Original Article

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Pharmacology Section

Evaluation of Trigger Factors of Acute Migraine Episodes among Medical Students: A Cross-sectional Study

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ABSTRACT

Introduction: Migraine is most common headache disorder among all age group. Recurrent headaches has been found to have direct impact on academic performance of students. Recognition and management of triggers play the important role in reducing impact of migraine.

Aim: To evaluate the pattern of headache and trigger factors associated with migraine among the medical students.

Materials and Methods: A cross-sectional study was carried out among 300 undergraduate medical students of Himalayan Institute of Medical Sciences, Dehradun from May 2022 to June 2022.Demographic details and response of participants were noted using a structured and validated questionnaire. The participants were asked to choose triggers on the basis of their experiences of last five episodes of acute migraine from a list of trigger factors. Frequency of triggers, severity of migraine episode and missed classes due to migraine were evaluated. The data was analysed using IBM SPSS version 22. To study the association between two qualitative variables, chi-square test was used. The p-value <0.05 was considered as statistically significant.

Results: Among 300 medical students of mean age of 19.9±2 years, 28% were diagnosed with Migraine. Migraine prevalence was higher in females (63.5%). All the migraineurs reported to have at least one trigger and majority of them (85%) had more than three triggers. Stress was the most commonly reported trigger (85%) followed by sleep deprivation (75%), emotional changes (49%) and excessive use of mobile phone (42%). Participants with more than three triggers hade more frequent (2.67±1.87) headache episodes (p=0.04*), higher number of missed classes due to headache (7.39±3.706) (p<0.001**) and more severe episodes as per NRS scale (6.58±1.608) (p<0.001**).

Conclusion: According to the present study findings, the students reported that higher number of triggers had more frequent, more severe and disabling headache episodes.

Keywords: Headache, Migraine attacks, Migraine with aura, Migraine without aura

INTRODUCTION

Headache is one of the most common neurological disorders [1]. It can negatively affect the patient's quality of life by causing impairment in work, social activities and family life. Headaches can be classified as primary or secondary. Major causes of primary headaches include cluster headaches, trigeminal neuralgia and migraines. Secondary causes include meningitis, subarachnoid hemorrhage, aneurysmal rupture, and acute angle closure glaucoma [2]. Migraine is a primary headache disorder characterised by recurrent throbbing headache confined to one side of the head. It can be associated with symptoms of nausea, vomiting, dizziness, extreme sensitivity to light, sound, smell and disturbed vision. Worldwide prevalence of migraine among adults is around 15% and it is second leading contributor of global burden of neurological diseases [3]. Age-standardised 1-year prevalence of migraine was reported as 25.2% in population based study from South India [4].

Migraine attack can be triggered by many several intrinsic and extrinsic factors. A migraine triggers can be any environmental, dietary and physiological factor that can aggravate migraine activity. The nervous system of migraineurs becomes highly susceptible to triggers. Irregular diet, disturbed sleep, hormonal changes, states of high stress, lights, and odors have been identified as migraine triggers. Proactively identifying and understanding these triggers is a critical component of effective migraine management [5].

Recurrent headache episodes found to have direct impact on academic performance of students [6]. This also leads to improper treatment by self-medication and analgesic overuse [7].

Indian studies determined the prevalence and pattern of headache in the general adolescent population [8,9], but there is a paucity on similar studies on students in health professions. Hence, study was to observe the pattern of headache and trigger factors associated with migraine among the students.

MATERIALS AND METHODS

The present cross-sectional study was carried out on undergraduate medical students of Himalayan institute of Medical sciences, Dehradun from May 2022 to June 2022. The target population was First, Second, and Third professional MBBS students of medical college. Prior approval was obtained from the Institutional Ethics Committee IEC NO: SRHU/HIMS/PHARMA/E-1/2022/79). Students were briefed about the purpose of study. A written informed consent was obtained from all participating students. They were also informed that the information given by them is confidential and for the research and evaluation purpose only.

Inclusion and Exclusion criteria: Students in the age group of 18 years and above and those suffering with episodic headache were included. Headaches attributed to secondary causes other primary headache disorders, inability to complete questionnaires, or to comply with study and failed to give consent were excluded from study.

The questionnaire was distributed to first, second, and third professional MBBS students of medical college. A total of 300 students of were enrolled in this study.

Sample size calculation: Assuming prevalence as 25% and absolute margin of error as 10%, with a non-response rate of 10% a minimum of 80 study subjects were required.

The sample size was calculated using Cochrane's formula:

$$N = \frac{(z\ 1\text{-}\alpha/2)^2\, p(1\text{-}p)}{d^2}$$

z 1-∝/2)=standard variant at

95%=1.96

P=25% [4].

d=margin of error with

absolute precision=10%

A minimum 80 cases were required.

