

# The Electroencephalographic Study Findings in Patients with Migraine without Aura

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## Abstract:

**Background:** There are different EEG findings in patients with migraine without aura, but still the majority of patients have normal EEG recordings.

**Aim of the study:** To evaluate EEG abnormalities in patients with migraine without aura.

**Methods:** Thirty patients with common migraine are evaluated by EEG test. Age of patients range from 18-45 years, eighteen of them was females and twelve were males. EEG was performed during headache and as soon as possible after attacks of headache.

**Results:** Out of the 30 patients who are studied, only 6(20%) show EEG changes, 4 females and 2 males, while the rest 24(80%) migraineurs had normal EEG. Of the 6 patients with EEG changes, 3 have left sided headache, 2 right sided headache and one bilateral headache. The EEG findings was slow waves in 4 patients (50%), sharp waves in 3 patients (37.5%), and spike in one patient (12.5%). The sites of EEG changes were 4 in frontal area, 3 in occipital area and 2 in temporal area. Bilateral EEG changes present in all 6 patients.

**Conclusion:** Our study shows significant EEG abnormalities in a good proportion of patients with migraine without aura, but these findings are not specific and cannot replace clinical and neurologic diagnosis.

**Keywords:** Migraine, Electroencephalography, Headache.

## Introduction:

Migraine is a primary headache disorder characterized by recurrent attacks of headache that are moderate to severe. Typically, the headaches affect one half of the head, are pulsating in nature, and last from two to 72 hours. Associated symptoms may include nausea, vomiting, and sensitivity to light, sound, or smell. The pain is generally made worse by physical activity. Up to one-third of people have an aura (typically a short period of visual disturbance which signals that the headache will soon occur). Occasionally, an aura can occur with little or no headache following it<sup>(1)</sup>. The pathogenesis of migraine may be related to an imbalance in activity

between brainstem nuclei regulating antinociception and vascular control<sup>(2)</sup>. Migraines are divided into two major classes (some of which include further subdivisions)<sup>(3)</sup>:

1. Migraine without aura, or "common migraine", involves migraine headaches that are not accompanied by an aura.
2. Migraine with aura, or "classic migraine", usually involves migraine headaches accompanied by an aura.

EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus on the spectral content of EEG, that is, the type of neural oscillations (popularly

called "brain waves") that can be observed in EEG signals<sup>(4)</sup>.

Electroencephalogram (EEG) as a test has been used for long time in the evaluation of migraineurs. The EEG findings of migraine patients may vary in different types of migraine, and include slowing of background rhythm, both generalized and focal, unilateral reduction of Alpha activity, unilateral intermittent or bilateral delta activity during attacks. Spike or sharp wave discharges in temporal region have been described in some patients with classical migraine and Sharp wave particularly in temporal region may be seen in hyperventilation. Paroxysmal theta activity, a variant of the discrete spike is the appearance of episodes, lasting from a fraction of a second to several seconds, of rhythmic high-voltage activity at 4-6Hz<sup>(5,6)</sup>.

### **Aim of the study:**

To determine the EEG findings in patients who have migraine without aura.

### **Patients and methods:**

Thirty patients with common migraine diagnosed by professional neurologists are evaluated with 19- electrodes EEG test (using Nihon Khoden device system, Japan) as a cross sectional study in EEG and EMG unit at department of medicine and neurology in Azadi teaching hospital in Kirkuk between April 2015 and March 2016. Age of patients range from 18-45 years, eighteen of them were females and twelve were males. Exclusion criteria were any neurologic disorders apart from migraine as epilepsy or known brain pathology.

EEG was performed during headache and as soon as possible after attacks of

headache. Each recording session lasted for a minimum of 15-30 minutes, with 3 minutes of hyperventilation and intermittent photic stimulation with a flash frequency ranging from 3-33Hz. The results are recorded and printed. The t-test and Chi-square test were used. A p-value of 0.05 and less was considered as significant.

### **Results:**

Out of the 30 patients who are studied, only 6(20%) show EEG changes, 4 females and 2 males, while the rest 24(80%) migraineurs had normal EEG. The recorded results of EEG are focusing on the site, shape, speed and intensity of wave changes. Regarding the side of headache, out of the 30 patient's sample, 13 have right sided, 11 have left sided, and 6 have bilateral headache. Of the 6 patients with EEG changes, 3 has left sided headache, 2 right sided headache and one bilateral headache.

The EEG findings was slow waves in 4 patients (50%), sharp waves in 3 patients (37.5%), and spike in one patient (12.5%). Pure slow waves in 2 patients, pure sharp waves in 2 patients also, combined slow and sharp waves in one patient and combined slow waves and spikes in one patient.

The sites of EEG changes were 4 in frontal area, 3 in occipital area and 2 in temporal area. Of the 6 patients, two has only frontal area changes, one have only occipital area changes, one have fronto-occipital changes, one have fronto-temporal changes, one have occipito-temporal changes. Bilateral EEG changes present in all 6 patients.

### **Discussion:**

In our study, migraine without aura (common migraine) has male to female

ratio of 2:3, this female predominance also seen in the results of Majeed Salih et al and H. Pourmahmoodian et al studies (1:4 and 1:1.6 respectively) <sup>(7, 8)</sup>.

Abnormal EEG findings were present in 6 out of 30 patients with common migraine (20%). H. Pourmahmoodian et al found abnormal EEG to be much more common in (47%), while Majeed Salih et al found EEG changes in (25%) of migraineurs which is much more comparable to our result <sup>(8, 7)</sup>.

The side of headache has no significant association with side of EEG changes because all of our patients with abnormal EEG have bilateral changes. This result coincide with Majeed Salih et al result who conclude that bilateral EEG changes are the most common abnormality regardless of side of headache <sup>(7)</sup>.

The most common EEG abnormality seen was slow wave changes, pure or in association with sharp waves or spikes. The next most common changes were sharp waves and lastly spike changes. This result goes with the result of Majeed Salih et al study which revealed that slow waves are the most common abnormality (52.64%) seen followed by sharp waves (42.10%) and spikes (5.26%) <sup>(7)</sup>.

EEG changes found in frontal, occipital and temporal areas, also regardless of side of headache. The most frequent site was frontal region, alone or in combination with occipital and less frequently temporal region, while in Majeed salih's study the most frequent site of EEG abnormality was in occipital

region followed by frontal region and lastly the temporal region <sup>(7)</sup>.

### **Conclusion:**

Our study shows significant EEG abnormalities in a good proportions of patients with migraine without aura, but these findings are not specific and cannot replace clinical and neurologic diagnosis.

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