The Characteristics of Epilepsy in Healthcare Facilities in Medan Period of 2015–2020

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Abstract. Background: Epilepsy is brain disorder marked by the tendency to continuously causing epileptic raise with neurobiological, cognitive, psychological, and social consequences. About 50 million people worldwide have epilepsy, making epilepsy the most common neurological disease globally. There are minimal data on the prevalence of epilepsy patients in Medan.

Objective: To determine the characteristics of epilepsy in health facilities in Medan from 2015 to 2020.

Method: This was a descriptive observational study with a cross-sectional design, using secondary data obtained from medical record of 4 hospitals and 10 health centers in Medan from the period 2015–2020, collected using the total sampling method.

Results: The population of epilepsy patients in Medan City is in the amount of 847 people. The median value of age 32 (18–89) years with the most age range is 18–28 years old in the amount of 362 subjects (42.7%) and onset age is dominated by age range 11–21 years old in the amount of 230 subjects (27.2%). The most sex is male with 441 subjects (52.1%). The most educational background is senior high school graduates with 483 subjects (57.0%). The most work status is employed with 435 subjects (51.4%). The most health facility is at Hospital Type A with 278 subjects (32.8%). The most illness duration is $\leq$ 5 years with 617 subjects (72.9%). The most dominated by generalized seizure patient with 495 subjects (58.4%). OAB type is valproate acid in the amount of 222 subjects (26.2%) and polytherapy with total subjects 474 (56.0%). The most ethiology is idopatic with 671 subjcets (79.2%). The most EEG description is abnormal with total subjects 663 (78.3%), 508 subjects (59.9%) did not conduct imaging examination.

Conclusion: The prevalence of epilepsy patients in Medan from 2015 - 2020 period was 847 and dominated by the young adult group and men. Mostly were high school graduates and working. Most patients were found in type A hospital, were idiopathic, suffered a generalized seizures, were treated with polytherapy, and mostly consumed valproic acid. Most patients had abnormal EEG images and didn't do any imaging.

Keywords: Epilepsy · Anti-epileptic drugs

1 Introduction

Epilepsy is a chronic disorder of the brain characterized by episodic and recurrent attacks, an epileptic seizure, and all its somatic and psychiatric consequences [1]. Epilepsy is

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a neurologic condition attacking everyone and does not limit geographically, socially or racially. The word "epilepsy" is derived from the Greek language meaning "taken or attacked". An epileptic seizure could contain motoric, sensory, psychic, autonomic or a combination of the four symptoms. An epileptic seizure is defined as a transient change in a patient's clinical condition caused by overly depolarized neurons. It could be provoked or unprovoked [2].

A cardinal sign of epilepsy is an epileptic seizure which is paroxysmal and recurrent, marked by a change of behavior that expresses the neural mechanism involved in it. Some diseases and head traumas are also involved in an epileptic seizure which the distribution varies around the world. Although many underlying diseases could lead to epilepsy, approximately 50% of epilepsy cases globally are idiopathic [1].

Around 50 million people in the world suffer from epilepsy, making epilepsy the most common neurology case globally [3]. The incidence of epilepsy in developed countries is 50 over 100,000 citizens with a range of 40–70 over 100,000/year, while in the undeveloped countries, it remains higher with a range of 100–190 over 100,000/year. Although there are many factors contributing to this difference, it is proven that citizens of low-income countries have a higher risk in suffering epilepsy [4].

Epilepsy incidence is higher in Asia compared to western countries because its citizen tends to higher risk to suffer from infections of the central nervous system such as cerebral malaria, neurocysticercosis, meningitis and encephalitis, including japanese encephalitis, tuberculosis and human immunodeficiency (HIV) virus infection [5].

The total case of epilepsy in Indonesia is quite high. On average, the prevalence of active epilepsy is 8.2 over 1,000 citizens, while the incidence reaches 50 over 100,000 citizens. If the total population of Indonesia is around 230 million, it is estimated that there are 1,8 million epilepsy patients who still needed treatment. *Perhimpunan dokter spesialis saraf Indonesia* (PERDOSSI) conducted a study in 18 hospitals in 15 cities in 2013 for 6 months and acquired 2,228 patients consisting of 487 new cases and 1,801 old cases of epilepsy [6, 7].

