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# CLINICAL PROFILE OF PRIMARY HEADACHE AND ASSOCIATED FACTORS IN SCHOOL-GOING CHILDREN: A CROSS-SECTIONAL STUDY IN A TERTIARY CENTRE

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## Abstract

**Background:** Headache is the most prevalent neurological manifestation in children and adolescents, and one of the leading causes of disability worldwide. It significantly impacts morbidity in children, causing distress and disability for both children and their families. The aim is to investigate the clinical profile of primary headaches and identify associated factors among school-going children attending a tertiary care center. **Materials and Methods:** A cross-sectional, observational study was conducted at SVS Medical College, a tertiary care center in Telangana, India, from May 2023 to June 2024. The study included children aged 5 to 16 years who presented with primary headaches to the Pediatric outpatient or emergency departments. A comprehensive clinical evaluation was conducted to collect the data regarding characteristics of headaches and probable etiologies and triggers. Data were entered in preformed proforma and analysed using the Chi-square test, with statistical significance defined as a p-value <0.05. **Result:** The study comprised 56 children (30 girls and 26 boys) with a female-to-male ratio of 1.15:1. The ages ranged from 5 to 16 years, with a mean age of 10.53 years (SD = 2.7 years). Tension-type headaches were the most common (46%), followed by migraines (40%) and other types (14%). The most frequent pain type was tightening (52%), followed by throbbing (39%). Pain was predominantly bilateral (64%), with unilateral pain in 21% of cases. Headache duration typically ranged from 1 to 4 hours (55.3%). Common precipitating factors included bright sunlight (41%), skipped meals (28%), and screen exposure (19.6%), with 46.4% of children having 2-4 hours of screen time daily. A family history of headaches was reported in 67.8% of cases. For acute therapy, 73% of children received NSAIDs, and 53.5% received prophylactic medications (flunarizine and propranolol). Factors such as pain site, type, duration, frequency, severity, screen time, positive family history, and medication use were significantly associated with primary headaches (P<0.05). **Conclusion:** Our study reveals a higher prevalence of primary headaches in school-aged girls, with tension-type headaches being the most common. Significant triggers include screen time, sunlight, and family history. We recommend NSAIDs for acute relief and flunarizine for prevention, providing key insights for future research and clinical practice.

## INTRODUCTION

Headache is one of the most common neurological symptoms among pediatric patients, often leading to missed school days, reduced quality of life, and significant distress for both children and their families.[1] The reported prevalence of headaches among children ranges from 37.0% to 51.0%, with about 60% of children worldwide experiencing at

least three headache attacks per year.[2,3] The prevalence of headaches increases throughout childhood, peaking at ages 11–13 in both sexes. Migraine and tension-type headaches (TTH) are the most predominant types, with 6.1% to 13.6% of children experiencing migraines and 9.8% to 24.7% experiencing TTH.[4,5] According to the "Global Burden of Disease Study 2016," migraine ranks as the second largest disease burden, with greater "Years Lived with Disability" than diabetes or bipolar disorder.[6]

Recurring headache prevalence varies with age, from 4.5% in children aged 4 to 6 to 27.4% in adolescents aged 16 to 18.[7] The prevalence of chronic daily headaches in the general population is around 4% to 5%. The International Classification of Headache Disorders, 3rd edition beta version (ICHD-III beta), categorises headaches into primary and secondary disorders based on underlying etiology. Headaches are further classified by attack frequency and duration into episodic (fewer than 15 days per month) or chronic (at least 15 days per month for at least three consecutive months).[8]

Primary headache disorders include migraine, TTH, trigeminal autonomic cephalalgias (TACs), and other specific primary headache disorders. Secondary headaches are attributed to underlying conditions such as intracranial space-occupying lesions (SOLs), central nervous system infections (e.g., meningitis or encephalitis), subarachnoid haemorrhage, giant-cell arteritis, cerebral venous thrombosis, and idiopathic intracranial hypertension.[9] Most childhood headaches are due to primary headache disorders like migraines or benign processes like viral infections. A thorough evaluation of headaches in the pediatric population is crucial for proper diagnosis and management.

In children and adolescents, headaches significantly impact quality of life, limiting social interactions, physical activities, and school attendance. They can lead to poorer academic performance, and an increased likelihood of leaving school, and negatively affect parental careers.[10] Enhanced understanding of the distinguishing features between primary and secondary headaches enables healthcare providers to optimize patient care, improving quality of life and minimizing disability.

