



AN OVERVIEW OF NEUROLOGICAL DISORDER: EPILEPSY

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Abstract:

Epilepsy is one of the neurological disorder which is typically a unusual changes in electric impulse of brain and it affected millions of people around the world. It may acquire through genetic inheritance or physical head trauma. Basically, epilepsy is identifiable by seizures, generalized and focal seizures are the two types. Which generally initiated by high frequency flare up of the action potential and increased synchronization of neuronal population. This neurological disorder condition is a result of the pathogenesis of various brain environment affecting comorbidity consequences of various disease such as cerebrovascular disease and some seizures can also show the signs of the actual stroke. Antiepileptic drugs may help to reduce the symptoms such as benzodiazepines and it can be diagnosed by impacting identifying procedures such as the EEG (Electroencephalogram) also by neurological examination. A Surgery can help to remove the affected region by a neurosurgeon. This neurological disorder is the most common medical chronic conditions, it seems that in 100,000 population there are almost 50% case appear per year. But almost 80% of epileptic patients controlled by medications. As far as this neurological disorder goes to generations to generations by far some patients can't able to show some positive response to the actually pharmacological drugs. This neurological disorder condition is not only seems to appear in this modern age it also appeared in the olden ancient days. Some epilepsies appears to be in the form of idiopathic which came to appear around the fourty percentage of the entire people who are affected by this neurological disorder medical condition epilepsy around the world which shows a difficulty joined and combined the part of the Inheritance which is in genes In a straight structure to perform in the another way to the patient who are affected by this neurological disorder medical condition to produce a important pointed systematic syndrome But some types of this neurological disorder condition epilepsy found to be more common in people with the family history. This article reviews an overview of epilepsy as its types and classification, treatment d drugs, pathophysiology, epidemiology and causes, symptoms and diagnosis.

Keywords:

Epileptic seizures, Electroencephalogram, Neurological disorder, genetic factors, Antiepileptic drugs, Electric impulse rhythm.

Introduction:

Epilepsy is a neurological disorder condition which can identified by happening of two or more seizures, Seizure is the transient evidence of symptoms due to unusual electric impulse neuronal activity in the brain. Signs of epilepsy may include some changes in the cognitive and sensation, autonomic and behavioral changes, and many conscious balance changes, and seizure events. Epilepsy also may happen due to a result of a genetic disorder or an acquired brain injury such as head trauma or stroke (4). But in Asia, epilepsy is common and more than 1 million cases per year are seen in statistics and there are two classifications of epileptic seizures are seen. Epilepsy may develop later after depressed fractures or large hematomas. Injury itself may have appeared trivial in children. After severe injuries early development of this disorder may happen (2). This neurological condition can't be cured, the Anti-epileptic drugs which are prescribed by neurologist can help to reduce the symptoms. Patients can live normal life if they had right precise treatment and diagnosis (13). Epileptic Seizures differentiates the seizure which is induced by unusual electric impulse rhythm of neurons. Epilepsy can be induced by a brain partition environment malfunction which is typically a result of multiple brain affecting comorbidity consequences of a neuronal disorder. It seems that about 76 percentage of this neurological disorder medical condition epilepsy induces in the life time period of the childhood, giving the evidence of triggering the way of pathogenesis

marks, making the brain to force its neurological healthy condition environment to the disorder medical disorganization the seizures (10). Multiple of uncontrollable seizures happening in a duration of less than the twenty-four hours increases the probability of getting this neurological disorder condition epilepsy, which further increases the inducing threat of uncontrollable seizures almost 61 percentage over the ten years, and it appears that the chain of the clinically proved properties which happens again and again joined with familiar variant of the seizure. Some epilepsies appears or induced due to no reason which came to appear around the fourty percentage of the entire people who are affected by this neurological disorder medical condition epilepsy around the world which shows a difficulty joined and combined the part of the Inheritance which is in the chain of DNA binded In a linear structure to perform in the another way to the patient who are affected by this neurological disorder medical condition to produce a important pointed syndrome (8). The disease which is affecting the cerebrovascular parts, it came to find out its also induces the increased probability of getting both acute seizures and epilepsy (4). Which may even have a negative impact of the consequences showing the symptoms. The seizures can happen around the duration of 7 days of signs of the actual stroke. Another form of cerebrovascular disease is the intra cranial hemorrhage which is a most inducing part of the epilepsy (9). Some patients show positive result and response to the specific antiepileptic drug medications and unfortunately some patients not showing a positive response to the drugs which in turn results the final treatment Surgery by a neurosurgeon specialist to remove affected region (3).

