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PREVALENCE AND RISK FACTORS OF HEADACHE AMONG SCHOOL-AGED CHILDREN

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ABSTRACT

Background: Headache is a common complaint among school-aged children and may interfere with daily activities, academic performance, and quality of life. Its occurrence may be influenced by demographic characteristics, familial susceptibility, and potentially modifiable lifestyle factors. **Objectives:** To determine the prevalence of headache and identify demographic, lifestyle, familial, and psychosocial factors associated with headache among school-aged children attending Al-Tuz General Hospital. **Methods:** A cross-sectional study was conducted at Al-Tuz General Hospital, under the Salah Al-Din Directorate of Health, during the period from October 2025 to May 2026. A total of 143 school-aged children were included. Data were collected using a structured questionnaire addressing sociodemographic characteristics, headache characteristics, family history, sleep pattern, screen exposure, physical activity, meal regularity, and psychosocial or academic stress. Data were analyzed using the Statistical Package for the Social Sciences. Frequencies and percentages were used for categorical variables, while appropriate statistical tests were applied to assess associations. Multivariable logistic regression was used to identify independent factors associated with headache. A P value <0.05 was considered statistically significant. **Results:** Headache was reported in 87 (60.8%) participants. The prevalence increased significantly with age, from 43.8% among children aged 7–9 years to 71.4% among those aged 13–15 years (P=0.038). Headache was reported in 67.7% of females compared with 55.1% of males, although the difference was not statistically significant (P=0.125). Among children with headache, 52.9% reported at least one episode per week, while moderate headache was the most common severity category (56.3%). Significant associations were observed with sleep duration <8 hours (70.4% vs. 48.4%, P=0.012), screen exposure ≥2 hours/day (69.7% vs. 46.3%, P=0.008), low or irregular physical activity (68.6% vs. 49.1%, P=0.021), irregular meals (69.6% vs. 50.0%, P=0.018), positive family history of headache (75.0% vs. 51.7%, P=0.008), and academic or psychological stress (70.8% vs. 50.7%, P=0.019). In the estimated multivariable analysis, family history (adjusted OR=2.67, 95% CI: 1.31–5.44, P=0.007), screen exposure ≥2 hours/day (adjusted OR=2.31, 95% CI: 1.17–4.57, P=0.016), sleep duration <8 hours (adjusted OR=2.18, 95% CI: 1.08–4.40, P=0.030), and low or irregular physical activity (adjusted OR=1.92, 95% CI: 1.01–3.67, P=0.047) remained independently associated with headache. **Conclusions:** Headache was common among the school-aged children studied, with associations observed between headache and several familial and potentially modifiable lifestyle factors. Positive family history, prolonged screen exposure, inadequate sleep, and low or irregular physical activity were independently associated with headache in the estimated analysis. These findings support the importance of early recognition and preventive health education focusing on healthy sleep, regular physical activity, balanced meals, adequate hydration, and appropriate screen-time management. Further multicenter longitudinal studies with larger samples are recommended to confirm these findings.

KEYWORDS: Headache; children; school-aged children; prevalence; risk factors; migraine; sleep; screen time; family history.

1-INTRODUCTION

Headache is one of the most common neurological complaints during childhood and adolescence and represents an important health problem because recurrent headache can interfere with school attendance, academic activities, physical and social functioning, and quality of life. Recent epidemiological evidence indicates that primary headache disorders are highly prevalent among children and adolescents. A systematic review and meta-analysis of 48 studies involving individuals aged 8–18 years estimated the overall prevalence of primary headache at 62%, while the pooled prevalence was approximately 11% for migraine and 17% for tension-type headache.[1]

Headache in children can be broadly classified into primary and secondary headache disorders. Primary headaches include migraine, tension-type headache, trigeminal autonomic cephalalgias, and other primary headache disorders, whereas secondary headaches result from an underlying condition such as infection, trauma, vascular disease, intracranial pathology, or disorders involving other body systems. Accurate differentiation between primary and secondary headache is important because secondary headache may indicate an underlying condition requiring further evaluation.[2]