This study aimed to examine the incidence and clinical features of primary headaches in children and adolescents aged 5 to 16 years at a teaching hospital. The study has been done for this age group as the younger children may not be able to describe the characteristics of headaches and the severity of the headaches given by children may not be reliable.

**Objectives**

- To determine the prevalence and types of primary headache disorders among school-going children.
- To analyze the demographic factors, including age, sex, and geographical area, associated with primary headaches in children.
- To evaluate the clinical characteristics of headaches, including duration, frequency, severity, and associated symptoms.
- To identify common precipitating factors, such as screen time, sleep patterns, and environmental triggers.
- To assess the impact of family history on the prevalence and type of primary headaches.
- To examine the treatment approaches used for managing primary headaches.

## MATERIALS AND METHODS

**Study Design:** This cross-sectional, observational study was conducted in the pediatric outpatient department of SVS Medical College, Mahabubnagar, Telangana, from May 2023 to June 2024. Children of either sex, aged 5 to 16 years, presenting with complaints of headache during the study period were included after obtaining written informed consent from their parents or guardians. Recurrent headache was defined as more than three episodes in the past 12 months. [11]

**Inclusion Criteria**

Children aged between 5 to 15 years attending pediatric and neurology outpatient services with a chief complaint of headache. Headache diagnosis is made using the International Classification of Headache Disorders, 3rd edition beta version (ICHD-III beta).[12]

**Exclusion Criteria**

Children suspected of having headaches due to any known systemic or secondary cause such as fever, meningitis, encephalitis, seizures, intracranial space-occupying lesions, acute trauma, intracranial infections, dental or sinus infections, chronic medical illnesses etc. were excluded.

**Sample Size:** The study included a total of 56 participants. As this was a time-bound study, all subjects who met the inclusion criteria during the study period were included.

**Data Collection:** A structured questionnaire based on the International Headache Society (IHS) criteria was used to diagnose headache disorders.[13] The questionnaire included detailed inquiries regarding the duration, onset, type, severity, and frequency of headaches, as well as associated symptoms such as aura, nausea, vomiting, tinnitus, paresthesias, and visual disturbances. Additionally, it covered factors that worsen or alleviate symptoms. Information was collected from both the patients and their parents

**Clinical Examination**: Comprehensive clinical examinations were conducted on all participants, including evaluations by ophthalmologists, ENT specialists, and dentists, to identify any underlying issues associated with headaches. All children were classified according to the ICHD-III beta criteria. Data regarding triggering factors were collected including screen time, hours of sleep per day (<8 hours/day or ≥8 hours/day), stress, and exposure to bright light. Pain quality was assessed using a 10-


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point Numeric Rating Scale, categorized as mild (1-3), moderate (4-6), and severe (7-10).[14]

**Management:** After diagnosing headaches, acute pain management included administering oral NSAIDs or acetaminophen. Prophylactic treatment with either flunarizine or propranolol was initiated based on the type, severity, and frequency of headaches.

**Statistical Analysis:** The results were tabulated and analysed using Excel and Epi Info version 7.2.6.0. Descriptive statistics were used to obtain the mean and standard deviations. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were presented as numbers (%). Categorical variables were compared using the Chi-square and Fisher's exact tests, with statistical significance defined as a p-value <0.05. This methodology adheres to standard practices in medical and social sciences research for comprehensive data handling, analysis, and interpretation.

## RESULTS

**Headache Prevalence and Demographics:** During the study period, 56 children presented with headaches, 30 were girls and 26 were boys, yielding a ratio of 1.15:1. The children's ages ranged from 5 to 16 years, with a mean age of 10.53 years (SD = 2.7 years). A majority of the children (n=31, 55%) were from urban areas, while the remaining (n=25, 45%) were from rural areas.

**Headache Characteristics:**

**Etiologic Types:** Tension-type headache was the most common type, affecting 26 (46%). Migraine was diagnosed in 22 (40%), with probable migraine being the most frequent subtype (10, 45%). Non-specific headache was present in 8 (14%).

**Characteristics:** Tightening or band-like headaches were the most frequently described type (29, 52%). Throbbing pain was reported by 22(39%), while pulsating pain was less common (5, 9%).

**Locations:** The most common location for headaches was bilateral (36, 71%), followed by unilateral (16, 29%) and diffuse (8, 14%) pain. Among those experiencing bilateral pain, bifrontal pain was predominant (20, 50%), followed by bitemporal pain (11, 28%).

