

# Review Epidemiology and Treatment Pattern of Epilepsy

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## Abstract

In this project work we discuss about different types of epilepsy. Epilepsy is 4th most common neurological disorder affecting 65 million peoples worldwide. According to epilepsy foundation of America, he found that approximately 45000 peoples are dead due to epilepsy. It is categorized into two main types i:e partial seizure (affecting small portion of brain) generalized seizures( covering all portion of brain). Several etiological factors responsible for causing epilepsy such genetic, CNS infection, metabolic disorders, miscellaneous. Epilepsy is caused due to imbalance between glutamate and GABA neurotransmitters. Abnormal jerking movement, confusion, fatigue, repetitive blinking are some common symptoms of epilepsy. While diagnostic test such as EEG, CT scan, PET scan, MRI and other treatment such ketogenic diet, vagus nerve stimulation, help to many people of all age who live with epilepsy. Today's several antiepileptic drugs are available such as phenytoin, carbamazepine, ethosuximide, phenobarbital, may help to treat al l types of epileptic seizures. So there is need to continue research on it to treat all epileptic problems worldwide.

## 1. INTRODUCTION:-

Epilepsy is a chronic disorder of the brain that affects people worldwide. Epilepsy is a chronic Non communicable disorder of the brain that affects people of all ages. It is characterized by recurrent seizures, which are brief episodes of involuntary movement that may involve a part of the body (partial) or the entire body (generalized), and are sometimes accompanied by loss of consciousness. There are over 2.5 million people diagnosed with epilepsy every year. Epilepsy is one of 4th most common serious neurological disorder affecting about 65 million people globally. It affects 1% of the population by age 20 and 3% of the population by age 75. Nearly 80% of the people with epilepsy live in low and middle-income countries. According to Epilepsy Foundation of America, he found that approximately 45,000 peoples are dead due to epilepsy. The estimated proportion is between 4 to 10 people /1000 is suffering from epilepsy. During the 20th century, the invention of EEG, the advance in neurosurgery, the discovery of antiepileptic drugs, and the delineation of underlying pathophysiological mechanisms, were the most significant advances in the field of research in epilepsy. Now a days different antiepileptic drugs are available to treat seizure. <sup>1</sup>

## 2. AIM:-

To perform a systematic literature review of studies in reviewed journals on the epidemiology and treatment pattern of Epilepsy.

## OBJECTIVES:-

People living with epilepsy can be targets of discrimination and experience lower quality of life. treatment in patients with epileptic seizures is to achieve a seizure-free status without adverse effects. This goal is

accomplished in more than 60% of patients who require treatment with anticonvulsants. Despite development in the last twenty years of the antiepileptic drugs, patients with epilepsy manifest resistance to pharmacotherapy. several antiepileptic drugs are available such as phenytoin, carbamazepine, ethosuximide, phenobarbital, may help to treat all types of epileptic seizures. So there is need to continue research on it to treat all epileptic problems worldwide. This paper is to correlate the concept of drug resistant epilepsy with the ways of diagnosis, treatment and impact on quality of life based on available data from literature.

### 3. LITERATURE REVIEW:-

#### 1) Carl E. Stafstrom and Lionel Carmant Cold Spring Harb Perspect Med.

Invent that, the exact term about neurological Disorder are given by Carl E. Stafstrom and Lionel Carmant in the form of seizure and Epilepsy Epilepsy is a chronic form of seizure which is a sudden rush of electrical activity in the brain.

#### 2) Andres M Kanner *et al.*

To update gives information about guideline for treating new-onset focal or generalized epilepsy (GE) with second- and third-generation antiepileptic drugs (AEDs)

#### 3) Ram Sankaraneni *et al.*

The treatment options for epilepsy have come a long way from the bromides to the current era in which we now have multiple treatment modalities, including medications, implantable devices, and surgery.

#### 4) Carl E. Stafstrom and Lionel Carmant *et al*

This article provides an overview of seizures and epilepsy for neuroscientists. We focus on broad concepts, rather than clinical details, and raise questions related to mechanisms, epileptogenesis, and therapeutic approaches that might generate interest among basic researchers. Further information about differential diagnosis, drug doses, and clinical management are available from numerous resources.

### 4. TYPES OF EPILEPSY / SEIZURES:-

Classification of seizures is as either focal or generalized, based on how the abnormal brain activity begins.

