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Epilepsy as a Disease Affecting Neural Networks

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Abstract: *This research aims to investigate and analyze epilepsy as a disease that affects nervous tissue. The approach used in this research is a qualitative approach with literature study. Epilepsy is a neurological disease characterized by recurrent epileptic seizures. This disease affects the nerve tissue in the brain, causing disruption in the normal functioning of the nervous system. This research method includes analysis of literature studies relevant to the topic of epilepsy and its effect on neural networks. Various sources such as scientific journals, articles and books related to epilepsy and the nervous system were used in this research. Data collected through literature studies were then analyzed qualitatively to identify patterns, trends and important findings related to epilepsy as a disease that affects nervous tissue. The results of this study suggest that epilepsy can affect various aspects of neural networks, including brain structure, synapse connectivity, and electrical activity. Epileptic seizures that occur can cause damage to nerve tissue and affect overall brain function. Apart from that, epilepsy can also affect the development and growth of nervous tissue in children. These findings have important implications in the development of epilepsy diagnosis and treatment. With a better understanding of how epilepsy affects neural networks, we can develop more effective approaches to diagnosing this disease and design more appropriate treatment strategies. In addition, this research also provides additional insight into the pathophysiological mechanisms of epilepsy and strengthens our understanding of the complexity of this disease. This research highlights the importance of understanding epilepsy as a disease that affects neural networks. A qualitative approach with literature studies has helped reveal the relationship between epilepsy and neural networks, as well as the importance of diagnosis and treatment. Further research is needed to deepen our understanding of epilepsy and its effects on neural networks in more detail.*

Keywords*: Epilepsy, Nervous Network, Therapeutic Actions*

BACKGROUND

Epilepsy is a neurological disorder characterized by repeated seizures. Although epilepsy can affect anyone, including children and adults, there are significant gaps in understanding and awareness about this condition. This gap in issues relates to various aspects of epilepsy, including causes, treatment, social stigma, and its effects on the nervous system.

Epilepsy is a disorder caused by electrical disturbances or excess electrical activity in the brain. This can cause epileptic seizures which can include seizures or impaired consciousness. Epileptic seizures can vary in frequency, intensity, and duration. Several risk factors that can increase a person's chances of experiencing epilepsy include family history, brain injury, brain infection, and genetic problems(Kaku et al., 2023). Epilepsy is a lack of understanding of its causes. Although there is research indicating that there are genetic factors, brain injury, infection, or developmental problems that can cause epilepsy, the exact cause is still unknown(Anand et al., 2023).

First, genetic factors may play an important role in the development of epilepsy. Some types of epilepsy are known to have a strong genetic component. If there is a family history

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of epilepsy, a person's risk of developing this condition may be higher. However, not all cases of epilepsy are linked to genetic factors, and the exact mechanisms are still not fully understood. Second, brain injury caused by physical trauma, such as a car accident, fall, or other head injury, may be a risk factor for epilepsy. Severe or repeated brain injuries can increase a person's chance of having an epileptic seizure. However, not everyone who experiences a brain injury will develop epilepsy. Third, brain damage can increase the risk of epilepsy. Examples include encephalitis (inflammation of the brain), meningitis (inflammation of the lining of the brain and spinal cord), and parasitic infections such as cysticercosis. Although infection can be a triggering factor, not everyone who experiences an infection will develop epilepsy. Fourth, disorders of brain development that occur from birth or during childhood can also contribute to epilepsy. For example, brain development disorders such as cortical dysplasia (brain structure abnormalities), tuberous sclerosis syndrome (abnormal growth of cells in various organs of the body), and Sturge-Weber syndrome (blood vessel abnormalities in the brain) can increase the risk of epilepsy(Berjaoui et al., 2023).

This knowledge gap may hinder efforts to effectively prevent and treat epilepsy. Additionally, there are also gaps in epilepsy treatment. Although there are various types of medications available to control seizures, not everyone with epilepsy responds well to these medications. Some people may need a combination of medications or surgical procedures to control their seizures(Fatmi et al., 2022). However, not everyone has equal access to appropriate and affordable care. This creates gaps in epilepsy treatment and affects the quality of life of people with epilepsy.