The epidemiology study of epilepsy patients in North Sumatra is still minimal and until this date, there are still no studies and publications about the prevalence of epilepsy patients in North Sumatra and Medan, in this research, the researchers are interested in studying the healthcare facilities in Medan city, the capital of North Sumatra province.

2 Patients and Method

2.1 Patients and Study Design

This was a descriptive observational study with a cross-sectional design, using secondary data sources obtained from medical record data at 4 hospitals and 10 health centers in Medan from the period 2015 to 2020, collected through total sampling method with epilepsy patients aging ≥18 years old as the inclusion criterion and patients not having a complete medical record as the exclusion criterion.

2.2 Methods

Authors collected epilepsy patients in outpatient and inpatient wards of 4 hospitals and 10 health centres in Medan city period 2015–2020, based on their medical record numbers,

registered in registration books or computers, the patients data such as age, gender, past education, occupation, type of hospital, disease duration, types of seizure, anti epileptic agents used and consumed, etiology of epilepsy, CT Scan, MRI and electroencephalography (EEG) results were collected. The researchers used secondary data written in patients' medical records. The data were then written on a data collection form. After it was completed, the data were then processed and analyzed.

2.3 Statistical Analysis

The results were then analyzed statistically with the help of statistical product and science service (SPSS) software version 22.0. Analysis and the data were done with univariate analysis to analyze the characteristic of the variables and descriptive studies to show the total and percentage categorical variables.

3 Results

847 patients fulfilled the inclusion criteria and 67 didn't in each type of hospital and 96 in health centres. Demographic characteristics of the subjects showed a median age of 32 (18–89) years old, dominated by the age range of 18–28 years old with a total of 362 patients (42.7%). Age of onset was dominated by the age range of 11–21 years old with a total of 230 patients (27.2%). This study was dominated by men with a total of 441 patients (52.1%). Most patients were high school students with a total of 278 patients (57.0%). Most of the patients had a job with a total of 435 patients (51.4%). Most of the patients were found in type A hospital with a total of 278 patients (32.8%) (Table 1).

Characteristics of epilepsy patients based on the duration of the disease were divided into 2 groups which were ≤ 5 years and > 5 years. Based on Table 2, the subjects were dominated by those having a duration of ≤ 5 years with a total of 617 patients (72.9%) consisting of 104 symptomatic patients (12.3%) and 513 idiopathic patients (60.6%), followed by 230 patients with duration of > 5 years consisting of 72 symptomatic patients (8.4%) and 158 idiopathic patients (18.7%).

The characteristic of epilepsy patients based on seizures were divided into 2 groups which were generalized and focal seizures. In Table 3, there were a total of 495 patients (58.4%) having generalized seizures consisting of 153 patients (18.1%) from type A hospital, 145 patients (17.1%) from type B hospital, 86 patients from type C hospital (10.2%) and 111 patients from public health care (13.1%), followed by a total of 352 patients (41.6%) having focal seizures consisting of 125 patients (14.8%) from type A hospital, 71 patients (8.4%) from type B hospital, 52 patients from type C hospital (6.1%) and 104 patients from public health care (12.3%).

The characteristics of epilepsy patients based on antiepileptic drugs (AED) were divided into several groups depending on the drugs consumed such as valproic acid, pheyntoin, phenobarbital, carbamazepine, clobazam dan topiramate. Based on Table 4, the most consumed AED is valproic acid with a total of 222 patients (26.2%), followed by a combination of phenytoin and valproic acid with a total of 207 patients (24.4%), phenytoin with a total of 135 patients (15.9%) and combination of phenytoin and phenobarbital with a total of 88 patients (10.4%).