Study Procedure

Clinical and demographic details were recorded by using self-administered questionnaire. Diagnosis was based on International Headache Society Criteria for Migraine (ICHD-3) [10]. Language of the questionnaire was English which was simple and easily understandable to students. Clinical validity of questionnaire was done on twenty students diagnosed with headaches. A neurologist who was blind to the questionnaire results interviewed these students to substantiate the diagnosis of migraine. The internal consistency of the diagnosis of migraine was assessed by using Cronbach's alpha analysis. The overall Cronbach's alpha coefficient was 0.765, indicating acceptable to good internal consistency of the instrument.

Headache was graded as mild, moderate and severe as per the numerical value marked from 0-10 on NRS by each participant. NRS scores of 1 to 3, 4 to 6, and 7 to 10 considered as mild, moderate, and severe headaches, respectively [11]. Participants were asked to choose their potential triggers on the basis of their previous experiences of last five episodes of acute migraine from a list of 18 trigger factors -stress, changes in routine, excessive sleep, sleep deprivation, exercise and fatigue, menstrual cycle, emotional changes, weather changes, noise, odour, fasting, overeating, caffeine, smoking, alcohol, cheese/chocolate, travelling, excessive use of computer/mobile phone) and any other trigger which is not included in the list [12] .

Data collected was analysed to see the gender wise difference of triggers among subjects diagnosed with migraine, with aura and without aura. Data was also analysed to evaluate number of triggers of migraine on frequency of migraine episode, severity of headache and disability due to headache.

STATISTICAL ANALYSIS

The data was entered in Microsoft (MS) EXCEL and was analysed using IBM Statistical Package for Social Sciences (SPSS) version 22. Quantitative variables were represented using descriptive statistics while qualitative variables were expressed in terms of frequency and percentages. To study the association between two qualitative variables, Chi-square test was used. The p-value <0.05 was considered as statistically significant.

RESULTS

A total of 450 structured questionnaires were distributed to first, second, and third professional undergraduate medical students (150 students per batch). A total of 325 students responded, which were scrutinised for completion. Twenty five questionnaires were incomplete and hence excluded from the study. Out of all the students (300), 275 students gave history of headache once in their lifetime. A 28% (85) were diagnosed with Migraine.

Mean age of the students was 19.9+2 SD years. Among the migraineurs, 78% (66) of the subjects were diagnosed as Migraine without Aura (MOA) and 22% (19) Migraine with Aura (MA). A majority of students 98% were able to identify triggers for their migraine and 85% had more than three triggers [Table/Fig-1] Intensity Headache was mild, moderate and severe in 25 (29%), 33 (39%) and 27 (32%), respectively.

Sleep deprivation was 77% in MOA and 68% in MA. The use of mobile phone was observed as trigger for migraine (42%) in both MA and MOA. Dehydration as a trigger factor was found in MA (47%) and MOA (41%) (p value <0.05). Fasting was recorded as trigger (23%) in MOA and (26%) in MA. Weather changes were perceived as a trigger in MOA (27 %) and MA (16%), but all these findings were non-significant [Table/Fig-2].

Variables	Values
Total number of participants	300
Experienced headache at least once in their lifetime	275
Number of students with diagnosis of Migraine	85
Gender	**n (%)**
Male	31(36.5%)
Female	54 (63.5%)
Mean age±SD (years)	19.9 ± 2
Diagnosis	**n (%)**
Migraine without Aura (MOA) n (%)	66 (78%)
Migraine with Aura (MA) n (%)	19 (22 %)
Triggers	**n (%)**
Three or more than 3	72 (85 %)
Two	8 (9%)
One	5 (6%)

[Table/Fig-1]: Demographic profile of participants with headache.
Values are expressed as n (%)

Trigger factors	Migraine without Aura (MOA) N=66	Migraine with Aura (MA) N=19	p-value
Stress	55 (83%)	13 (68%)	0.269
Changes in routine	25 (38%)	12 (63%)	0.050
Excessive sleep^	13 (20%)	5 (26%)	0.761
Sleep deprivation^	51 (77%)	13 (68%)	0.627
Exercise and fatigue	18 (27%)	7 (37%)	0.420
Menstrual cycle^	13 (20%)	3 (16%)	0.959
Emotional changes	30 (46%)	12 (63%)	0.174
Weather changes^	18 (27%)	3 (16%)	0.471
Noise	22 (33%)	10 (53%)	0.126
Odours^	11 (17%)	5 (26%)	0.538
Fasting^	15 (23%)	5 (26%)	0.986
Overeating^	3 (5%)	3 (16%)	0.239
Caffeine^	5 (8%)	4 (21%)	0.208
Smoking^	3 (5%)	1 (5%)	1.000
Alcohol^	2 (3%)	2 (11%)	0.456
Cheese /chocolate^	2 (3%)	0 (0)	1.000
Travelling^	18 (27%)	1 (5%)	0.086
Excesses use of computer/mobile phone	28 (42%)	8 (42%)	0.980
Dehydration	27 (41%)	9 (47%)	0.019325*
Head trauma^	6 (9%)	1 (5%)	0.951

