Correlation between severity of migraine attacks and IgE level in peripheral blood

Maryam Hassanpour Moghadam*, Hamidreza Ardalani, Alireza Alehashemi, Mahboobeh Adami Dehkordi and Mojtaba Meshkat

**Abstract**

**Background**: The correlation between allergic diseases and migraine is partially due to a better understanding of inflammatory mediators with vasoactive function that play an important role in these diseases. This study aimed to evaluate the correlation between allergic sensitization and severity of migraine.

**Methods**: This study was carried out on 212 patients who suffered from migraine headache in a university hospital in Mashhad, Iran. All of these patients were evaluated for allergic rhinitis (AR) by measuring the IgE level in peripheral blood and assessing the clinical symptoms of AR. Prevalence of AR in migraine patients and degree of allergic sensitization was assessed in this study.

**Results**: The prevalence of AR in migraine patients was 78.30%. Total IgE levels in the peripheral blood in migraine patients with AR were found to be significantly (p < 0.0001) higher than those without migraines. There was a significant difference between severity of AR (higher level of IgE) and severity of migraine attacks (p < 0.0001), but there was not any significant difference between severity of AR and other factors.

**Conclusions**: We propose that inflammatory mediators play a key role in triggering migraine attacks. Thus, effective treatment of AR in migraine patients plays an important role in treatment and prevention of migraine headaches.

**Keywords**: allergic rhinitis; IgE; migraine.

**Introduction**

Migraine is a great health problem and is the most common cause of headache [1]. It is a complex, chronic and multifaceted disorder that has long perplexed both those who suffer its ill effects and those who have tried to treat it [2]. Migraine headache is traditionally described as a severe pain in one temple and not infrequently takes this form [3]. It is an episodic headache that is usually associated with certain features such as sound, sensitivity to light, nausea and vomiting [4, 5]. Migraine can often be identified by its triggers; in migraine patients the brain is sensitive to some triggers including glare, sounds, hunger, excess stress, physical exertion, stormy weather or barometric pressure changes, hormonal fluctuations during menses, lack of or excess sleep and alcohol or other chemical stimulation [6]. Nowadays, ear, nose and throat (ENT) specialists report many cases of migraine headache in their patients [7]. Due to the high prevalence of migraine and allergic rhinitis (AR), it seems that many patients suffer from both these conditions [8, 9]. AR is the main cause of complaints in the majority of patients who are referred to ENT departments and allergy clinics [10]. The pathophysiology of migraine is related to the anatomy and physiology of the pain-producing structures in the brain [11]. Nitric oxide (NO) is the main substance implicated in the pathogenesis of migraine. It is a vasodilator and a neurotransmitter of nociceptive impulses. Histamine is another important mediator that is also a vasodilator and leads to the release of NO [12, 13]. It is an inflammatory mediator that is involved in the activation and degranulation of basophils and mast cells [14]. Actually, there are some inflammatory mediators with vasoactive functions that participate in AR and migraine, and there may be some pathophysiologic similarity between these two diseases [15–17]. Important therapeutic strategies include the minimization or avoidance of triggering factors that can reduce the frequency, intensity, and duration of attacks [18]. There are a few studies that investigate the correlation between migraine and AR, such as similar mechanisms, clinical resemblances, statistical evidence and response to similar treatments [19, 20]. In this study, the

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correlation between allergic sensitization and severity of migraine attack was evaluated. We supposed that patients with more severe migraine would be more likely to have allergic sensitization (increased IgE level in their peripheral blood) and migraine attack in these patients may be more frequent than those with lower degrees of allergic sensitization.

**Materials and methods**

**Baseline data**

For each patient, we were collected sociodemographic data such as: age, sex and marital status and clinical symptoms of AR. Social and demographic characteristics of outpatients are shown in Table 1.

**Study population**

This study was conducted in a neurology clinic of a university hospital, in Mashhad, Iran between January 2013 and November 2014. During this period 212 patients (53% female and 47% male, mean age 30.9 years), who were diagnosed with migraine were selected, then for a definitive diagnosis of AR, the total IgE level in peripheral blood was measured in all patients. Total IgE concentrations of >100 IU/mL were considered as a positive IgE test. Serum total IgE was determined by ELIZA method using special kit (prepared by Binding Site Co., Italy). This trial was carried out in accordance with Ethical Committee Acts in Azad University of Medical Sciences, Mashhad branch.

