



Prevalence and profile of headache in school-going adolescents aged 10 – 19 years in Benin city: a cross sectional survey

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Introduction

Adolescent headaches significantly impact their daily functioning, academic performance, and quality of life. The occurrence of headaches is influenced by genetics, psychological stressors, and environmental exposures. Understanding these influences is crucial for effective management strategies.

Aim

To determine the prevalence, characteristics, and associated factors of headaches among school-going adolescents in Benin City, Nigeria.

Method

This was a descriptive cross-sectional study among secondary school students. Using a structured questionnaire, data on sociodemographics, headache characteristics, triggers, and impacts were collected. The chi-square test was used to assess the association between the presence of headaches and categorical covariates. All analyses used a significance level of $p < 0.05$.

Result

Of the 486 respondents 235 (48.4%) were boys and 251 (48.3%) were girls with a M:F ratio of 1:1.07. The mean age of the study participant was 13.7 (+ 1.78) years. The one-year prevalence of headache was 84%. 92 (18.9%) of those reporting headaches met the diagnostic criteria for chronic daily headache. The most common impact of headache was poor concentration (110; 22.6%). Psychological stress (55.3%) and poor sleep (26.1%) were the most commonly reported headache triggers.

Conclusion

More than four in five school-going adolescents have headache at one time in the past year. Reading and concentration problems are the most common adverse effect of headache in adolescents.



Introduction

Headache is one of the most common neurological symptoms experienced by people of all ages worldwide (1). Globally, headache disorders affect approximately 40% of the population, or 3.1 billion people in 2021, and are more common in females compared to males (2). In 2019, headache disorders accounted for the third highest cause of disability-adjusted life years (DALYs) among neurological disease burden worldwide, after stroke and dementia (2). Adolescent headaches are of particular concern due to their potential impact on daily functioning, academic performance, and overall quality of life. In adolescents, headaches commonly limit social activities and physical activities, leading to increased school absenteeism, poorer learning outcomes, a higher risk of dropping out of school, and even negatively impacting parents' careers (3–5). Headaches during adolescent period if untreated may persist into adulthood as chronic headaches syndromes (6).

The occurrence of headaches in adolescents is influenced by many factors. Genetic predisposition plays a crucial role in adolescent headaches, as family history can significantly increase the likelihood of experiencing headaches (7,8). Psychological stressors, including academic pressures, social relationships, emotional well-being, comorbid depression and anxiety disorders are also critical determinants. However, lifestyle factors, including diet, sleep patterns, and physical activity levels, also contribute to headache prevalence (9,10). Furthermore, environmental exposures, such as excessive lighting, pollution and noise, may exacerbate headache conditions (11,12). Understanding these multifaceted influences is essential for developing comprehensive strategies to manage and reduce the burden of headaches among adolescents.

Previous epidemiological studies have estimated that the one-year prevalence of headaches among adolescents ranges from 58% to 88% (13–15). However, specific regional studies reveal varying results (5). For instance, Ofovwé and Ofili (16) conducted a study in Benin City, Nigeria, which reported a significantly lower prevalence rate of 19.5% among school-going adolescents. This disparity can be attributed to the study's focus on only two types of headaches—migraine and tension-type headaches—potentially underestimating the overall headache prevalence by excluding other types. Limiting headache studies to primary headache syndromes, such as migraines and tension-type headaches, may not fully capture the broader spectrum of headache disorders affecting adolescents. This narrow focus overlooks other significant headache types, including secondary headaches caused by underlying medical conditions, and chronic daily headaches, all of which can substantially impact an adolescent's quality of life. A comprehensive approach that includes a wider variety of headache disorders, patterns and triggers is essential to accurately

assess prevalence, identify risk factors, and develop effective treatment and prevention strategies for all adolescents experiencing headaches. This study therefore, sought to determine the prevalence, characteristics, and associated factors of headaches among school-going adolescents in Benin city, Nigeria.

Method

Study design

This was a descriptive cross-sectional study.

Place of study

The study was conducted in a public secondary school in Benin City, Edo state, Nigeria, between February and March 2024. We selected the school based on the following criteria: large public school in an urban area (over 1000 students) offering both junior secondary and senior secondary school classes. The school had 1360 students in six arms of secondary school (JSS 1-3 for junior secondary school and SSS 1 -3 for senior secondary school). Each arm had a minimum of six classes made up of at least 35 students per class. Classes hold from 8am to 2:30 pm with a 30 minutes break between 12 pm and 12:30 pm.