**Severity:** On the numerical pain scale, moderate pain was reported by 26 (46.4%), while 16 (28.5%) described their pain as mild. Severe pain was noted in 10 (17.8%), with four (7%) unable to specify the severity.

**Duration:** The majority of children (31, 55%) experienced headaches lasting between 1 and 4 hours. Less frequent were headaches lasting less than 1 hour (21, 37.5%). Only a small portion (4, 7%) reported headaches exceeding 4 hours.

**Frequency**: Most children experienced headaches once a month (24, 43%), followed by weekly (15, 27%) and once every 3 months (13, 23.2%). A small portion of children (4, 7%) were unable to recall the frequency of their headaches.

**Precipitating Factors**: Bright sunlight exposure during prayer time (23, 41.1%) was the most frequent contributor to headaches, followed by skipped meals (16, 28.6%) and screen time (11, 19.6%). Academic stress and lack of sleep were less common (both 3, 5.4%).

**Sleep Pattern:** Out of the 56 children, 35 (62.5%) reported sleeping for eight hours or more per day (≥8 hours/day), while 21 (37.5%) reported sleeping for less than eight hours per day (<8 hours/day).

**Screen Time**: Among the 56 children, nearly half (26, 46.4%) spent between 2 and 4 hours daily on screens, while 16 (28.6%) reported less than 2 hours, and 14 (25.0%) exceeded 4 hours.

**Family History:** A family history of headache was observed in 38 (68%) and was negative in 18 (32%).

**Medication**: Non-steroidal anti-inflammatory medications were administered to 41 (73.2%) for acute pain management. Among these, Naproxen was used by 32 (57%), ibuprofen by 9 (16%), and acetaminophen by 10 (17.8%). Triptans were prescribed to 5 (8%) for pain relief, and no injectable medications were administered. For prophylaxis, either flunarizine or propranolol was given to 30 (53.7%), while 26 (46.4%) did not receive any prophylactic treatment.

**Table 1: Clinical and Demographic Characteristics of Patients with Primary Headache.**

| Variable | Migraine (n=22) (%) | TTH (n=26) (%) | Others (n=8) (%) | P - value |
|---|---|---|---|---|
| Age in years | 11.59+_2.82 | 10.73+_1.97 | 7.00+_1.69 | |
| Sex | | | | |
| Male | 9 (41) | 13 (50) | 4 (50) | 0.80 |
| Female | 13 (59) | 13 (50) | 4 (50) | |
| Geographical area | | | | |
| Urban | 9 (41) | 18 (69) | 4 (50) | 0.137 |
| Rural | 13 (59) | 8 (31) | 4 (50) | |
| Site | | | | |
| Bilateral | 8 (36) | 23 (88) | 5 (63) | 0.0001 |
| Unilateral | 11 (50) | 1 (4) | 0 (0) | |
| Diffuse | 3 (14) | 2 (8) | 3 (37) | |
| Type of pain | | | | |
| Tight | 4 (18) | 20 (77) | 5 (63) | 0.0011 |
| Throbbing | 14 (64) | 6 (23) | 2 (25) | |
| Pulsating | 4 (18) | 0 (0) | 1 (12) | |
| Duration | | | | |
| < 1hr | 2 (9) | 11 (42) | 8 (100) | 0.0002 |


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| | | | | |
|---|---|---|---|---|
| 1-4 hr | 17 (77) | 14 (54) | 0 (0) | |
| >4hr | 3 (14) | 1 (4) | 0 (0) | |
| Frequency | | | | |
| Weekly | 5 (23) | 7 (27) | 3 (37) | 0.00002 |
| Monthly | 9 (41) | 14 (54) | 1 (13) | |
| 3monthly | 8 (36) | 5 (19) | 0 (0) | |
| Not recalled | 0 (0) | 0 (0) | 4 (50) | |
| Severity | | | | |
| Mild | 5 (23) | 8 (31) | 3 (38) | 0.00007 |
| Moderate | 12 (54) | 13 (50) | 1 (12) | |
| Severe | 5 (23) | 5 (19) | 0 (0) | |
| Ill-defined | 0 (0) | 0 (0) | 4 (50) | |
| Precipitating factor | | | | |
| Lack of sleep | 2 (9) | 1 (4) | 0 (0) | 0.1135 |
| Sunlight | 8 (36) | 13 (50) | 2 (25) | |
| Skipped meal | 7 (32) | 8 (30) | 1 (12) | |
| Screen | 3 (14) | 3 (12) | 5 (63) | |
| Stress | 2 (9) | 1 (4) | 0 (0) | |
| Screen time | | | | |
| <2hr | 7 (32) | 4 (16) | 5 (63) | 0.052 |
| 2-4hr | 11 (50) | 12 (46) | 3 (37) | |
| >4hr | 4 (18) | 10 (38) | 0 (0) | |
| Family history | | | | |
| Present | 18 (82) | 13 (50) | 7 (88) | 0.027 |
| Absent | 4 (18) | 13 (50) | 1 (12) | |
| Sleep | | | | |
| <8hr | 12 (55) | 9 (35) | 0 (0) | 0.022 |
| >8hr | 10 (45) | 17 (65) | 8 (100) | |
| Medication | | | | |
| NSAIDs | 18 (82) | 20 (78) | 3 (37) | 0.011 |
| Acetaminophen | 2 (9) | 3 (11) | 5 (63) | |
| Triptans | 2 (9) | 3 (11) | 0 (0) | |
| Prophylaxis | | | | |
| Yes | 20 (91) | 9 (35) | 1 (13) | 0.0000 |
| No | 2 (9) | 17( 65) | 7 (87) | |