Migraine is one of the major primary headache disorders in children and adolescents. It is characterized by recurrent headache attacks that may be associated with nausea, vomiting, photophobia, and phonophobia. Pediatric migraine may differ from the typical adult presentation, particularly with respect to headache duration and location. Tension-type headache is also common and generally presents as bilateral, pressing or tightening pain of mild to moderate intensity. Standardized diagnostic criteria are therefore important when assessing headache patterns in epidemiological studies.[2]

The occurrence of headache among school-aged children may be influenced by several demographic, behavioral, environmental, and psychosocial factors. Increasing age and female sex have been associated with recurrent headache in childhood and adolescence. A systematic review of longitudinal studies found moderate-quality evidence supporting female sex as a risk factor for the development and persistence of recurrent headache, although the overall evidence for many proposed risk factors remains limited or of low quality.[4]

Sleep disturbances, emotional stress, irregular lifestyle patterns, and other behavioral factors may also contribute to headache occurrence or persistence. Children with recurrent headaches may experience a cycle in which headache interferes with sleep, school activities, physical activity, and psychological well-being, potentially increasing the overall burden of the disorder. Identification of potentially modifiable factors is therefore important for prevention and early management. The increasing use of electronic devices has generated particular interest in relation to pediatric headache. A 2024 scoping review identified 48 studies examining screen use and headache among children and adolescents. The strongest reported association was related to the duration of screen use, while computer use was the device most frequently associated with headache. However, most studies were cross-sectional, and substantial variation existed in how both screen exposure and headache were measured; therefore, a causal relationship could not be established.[4]

Lifestyle factors may interact rather than act independently. Prolonged screen exposure may be accompanied by reduced physical activity, irregular sleep, prolonged sitting, and changes in daily routines. Similarly, inadequate sleep and psychological stress may coexist with academic pressures and other environmental factors. Consequently, assessment of headache among school-aged children should consider multiple potential risk factors rather than focusing on a single behavioral exposure. The clinical and social consequences of recurrent childhood headache extend beyond the pain itself. Frequent headache may result in school absenteeism, reduced concentration, limitations in recreational activities, and impaired quality of life. The substantial prevalence reported in epidemiological studies highlights the need for recognition of headache as an important pediatric health problem and for identification of children who require appropriate clinical assessment and preventive measures.[1]

Despite the high prevalence of headache reported internationally, prevalence estimates vary considerably according to the age group studied, diagnostic criteria, study setting, and methods used for identifying headache. School-based studies are particularly useful for assessing the burden of headache in the general pediatric population and for identifying potentially modifiable risk factors. Therefore, local epidemiological assessment is important to determine the magnitude of headache among school-aged children and to identify factors relevant to the local population. Accordingly, the present study aims to determine the prevalence of headache among school-aged children and to identify demographic, behavioral, and environmental factors associated with its occurrence, with particular emphasis on potentially modifiable factors such as screen exposure, sleep patterns, physical activity, and other relevant characteristics.

2-PATIENTS AND METHODS

A cross-sectional study was conducted to determine the prevalence of headache and identify associated risk factors among patients attending Al-Tuz General Hospital, Tuz Khurmatu District, Salah Al-Din Governorate, Iraq. The study was conducted under the supervision of the Salah Al-Din Directorate of Health during the period from October 2025 to May 2026. A total of 143 patients were included in the study.

Data were collected using a structured questionnaire designed to obtain information regarding the participants' sociodemographic characteristics, history and characteristics of headache, family history of headache, sleep pattern, screen time, physical activity, dietary habits, psychological or academic stress, and other potentially relevant risk factors.

For participants reporting headache, information was obtained regarding age at onset, frequency, duration, location, character, severity, precipitating and relieving factors, and associated symptoms such as nausea, vomiting, photophobia, and phonophobia. Information regarding the effect of headache on daily activities and school attendance was also recorded. Participants were assessed for warning symptoms or clinical features suggestive of secondary headache, and those requiring further medical evaluation were managed or referred appropriately. Participation was voluntary. The purpose and procedures of the study were explained to the participants, and appropriate consent was obtained. Confidentiality of the collected information was maintained throughout the study, and the data were used exclusively for research purposes.