Classification Of Epileptic Seizures:

Epileptic seizures are segmented into focal or partial seizures and generalised seizures based on the unique fluctuation in the brain's electrical activity. A new naming convention for this type of epilepsy is the group of combined generalised and translocated epilepsy. Either tonic or epileptic spasms will also be used to elucidate motor area seizures. A cognitive arrest is predominantly seen in cognitive seizures (23). As for this neurological disorder condition, the International League Against Epilepsy partitioned and released epileptic seizures in to other two broad categories, namely focal seizures and generalised seizures, pursuing dozens of reports and commission members' relevant data and opinions to provide an opportune nearly concise characterization for further modernization (26). The neurologist will be capable of giving the affected patient an effective treatment that will help them survive by amassing the pertinent family history, the results of the specific diagnostic test for this neurological disorder condition, such as the Electroencephalogram, and some additional facilitating and influencing relevant data. If left untreated, some of these epileptic episodes annotated as such necessitate surgery. There was an incident of a pervasive seizure that appeared in Berlin in 1977. Although there have been numerous attempts to define epileptic seizures, we still possess the requisite knowledge and intelligence pertaining predefined neurological illnesses (14). The most suitable approach to discern the difference between those many types is to measure its results. The signs of this illness to compartmentalize it. To define the diverse array of this neurological illness condition, it is essential to comprehend a wide set of possibilities, including that of the pathophysiology of the disorder and its symptoms. Between the complex and partial, there is a fundamental distinction. The onset of seizures culminates in a diminished capacity for change in the conscious division (6). Nonetheless, in the treatment protocol to the segmentation of seizures, partial onset is may be in the temporal, extra temporal, and a lesional and non-lesion lands pervasive onset may be idiopathic, symptomatic, particular syndrome, and specific disease. Idiopathic conditions could have hypothesized or common underlying causes (no lesion; no neurological deficit; often age dependent). The origins of cryptogenic symptoms is undetermined, but they may entail structural or metabolic implications (12). Heterogeneous epilepsy syndromes, which can aggravate both focal and ubiquitous seizures, can cause systemic the complete collapse of the brain. Evidently, low-amplitude headaches, particularly ones between 8 Hz, sleepiness, agitation, or sleep manifest throughout that known and important subset of the neurological disorder epilepsy (15).

Focal or Partial Seizures:

They are alluded to as focal or partial seizures when only one part of the brain is influenced by an atypical electric impulse during a seizure. These seizures are triggered by a specific region or partition of the neuro connectome in one of the cerebral sides of the brain (18). It's pretty much exactly changes in brain activity which purports to emanate from a specific region of the brain. Attribution of the specific or accurate localized seizure origin in the particular patient is fundamental in therapeutic option. The Electroencephalogram (EEG), a diagnostic and testing tool for the neurological disease of epilepsy, monitors these parameters (10). Therefore, based on clinical interrogations, it may have many varieties of mechanisms, and focal seizures are further split into two types based on the ability of the implicated area (17).

1. Simple Focal Seizures:

The first critical element about this straightforward focal seizure is that it has no repercussions and doesn't cause consciousness loss. These convulsions may significantly change emotional components as well as the manner that alludes sound, feel, appear, smell, and taste (1). Furthermore, they may have an effect and cause sensory momentary symptoms such as tingling, dizziness, and flashing lights, as well as the voluntary shaking about certain body parts, such as with the arm and leg (11).

2. Complex Partial Seizures:

These forms of seizures can be perceived by the focal seizures' activities and the temporary reduction in the patient's ability to retain a steady link or touch with the outside world (21). During this variety of neurological disease, which is a complex seizure, the patient suddenly finds it difficult to immediately respond to visual or verbal cues or directives, and the patient has a low impacted accumulation of the ictal phase. Typically, persons who have simple partial seizures will cause or enflame seizures (23).

Generalized Seizure

Generalized seizures are associated with the reduction of sensory perception and violet muscle contractions that are typically managed to bring on by significantly lower blood sugar and a stroke. These seizures are best described by an unusual electric impulse rhythm that initially appeared to be all over the area of the brain during the seizure (1). It only quickly enhances both cerebral hemispheres, increasing the contraction of the muscles that they may aggravate to "cry" as a result of the abrupt cessation of airflow over the glottis and from a sudden, shaking tonic contraction (19). The patient's limbs and body become stiff with extension. There are six various variations of generalised seizures (12).

