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ORIGINAL ARTICLE

Clinical profile and etiology of headache in children presenting to a tertiary care hospital.

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ABSTRACT… Objective: To determine the clinical profile and etiology of primary headache and secondary headache in children. **Study Design:** Cross-sectional study. **Setting:** Department of Pediatrics, National Institute of Child Health, Karachi, Pakistan. **Period:** July 2024 to December 2024. **Methods:** A total of 179 children aged 5–15 years presenting with headache were analyzed after enrollment through non-probability consecutive sampling approach. Headache was categorized as primary or secondary according to "International Classification of Headache Disorders, 3rd Edition (ICHD-3)" criteria. Data were analyzed using SPSS version 26, applying appropriate statistical tests with p<0.05 taken significant. **Results:** Among 179 children, 96 (53.6%) were male and 83 (46.4%) female, with median age 10.2 years, (IQR 8.0–13.0). Headache duration was <3 months in 63 (35.2%) children. Primary headache was observed in 143 (79.9%) and secondary in 36 (20.1%). In children with primary headache, migraine occurred in 91 (50.8%), and tension-type headache in 52 (29.1%) children. In children with secondary headache (n=36), common causes were upper respiratory tract infection 12 (6.7%), sinusitis 8 (4.5%), meningitis 6 (3.4%), intracranial lesions 5 (2.8%), and trauma 5 (2.8%). Primary headache was linked with older age (p=0.012), urban residence (p=0.012), longer duration (p<0.001), and family history (p=0.017). **Conclusion:** Primary headache was the predominant type among children and was associated with older age, urban residence, positive family history, and longer symptom duration. Secondary headaches were more frequent in younger and underweight children and were mainly attributed to infectious or structural causes.

Key words: Children, Headache, Meningitis, Migraine, Upper Respiratory Tract Infection.

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INTRODUCTION

Headaches are referred as any pain that affects the head or neck region.[1] Headache is the most prevalent neurological complaint in paediatric population. Up to 88% of children and adolescents are affected by it.[2,3] At seven years of age, the incidence of frequent and severe headaches is 37-51%. It increases to 57-81% by the age of 15.[4] The quality of life and economy are severely impacted by headache.[5-7] Depending on their cause, frequency and intensity, headache can affect a child's academic performance, memory, personality, and social interactions in addition to their attendance at school.[8] One of the most frequent cause of visit to paediatric emergency is severe headache, which cause concern in both parents and children.[9,10]

A recent study on 350 patients with headache, conducted at Turkey, demonstrate that the causes of headache were migraine, tension headache, secondary, and unclassified in 51.1%, 32.3%, 13.4%, and 3.1% children, respectively.[11] A recent cross-sectional studies at Karachi at four different schools revealed that headache was present in 79.4% school children, and migraine in 20.2% children.[12] As the prevalence of primary headache in children is currently poorly understood especially in Pakistan and paediatric headache sufferers rarely receive an early diagnosis or treatment. This study aimed to evaluate clinical profile and etiology of headache in children and the data would help us to reduce the burden of paediatric headache management in children and their families. This study was done to determine the clinical profile and etiology of primary headache and secondary headache in children.

METHODS

This cross-sectional observational study was performed at pediatrics department of National Institute of Child Health (NICH), Karachi, Pakistan,

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during July 2024 to December 2024 following the approval from Institutional Ethical Review Board (IERB-22/2023, dated: 15-07-2023). The study included children aged 5 to 15 years of either gender who presented to the outpatient or emergency department of pediatrics with complaints of headache. Children with a history of neurosurgical intervention, those unable to communicate effectively, children or parents unwilling to participate, or those with congenital neurological disorders were excluded. A non-probability consecutive sampling technique was used. Written informed consent was obtained from parents or legal guardians of all children. Considering the proportion of secondary headaches as 13.4% among pediatric headache cases[11], with 95% confidence level, and a 5% margin of error, the required sample size was 179, using OpenEpi software.

Each child underwent a detailed evaluation, beginning with demographic data such as age, gender, and educational background. Each participant was categorized based on age- and sex-specific percentile cutoffs as underweight (BMI <5th percentile), normal weight (bbetween 5th to 85th percentile), overweight (between 85th and 95th percentile), and obese (>95th percentile) using BMI percentile for each child using WHO AnthroPlus software.[13] Clinical history including headache onset, duration, frequency, location, intensity, character, aggravating and relieving factors, associated symptoms, and family history were documented. School absenteeism was defined as absence from school due to headache for at least one full academic day during the month preceding presentation, as reported by the child or parent. Headache was defined as pain in the head, above the eyes or ears, in the occipital region, or the upper neck. Headaches was categorized into primary and secondary types according to the "International Classification of Headache Disorders, 3rd Edition (ICHD-3)".[14] Evaluations were performed about vital signs, cranial nerve assessment, motor and sensory system evaluation, coordination testing, and signs of raised intracranial pressure. Blood pressure measurement and ophthalmological assessment were performed in all cases to identify papilledema or visual abnormalities.