#### Focal/ partial seizures:-

- a. Simple focal seizures
- b. Dyscognitive focal seizures

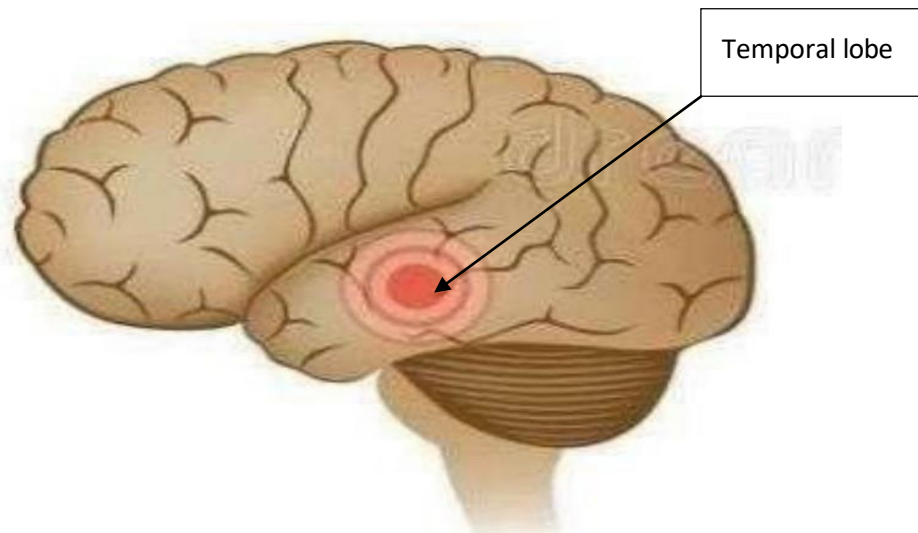
#### Generalized seizures:-

- a. Tonic-clonic seizures/ Convulsive seizures
- b. Absence seizures
- c. Tonic seizures
- d. Clonic seizures
- e. Atonic seizures
- f. Myoclonic seizures

#### Focal seizures :-

Focal seizures (previously called partial seizures) start in one part of the brain and affect the part of the body controlled by that part of the brain or generally produced in a small area of the brain (fig no1). The symptoms the person experiences will depend on the function that the focal point is associated with or controls.

Depending on where they start and which parts of the brain they involve, focal seizures may or may not alter consciousness or awareness, they can be classified into two types.



**Fig 1:- Represent focal Seizures**

### **I. Simple focal seizures:-**

These seizures do not result in loss of consciousness. They may alter emotion or change the way things look, smell, feel, taste or sound. They may also result in involuntary jerking of the body parts, such as an arms or legs, and spontaneous sensory symptoms such as tingling, dizziness, and flashing lights.

### **II. Dyscognitive focal seizures:-**

These seizure alter consciousness or awareness and may cause to lose awareness for a longer period of time. Dyscognitive focal seizures often result in starting and purposeless movements such as hand rubbing, chewing, swallowing, or walking in circles.

### **2) Generalized seizures:-**

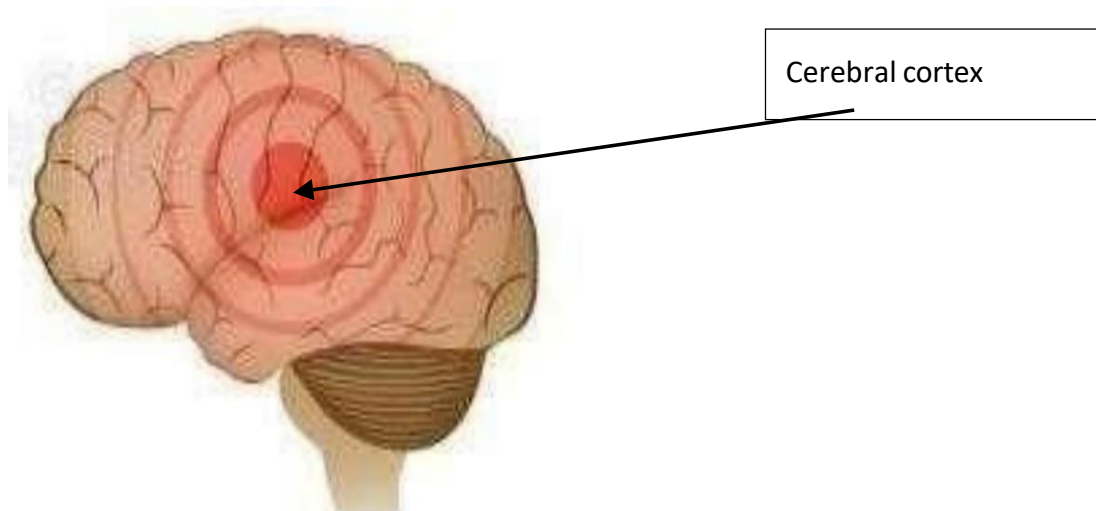
Seizures that appear to involve all areas of the brain are called generalized seizures. Generalized epilepsy, also known as primary generalized epilepsy or idiopathic epilepsy, is a form of epilepsy characterized by generalized seizures with no apparent cause

- bite your cheek or tongue
- lick your jaw
- lose control of your bladder or bowels
- turn blue on the face

Many generalized seizures start and spread so quickly all over in brain it is difficult to identify the source.

If the source of a seizure is unidentifiable, surgery is not available as a treatment option.

Generalized seizures follow a basic pattern. First, your muscles stiffen and become rigid. Then, you experience violent muscle contractions in which the muscles move in quick, random spasms.



**Fig 2:- Represent generalized seizures**

You lose consciousness, or black out, so that you're no longer aware of what's happening. The different types of generalized seizures are:

**I. Tonic-clonic seizures:-**

Tonic means stiffening, and clonic means rhythmical jerking Tonic-clonic seizures (formerly known as grand mal seizures) are a type of generalized seizure that affects the entire brain. A tonic-clonic seizure usually begins on both sides of the brain, but can start in one side and spread to the whole brain.

**II. Absence seizures:-**

Most commonly seen in children's. Absence seizures are characterized by a brief loss of awareness, impairment of consciousness, blank stare, brief upward rotation of eyes. These type seizures last from few second to half of minutes.