Recruitment of participants

In order to familiarize students with the study, prior information about the scope of the study was shared at the school assembly ground. An informative letter and the informed consent form were sent to the students' parents in order to inform them of the objectives and procedures of the study. Three classes were randomly selected from each arm and study participants were recruited from the classes. The students in each class were assigned a number and were randomly selected according to inclusion criteria. The inclusion criteria were: being between 10 and 19 years old; and having returned the consent form signed and dated by their carer. Exclusion criteria were: having physical, behavioural and/or psychological alterations that would prevent them from filling out the data collection instrument; having significant neurological disorders; having facial trauma; and being pregnant or breastfeeding for the previous six months.

Definitions

Headache was defined as any pain or discomfort arising from pain-sensitive structures in the head including extracranial structures such as the skin, muscles, and blood vessels in the head and neck; mucosa of the sinuses and dental structures (17). If a subject responded "≥15 days" to the question "on the average, how often do you have



such headaches in a month over the past 3 months?”, he/she was classified as having chronic daily headache (18). A trigger was defined as specific factors or activities whose occurrence preceded and predicted the development of the headaches.

Data collection

We used a structured questionnaire formulated by researchers with questions on sociodemographic data, characteristics of headache, headache triggers and impact of headache. Before data collection, a pilot study was conducted in a monthly seminar attended by secondary school students from other schools. Twenty adolescents filled the questionnaire during pilot testing in order to improve the study questionnaire, and review the study design. At debriefing following the pilot study, some items on the study questionnaire were modified for ease of understanding while the study design was maintained. The questionnaire was self-administered, and three trained research assistants supervised the adolescents to answer any possible questions. They provided clarifications to ambiguous questions when necessary and referred those who ticked “> 15 days a month” to questions on headache frequency for neurologist review. The researcher was available to confirm diagnosis of migraine and tension-type headache using ICH-3 classifications.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Categorical variables were expressed as frequencies and percentages. Numerical data such as age, duration of headache episode, headaches frequency were further categorised into groups. Age was categorised into groups of 10-13 years, 14 – 16 years and 17 – 19 years; headache frequency was categorised as 1 – 3 days/month, 1 – 3 days/week and > 15 days/month while duration of headache episodes was grouped as < 30 minutes; 30 minutes – 1 hour; 1 – 4 hours and > 4 hours per episode. The chi-square test was used to assess the association between the presence of headaches and categorical covariates. All test were significance at $p < 0.05$.

Ethics

This study was approved by the Health Research Ethics Committee the University of Benin Teaching Hospital - Protocol number:ADM/E22/A/VOL.VII/48311689. Permission for the study was sought from the head of the school and written informed consent was gotten from the parents of each participants.

Result

Characteristics of study participants

Four hundred and eighty-six students completed the questionnaires and returned the forms. Fourteen students did not return the filled questionnaires giving a non-response rate of 2.8%. Of the 486 respondents 235 (48.4%) were boys and 251 (48.3%) were girls with a male: female ratio of 1:1.07. The mean age of the study participant was 13.7 years (SD – 1.78 years). Most (57.4%) of the participants were in senior secondary school. The distribution of the study participants is shown in Table 1.

Table 1 Characteristics of study population

Variable	Frequency (n)	Percentage (%)
Age group		
10 – 13	231	47.5
14 – 16	235	48.3
17 – 19 years	20	4.1
Sex		
Male	235	48.4
Female	251	51.6
School		
Junior Secondary	207	42.6
Senior Secondary	279	57.4
Positive Family history		
Yes	193	39.7
No	293	60.3

Prevalence of headache

Of the 486 participants, 408 reported that they had experienced at least one episode of headache in the past 12 months, giving a one-year prevalence of 84%. Among the subjects who reported having had at least one episode of headache in the last 12 months, 86 (17.7%) had headache episodes at least 15 days per month in the preceding three months and thus met the diagnostic criteria for chronic daily headache. Of the students with chronic daily headache, tension-type headaches was present in 40 adolescents (8.2%); migraine headache in 20 (4.1%) while 26 (5.3%) had other forms of chronic daily headaches.

Frequency of headache

Most students (268; 55.1%) had headache infrequently about 1 – 3 days per month. While 86 students (17.7%) had very frequent headaches of at least 15 days a month. The frequency of headache episodes (irrespective of type) is shown in figure 1.

