

Clinical Profile, Headache-Related Disability, and Associated Lifestyle Factors among Children with Primary Headache at a Tertiary Care Center in North India: A Cross-Sectional Observational Study

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Abstract

Background: Primary headache disorders are among the most common neurological conditions in children and adolescents, with substantial effects on academic performance, quality of life, and psychosocial well-being. Data from India on the clinical spectrum, disability burden, and lifestyle correlates of pediatric primary headache remain limited, particularly among children attending tertiary care centers.

Objective: To evaluate the clinical profile, headache-related disability, and associated lifestyle and psychosocial factors among children with primary headache attending a tertiary care center in North India.

Methods: This hospital-based cross-sectional observational study was conducted in the Department of Pediatrics, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, over 18 months. Seventy-one consecutive children aged 5–18 years diagnosed with primary headache according to International Classification of Headache Disorders, Third Edition (ICHD-3) criteria were enrolled. Demographic characteristics, headache profile, associated symptoms, lifestyle factors, PedMIDAS disability scores, and psychological stressors were recorded using a structured proforma. Statistical analysis was performed using IBM SPSS Statistics version 26.0; associations were assessed using the Chi-square or Fisher's exact test, with a two-tailed $p < 0.05$ considered statistically significant.

Results: The mean age of participants was 11.8 ± 3.2 years, and 56.3% were female. Migraine was the most common primary headache subtype (50.7%), followed by tension-type headache (38.0%). Nausea (49.3%), photophobia (42.3%), and vomiting (33.8%) were the most frequent associated symptoms. Moderate-to-severe headache-related disability was observed in 47.9% of participants. Greater disability was significantly associated with prolonged screen time ($\chi^2 = 8.87$, $p = 0.032$) and sleep duration < 7 hours/day ($p < 0.001$), while headache subtype showed no significant association ($p = 0.072$). Neuroimaging was performed in 12.7% of children, with abnormal findings in only 1.4%.

Conclusion: Migraine was the predominant primary headache disorder among children attending a tertiary care center and was associated with substantial headache-related disability. Inadequate sleep and prolonged screen exposure were significant modifiable factors. Early diagnosis using ICHD-3 criteria, routine PedMIDAS assessment, lifestyle counseling, and selective neuroimaging may improve pediatric primary headache management.

Keywords: Primary Headache; Migraine; Tension-Type Headache; PedMIDAS; Children; Screen Time; Sleep Duration.

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Introduction

Primary headache disorders are among the most common neurological conditions affecting children and adolescents, accounting for a substantial proportion of pediatric outpatient and neurology consultations worldwide. Although once

considered predominantly adult disorders, headaches are now increasingly recognized as an important cause of morbidity in the pediatric population, with significant effects on physical health, emotional well-being, academic

performance, and quality of life [1]. The prevalence of recurrent headache increases progressively with age, particularly during adolescence, when migraine and tension-type headache (TTH) become the predominant clinical entities. According to the International Classification of Headache Disorders, Third Edition (ICHD-3), primary headaches include migraine, tension-type headache, and trigeminal autonomic cephalalgias. In contrast, secondary headaches result from underlying structural, infectious, vascular, or metabolic disorders. Accurate differentiation between these categories is essential because management strategies and prognostic implications differ considerably [2].

Primary headache significantly affects school attendance, academic performance, quality of life, and psychosocial well-being. Lifestyle factors such as inadequate sleep, excessive screen exposure, irregular meals, and stress may increase headache frequency and disability [1,3].

The diagnosis of primary headache in children is primarily clinical and relies on careful assessment using standardized diagnostic criteria. In the absence of neurological deficits or other “red-flag” features, extensive investigations such as neuroimaging generally have a low diagnostic yield [4]. They may unnecessarily increase healthcare costs and parental anxiety. Consequently, current recommendations advocate judicious use of investigations while emphasizing comprehensive clinical evaluation. Headache-related disability can be assessed objectively using the validated Pediatric Migraine Disability Assessment (PedMIDAS) questionnaire [5,6].

