

Headache in Adolescence: Characteristics and Prevalence of an Urban Portuguese Population

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Abstract

Introduction: Headache is a frequent complaint among children and adolescents. Its prevalence is still poorly described in this Portuguese population. The most frequent primary headache disorders are migraine and tension-type headache. The authors aimed to characterise and to determine the prevalence in a three months period of headache among adolescents in a Portuguese urban county.

Methods: Population-based cross-sectional study with data collected through anonymous questionnaire to an adolescent sample attending the third cycle of basic education. The questionnaire was compiled using the International Headache Society diagnostic criteria.

Results: A total of 2123 valid questionnaires were obtained. The three months headache prevalence was 74.5%, higher among female adolescents (boys 63.9%, girls 84.6%). Recurrent headache (more than one episode in three months) prevalence was 49.7% and frequent recurrent headache (14 or more episodes in three months) prevalence was 6.2%. Using a visual analog scale from 0-10 points, the average intensity was 4.64 points (boys 4.47, girls 4.77) and 12.4% (boys 9.3%, girls 15.3%) of all adolescents reported severe intensity pain (≥ 7 points). According to the International Headache Society diagnostic criteria 5.4% (boys 4.3%, girls 6.4%) students reported headache that fulfilled migraine criteria and 7.6% (boys 8.3%, girls 7.0%) tension-type headache criteria. Among female adolescents, significant association was detected ($p < 0.05$) between the increasing age and the prevalence of three months headache as well as headache that fulfilled migraine criteria.

Discussion: This study shows the high prevalence of headache among the studied adolescents supporting the need for greater awareness of this clinical entity.

Keywords: Adolescents; Headache/epidemiology; Migraine Disorders; Portugal; Prevalence; Surveys and Questionnaires; Tension-Type Headache

Introduction

Headache is a very common symptom, not only in the adult population, but also in the paediatric population, especially among adolescents.

In addition to being associated with an important socio-economical impact, headaches often condition school absenteeism, as well as decreasing the quality of life of adolescents.^{1,2}

Studies that assess the prevalence of headaches in paediatric age and, more specifically, primary headache syndromes among adolescents, are still sparse. The use of different data collection methods and diagnostic criteria may explain the disparities in prevalence reported by several studies, ranging between 21% and 91% for global (or generalised) headache and between 0.5% and 21.7% for migraine.³ One common finding in the vast majority of studies is the higher prevalence in female adolescents when compared to male.

In Portugal, data referring to the prevalence of headache among adolescents is even more limited. The only study conducted in our country for this age group, published in 2010, reports a total prevalence of headache of 78.2%, also higher in females.⁴

Our study aims to determine the prevalence and describe the characteristics of primary headache and its main subtypes, tension headache and migraine, during a three-month period, among adolescents between 7th and 9th grade in schools of an urban municipality in the north of Portugal.

Methods

We designed and conducted a descriptive and cross-sectional study, with data collected by anonymous questionnaires. The study included all public and private schools that had 7th to 9th grade students in the municipality. Of the 27 schools invited, 25 agreed to participate in the study.

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From the total number of students who attended 7th to 9th grade in each educational establishment, while maintaining the proportion to the total number of students for each selected sample, the number of classes in each school to be included in the study was determined. The selection of classes to apply the questionnaire was carried out at random by the teachers of each school, who were responsible for liaison with the authors.

After written consent for participation in the study from the parents, the questionnaire was applied to 93 classes. 2256 students participated and 2123 valid questionnaires were obtained after applying the exclusion criteria (headaches related to head trauma or secondary to another condition and questionnaires with less than half answered questions).

The questionnaire was filled out anonymously in classroom environment prior to the beginning of daily classes. One of the authors was present at all times, succinctly explaining to the subjects the study, its goals and directions for filling out the questionnaire. The same author answered any questions posed by the subjects during the filling of the questionnaire. The completion time of the questionnaires was between 15 and 20 minutes.

