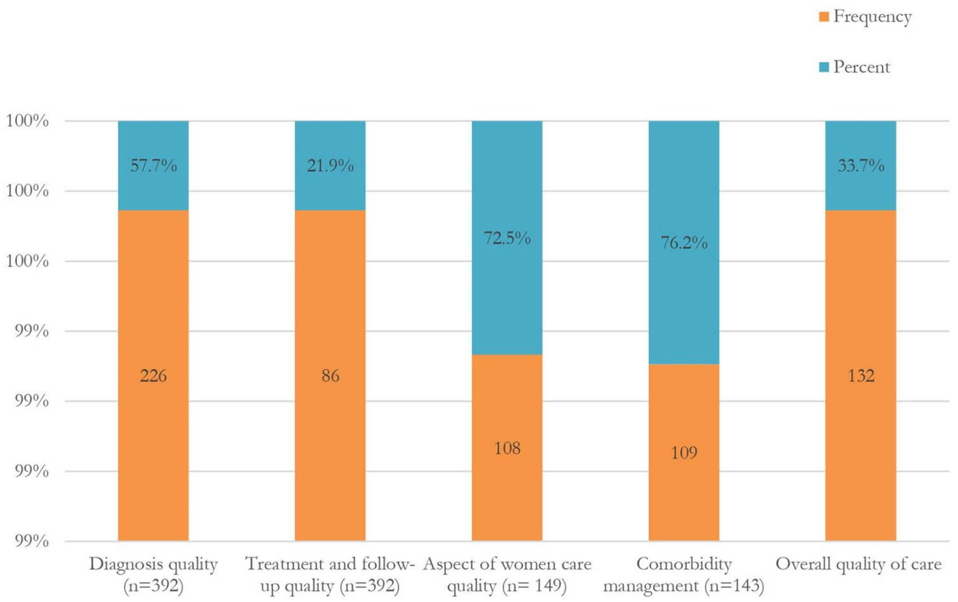

Fig. 2 Quality of care provided to people with epilepsy at public hospitals in Arba Minch Town based on the American Academy of Neurology (AAN) in January 2024 ($n = 392$)

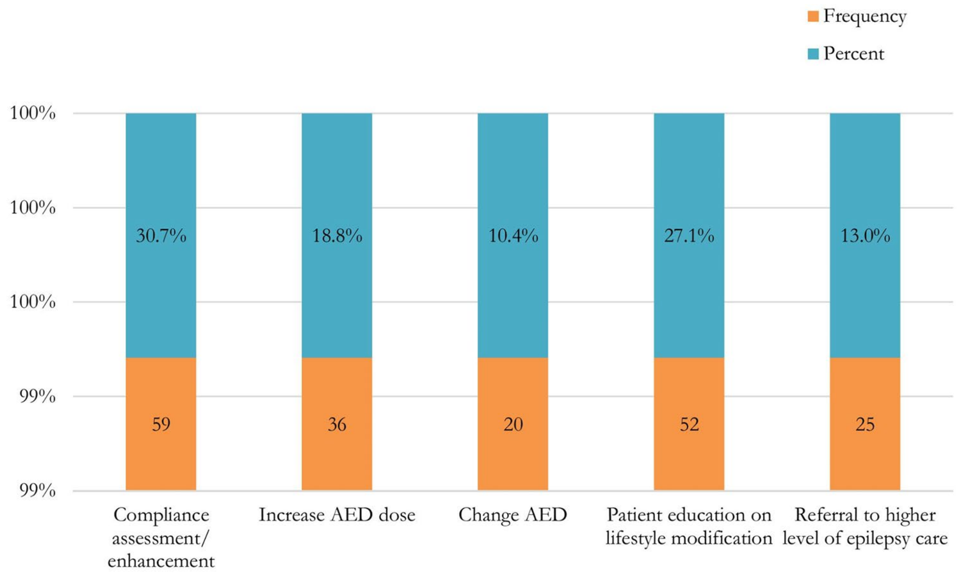

Fig. 3 Physician interventions for uncontrolled seizures in Arba Minch town, January 2024. AED = Antiepileptic drugs

Table 5 Health system variables for epilepsy care at public hospitals in Arba Minch Town, January 2024

