



## Investigating the Electroencephalographic Changes in Migraine Patients Referring to Urmia Neurology Specialized Clinics from 2010 to 2011

Arash Mosarrezai<sup>1</sup>, Babak Ahmadi Salmasi<sup>2</sup>, Azam Karimi Asl<sup>3</sup>

<sup>1</sup>Department of Neurology, Imam Khomeini Hospital, Urmia University of Medical Sciences, Urmia, Iran

<sup>2</sup>Department of Neurology, Imam Khomeini Hospital, Urmia University of Medical Sciences, Urmia, Iran

<sup>3</sup> MD, Urmia University of Medical Sciences, Urmia, Iran

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### ABSTRACT

Migraine is one of the most common and annoying headaches in today's society. The highest prevalence of this disease is before 40 years of age. Migraine disease is currently diagnosed on the basis of the International Association of Headache criteria. Migraine disease is divided into two types of a common migraine and migraine with aura. Typically, the duration of a common migraine, which lasts 4 to 72 hours, is greater than the duration of migraine with aura, which usually lasts less than 60 minutes. The aim of this study was to determine the frequency of changes in the electroencephalogram (EEG) in patients with migraine referred to Urmia neurology specialist clinics. In this descriptive cross-sectional study, electroencephalograms of 80 patients referred to neurology specialized clinics were recorded. In this study, the variables studied included electroencephalogram changes in migraine patients while feeling headache, determination of frequency of migraine pathology patterns in different age groups, determination of the frequency of migraine pathology patterns in different gender groups, positive family history of the patient, response to making hyperventilation and shining a light as well as dependence on sedative that all information obtained from the patient was recorded and investigated in the relevant questionnaire. Data were analyzed by SPSS version 21 software. In this study, 67.5% of the subjects were women and 32.5% were men, of which 77.5% had common migraine and 22.5% had migraine with aura. Also out of 80 patients, 70% had a family history of migraine disease and 30% did not mention any family history. In the entire statistical population, abnormal brain waves were recorded from 22.5% of the subjects, of which 7.5% were men and 15% were women. The findings from this study indicate that this disease has a familial affinity, as well as a number of individuals having their own specific brainwaves. Of course, more research should be done to generalize this issue to the whole community.

**Key words:** Common Migraine, Migraine with Aura, Electroencephalogram, Pathological Changes

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**Corresponding author:** Arash Mosarrezai

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### INTRODUCTION

Migraine is a type of a pervasive headache that is usually associated with changes in neurology, digestion and autonomic nervous system and is usually unilateral and pulsating. In the United States, 14.2% and in the whole world, 14.7-18.5% of the population suffers from this disease. 1.2 - 2 % of the population suffers from the chronic form of this disease (i.e., headaches for 15 days or more

per month for at least 3 months) [1, 2]. Regarding diagnostic criteria, migraine is divided into two groups: migraine with aura and migraine without aura [3]. Migraine with aura is usually a recurring disorder, which can be recurred as headaches with focal neurological symptoms, which is usually gradually developed within 5-20 minutes, and the duration of which is less than a migraine without aura and it usually lasts less than 60 minutes. Migraine without aura is a headache that usually lasts for 4-72 hours, although this will be if this disease is not treated or treatment is

unsuccessful [4]. In migraine patients with aura, cortical activity in the posterior lobe is higher, and this causes electroencephalogram dysfunction, and these changes in the electroencephalogram will continue at least 48 hours after the onset of migraine headache and if this increased cerebral activity can be prevented, the length and severity and the number of migraine attacks will decrease [5]. In their study, Takashima et al. showed that there is a significant relationship between electroencephalogram changes and migraine headache [6]. Migraine is also associated with some psychiatric and neurological diseases, that restless legs syndrome is among these diseases, which has been proven to be more prevalent in people with this classic migraine syndrome than in normal population [7]. Migraine is more prevalent in women than men, and even according to some reports, headaches are also more severe in women than men [8]. There are also various studies suggesting the genetic basis for migraine, that so far 3 genes associated with migraine have already been identified on chromosomes 19-1 [9]. The electrical activity of the neurons on the skull surface causes the electrical activity of the brain which is called brainwaves. Brainwaves have different types and functions that all of these waves exist at all times, but under different operating conditions, a certain wave will overcome [9]. Recommended drugs for the treatment of an acute migraine include nonsteroidal anti-inflammatory drugs (NSAIDs), triptans, ergotamines and antiemetics [10]. Preventive factors, including anticonvulsants, beta-blockers, botulinum toxin, candesartan and tricyclic antidepressants, have a relatively low efficacy and are advised not to be used because of the many side effects [11, 12]. So far, no reliable paraclinical method has been used for detecting migraine, sometimes some doctors find it difficult to diagnose this disease and this disease has not been diagnosed and persisted for many years. However, some doctors have done studies on this but have not obtained a reliable result [13, 14]. In the meantime, a simple and non-invasive method that can help diagnose migraine headaches can be an effective step in diagnosing the disease. Electroencephalography method is a safe and relatively low-cost and non-invasive method used to record electrical waves of the brain, especially in seizure patients. Distributed studies that have been carried out in other countries at different times have had different results [15]. There is currently no way to prove or help diagnose migraines. The aim of this study was to investigate

the relationship between migraine and electroencephalographic changes in order to find a better and faster way of diagnosing this disease and help the physician to decide about beginning and treatment of migraine.