**III. Tonic seizures:-**

These are the type of generalized seizures which causes stiffening of muscles. These seizure usually affects the muscles of arms and legs and may cause to fall to the ground. These types of seizures usually last 1 to 3 minutes and take longer period of time to recover for a person.

**IV. Clonic seizures:-**

Clonic seizures are associated with rhythmic, jerking muscles movements. These seizures usually affects the neck, face, and legs.

**V. Atonic seizures:-**

These are the type of generalized seizures which causes a loss of muscle control or tone, which may result in suddenly collapse or fall down. Atonic seizures can be begin in one area or side of the brain (focal onset) or both sides of the brain (generalized onset). These seizures typically last less than 15 second **VI.**

**Myoclonic seizure:-**

These are the type of generalized seizures usually appear as sudden brief jerks or twitches of arm and legs. During a myoclonic seizure, the person is usually awake and able to think clearly. Myoclonic twitches or jerks usually are caused by sudden muscle contractions, called positive myoclonus, or by muscle relaxation, called negative myoclonus.<sup>2</sup>

**5. ETIOLOGY / CAUSES:-**

Many times the seizure is idiopathic in nature where exact cause is not found. It may vary in peoples. Some people with no clear cause of epilepsy, but may have a some following causes which are responsible for epilepsy <sup>3</sup>

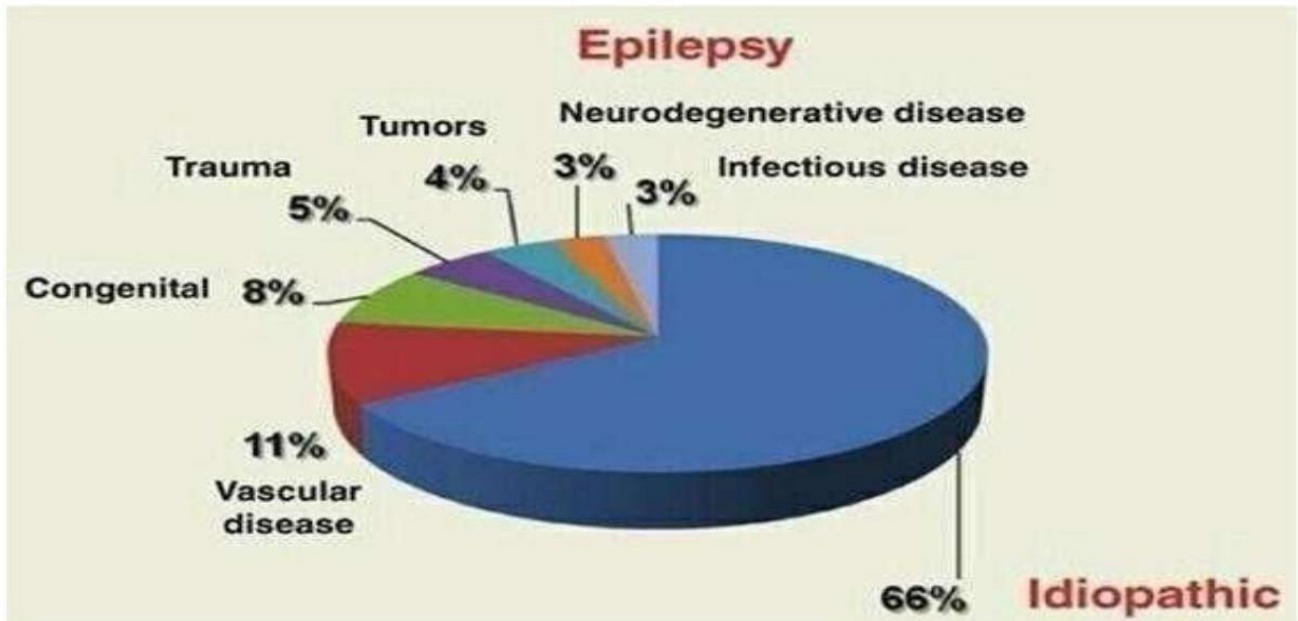
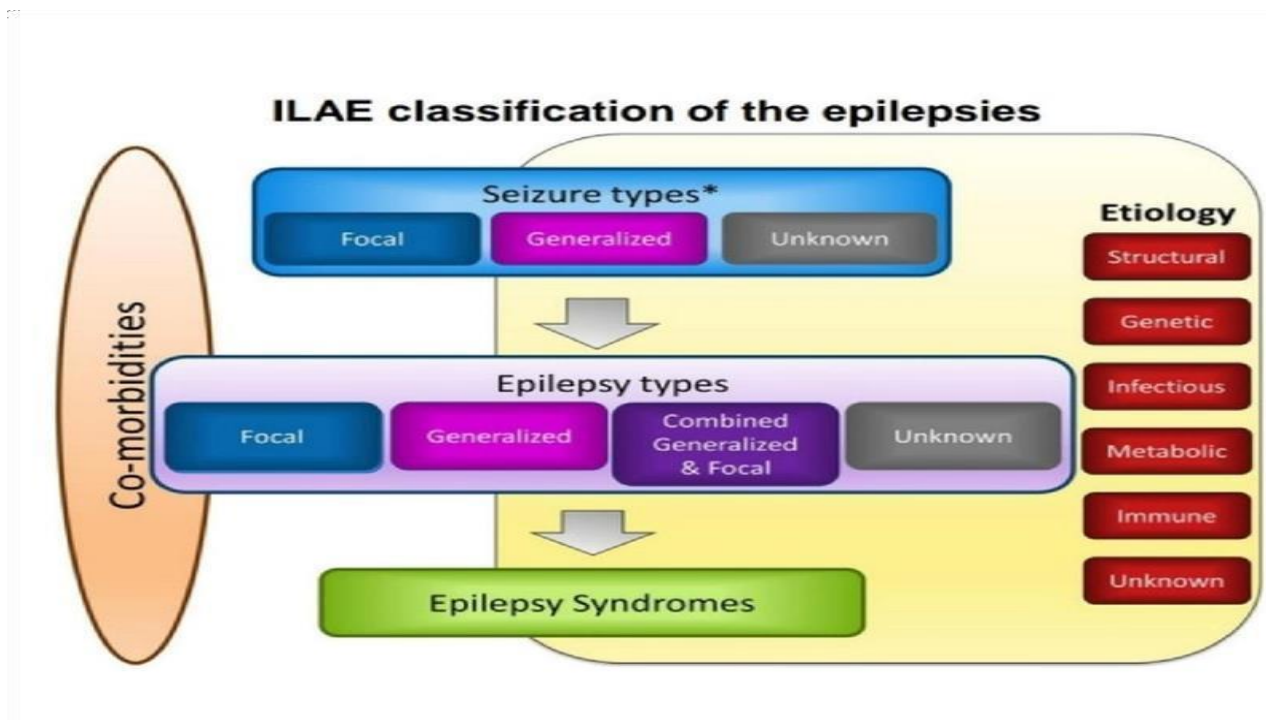