Despite the growing recognition of pediatric headache as a major public health concern, data from India remain limited, particularly regarding the clinical spectrum, disability burden, lifestyle factors, and psychosocial correlates among children attending tertiary care centers [7]. Most available studies are community- or school-based and may not adequately represent children requiring specialist evaluation [8–10]. Regional differences in healthcare access, sociocultural practices, environmental exposures, and lifestyle patterns further limit the generalizability of international findings to the Indian population [11]. Therefore, the present study was undertaken to evaluate the clinical profile of children with primary headache attending a tertiary care center in North India, with particular emphasis on headache characteristics, associated symptoms, lifestyle and psychosocial factors, headache-related disability, and patterns of clinical evaluation and management. The findings are expected to provide evidence that will facilitate early diagnosis, rational investigation, and comprehensive management of pediatric primary headache in routine clinical practice.

Materials and Methods

Study Design and Setting: This hospital-based cross-sectional observational study was conducted in the Department of Pediatrics, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, a tertiary-care teaching hospital serving both urban and rural populations of southern Rajasthan. The study was conducted from July 2024 to December 2025. Ethical approval was obtained from the Institutional Human Research Ethics Committee (HREC), Geetanjali University, Udaipur, Rajasthan (Approval No. GU/HREC/EC/2024/2518) before commencement of the study. Children attending the pediatric outpatient department and inpatient services during the study period were screened for eligibility.

Study Population: The study population comprised children aged 5–18 years who presented with recurrent headache to the Pediatric Outpatient Department or were admitted to the Pediatric Ward of Geetanjali Medical College and Hospital during the study period. A pediatrician evaluated all children, and the diagnosis of primary headache was established according to the International Classification of Headache Disorders, Third Edition (ICHD-3) criteria.

Sampling Technique and Participant Recruitment: A consecutive sampling technique was employed, whereby all eligible children presenting during the study period were screened for inclusion. Children who met the eligibility criteria were enrolled consecutively until the predetermined sample size was reached. Written informed consent was obtained from parents or legal guardians before enrollment, and assent was obtained from older children when appropriate.

The sample size was estimated using the single-population proportion formula for cross-sectional studies: $n = Z^2P(1-P)/d^2$, where n = required sample size, Z = standard normal deviate corresponding to a 95% confidence level (1.96), P = expected prevalence of primary headache among children (as reported in previous literature), and d = absolute precision (5%). Assuming an expected prevalence of 19%, $Z = 1.96$, and an absolute precision of 5%, the calculated sample size was 66, which was increased to 71 to compensate for an anticipated non-response rate of approximately 10%.

Eligibility Criteria: Inclusion criteria: Children aged 5–18 years; diagnosis of primary headache according to ICHD-3 criteria; recurrent headache requiring pediatric evaluation; written informed consent obtained from parents or legal guardians.

Exclusion criteria: Secondary headache due to central nervous system infection, intracranial space-occupying lesions, head trauma, hydrocephalus, hypertension, metabolic disorders, or other systemic illnesses; major neurological disorders or developmental delay interfering with headache assessment; children with incomplete clinical records or whose parents/guardians declined consent.

Bias: Selection bias was minimized through consecutive recruitment, while information bias was reduced using standardized ICHD-3 criteria, a pretested case record form, and uniform PedMIDAS assessment.

Data Collection and Clinical Assessment: Data were collected prospectively using a predesigned, pretested structured case record form by trained pediatric residents under the supervision of consultant pediatricians. Data collected included demographic characteristics, headache profile, associated symptoms, lifestyle factors, psychosocial stressors, PedMIDAS disability scores, and neuroimaging findings.