## MATERIALS AND METHODS

In this descriptive cross-sectional study, electroencephalogram of 80 patients who referred to the neurology specialized clinics was recorded by an electroencephalogram device model EBNneuro which was made in Italy. The first electroencephalography was recorded within the first 72 hours after the onset of a migraine headache attack, and the next electroencephalographs were recorded in subsequent referrals. In this study, the variables studied included electroencephalography changes in migraine patients while feeling headache, determination of frequency of migraine pathology patterns in different age groups, determination of the frequency of migraine pathology patterns in different gender groups, positive family history of the patient, response to Hyperventilation and shining a light as well as dependence on sedatives that all information obtained from the patients was recorded in the relevant questionnaire. Data of this study were analyzed by SPSS version 21 software. The statistical methods used in this study were two methods of McNemar test and chi-square test, which was used to study the effect of shining a light and Hyperventilation on the abnormal pattern of the electroencephalography. McNemar test was used for gender segregation and Chi-square test at the significance level of  $P < 0.05$  was used to investigate the correlation between gender and abnormality of the subjects' electroencephalography.

## RESULTS

In this study, out of 80 collected samples, 54 (67.5%) were female and 26 (32.5%) were male. The age range of those who participated in the study was between 15 and 60, with the largest number of migraine sufferers aged 26 to 40 years. The prevalence of migraine in the ages of 15-20 years was less than 50 to 60 years and in 40 to 50 years it was more than 50 to 60 years. Of the 54 female subjects referred to clinics, 16 had OCP using record, which included about 30% of the female population, since migraine disease was proven in line with these subjects and then our study was done on them, so we cannot obtain

reach a meaningful relationship between OCP use and the spread of the disease, but it's possible to find a relationship in line with this issue that whether with the use of these pills the onset of attacks increases or it does not indicate any changes. Of the 12 females who were attacked by migraine while responding to light stimulation (light sensitivity), 7 showed changes in the electroencephalogram and from 42 females who were not affected by migraine in line with light stimulation, only 11 cases showed changes in the electroencephalogram. Of the 12 respondents who were stimulated in response to light, 41% had normal electroencephalogram, and out of 42 subjects who were not stimulated, 74% had no electroencephalogram changes. Then, according to the results of the McNemar statistical method of the data obtained from the primary electroencephalogram and electroencephalogram produced after stimulation with light, it was found that among women there was a significant relationship between the electroencephalogram changes in light stimulation ( $P = 0.31$ ). However, in the men group, of the 8 subjects who had been stimulated, 38% had light variations and 62% had no light changes, and out of 18 people who were affected by stimulation, 39% had an abnormal electroencephalogram and 61% showed normal electroencephalogram. The obtained data were analyzed by McNemar statistical method and it was found that there was no significant relationship between the changes in the electroencephalogram in the men's group in response to the stimulation of light ( $P=0.454$ ). Also, by analyzing the data by the method mentioned in the sum of both genders, there was no significant relationship between electroencephalogram changes from the primary electroencephalogram and after exposing to light ( $P=0.164$ ). Investigating the relationship between changes in the electroencephalogram after Hyperventilation showed that, in general, in 14 (17.5%) cases, people manifested migraine attacks after Hyperventilation, that by separating the subjects, it is same as the response to light in men about 19%, and in women 17 %, of which about responding to Hyperventilation in men was 2% more than women. Of the 9 females who were attacked by migraine while responding to Hyperventilation, 67% had electroencephalogram changes, 33% had no changes in the electroencephalogram, and of the 45 respondents who did not respond to Hyperventilation, 22% had abnormal electroencephalogram, but the remaining, 35 (78%), did not show any changes,