In addition to medical issues, social stigma is also a significant gap issue in epilepsy. Many people with epilepsy face discrimination, negative stereotypes, and social isolation. The general public often has misconceptions about epilepsy, considering it a mental illness or associating it with insanity. This not only affects the quality of life of people with epilepsy, but also prevents them from seeking appropriate treatment and being open about their condition(Naji et al., 2023).

Epileptic seizures can affect the chemical balance of the brain and disrupt normal nervous activity. When an attack occurs, there are abnormal electrical discharges in the brain that cause symptoms such as seizures, loss of consciousness, or changes in behavior(Yaksa et al., 2018). Repeated seizure attacks can cause damage to the nerves and be annoying. One study conducted by the Department of Neuroscience and Neurology FKUI/RSCM in 2010 showed that the prevalence of epilepsy in Indonesia was estimated to be around 6.4 per 1,000

population. This study involved a number of respondents from various regions in Indonesia, including Jakarta, West Java, Central Java and East Java. The results of this study show that epilepsy is more common in the younger age group, with the peak incidence occurring at the age of 10-19 years. Apart from that, a study by the Ministry of Health's Data and Information Center in 2018 also provided an overview of epilepsy cases in Indonesia. According to this research, around 6.5 million Indonesians are thought to have epilepsy.

Cases of epilepsy begin in childhood, although it can occur at any age. In 2000, it was estimated that around 50 million people worldwide suffered from epilepsy. Of this number, around 37 million people experience primary epilepsy, which means the epilepsy is not the result of another medical condition. Interestingly, approximately 80% of those suffering from primary epilepsy live in developing countries. This shows that access to epilepsy care and support remains an issue in some areas.

Health records in Indonesia found that around 1.1-8.8 million people suffer from epilepsy. This figure includes all types of epilepsy, whether caused by genetic factors or other medical conditions. The incidence is estimated at around 50-70 cases per 100,000 population. According to data from the World Health Organization (WHO), the prevalence of epilepsy in Indonesia ranges from 0.5% to 0.9%. This means that the number of people suffering from epilepsy in Indonesia could reach 1.2 million to 2.16 million people. These figures underscore the importance of adequate support and care for those suffering from epilepsy. This also highlights the need for global efforts to raise awareness and improve access to epilepsy care in developing countries(Walker & Peterson, 2023).

According to the WHO (World Health Organization) report in 2001, it is estimated that there are an average of 8.2 people with active epilepsy among 1000 residents. The incidence rate of epilepsy is 50 per 100,000 population. The prevalence and incidence rates of epilepsy are estimated to be higher in developing countries. Based on literature figures, epilepsy sufferers account for 1.9-2 percent of the total population of a country(Frans Louise Draven Rudyanto, 2020). Therefore, it is estimated that there are around 4 million epilepsy sufferers in Indonesia. This figure may be higher because nutritional levels and infection rates are still high. If people with epilepsy are not treated properly, this can cause social problems and become a burden for families and society.

Even though these figures are quite worrying, the prevalence figures for epilepsy are not too surprising when compared with the prevalence figures for other diseases in Indonesia. For example, the prevalence of cancer in Indonesia has also increased. According to Riskesdas data, the prevalence of tumors/cancer in Indonesia increased from 1.4 per 1000

population in 2013 to 1.79 per 1000 population in 2018. The highest cancer prevalence occurred in DI Yogyakarta province, followed by West Sumatra and Gorontalo. However, it is important to give serious attention to people with epilepsy so that they get good treatment. Epilepsy is not a contagious disease or a curse. With appropriate and prompt treatment for 2 years or more, epilepsy can be cured. Therefore, it is important to increase public awareness and understanding of epilepsy and provide adequate support to people with epilepsy and their families.

THEORETICAL STUDY

In research conducted by Dede Khairin (2020) entitled Febrile Seizures as a Predisposing Factor for Epilepsy in Children using the temperature measurement method. that epilepsy is a condition of recurrent unprovoked seizures two or more times with an interval of more than 24 hours. Data shows 2% to 10% of febrile seizures will become epileptic. The presence of obvious neurological or developmental abnormalities before the first febrile seizure, complex febrile seizures, a history of epilepsy in parents or siblings, and repeated simple febrile seizures of 4 episodes or more in 1 year are risk factors for febrile seizures to become epilepsy. Giving treatment for febrile seizures has not been proven to prevent epilepsy in the future.