A comprehensive general physical examination and detailed neurological examination were performed in all participants. Neuroimaging and other diagnostic investigations were requested only when clinically indicated by abnormal neurological findings or recognized red-flag features suggestive of secondary headache.

Outcome Measures: The primary outcome was the clinical profile of pediatric primary headache.

Secondary outcomes included headache-related disability, associated lifestyle and psychosocial factors, and utilization of neuroimaging.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA). Data were checked for completeness, consistency, and accuracy before analysis. Continuous variables were expressed as mean $\pm$ SD or median (IQR), whereas categorical variables were summarized as frequencies and percentages. Associations were analyzed using the Chi-square test, Fisher's exact test, Student's t-test, or Mann-Whitney U test, as appropriate.

A two-tailed $p < 0.05$ was considered statistically significant. No imputation of missing data was required because complete clinical information was available for all enrolled participants; statistical analyses were performed using complete-case analysis.

Results

During the study period, 84 children presenting with recurrent headache were screened for eligibility. Of these, 79 children met the predefined eligibility criteria based on the International Classification of Headache Disorders, Third Edition (ICHD-3). Five children were excluded, including three with secondary headache disorders and two whose parents declined to provide informed consent. Consequently, 71 children with primary headache were enrolled and included in the final analysis.

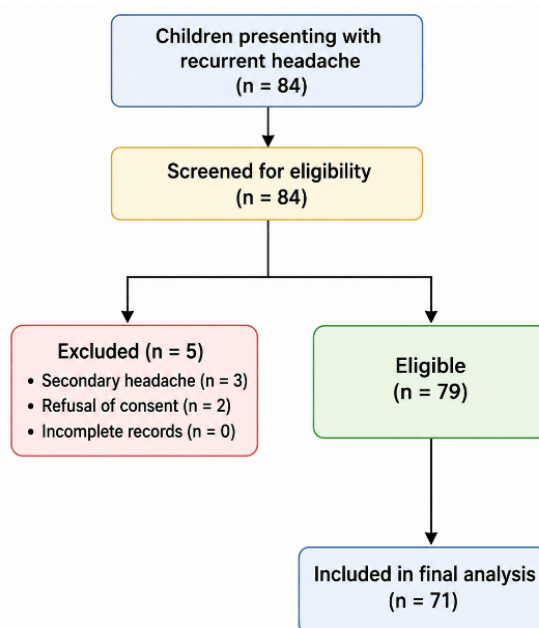


Figure 1: Flow diagram showing recruitment and inclusion of study participants

The baseline demographic and clinical characteristics of the study participants are summarized in Table 1. Migraine was the predominant primary headache subtype, followed by tension-type headache.

Table 1: Baseline Demographic and Clinical Characteristics of Children with Primary Headache (n = 71)

Variable	n (%) / Mean $\pm$ SD
Age (years)	11.8 $\pm$ 3.2
5–8 years	15 (21.1)
9–12 years	27 (38.0)
13–18 years	29 (40.9)
Male	31 (43.7)
Female	40 (56.3)
Urban residence	39 (54.9)
Rural residence	32 (45.1)
Middle socioeconomic class	35 (49.3)
Duration of headache >6 months	46 (64.8)
≥ 1 headache episode/week	42 (59.2)
Primary headache subtype	
Migraine	36 (50.7)
Tension-type headache	27 (38.0)
Other primary headaches	8 (11.3)
Site of pain	
Frontal	27 (38.0)
Temporal	18 (25.4)
Diffuse	15 (21.1)
Occipital	11 (15.5)
Character of pain	
Throbbing	34 (47.9)
Tightening	24 (33.8)
Other	13 (18.3)
Positive family history of headache	31 (43.7)

Table 2 summarizes the clinical characteristics, associated symptoms, headache-related disability, and lifestyle factors among the study participants.

