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Spectrum of Headache Disorders in Pakistan: A Multicenter Study

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SPECTRUM OF HEADACHE DISORDERS IN PAKISTAN: A MULTICENTER STUDY

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ABSTRACT

Background and Objective:

Headache disorders represent some of the most prevalent neurological conditions worldwide. While community-based studies provide general prevalence, data on their diagnostic spectrum in specialized clinical settings in Pakistan remain limited. The objective of this multicenter study was to evaluate the demographic distribution and spectrum of headache disorders among patients presenting to neurological services across Pakistan.

Methods:

This cross-sectional observational study was carried out at 39 neurology centers across Pakistan, from August 2017 to December 2019. Diagnosis was made using International Classification of Headache Disorders, 3rd edition (ICHD-3). Demographic details, and headache subtypes were compared across gender and age. Chi-square analysis was used, with $p < 0.05$ considered significant.

Results:

Among the 5,366 patients, 1,903 (35.4%) were male and 3,463 (64.6%) were female. The most frequent age group was 18-30 years. Migraine was the predominant diagnosis (57.4%), with a significantly higher prevalence in females than males (60.8% vs 51.2%; $p < 0.001$). Tension-type headache (30.2%) and cranial neuralgias (4.8%) both increased with age. Other headache disorders included cluster headache (1.7%), and headaches attributed to psychiatric (1.2%) and vascular disorders (1.0%), along with other secondary causes, which were less frequent overall and showed heterogeneous age and gender distributions across subtypes.

Conclusion:

This regional dataset highlights migraine as the most prevalent headache disorder, especially in younger adults and females, while tension-type headache and cranial neuralgias are more frequent in older patients. These findings emphasize important demographic variations in headache patterns in tertiary care settings in Pakistan.

Keywords: Migraine, Tension-type headache, Cranial neuralgia, Demographics

INTRODUCTION

Headache disorders represent some of the most prevalent neurological conditions worldwide and are a major cause of disability and reduced quality of life. They encompass both primary headache disorders, such as migraine, tension-type headache (TTH), and cluster headache and secondary headaches that arise from structural, vascular, metabolic, or infectious pathologies.¹ According to the Global Burden of Disease Study 2019, headache disorders are the third leading cause of

disability-adjusted life years (DALYs) among neurological illnesses, following stroke and dementia. The consistently high prevalence of tension-type headache across age groups and geographical regions highlights the global impact of these conditions, while migraine alone ranks as the second most common cause of years lived with disability (YLDs) worldwide.²

Headache disorders are highly prevalent across the globe. In 2021, approximately 3.1 billion individuals, almost

around 40% of the world's population were affected by some form of headache disorder.³ Although their frequency and clinical presentation vary according to age and gender, these conditions impact individuals of all ages, ethnic backgrounds, and socioeconomic levels. Women experience headaches more commonly than men, particularly during their reproductive years, a difference likely influenced by hormonal fluctuations.⁴ Among these disorders, migraines are especially impactful, often leading to diminished academic performance and a significant reduction in overall quality of life.⁵

Headache disorders represent a major public health concern in South Asia, where the prevalence of migraine and tension-type headache is comparable to, or even higher than, that reported in Western populations. Studies conducted across the nation indicate that the prevalence of migraine headaches in Nepal exceeds 30%.⁶ In India, a community survey revealed that 25.2% of persons met criteria for migraine and 35.1% for TTH, with approximately 4% enduring chronic daily headache.⁷ A university based study in Bangladesh found that 21.4% of people had migraines. Women were more likely to have them, which made it difficult to do everyday activities.⁸ These findings emphasize the significant burden in the region and reinforce the necessity for population specific data and treatments. Limited but significant epidemiological research has shown that headache disorders are very common in Pakistan. According to a population based study conducted in Karachi, 76.6% of adults reported headaches, with 22% meeting migraine criteria and over half meeting TTH criteria.⁹ While a recent nationwide population-based survey has further established the high prevalence of primary headache disorders across Pakistan, there remains a significant gap in understanding the full diagnostic spectrum within specialist clinical settings.¹⁰ Due in part to low public knowledge, self-medication, and limited access to healthcare, headache disorders are underdiagnosed and undertreated in Pakistan despite their prevalence.¹¹ Furthermore, chronic headaches are often linked to psychological comorbidities such as anxiety and depression, which makes management and prognosis more difficult.¹²

The goal of this study was to describe the clinical spectrum of headache conditions among patients presenting for specialized neurological care. By classifying headache types by age and gender in both outpatient

(OPD) and inpatient settings; we aim to identify diagnostic trends that can guide clinical suspicion and early diagnosis in a hospital environment.

METHODS

This retrospective cross-sectional observational study was carried out at 39 neurology centers across Pakistan, encompassing both public and private healthcare institutions located in urban as well as rural regions. Following approval and exemption from the local Ethics Review Committee, data collection was carried out between August 2017 and December 2019. Headache diagnoses were made by participating neurologists in accordance with the ICHD-3 classification. Prior to full implementation, the survey form underwent pilot testing at Aga Khan University Hospital, to ensure clarity and completeness in capturing information on educational background and comorbidities.