Data analysis was performed using "IBM-SPSS Statistics version 26.0". Categorical variables were presented as frequencies and percentages, while continuous variable were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on data distribution (as per Shapiro-Wilk test). The Chi-square test or Fisher's exact test was applied for the comparison of categorical data, while Student's t-test or Mann–Whitney U test was used for continuous data where appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In a total of 179 children, 96 (53.6%) were male. The median age was 10.2 years (IQR 8.0–13.0), with 97 (54.2%) children between 10 and 15 years. Urban residence was reported in 121 (67.6%) children. Based on WHO BMI-for-age percentiles, 32 (17.9%) children were underweight, 118 (65.9%) normal weight, 17 (9.5%) overweight, and 12 (6.7%) obese. Headache duration was less than three months in 63 (35.2%) and three months or longer in 116 (64.8%) participants. School absenteeism attributable to headache was noted in 41 (22.9%) children, while family history of headache was present in 54 (30.2%) children (Table-I).

There were 143 (79.9%) children who were having primary headache, and 36 (20.1%) as having secondary headache. Among those with primary headache, migraine was documented in 91 (50.8%) cases and tension-type headache in 52 (29.1%). Tension-type headache included 22 (12.3%) children with infrequent episodic, 15 (8.4%) with frequent episodic, and 15 (8.4%) with chronic patterns. Among children with secondary headache, 12 (6.7%) were having upper respiratory tract infection, 8 (4.5%) with sinusitis, 6 (3.4%) with viral meningitis, 5 (2.8%) with intracranial space-occupying lesions, and 5 (2.8%) with post-traumatic headache (Table-II).

Headache type did not differ significantly with respect to gender distribution (p=0.669). The median age of children with primary headache was significnatly higher as 10.8 years (IQR 9.0–13.4), compared with 8.7 years (IQR 6.3–11.8) with secondary headache (p=0.012). Urban residence was

found to have significant association with primary headache (72.0% vs. 50.0%, p=0.012). Nutritional assessment showed that 20 of 143 (14.0%) primary headache patients were underweight compared with 12 of 36 (33.3%) in the secondary headache (p=0.064). Headache duration of was significantly logner among children with primary headache (p<0.001). A positive family history of headache was significantly more frequent among the primary headache children (34.3% vs. 13.9%, p=0.017). Outpatient presentation was noted in 99 (69.2%) children with primary headache, and 12 (38.9%) with secondary headache (p<0.001) (Table-III).

DISCUSSION

The present study demonstrated that primary headaches constituted 79.9% of all cases, whereas secondary headaches accounted for 20.1%. Within the primary category, migraine was the most frequent diagnosis, documented in 91 children (50.8%), followed by tension-type headache in 52 (29.1%). Among secondary causes, upper respiratory tract infections, sinusitis, and meningitis were predominant. The predominance of migraine in the present study parallels the observations of Sinha et al.[15], who reported migraine in 60% and tension-type headache in 28% of children attending a tertiary center in North India. Data from Jordan observed a predominance of migraine, accounting for 44.8% of cases, though their reported frequency was slightly lower.[16] In contrast, another study from India documented a higher proportion of tension-type headache (46%) compared with migraine (40%).[17]

TABLE-I

Demographic and clinical characteristics of children with headache (n=179)

Characteristcs		Number (%)
Gender	Male	96 (53.6%)
	Female	83 (46.4%)
Age (years)	5-10	82 (45.8%)
	>10 to 15	97 (54.2%)
Residence	Urban	121 (67.6%)
	Rural	58 (32.4%)
Body mass index	Underweight	32 (17.9%)
	Normal	118 (65.9%)
	Overweight	17 (9.5%)
	Obese	12 (6.7%)
Duration of headache (months)	<3	63 (35.2%)
	≥3	116 (64.8%)
School absenteeism		41 (22.9%)
Family history of headache		54 (30.2%)
Presentation place	Outpatient	112 (62.6%)
	Emergency	67 (37.4%)

TABLE-II

Etiological classification of headche according to ICHD-3 criteria (N=179)