Table 2: Clinical Features, Lifestyle Factors, and PedMIDAS Disability among Study Participants (n = 71)

Variable	n (%)
Associated symptoms	
Nausea	35 (49.3)
Vomiting	24 (33.8)
Photophobia	30 (42.3)
Phonophobia	26 (36.6)
Dizziness	20 (28.2)
Sleep duration	
<7 hours/day	30 (42.3)
7–8 hours/day	26 (36.6)
>8 hours/day	15 (21.1)
Screen time	
<2 hours/day	12 (16.9)
2–4 hours/day	21 (29.6)
>4 hours/day	38 (53.5)
Regular balanced diet	29 (40.8)
Irregular meal pattern	18 (25.4)
Skipping breakfast	14 (19.7)
Common headache triggers	
Sleep deprivation	34 (47.9)
Excessive screen time	31 (43.7)
Academic stress	29 (40.8)
Skipping meals	26 (36.6)
PedMIDAS disability	
Little/no disability	17 (23.9)
Mild disability	20 (28.2)

Moderate disability	19 (26.8)
Severe disability	15 (21.1)

Associations between headache subtype, lifestyle factors, PedMIDAS disability, and clinical management are presented in Table 3. Statistically significant associations were observed between prolonged screen time, inadequate sleep, academic stress, psychological stress, and greater headache-related disability, whereas the association with headache subtype did not reach statistical significance.

Table 3: Factors Associated with Headache-Related Disability (PedMIDAS) Among Children with Primary Headache (n = 71)

Variable	Result (n, %)	Statistical test	p value
Headache subtype vs PedMIDAS severity	Migraine: Mild 9 (25.0%), Moderate 15 (41.7%), Severe 12 (33.3%); TTH: Mild 12 (44.4%), Moderate 11 (40.7%), Severe 4 (14.9%); Other: Mild 2 (25.0%), Moderate 1 (12.5%), Severe 5 (62.5%)	$\chi^2 = 8.59$, df = 4	0.072
Daily screen time vs PedMIDAS severity	Severe disability increased from 8.3% (<2 h/day) to 58.3% (>6 h/day)	$\chi^2 = 13.82$, df = 6	0.032
Sleep duration vs severe disability	<7 h/day: 16/30 (53.3%); ≥ 7 h/day: 3/41 (7.3%)	$\chi^2 = 18.72$	<0.001
Academic stress vs severe disability	Present: 14/37 (37.8%); Absent: 5/34 (14.7%)	$\chi^2 = 4.84$	0.028
Psychological stress (DAP) vs severe disability	Moderate–severe: 13/32 (40.6%); None/mild: 6/39 (15.4%)	$\chi^2 = 5.71$	0.017

Abbreviations: PedMIDAS, Pediatric Migraine Disability Assessment; DAP, Draw-A-Person; χ^2 , Chi-square test.

Additional subgroup analyses demonstrated statistically significant associations between migraine subtype, prolonged screen exposure, inadequate sleep, and greater headache-related disability. No sensitivity analyses or multivariable analyses were undertaken.

Discussion

The present study was undertaken to evaluate the clinical profile, headache-related disability, and associated lifestyle and psychosocial factors among children with primary headache attending a tertiary care center in North India. In keeping with the study objectives, migraine emerged as the most common primary headache disorder (50.7%), followed by tension-type headache (38.0%). Nearly half of the participants (47.9%) experienced moderate-to-severe headache-related disability, and statistically significant associations were observed between prolonged screen exposure, inadequate sleep, academic stress, psychological stress, and greater disability, while headache subtype showed a non-significant trend toward greater disability. Furthermore, neuroimaging demonstrated a very low diagnostic yield in neurologically normal children, supporting a selective rather than routine approach to neuroimaging in pediatric primary headache.