		Frequency	Percent
Availability of diagnostic tests	Yes	7	43.7
	No	9	56.3
Availability of evidence-based guidelines	Yes	12	75.0
	No	4	25.0
Availability of epilepsy guidelines	Yes	0	0
	No	16	100
Access to anti-epileptic medicines	Yes	7	43.7
	No	9	56.3

reported 52 (23.6%) seizure control rate [40]. This could be due to the difference in the definition of seizure control (i.e. 3 months) used in this study. Most studies use achieving a 1–2 years seizure-free stay on follow-up to define remission (seizure control) [41]. On the other hand, the finding is lower than evidence from systematic review, 49% [42], Mettu Karl Hospital, 43.96% [31], Gondar University Hospital, 138 (43.1%) [43], and South West Ethiopia, 165 (52.5%) [44]. This low level of seizure control could be explained by personal and socioeconomic factors like occupational status, poor sleep quality, Insomnia, number of medications, presence of comorbidity, and medication adherence [45]. This requires due attention from healthcare providers and all relevant stakeholders. Improving patient knowledge, treatment

Table 6 Factors affecting the quality of epilepsy care among adults at public hospitals in Arba Minch Town, January 2024

Quality of Epilepsy Care			Good quality (*n* = 213)	Poor quality care (*n* = 179)	COR	95% CI for COR		P value	AOR	95% CI for AOR	
						Lower Bound	Upper Bound			Lower Bound	Upper Bound
Good quality	Age	18–29 years	106	67	0.043	0.013	0.144	0.000	30.832	8.222	**35.616***
		30–39 years	86	60	0.048	0.014	0.160	0.000	18.417	5.016	67.613*
		40–49 years	18	8	0.030	0.007	0.127	0.000	31.732	6.663	151.1
		50 years and above	3	44	Ref				Ref.		
	Seizure frequency	Less than three	51	64	2.431	1.199	4.929	0.043	2.318	1.028	**5.225***
		Three to Five	131	99	1.464	0.759	2.826	0.702	0.862	0.404	1.841
		Above Five	31	16	Ref	Ref.			Ref.		
	Patient knowledge	Good knowledge	104	162	Ref				Ref.		
		Poor Knowledge	109	17	9.988	5.663	17.614	0.000	0.107	0.057	**0.202***
	Patient adherence to treatment	Poor adherence	110	109	1.458	1.075	2.182	0.715	0.914	0.562	1.484
		Good adherence	103	70	Ref.				Ref.	.	.

a. The reference category is: Poor quality adherence and access to diagnostic facilities and medicines can improve the reported rate of low seizure control. In addition, integrating epilepsy treatment into primary healthcare systems could further improve the seizure control rate [14].

Quality of epilepsy care

The overall quality of care (quality of diagnosis, quality of treatment and follow-up, quality of care, and comorbidity management) was 213 (54.3%). This finding is almost comparable with findings that the quality of care for adults with epilepsy was 55.6% [27]. Just above one-half 215 (54.8%) of the patients had a detailed history taken during the evaluation, and 293 (74.7%) received information on driving restrictions. The majority 343 (87.5%) patients had counseling about the adverse effects of antiepileptic drugs. A similar study revealed that 66% of the patients received counseling about the side effects of AEDs during every visit. Almost all patients with intractable epilepsy were referred for surgical therapy. Safety issues were explained to 37% of the patients, and less than half of the women of childbearing age with epilepsy had received counseling regarding contraception and pregnancy at least once a year [46]. Evidence of counseling about antiepileptic drug side effects was present in 54 (34%) records. Counseling for women of childbearing potential was documented in 18 (33%) relevant records [47]. This highlighted that the quality of care provided to patients with epilepsy was below standard and needed attention from professionals, the health care system, patients, and the general public.

More than eight out of the ten 238 (85.6%) and 335 (85.4%) patients had seizure types and seizure frequencies documented. Similarly, 178 (45.4%) patients had documented etiology of epilepsy or epilepsy syndrome. Findings from a similar study revealed that 142 (88%) patients had documented seizure type and seizure frequency at each visit. Similarly, the etiology of seizure or epilepsy syndrome was documented in 93 (58%) patients [47].

In this study, less than one-fourth of the 78 (19.9%) patients had EEG, MRI, or CT results or tests requested. Surgical therapy referral for intractable epilepsy was performed for 38 patients (80.9%). These findings are lower than those of a similar study conducted in the USA, which reported that > 70% of new-onset epilepsy patients underwent diagnostic procedures (such as EEG and neuroimaging) [3]. Improving access to imaging studies could contribute to diagnostic quality since the classification of seizure types requires this approach.