Fig 3:- Etiological causes of epilepsy

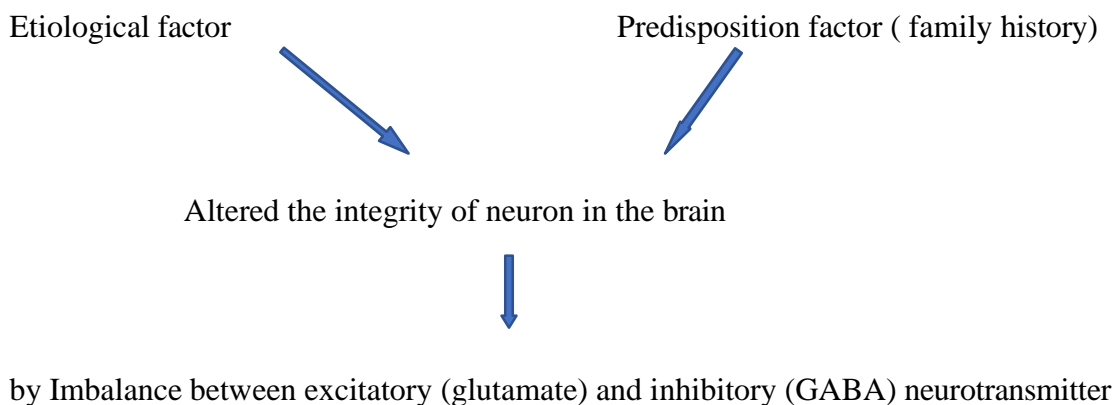


**Common causative factors for causing epilepsy:**

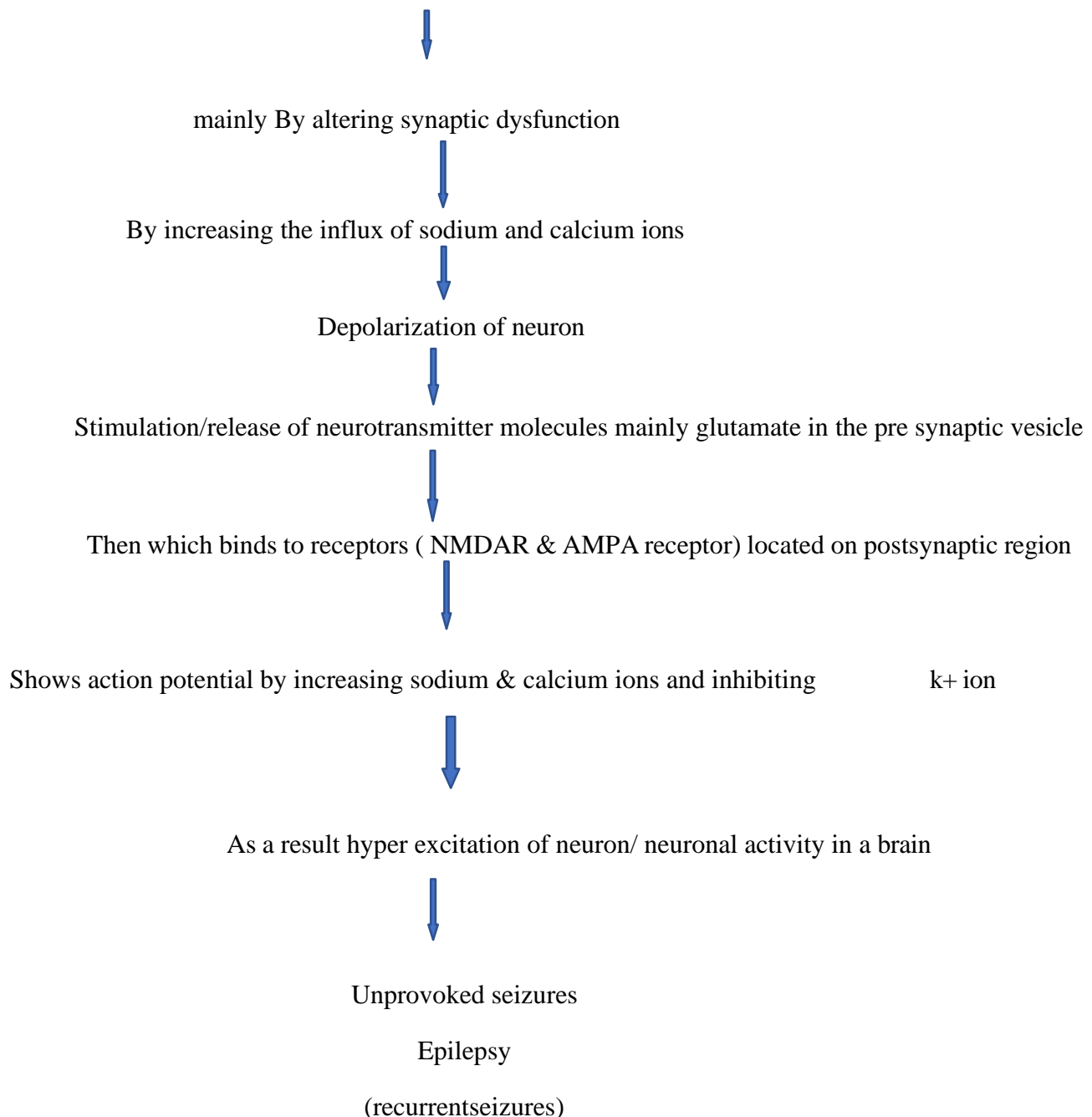
Genetics	Mitochondrial disorder, gene disorder
Metabolic Disorder	Alkalosis, hyperparathyroidism, hypocalcemia, hyponatremia, hypoglycemia, uremia, fever, phenyl-ketonuria
CNS infection	Meningitis, encephalitis, neurosyphilis, toxoplasmosis.
Cardiovascular disorders	Hypertension, hypertensive encephalopathy
Cerebrovascular disease	Hemorrhage, thrombosis, cysts, aneurysms, migraine. hypoxia, stroke.
Degenerative diseases	Alzheimer’s disease, multiple scler
Head injury	Trauma, increased intracranial pressure, birth trauma.
Drugs and chemicals	Amphetamines, camphor, epinephrine, carbon monoxide , amitriptyline, lead, lidocaine.

