IJMRP

International Journal of Medical Research Professionals

Original Article

Analysis of the Role of Magnesium in Migraine Patients: An Institutional Based Study

Mohammed Taher Ali

Associate Professor, Department of Pharmacology, Al-Azhar Medical College and Super Specialty Hospital, Ezhalloor, Thodupuzha, Kumaramangalam, Kerala, India.

Article History
Received: 12 Feb 2015
Revised: 19 Mar 2015
Accepted: 06 Apr 2015

***Correspondence to:**
Dr. Mohammed Taher Ali, Associate Professor, Department of Pharmacology, Al-Azhar Medical College and Super Specialty Hospital, Ezhalloor, Thodupuzha, Kumaramangalam, Kerala, India.

ABSTRACT

Background: Migraine is likely to be a brain disorder involving altered regulation and control of afferents, with a particular focus on the cranium. Magnesium's role in migraine pathogenesis is well-described, with deficiencies known to promote cortical spreading depression, alter nociceptive processing and neurotransmitter release, and encourage the hyperaggregation of platelets, all major elements of migraine development. Hence, the present study was conducted for analysis of the role of magnesium in migraine patients.

Materials & Methods: A total of 50 migraine patients and 50 healthy controls were enrolled. All the migraine patients were recalled within the attachment and blood samples were obtained. All the healthy controls were recalled in the morning and blood samples were obtained. All the samples were sent to the laboratory where an auto-analyzer was used for evaluation of serum magnesium levels. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Results: Mean serum magnesium levels among the patients of the study group and control group were 1.76 mg/dL and 2.31 mg/dL respectively. While comparing the mean serum magnesium levels among study group and control group, it was observed that mean magnesium levels were significantly lowered among patients with migraine in comparison to controls.

Conclusion: Magnesium plays a significant role in the pathogenesis of the disease.

KEYWORDS: Magnesium, Migraine.

INTRODUCTION

Migraine is likely to be a brain disorder involving altered regulation and control of afferents, with a particular focus on the cranium. An understanding of the pathophysiology of migraine should be based upon the anatomy and physiology of the pain-producing structures of the cranium integrated with knowledge of their central nervous system modulation.[1, 2]

Studies of evoked potentials and event-related potentials provide some link between animal studies and human functional imaging. Authors have shown changes in neurophysiological measures of brain activation, but there is much discussion as to how to interpret such changes. Perhaps the most reliable theme is that the migrainous brain does not habituate to signals in a normal way, nor indeed do patients who have first-degree relatives with migraine.[3- 5] The pathophysiology of migraine can be studied keeping in mind the series of clinical events occuring during an acute migraine attack. The prerequisite for migraine attack is initiation event followed by activation and transmission within sensory trigeminal neurons and finally modulation of the nociceptive trigeminal information within the central nervous system. The pain initiating events take place in the trigeminovascular system. The transmitting event is mediated by interaction between the neurons through the release of different neurotransmitters. Focus on initiation phenomenon led to the postulation of different theories in the last sixty years stating migraine to be a vascular, neuronal or neurovascular disorder, but a unifying convincing mechanism for this debilitating disorder is still awaited.[6-8]

Magnesium's role in migraine pathogenesis is well-described, with deficiencies known to promote cortical spreading depression, alter nociceptive processing and

neurotransmitter release, and encourage the hyperaggregation of platelets, all major elements of migraine development. Research on magnesium has found it to be a potentially well-tolerated, safe and inexpensive option for migraine prevention, while it may also be effective as an acute treatment option for headaches including migraines, tension- type headaches and cluster headaches, particularly in certain patient subsets.[9]

Hence; the present study was conducted to analyse the role of magnesium in migraine patients.

MATERIALS & METHODS

The present study was conducted for analysis of the role of magnesium in migraine patients. A total of 50 migraine patients and 50 healthy controls were enrolled. Complete demographic and clinical details of all the patients were obtained. A Performa was made and the detailed medical history of all the patients was recorded separately. All the migraine patients were recalled within the attachment and blood samples were obtained. All the healthy controls were recalled in the morning and blood samples were obtained. All the samples were sent to the laboratory where an auto-analyzer was used for evaluation of serum magnesium levels. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Student t test was used for evaluation of level of significance.