Furthermore, in research conducted by Aprin Nabila Rahmat (2023) with the title The Role of Age of Seizure Onset in Intractable Epilepsy in Epilepsy Patients using the literature review method of 30 PubMed NCBI articles, and Google Scholar with the keywords "epilepsil", "intractable", "seizures" , and “age” from 2002 to 2019 and only around 19 selected articles were taken. It was found that the age of seizure onset plays a role in the occurrence of intractable epilepsy in epilepsy patients. Pediatric epilepsy patients with a seizure onset age of <1 year need special attention and more aggressive management of OAE administration, especially in terms of increasing the dose and selecting the type of OAE. However, there are still other factors that influence the incidence of intrauterine epilepsy.

Then Siswandari Noertjahjani (2023) with his research entitled Detection of Epilepsy with Least Square Error. Using the feature extraction method then LSE feature selection and the classification method carried out specifically through Back propagation Neural Network, it was found that the final overall results showed that the level of accuracy in epilepsy detection with LSE feature selection reached a perfect value.

Adinda Chrisianti Suparno (2022) with her research entitled Next Generation: Mesenchymal Stem Cells as a Cell-Based Drug Delivery System, found that MSCs as a cell-

based drug delivery system have begun to be intensively implemented, this is proven by several studies that have been carried out using test animals, proving that MSCs have potential in the treatment of glioblastoma, sensorineural hearing loss, colorectal cancer, epilepsy, ischemic stroke and Intervertebral Disc Degeneration (IDD). Therefore, MSCs have great potential to be developed into a promising cell-based drug delivery system for the next generation. However, in its development in several studies, challenges were still encountered in this system, one of which was the genetic modification of MSCs which was carried out in several studies which gave promising results in test animal models but there were still risks when applied clinically. So, MSCs currently still require further research so that in the future they can be used optimally as a drug delivery system and can be developed more widely, considering that various further research related to MSCs is currently still being carried out and developed.

Meanwhile, research conducted by Dwi Yunita Haryanti (2022) with the title Improving the Quality of Life Through Physical and Spiritual Treatment in Patients with Epilepsy: Case Study found that the potential role of physical and spiritual treatment based on physical activity implementing the pillars of Islam in improving the quality of life of patients with epilepsy cannot be ignored. These 5 pillars have significant implications in nursing, especially in efforts to prepare for a good end of life.

And research conducted by Olivia Wangidjaja (2022) with the title Review of Post-Traumatic Capitis Epilepsy, found that post-traumatic capitis epilepsy is an unprovoked epileptic seizure that occurs after 7 days to years after capitis trauma. Most post-traumatic epilepsy capitis patients suffer from moderate to severe head injuries. The risk of post-traumatic epilepsy capitis varies depending on the location of the impact and the severity of the injury. The diagnosis can be made mainly from anamnesis supported by physical and supporting examination. Therapy using anti-epileptic drugs (AEDs), in patients who do not improve with AEDs, other treatments can be considered in the form of vagal nerve stimulators and surgical resection of epileptogenic lesions.

The similarity found in the research above is that epilepsy can attack the nerves, causing seizures, where this disease cannot be ignored and must receive regular attention and treatment such as therapy. High fever is prone to the onset of epilepsy in the form of seizures. And the difference is that each case studied has its own focus of study, such as hereditary epilepsy, post-epileptic trauma and therapy for epilepsy.

RESEARCH METHODS

The approach used in this research is a qualitative approach with literature study. This research method involves analysis of literature studies relevant to the topic of epilepsy and its effects on neural networks. Various sources such as scientific journals, articles and books related to epilepsy and the nervous system were used in this research. Data collected through literature studies were then analyzed qualitatively to identify patterns, trends and important findings related to epilepsy as a disease that affects nervous tissue.

RESULTS AND DISCUSSION

Definition and Classification of Epilepsy

Epilepsy is a neurological disorder characterized by recurrent seizures. Seizures occur due to irregular electrical activity in the brain, which disrupts normal signals between nerve cells. Epilepsy can affect individuals of all ages, both children and adults. The causes of epilepsy can vary, including genetic factors, brain trauma, infection, brain development problems, or structural abnormalities(Yovita Karina Pandan Putri et al., 2022). The term MTS is used to describe scar tissue located in the deep part of the temporal lobe of the brain.