1.Tonic seizures:

These seizures typically happen at night and are perceived by a sudden hardness or a strong trembling in the muscles of the arms and legs. The tightness lasts for about 20 seconds (16). These seizures may emerge while the person is standing, which might also aggravate them to trip or fall. Following the seizure, they might appear confused or depleted (27).

2.Clonic seizures:

The highly prevalent wanking of the arms and legs on one or both sides of the body, as well as the incidence of numbness and tingling, are signs of these types of seizures (26). They typically cause a rhythmic shaking of the muscles in the arms, neck, and face (15).

3.Absence seizures:

It is also referred to as petit-mal, and is distinguished by its glaring and subtle body movements. The main potential of this seizure neurological disorder is that these kinds of seizures might cause a prolonged loss of awareness (17). These types of relatively brief seizures may be linked to genetic inheritance factors, and they can take a variety of forms, including genetic generalised epileptic seizures like CAEs (childhood absence seizures) (26).

4.Atonic Seizures:

These are also referred to as "drop seizures" because of their tendency to make people lose control of their muscles or become paralysed. Which could result in an abrupt collapse and falling (6). The patient typically remains conscious despite the extent of the seizure's capacity to weaken the patient's muscles. Atonic seizures are typically distinguished from myoclonic or tonic seizures by a sudden paralysis of muscular tone (28).

5.Tonic-Clonic seizures:

Grand mal seizures, also referred to as tonic-clonic seizures, are determined by an exclusive experience of loss of consciousness and violent muscle jerking movements. Sometimes they are caused by strokes and low blood sugar levels, and they can start with an aura, a simple partial seizure that can progress to a grand mal seizure if the patient experiences changes in sensation or emotion (29).

6.Myoclonic seizures:

These seizures are frequently associated with atonic seizures and can result in abrupt, rhythmic, jerking movements that are followed by an electric shock-like sensation. They typically start in childhood and are referred to as juvenile myoclonic epilepsy (7). They rarely last more than a few seconds, and during the wanking movements, the patient may perceive some unusual discomfort in their body (27).

Psychogenic Non-Epileptic seizures:

A neurological disease condition known as a neurobehavioral condition at the interface between neurology and psychiatry is known as a psychogenic non-epileptic seizure (20). Although it might be challenging to distinguish between psychogenic non-epileptic seizures and epileptic seizures, most epileptic seizures in patients have the sign of the eyes being open, whereas in about 95 percent of non-epileptic seizures, the eyes are closed (21). There may be some negative consequences if antiepileptic medicine is consumed more frequently over a lengthy period of time (23). Many individuals with psychogenic non-epileptic seizures frequently seek medical attention, and they are treated for more than 360 months with a lot of antiepileptic medicine (22). The

evidence demonstrates that whereas generalised mixed epileptic seizures don't seem to terminate after surgery, psychogenic non-epileptic seizures occasionally end when a patient has a successful operation (24). Although a neurologist regularly prescribes the current medical standard of care, psychotherapy is strongly advised for patients with psychogenic non-epileptic seizures (25).

Epidemiology:

Nearly 2.5 million individuals consume this neurological illness test result each year. One of the most pervasive severe neurological disorders, epilepsy affects somewhere around 65 million individuals worldwide. By the age of 20, it influences 1% of the population, and by the age of 75, it affects 3% of the population (3).. The overall difference between some of the prevalence of the condition in men and women is small, and the preponderance of cases—80%—are also in the initial phases of development worldwide. Although it can happen at any age, it is invariably seen in children or teenagers. About 30% of patients have it under close monitoring thanks to drug treatment (19). Even so, epilepsy has a negligible mortality risk roughly equivalent to other neurological disorders. Nonetheless, when comparing, a tremendous disparity in death rates is envisaged. People with this epilepsy have a higher risk of dying compared to the general population due to lapses in keeping the right treatment and diagnosis at the right time, regardless of the frequency and prevalence researches undertaken among children, adults, and people with idiopathic and symptomatic seizures (11). But when comparing statistics amongst men and women, men had a somewhat higher standard mortality ratio (9). If we look at a graph throughout 2016, there are more idiopathic cases in every nation. As a result of improved cleanliness practices and other reductions in adverse health outcomes and epileptogenic factors, communicable disease has decreased dramatically. Furthermore, the incidence of contracting the neurological ailment epilepsy at some point during a person's lifespan is elevated in roughly one out of every 26 persons (22). Thus, epilepsy, a neurological ailment, can arise at any time, whether it be childhood or adulthood. Nonetheless, epilepsy can emerge in young infants as young as 2 years old or adults as old as 66. In terms of this disease, statistics show that in the United States of America, approximately 1,181,210 individuals are impacted by the neurological disorder condition epilepsy, compared to roughly 4,101,737 people in India. These statistics can be seen through the year 2016. According to projections from 2015, there were more than 39 million people plagued by this neurological disorder condition, which was at the time the most prevalent neurological disorder condition. It emerges that very 1% of individuals beneath 20 and 3% of people over 75 have always been affected by epilepsy (25).