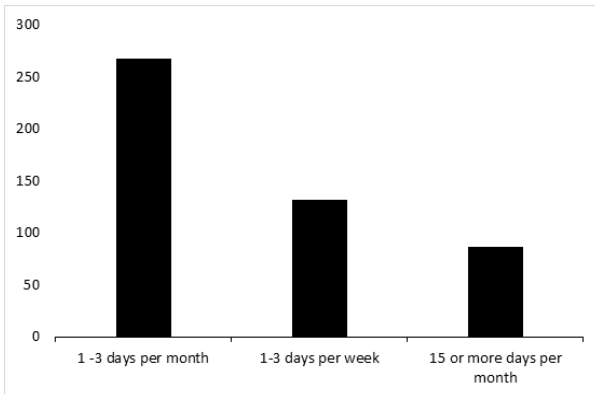


Figure 1. Frequency of headache episodes in adolescents.

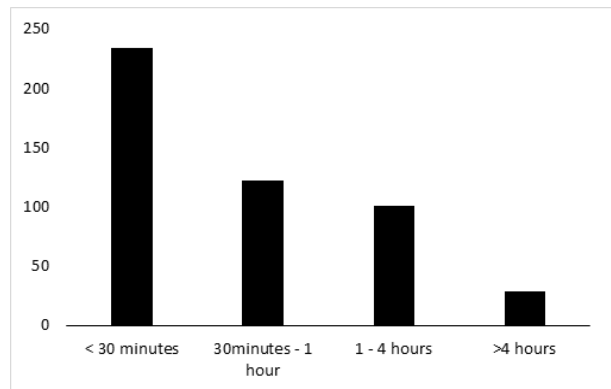


Figure 2. Duration of headache episode in adolescents.

Duration of episodes

Two hundred and thirty-four (48.1%) of the subjects had headache episodes lasting less than 30 minutes while 122 (25.1%) had duration between 30 minutes and 1 hour. Only 29 (6.0%) of the subjects had prolonged headache episodes lasting more than 4 hours.

Headache impact on subjects' activities

The most common impact of headache on school going adolescents is in their ability to concentrate (110; 22.6%) during their studies as well as restriction of play and other physical activities (73; 15.0%). Other commonly reported negative impacts are its limitation of their social engagement (24; 4.9%) and performance of domestic chores (24; 4.9%). Thirty-three (20.0%) of the subjects had missed school attendance in the preceding year on account of headache. The impact of headache on the activities of study subjects are summarised in Figure 3.

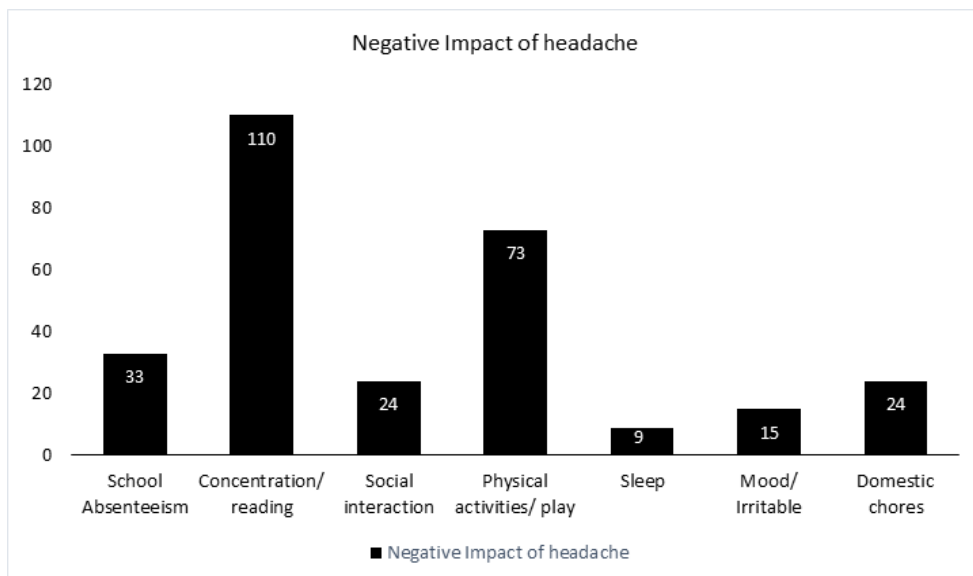


Figure 3. Headache impact in school-going adolescents.