Table 1. Demographic characteristics of epilepsy patients

Respondent characteristics	**Median**	**n (%) = 847**
Age	32 (18-89)	
• 18–28 years old • >28–38 years old • >38–48 years old • >48–58 years old • >58–68 years old • >68 years old		362 (42.7) 184 (21.7) 109 (12.9) 101 (11.9) 61 (7.2) 30 (3.5)
Age of onset		
• 11–21 years old • >21–31 years old • >31–41 years old • >41–51 years old • >51–61 years old • >61–71 years old • >71–81 years old • >81 years old		230 (27.2) 224 (26.4) 152 (17.9) 103 (12.2) 82 (9.7) 46 (5.4) 7 (0.8) 3 (0.4)
Gender		
• Male • Female		441 (52.1) 406 (47.9)
Education level		
• Primary • Secondary • High School • Diploma • Bachelor • Master		34 (4.0) 149 (17.6) 483 (57.0) 65 (7.7) 114 (13.5) 2 (0.2)
Job		
• Employed • Unemployed		435 (51.4) 412 (48.6)
Healthcare facility		
• Type A hospital • Type B hospital • Type C hospital • Public health centre		278 (32.8) 216 (25.5) 138 (16.3) 215 (25.4)

Characteristics of epilepsy patients based on AED consumed were divided into 2 groups such as monotherapy and polytherapy. Based on Table 5, there were a total of 373 (44.2%) monotherapy patients consisting of 138 (16.3%) patients from type A hospital, 76 (9,0%) patients from type B hospital, 65 (7.7%) patients from type C hospital and 95 (11.2%) patients from public health care. Polytherapy patients consist of a total 474

Table 2. Epilepsy patients characteristics based on duration of disease

Respondent characteristics	n (%) = 847
Duration	
• ≤5 years Symptomatic Idiopathic	617 (72.9) 104 (12,3) 513 (60,6)
• >5 years Symptomatic Idiopathic	230 (27.1) 72 (8,4) 158 (18,7)

Table 3. Epilepsy patients characteristics based on seizure

Respondent characteristics	n (%) = 847
Seizures	
• Generalized	495 (58.4)
Type A Hospital	153 (18.1)
Type B Hospital	145 (17.1)
Type C Hospital	86 (10.1)
Public Health Centre	111 (13.1)
• Focal	352 (41.6)
Type A Hospital	125 (14.8)
Type B Hospital	71 (8.4)
Type C Hospital	52 (6.1)
Public Health Centre	104 (12.3)

patients (56.0%), with patients having 2 AED consisting of 423 patients (50.0%) and 3 AED consisting of 51 patients (6.0%). The distribution of polytherapy patients was as follows; 47 (17.4%) patients from type A hospital, 134 (15.8%) patients from type B hospital, 73 (8.7%) patients from type C hospital and 120 (14.1%) patients from the public health centre.

Epilepsy patients characteristics based on etiology are divided into 2 groups which were symptomatic and idiopathic patients. Based on Table 6, there were 671 idiopathic patients (79.2%) and 176 symptomatic patients (20.8%).

Epilepsy patients characteristics based on EEG were divided into 3 groups such as abnormal, normal and no EEG examination. Based on Table 7, there were 663 patients (78.3%) with abnormal EEG, consisting of 381 patients with generalized seizure (45.0%) and 282 patients with focal seizure (33.3%), followed by 16 patients (1.9%) with normal EEG, consisting of 13 patients with generalized seizure (1.5%) and 3 patients with focal

Table 4. Epilepsy patients characteristics based on antiepileptic drugs

Respondent characteristics	**n (%) = 847**
Antiepileptic agents	
• VPA	222 (26.2)
• PHT	135 (15.9)
• PB	4 (0.5)
• CBZ	10 (1.2)
• TPM	2 (0.2)
• VPA, PHT	207 (24.4)
• PHT, PB	88 (10.4)
• VPA, PB	53 (6.3)
• PHT, CBZ	32 (3.8)
• VPA, CBZ	26 (3.1)
• PHT, CLB	8 (0.9)
• VPA, CLB	1 (0.1)
• PA, TPM	2 (0.2)
• PB, CLB	3 (0.4)
• CBZ, PB	3 (0.4)
• CBZ, VPA, PB	9 (1.1)
• CBZ, VPA, PHT	16 (1.9)
• VPA, PHT, PB	17 (2.0)
• PHT, CBZ, PB	5 (0.6)
• PHT. PB, CLB	2 (0.2)
• VPA, PHT, CLB	2 (0.2)

seizure (0.4%) and a total of 168 patients (19.8) with no EEG examination, consisting of 101 patients with generalized seizure (11.9%) and 67 patients with focal seizure (7.9%).