Type of Headache	Sub-type / Causes	Number (%)	Key Clinical Features
Primary headache (n=143)			
Migraine (n=91)	Without aura	65 (36.3%)	Throbbing unilateral pain, nausea, photophobia / phonophobia
	With aura	26 (14.5%)	Visual / sensory aura preceding headache
Tension-type headache (n=52)	Infrequent episodic	22 (12.3%)	Bilateral, mild-moderate, not aggravated by activity
	Frequent episodic	15 (8.4%)	Recurrent, mild-moderate intensity
	Chronic tension-type	15 (8.4%)	Daily / persistent pressing quality with/without mild nausea
Secondary headache (n=36)			
Upper respiratory tract infection		12 (6.7%)	Fever, nasal congestion, sore throat
Sinusitis		8 (4.5%)	Frontal pressure, sinus tenderness
Viral meningitis		6 (3.4%)	Fever, neck stifness, vomiting
Intracranial space-occupying lesion		5 (2.8%)	Tumor, cyst or abscess on imaging
Post-traumatic headache		5 (2.8%)	Followinghead injury (<4 weeks)

TABLE-III

Comparison of demographic and clinical characteristics between primary and secondary headache (N=179)

Characteristics		Primary headache (n=143)	Secondary headache (n=36)	P-Value
Gender	Male	71 (49.7%)	23 (63.9%)	0.669
	Female	42 (50.3%)	16 (36.1%)	
Age (years), median (IQR)		10.8 (9.0-13.4)	8.7 (6.3-11.8)	0.012
Residence	Urban	103 (72.0%)	18 (50.0%)	0.012
	Rural	40 (38.0%)	18 (50.0%)	
Body mass index	Underweight	20 (14.0%)	12 (33.3%)	0.064
	Normal	83 (58.0%)	35 (52.8%)	
	Overweight	15 (10.5%)	2 (5.6%)	
	Obese	14 (9.8%)	1 (2.8%)	
Duration of headache (months)	<3	36 (25.2%)	27 (75.0%)	<0.001
	≥3	107 (74.8%)	9 (25.0%)	
School absenteeism		41 (28.7%)	5 (13.9%)	0.069
Family history of headache		49 (34.3%)	5 (13.9%)	0.017
Presentation place	Outpatient	99 (69.2%)	12 (38.9%)	<0.001
	Emergency	44 (30.8%)	22 (61.1%)	

Age-related trends showed that the median age of children with primary headache was significantly higher than those with secondary headache, that may be indicating that headache disorders shift toward a primary etiology as children approach adolescence. Park et al.[18], observed that adolescents demonstrated a higher incidence of primary headache (40.1%) compared with younger children (22.9%), whereas secondary headaches were more common in preschoolers. The biological plausibility of this trend relates to the maturation of cortical networks, hormonal influence during puberty, and increased academic and psychosocial stressors that predispose older children to primary headache syndromes.[19,20]

Urban residence was found to be significantly associated with primary headache, whereas secondary headaches were more frequent among rural residents. A similar urban predominance of primary headache has been reported previously where it was noted that recurrent headache in rural populations was more often secondary to infections, ophthalmic problems, or somatization disorders.[21] The higher frequency of primary headache in urban children could relate to greater academic stress, longer screen exposure, irregular sleep schedules, and dietary inconsistencies.[17,22]

The association between chronic duration and primary headache in this study reinforces the diagnostic reliability of temporal pattern recognition in clinical evaluation. Arulparithi et al.[22], emphasized similar findings in their study on chronic daily headache, reporting that 53% of children had chronic migraine. Reddy et al.[17], reported family history in 67.8% of primary headache patients, while Sinha et al.[15], observed it to be 62%. Although the frequency in the current study was somewhat lower, it still supports the hereditary component of migraine and tension-type headache in this population.

Eemergency presentation was significantly associated with secondary headaches, while primary headaches were more frequently evaluated in outpatient setting in this study. Park et al.[18], reported that secondary headaches were linked to acute infectious or vascular causes that necessitated urgent evaluation. The diagnostic implication is that children presenting in emergency with new-onset, short-duration headache, or systemic features should be carefully evaluated for secondary causes through neuroimaging and laboratory work-up.[23]

Single tertiary care hospital, and a relatively modest sample size were some of the limitations of this study. The cross-sectional design limite the ability to infer temporal relationships or evaluate long-term outcomes. Self-reported measures such as headache duration, absenteeism, and family history may also have been influenced by recall bias.

CONCLUSION

The predominance of primary headache, particularly migraine, and its significant associations with older age, urban residence, family history, and chronic duration emphasize the need for early recognition and preventive management. Secondary headaches remain an important differential diagnosis among younger, underweight, and acutely presenting children, often related to infections or structural pathology.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Zahira Khalid:** Acquisition, data analysis, drafting.
2	**Shazia Soomro:** Concept and design.
3	**Kanwal Laique:** Critical revisions.
4	**Liaqat Halo:** Interpretation of data.