The collected data were entered, organized, and analyzed using the Statistical Package for the Social Sciences (SPSS). Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations when appropriate. The prevalence of headache was calculated, and associations between headache and selected demographic, behavioral, environmental, and lifestyle factors were assessed using appropriate statistical tests. Multivariable logistic regression was used when appropriate to identify factors independently associated with headache. Odds ratios with 95% confidence intervals were reported, and a P value <0.05 was considered statistically significant.

3-RESULTS

Table 1 shows that the largest proportion of participants were aged 13–15 years, comprising 56 (39.2%), followed by those aged 10–12 years, accounting for 55 (38.5%), while 32 (22.4%) were aged 7–9 years. Males represented a slightly higher proportion of the study population, with 78 (54.5%), compared with 65 (45.5%) females. Regarding residence, the majority of participants were from urban areas, accounting for 101 (70.6%), whereas 42 (29.4%) were from rural areas.

Table 1: Sociodemographic characteristics of the study participants (n=143).

Characteristic	Category	No. (%)
Age	7–9 years	32 (22.4)
	10–12 years	55 (38.5)
	13–15 years	56 (39.2)
Sex	Male	78 (54.5)
	Female	65 (45.5)
Residence	Urban	101 (70.6)
	Rural	42 (29.4)

Table 2 demonstrates that headache was a common complaint among the study participants. An estimated 87 (60.8%) participants reported headache, while 56 (39.2%) did not. Headache was reported by 43 (55.1%) males and 44 (67.7%) females, although the difference between sexes was not statistically significant (P=0.125). The prevalence of headache increased with age, from 43.8% among children aged 7–9 years to 71.4% among those aged 13–15 years. This difference was statistically significant (P=0.038), indicating that older age was associated with a higher occurrence of headache in the estimated study population.

Table 2. Prevalence of Headache According to Selected Demographic Characteristics (n=143).

Characteristic	Category	Headache No. (%)	No headache No. (%)	P value
Overall	All participants	87 (60.8)	56 (39.2)	<0.001
Sex	Male	43 (55.1)	35 (44.9)	0.125
	Female	44 (67.7)	21 (32.3)	
Age	7–9 years	14 (43.8)	18 (56.3)	**0.038**
	10–12 years	33 (60.0)	22 (40.0)	
	13–15 years	40 (71.4)	16 (28.6)	

Among the 87 participants with headache, more than half, 46 (52.9%), reported headache at least once weekly, while 29 (33.3%) experienced one to three episodes per month and 12 (13.8%) reported less than one episode per month. Regarding duration of headache history, 37 (42.5%) had experienced headache for one to three years. Frontal headache was the most frequently reported location, occurring in 36 (41.4%), followed by bilateral or diffuse headache in 31 (35.6%). Moderate headache severity was predominant, reported by 49 (56.3%), while severe headache was reported by 21 (24.1%). As shown in table 3.

Table 3: Clinical characteristics of headache among participants with headache (n=87).

Characteristic	Category	No. (%)
Frequency	<1 episode/month	12 (13.8)
	1–3 episodes/month	29 (33.3)
	≥1 episode/week	46 (52.9)

Duration	<1 year	25 (28.7)
	1–3 years	37 (42.5)
	>3 years	25 (28.7)
Location	Frontal	36 (41.4)
	Bilateral/diffuse	31 (35.6)
	Other	20 (23.0)
Severity	Mild	17 (19.5)
	Moderate	49 (56.3)
	Severe	21 (24.1)

Table 4 demonstrates significant associations between headache and several lifestyle factors. Headache was reported by 70.4% of participants sleeping less than eight hours per day compared with 48.4% among those sleeping at least eight hours (P=0.012). Similarly, headache was more frequent among participants with screen time of two hours or more per day (69.7%) compared with those with less than two hours (46.3%), and this difference was statistically significant (P=0.008). Low or irregular physical activity was also associated with a higher prevalence of headache (68.6% vs. 49.1%, P=0.021). In addition, participants with irregular meals had a higher prevalence of headache than those with regular meals (69.6% vs. 50.0%, P=0.018).

Table 4: Association between selected lifestyle factors and headache (n=143).

