J. Pharm. Res. 2023;22(4):186–191

Print ISSN: 0973-7200
Online ISSN: 2454-8405

Journal of Pharmaceutical Research

Original article

Demographic Insights into Migraine Prevalence and a Cost-Effective Analysis of Various Prophylactic Medications

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ARTICLE INFO

Article history:
Received 10.10.2023
Accepted 15.12.2023
Published 30.12.2023

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https://doi.org/10.18579/jopcr/v22.4.60

ABSTRACT

Headache, a common human experience, has been classified since antiquity. Migraine, a prevalent disabling primary headache condition, has significant personal and societal consequences. Understanding its demography is critical for creating effective prevention and treatment methods. An observational study of 387 persons with chronic migraine was conducted over a six-month period. They were divided into three groups and given a separate prophylactic drug. Demographic information was collected at the outset, and patients were assessed at 4, 8, and 12 weeks. The study population had an average age of 38.20 ±12.78 years, with 90% of the participants being female. Migraine was most common in those under 30 (37%), followed by those between 31 and 40 (28%). The most common co-morbidity (43.5%) was anxiety. Propranolol alone was the most cost-effective preventative medication, followed by propranolol plus escitalopram. This study sheds light on the intricate relationship between migraine and demographic characteristics, underlining the significance of individualized care. Because females are more vulnerable, age-specific therapies are critical, as are gender-sensitive approaches. The potential benefits of preventative drugs in decreasing both personal and society burdens are highlighted by socioeconomic factors and cost-effectiveness analyses. To optimize outcomes and cost allocation, this study advocates for a patient-centered, comprehensive approach to migraine care.

Keywords: Migraine; Prevalence; Prophylactic Medications; Demographics; Costeffectiveness Analysis

INTRODUCTION

Headache, an extremely universal human sensation, is one of the most common complaints addressed in medicine. Though known since antiquity, Aretaeus of Cappadocia provided the first classification in 200 AD, and more categories followed. The diagnosis of this ailment can be both simple and difficult, and while headache is usually harmless, it can be a warning sign[1]. According to the International Classification of Headache Disorders (ICHD-3), migraine, the most frequent type of vascular headache, is a prevalent disabling primary headache disease. Many epidemiological studies have documented its global prevalence, as well as its socioeconomic and personal consequences[2].

According to the Global Burden of Disease (GBD) 2019, migraine is the second-leading cause of disability in those under the age of 50. Migraine prevalence varies internationally, with rates ranging from 9.1% to 18.2%[3]. Migraine is more frequent in cities, with a 1-year prevalence rate of 25.2% and a lifetime prevalence estimated to be between 7% and 17%[4,5]. Migraine is also up to four times more common in women than in men, may be because to hormonal variations or certain psychosocial stressors. Migraine is a complex disease with unknown pathogenic causes, however it is frequently related with aberrant sensitivity of blood arteries in the brain, resulting in arterial spasms[6,7].

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The impact of migraine extends beyond the individual to the healthcare system and society as a whole. Migraine attack prevention or reduction in frequency and severity is crucial for pain relief and minimising the socioeconomic burden associated with migraines. The major goals of migraine treatment are to alleviate symptoms as quickly as possible, restore normalcy to the body, lower the frequency and intensity of future migraine attacks, and keep the illness from becoming chronic[8]. Furthermore, it underlines that even with appropriate treatment, migraine attacks may not always be properly controlled, necessitating the use of preventative medicines[9,10].

There are plenty of reasons stated for selecting preventative treatment, including adverse side effects from acute therapeutic alternatives, contraindications, and patient preferences. Although fewer people with episodic migraines use preventative medicine, a large number of them could benefit from it[11]. Beta-blockers such as propranolol, timolol, metoprolol, and atenolol, tricyclic antidepressants such as amitriptyline, venlafaxine, and fluoxetine, and selective serotonin reuptake inhibitors such as escitalopram are among the treatment choices. Calcium channel blockers like Flunarizine and Verapamil, as well as antiepileptic medicines like topiramate, valproic acid, and gabapentin, are fewer common substitutes[12].

This study aims to provide a comprehensive exploration of the demographic details surrounding migraine, illuminating its occurrence, distribution among various population groups, and associated healthcare expenses. Additionally, it explores a critical assessment of the cost-effectiveness of various prophylactic medications frequently prescribed for the treatment of migraines. Healthcare professionals, governments, and patients can make educated decisions about migraine prevention measures by being aware of the demographic features of migraine and evaluating the cost-effectiveness of prophylactic treatments.

