

# **A Study of EEG Finding in Children with Migraine**

*Thesis*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# قالوا

لسببناك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدق الله العظيم

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## List of Abbreviations

<i>Abbr.</i>	<i>Full-term</i>
<b>CSD</b>	: Cortical spreading depression
<b>EEG</b>	: Electroencephalography
<b>ENT</b>	: Ear, Nose and Throat
<b>FHM</b>	: Familial hemiplegic migraine
<b>ICHD</b>	: International classification of headache disorder
<b>IHS</b>	: International Headache Society
<b>MIDAS</b>	: Migraine Disability Assessment Score
<b>NSAIDs</b>	: Non-steroidal anti-inflammatory drugs
<b>OTC</b>	: Over the counter
<b>PedMIDAS</b>	: Pediatric Migraine Disability Assessment Score

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## ABSTRACT

**Background:** Headache is a common complaint in children and adolescents and is associated with substantial impairment, particularly in the educational sphere. It is often comorbid with a range of physical and mental health problems including asthma, allergies, sleep disorders, suicidal ideation, depression and anxiety.

**Aim of the Work:** The purpose of this study was to study EEG changes in a clinic-based sample of migraineurs using the new International Classification of Headache Disorders Criteria third edition, beta version.

**Patients and Methods:** The current study was a cross sectional one which was conducted in the Pediatric Neurology Clinic, Children's Hospital, Ain Shams University. It included 100 migraineurs patients aging between 3-12 years during the period from January 2017 – May 2018.

**Results:** There is a significant difference between severity of headache and gender showing that most of cases with mild headache were females and most of cases with severe headache were males. There is significant difference between severity of headache and abnormal EEG findings.

**Conclusion:** From our study we concluded that EEG is a noninvasive, rapid, safe and validated technique that measures brain activity. PedMIDAS is an important tool in assessment of migraine disability in pediatric patients.

**Recommendations:** For future research in this field we suggest increasing the sample of patients to allow better analysis and better results. ICHD III should be used to confirm diagnosis of headache for proper diagnosis. PedMIDAS Score is recommended to be done to all patients suffering from migraine for follow up of treatment.

**Key words:** Migraine, Electroencephalography, Pediatric Migraine Disability Assessment Score (PedMIDAS), International Classification of Headache Disorders (ICHD III).

## Introduction

Headache, and more particularly migraine, is a frequent health problem in children and adolescents. Estimates are that headaches occur in up to 75% of adolescents and 25% of younger children. The greatest impact on a child and parent is from migraine, which occurs in up to 10.6% of children between the ages of 5 and 15 years, and 28% in children aged 15 to 19 years. This prevalence ranks headache and migraine in the top five health problems of childhood (*Winner et al., 2006*).

The international classification of headache disorder (ICHD) was first published in 1988, with a second edition in 2004 and a third edition beta in 2013 (*ICH III, 2013*). A Korean version of the International Classification of Headache Disorders, third edition, beta version (ICHD-3 $\beta$ ) was also published (*Korean Headache Society, 2013*). The ICHD-3 $\beta$  expanded the probable categories and no longer requires remission of the underlying causative disorder before the headache diagnosis, so ICHD-3 $\beta$  offers advantages in headache diagnosis for first-visit patients (*Olesen, 2014*) (*Kim et al., 2016*).

Approximately 5% of children have recurrent episodes of headache that are consistent with the diagnosis of migraine. Migraine without aura is the most common form of migraine in children constituting approximately 60% of the cases (*Ottman and Lipton, 1994*).

Headache may represent an epileptic event, an aura of a major motor seizure, or a postictal period of a non-evident seizure (*Schon and Blau, 1987*).

The electroencephalogram (EEG) was frequently used in the examination of patients with migraine before the era of neuroimaging, the findings which were reported in migraine previously included focal slow activity, spike activity, posterior quadrant slow wave abnormality, generalized slow activity, low amplitude record and exaggerated hyperventilation response. These electroclinical studies in migraine however were based on old diagnostic criteria and analogue EEG. Owing to evolving diagnostic criterion, the true prevalence of EEG changes in migraine may be under or overrepresented (*Olsen and Steiner, 2005*).