MTS is the most common cause of structural epilepsy and focal temporal lobe epilepsy. One type of epilepsy in adults, including in Indonesia, which is often difficult to treat with antiepileptic drug therapy (intractable) is mesial temporal lobe epilepsy (MTLE). Difficult-to-treat cases of MTLE are often caused by sclerosis (hard tissue) in an area of the brain called the hippocampus.

Surgical therapy of the hippocampus affected by sclerosis often produces positive results. This procedure certainly requires accuracy in determining the location and branching of the epileptogenic zone to provide good postoperative results. Determining the degree of branching of the epileptic zone plays an important role in diagnosis, selecting treatment methods, planning surgery and predicting the success of epilepsy treatment in patients. This point can be determined using brain imaging which is usually done using MRI (Magnetic Resonance Imaging).(Sahara et al., 2021).

The use of MRI as a non-invasive imaging tool has the advantages of good atomic resolution and sensitivity for identifying small structural abnormalities. However, approximately 20 to 30 patients with focal epilepsy have refractory cases that cannot be detected with standard MRI. MTS affects the hippocampus, a brain region involved in memory formation and retrieval, and the amygdala, which is involved in emotional

processing. MTS causes partial (focal) epilepsy, in which seizures are limited to one area of the brain.

This condition can cause various symptoms, such as strange feelings, changes in behavior or emotions, muscle spasms, or seizures. Partial seizures can escalate into generalized seizures, which affect the entire brain and can cause sudden loss of consciousness or awareness. Changes associated with MTS can often be identified with magnetic resonance imaging (MRI). This scan uses magnets, radio waves, and a computer to create images of the body's structure(Syakina & Hawari, 2020).

Risk factors for MTS are brain damage due to trauma, infection, brain tumor, stroke, or uncontrolled seizures which are thought to cause scar tissue to form, especially in the hippocampus. This area begins to atrophy; Nerve cells die and more scar tissue forms. This lesion is considered an important cause of temporal lobe epilepsy. In fact, 70% of temporal lobe epilepsy patients suffer from some level of sexually transmitted disease. If additional attacks occur, this can make PMS worse.

Epilepsy classification is the process of grouping seizure types based on clinical and electroencephalographic (EEG) characteristics. The purpose of classification is to understand different seizure patterns and aid in proper diagnosis and treatment(Beghi, 2020). There are several classification systems used for epilepsy, including one developed by the International League Against Epilepsy (ILAE) Classification Commission.

The most recent ILAE classification system is the 2017 Epilepsy Classification, which divides epilepsy into several main types based on seizure characteristics and their causes. Several types of epilepsy can be seen in the following table.

Table 1.
Types of Epilepsy Based on the ILAE Classification

Category	**Information**	**Influence**	**Sub Category**
Focal Epilepsy	Epilepsy that starts in one part of the brain.	Affecting an individual's movements, feelings, or perceptions	1. Conscious focal epilepsy 2. Unconscious focal epilepsy.
Generalized Epilepsy	This epilepsy involves both sides of the brain at once.	Loss of consciousness and involves movements involving the whole body.	1. Absence epilepsy 2. Myoclonic epilepsy 3. Tonic-clonic epilepsy 4. Atonic epilepsy.

Unclassified Epilepsy	Epilepsy refers to seizures that cannot be classified into any of the known types of epilepsy. This may be because of incomplete or inadequate information about seizures or because seizures have unique characteristics or are rare.	Changes in your sense of taste, smell, sight, hearing, or touch	-

Based on table 1 regarding the three categories of epilepsy above, it can be concluded that. First,Focal epilepsy, also known as partial epilepsy, is a type of epilepsy that starts in one part of the brain. The two categories of epilepsy are: (1) Conscious Focal Epilepsy: In conscious focal epilepsy, the individual remains conscious during the seizure. Symptoms may vary depending on the area of the brain affected. Some symptoms that may occur include uncontrolled movements in certain parts of the body, changes in sensation such as numbness or strange sensations, and changes in emotions or thoughts. (2) Unconscious Focal Epilepsy: In unconscious focal epilepsy, the individual loses consciousness during the seizure. Symptoms that appear can involve uncontrolled movements throughout the body, loss of consciousness, as well as automatic changes such as pursing the lips, chewing, or biting the tongue.