MATERIALS AND METHODS

An observational study was conducted at a Tertiary care hospital in Jaipur, Rajasthan. The trial lasted 6 months, from October 2022 to March 2023, after receiving ethical approval (EC/P-27/2022). 387 people over the age of 18 with chronic migraine, either with or without aura, were enrolled in the study with their permission. Using a computer-generated random number sequence, an impartial observer separated the recruited patients into three groups A, B, and C. The baseline/enrollment visit was Visit Zero. The demographic information of all recruited patients was gathered at visit zero, i.e., the start of preventative medicine.

The patients in group A were treated with propranolol 40-160 mg once daily for three months; patients in group B were treated with amitriptyline 10 mg once daily for three months; and patients in group C were treated with propranolol (40-160 mg) with escitalopram 10 mg OD once daily for three months. The data were collected and analysed statistically. Statistical analysis was performed using the SPSS (20.0) version software. Repeated two-factor measurements ANOVA was used to determine the statistical significance of the difference between the three groups and within each group. A p-value of 0.05 was deemed statistically significant.

RESULTS AND DISCUSSION

The current study involved 387 adult chronic migraine patients with an average age of 38.20 ± 12.78 years. The distribution across the groups (A, B, C) is fairly similar, with no significant difference in percentages (p-value = 0.999, Table 1) 90% of those with chronic migraines were female, with patients under 30 years old (37%) and those between 31 and 40 years old (28%) having the highest prevalence (p-value = 0.894).

A graduate degree or above was held by 58% of our entire patient population (p-value=0.996). The educational levels of the three groups were comparable. In our study, married patients made up 83% of the population. In terms of marital status, there was no statistically significant difference between the three study groups. Cities accounted for 58% of survey participants. The residential areas of the three groups were comparable. In each group, housewives had the largest percentage of migraine patients, followed by teachers and students. In 12% of cases, migraine ran in the family.

Because 93% of all patients were non-smokers and 96.9% were non-alcoholic, the inter-group difference was not statistically significant. Food, environmental, or medication allergies affected 7% of research participants. 11% of our patients had high blood pressure, and 6% were anaemic. The distribution of the related disorders varies significantly across the group (p-value=0.0001). Group A includes a higher number of anaemic participants, while Group B has a higher percentage of hypertensive participants.

70% of the participants in the current study had no prior history of a relevant hormonal issue. The most common were PCOD (8%) and thyroid disease (12%). The three groups were comparable in terms of related hormonal disease when it came to linked hormonal disease. 70% of patients had no other treatment options. Yoga was chosen by 11% of those who practiced it. However, the intergroup difference was not statistically significant (Table 2).

To assess the cost-effectiveness of each drug, the price per pill was divided by the dosage strength to determine the cost per unit of active component. Propranolol, amitriptyline, and escitalopram were obtained for Rs. 0.21, 1.84, and 0.28 per tablet, respectively, at our hospital.

We determined the most cost-effective option by comparing the cost per unit of active component for each drug and its associated effectiveness in separate groups. Among the three groups tested, propranolol alone (group A) was the most cost-effective medicine, followed by propranolol +

Table 1: Mean age & weight of Participants

	A			B			C			P value
	Mean	**SD**	**Median**	**Mean**	**SD**	**Median**	**Mean**	**SD**	**Median**	
Mean Age	38.09	12.76	35.00	37.70	12.73	35.00	38.80	37.00	12.92	0.793
Weight	61.82	9.572	62.00	61.67	9.534	62.00	62.07	9.615	62.00	0.943

Table 2: Various Demographic Details of Participants

Parameters		**Group**						**p-value**
		A		**B**		**C**		
		N	**%**	**N**	**%**	**N**	**%**	
Age group	≤30 yrs	48	37.2%	50	38.8%	44	34.1%	0.999
	>30 yrs	81	62.8%	79	61.2%	85	65.9%	
Gender	Female	115	89.1%	115	89.1%	117	90.7%	0.894
	Male	14	10.9%	14	10.9%	12	9.3%	
Education	Illiterate	23	17.8%	25	19.4%	26	20.2%	0.996
	Literate	106	82.2%	104	80.6%	103	79.8%	
Marital Status	Married	106	82.2%	106	82.2%	109	84.5%	0.848
	Unmarried	23	17.8%	23	17.8%	20	15.5%	
Residence	Rural	52	40.3%	53	41.1%	57	44.2%	0.800
	Urban	77	59.7%	76	58.9%	72	55.8%	
Family History	No	111	86.0%	114	88.4%	115	89.1%	0.730
	Yes	18	14.0%	15	11.6%	14	10.9%	
Smoking History	No	119	92.2%	120	93.0%	120	93.0%	0.962
	Yes	10	7.8%	9	7.0%	9	7.0%	
Alcohol History	No	124	96.1%	125	96.9%	125	96.9%	0.923
	Yes	5	3.9%	4	3.1%	4	3.1%	
Allergy	Yes	8	6.2%	9	7.0%	12	9.3%	0.616
	No	121	93.8%	120	93.0%	117	90.7%	
Associated Diseases	Anaemia	11	8.5%	7	5.4%	5	3.9%	0.0001
	Hypertension	0	0.0%	23	17.8%	21	16.3%	
	No	118	91.5%	99	76.7%	103	79.8%	
Associated Hormonal Diseases	No	90	69.8%	89	69.0%	93	72.1%	0.896
	Yes	39	30.2%	40	31.0%	36	27.9%	
History of alternative therapy	No	89	69.0%	88	68.2%	95	73.6%	0.843
	Yes	40	31.0%	41	31.8%	34	26.4%	