**Table 1: common causative factors for causing epilepsy**

**6. PATHOGENESIS OF EPILEPSY**

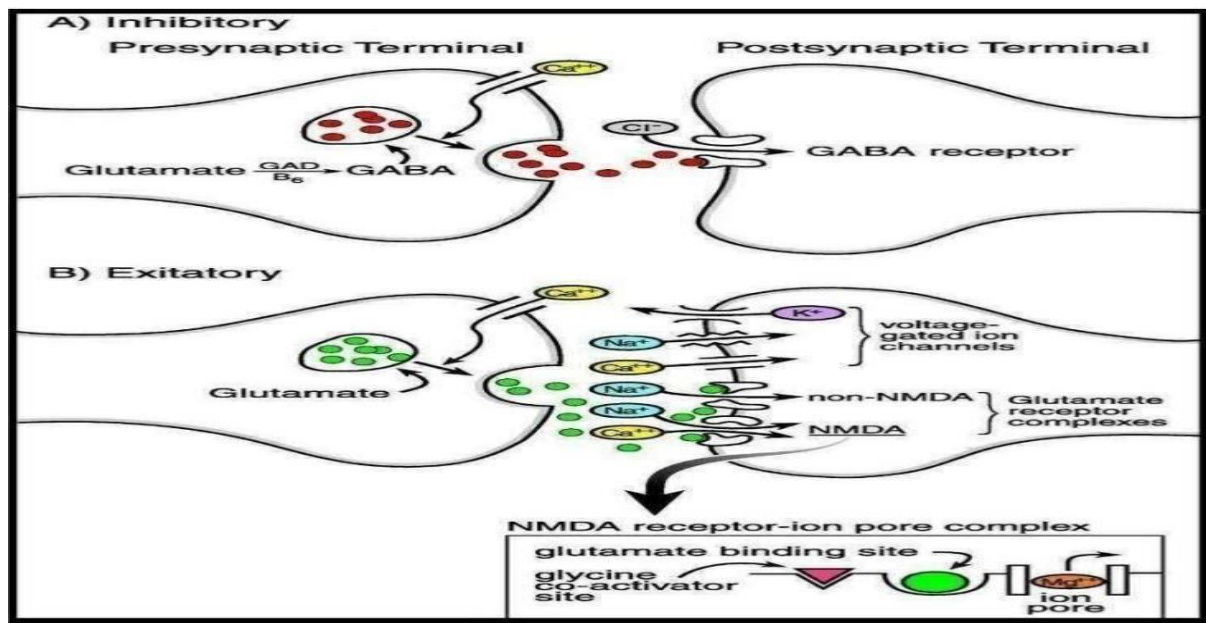






**Fig.4:-Flow chart- pathogenesis of Epilepsy**

So currently, there is no universally accepted definition for epileptogenesis. The term epileptogenesis is defined as a process that leads to the occurrence of the first spontaneous seizure and recurring epileptic form events after the brain insult. OR Epileptogenesis is the process by which the previously normal brain is functionally altered and biased towards the generation of the abnormal electrical activity that subserves chronic seizures. Latency period refers to seizure-free or pre-epileptic periods between the brain insult and the occurrence of the first spontaneous seizure.<sup>4</sup>