Focal epilepsy can occur due to various factors, including structural abnormalities in the brain, head injury, brain infection, or genetic factors. Neurological disorders associated with focal epilepsy may include motor disorders such as tonic seizures, clonic seizures, or myoclonic seizures. In addition, sensory disturbances such as numbness or strange sensations may also occur(Sopandi & Nesi, 2021).

Second, Generalized epilepsy involves both sides of the brain at once. Generalized seizures can cause loss of consciousness and involve movements involving the entire body. This epilepsy has two categories, namely (1) Absence Epilepsy, characterized by a brief loss of consciousness, usually only a few seconds. During this loss of consciousness, the individual may appear “absent” or unresponsive. Absence seizures often occur in children and can affect concentration and learning, (2) Myoclonic Epilepsy, characterized by myoclonic seizures, namely sudden and brief muscle movements. This movement can occur in certain parts of the body or involve the whole body. Myoclonic seizures often occur while the individual is awake and can affect daily activities, (3) Tonic-Clonic epilepsy, known as

grand mal epilepsy, is the most commonly known type of generalized epilepsy. Tonic-clonic seizures are characterized by loss of consciousness, muscle rigidity (tonic seizures), and uncontrolled movements (clonic seizures) throughout the body. After a seizure, the individual may feel tired or confused, and (4) Atonic Epilepsy: Atonic epilepsy is characterized by a sudden loss of muscle tone, which may cause the individual to suddenly fall or lose balance. Atonic seizures can affect an individual's ability to stand or maintain certain body positions. Neurological disorders associated with generalized epilepsy may include motor disorders such as tonic seizures, clonic seizures, or myoclonic seizures. In addition, sensory disturbances such as numbness or strange sensations may also occur.

Third, Unclassified epilepsy refers to seizures that cannot be classified into one of the known types of epilepsy. This may be due to incomplete or inadequate information about seizures or because seizures have unique characteristics or occur infrequently. Unclassified epilepsy may occur in individuals who experience seizures with symptoms that are atypical or do not fit the diagnostic criteria for a known type of epilepsy. These unclassifiable seizures may have unique characteristics or be rare, making it difficult to identify the exact type of epilepsy. The neurological disorders associated with unclassified epilepsy can vary depending on the symptoms present during the seizure. Motor, sensory, or cognitive impairment may occur, depending on the area of the brain affected.

Neurological Mechanisms of Epilepsy

Epilepsy is a neurological disorder characterized by recurrent seizures caused by abnormal electrical activity in the brain. The neurological mechanism of epilepsy involves disturbances in the neural circuits in the brain that control electrical activity. When there is a disruption in this circuit, a series of seizures can occur.

One of the neurological mechanisms involved in epilepsy is ion channel dysfunction. Ion channels play an important role in regulating the flow of electricity within nerve cells. Under normal conditions, ion channels are regulated and control the movement of ions such as sodium, potassium, and calcium in nerve cells. However, in epilepsy, ion channels can become hyperactive or not function properly, resulting in increased electrical activity within the brain.

In addition, the neurological mechanism of epilepsy also involves neurotransmitter imbalance. Neurotransmitters are chemicals that are responsible for sending signals between nerve cells. In epilepsy, there is an increase or decrease in levels of certain neurotransmitters, such as gamma-aminobutyric acid (GABA) which plays a role in inhibiting electrical activity

in the brain. An imbalance of these neurotransmitters can cause nerve hyperactivity and trigger seizures(Nurlailah Ramadhani et al., 2023).

Furthermore, inflammation and nerve cell damage are also neurological mechanisms of epilepsy. When inflammation occurs in the brain, nerve cells can be damaged or die. This nerve cell damage can disrupt normal nerve circuits and cause seizures. Factors that can cause inflammation and damage to nerve cells include infections, head injuries, brain tumors, and other neurological conditions.

According to data from the Indonesian Ministry of Health, it is estimated that around 6 million people suffer from epilepsy in Indonesia. Epilepsy is a chronic neurological disorder characterized by recurrent seizures. This disorder can affect anyone, regardless of age, gender, or social background. Epilepsy can have a significant impact on the life of the affected individual, including interference with daily activities, education, and employment. However, only a small proportion of them receive adequate treatment. This problem is related to the lack of public awareness and understanding of epilepsy, the social stigma attached to this disease, as well as limited access to health facilities and necessary medicines.