Demographic and clinical data, including age, comorbid conditions, and headache etiology, were extracted from hospital records and systematically documented using a structured questionnaire. The study population comprised adults aged 18 years or older who presented with headaches as a primary complaint, including those evaluated in outpatient departments (OPD) as well as those admitted as inpatients at participating centers. Information regarding demographics, education, and comorbidities was recorded for all eligible participants. To maintain confidentiality, each participant was assigned a unique identifier during data entry. All records were securely stored in Microsoft Excel with access limited to the principal investigator, and the finalized dataset was shared exclusively with the statistician for analysis.

All statistical analyses were performed using IBM SPSS Statistics software, version 19.0. Descriptive analyses were applied to summarize the dataset. Categorical variables were expressed as frequencies and percentages, whereas continuous variables were presented as mean values with their corresponding standard deviations (SD). To examine the association between headache classifications and demographic factors, chi-square tests were used for categorical comparisons with gender and categorized age groups. All p-values were two-sided, and a p-value < 0.05 was regarded as statistically significant.

RESULTS

The age, gender, education and comorbid profile of the study population is given in Table 1.

Table 1: Demographics of the Study Population	
Characteristics	N= 5366 (%)
Age, in years	37.5 ± 13.2
Age, median (IQR)	35(27-45)
18-30	1899(35.4)
31-40	1642(30.6)
41-50	1003(18.7)
51-60	494(9.2)
61-70	209(3.9)
> 70 years	119(2.2)
Gender	
Male	1903(35.5)
Female	3463(64.5)
Education	
Unknown	1629(30.4)
Illiterate	1357(25.3)
Under Matric	1280(23.9)
Inter	510(9.5)
Graduate	394(7.3)
Masters	157(2.9)
PhD	2(0.0)
Doctor	17(0.3)
Other	20(0.4)
Comorbid	
Hypertension	744(13.9)
Diabetes	275(5.1)
Dyslipidemia	96(1.8)
Coronary Artery Disease	57(1.1)
Tobacco	159(3.0)
Depression	332(6.2)

Headache types varied significantly among gender and age categories ($p < 0.001$). Migraine was the most prevalent headache type overall, occurring significantly more frequently in females (60.8%) than in males (51.2%), whereas tension-type headache showed comparable proportions between the two genders.

Cluster headache, vascular and non-vascular intracranial headaches, psychosomatic headaches, and cranial neuralgias were more frequent among males, while post-traumatic and infection-related headaches were comparable between two groups (Table 2).

Table 2: Headache distribution between different genders

Headache Type	Male (n=1903)	Female (n=3463)	p-value
Migraine	975 (51.2)	2104 (60.8)	
Tension type headache	569 (29.9)	1054 (30.4)	
Cluster headache	58 (3.0)	32 (0.9)	
Headache attributed to head/neck trauma	31 (1.6)	31 (0.9)	
Headache due to vascular disorder	28 (1.5)	24 (0.7)	
Headache due to non-vascular intracranial disorders	19 (1.0)	16 (0.5)	<0.001
Headache due to drugs/substance withdrawal	20 (1.1)	6 (0.2)	
Headache due to infection	11 (0.6)	16 (0.5)	
Headache due to craniofacial structures	22 (1.2)	27 (0.8)	
Headache due to psychiatric disorders	34 (1.8)	29 (0.8)	
Cranial neuralgias and central cause of facial pain	136 (7.1)	124 (3.6)	

Migraine was the predominant diagnosis among younger adults, occurring in (65.6%) of patients aged 18–30 years and (60.7%) of those aged 31–40 years, with prevalence declining progressively after 40 years, reaching (29.4%) in individuals over 70 years. On the other hand, tension-type headache (TTH) affected (26.4%) of patients aged 18 to 30 years. Cluster

headache, post-traumatic headache, and vascular headaches were rare among all age groups, each accounting for less than 4% of instances. Cranial neuralgias exhibited a significant age correlation, increasing from (1.4%) in the youngest demographic to (32.8%) in individuals over 70 years of age (Table 3).