Headache triggers

Psychological stress (55.3%), poor sleep (26.1%) and loud noise (24.5%) were the most commonly reported triggers of headache in school going adolescents. Other reported triggers are listed in Table 2.

Table 2. Headache triggers in adolescents

Trigger	Frequency	Percentage
Bright Light	60	12.3
Poor sleep	127	26.1
Chocolate/ coffee	7	1.4
Strong smell	23	4.7
Loud noise	119	24.5
Skipping meals	57	11.7
Dehydration	20	4.1
Physical exertion	47	9.7
Psychological Stress	269	55.3

Factors associated with adolescent headaches

Age group, sex and school type were compared between the adolescents who reported headache in the preceding year and those who did not. Headache was more prevalent in girls ($\chi^2 = 12.477$, $p < 0.001$) and older adolescents ($\chi^2 = 10.212$, $p = 0.007$). Headache was however less prevalent in junior secondary school adolescents compared to those in senior secondary school ($\chi^2 = 8.664$, $p = 0.004$) (Table 3).

Table 3. Factors associated with one-year prevalence of headache in adolescents

Variables	Yes	No	χ^2	P
Age group				
10-13 years	182	49	10.212	0.007
14-16 years	210	25		
17-19 years	16	4		
Gender				
Male	225	26	8.664	0.004
Female	183	52		
School				
Junior secondary	162	45	8.664	0.004
Senior secondary	246	33		
Positive Family History				
Yes	162	31	<0.001	1.000
No	246	47		

Multivariate analysis

On multivariate logistic regression only gender was significantly associated with one-year prevalence of headache. Females have more than two times the odds of reporting headaches in the past one year compared to males. Other variables did not show independent associations (Table 4).

Table 4. Multivariate analysis of factors associated with adolescent headaches

Variable	Yes	No	Wald	Odd ratio	95% CI	P
Age						
10-13 years	182	49	0.009	0.930	0.212-4.081	0.923
14-16 years	210	25	0.706	1.664	0.518-5.464	0.401
17-19 years	16	4				
Gender						
Female	225	26	11.015	2.404	1.432-4.037	0.001
Male	183	52				
Class						
Junior school	162	45	0.290	0.755	0.271-2.102	0.590
Senior school	246	33				
Positive Family History						
Yes	162	31	0.266	0.872	0.518-1.478	0.606
No	246	47				

Discussion

Our study reveal a one-year headache prevalence of 84% among school-going adolescents. About one-fifth of adolescents who report headache in the last one year had chronic daily headache. Most adolescent headaches were infrequent and short duration. Stress, poor sleep, bright light and loud noise are the most commonly reported triggers of headache in adolescents. Factors associated with reporting headache in the last one year were older adolescents, females and being in senior secondary school. However, only gender remained significantly associated on multivariate regression.

More than four-fifths of school-going adolescents reported experiencing at least one episode of headache in the preceding year, highlighting the widespread nature of headaches. The one-year prevalence of headaches in our study aligns closely with findings from similar research (11,19–21). The similarity in our observations indicate that headache is a common problem among adolescents globally. There is need for universal strategies in addressing this health concern. Such strategies should encompass both preventative measures and effective



treatments to reduce the frequency and severity of headaches in adolescents. Collaborative efforts from governments, healthcare organizations, and educational institutions are crucial to developing and implementing these strategies effectively. The findings of this study was however, higher than what was reported by Okamura and colleagues in Brazil (22). The dissimilarity may be related to methodological difference. The current study was among school-going adolescents while the Brazilian study was a population-based study. Targeting a homogeneous group of school-going adolescents provides the opportunity to understand the unique influence of academic and environmental stressors as well as psychosocial determinants on adolescents' health. It also aids the implementation and monitoring of the effectiveness of targeted interventions.

Chronic daily headache (CDH) was observed in about one-fifth of school-going adolescents in our study. This finding aligns with the results of previous studies which reported prevalence ranging from 8 – 20% (23,24). Our observation is however, higher than the 1.5% observed by Wang and colleagues among middle school students aged 12-14 in Taiwan (25). The higher prevalence seen in the present study may be due to the inclusion of older adolescents in our cohort. Headache episodes are generally more common and severe in older adolescents compared to their younger peers (23). The inclusion of older adolescents in the present study therefore, provides a more holistic information on adolescent chronic daily headaches in our locale.