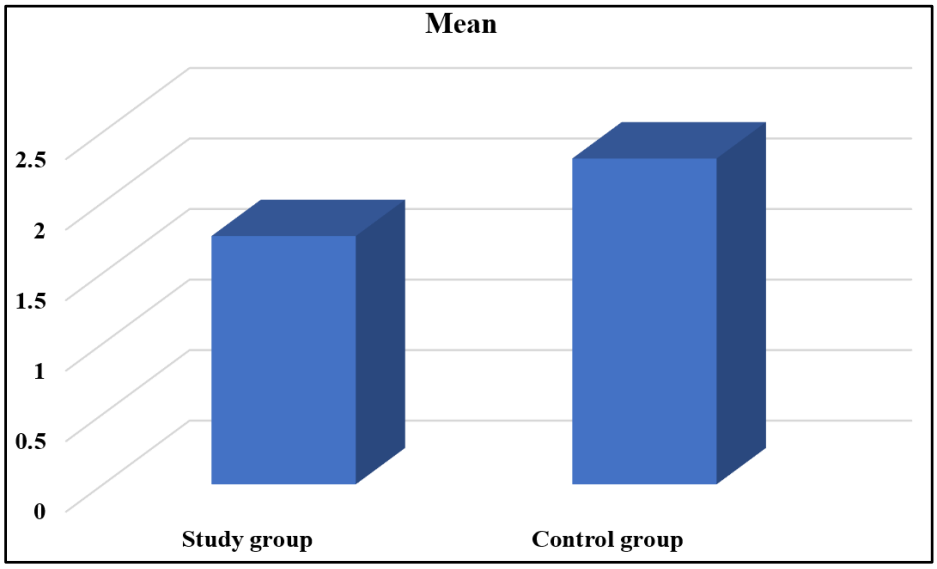
RESULTS

Mean age of the patients of the study group and control group was 41.3 years and 39.4 years respectively. Majority proportion of the patients of both the groups were males and were of rural residence. Mean serum magnesium levels among the patients of the study group and control group were 1.76 mg/dL and 2.31 mg/dL respectively. While comparing the mean serum magnesium levels among study group and control group, it was observed that mean magnesium levels were significantly lowered among patients with migraine in comparison to controls.

Table 1: Comparison of serum magnesium levels

Magnesium levels (mg/dL)	Study group	Control group
Mean	1.76	2.31
SD	0.23	0.43
p-value	0.001 (Significant)	

Graph 1: Comparison of serum magnesium levels



DISCUSSION

Although tension headache is the most common headache type, migraine is the most common headache complaint in clinical practice. Migraine affects approximately 13% of adults in the U.S., and its prevalence ranges between 12% and 20% in various countries around the world.1 Migraine is more common in females than males, with a prevalence of 19% and 7%, respectively. Approximately 80% of patients report a family history. Because migraine affects people during their most productive years (the 25- to 50-year-old age group), direct and indirect costs have a significant

impact on society. The direct costs are approximately $1 billion annually, and the indirect costs of lost time at work, school, and home result in an estimated $5.6 billion to $17.2 billion per year. The pharmacotherapy of migraine is complex, and the appropriate use of abortive agents and preventative medications requires an understanding of the various medications available and when they are best used in migraine management.[10- 13]

Using phosphorus nuclear magnetic resonance spectroscopy (MRS), low levels of magnesium have been found in the cerebral tissue of some migraineurs both during attacks and interictally. Another study utilized the same technology to assess the brain cytosolic free magnesium concentration and free energy released by the hydrolysis of adenosine triphosphate, an index of cellular bioenergetics in both migraineurs and patients with cluster headaches. Cytosolic free magnesium and the free energy released by the reaction of ATP hydrolysis were significantly reduced in the occipital lobes of patients with all types of migraine as well as in cluster headache patients. The authors of this study took these results to lend support to their hypothesis that the reduction of free magnesium in tissue with mitochondrial dysfunction is due to a bioenergetics deficit, as magnesium is essential for mitochondrial membrane stability and the coupling of oxidative phosphorylation.[14, 15]

Mean age of the patients of the study group and control group was 41.3 years and 39.4 years respectively. Majority proportion of the patients of both the groups were males and were of rural residence. Mean serum magnesium levels among the patients of the study group and control group were 1.76 mg/dL and 2.31 mg/dL respectively. While comparing the mean serum magnesium levels among study group and control group, it was observed that mean magnesium levels were significantly lowered among patients with migraine in comparison to controls. In a previous review conducted by Mauskop A et al, authors summarized role of magnesium in migraine patients. Migraine sufferers may develop magnesium deficiency due to genetic inability to absorb magnesium, inherited renal magnesium wasting, excretion of excessive amounts of magnesium due to stress, low nutritional intake, and several other reasons. There is strong evidence that magnesium deficiency is much more prevalent in migraine sufferers than in healthy controls. Double-blind, placebo-controlled trials have produced mixed results, most likely because both magnesium deficient and non-deficient patients were included in these trials. This is akin to giving cyanocobalamine in a blinded fashion to a group of people with peripheral neuropathy without regard to their cyanocobalamine levels. Both oral and intravenous magnesium are widely available, extremely safe, very inexpensive and for patients who are magnesium deficient can be highly effective.[16]