Factor	Category	Headache n (%)	No headache n (%)	P value
Sleep duration	≥8 hours/day	30 (48.4)	32 (51.6)	**0.012**
	<8 hours/day	57 (70.4)	24 (29.6)	
Screen time	<2 hours/day	25 (46.3)	29 (53.7)	**0.008**
	≥2 hours/day	62 (69.7)	27 (30.3)	
Physical activity	Regular	28 (49.1)	29 (50.9)	**0.021**
	Low/irregular	59 (68.6)	27 (31.4)	
Meals	Regular	32 (50.0)	32 (50.0)	**0.018**
	Irregular	55 (69.6)	24 (30.4)	

Table 5 shows that headache was more frequent among participants with a positive family history of headache. Among those reporting a family history, 75.0% had headache compared with 51.7% among those without such a history, and the association was statistically significant (P=0.008). Similarly, headache was reported by 70.8% of participants experiencing academic or psychological stress compared with 50.7% among those without reported stress (P=0.019). A particularly high prevalence was observed among participants with a history of recurrent headache, where 81.0% reported headache compared with 52.5% among those without such a history (P=0.002).

Table 5: Association of family history and psychosocial factors with headache (n=143).

Factor	Category	Headache n (%)	No headache n (%)	P value
Family history	Yes	42 (75.0)	14 (25.0)	**0.008**
	No	45 (51.7)	42 (48.3)	
Academic/psychological stress	Yes	51 (70.8)	21 (29.2)	**0.019**
	No	36 (50.7)	35 (49.3)	
Previous recurrent headache	Yes	34 (81.0)	8 (19.0)	**0.002**
	No	53 (52.5)	48 (47.5)	

The multivariable logistic regression analysis showed that several factors remained significantly associated with headache after adjustment for the other variables included in the model. Participants sleeping less than eight hours per day had approximately 2.18 times higher odds of headache (adjusted OR=2.18, 95% CI: 1.08–4.40, P=0.030). Screen time of two hours or more per day was also independently associated with headache (adjusted OR=2.31, 95% CI: 1.17–4.57, P=0.016). Low or irregular physical activity was associated with increased odds of headache (adjusted OR=1.92, 95% CI: 1.01–3.67, P=0.047). A positive family history showed the strongest estimated association (adjusted OR=2.67, 95% CI: 1.31–5.44, P=0.007). In contrast, academic or psychological stress, female sex, and age 13–15 years were not statistically significant after adjustment (P>0.05).

Table 6: Multivariable Logistic Regression Analysis of Factors Associated with Headache.

Variable	Adjusted OR	95% CI	P value
Sleep <8 hours/day	2.18	1.08–4.40	**0.030**
Screen time ≥2 hours/day	2.31	1.17–4.57	**0.016**
Low/irregular physical activity	1.92	1.01–3.67	**0.047**
Family history of headache	2.67	1.31–5.44	**0.007**
Academic/psychological stress	1.71	0.89–3.28	0.105
Female sex	1.38	0.72–2.66	0.328
Age 13–15 years	1.54	0.76–3.12	0.231

4- DISCUSSION

In the present estimated study, 87 (60.8%) of 143 participants were reported to have headache. This indicates that headache represents a frequent complaint among the studied school-aged population. The finding is broadly consistent with recent epidemiological evidence showing that headache is highly prevalent during childhood and adolescence. A systematic review and meta-analysis of 48 studies reported a pooled prevalence of primary headache of 62% among children and adolescents aged 8–18 years, although substantial heterogeneity existed between studies.[1] Differences between studies may be explained by variations in age groups, diagnostic criteria, recall periods, questionnaire design, and whether all headaches or only primary headache disorders were assessed.

In the present estimated results, headache prevalence increased significantly with age, from 43.8% among children aged 7–9 years to 71.4% among those aged 13–15 years (P=0.038). This pattern is compatible with the recognized increase in headache burden during adolescence. The systematic review by Onofri et al. demonstrated substantial differences in pediatric headache prevalence according to age and sex, with females showing a higher pooled prevalence of primary headache than males.[1] The increasing prevalence during adolescence may also reflect hormonal, behavioral, academic, and lifestyle changes occurring during this period.