The mean age of children in our study was 11.8 ± 3.2 years, with 78.9% belonging to the 9–18-year age group, and females constituted 56.3% of the study population. These findings closely resemble those reported by Reddy et al. (2025) [12], who observed a mean age of 10.53 ± 2.7 years with a

female-to-male ratio of 1.15:1 among 56 children with primary headache. Similarly, Sinha et al. (2023) [11] reported a mean age of 10.1 ± 2.8 years, with 60% female, while Adhikari et al. (2023) [10] reported a mean age of 14.4 ± 2.58 years, with a female predominance of 58.6% among 280 children. Üstün et al. (2025) [13] also demonstrated that headaches were significantly more common among adolescents aged 12–17 years ($p < 0.001$) and that females accounted for 64.8% of cases. These findings support the observation that headache prevalence increases with age and becomes more common among girls during adolescence, probably because of hormonal, psychosocial, and behavioral influences.

Migraine was the predominant headache subtype in our study (50.7%), followed by tension-type headache (38.0%). Comparable results have been reported in several hospital-based studies. Kılıç et al. (2021) [14] found migraine in 51.1% and tension-type headache in 32.3% of 350 children, while Kawatu et al. (2022) [15] reported migraine in 53.2%, undifferentiated headache in 14.8%, and tension-type headache in 12.1% among 2,089 schoolchildren. Likewise, Lailatunnessa et al. (2024) [16] observed migraine without aura in 54%, migraine with aura in 16%, and tension-type headache in 22% of children. In contrast, Reddy et al. (2025) [12] reported tension-type headache (46%) slightly more frequently than migraine (40%), and Malik et al. (2012) [17] found tension-type headache (50.99%) to be more prevalent than migraine (26.98%) in a large school-based study involving 5,000 children. These differences

probably reflect variations in study setting, referral bias, diagnostic criteria, and age distribution.

A positive family history of headache was documented in 43.7% of our participants. Similar findings were reported by Tunje et al. (2025) [18], who observed family history in 46.6% of children, while Lailatunnessa et al. (2024) [16], Sinha et al. (2023) [11], and Balaraman et al. (2018) [19] reported positive family history in 63%, 62%, and 62%, respectively. Reddy et al. (2025) [12] reported an even higher prevalence (68%) and identified family history as a statistically significant predictor of primary headache ($p < 0.05$). Furthermore, Al Momani et al. (2021) [20] reported that a positive family history increased the likelihood of primary headache by nearly fourfold (OR 3.68, $p < 0.001$). These consistent findings reinforce the well-established genetic predisposition underlying pediatric migraine.

Among associated symptoms, nausea (49.3%), photophobia (42.3%), vomiting (33.8%), and phonophobia (36.6%) were the most frequent manifestations in our study. These findings are consistent with Üstün et al. (2025) [13], who reported photophobia in 36.4%, phonophobia in 33.8%, nausea in 30.8%, and headache duration of 1–4 hours in 38.2% of children. Similarly, Ruangsawan et al. (2007) [21] documented nausea in 52.3%, vomiting in 41.9%, photophobia in 38.5%, and phonophobia in 33.9%, while Cuvellier et al. (2008) [22] found associated symptoms in 84.4% of children with migraine. Padhy et al. (2025) [23] reported even higher frequencies among migraine patients, with nausea in 91.4%, photophobia in 71.9%, and phonophobia in 64.8%. These comparisons indicate that autonomic and sensory symptoms remain characteristic features of pediatric migraine and are valuable for differentiating migraine from tension-type headache.

Lifestyle factors emerged as important contributors to headache burden in our study. Sleep deprivation was identified as the commonest trigger (47.9%), and severe PedMIDAS disability occurred in 53.3% of children sleeping < 7 hours/day, compared with only 7.3% among those sleeping ≥ 7 hours ($p < 0.001$). Similar findings were reported by Kılıç et al. (2021) [14], who identified insomnia as the commonest precipitating factor (52.7%), followed by stress (45.9%). Tunje et al. (2025) [18] found sleep disorders in 32.9% of children, whereas Al Momani et al. (2021) [20] reported sleep deprivation in 21.1% of pediatric headache patients. These findings suggest that inadequate sleep substantially contributes to headache occurrence and disability and should be routinely addressed during counseling.