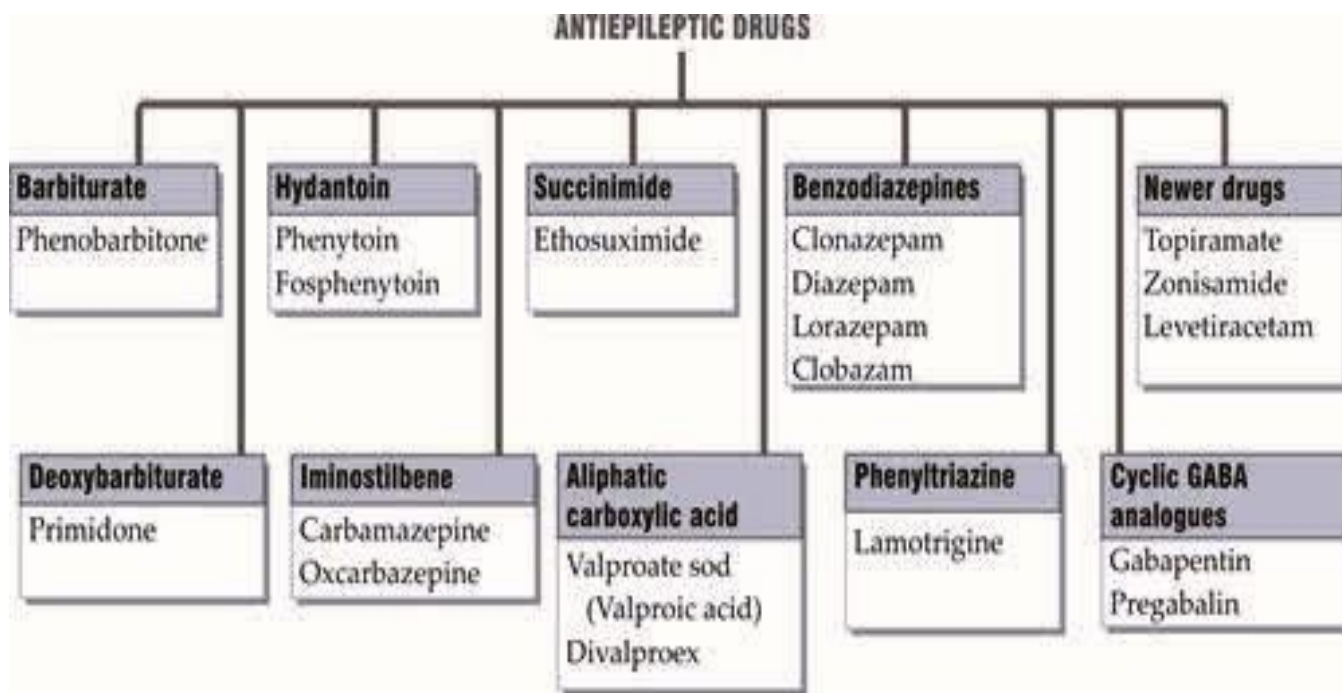
**Fig 5:- Excitatory and inhibitory neurotransmitter involved in Pathogenesis of epilepsy by binding to their specific receptor.**

### 7. SIGN AND SYMPTOMS:-

Following signs and symptoms are observed, if patients suffering from epilepsy.

- a. Loss of consciousness or awareness
- b. Uncontrollable/ involuntary jerking movements of arms and legs
- c. Visual hallucination
- d. Temporary confusion
- e. Alteration to sense of taste, smell, sight, hearing, and touch
- f. Performing repetitive movements
- g. Speech arrest, vocalizations
- h. Shaking
- i. Loss of bladder or bowel control
- j. Muscle stiffness, stiffening of body
- k. Episodes of staring
- l. Illusions
- m. Pupillary dilation/ eye rolling
- n. Repetitive movements of lip smacking and blinking
- o. Sometimes person goes in dreamy state
- p. Unusual fatigue
- q. Headache, nausea, vomiting
- r. Rapid heartbeats
- s. Sweating, excessive salivation > Muscle spasms.
- t. Repetitive blinking of eyelids
- u. Altered mood<sup>4</sup>





Sr.No	Type	Symptoms
A	Partial/ focal seizures	Involuntary movement, unpleasant smell, taste, stiffening of limbs, altered emotion, nausea, seizure less than 2 min
a	Simple partial seizures	Change in way of things, odd sound, smell, taste, dizziness, rising feeling in tummy, involuntary movements of body parts such as arms & legs, flashing lights
b	Complex partial seizures	Loss of consciousness, picking at cloths, smacking your lips, hand rubbing, chewing, swallowing, walking in circles
B	Generalized seizures	Loss of consciousness or awareness, involuntary jerking movements of arms and legs, stiffening of body muscles, altered smell, taste, sound, seizures last less than 3 min.
A	Tonic-clonic seizures	Stiffening or rhythmical jerking movements of arms and legs, shaking, increase heartbeats, loss of consciousness, biting tongue, difficult in breathing, loss of bladder control, lips may turn blue, seizures at least 1-3 min.
B	Absence seizures	Blank stare, brief loss of consciousness or awareness, repetitive blinking, seizures at least few sec to half of min.
C	Tonic seizures	Stiffening of muscles may cause to fall down, seizures at least 13min