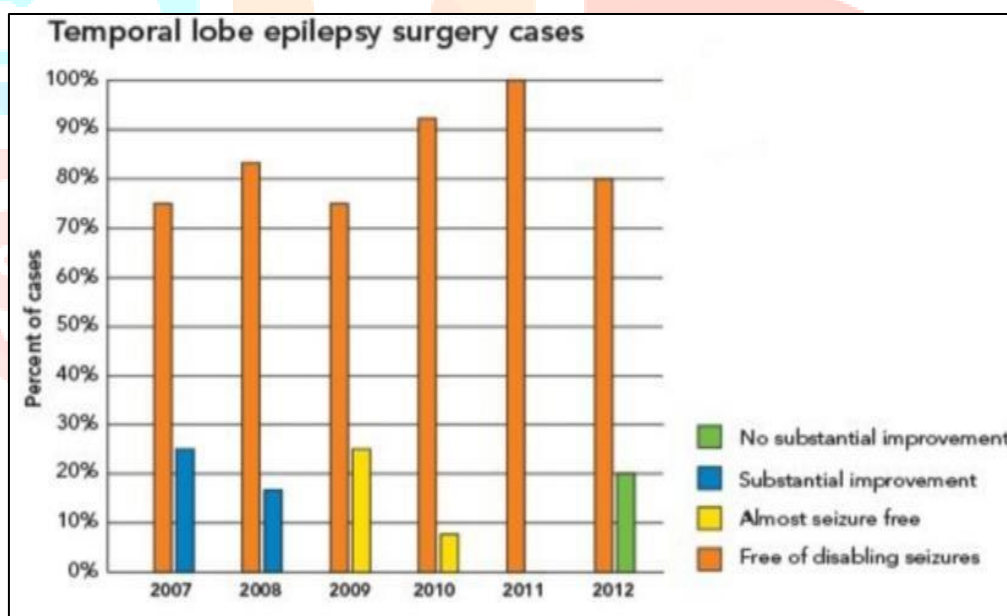


Figure.1 Graph of temporal lobe epilepsy Surgery cases

Etiology:

Pertaining this neurological condition, there is no information that can be located. The reasons for fifth of the people could be several. Similar to circumstances that affect newborns, including acute CNS infectious diseases, perinatal hypoxia, congenital anomalies, and trauma, brain tumours in adults and adolescents can also result from strokes and vascular diseases (2). When epilepsy is detected through a diagnosis test, it is sometimes attributable to other neurological problems like a brain tumour or a stroke. Other things that can cause epilepsy include genetic abnormalities, brain infections, genetic developmental disorders, and prenatal injuries. Although, in terminology of the neurological problem condition epilepsy, around half of those plagued by it do not have any precise reason (17). Here, we can assume that a broad spectrum of factors, together with traumatic brain injury, post-traumatic epilepsy—brain scarring alongside a brain injury—serious illness or exceedingly high fever, stroke, which causes about half of epilepsy problems, and cases in older adults with an idiopathic undisclosed purpose all play a part to this neurological disorder condition. Hypoxia or oxygen depletion in the brain, a brain cyst or tumour (13). Specific medications taken by mothers, birth injuries, brain damage, or a lack of oxygen after delivery, as well as viral diseases including the human immunodeficiency virus,

acquired immune deficiency syndrome, and inflammation of the meninges, or meningitis, are all contributing factors of meningitis. Troubles of development, genetics, or neuropathies (15).

