



Research Article

STRESS- A PRECIPITATING FACTOR IN JUVENILE MYOCLONIC EPILEPSY (JME)

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ABSTRACT

Objectives: Juvenile myoclonic epilepsy (JME) is the most common idiopathic generalized epilepsy (IGE). Stress is considered as one of the common precipitating factor of seizures in patients with various types of epilepsy syndromes. Different regions of the brain, i.e. hippocampus, amygdala, prefrontal cortex, thalamus, cerebral cortex, frontal and temporal lobes are reported to get affected in individuals with various kinds of stress and these are the regions which are also implicated in patients with epilepsy. The aim of present study is to determine the stress as a precipitating factor for seizure initiation in juvenile myoclonic epilepsy.

Methods: A total 55 JME patients were evaluated to know whether they were subjected to stress or not, if the yes detailed history of stress were collected from the patients and statistically analyzed. Patient selection and diagnosis was based on the criteria of the commission and terminology of the international league against epilepsy. JME cases were diagnosed by experienced Epileptologists on the basis of patient's medical history and on Electro encephalo graphy (EEG). Patients with other neurological trauma, Mental retardation and epilepsy syndrome other than JME were excluded from this study.

Results: Our study results showed 58.2% of patients with seizures were under stress. The females (69.6%) were more prone to seizures due to stress when compared to males (46.9%).

Conclusions: The present study results indicate that the stress is one of the major precipitating factor in initiating seizures in JME. The probable mechanism might be that stress is leading to alterations in the various regions of the brain, which are proven to get affected by stress, which in turn may result in the functional impairment leading to the seizures in juvenile myoclonic epilepsy.

Keywords: Juvenile myoclonic epilepsy (JME), Stress, Brain, Seizures.

INTRODUCTION

Juvenile myoclonic epilepsy (JME) is a sub syndrome under idiopathic generalized epilepsy (IGE) that is commonly observed during adolescence with a prevalence of 5-11% among all epilepsy patients¹⁻⁴. It is manifested by mandatory or typical myoclonic seizure in 97%, with generalized tonic clonic seizures (GTCS) often on awakening and with less of absence seizures (ABS) in 15-30%⁵⁻⁷. Seizures are often

precipitated by alcohol consumption, sleeplessness, menstruation, fatigue and stress. Patients with JME are generally reported to have unsuccessful social outcomes⁸⁻¹⁰; social difficulties and impulsive personality of JME patients were first reported by Janz¹¹. A study on JME patients reported a worse social adjustment in work and family relationship of their lives¹². In patients with JME, mild but characteristic personality problems have been initially

described by Janz and Christian¹ and later by other authors¹³⁻¹⁵.

Stress is a biological and psychological response of the brain to any demand; it can be triggered by many things, including change. Changes may be positive or negative, real or perceived. They may be recurring, short term or long-term and may include things like commuting to and from school or work every day. Some changes are major factors such as marriage or divorce and serious illness can lead to traumatic stress¹⁶.

A study by Sonmez .F et al. reports that JME patients may exhibit seizures due to stress¹⁷. But more detailed reports on the stress as a precipitating factor for seizures in JME and the role of stress in JME is lacking in the literature. So the present study is aimed at determining the stress as a precipitating factor for seizures in JME and a hypothetical mechanism of action of stress resulting in the seizures.

MATERIALS AND METHODS

Samples consist of 55 JME patients. Among 55 JME patients, 32 were males and 22 females. The age of the patients were between 8-25 years. Patient selection and diagnosis was based on the criteria of the commission and terminology of the international league against epilepsy. JME cases were diagnosed by experienced Epileptologists on the basis of patients medical history and on Electro encephalo graphy (EEG). Patients with other neurological trauma, Mental retardation and epilepsy syndrome other than JME were excluded from this study.

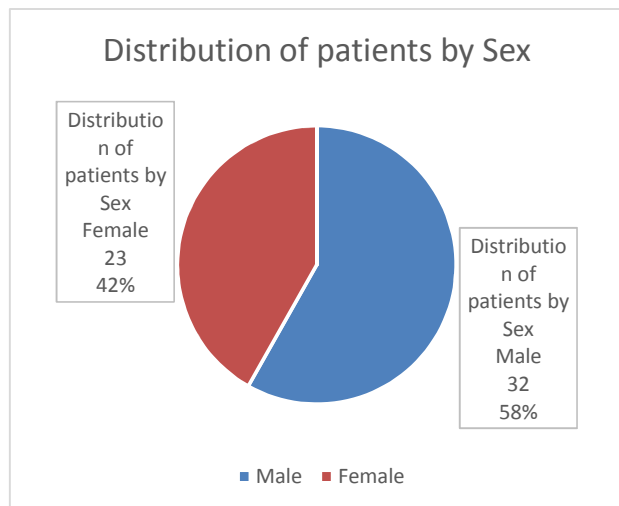


Figure 1. Showing distribution of patients according to sex.