In order to overcome the problem of epilepsy in Indonesia, steps need to be taken to increase public understanding of epilepsy, reduce social stigma, and expand access to quality health services. Comprehensive health education about epilepsy should be provided to the public, including information about the neurological mechanisms of epilepsy, symptoms and signs of epilepsy, as well as how to treat seizures and provide first aid.

Strengthen the health service network throughout Indonesia, including medical facilities and medical personnel trained in managing epilepsy. Increasing access to affordable, quality antiepileptic drugs should also be a priority. Governments and health institutions can work together with civil society organizations and international institutions to advocate for the rights of people with epilepsy and fight to improve their quality of life(Mahendrakrisna & Taslim Pinzon, 2020).

In conclusion, the neurological mechanisms of epilepsy involve disturbances in neural circuits, ion channel dysfunction, neurotransmitter imbalance, and inflammation and damage to nerve cells. Epilepsy is a significant health problem in Indonesia, and steps need to be taken to increase public understanding of epilepsy, reduce social stigma, and expand access to quality health services. With the right efforts, epilepsy sufferers in Indonesia can get the care they need to better manage their condition.

Epilepsy sufferers often experience changes in behavior and emotions. They may experience sudden changes in mood, such as depression, anxiety, or aggression. This can

affect their quality of life and social relationships with others. First, a change in mood. Epilepsy sufferers often experience sudden mood swings. They may feel sad, anxious, angry, or restless for no apparent reason. These mood changes can occur before, during, or after a seizure(Access, 2025). Factors such as stress, lack of sleep, or side effects of medication can also influence mood changes in people with epilepsy. Second, depression. A condition that often occurs in people with epilepsy. People with epilepsy have a higher risk of experiencing depression compared to the general population. Depression can affect the quality of life of people with epilepsy and can cause problems in social relationships, work and daily activities. Third, anxiety. People who suffer from Epilepsy tend to feel anxious, worried, or afraid for no apparent reason. Anxiety can affect the quality of life of people with epilepsy and can cause physical symptoms such as stomach aches, headaches, or difficulty sleeping. Fourth, aggression in epilepsy sufferers tends to be irritable, irritable, or difficult to control their emotions. This change in aggressive behavior can affect the social relationships of people with epilepsy with other people.

Treatment Approaches for Epilepsy and Neurological Disorders

Comorbidities are health problems that appear together with the main condition, in this case epilepsy. Epilepsy sufferers can experience various comorbidities, including neurological disorders and psychiatric disorders. The treatment approach for epilepsy and neurological disorders involves a variety of methods aimed at controlling seizures and related symptoms. Treatment of epilepsy and neurological disorders is based on correct diagnosis, recognition of triggering factors, and adjustment of therapy according to the patient's condition(Abdullah & Ikhsani, 2021).

One commonly used treatment approach is the use of anti-seizure medications. This drug works by regulating electrical activity in the brain to prevent seizures. Some examples of commonly used anti-seizure medications include phenytoin, carbamazepine, valproate, and lamotrigine. The choice of medication depends on the type of seizures experienced by the patient and the individual's response to the medication. First, Myoclonic Seizures appear in a variety of symptoms and the response to therapy varies greatly. Sodium valproate is the drug of choice to treat myoclonic seizures. Apart from that, clonazepam and lamotrigine can also be used as alternatives. Other drugs that may be used as adjunctive therapy include clobazam, levetiracetam, and topiranate. Second, Atypical Absence, Atonic, and Tonic Seizures appear in childhood, in specific epilepsy syndromes, or are associated with cerebral damage or mental retardation. This type of seizure responds poorly to traditional therapy. However, you can try giving sodium valproate, lamotrigine, and clonazepam. Second-line therapy including

acetazolamide, clobazam, ethosuximide, levetiracetam, phenobarbital, phenytoin, and topiramate may also be helpful. Third, Focal Seizures (Partial Seizures). Anti-seizure drugs used to treat focal seizures include phenytoin, carbamazepine, valproate, and lamotrigine. Phenytoin is a drug commonly prescribed to prevent and relieve seizures in people with epilepsy. This drug is included in the class of anti-seizure drugs which are effective for treating partial tonic-clonic and complex seizures in people with epilepsy. The drug carbamazepine helps inhibit the flow of sodium in the brain, thereby reducing abnormal electrical activity between nerve cells. This drug is used to control seizures in parts of the body. Sodium valproate is the drug of choice for treating myoclonic seizures and can be tried in tonic, atonic, and atypical absence seizures. This drug can also be used as additional therapy for focal seizures. Lamotrigine can be used to treat myoclonic seizures and can be tried in tonic, atonic, and atypical absence seizures. This drug can also be used as additional therapy for focal seizures(Saputra, 2022).