**Migraine diagnosis**

Migraine headache was diagnosed by a neurologist in accordance with the International Headache Society (IHS) criteria for migraine headaches [21]. Frequency of attacks per month, severity and average duration of attacks were recorded. Migraine severity was evaluated by visual analogue scale (VAS) (Figure 1) [22]. The VAS was administered at home after headaches. Patients were instructed to make a single vertical mark at the point on the VAS.

Finally all included patients signed written informed satisfaction. Inclusion criteria for this study were as follows: age between 20 and 50 years, migraine headache with a frequency of at least five attacks per month, headache attacks lasting 4–72 h (when untreated or unsuccessfully treated), beginning of migraine attacks at least 1 year before study and before the age of 45. Headache not due to any other disease. Exclusion criteria were: other kind of headache like cluster, tension or sinus headache, age <18, previous diagnosis of secondary headache disorders such as a brain tumor or brain aneurysm, history of any type of stroke, positive pregnancy test in women, history of alcohol, drug or substance abuse within the previous year. Finally, 212 patients were matched with these criteria and included in our study.

**Statistical analysis**

The statistical analysis was conducted on $\chi^2$-tests, Pearson's correlation coefficient ($r$). Statistical analysis was performed using the statistical package for the social sciences (SPSS) software package version 20.0. A value of $p<0.05$ was considered statistically significant.

**Results**

A total of 212 adult patients, 101 (47%) male and 111 (53%) female with mean age of 30.9±8.1 years were evaluated in this study. Of the 212 patients, 166 patients had clinical symptoms of AR and a total IgE concentration of >100 IU/mL (definitive diagnosis of AR). Forty-six patients had a total IgE concentration <100 IU/mL and no clinical symptoms of AR. Due to this result, the prevalence of AR in migraine patients were estimated at 78.30%.

In patients with a positive test for AR, 92.9% had severe pain, 5.6% had moderate pain and 1.5% had mild pain; but in patients with a negative test for AR, 2% had severe pain, while 78.80% and 19.2% had mild and moderate pain, respectively.

In this study as depicted in Figures 2 and 3, and Table 2; there was a significant difference between IgE level in peripheral blood and severity of migraine attack ($p<0.0001$). Also, statistical analysis did not show any significant correlation between age, sex, marital status and IgE level in peripheral blood ($p>0.05$) (Figures 4–6).
Discussion

Migraine is a complex disorder determined by recurrent episodes of headache [23, 24]. Migraine pathophysiology is related to the central nervous system (brainstem and diencephalon) and peripheral activation (via the sensory nerves that surround the blood vessels of the head) [25, 26]. The role of vasodilation of arteries is believed to be significant [27]. As previously described, histamine and NO have important roles in migraine development [10, 11]. Several researchers have considered the possible link between allergy and migraine headaches [28]. Sedgwick et al. reported a correlation between migraine headaches...
and asthma [29]. Martin et al. reported the association of allergy with migraine headaches; they found that lower degrees of atopy are associated with less frequent and disabling migraine headaches in patients while higher degrees were associated with more frequent migraines [30]. Actually, the percentage of migraine patients with a positive history of allergic diseases has increased [31]. Probably the severity of migraine in allergic patients is higher when allergic conditions exist [32]. There is some research suggesting the changes of immunoglobulines, inflammatory cells, cytokines and mediators in migraine, indicating an involvement of the immunological system in the pathophysiology of migraine [33, 34]. The present study investigated the association between migraine severity and allergic sensitization degree. In this study, we found migraine severity was associated with an increased IgE level in the peripheral blood in patients with AR. Our results showed that patients with more severe migraine had a significantly higher level of serum IgE (p<0.0001). But there were not any significant correlation between age, sex, marital status and serum IgE levels (p>0.05). Regarding these finding, identifying migraine patients and using effective treatment of AR for them, may reduce migraine attacks. This is an important factor for the treatment and prevention of migraine headaches.

Conclusion

Briefly, allergic disease has been associated with migraine headaches. The present study showed a significantly increased severity of migraine attack in patients with higher IgE level in peripheral blood.

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