INTRODUCTION

An epileptic seizure is an episode of neurologic dysfunction in which abnormal neuronal firing is manifest clinically by changes in motor control, sensory perception, behavior, and/or autonomic function. Epilepsy is the condition of recurrent spontaneous seizures arising from aberrant electrical activity within the brain. While anyone can experience a seizure under the appropriate pathophysiological conditions, epilepsy suggests an enduring alteration of brain function that facilitates abnormal neuronal firing ***(Chang and Lowenstein et al., 2003).***

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The aberrant electrical activity that underlies epilepsy is the result of biochemical processes at the cellular level promoting neuronal hyperexcitability and neuronal hypersynchrony. However, a single neuron, discharging abnormally, is insufficient to produce a clinical seizure, which occurs only in the context of large neuronal networks. Cortical and several key subcortical structures are involved in generating a seizure ***(Avanzini and Franceschetti et al., 2003).***

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"Monitoring for seizure activity in intensive care patients is important in order to identify small, clinically invisible seizures, which might explain why patients are not waking up namely, because they are having lots of mini-

seizures in multiple locations. Treating these clinically silent seizures may lead to improved alertness, reverse ongoing brain dysfunction, and prevent progressive injury to brain cells ***(Benbadis et al., 2009).***

~~Seizure disorders are considered an important neurological problem and neurological emergency that occurring among critically ill patients and depending on how it is defined carries a high mortality (3-5%) for the patient. In 30-50% of cases it does not respond to first-line treatments (benzodizepines and/or phenytoin), and by definition becomes refractory. This state becomes progressively more difficult to treat acutely, and goes on to alter the brain so that subsequent convulsive episodes, and neurological deficit are much more likely ***(Holtcamp et al., 2003).***~~

The risk of epilepsy from birth through age 20 is approximately 1 percent. Within this group, the risk is highest during the first year of life and increases at the onset of puberty. From age 20 to 55 it decreases again, but increases after age 55 ***(Krumholz et al., 2007)***

There are a wide variety of possible symptoms of seizures, depending on what parts of the brain are involved. Many, if not all, types of seizures cause loss of awareness and some cause twitching or shaking of the body ***(Pollack, 2006)***.

A seizure may be related to a temporary condition, such as exposure to drugs, withdrawal from certain drugs, a high fever, or abnormal levels of sodium or glucose in the blood. If the repeated seizures do not happen again once the underlying problem is corrected, the person does no have epilepsy. In other cases, injury to the brain (for example, stroke or head injury) causes brain tissue to be abnormally excited. In some people, problem that is passed down through families (inherited) affects nerve cells in the brain, which leads to seizures. In these cases, the seizures happen spontaneously, without an immediate cause, and repeat over time. This is called epilepsy ***(Spenser, 2007)***.

Idiopathic seizures are chronic seizures that occur without an identifiable cause. They usually begin between ages 5 and 20, but can occur at any age. The person can have a family history of epilepsy or seizures ***(Marx, 2002)***.

~~Many types of brain abnormalities can be responsible for producing seizure activity. Abnormal discharges may spread to other cells in a local area or to remote areas of the brain, resulting in intermittent disturbance in the brain's normal functions, changes in brain biochemistry and communication between brain cells occur. These basic neurofunctional abnormalities that lead to epilepsy produce the clinical symptoms that are seen. In turn, recurrent seizures or prolonged seizures can cause injury to the brain. Seizures that last longer than 20 to 30 minutes can damage~~

~~the brain's neurons *(Rho and Stafstrom et al ., 2006).*~~

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Some people with certain types of seizures may be able to reduce or completely stop their seizure medicines after having no seizures for several years, and for some people, epilepsy may be a lifelong condition. In these cases, the seizure drugs need to be continued. Death or permanent brain damage from seizures is rare. However, seizures that last for a long time or two or more seizures that occur close together (status epilepticus) may cause permanent harm. Death or brain damage are most often caused by prolonged lack of breathing, which causes brain tissue to die from lack of oxygen. There are also some cases of sudden, ~~unexplained~~ unexpected death in patients with epilepsy ***(Elson~~ et al .~~, 2008).***

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AIM OF THE WORK

The aim of the work is to determine:

- The possible causes of seizures among critically ill patients, the new updates in the diagnosis and management of these seizures and how can prophylaxis against these seizures be done depending on clear understanding of basic pathogenesis of seizures.