In addition, 87 (58.4%) of the women were receiving counseling during their childbearing years, and 109 (76.2%) had managed comorbidities. These findings are greater than those from a similar study based on eight epilepsy care quality measures, which revealed that less than half (37%) of the women of childbearing age with epilepsy had received counseling regarding contraception and pregnancy at least once a year [46]. A study conducted in the USA reported that educational and counseling measures were provided or documented to <50% of patients [3]. Counseling provided for women of childbearing potential was documented in 18 (33%) relevant records [47], and counseling for women of childbearing potential was documented in 18 (33%) relevant records [47]. The quality of care for adults with epilepsy assessed using the Quality Indicators in Epilepsy Treatment (QUIET) measure showed that care specific to women had the lowest concordance, 45%, with chronic care [27]. This better performance could be explained by differences in the study period, tools used, and sociodemographic characteristics of the patients.

Younger age is associated with better quality of care. Patients aged 18–29 years [AOR = 30.8 (95% CI, 8.22–35.616; $p < 0.000$)] and 30–39 years [AOR = 18.4 (95% CI, 5.016–67.613; $p < 0.000$)] were more likely to have good-quality care than were those aged 50 years and above. The improved awareness of the young population and resistance to antiepileptic medication among long-term users could explain these findings. In addition, age-related factors, such as polypharmacy, affect medication adherence [48].

In this study, patients with a seizure frequency less than three were two times more likely to have quality care [AOR = 2.318 (95%, CI, 1.028–5.225; $p < 0.043$)] than patients with five or more seizures. This could be explained by a seizure frequency-related reduction in the self-care of patients with epilepsy [48]. In addition, a higher seizure frequency is associated with uncontrolled seizures and could affect treatment adherence [43].

Patients with poor knowledge of epilepsy were 10% less likely [AOR = 0.107 (95% CI, 0.0.057–0.202; $p < 0.000$)] to have quality care than those with poor knowledge. This is because patients with epilepsy need to know about the diagnosis, treatment, and maintenance of psychosocial and comorbidity-related problems. Therefore, enhancing overall self-management knowledge through public education, media, digital technology, and peer education can improve quality care and treatment outcomes. Patients and public awareness of the disease and its management principles should support this. This is because knowledge is relevant only when patients and communities have the awareness and desire to engage first, and only then will knowledge lead to successful change [49].

Strengths and limitations of this study

The strength of the study relies on its methodology. Adequate and representative sample size was used to answer the question under study, and the Donabedian model integrated with the American Academy of Neurology quality metrics was used. However, no temporal relationship was identified due to the nature of the study. The use of patient records might contribute to the under- or overestimation of quality of care.

Conclusion

The quality of care provided to adults at selected public hospitals was low. In addition, patient knowledge, medication adherence, and the seizure control rate were also suboptimal. Age 18–29 years, age 30–39 years, and low seizure frequency were positively associated with quality of care. However, poor knowledge about epilepsy was negatively associated with quality care. Therefore, health professionals providing care should educate patients about epilepsy and its management including medication adherence and lifestyle management. Respective hospitals should provide evidence-based guidelines for the management of epilepsy. The regional health bureau should ensure access to diagnostic facilities and medicines. Patients should be discussed with their care providers before taking any other drugs, including traditional medicines. Patients should adhere to their treatment schedule and communicate any modifications needed with their providers. Finally, researchers willing to study this topic should use strong designs that can determine causal determinants of quality care.

Abbreviations

AED	Antiepileptic Drug
ASM	Anti-Seizure Medicine
ILAE	International League Against Epilepsy
NICE	National Institute for Health and Care Excellence
OPD	Outpatient Department
PWE	People with Epilepsy
QALYs	Quality-Adjusted Life Years
QOL	Quality of Life
WHO	World Health Organization

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Author contributions

All the authors read and approved the manuscript. MB conceived the research, framed the formatted the design, and conducted the data analysis; GE and TT participated in the data analysis, reviewed the manuscript writing process, and polished the manuscript. MS participated in the data analysis, reviewed the manuscript writing process, polished the manuscript, and developed the manuscript for publication.The guarantor of the study is MS. The authors accepts full responsibility for the finished work and/or the conduct of the study, has access to the data, and controls the decision to publish.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethical approval

Ethical clearance was obtained from Arba Minch University, the College of Medicine, and the Health Sciences Institutional Review Board with the following reference number: *IRB/T13/2016*. After the study objective and confidentiality of the information were clarified, verbal informed consent to participate was obtained from obtained from participants, or the parents or legal guardians of illiterate participants.

Consent for publication

All authors read the full version of this manuscript and agreed to publish.

Competing interests

The authors declare no competing interests.

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