Table 3: Purchasing rate per tablet

Medication	**Purchasing Rate (Rupees per Tablet)**
Propranolol	0.21
Amitriptyline	1.84
Escitalopram+ propranolol	0.28

escitalopram (group C), while amitriptyline (group B) was the least cost-effective (Table 3).

The International Headache Society (IHS) currently defines migraine as having at least 5 (headache) attacks that last 4-72 hours, are unilateral, pulsating, moderate or severe in intensity, are aggravated by or cause avoidance of routine physical activity, and are accompanied by nausea and/or vomiting, photophobia or phonophobia[2]. IHS further categorises migraine as episodic or chronic, with or without an aura. Migraine headaches are widespread, with a reported global prevalence of 8% to 18%[6]. Headaches can be treated either acutely or prophylactically. Abortive treatment alleviates immediate headache symptoms, whereas preventive treatment seeks to lessen the frequency or severity of future headaches[7]. The current study collected demographic information from chronic migraine patients and looked at the cost effectiveness of propranolol, amitriptyline, and propranolol in combination with escitalopram in migraine prophylaxis.

The current study, which included 387 adult chronic migraine sufferers, discovered that our study participants' average age was 38.20 ±12.78 years. Individuals under the age of 30 were found to have the highest prevalence (37%), followed by those between the ages of 31 and 40 (28%). A similar trial comparing propranolol and amitriptyline for migraine prophylaxis was undertaken by Gorukanti DR et al[13]. In his study, the mean age in the propranolol group was 31.45±9.37 and 30.28±9.79 in the amitriptyline group, with the majority of patients aged 18 to 30 and the fewest aged 51 to 70[13].

Migraines often occur in youth or early adulthood, according to Peterlin et al.[14]. Singh G. et al discovered that the peak incidence of migraine occurs around the age of 40 and thereafter steadily declines. According to study, headache intensity dropped from 40 to 74 years old while headache frequency and duration remained constant[15]. The prevalence of vascular headache varies by country, according to Ray BK et al. The 1-year incidence in Europe was predicted to be 14%, with the greatest occurrence happening between the ages of 20 and 50. The 3-month general prevalence in the United States was 14.2%, with the largest frequency occurring in people aged 18 to 44 years. Across Latin America, the 1-year frequency ranged from 6.1% to 17.4% for women and 2.9 to 7.8% for men. The combined prevalence in Africa was 5.6% of the general population. In Asia, the prevalence is estimated to be between 8.4% and 12.7%. The varying rates could be related to differences in approach, discrepancies in defining headache prevalence criterion (1 year vs. 3 months), coexisting environmental factors, urban/rural disparities, or ethnicity of the analysed sample[6].

90% of chronic migraine patients in our study were female, with 10% being male. 83% of individuals polled were married, while 17% were single. Migraine is more common in women, according to the current study. In their investigation of 105 cases, Angra et al. discovered a female majority (85.7%)[16]. Toni et al. found significant sex/gender differences in headaches, showing that migraine is mostly a female illness. Pathology follows a bimodal pattern in both genders, with two peaks at 35 and 50 years old, declining with age. Migraines become three to four times more likely in women during adolescence than in men[17]. According to Burch R et al, the global prevalence is 20.7% in women and 9.7% in men[18].