Prolonged screen exposure also showed a

significant association with headache-related disability in our study. More than half of the participants (53.5%) reported screen time exceeding four hours daily, and severe disability increased from 8.3% among children with screen time below two hours to 58.3% among those with prolonged exposure ($p = 0.032$). Adhikari et al. (2023) [10] similarly demonstrated that screen exposure exceeding 4 hours/day was significantly associated with primary headache ($p < 0.001$); migraine was associated with greater functional limitation (PedMIDAS > 10 in 52.4%) than tension-type headache (12.5%). Sinha et al. (2023) [11] also found screen exposure of 2–4 hours/day to be significantly associated with headache ($p < 0.05$), while Reddy et al. (2025) [12] reported significant associations between screen time, headache frequency, and medication use ($p < 0.05$). These observations highlight excessive digital screen exposure as an important modifiable risk factor for pediatric headache.

Dietary and psychosocial factors also influenced headache occurrence. Skipping meals was identified as a trigger in 36.6% of our participants, while 40.8% reported a regular balanced diet. Reddy et al. (2025) [12] observed skipped meals in 28.6% of children, whereas Lailatunnessa et al. (2024) [16] reported school examinations (45%) and academic assignments (39%) as important precipitating factors. Malik et al. (2012) [17] identified stress as the commonest trigger (73.4%) among schoolchildren with primary headache. These findings emphasize that dietary irregularities and psychosocial stress are important modifiable contributors to pediatric headache and should be addressed through counseling and behavioral interventions.

Headache-related disability was considerable in the present study, with 47.9% of children experiencing moderate-to-severe disability. Although severe disability was more frequent among children with migraine and other primary headache disorders, the association between headache subtype and PedMIDAS severity did not reach statistical significance ($\chi^2 = 8.59$, $df = 4$, $p = 0.072$). Adhikari et al. (2023) [10] similarly reported PedMIDAS scores > 10 in 52.4% of children with migraine compared with 12.5% in tension-type headache, while school absenteeism occurred in 67.1% of migraineurs compared with 12.5% of children with tension-type headache ($p < 0.001$). Collectively, these studies indicate that pediatric primary headache has a substantial impact on school performance, daily activities, and quality of life.

Only 12.7% of children in our study underwent neuroimaging, and abnormal findings were identified in just one patient (1.4%), confirming the low diagnostic yield of routine imaging in neurologically normal children. Comparable

findings were reported by Üstün et al. (2025) [13], who found clinically significant MRI abnormalities in only 0.8% of 500 children despite neuroimaging being performed in selected cases. Tunje et al. (2025) [18] reported abnormal MRI findings in 4.1% and normal CT scans in 100% of children, while Kılıç et al. (2021) [14] found clinically significant MRI abnormalities in only 0.28% despite imaging 34.5% of patients. These findings strongly support current recommendations that neuroimaging be reserved for children with an abnormal neurological examination or other red-flag features, rather than performed routinely.

Strengths and Limitations

The study's strengths include standardized diagnostic criteria and validated disability assessment. Limitations include its single-center, cross-sectional design, small sample size, possible recall bias, and absence of long-term follow-up, which may limit generalizability and causal inference.

Conclusion

Migraine was the most common primary headache disorder among children attending our tertiary care center and was associated with greater disability than other headache types. Sleep deprivation, prolonged screen exposure, and irregular dietary habits emerged as important modifiable risk factors. Early diagnosis using ICHD-3 criteria, routine assessment with PedMIDAS, appropriate lifestyle counseling, and selective use of neuroimaging can substantially improve the clinical management and quality of life of children with primary headache. Although conducted at a single tertiary-care center, the findings are likely applicable to children presenting with primary headache at similar referral hospitals, but should be generalized to community settings with caution.

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