D	Clonic seizures	Mainly affect on neck, face or legs.
E	Atonic seizures	Loss of muscle control or tone, results collapse or fall down, droop attack, seizures less than 15sec.
F	Myoclonic seizures	Sudden brief jerks or twitches of arms and legs, muscles contraction

**Table 2:-Different epileptic seizures shows different sign and symptoms.**

### 8. DIAGNOSIS & COMPLICATIONS OF EPILEPSY:-

Epilepsy can be diagnosed by carried out different test , they are given below. Your doctor may order several tests to diagnose epilepsy and determine the cause of seizures, they are given below

- 1)Neurological examination
- 2) Electroencephalogram (EEG)test
- 3) Computerized axial tomography (CT scan CAT scan)
- 4) Magnetic resonance imaging (MRI scan)
- 5) Functional magnetic resonance imaging (fMRI scan)
- 6) Positron emission tomography (PETscan)
- 7) Complete blood count (CBC Test)
- 8) Chemistry panel
- 9) Spinal tap test
- 10) Single photo emission computerized tomography (SPECT scan)
- 11) Magnetic resonance spectroscopy (MRSscan)

### COMPLICATIONS:-

Epileptic seizures create many complications, sometimes it is dangerous to human beings, they are given below.

#### 1. Injuries and accidents:-

**Injuries from falls:-** Because many people with seizures fall, injuries are common. Although such injuries are usually minor, people with epilepsy have a higher incidence of fractures than those without the disorder. Patients who take the drug phenytoin have an even higher risk, since the drug can cause osteoporosis.

**Household accidents:-** Household environments, such as the kitchen and bathroom can be dangerous places for children with epilepsy. Parents should take precautions to prevent burning accidents from stoves and other heat sources. Children with epilepsy should never be left alone when bathing.

**Driving and the risk for accidents?:-** Being unable to drive is an extremely distressing and severe component of epilepsy. Drivers with well- controlled epilepsy are not at a high or unacceptable risk for automobile accidents. Uncontrolled epilepsy, however, poses a high risk. Needless to say, seizures can be very dangerous if they occur while a person is driving and result in injuries to the patient or others.

## 2. Sudden Unexplained Death in Epilepsy (SUDEP):-

Sudden unexplained death in epilepsy (SUDEP) occurs in a small percentage of persons with epilepsy. For reasons that are poorly understood, an otherwise healthy person with epilepsy can die suddenly. While this also happens within the general population, persons with symptomatic epilepsy have a much greater risk. Autopsies have not uncovered a physical cause of SUDEP. It is possible that pulmonary edema (fluid buildup in the lungs), suffocation, or cardiac arrhythmias (irregular heartbeat) may be responsible. Some people appear to be at a higher risk than others, such as young adults with generalized tonic-clonic seizures that are not fully controlled with medication and those who abuse alcohol and illicit drugs. Patients using two or more anticonvulsants may be at increased risk for SUDEP.

## 3. Effect of epilepsy on children's:-

**Long-term general effects:-** In general, the long-term effects of seizures vary widely depending on the seizure's cause. The long-term outlook for children with idiopathic epilepsy (epilepsy of unknown causes) is very favorable.

Children whose epilepsy is a result of a specific condition (for example, a head injury or neurologic disorder) have higher mortality rates than the normal population, but their lower survival rates are most often due to the underlying condition, not the epilepsy itself.

**Effect on memory and learning:-** The studies on the effects of seizures on memory and learning vary widely and depend on many factors. In general, the earlier a child has seizures and the more extensive the area of the brain affected, the poorer the outcome. Children with seizures that are not well-controlled are at higher risk for intellectual decline.

**Social and Behavioral Consequences:-** Learning and language problems, emotional and behavioral disorders, can occur in some children. Whether these problems are caused by the seizure disorder and anti-seizure medications or are simply part of the seizure disorder remains unclear.

## 4. Effect of epilepsy in adults:-

**Psychological Health:-** Many adults with epilepsy show signs of depression. People with epilepsy have a high risk for suicide, particularly in the first 6 months following diagnosis. The risk for suicide is highest among people who have epilepsy and an accompanying psychiatric condition such as depression, anxiety disorder, schizophrenia, or chronic alcohol use. Antiepileptic drugs (such as carbamazepine, gabapentin, topiramate, valproate, and many others) can increase the risk of suicidal thoughts and behavior

**Overall Health.** Patients with epilepsy often describe their overall health as "fair" or "poor," compared to those who do not have epilepsy. People with epilepsy also report a higher frequency of pain, depression, anxiety, and sleep problems. In fact, their overall health state is comparable to people with other chronic diseases, including arthritis, heart problems, diabetes, and cancer. Treatments can cause considerable physical effects, such as osteoporosis and weight changes.