**Note:** Test Applied: Chi-square test;
Abbreviations: TTH: Tension-Type Headache, NSAIDs: Nonsteroidal Anti-inflammatory Drugs

## DISCUSSION

Headache is one of the most common neurological reasons for children to visit pediatric and neurology outpatient departments, causing significant distress for both children and their parents due to potential serious etiologies. This study was a cross-sectional study of the clinical profile of primary headaches and associated factors in school-going children.

The study revealed that primary headache disorders are more common in females than males, consistent with findings by Arpita et al., Kankane et al., M. Al Momani et al., and Agrawal et al.[3,10,15,16] Headache disorders, particularly migraines, are more common in females than males, likely due to hormonal influences. Fluctuations in hormones, especially estrogen, have been shown to play a significant role in triggering migraines and other headache disorders in females. This hormonal link may explain the higher prevalence observed in females.[17]

The mean age of children with headaches was 10.53 years (SD = 2.7 years), which is lower than the observation by Arpita et al (14.4 years, SD =2.28). This age difference may be attributed to the earlier onset of headache disorders in children, which can significantly impact their quality of life, academic performance, and social interactions. Early diagnosis and management are crucial to mitigate these effects.[3]

Among the children with primary headaches, tension-type headache was the most common (46%) followed by migraine (40%). These findings align with the findings reported by Agrawal et al. (46.9%) and Malik et al. (50.99%) for tension-type headaches.[16,18] On the other hand, studies by Sinha R et al. and Arpita et al. highlight migraine as the most common cause of primary headaches.[1,3]

This high prevalence of tension-type headaches underscores the importance of early recognition and intervention. Tension-type headaches, often linked with stress, poor posture, and muscle tension, can significantly impact a child's daily life, academic performance, and social interactions. Early identification enables targeted interventions such as stress management techniques, physical therapy, and ergonomic adjustments, which can greatly improve the quality of life.[16]

Migraines, although less common, are often more debilitating due to severe symptoms like nausea, vomiting, and sensitivity to light and sound. The significant proportion of migraine cases highlights the necessity for early and accurate diagnosis to implement effective management strategies, including lifestyle modifications and pharmacological treatments.[17] Understanding these patterns can guide healthcare providers and policymakers in developing tailored headache management programs for pediatric populations.


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In this study, 10 children did not fully meet the ICHD-III beta criteria for migraine and were classified as having probable migraine, which is similar to observations made by Kankane et al.[10] Furthermore, the data suggests a trend where children with tension-type headaches tend to be younger than those with migraines (10.7 ± 1.9 vs. 11.59 ± 2.8 years, p = 0.120), though this difference was not statistically significant. This observation is clinically significant as it may indicate that different age groups have distinct headache profiles, which could impact treatment and management strategies. Younger children with tension-type headaches might benefit from non-pharmacological interventions such as behavioural therapies and lifestyle modifications, which can be more effective for this age group.[19]

The headache was mostly characterised by a tightening or band-like sensation among children with tension-type headaches, whereas a throbbing headache was common with migraine. Similar reports were observed from Sinha R et al. and Agrawal et al.[1,16]

The majority of children complained of bilateral more than unilateral headaches, with bifrontal being the most common site overall. These findings are in concordance with studies by Jo YH et al., Genizi et al., and Kankane et al.[2,4,10]