Researchers first observed genes involved with the neurological ailment epilepsy in the late 1990s, and they soon revealed what appears to have been more than 500 genes, some of which have been attributed to the various forms of epilepsy (13). Not all genes have been attributed to the epilepsy that is likely to run in families or throughout generations. Nevertheless, it has been discovered that some manifestations of the neurological ailment epilepsy are more prevalent in persons who have a family history of it. Furthermore, even if a youngster inherits the gene for the neurological disorder condition epilepsy, they are prone to developing it by the time they are 40 years old (14).

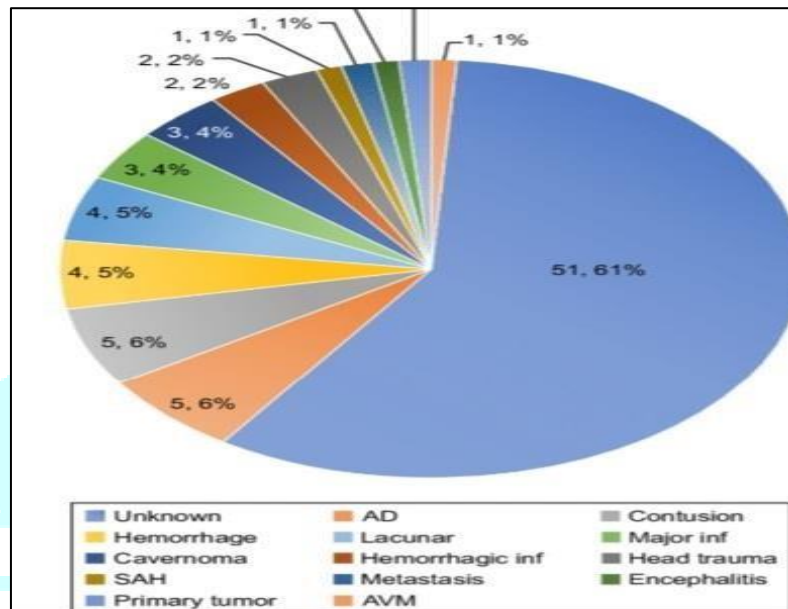


Figure.2 A pie chart showing the percentage of epilepsy etiology.

Pathophysiology:

The onset of a seizure is signalled by two neurological occurrences. One is the firing of a powerful wave of action potential and another one is neuron's environment is hyper synchronized (7). The EEG's so-called spike discharge is actually a collection of linked bursts from a large number of neurons.. Single-neuron activity in the epileptic form consists of continuous neuronal depolarization that produces spikes of the action potential, followed by a fast repolarization and hyperpolarization (27). The terminology "paroxysmal depolarizing shift" refers to this sequence. Multiple discharges may trigger calcium ions to get into the presynaptic terminal. The mechanism by which the partial seizures spread is called propagation (28). More calcium reflux and neuronal activation are brought on by the depolarization-induced stimulation of NMDA subtype receptor. Depending on the type of cell, GABA receptors and the chlorine ion reflex mediate the subsequent neuronal excitability after the potential. Status epilepticus refers to the failure of endogenous seizure termination in a life-threatening circumstance (18). Epilepsy typically results in higher levels neuronal excitement stage firing, which is a neurological disease condition. A central nervous system disorder or uncommon triggering elements such trauma, impaired oxygen supply or lack of oxygen transport may be to fault (16). However, it indicates that, as far as this neurological problem of epilepsy is concerned, the other half of those who have it do not appear to be influenced by any specific or significant contributory components. However, the underlying issues and. However, it appears that, as far as this neurological illness of epilepsy is involved, the other half of those who have it do not appear to be impacted by any specific or significant causative causes. However, the pathophysiology and underlying origins of some of the subsets of epilepsy are somewhat understandable (12). The types of disorders that affect the neuronal electric impulse rhythm are the most common developmental disorders that are paving the way for this neurological disorder condition. These neurological disorders may have genetic causes (30). Numerous researches have been done, and some of the outcomes indicate that the microgyria area has enhanced glutamate receptors while lowering GABA receptors. cortical provinces that may encourage epileptogenesis (3). According to study, auditory attributes of an epilepsy type called autosomal dominant partial epilepsy, such as auditory hallucinations, can be used to pinpoint it (5). The conspicuous interaction between cytokines, glutamate, and GABA reveals a future interactions to the cytokine-mediated alterations in neuronal firing amplitude that support the neurological condition seizure and the concomitant neuropathy (18). More evidence points to the intervention of miRNAs in the development of neurons, and it turns out that they are pivotal to the pathophysiology and mechanism of epilepsy (16).