DEFINITIONS

Definition of seizure:

A seizure is a transient symptom of excessive or synchronous neuronal activity in the brain. It can manifest as an alteration in mental state, tonic or clonic movements, convulsions, and \or various other psychic symptoms (such as déjà vu or jamais vu). The medical syndrome of recurrent, unprovoked seizures is termed epilepsy, but seizures can occur in people who do not have epilepsy***) (Noachtar and Peters, 2009)).***

Definition of Epilepsy:

Epilepsy:

Is a chronic neurological disorder characterized by recurrent unprovoked seizures. These seizures are transient signs and/or symptoms of abnormal, excessive or synchronous neuronal activity in the brain ***(Schaefer and Wyllie, 2007).***

Epilepsy is a condition where nerve cells in one area of the brain, or in multiple areas of the brain, signal abnormally to each other. In a normal brain, signaling between nerve cells is required for communication and is used to carry out all processes in the body, such as movement. When nerve cells abnormally fire, they can cause a seizure. While one seizure can occur under certain

conditions in anybody, epilepsy is a condition where somebody has multiple seizures. These individuals will require medication and other means to control their seizures ***(Fisher et al., 2005).***

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Definition of Aura:

An aura is a distinct perception - either visual, motor, sensory, or psychological - felt around the time a seizure occurs. Although an aura may signal a seizure because it usually happens a few seconds before a seizure occurs, an aura and a seizure may be separated by as much as an hour. Auras are not experienced with all types of seizures. They are mostly seen in individuals who suffer from complex or generalized seizures. Additionally, auras vary from person to person, and can manifest in a number of ways ***(Rossetti and Kaplan, 2010).***

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Status epilepticus:

Status epilepticus is defined as a continuous state of seizures, or multiple seizures, without return to baseline, resulting in observable or even subjectively perceived sensory, motor, and/or cognitive dysfunction for at least **30 minutes**. However, seizures usually last only a few minutes; therefore, those lasting 20 minutes, 10 minutes, or even 5 minutes are likely to persist, and functionally represent status epilepticus ***(Lowenstein et al., 2003).***

CLASSIFICATION AND TYPES OF SEIZURES

Many classifications have been done for seizures. The first accepted one was ~~I~~international League Against Epilepsy (ILAE) which was done in 1981 then newer classifications have been done till the most recent one which is international classification of seizures in 2010. Seizures are classified into two major groups which are partial seizures and generalized seizures. Partial seizures originate as abnormal electrical discharges that are confined to a focal or restricted part of the cerebral cortex. They are subdivided into simple partial seizures (without impairment of the level of consciousness) and complex partial seizures (with impairment of the level of consciousness) and partial seizures with secondary generalization (a partial seizure that evolves into a generalized convulsive seizure). Generalized seizures arise from bilateral, symmetric and synchronous electrical discharges involving the entire cerebral cortex which may or may not be accompanied by muscle contractions ***(Holmes, 2010).***

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International Classification of Epileptic Seizures (Holmes, 2010):

I- Partial seizures

A. Simple partial seizures

1. With motor signs

a. Focal motor without march

b. Focal motor with march (Jacksonian)

c. Versive

d. Postural

e. Phonatory

2. With somatosensory or special-sensory symptoms

a. Somatosensory

b. Visual

c. Auditory

d. Olfactory

e. Gustatory

f. Vertiginous

3 With autonomic symptoms or signs.

4. With psychic symptoms

a. Dysphasia

b. Dysmnesic

c. Cognitive

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d. Affective

e. Illusions

f. Structured hallucinations

B. Complex partial seizures

1. Simple partial seizures at onset, followed by impairment of consciousness

a. With simple partial features

b. With automatisms

2. With impairment of consciousness at onset

a. With impairment of consciousness only

b. With automatisms

C. Partial seizures evolving to secondarily generalized seizures

1. Simple partial seizures evolving to generalized seizures
2. Complex partial seizures evolving to generalized seizures
3. Simple partial seizures evolving to complex partial seizures evolving to generalized seizures

