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A Review on Epilepsy and its Treatment

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ABSTRACT:

Epilepsy encompasses a collection of non-communicable neurological disorders marked by recurrent seizures. It is a neurological condition that leads to unprovoked, repeated seizure episodes, which are the result of sudden bursts of abnormal electrical activity in the brain, reflecting a malfunction in nerve cell activity. A growing number of infantile epilepsy syndromes have been identified; however, many infants (those aged 1 to 24 months) do not conform to any existing classifications. This article evaluates the clinical manifestations, electroencephalographic findings, progression, and treatment options for various conditions, including early infantile epileptic encephalopathy, early myoclonic epilepsy, infantile spasms/West syndrome, severe myoclonic epilepsy of infancy, myoclonic-astatic epilepsy, generalized epilepsy with febrile seizures plus, malignant migrating partial seizures of infancy, hemiconvulsions-hemiplegic epilepsy, benign myoclonic epilepsy, and benign familial/non-familial infantile seizures. Issues related to their classification are explored.

Keywords: Epilepsy; causes; etiology; epidemiology; symptoms and signs; risk factors; pathophysiology; biomarkers and treatments

Introduction

Epilepsy is the second most common neurological condition and significantly impacts patients, their families, and healthcare systems. Recent research indicates that nearly 90% of the approximately 70 million people with epilepsy globally live in low-income countries. Epilepsy is a leading non-communicable disease that causes notable disability and mortality. Current estimates suggest that about 70 million individuals worldwide are affected by this disorder. It is characterized by two or more unprovoked seizure episodes. The average prevalence of epilepsy is about 6.8 per 1,000 in the U.S., 5.5 per 1,000 in Europe, and varies from 1.5 to 14 per 1,000 in Asia.

Definitions

Epilepsy is defined as a neurological disorder that predisposes individuals to multiple recurrent epileptic seizures. It is not a singular disease but rather a manifestation of several underlying neurological defects or changes in brain structure and function. This condition is generally seen as independent of identifiable transient factors that can provoke seizures in a healthy brain.

Classification:

Epilepsy is not a singular disease but comprises a range of neurological disorders. To address concerns about current classification systems, the International League Against Epilepsy has proposed a multi-axial diagnostic framework, summarized in Table 1. This scheme aims to categorize individuals according to standardized terminology that most physicians from various specialties can utilize while remaining adaptable to the evolving nature of the condition. However, a syndromic diagnosis may not always be feasible, as the types of presumed seizures and syndromes may change with new insights. Classification systems are utilized for diverse purposes—including epidemiological research, basic science, clinical considerations (such as patient screening before surgery), and clinical trials—thus, they need to accommodate the varied demands across different fields.

Etiology:

Some seizure causes are more prevalent in specific age demographics. In newborns, identifiable causes such as neonatal encephalopathy, metabolic disorders, or systemic infections affecting the central nervous system are common. In older infants and young children, febrile seizures represent the most frequent age-related cause. A structural etiology is indicated when neuroimaging reveals abnormalities, supported by signs and symptoms that, along with electroencephalogram (EEG) data, suggest these abnormalities are likely responsible for the seizures. If the clinical and EEG findings do not align with the anatomical abnormalities visible on imaging, then the identified structural change may not be pertinent to the individual's epilepsy. The structural issue may be genetic, acquired, or a combination of both.

Epidemiology:

Studies examining the epidemiology of epilepsy have reported prevalence rates from various countries, including Algeria, Argentina, and China, among others. These studies offer insights into lifetime prevalence (which approximates cumulative incidence) and active prevalence (which measures current seizures or current anti-epileptic drug use). Reports have shown variability in epilepsy prevalence in emerging markets, with studies in Argentina indicating lifetime and active prevalence rates of 3.2 and 2.6 per 1,000, respectively, in primary school children, while another study found higher rates of 71.9 and 64.8 per 1,000 among students with physical or mental disorders in special schools in Buenos Aires.

Causes:

* Severe head injury

* Stroke

* Brain tumor

* Brain infections, such as meningitis, encephalitis, or neurocysticercosis

Seizures or epilepsy can also result from any condition that damages the brain, including: head trauma, stroke or brain hemorrhage, infections or inflammation like meningitis or encephalitis, structural brain malformations or tumors, diseases such as Alzheimer's, and imbalances in blood sugar or other biochemical processes.

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