In our study, 58% of patients were from urban areas. This is most likely due to the study location, as the current study was carried out at an urban tertiary care centre. Furthermore, the majority of the respondents (58%) had a bachelor's degree or higher. The majority of migraine sufferers were housewives, followed by students and teachers. Ninety-three percent of patients were nonsmokers, and 96.9% were not alcoholics. There was a migraine family history in 12% of cases. 70% of participants in the current study did not use alternative therapy. Yoga was the most popular (11%) activity. The intergroup difference, however, was not statistically significant. Müller KI et al. also said that rural women made up a much smaller proportion of the population than urban women (p-value = 0.04), and rural women experienced much higher levels of pain in their study[19]. In contrast to our findings, Burch RC et al discovered that single or separated adults experienced migraine more frequently than married adults. Higher education levels and lower household income levels were connected to a higher migraine prevalence. Migraine sufferers are more likely to suffer from despair, anxiety, and other pain difficulties[20]. In their study, Islam RA et al found that lifestyle factors such as seldom exercise and increased screen time were associated with migraine. Other lifestyle factors, such as tobacco use and substance abuse, were not shown to be associated with migraines in their study[21]. Arajo CM et colleagues discovered in a cross-sectional, community-based research of 48 medical students that those who exercised frequently (MIDAS: 15.49 1.78) had significantly lower headache associated impairment (p = 0.03) than those who did not exercise (MIDAS: 8.81 1.40). There was no difference in migraine prevalence between the two groups, however[22]. In the current study, 70% of patients had no prior history of hormonal disease. The most common conditions were thyroid (12%) and PCOD (8%). In our study, 11% of the patients had hypertension and 6% were anaemic. 7% of research participants were allergic to foods, environmental factors, or medications. According to Müller KI et al, the most common concurrent diseases were chronic neck pain (46.8%) and insomnia (31.3%), followed by hypertension (9.0%), asthma (5.2%), depression (4.5%), and hypothyroidism (3.7%)[19]. According to Singla M et al, anxiety is the most prevalent comorbidity, affecting 43.5% of the population, followed by depression (25.7%)[23].

The cost-effectiveness of therapy refers to how well a specific medical intervention or treatment provides health benefits in relation to the expenditures incurred. It is a measure of the worth or utility of a healthcare intervention that takes into account both clinical effectiveness and cost. The importance of cost-effectiveness arises from its ability to affect healthcare decision-making and resource allocation. Given limited healthcare resources, it is crucial to select interventions that provide the most health benefits for the least amount of money. By evaluating the cost-effectiveness of various therapies, governments, healthcare professionals, and patients can make informed decisions about which interventions to pursue and which to avoid, ultimately enhancing the overall health of a community. Finally, cost-effectiveness analysis can aid in ensuring that healthcare resources are used efficiently[24] .

In our study, the most cost-effective drug for the prevention of chronic migraine was propranolol alone (group A), followed by propranolol + escitalopram (group C), and amitriptyline (group B). A comparable study by

Linde at el discovered that self-management with simple analgesics was by far the most cost-effective strategy for migraine therapy in low- and middle-income countries, reflecting a remarkably efficient use of health resources[25] .

Consumer education and provider training, in addition to being economically appealing, are projected to expedite progress towards desirable levels of coverage and adherence. More evidence-based migraine studies in terms of treatment/prophylaxis as well as economic aspects will provide sufficient data to aid in the management of scarce health resources for the maximum benefit of patients, particularly in this chronic, noncommunicable condition that imposes a significant burden on society.

CONCLUSION

The investigation of the impact of migraine on numerous sociodemographic parameters in the study indicates the delicate interplay between this debilitating ailment and the personal qualities of its victims. Age, as a key component, demonstrates how migraine prevalence varies across the lifespan. The study found that migraine frequency generally peaks in the 30s and 40s, highlighting the significance of adapting therapies to age-specific needs. Gender differences, with women being more susceptible to migraines than males, highlight the need for a gender-sensitive approach to migraine care, taking into account hormonal impacts and unique symptom profiles.

Individuals from poorer socioeconomic origins may have difficulty accessing appropriate healthcare resources, making socioeconomic status an important determinant. This highlights the importance of inclusive healthcare programmes that take financial constraints into consideration and promote fair access to preventative drugs.

The study highlights the considerable financial burden that migraines inflict on both individuals and healthcare systems in terms of cost-effectiveness. According to the economic analysis, certain preventative medications can not only lower migraine-related healthcare costs but also improve patients' general quality of life, implying that early investment in prophylactic pharmaceuticals can generate long-term benefits. These medications offer a viable route for cost reduction by addressing the underlying causes of migraines and reducing the need for frequent, costly acute therapies.

Finally, this study emphasises the multidimensional character of migraines and the importance of personalised healthcare methods that take age, gender, and socioeconomic position into account. It also emphasises the possible cost savings and improvements in quality of life associated with preventative drugs, emphasising the significance of informed medication selection and personalised therapy. These findings should serve as a wake-up call to healthcare providers and policymakers to embrace a patient-centered, holistic approach to migraine management that not only alleviates suffering but also saves vital healthcare resources.

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