and then the data were analyzed by McNemar statistical method and according to obtained  $P=0.572$ , it was concluded that there was no meaningful relationship between Hyperventilation and electroencephalogram changes in female subjects. Also, in men's brain electroencephalograms, those who were attacked by migraine in response to Hyperventilation had 40% of the changes in the brain and 60% did not show any changes and in the electroencephalograms that were taken from other men in this study, 38% had electroencephalogram variations and 62% had normal electroencephalograms. After analyzing the data by using McNemar's statistical method, the obtained  $P=0.125$ , indicated that there is no significant relationship between changes in the electroencephalograms following stimulation with Hyperventilation. For both males and females, with respect to  $P = 0.152$ , McNemar's statistical method did not show a meaningful relationship between changes in the primary electroencephalograms and electroencephalograms after stimulation by Hyperventilation. But the statistics about the response to the sedatives showed the dependence of migraine headaches on sedatives. Out of 54 women, 39 (72%) improved their headache after receiving sedatives, and in men out of 26 subjects, 18 (69%) showed a response to the sedatives, which was concluded as 71.25% in the total population. In subjects of our study, a total of 62 subjects suffered from a common migraine, of which 43 were females and 19 were males. Also, 18 of the subjects were migraine with aura, of which 11 were male (20%) and male 7 (27%). In general, it can be said that 77.5% of the cases suffered from common migraine and 22.5% had migraine with aura. One of the important parameters studied in this study was the familial dependence of migraine spread in individuals, that in this statistical population, 74% of females and 62% of males and 70% of the general population proposed a family history which is a reason of family affiliation of this disease. This family affiliation was observed in all age groups. The family history was highest in the 15-40 years age group and showed the lowest relationship in over 40 years of age. After differentiation of people with positive and negative familial history and analysis of electroencephalograms changes in both groups, the data were analyzed by Chi-square test that according to obtained  $P=0.028$ , it was concluded that there is a significant relationship

between familial history and the changes in the electroencephalograms.

### DISCUSSION

In this study, two methods of stimulation with light and Hyperventilation were used to stimulate and start a headache in migraine patients. Migraine patients' electroencephalograms that were stimulated by light and Hyperventilation showed more changes than healthy subjects. Perhaps if one can find a relationship between these abnormal electroencephalograms and the conditions for migraine headaches, can prevent a headache in many migraine patients. In a similar study by Coppola and colleagues which was done on 36 subjects, it was indicated that by performing fast respiration in migraine patients, which is a stimulant to evoke migraine symptoms, these weaker provocations compared with healthy people, will form electroencephalograms and for this reason, people with migraine suffered headaches and tearing, while in healthy people this problem did not happen [16].

The aim of the present study was to get an early diagnosis of the disease in the presence of pathologic and specific electroencephalography of patients with migraine and to start faster treatment for affected patients. A similar study was conducted by Pourmahmoodian and his colleagues as a case study, in which 47% of migraine patients and 7% of the control group showed pathological changes. The most common pathological electroencephalography pattern was for patients with Slow High Voltage that formed 70% of the changes, and two-thirds of them were in the occipital area on the opposite side of headache. Twenty-nine percent of patients also showed focal changes such as slow and sharp and mixed waves [17]. The results obtained from the prepared electroencephalographs showed that the underlying rhythm was normal at the beginning and the end and the recorded waves included alpha waves. The results were similar to the results of a study by Tommaso *et al.* on 85 subjects with migraine and it has been shown that about 70% of them, in addition to the normal alpha waves of the cortex, have a series of similar brain stimulated regions alpha waves that are carried by the main waves and the brain is more active than normal subjects [18].

In this study, by demonstrating the changes in the electroencephalographs in migraine patients, as well as familial affiliation and response to Hyperventilation and stimulation with light, it

seems possible to detect and treat migraine as soon as possible. Chastan *et al.* studied electroencephalographs changes in migraine patients based on spatial and temporal distribution. At the beginning of the study, the electroencephalographs did not show any changes, but with the passage of time, the changes in the electroencephalograph were clearly identifiable first in the central region (5 minutes after the onset of regional hemiplegia), then in the forehead area and later on in both hemispheres of the brain [19]. In a study done by Kashiwagi and colleagues on a boy who was one year old before the onset of symptoms, changes in electroencephalography were caused by the creation of weak frequency waves and weak intensity. In their studies during the attacks, these people also performed angiography of the cerebrovascular, indicating the presence of transient ischemia in the vascular in front of the Hemiplegia. The study was conducted for a long time so that the child repeatedly suffered from similar attacks, in all cases, the attack of these vascular changes and brain waves were recorded, indicating that these findings were not accidental [20]. Therefore, according to the mentioned studies and the current study it was found that migraine disease is a complicated disease, and there are many cases that have not been identified, and it may be possible to use this information to get better diagnose of this disease and to provide better treatments.

### CONCLUSION

The findings of this study indicate that migraine disease has a familial affinity and in some cases, subjects have their own specific brainwaves. Of course, more research is needed in order to generalize this issue to the whole community.

### Suggestions

It is suggested that this research is conducted in other parts of the country, in collaboration with more specialists in this field and in a larger statistical society, in order to be able to diagnose the disease quickly with the necessary conclusions. Also, given the difference in the number of women and men, it is recommended that in future studies, in addition to the larger statistical community, the number of people in each group based on the gender of subjects be equal.

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