Questionnaire with details such as whether the individual is subjected by stress or not, if yes, what kinds of stress were collected from the patients. Further clinical data such as type of seizure, time period of seizure were also collected. The entire study was carried out by obtaining institutional ethical clearance (IEC: MNRMC/EC/638).

The data was tabulated in the excel sheet and analyzed for total number of patients experiencing the seizures on stress and their percentage was calculated.

RESULTS

The study comprises of 55 JME patients with 32 males and 23 females representing 58.2% and 41.8% respectively (Fig.1).

Further, the present study indicates 58.2% of patients with seizures were under stress. The females were more prone to seizures due to stress when compared to males. The percentage of female patients under stress was 69.6%, while it was 46.9% in the case of males (Table 1, Fig 2).

DISCUSSION AND CONCLUSION

The present study results indicate that 58.2% of JME patients were under stress. The percentage of female patients under stress was more i.e. 69.6% when compared to male patients, i.e. 48.9%.

Stress is a major factor in disturbing the homeostasis of the neuronal activities, however pinpointing exactly which regions of the brain are responsible for a particular type of stress is difficult and often unclear¹⁸. In spite of this, several important regions of the brain are implicated in playing a key role in stress, i.e. hippocampus, amygdala, prefrontal cortex, thalamus, cerebral cortex, frontal and temporal lobes¹⁹.

Various studies confirmed that in a person with epilepsy syndrome, multiple regions of the brain get involved, i.e. mesiofrontal, left inferior frontal and frontobasal regions of the frontal lobe, thalamus, white matter tracts connecting thalamus and frontal lobe, gray matter volumes in the visual cortices, left hippocampus, striatum, Sylvian and Rolandic regions and dentate gyrus^{19, 21, 22, 23, 27, 31, 36}.

Early histopathologic studies in patients with idiopathic generalized epilepsy report subtle gray and white matter abnormalities, suggestive of Microdysgenesis²⁰. Quantitative analysis of high resolution magnetic resonance imaging (MRI) identified changes of the medial prefrontal cortex^{21, 22}, as

Table 1. Showing the percentage of patients affected by stress.

sex	No. of patients (n)	No of patients affected by stress	Percentage (%)
	55	32	58.2
Male	32	15	46.9
Female	23	16	69.6

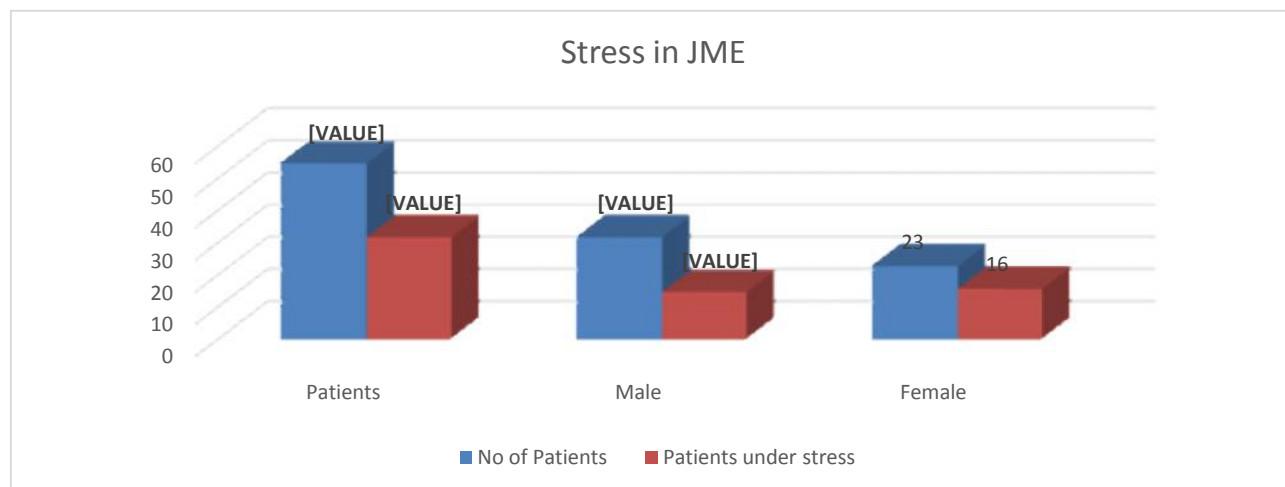


Figure 2. Showing number of patients affected by stress in JME.