Epilepsy patients characteristics based on imaging were divided into 3 groups such as abnormal imaging, normal imaging, and no imaging. Based on Table 8, there were 302 patients (35.7%) with abnormal imaging, consisting of 136 patients with generalized seizure (16.1%) and 166 patients with focal seizure (19.6%), followed by 37 patients (4.4%) with normal EEG, consisting of 14 patients with generalized seizure(1.7%) and 23 patients with focal seizure (2.7%) and a total of 508 patients (59.9%) with no EEG examination, consisting of 345 patients with generalized seizure (40.7%) and 163 patients with focal seizure (19.2%).

Table 5. Epilepsy patients characteristics based on antiepileptic drugs consumed

Respondent characteristics	**n (%) = 847**
Total	
• Monotherapy	373 (44.2)
Type A Hospital	138 (16.3)
Type B Hospital	76 (9,0)
Type C Hospital	65 (7.7)
Public Health Centre	95 (11.2)
• Polytherapy	474 (56.0)
– 2 AED	423 (50.0)
– 3 AED	51 (6.0)
Type A Hospital	147 (17.4)
Type B Hospital	134 (15.8)
Type C Hospital	73 (8.7)
Public Health Centre	120 (14.1)

Table 6. Epilepsy patients characteristics based on etiology

Respondent characteristics	**n (%) = 847**
Etiology	
• Symptomatic	176 (20.8)
• Idiopathic	671 (79.2)

Table 7. Epilepsy patients characteristics based on EEG

Respondent characteristics	n(%) = 847
EEG	
Abnormal	663 (78.3)
• Generalized	381 (45.0)
• Focal	282 (33.3)
Normal	16 (1.9)
• Generalized	13 (1.5)
• Focal	3 (0.4)
No EEG examination	168 (19.8)
• Generalized	101 (11.9)
• Focal	67 (7.9)

Table 8. Epilepsy patients characteristics based on imaging

Respondent characteristics	n(%) = 847
Imaging • Abnormal Generalized Focal	302 (35.7) 136 (16.1) 166 (19.6)
• Normal Generalized Focal	37 (4.4) 14 (1.7) 23 (2.7)
• No imaging Generalized Focal	508 (59.9) 345 (40.7) 163 (19.2)

4 Discussion

4.1 Demographic Characteristics of the Study

Demographic characteristics in this study such as gender and age are relevant to a study by Maryam et al., (2018) in the neurology outpatient ward of Sanglah General Hospital period of January–December 2016 reporting that epilepsy was dominated by men with average of 35 years old when the study was conducted. Seizure onset was found in an average age of 29 years old.8 This result is also in coherence with the study of Li et al., which was written in PERDOSSI epilepsy study group, stating that the prevalence in Asian countries is dominated by men [6].

Several studies have indicated that women had slightly lower unprovoked epilepsy incidents rather than men. This difference is usually associated with men being exposed to larger risk factors for epileptic lesion and acute symptomatic seizures. Gender also has an important effect on epilepsy patients regarding medical considerations, hormonal changes and social functions. Almost all studies examine epilepsy, which based on gender, focused on the characteristics of epileptic seizures rather than patients characteristics [9, 10]. Related to age, older ages also have a higher risk of being exposed to epileptic risk factors such as; head trauma, central nervous system infection, space-occuping lesions, blood circulation disorders, toxin (alcohol and drugs), metabolic disoders and neurodegenerative disorders [8].

Another study related to the results of this study is the study by Nisa et al., (2017) in General Hospital Haji Adam Malik Medan, showing that 33 patients had jobs and most were high school graduates with a total of 17 patients [11].

4.2 Epilepsy Patients Characteristics Based on Duration of Disease

In this study, the distribution of epilepsy patients based on the duration of the disease was found to be the most in the group of disease duration ≤5 years with a total of 617 patients (72,8%). This study is in accordance with study by Alsaadi et al., (2017) who reported that the duration of epilepsy in their study subjects was dominated by the <5 years group compared to the >5 year group [12]. This study is also close to the study conducted by

Rajandran et al., (2017) at the General Hospital Haji Adam Malik Medan which reported 64 patients (74.1%) in their study had epilepsy duration of <3 years [13]. This study is contradictive with the study by Sigar et al., in 2017 who reported ≥50% of their study subjects had epilepsy duration of >6 years [14].