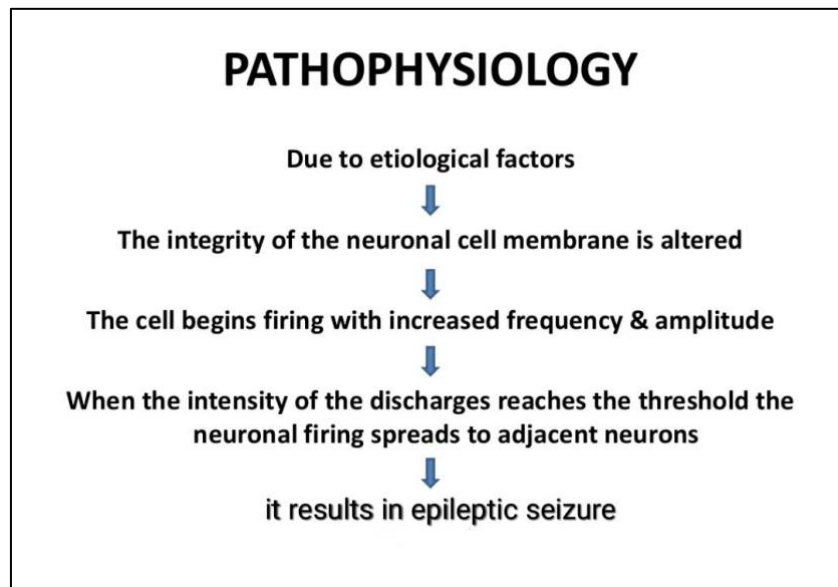


Figure.3 A flow chart Showing the pathophysiology of epilepsy

Symptoms:

Symptoms may include during epileptic seizure time, the patient may experience such as the Pain in the head, Sudden weakness, Vision changes, shaking movements of arms and legs, Body sensation loss, consciousness loosing, Falling, Teeth Clenching, Tongue biting, Bladder and bowel control loss, A sudden feeling of being sick, fear and anxiety, Strike of unusual muscle spasm and confusion. The symptoms can last anywhere from a few seconds to 15 minutes per episode which is caused by unusual activity in brain cells (26). These symptoms may differ in some types of epilepsy, for example if there is any behavioral arrest it belongs to non-motor seizures. But many symptoms you can simply observe in those period of epilepsy strikes the jerking movement of muscles in those patients who are affected by neurological disorder condition. Symptoms goes worse day by day, if left untreated it can be a fatal end. Also, Symptoms gets worse in generalized seizures and the seizures which causes is still unknown which are idiopathic (3). Sometimes in negative temperature or chillness, it can induce this disorder due to making the neurons fire more. Sometimes patient may experience some sort of sensation aura and pine needles, and psychological effects such as the depression and anxiety, amnesia and staring spells and sometimes lapses of memories and loss of awareness and kind of fuzzy feeling which is the confusion (24). Some sort of mini seizures feels like you are paralyzed and disconnected too other. Most of the patient will forget the memory about that happening of epileptic seizures (4).

Treatments And Drugs:

The pharmacological drugs which involve in the process of the modulation of voltage dependent ion channels such as Carbamazepine, oxcarbazepine and Phenytoin. These antiepileptic drugs may help in primary generalized tonic seizures, partial seizures, absence seizures and for the enhancement of activity of major inhibitory neurotransmitter of brain GABA, drugs such as Benzodiazepines, Phenobarbital, Tiagabine and for the Suppression of excitatory neuro transmission: drug such as Lamotrigine, Felbamate. A Surgery may help to remove the area of brain which causes seizures (8). First drugs in site of the modulation of ion channels involves in sodium channel blockade which is the drugs such as the Carbamazepine and Phenytoin and for the potentiation of GABAergic transmission drugs such as Benzodiazepines and Phenobarbital may affect and for the modulation of voltage gated calcium channels via the alpha 2S regulatory site drugs such gabapentin and pregabalin may show site of pharmacological action and the blockade of T-type calcium channels drug such as ethosuximide can help and For the SV2A-Mediated modulation of transmitter release drugs such as levetiracetam and brivaracetam can show its site of pharmacological action and For the enhancement of potassium currents Retigabine can help and for the antagonism of AMPA receptors Perampanel can help and additional mechanism can lead to the clinical effects (30). Sometime dietary changes can help and sometimes A Surgery can help to remove the affected area by a neurosurgeon and those who unable to response a positive result in those antiepileptic medications also need a Surgery (4) and nerve pain medications and sedative also given to the patient to have some normal effect to counter and this neurological disorder condition only treated by usually as prescribing those antiepileptic medications. Enzyme inducing drugs such as those mentioned early like phenytoin, they may increase the metabolism of hormones such the progesterone and estrogen and further decreasing its concentration up to 50 percent (29). Basic fundamental mechanism is induced to connect with the clinical information in the first treatment of level with benzodiazepines but after the that evidence of information is not highly clear (16). One of the Antiepileptic drugs such as phenytoin which appears to have an average half-life of 24 hours.(17)