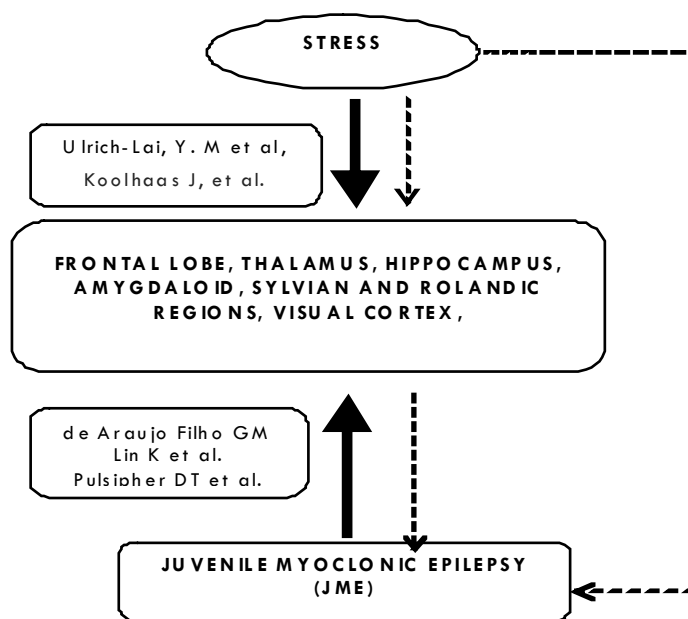
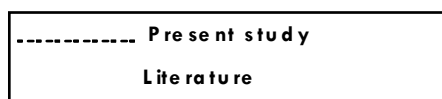


Figure.1. Schematic diagram showing the probable role of stress in JME.



well as the thalamus²³, with molecular imaging studies reporting abnormalities of the dorsolateral prefrontal cortex²⁴, indicative of an underlying thalamofrontocortical network dysfunction.

Further, de Araujo Filho et al. Found significant volume reductions in thalami and increase in mesiofrontal and frontobasal regions as well as significant reduction of N-acetyl aspartate/creatinine (NAA/Cr) ratio in the frontal lobes of JME patients with a personality disorders^{25, 26}. A study by Lin et al., reported a significant increase in gray matter volumes in the frontal lobes of the JME group compared to controls, but the investigation also revealed increased gray matter volumes in the visual cortices and reduced volumes in the left hippocampus and left inferior frontal regions of JME patients²⁷.

Regions in the brain other than frontal lobe have been found to be abnormal in JME patients. Decrease in thalamic volume and abnormalities in the white matter tracks connecting the thalamus and frontal regions have been significantly related to abnormalities in executive functioning among JME patients^{28, 29}. Autopsy studies by Janz and Meencke have identified cortical and subcortical dystopic neurons and few microscopic structural abnormalities in patients with IGE includes JME³⁰.

Sylvian and Rolandic regions of the brain are usually associated with psychiatric complications like depression, aggressive behavior, stress, psychosis and attention deficit hyperkinetic disorder in patients with juvenile myoclonic epilepsy³¹⁻³⁶. Patients with JME may have cortical disorganization that affects both the epileptogenic potential and frontal lobe cognitive functioning³⁷. Such patients may exhibit abnormal patterns of cortical activation that are associated with subtle cognitive dysfunction.

The above data reveals that certain regions of the brain like mesiofrontal, left inferior frontal and frontobasal regions of the frontal lobe, thalamus, white matter tracts connecting thalamus and frontal lobe, gray matter volumes in the visual cortices, left hippocampus, striatum, Sylvian and Rolandic regions and dentate gyrus are implicated in the brain and these are the regions which are also indicated to undergo changes under various conditions of stress.

The present study results also indicate that stress is a factor in precipitating the seizures in JME. The probable mechanism might be that stress is a leading cause to show alterations in

the various regions of the brain, which in turn may result in the functional impairment leading to the seizures. Though this study clearly indicates stress as one of the important precipitating factor for seizures more detailed study with a number of samples, functional MRI evaluation and different geographic distribution will definitely give more authenticated results.

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