According to the researchers, this difference can be caused by several factors that can affect the duration of epilepsy, one of which is seizure-free. In adults, gradual discontinuation of AED may be considered after 3–5 years of being seizure-free. AED can be discontinued without recurrence in 60% of patients. In terms of discontinuing AED, there are important things to note, namely the general requirements for stopping AED and the possibility of recurrence after AED are stopped. The requirements to stop AED are as follow;6,15 after being seizure-free for minimum of 3 years and normal EEG, approval of AED discontinuation from patients or family, must be done gradually 25% of original dosage every month for 3–6 months, if patient consume more than 1 AED, then non primary AED is stopped first. Research conducted by Ernawati et al. (2019) reported that there was an association between compliance and the incidence of seizures, the more non-adherent to AED consumption was directly proportional to the increase seizures [16].

4.3 Epilepsy Patients Characteristics Based on Seizure

In this study, based on the type of seizure, it was found that mostly had generalized seizure with a total subjects of 495 (58,4%) patients. This study is relevant with the distribution of epileptic seizures in Asia according to the classification by International League Against Epilepsy (ILAE) stating that it is mostly generalized epilepsy with percentage ranging from 50%-69%,followed by focal epileptic seizures ranging 31% - 50%, symptomatic epilepsy ranging 22%-53%, idiopathic epilepsy ranging 4%-42%, and cryptogenic epilepsy ranging 13%-60% [6]. Other study which is also in accordance with our result is by Anwar et al., (2017) in Mataram city reporting that 60.9% of their patients were in generalized seizure group while 39.1% had focal seizures [17].

But, this study has different result from the study by Lilik et al., (2013) which stated that focal seizures were more dominant in their study [18]. This study also differs from study by Beghi reporting that focal seizures were more dominant in low income countries [19].

This difference could occur one of which is failing in identifying tipe of seizure. The determination of seizure type depends on the information obtained from history taking without the availability of adequate diagnostic testing, as result, it often wrong identifies focal seizure as generalized seizure [19, 20] This error could cause by patient themselves, family or others who explained the type of seizure, and also could be from the doctor doing the history taking. A witness need to collect adequate information about patient's seizure because in many cases patients were unconscious during the seizure [21].

4.4 Epilepsy Patients Characteristics Based on AED

The AEDs consumed in this study were; valproic acid, phenytoin, phenobarbital, carbamazepine, clobazam dan topiramate. The most types of AED consumed by the subjects

of this study were valproic acid with total of 222 patients (26.2%). This result is close to the study by Hasibuan et al., (2016) reporting that distribution of epilepsy patients in the neurology outpatient ward of Prof. Dr. R.D. Kandau Manado Hospital period of June–July 2015 based on their therapy is dominated by phenytoin (53.2%), followed by valproic acid (21.5%) and carbamazepine (10.1%) [22].

Study by Deirfana et al.,stated that mostly used AED in their study is valproic acid, followed by phenytoin and carbamazepine. Another study by Glause et al., also showed that phenytoin, carbamazepine and valproic acid were generally still proven to be effective in controlling seizures in pediatric or adult epilepsy patients [23]. In guideline by PERDOSSI, it stated that choice of AED is based on type of seizure; adult with partial seizure (carbamazepine, phenytoin, levetiracetam and zonisamide) and adult with generalized seizure (phenytoin, carbamazepine, valproic acid, oxcarbazepine) [15].

4.5 Epilepsy Patients Characteristics Based on Total of AED Consumed

In this study, the distribution of epilepsy patients based on the total of AED consumed was in the polytherapy group category with a total of 474 patients (56.0%). Short term target of epilepsy treatment is being seizure-free with monotherapy of AED without resulting in any side effects. 10 About two-thirds of epilepsy patients will be seizure- free within first or second AED monotherapy, but the rest do not reach remission even though given the maximal tolerated dose. The failure of monotherapy causes the development of the concept of combining two or more AED (polytherapy) to be seizure-free. Polytherapy is still widely used in the treatment of epilepsy. Study shows that the proportion of epilepsy patients receiving polytherapy varied from 20% to 51% in the survey of general population, and other survey conducted by hospital resulted in percentage reaching 65%. The uncertainty of "monotherapy for all" policy is shown in a Scotlandia study which evaluate longer outcome in newly diagnosed adolescent and adults, resulting in monotherapy AED is not effective in almost 40% of patients. The controversial keeps going on with the development of several new generation AEDs which have a total of more than 10 [24].