Table 3: Headache types according to age groups

Category	18-30	31-40	41-50	51-60	61-70	>70	p value
Headache Type							
Migraine	1245 (65.6)	996 (60.7)	540 (53.8)	188 (38.1)	75 (35.9)	35 (29.4)	
Tension type	501 (26.4)	488 (29.7)	324 (32.3)	190 (38.5)	86 (41.1)	34 (28.6)	
Cluster headache	28 (1.5)	24 (1.5)	19 (1.9)	12 (2.4)	3 (1.4)	4 (3.4)	
Head/neck trauma	18 (0.9)	16 (1.0)	14 (1.4)	10 (2.0)	3 (1.4)	1 (0.8)	<0.001
Vascular disorder	14 (0.7)	9 (0.5)	13 (1.3)	12 (2.4)	3 (1.4)	1 (0.8)	
Non-vascular intracranial disorders	13 (0.7)	12 (0.7)	6 (0.6)	0	1 (0.5)	3 (2.5)	
Drugs/substance	5 (0.3)	14 (0.9)	5 (0.5)	2 (0.4)	0	0	
Infection	10 (0.5)	9 (0.5)	3 (0.3)	4 (0.8)	0	1 (0.8)	
Craniofacial structures	14 (0.7)	15 (0.9)	11 (1.1)	6 (1.2)	2 (1.0)	1 (0.8)	
Psychiatric disorders	24 (1.3)	18 (1.1)	14 (1.4)	3 (0.6)	4 (1.9)	0	
Cranial neuralgias	27 (1.4)	41 (2.5)	54 (5.4)	67 (13.6)	32 (15.3)	39 (32.8)	

DISCUSSION

Our study demonstrates a higher frequency of headaches among females and individuals from the illiterate population. Primary headaches were most common in our cohort, particularly among women of reproductive age, along with tension-type headaches. Although headaches overall were more frequent in females, it was noteworthy that males predominated in those aged above 70 years.

Migraine, being the most prevalent primary neurological disorder, significantly impacts daily functioning and is consistently reported as the most common headache type across various populations, with a higher occurrence in females. However, symptom variation between genders has been shown to be comparable, a finding that aligns with our population.¹³ Rasmussen BK et al. also reported a decline in migraine prevalence with advancing age, which is consistent with our results. Similar age-stratified patterns of migraine distribution have been observed in South Asian populations as well.^{14,15} These differences are likely attributable to hormonal influences and underlying neuronal pathway mechanisms.¹⁶

Tension-type headache demonstrated a female predominance in the 18-30 years age group, which may

be attributed to socioeconomic pressures and socially determined roles of women. This contrasts with previously published literature, which reports a higher prevalence of TTH in individuals over 60 years of age.¹⁷ However, data from South Asian populations are consistent with our findings, showing the most common age of occurrence to be between 10-38 years.¹⁸

Similarly, cluster headaches were more frequent in our population among males aged 18-30 years and were also associated with substance withdrawal. Secondary headaches due to infections, psychiatric disorders, and neuralgiform syndromes exhibited nearly equal frequency across both genders. In contrast, neuralgic headaches were more commonly observed in individuals older than 40 years.

Our findings also demonstrate a higher frequency of headache reports among individuals with incomplete primary education or no formal education. This aligns with existing literature, which indicates that up to 62% of headaches are reported by illiterate individuals. Evidence from Western populations similarly supports an association between lower educational status and increased headache frequency. A study from Pakistan further reported a negative correlation between migraine

occurrence and higher levels of education .¹⁰ While the study established the general prevalence of headache in Pakistan, our results provide a distinct and necessary clinical perspective. By focusing on patients seeking specialist intervention in both outpatient (OPD) and inpatient settings, we highlight the specific diagnostic spectrum encountered in tertiary care.

These findings emphasize that headache disorders remain a considerable source of personal and societal burden in Pakistan. By stratifying the clinical population according to age and gender, our study highlights the widespread prevalence and varying patterns of headache disorders among those seeking specialist care.

This study has several limitations. As a hospital based multicentre study involving both inpatients and outpatients, it reflects the specific clinical spectrum of patients seeking specialist neurological care and may not represent the true community burden of headache disorders. Consequently, individuals from rural populations or those with limited healthcare access may be underrepresented, limiting the generalizability of these findings to the broader population of Pakistan. Additionally, due to the retrospective nature of this study

and its reliance on hospital records, validated headache specific disability tools, such as the MIDAS or HIT-6 scores, could not be applied. Finally, the relatively low prevalence of medication overuse headache observed may reflect under ascertainment in retrospective clinical charts rather than a true low prevalence in the population.

CONCLUSION

This multicenter study identifies migraine as the predominant headache disorder in Pakistan's specialist clinical settings, particularly among females and younger adults. Conversely, tension-type headaches and cranial neuralgias show a progressive increase with age, with neuralgias reaching their peak frequency in patients over 70 years. These findings reveal significant demographic variations and a high clinical burden among individuals with limited formal education. While hospital-based data may not reflect the full community burden, it provides a vital specialist perspective for neurological training and resource planning. Ultimately, improved awareness and tailored management strategies are essential to address the unique diagnostic landscape of headache disorders in Pakistan.

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Amina Javed: Concept, Design, Data collection, manuscript writing

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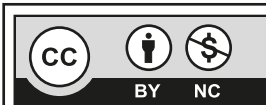
Manzoor Lakhair; data collection, data analysis, manuscript writing

Fahad Saleem; data analysis, manuscript revision

Waleed Shahzad; data interpretation, manuscript revision

Ahmed Wali; data interpretation, manuscript revision

All the authors have approved the final version to be published and agree to be accountable for all aspects of the work.



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