Apart from anti-seizure drugs, another therapy that can be used is ketogenic diet therapy. This therapy involves consuming foods with very low carbohydrate levels and high fat content. The ketogenic diet has been shown to be effective in reducing the frequency of seizures in some patients with difficult-to-control epilepsy. In the ketogenic diet, the body is directed to switch from using carbohydrates as the main energy source to using fat. This can be achieved by limiting carbohydrate consumption to around 20-50 grams per day, depending on individual needs. In this condition, the body will produce compounds called ketones, which can be used as an alternative energy source. The ketogenic diet has been used as a treatment method for epilepsy since the early 20th century. Various studies have investigated its effectiveness, especially in reducing the frequency of seizures in patients with difficult-to-control epilepsy. Several studies show that around 50-70% of patients experience a decrease in seizure frequency after undergoing a ketogenic diet. Although the exact mechanism of how the ketogenic diet works in reducing seizures is still not completely understood, there are several proposed theories. One is that ketones can have a direct anti-seizure effect on the brain. In addition, the ketogenic diet can also improve blood sugar stability, reduce inflammation, and influence neurotransmitter activity in the brain, all of which can contribute to reducing seizures.(Putra et al., 2022).

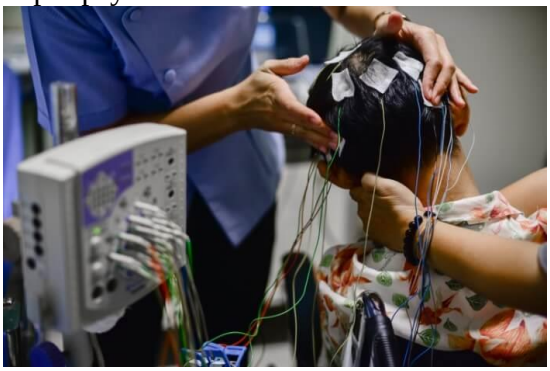
Surgical therapy may also be an option for some patients with epilepsy and neurological disorders that are severe and difficult to control with medication. This surgical therapy involves removing the area of the brain that causes seizures or brain stimulation that can reduce seizure activity. Surgical therapy for epilepsy involves removing the area of the

brain that causes seizures. This procedure can be performed using a variety of surgical techniques, including lobectomy, hemispherotomy, and corpus callosotomy.

First, Lobectomy. A procedure in which part or all of the lobe of the brain involved in the seizure is removed. This is usually done if the seizure originates in one particular lobe of the brain, such as the temporal lobe. In some cases, removal of the entire temporal lobe may be necessary to achieve effective control of seizures. The following are the steps taken by a surgeon when performing lobectomy surgery on an epileptic patient:

1) Patient Selection: Before performing lobectomy surgery, the surgeon will select the patient. Patients recommended for this surgery are epilepsy patients who cannot be controlled with medication. Additionally, patients must also undergo a series of tests and evaluations to ensure that surgery is the best option for them.
2) Identify the Point of Origin of Seizures: In a lobectomy procedure, the neurosurgeon will remove the part of the brain identified as the point of origin of the seizure. In patients with epilepsy, seizures usually begin from a clear focal point that can be identified through electrical testing such as an electroencephalogram (EEG). Electroencephalogram (EEG) electrical testing is used to record electrical activity in the brain and assist in the diagnosis of epilepsy and other brain disorders 1. The following are the stages and formulas used in EEG testing:
   - Preparation:
     a) Patients will be asked to wash their hair the night before testing.
     b) Patients should not use hair products such as gel or spray on the day of testing.
     c) Patients should tell their doctor about the medications they are taking.
   - Electrode Installation:
     a) Small electrodes made of metal discs will be placed on the patient's scalp.
     b) This electrode will be used to record electrical activity