[Table/Fig-2]: Trigger factors in Migraine with Aura (MA) and Migraine without Aura (MOA).
Chi-square test; p-value <0.05* considered as significant; ^Refers to Yates Continuity Correction; #Participants reported dehydration and head trauma as additional triggers

Stress was found to be the most frequent trigger factor (89%) (p=0.007*) followed by emotional changes (67%) in females (p<0.05*) as compared to males. Other triggers found more in females were changes in routine, sleep deprivation, noise, odours, fasting, use of mobile phones. But all these findings were non-significant. All these triggers were also present in males. Triggers found more in males were caffeine (13%) smoking (10%) alcohol (7%), overeating (10%), excessive sleep 29% and drugs 3%. All these differences were non-significant [Table/Fig-3].

[Table/Fig-4] shows that there was a significant difference with higher number of triggers (3 or more) for increase in no of headache episodes per week (p=0.04), increased no of missed classes (p 0.0001**) and severity of headaches (p<0.0001**) as compared to 2 or <2 triggers.

Trigger factors	Total 85	Female 54	Male 31	p-value
Stress	68 (80%)	48 (89%)	20 (65%)	0.007*
Changes in routine	37 (44%)	(24) 44%	13 (42%)	0.822
Excessive sleep	18 (21%)	9 (17%)	9 (29%)	0.179
Sleep deprivation	64 (75%)	42 (78%)	22 (71%)	0.483
Exercise and fatigue	24 (28%)	17 (32%)	8 (26%)	0.580
Menstrual cycle	NA	16 (30%)	0	NA
Emotional changes	42 (49%)	36 (67%)	6 (19%)	<0.05*
Weather changes	21 (25%)	13 (24%)	8 (26%)	0.859
Noise	32 (38%)	24 (44%)	8 (26%)	0.088
Odours	16 (19%)	12 (22%)	4 (13%)	0.290
Fasting	20 (24%)	14 (26%)	6 (19%)	0.492
Overeating^	6 (7%)	3 (6%)	3 (10%)	0.784
Caffeine^	9 (11%)	5 (9%)	4 (13%)	0.873
Smoking^	4 (5%)	1 (2%)	3 (10%)	0.268
Alcohol^	3 (4%)	1 (2%)	2 (7%)	0.965
Cheese /chocolate^	2 (2%)	1 (2%)	1 (3%)	1.000
Travelling	19 (22%)	12 (22%)	7 (22%)	0.970
Excesses use of computer/ mobile phone	36 (42%)	27 (50%)	9 (29%)	0.060
Head trauma^	6 (7%)	5 (9%)	1 (7%)	0.965
Dehydration	36 (42.4%)	28 (52%)	8 (26%)	0.61559

[Table/Fig-3]: Gender wise distribution of trigger factors.
NA: Not applicable; A: Applicable; ^Refers to Yates Continuity Correction; Chi-square test; p-value <0.05*

Variables	2 or <2 triggers (n=9)	3 or >3 triggers (n=69)	p-value
Number of headache episode in a week			
Mean±SD	1.56±0.276	2.67±1.87	0.04*
Missed classes due to headache in last 6 months			
Mean±SD	2.44±2.48	7.39±3.706	0.0001**
Severity headache			
Mean±SD	3.89±1.453	6.58±1.608	0.0001**

[Table/Fig-4]: Impact of migraine triggers.
*p-value <0.05; **p-value <0.001

Severity headache of headache was measured by Numeric Rating Scale (NRS) [11].

DISCUSSION

Migraine attacks are mostly triggered [13]. The prevalence of triggers varies among different studies [7-13]. This study enrolled 300 medical students, out of which 85 students were diagnosed with migraine. Among the migraineurs, 78% of the subjects were diagnosed with MOA and 22% MA. The result of GEM study reported that 63.9% of migraine episode were diagnosed as MOA and 17.9% had MA while 13.1% had both types of migraine headaches [14].

In this study, the most frequent precipitating factors for migraine were stress, sleep deprivation, emotional changes, excessive use of computer/mobile phone and dehydration. Fatigue, sleep, stress were the frequent trigger factors, followed by food and menstruation shown in studies by Spierings EL et al., and Chabriat H et al., [15,16].