Although headache was more common among females than males in the present estimated study (67.7% versus 55.1%), the difference was not statistically significant (P=0.125). This finding is not necessarily inconsistent with previous literature, because the magnitude of sex differences varies according to age and headache subtype. In the systematic review, the pooled prevalence of primary headache was higher in females than males, but the authors also emphasized considerable heterogeneity among the included studies.[1] The lack of statistical significance in the current estimated sample may partly reflect the relatively small number of participants.

Among participants reporting headache, 52.9% were estimated to experience attacks at least once weekly, while moderate headache intensity was the most common severity category (56.3%). Frontal headache was the most frequent location (41.4%), followed by bilateral or diffuse headache (35.6%). These findings indicate that headache was not merely an occasional symptom for many participants, but frequently represented a recurrent complaint. However, because the present study was not designed to establish formal headache diagnoses according to the International Classification of Headache Disorders, these clinical characteristics should not automatically be interpreted as representing specific headache subtypes.

A significant association was observed between sleep duration and headache. Participants sleeping less than eight hours per day had a higher estimated prevalence of headache than those sleeping at least eight hours (70.4% vs. 48.4%, P=0.012), and inadequate sleep remained independently associated with headache in the estimated regression model (adjusted OR=2.18, 95% CI: 1.08–4.40, P=0.030). Sleep and headache may have a bidirectional relationship: inadequate or disturbed sleep may contribute to headache susceptibility, while recurrent headache may itself interfere with sleep. Recent pediatric literature emphasizes the importance of sleep in children's physical, emotional, and cognitive health, although the precise relationship between sleep disturbances and individual symptoms can be complex.[5] Screen exposure was another important factor in the estimated findings. Headache was reported in 69.7% of participants with screen time of at least two hours daily compared with 46.3% among those with less than two hours (P=0.008). Screen time also remained significantly associated with headache after adjustment (adjusted OR=2.31, 95% CI: 1.17–4.57, P=0.016). This finding is supported by a 2024 scoping review that included 48 studies of children and adolescents and found preliminary evidence of an association between screen use and pediatric headache. The strongest association was related to the duration of screen use, although the authors emphasized that most available studies were cross-sectional and that differences in how screen exposure and headache were measured limited conclusions regarding causality.[6]

The association between screen exposure and headache may involve several mechanisms. Prolonged screen use may contribute to visual strain, prolonged static posture, reduced physical activity, irregular sleep, and changes in daily routines. However, these mechanisms should be considered potential explanations rather than established causal pathways. A clinical study of 139 children and adolescents with headache found no significant difference in overall screen time between headache diagnostic groups, although greater screen time was associated with increased headache frequency in children with migraine with aura.[7] Therefore, the relationship between screen exposure and pediatric headache appears to be multifactorial and may differ according to headache phenotype.

The present estimated study also demonstrated a significant association between physical activity and headache. Headache was reported in 68.6% of participants with low or irregular physical activity compared with 49.1% among those with regular activity (P=0.021). Low or irregular physical activity remained significant in the adjusted analysis (adjusted OR=1.92, 95% CI: 1.01–3.67, P=0.047). Reduced physical activity may coexist with prolonged screen exposure and inadequate sleep, making it difficult to determine whether any single behavior is independently responsible for headache. Recent pediatric research increasingly emphasizes the importance of considering screen use, physical activity, and sleep as interconnected lifestyle behaviors rather than isolated exposures.[8]

Irregular meals were also significantly associated with headache in the estimated analysis, with headache reported in 69.6% of participants with irregular meals compared with 50.0% among those with regular meals (P=0.018). This finding is consistent with recent population-based evidence. A Canadian population-based study of children and adolescents reported that frequent recurrent headaches were associated with meal regularity, with greater meal regularity associated with lower odds of frequent headache after adjustment for age and sex (adjusted OR=0.90, 95% CI: 0.89–0.92).[9] Similarly, a 2025 scoping review including 36 studies found that although the evidence was heterogeneous, many studies supported an association between fasting or skipped meals and migraine, particularly when breakfast was omitted.[10] A study among children and adolescents also reported increased odds of headache with skipping lunch or dinner.[11] However, not all studies have demonstrated this association; for example, a large cross-sectional study of 1,260 high-school students found no significant association between meal skipping and headache.[12] Therefore, the relationship may depend on the type of headache, dietary pattern, hydration, and other coexisting lifestyle factors. Possible mechanisms include prolonged fasting, reduced energy availability, and dehydration, but the present cross-sectional design cannot establish causality. Dietary behaviors may also cluster with other lifestyle factors, such as inadequate sleep, prolonged screen exposure, low physical activity, and psychosocial stress.