## 5. Effect on sexual and reproductive health :-

**Effects on Sexual Function.** Some patients with epilepsy experience sexual disturbances, including erectile dysfunction. Causes of these problems may be emotional, medication induced, or a result of changes in hormone levels.

**Effects on Reproductive Health .** A woman's hormonal fluctuation can affect the course of her seizures.

Estrogen appears to increase seizure activity, and progesterone reduces it. Antiseizure medications may reduce the effectiveness of oral contraceptives. Epilepsy can pose risks both to a pregnant woman and her fetus. Some types of anti-epileptic drugs should not be taken during the first trimester as they can cause birth defects. Women with epilepsy who are thinking of becoming pregnant should talk to their doctors in advance to plan changes in their medication regimen. Women should learn about the risks associated with epilepsy and pregnancy, and precautions that can be taken to reduce them.

## 6. Effects of epilepsy on pregnant women:-

If the pregnant women suffering from tonic-clonic seizure, there is a temporary interruption of breathing; although this interruption rarely affects the mother, it can lead to oxygen deprivation in your baby.

Additionally your baby's heart rate can slow for as long as 30 minutes after a tonic-clonic seizure. This form of seizure also increases the risk of trauma to the baby. Tonic-clonic seizures present the greatest risk during the last trimester, when the baby's brain is larger and needs more oxygen. Epilepsy can affect pregnancy in a variety of ways. If seizures occur during pregnancy, a number of complications can occur affecting the baby including:

- a. Fetal heart rate deceleration
- b. Fetal injury
- c. Premature separation of the placenta from the uterus
- d. Miscarriage due to trauma experienced during seizures
- e. Preterm labor ➤ Premature birth

Anticonvulsant drugs: Epileptic women have a 4-6 % chance of having a baby born with a birth defect as a result of taking anticonvulsant drugs. Some are mild defects such as small fingers and toenails. However, there are more major birth defects such as spinal bifida, cleft lip, neural tube defects, and heart abnormalities. You should consult your doctor about your anticonvulsant medication when trying to become pregnant. They may recommend changing your medication or lowering the dosage of your current medication.

## 9. TREATMENT:-

Different non pharmacological treatment available to control epileptic seizures or also treat them.

### 1) Ketogenic diet:-

The ketogenic diet is a special high-fat, low-carbohydrate diet that helps to control seizures in some people with epilepsy. It is prescribed by a physician and carefully monitored by a dietitian. It is more strict, with calorie, fluid, and protein measurement and occasional restriction than the modified Atkins diet, which is also used today.

### 2) vagus nerve stimulation:-

Vagus nerve stimulation (VNS) is designed to prevent seizures by sending regular, mild pulses of electrical energy to the brain via the vagus nerve. These pulses are supplied by a device something like a pacemaker.

### 3) Ayurvedic treatment for epilepsy:-

In Ayurveda Epilepsy is known as Apasmara and the epileptic attacks are known as Akshpaka. There are some herbs that are used in treatment of epilepsy.

These are as following:

#### a) Brahmi (Bacopa monnieri):-

- It nourishes brain and helps in bringing coordination between nervous system and daily activity.

- It acts as braintonic.
- It is also helpful in treatment of epilepsy,insomnia
- It is helpful in all type of mood disorders. It is also helpful in relieving anxiety, stress and mental fatigue

**b) Ashwagandha ( With aniasomnifera):-** It is best anxiolytic herb in Ayurveda.

- It manages stress and anxiety.
- It is nerve tonic, it has claiming effect on nerves.
- It is very beneficial for the nervous system.
- This herb possesses anti-inflammatory, anti-stress, immune modulatory, antioxidant properties.
- It is useful in increase mental and physical performance.

**c) Jatamansi (Nardostachys jatamansi):-**

- It is CNSrelaxant.
- It is best herb with tranquillizing effect on brain.

**d) Tagar ( Valerianawallich):-**

- It helps to calming down nervous system.
- It helps to relieve stress, depression and anxiety which are the underlying causes of epilepsy.

**e) Shankpushpi (Convolvulus pluricaulis):-**

- It has mild anti-epileptic/ anticonvulsant property.
- It help to reduce stress, depression, anxiety, dementia which are underlying causes of epilepsy

**4) Others:** a)Asan b)Yoga

Type of seizure	First line drug	Second line drug
Partial seizure	Carbamazepine, Phonation	Gabapectin, Pregabalin
Generalized tonic-clonic seizure	Carbamazepine, Phenytoin, valproate	Lamotrigine, clonazepam, oxcarbamazepine
Absence seizures	Ethosuximide, valproate	Acetazolamide, clobazam
Myoclonic/atonic Seizures	Valproate, sodium valproate, topiramate	Clonazepam
Tonic seizures	Phenobarbital	Gabapectin

**Table no 3: Choice of proper antiepileptic drugs for specific type of seizures.**

**10. CONCLUSION:-**

The treatment of epilepsy has been transformed since the serendipitous discovery of phenobarbitalin 1912, both in the spectrum of medication available and improved knowledge of how best to use AED's. Improving access to specialist information, as provided by the PwSI epilepsy service in primary care, encouraging adherence to medication combined with a rational combination of AED and concomitant medication, minimising side-effects and addressing any modifiable risk factors and addressing psychosocial issues can serve to optimise care for the patients with epilepsy.

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