Headaches can have severe implications for an individual and family members, due to significant disruptions to daily activities and challenges in managing symptoms. In the present study, students reported negative effects from headaches, including difficulties with concentration and reading, as well as disrupted sleep patterns. These physiologic alterations can substantially diminish their quality of life, resulting in decreased academic performance and limited participation in social and recreational activities, which are crucial for their overall development. Furthermore about 7% of the adolescents sampled had missed at least one school day on account of headache. School absenteeism in adolescents have implication for achieving their educational and career goals. Adolescent headaches thus have far-reaching implications beyond adolescent stage of development.

Stress, resulting from academic pressures, social dynamics, and extracurricular commitments, contributes to the burden of headaches in school-going adolescents (26). In the present study more than half of the participating adolescents reported stress as a trigger of their headache. This report accords with the observation from previous research. For instance, Siniatchkin et al. (27) demonstrated that stress is a significant precipitating factor for headaches in adolescents, particularly for

tension-type headaches and migraines. Similarly, a study by Pakalnis and colleagues (28) found that stress, both from academic pressures and social challenges, was a common trigger for recurrent headaches in adolescents. Another study by Martin et al. (29) corroborated these findings, highlighting that emotional stress and anxiety were among the most frequently reported headache triggers in a large cohort of adolescents.

The observation may partly be explained by the increased work load combined with extracurricular activities borne by secondary school students especially in higher classes. Stress management therefore, should be an integral part of headache prevention and treatment among school-going adolescents. Also, environmental factors such as harsh indoor lighting (26) and noise and sleep problems (30) can further exacerbate or trigger headaches, particularly in environments like classrooms where students are exposed to these conditions for extended periods. About a fourth of adolescents participating in the present study reported poor sleep as triggers of headache while one-eighth considered excessive lighting as precipitating factor. The findings of our study highlight the significant impact that environmental and psychological factors have on adolescent health. Addressing these triggers requires multiple approaches. For example, schools can implement better lighting conditions, encourage regular breaks to reduce screen time, and provide resources for stress management. Educating students about headache prevention and management strategies, such as maintaining proper hydration, developing stress coping skills, and adopting healthy sleep habits, can be beneficial. These targeted interventions such as coping skills trainings and management of psychological stress should be integrated into the school health program in order to mitigate the impact of headaches among school-going adolescents.

In the present study, headache prevalence was notably higher among girls and older adolescents, aligning with existing literature that indicates hormonal changes and stress factors may contribute to a higher incidence of headaches in these groups (31). Adolescents in junior secondary school reported lower prevalence of headaches compared to their senior counterparts. This discrepancy might be attributed to increased academic pressures and lifestyle changes experienced by senior secondary students, which have been documented as significant headache triggers (32). However, after controlling for various factors, only gender remained independently associated with headache prevalence over the past year. The association between gender and headache has been long established. Thus underscoring the need for gender-specific interventions in headache management and prevention strategies in adolescents (33).

Limitation of study

Our study has some inherent limitations. Firstly, our study



relied on headache characterisation by the participants and there was no supporting medical records or data accessed. The study could have been influenced by recall bias because it is possible that some of the participants did not readily recall the characteristics of the headaches they had in the past. Secondly, the participating adolescents were recruited from only one secondary school. The school being a school for families with higher than average monthly income might have inadvertently excluded adolescents from lower social class, thus limiting the generalisation of our findings. However, this study provides useful insight into the burden, triggers and impact of headache in school-going Nigerian adolescents.

Conclusion

In conclusion, the burden adolescent headache and its impact on their academic performance and quality of life is not fully appreciated in our locale. More than four in five school-going adolescents have had headache at least once in the past year. Reading and concentration problems are the most common adverse effects while psychological stress and environmental factors are significant triggers of adolescent headaches in Nigeria.

Recommendation

Targeted interventions such as coping skills trainings and management of psychological stress should be integrated into the school health program in order to mitigate the impact of headaches among school-going adolescents. Additionally, creating a supportive school environment that minimizes environmental triggers — such as ensuring proper lighting and ergonomically designed study spaces—can help alleviate some of the environmental factors contributing to headaches. A longitudinal and interventional study involving more than one secondary school should be carried out to understand the impact of headache intervention in adolescents.

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Authors' contributions: PEI, conceptualization, design of the study, Data analysis and interpretation, wrote the initial draft of the paper; IM, study design, Data collection, review of manuscript critically for intellectual content. Both authors gave final approval of the version to be published and agree to be accountable for all aspects of the work in ensuring that questions relating to the accuracy or integrity of any part of the study are appropriately investigated and resolved.

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