A family history of headache showed a significant association with headache in the present estimated analysis, with headache reported in 75.0% of participants with a positive family history compared with 51.7% among those without such a history (P=0.008). Family history remained independently associated with headache in the estimated multivariable regression model (adjusted OR=2.67, 95% CI: 1.31–5.44, P=0.007). This finding is supported by recent evidence indicating a familial component to primary headache disorders in children and adolescents. A 2025 scoping review of the inheritance of primary headache in children and adolescents found that all included studies demonstrated familial aggregation or heritability of primary headache.[13] Earlier pediatric evidence also demonstrated that migraine occurred at a younger age among children with a parental history of migraine, supporting the contribution of familial susceptibility.[14] These findings are biologically plausible because genetic susceptibility is recognized particularly in migraine, although familial clustering may reflect both genetic and shared environmental or behavioral influences. Thus, the association observed in the present study should not be interpreted as evidence of a purely genetic mechanism, particularly because the study did not distinguish specific headache diagnoses or assess the genetic characteristics of affected families.

Psychological or academic stress was similarly associated with headache in the estimated results. Headache was reported by 70.8% of participants reporting significant academic or psychological stress compared with 50.7% among those without such stress (P=0.019). This association did not remain statistically significant after adjustment (adjusted OR=1.71, 95% CI: 0.89–3.28, P=0.105), suggesting that its apparent unadjusted relationship may partly overlap with other factors. Recent evidence supports an association between adverse childhood experiences and primary headache disorders, although the mechanisms are complex and may involve psychological, behavioral, and biological pathways.[15]

The estimated multivariable analysis is particularly important because several associations persisted after adjustment. Family history, prolonged screen exposure, inadequate sleep, and low physical activity remained statistically significant, whereas sex, age, and academic/psychological stress did not. This pattern suggests that behavioral and familial factors may have greater independent associations with headache than some basic demographic characteristics in the present estimated population. Nevertheless, the relatively small sample of 143 participants may limit the precision of the regression estimates, as reflected by the relatively wide confidence intervals.

The findings should be interpreted in light of the study design. The cross-sectional nature of the study prevents determination of temporal relationships between headache and its associated factors. For example, children may reduce physical activity because they experience headaches, rather than low physical activity necessarily causing headache. Similarly, headache may interfere with sleep, while inadequate sleep may increase susceptibility to headache. The reliance on self-reported screen time, sleep, dietary patterns, and headache characteristics may also introduce recall and reporting bias. These limitations are particularly relevant because recent reviews have highlighted the predominance of cross-sectional studies in pediatric headache research and the resulting limitations in establishing causality.

5- CONCLUSION AND RECOMMENDATION

Headache was common among the school-aged children included in this estimated study, with an overall prevalence of 60.8%, and its occurrence increased significantly with age. Headache was significantly associated with inadequate sleep, prolonged screen exposure, low or irregular physical activity, irregular meals, psychosocial or academic stress, and a positive family history, while family history, prolonged screen exposure, inadequate sleep, and low or irregular physical activity remained independently associated with headache in the estimated multivariable analysis. These findings highlight the importance of recognizing both familial susceptibility and potentially modifiable lifestyle factors in children with recurrent headache. Therefore, healthcare professionals should provide appropriate education to children and parents regarding regular sleep, balanced and regular meals, adequate hydration, limitation of excessive screen exposure, and maintenance of regular physical activity, while attention should also be given to psychosocial and academic stressors. Children with recurrent, severe, or atypical headaches should undergo appropriate clinical assessment to identify possible secondary causes, and further multicenter longitudinal studies with larger samples are recommended to confirm these associations and evaluate the effectiveness of preventive lifestyle interventions.

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