Drug	Mechanism(s) of action(site of action)
Phenytoin	Na ⁺ channel blocker
Phenobarbital	GABA potentiation
Carbamazepine	Na ⁺ channel blocker
Valproate	Multiple: GABA potentiation, glutamate (NMDA) inhibition, Na ⁺ channel blockade, T-type calcium channel blockade
Clobazam	GABA potentiation
Gabapentin	Ca ²⁺ blocker ($\alpha 2\delta$ subunit)
Pregabalin	Ca ²⁺ blocker ($\alpha 2\delta$ subunit)
Oxcarbazepine	Na ⁺ channel blocker
Eslicarbazepine acetate	Na ⁺ channel blocker
Lamotrigine	Na ⁺ channel blocker
Levetiracetam	SV2A modulation
Topiramate	Multiple: GABA potentiation, glutamate (AMPA) inhibition, sodium and calcium channel blockade
Zonisamide	Na ⁺ channel blocker
Perampanel	Non-competitive AMPA antagonist
Lacosamide	Enhanced slow inactivation of voltage gated Na ⁺ channels

Figure.4. A table showing the Anti-epileptic drugs and its site of action

Diagnosis And Test:

•Neurological Examination:

This examination typically finds how well the brain is and its rest of the nervous system are functioning and it may test cognitive and motor and mental functions and other areas to diagnose this neurological condition and this neurological disorder condition epilepsy (26). The main objective of this examination is to find the ability to tell whether the objects that are cold, hot, smooth or rough on a person so if the neurological examinal product identification time is exceeded when compare to standard volume then neurons of that neurological disorder condition affected patient is abnormal in function (22).

•Electroencephalogram (EEG):

An electroencephalography test can induce the ways for to diagnose the neurological conditions of seizure. These tests can be succeeded by measuring brain waves and viewing brain waves during the unusual electric impulse neuronal activity which can help to diagnose the variant of those specific seizure (6). EEG enables the ways to measure the neurophysiological functions (7). This graph is widely used and allows various researchers to collect the EEG data. It's also providing a relative duration of the nearly numerous neural events (27).

•Neuroimaging:

Computerized Tomography scan (CT) and Magnetic Resonance imaging (MRI) such imaging scans and including functional Magnetic Resonance Imaging, Position emission Tomography or single photon emission computerized Tomography also can help in various ways to provide the nearly a clear image of brain affected internal environment and these specific scans can help to allow to look abnormalities like tumors or blocked blood flow (8). The most common tool for the examination of trauma and brain disease is the structural MRI (12).

•Neurophysiological Tests:

These specific tests are performed to assess some cognitive or thinking, memory, and speech skills. The result of this test can help to determine which specific area of the brain affected by a seizure or some neurological disorder condition (7). This tests basically provides a general or specific data about that cognitive performance. So, there are several factors affecting the cognitive area ability and this test will impact on the level of the performance of the individual comparing the normal measures of the standards. This test assessment indicated when there is an injury potential in cognitive functioning or some degenerative dementia (8).

Conclusion:

Epilepsy is a serious neurological condition which affects more than 65 million people in world. Still there are many helpful antiepileptic drugs to reduce the symptoms. It can be acquired through head trauma, genetic disorder it can occur to people at any age. There are several types of this neurological disorder which results in various changes in brain and muscle coordination and it may last in just few seconds of time. Still there are so many researchers are trying to find the right cause of this neurological disorder condition epilepsy which in future may come to know as far as this disorder goes, several people are affected in many causes of trauma and accidents. Many diagnosis procedures are available to diagnose such as EEG, and test procedures to get a accurate information about the type of the epileptic seizures. If there no response in the drugs in site of action a Surgery is potentially a helpful procedure to remove the affected part.

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