Samaie A et al determined the total Mg serum status of patients with migraine within and between the headache attacks and compare it with non-migraineurs. Their study was performed on 50 migraineurs patients diagnosed according to the International Headache Society (IHS) criteria for acute migraine headache. Fifty healthy subjects without any family history or evidences of migraine were randomly selected from hospital personnel as the control group. Serum Mg level was measured by Xylidyl blue method. In the group with migraine headache, no significant difference was found in the serum total Mg levels within and between migraine headache attacks. But, serum total Mg level was notably lower in the group with these attacks compared to the control group. Serum Mg level is on average significantly reduced in patients with migraine compared to the healthy group.[17]

CONCLUSION

Magnesium plays a significant role in the pathogenesis of the disease.

REFERENCES

1. van den Maagdenberg AM, Haan J, Terwindt GM, Ferrari MD. Migraine: Gene mutations and functional consequences. Curr Opin Neurol. 2007;20:299–305.

2. Goadsby PJ, Lipton RB, Ferrari MD. Migraine- current understanding and treatment. N Engl J Med. 2002; 346: 257–70.

3. Goadsby PJ, Charbit AR, Andreou AP, Akerman S, Holland PR. Neurobiology of migraine. Neuroscience. 2009;161:327–41.

4. Russell MB, Iselius L, Olesen J. Investigation of the inheritance of migraine by complex segregation analysis. Hum Genet. 1995;96:726–30.

5. Goadsby PJ. The Vascular Theory of Migraine-a great story wrecked by the facts. Brain. 2009;132:6–7.

6. Gorji A, Scheller D, Straub H, Tegtmeier F, Kohling R, Hohling JM, Tuxhorn I, Ebner A, Wolf P, Werner Panneck H, Oppel F, Speckmann EJ. Spreading depression in human neocortical slices. Brain Res. 2001;906:74–83.

7. Henrotte JG. Genetic regulation of red blood cell magnesium content and major histocompatibility complex. Magnesium. 1982;1:69–80.

8. Jain AC, Sethi NC, Balbar PK. A clinical electroencephalographic and trace element study with special reference to zinc, copper and magnesium in serum and cerebrospinal fluid (CSF) in cases of migraine. J Neurol. 1985;232 Suppl:161.

9. Schoonman GG, van der Grond J, Kortmann C, van der Geest RJ, Terwindt GM, Ferrari MD. Migraine headache is not associated with cerebral or meningeal vasodilatation–a 3T magnetic resonance angiography study. Brain. 2008;131:2192–200.

10. Lipton RB, Stewart WF, Scher AI. Epidemiology and economic impact of migraine. Curr Med Res Opin. 2001;17(Suppl 1):S4–S12.

11. Rozen TD, Swanson JW, Stang PE, et al. Increasing incidence of medically recognized migraine headache in a United States population. Neurology. 1999;53(7):1468–73.
12. Stewart WF, Lipton RB, Celentano DD, et al. Prevalence of migraine headache in the United States. JAMA. 1992;267(1):64–69.
13. Goldberg LD. The cost of migraine and its treatment. Am J Manag Care. 2005;11:S62–S67.
14. Ramadan NM, Halvorsan H, Vande-Linde A, Levine SR, Helpern JA, Welch KMA. Low brain magnesium in migraine. Headache. 1989;29:590–3
15. Lodi R, Iotti S, Cortelli P, Pierangeli G, Cevoli S et al. Deficient energy metabolism is associated with low free magnesium in the brains of patients with migraine and cluster headache. Brain Res Bull. 2001;54:437–41.
16. Mauskop A, Varughese J. Why all migraine patients should be treated with magnesium. J Neural Transm (Vienna). 2012;119(5):575-579
17. Samaie A, Asghari N, Ghorbani R, Arda J. Blood Magnesium levels in migraineurs within and between the headache attacks: a case control study. Pan Afr Med J. 2012;11:46.

How to cite the article: Mohammed Taher Ali. Analysis of the Role of Magnesium in Migraine Patients: An Institutional Based Study. Int J Med Res Prof. 2015, 1(2); 194-97.