Figure 1.
Electrode Installation in Epilepsy Patients



3) Removal of Part of the Brain Involved: Once the point of origin of the seizure is identified, the surgeon will remove the part of the brain involved in the seizure. In lobectomy surgery, the part of the brain that is removed is usually the temporal part affected by epilepsy. Complete removal of sclerotic structures in this part of the brain can produce the best results in eliminating seizures.
4) Postoperative Recovery: After lobectomy surgery, the patient will undergo a recovery period in the hospital. The doctor will monitor the patient's condition and provide the necessary treatment. Patients will also be given instructions regarding surgical wound care, use of medications, and precautions to follow during the recovery period.
5) Follow-up: After lobectomy surgery, the patient will undergo follow-up with the surgeon and epilepsy doctor. Patients will be monitored to see the development of their epilepsy condition and adjust treatment if necessary. Additional therapies such as physical therapy or speech therapy may also be recommended to help the patient recover(Kosasih & Wahyudi, 2023).

Second, Hemispherotomy. A more invasive procedure in which one half of the brain is removed. This is done if the seizure spreads to all half of the brain and cannot be controlled with medication or simpler surgical procedures. Hemispherotomy is usually only performed on patients with very severe and difficult-to-treat neurological disorders. Third, corpus callosotomy, a surgical procedure in which the connecting fibers between the two halves of the brain are cut. This stops the spread of the seizure between both halves of the brain, thereby limiting the seizure to only one half of the brain. This procedure is usually performed on patients whose seizures are very severe and do not respond to medications or other surgical procedures.

Fourth, Vagus nerve stimulation involves placing a small device under the skin on the patient's chest. This device sends electrical signals via the vagus nerve to the brain, which can reduce seizure activity. Vagus nerve stimulation therapy is usually used in patients with epilepsy that is difficult to control and does not respond to medications or other surgical procedures.

Although surgical therapy can be an effective option for some patients with epilepsy and severe neurological disorders, this procedure is not always suitable for everyone. Each patient should be evaluated individually by a trained medical team to determine whether surgical therapy is the best option for them. Apart from that, surgical therapy also has risks and side effects that need to be considered. Some of the risks associated with surgical treatment of epilepsy include infection, bleeding, nerve damage, and changes in cognitive

function. Patients considering surgical therapy should understand all the risks and benefits associated with the procedure.

In order to achieve optimal seizure control, it is important for patients to adhere to an established treatment schedule, avoid known trigger factors, and live a healthy lifestyle including a balanced diet and adequate rest. Apart from that, family support and a good understanding of this condition can also help patients deal better with epilepsy and nervous disorders. With the right treatment approach and adequate support, patients with epilepsy and neurological disorders can achieve good seizure control and improve their quality of life. It is important to remember that each case can be different, therefore consult with the relevant doctor or neurologist to get the treatment that best suits individual conditions.

CONCLUSIONS AND RECOMMENDATIONS

This research identifies that epilepsy is a disease that affects the nerve tissue in the brain. Irregular electrical activity in the brain can cause epileptic seizures. Epilepsy can be caused by various factors, including head trauma, genetic disorders, and brain infections. Additionally, epilepsy can affect individuals of all ages, with children and young adults being more susceptible to the disease. A better understanding of the mechanisms of epilepsy and the risk factors associated with it may help in the development of more effective treatment strategies and better prevention for epilepsy. Based on the research results, researchers will recommend several steps that can be taken to improve understanding and treatment of epilepsy. First, it is important to continue conducting further research into the mechanisms of epilepsy and the risk factors associated with it. This will help in developing more sophisticated approaches in the treatment and prevention of epilepsy. Furthermore, further studies need to be carried out to understand the long-term effects of epilepsy on the brain and cognitive function. By better understanding the impact of epilepsy, we can develop better interventions to improve the quality of life of epilepsy patients. Lastly, we encourage collaboration between researchers, medical practitioners, and epilepsy patients to bring greater awareness to the disease, reduce the stigma associated with epilepsy, and increase the accessibility of health services for those affected by it. In order to achieve this goal, greater support and funding for epilepsy research is needed. Governments, health foundations, and research institutions must commit to supporting research focused on epilepsy. In addition, it is important to increase public awareness about epilepsy through educational campaigns and accurate information. By improving the understanding and management of epilepsy, we can

help improve the quality of life for epilepsy patients and move towards a society that is more inclusive and caring for people living with epilepsy.

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