Understanding the distinct characteristics of headache types is crucial for accurate diagnosis and effective treatment. Tension-type headaches, often described as a tightening or band-like sensation, can significantly impact daily activities and quality of life. Early identification and management, including stress reduction and physical therapy, are essential. Migraine headaches, characterized by throbbing pain, require tailored interventions such as pharmacological treatment and lifestyle adjustments to reduce their frequency and severity.[17,19]

The severity of pain described by children was moderate for both migraine and tension-type headaches. Similar findings were observed by Sinha R et al., Al-Hashel et al., and Agrawal et al.[1,5,12] The majority of children reported the duration of pain between 1 to 4 hours. Of these, 77% had migraines and 54% had tension-type headaches (p = 0.002). Similar findings were noted by Sinha R et al. and Kankane et al.[1,10] Understanding the moderate severity and duration of primary headaches in children is crucial for effective management and treatment. Moderate pain can significantly disrupt daily activities, schooling, and social interactions, highlighting the need for timely and appropriate interventions.[19]

The frequency of headaches was reported monthly by 42% of children. Similar findings were observed in studies by Sinha R et al. and Agrawal et al.[1,16] Frequent headaches can significantly impact a child's quality of life, including their academic performance, social interactions, and overall well-being. Early identification and management of frequent headaches are essential to mitigate these effects and improve the child's quality of life.[20]

The majority of children had screen time between 2-4 hours, which was statistically significant (p = 0.052), echoing the findings by Arpita et al.[3] High screen time has been associated with increased prevalence of headaches in children due to factors like eye strain, poor posture, and reduced physical activity. Addressing screen time in children is crucial for mitigating headache frequency and improving overall well-being.[21]

Bright sunlight exposure during prayer time was identified as the most common precipitating factor, followed by skipping meals and screen time. This highlights the need for preventive measures such as wearing protective eyewear and maintaining regular meal schedules to reduce headache triggers.[22,23]

A positive family history of headache disorders was noted in 68% of children, with a higher prevalence among those with migraine-related headaches (82%) compared to tension-type headaches (50%; p = 0.027). These findings are consistent with the studies by Sinha R et al. and Malik et al., which also reported significant associations between family history and the occurrence of primary headache disorders.[1,18] This finding underscores the genetic component of headache disorders and the importance of family history in diagnosis and management. Educating families about headache management can play a significant role in reducing the impact of these conditions.[24]

Oral nonsteroidal anti-inflammatory drugs (NSAIDs) were the most commonly administered medications during acute pain episodes, with Naproxen being the most frequently used, followed by Ibuprofen. This finding is significant as NSAIDs are effective in providing rapid relief from headache symptoms due to their anti-inflammatory properties. The use of Naproxen and Ibuprofen in managing acute pain aligns with current clinical guidelines and practices.[25]

For prophylaxis after the acute episode, Flunarizine 5 mg was the most commonly used medication (p = 0.011). Flunarizine is a calcium channel blocker that effectively reduces the frequency and severity of migraines. This aligns with similar observations by Genizi et al. who reported significant benefits of using Flunarizine for headache prophylaxis in children.[4]

The appropriate use of NSAIDs for acute pain management and Flunarizine for prophylactic treatment underscores the importance of tailored pharmacological strategies in managing primary headache disorders in children. These medications not only provide symptomatic relief but also contribute to the overall reduction in headache frequency and severity, improving the quality of life for affected children.[4,25]

**Limitations**

This study has several limitations. Firstly, the sample size was limited, which may affect the generalizability of the findings. Secondly, the study relied on self-reported data from children and their parents, which could introduce inaccuracies in the


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reported headache characteristics and triggers. Additionally, potential confounding factors such as dietary habits, physical activity levels, and sleep patterns were not fully accounted for in this study, which may influence the outcomes. Further research with a larger sample size and more controlled variables is recommended to validate these findings.

## CONCLUSION

This study provides a comprehensive analysis of the prevalence, clinical profile, and management of primary headache disorders in school-going children. The findings revealed a slightly higher prevalence of headaches in females, with tension-type headaches being the most common, followed by migraines. Key triggers identified include screen time, bright sunlight exposure, and family history, which were significant in both the diagnosis and management of headaches. The study supports the use of oral NSAIDs for acute pain relief and Flunarizine for prophylactic treatment, aligning with existing literature. These insights contribute to a better understanding of the nature and treatment of headaches in children, providing a foundation for future research and improved clinical care.

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