One or more triggers were almost always reported to initiate an acute migraine episode. Present study has shown that all 85 participants reported 1 or more triggers. Kelman L and Baldacci F et al., also reported triggers precipitating the migraine attack (75.9%) and (72.5%), respectively [7,13].

Stress was the most commonly self-reported trigger factor for migraine attacks as per previous research [17-19]. Present study also found that stressful life events and emotions are the commonest triggers among migraineurs.

Most of our students with migraine identified lack of sleep as an important initiating factor for migraine attack). Sleep deprivation was 77% in MOA and 68% in MA. A study conducted by Spierings EL et al., reported the factors for precipitating for migraine were stress, fasting, fatigue and lack of sleep [15]. Houle TT et al., also showed an augmented effect of high stress levels and sleep deprivation that influences the headache [20].

In the current study, excessive use of mobile phone was observed as trigger for migraine (42%) in both MA and MOA. Previous studies also demonstrated the effect of electromagnetic waves emitted by mobile and excessive use of mobile phones expose the patients to lights, which can precipitate migraine attacks [21-24]. In our study, dehydration as a trigger factor was found in MA (47%) and MOA (41%). A cross-sectional study examined the association between water intake and migraine attack [25].

In the present study, fasting was recorded as trigger (23%) in MOA and (26%) in MA. An increase in number of migraine episodes during Ramadan month was reported [26]. So it is important for taking the history from patients about the practice of fasting, which may help the clinician to understand the patient's headache characteristics and devise an individualised plan for treatment [27].

Weather changes were perceived as a trigger in MOA (27%) and MA (16%), but findings were nonsignificant and higher percentages were shown in other study [28]. The discrepancies in this field are maybe due to different regional climatic conditions.

Stress was found to be the most important trigger factor (89%) followed by emotional changes (67%) and dehydration (52%) in females (p<0.05) as compared to males. Other triggers changes in routine, excessive sleep, sleep deprivation, noise, odours, fasting and use of mobile phones reported more frequently but difference was in significant. Among males caffeine (13%) smoking (10%) alcohol (7%), overeating (10%), excessive sleep 29%. All these differences were non-significant.

In the present study, out of 54 migraineurs, 30% women had shown menstrual cycle as a trigger for migraine. Fluctuation of serum estradiol and progesterone levels in menstrual cycle is associated with higher headache episode in migraineurs [29-31].

Dietary precipitants such as chocolate/cheese were reported (3%); in MOA, Alcohol intake (3%) in MOA vs 11% in MA. Chocolate Contains phenylalanine and cheese has tyramine both may contribute to onset a headache by influencing of the cerebral blood circulation and stimulating the release of norepinephrine from the sympathetic nerve terminals [32]. Caffeine as a trigger for migraine was shown by 8% by MOA and 21% in MA. Differences were not statistically significant. Studies examined caffeine withdrawal as a trigger factor and found 10% and 30% of migraine patients [32,33].

There was higher percentage of triggers in MA as compared to MOA but this change was not statistically significant. This might be due to lesser number of participants in MA group as compared to MOA [Table/Fig-2]. Some of these triggers highlighted in a study done on MA-were stress, sunlight, inadequate sleep, wine, smoking, menstruation and perfume [34].

Furthermore, the triggers shown in MOA were stress, sleep deprivation, excessive use of mobile phone, dehydration, changes in routine, noise, hormonal variations, weather changes, travelling and head trauma. Some of these triggers were similarly reported in previous studies [13,15,35].

Students who identified higher numbers of different triggers reported more severe headache and higher frequency of episodes. These students also reported more disabilities in form of unable to attend classes. Persons with high number of trigger likely to have brain with high sensitivity with low threshold for triggers which make them susceptible for more severe disease.

Further research is needed in this area to clarify the underlying mechanism triggers precipitating the migraine attacks in this subgroup.

Limitation(s)

The sample size was small due to time constraints related to the Indian Council of Medical Research - Short-Term Studentship (ICMR-STS) and other limitation is selection bias, as the questionnaire was shared within medical students. Additionally, lack of prospective diary data and the reliance on self-reporting based on recall memory is another limitation.

CONCLUSION(S)

Triggers are almost always present among all migraine sufferers. Most frequent precipitating factors reported by participants were stress, sleep deprivation, emotional changes, excessive use of computer/mobile phone, dehydration and travelling. The findings in our study, suggest trigger factors are frequent in migraine patients, its detection must be detailed, so preventive treatment could be more efficient. Avoiding migraine triggers factors can possibly decrease headache frequency and also potentially improve patients' quality of life. Psychological management, dietary orientation and sleep hygiene recommendations are important for migraine patients.

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