II. Generalized seizures

A. Absence seizures

1. Typical absence seizures

a. Impairment of consciousness only

b. With mild clonic components

c. With atonic components

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d. With tonic components
e. With automatisms
f. With autonomic components

2. Atypical absence seizures

B. Myoclonic seizures

C. Clonic seizures

D. Tonic seizures

E. Tonic-clonic seizures

F. Atonic seizures

III. Neonatal seizures:

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The neonatal period is limited to the first 28 days of life in a term infant. For premature infants, this term usually is applied until gestational age 44 weeks; ie, the age of the infant from conception to 44 weeks (ie, 4 weeks after term). The most prominent feature of neurological dysfunction in the neonatal period are seizures. Most neonatal seizures occur over only a few days, and fewer than half of affected infants develop seizures later in life. Such neonatal seizures could be considered acute reactive (acute symptomatic). Seizures in neonates are relatively common, with variable clinical manifestations. Their presence is often the first sign of neurological dysfunction, and they are powerful predictors of long-term cognitive and developmental impairment ***(Silverstein and Jensen, 2007).***

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Neonatal seizures are classified into focal seizures which is the most common type and generalized seizures. Subtle seizures can also occur and are more common in

full-term than in premature infants. Examples of subtle seizures include chewing, pedaling, or ocular movements. Clonic seizures often involve one extremity or one side of the body. The rhythm of the clonic movements is usually slow, 1-3 movements per second. Tonic seizures may involve one extremity or the whole body. It can be focal tonic seizures which involve one extremity, and generalized tonic seizures which often manifest with tonic extension of both upper and lower limbs and also may involve the axial musculature in an opisthotonic fashion. Myoclonic seizures may occur focally in one extremity or in several body parts ***(Engel ~~et al~~ ., 2006)***.

The most common cause is hypoxic-ischemic encephalopathy which may be seen in both full term and premature infants and frequently present within the first 72 hours of life ***(Volpe, 2003).***

Other causes include the following (Sheth et al., 2004).

- –Intracranial hemorrhage which occurs more frequently in premature than in full term infants and it can be subarachnoid, intraventricular or subdural haemorrhage.
- –Metabolic disturbances which include hypoglycemia, hypocalcemia, and hypomagnesemia**.**
- -Intracranial infections including meningitis, encephalitis (including herpes encephalitis), toxoplasmosis, and cytomegalovirus (CMV) -infections. The common bacterial pathogens include *Escherichia coli* and *Streptococcus pneumoniae*.

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Classification and Types of Seizures ~~Review of Literature~~ ~~Review of literature~~

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~~Classification of status epilepticus~~

~~Two major types of status epilepticus based on seizure semiology were distinguished by Gastaut: generalized status epilepticus and partial status epilepticus. (Gastaut , 2003).~~

~~Generalized status epilepticus includes generalized convulsive status epilepticus, described as tonic clonic status epilepticus (grand mal status epilepticus), tonic status epilepticus, clonic status epilepticus or myoclonic status epilepticus, and nonconvulsive status epilepticus. Partial status epilepticus includes simple partial status epilepticus, either motor (epilepsia partialis continua), sensory, or aphasic and complex partial status epilepticus. (Luders et al., 2005).~~

~~Nonconvulsive status epilepticus can be defined as a condition of ongoing or intermittent clinical epileptic activity without convulsions, for at least 30 minutes, with electroencephalographic evidence of seizures. (Celesia , 2006).~~

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