The principle of combination therapy is continue to be evaluated as a treatment strategy in epilepsy for more than two decades. This is because there are many uncontrolled epilepsy cases undergoing monotheraphy and also the rapid development of modern AEDs. Modern AEDs are better tolerated by patients and tend to not having any interactions compared to older AEDs.There haven't be a lot of strong scientific proofs to be used as guidance by practitioners about how and when to combine AEDs, and mostly recommendations release today are empiric [24].

4.6 Epilepsy Patients Characteristics Based on Etiology

There were 671 (79,2%) idiopathic patients, followed by 176 symptomatic patients (20.8%). This result is in accordance with several studies such as, study in General Hospital Bali Mandara, reporting idiopathic patients as much as 98 patients (65.8%), while the rest 51 patients (34.2%) were symptomatic [25]. Study conducted in Harapan Kita Jakarta Hospital showed that 53.1% out of 141 patients were idiopathic [26] In previous study, it also found that idiopathic etiology dominated with a total of 74 patients (71.2%) [27]. Study in Sanglah Hospital had the most idiopathic patients with a total of 205 patients (74.4%) [8].

4.7 Epilepsy Patients Characteristics Based on Imaging

In this study, it was found that the distribution of epilepsy patients based on imaging examination were dominated by the group without imaging examination with a total of 508 (60,0%) patients. The same as EEG limitations in diagnostic tools at Putri Hijau Hospital and health centers where the research was carried out were one of the reasons patients didn't have imaging examination and the results were also not returned by the patients Neuroimaging could help in diagnosis and identifying epileptogenic lesions. Epileptogenic lesions included prenatal or perinatal brain damage, cortical development malformation including focalcortical dysplasia, tumor, post stroke or post trauma encephalomalacia, vascular anomaly and hippocampus sclerosis. Neuroimaging should be done in all patients with new onset of epileptic seizures except in individual with genetic generalized epilepsy (idiopathic) [28].

5 Conclusions

Based on the analysis of the data obtained in this study, it can be concluded that:

1. The prevalence of epilepsy patients in 4 teaching hospitals and 10 health centers in Medan City is 847 patietns.
2. In this study, the median age value was 32 (18–89) years with the highest age range being 18–28 years with 362 patients (42.7%).
3. In this study, the age of onset was dominated by the age range of 11–21 years as many as 230 patients (27.2%).
4. In this study, the gender of the patients was mostly men with a total of 441 patients (52.1%).
5. In this study, most patients were high school graduates with a total of 483 patients (57.0%).
6. In this study, most patients were working with a total of 435 patients (51.4%).
7. In this study, most patients were found in type A hospital with a total of 278 patients (32.8%), followed by type B hospital with 216 patients (25.5%), public health center with 215 patients (25.4%) and type C hospital with 138 patients (16.3%).
8. Patients included in the disease duration of ≤ 5 years were 617 patients (72.9%) and > 5 year group with a total of 230 patients (27.1%).
9. There were 495 patients with generalized seizure (58.4%)and 352 patients with focal seizure (41.6%).
10. Mostly consumed AED in this study is valproic acid with a total of 222 patients (26.2%), followed by combination of phenytoin and valproic acid with 207 patients (24.4%).
11. There were 373 patients (44.2%) who had monotherapy and 474 patients had (55.8%) polytherapy; with 423 patients (50.0%) had 2 AED combination and 51 patients (6.0%) had 3 AED combination.
12. There were 176 patients (20.8%) who were symptomatic and 671 patients (79.2%) were idiopathic.
13. 663 patients had abnormal EEG findings (78.3%), 16 had normal EEG findings (1.9%) and 168 didn't have any EEG findings (19.8%).
14. 302 patients had abnormal imaging findings (35.7%), 37 patients (4.4%) had normal imaging and 508 patients didn't have imaging findings (59.9%).

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Transparency Declarations. Competing interests: None to declare.

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