School-related disability is one of the most important components of a child's quality of life. School is important for social, intellectual and emotional development in childhood. Migraine headache may cause lost school time or impact a student's school or homework performance (*Akyol et al., 2007*).

Headache disability can be assessed with the current PedMIDAS (Pediatric Migraine Disability Assessment Score) (*Hershey et al., 2001*).

## **Aim of the Work**

**T**he purpose of this study will be to study the EEG changes in a clinic-based sample of migraineurs using the new International Classification of Headache Disorders Criteria third edition, beta version (ICHD-3 $\beta$ ).

## Review of Literature

Headache is a common complaint in children and adolescents and is associated with substantial impairment, particularly in the educational sphere. It is often comorbid with a range of physical and mental health problems including asthma, allergies, sleep disorders, suicidal ideation, emotional and behavioral problems, and depression and anxiety. Accurate diagnosis of headache in youth is essential to effective treatment and prevention efforts (*Lateef et al., 2009*).

The international classification of headache disorder (ICHD) was first published in 1988, with a second edition in 2004 and a third edition beta in 2013 (*ICH III, 2013*). A Korean version of the International Classification of Headache Disorders, third edition, beta version (ICHD-3 $\beta$ ) was also published (*Korean Headache Society, 2013*). The ICHD-3 $\beta$  expanded the probable categories and no longer requires remission of the underlying causative disorder before the headache diagnosis, so ICHD-3 $\beta$  offers advantages in headache diagnosis for first-visit patients (*Olesen, 2014*) (*Kim et al., 2016*).

In 2004, the second edition of the International Classification of Headache Disorders (ICHD-2) was released. These criteria provided improved recognition of childhood headaches in the footnotes for migraines. Among the improvements in criteria that were recognized was an

expanded duration of attacks from between 1 and 72 hours, but still possessing the features of a throbbing or pulsatile headache of moderate to severe intensity with exacerbation with physical activity. Children with migraine pain could have bifrontal or bitemporal pain, though exclusively occipital pain requires further investigation. Migraine-associated symptoms continued to require nausea or vomiting (or both), or light and sound sensitivity. Additionally, the criteria allowed for parental inference of these associated symptoms (*Silberstein et al., 2005*).

Migraine is a common neurovascular disorder with associated GI and autonomic symptoms that is frequently treated by neurologists in the clinical setting. Nausea, vomiting, photophobia, and phonophobia are strongly associated with migraine attacks, and are an integral part of the diagnostic criteria for migraine according to International Headache Classification II and III-beta version (*Chai N et al., 2014*).

The evaluation of childhood headaches requires a complete general health assessment, as well as a neurologic and headache history. Headache history includes an identification of the frequency, duration, severity, and quality of the headache components, as well as location on the head, impact of disability, and associated symptoms. Guidelines in this evaluation and the use of ancillary tests have been developed (*Lewis et al., 2002*).

Headache disability can be assessed with the current PedMIDAS (Pediatric Migraine Disability Assessment Score) (*Hershey et al., 2001*).

## **Epidemiology:**

Migraine epidemiology presents methodological challenges, partially simplified by the use of the new International Headache Society (IHS) Classification. Most previously published migraine studies were clinic-based, which introduces bias since less than 5% of migraineurs consult specialists (*Silberstein and Lipton, 1993*)

The classification of headache syndromes in children in the second edition of the International Classification of Headache disorders criteria (ICHD-II) differentiates migraine in children from adults by requiring shorter duration (1–72 hours instead of 4–72 hours), less restrictive location (bifrontal /bitemporal or unilateral instead of just unilateral), and symptoms of photophobia and phonophobia that can be inferred from behavior during the headache (i.e., going into a dark, quiet room) instead of just directly asking the child. Even though the ICHD-II criteria have led to enhanced sensitivity of the diagnosis of migraine with aura in children, approximately half of pediatric migraine remains undetected by the classification system (*Lima et al., 2005*)