Prior authorization from the Ministry of Education to conduct the study through the School Environment Survey Monitoring platform was obtained (<http://mime.gepe.min-edu.pt>). Prior to the beginning of the study, a pilot phase was carried out, with the application of the questionnaire to a class of each year between the 7th and 9th grades, comprising of 62 students. No interpretation or filling in difficulties were detected, namely recurring doubts or systematic errors.

In the absence of a validated questionnaire for the Portuguese language, a specific questionnaire was created for the study, based on instruments already widely used and validated,⁵⁻⁷ in the English and German languages, for the evaluation of headaches and pain in children and adolescents. The questionnaire was divided into two parts. On the first part, socio demographic data of adolescents were collected, including gender, age, weight and height, school performance, among others. The second part included questions related to the frequency and characteristics of the headache and was built taking into account the diagnosis criteria of the International Classification of Headache Disorders 2nd edition (ICHD-II) of the International Head Society (IHS).⁸

The adolescents were questioned on the occurrence of, at least, one episode of headache in the three previous months. Only those who responded affirmatively to this question continued to answer the remaining questions, namely regarding the frequency of headache, other characteristics of the pain (duration of each crisis, inten-

sity, location and distribution of the pain throughout the day) and associated symptoms such as nausea, vomiting, photophobia and phonophobia, among others.

For the determination of the usual intensity of headache, an analog scale of 11 points (0 to 10) was used. The study defined the intensity as moderate for values between 4-6 and as severe for values between 7-10.⁹ To determine the pain usual location, figures representing human heads were used. The headache frequency was determined by the number of days with headache in the past three months and categorised as a single day, two to three days, four to 14 days and more than 14 days.

To determine the prevalence of primary headache syndromes, migraine and tension headache, ICHD-II diagnostic criteria were also used. According to these criteria, for a definitive migraine diagnosis, a minimum of five episodes are required and the questionnaire referred only to symptoms in the last three months, the adolescents who met the criteria for migraines were identified as suffering from probable migraine.

Statistical analysis was performed using SPSS 20.0 IBM® (Chicago, IL, USA) for Microsoft Windows®. A type I (α) error probability of 0.05 was considered in all inferential analyses. The 95% confidence intervals (95% CI) for proportions were calculated using the calculation tool made available by McCallum Layton (<https://www.mccallum-layton.co.uk/tools/>). In the comparison of means between different groups, parametric Student's t test and variance analysis (ANOVA) were used and, when comparing prevalences, non-parametric chi-square (χ^2) test, the odds ratio (OR) and its 95% confidence interval (CI) were used.

Results

The average age of adolescents was 13.6 years (11-17 years), slightly higher among boys (13.58 years) than girls (13.51 years). 51% of the adolescents were female. 3.4% of students attended vocational courses and the remaining attended regular curriculum.

The headache prevalence in the previous three months was 74.5% (95% CI 72.7-76.4), significantly higher amongst girls (84.6%) when compared with boys (63.9%) (OR 3.10; 95% CI 2.5-3.8). Of all students, 24.8% reported only one episode of headache in the three previous months and 49.7% reported recurring headache, defined as more than one episode in the same time period, again with significant difference between genders (60.8% girls; 38.2% boys; OR 2.51; 95% CI 2.11-2.99). The prevalence of recurrent and frequent headache, defined as at least 14 episodes of headache

in the past three months, was 6.2%, also higher in females (8.1% girls; 4.3% boys; OR 1.99; 95% CI 1.37-2.89) (Table 1). The usual average intensity of headache among those who reported at least one episode in the three previous months was 4.64 points. Girls reported a higher average headache intensity in relation to boys (4.77 girls; 4.47 boys; $p = 0.02$) (Table 2). Of all students, 39.7% suffered

from moderate intensity headache and 12.7% from severe intensity headache. Recurring and frequent (≥ 14 episodes in three months) with severe intensity headache was reported by 2.8% of the adolescents.

In addition to the description of frequency and intensity, the questionnaire included points related to other characteristics of the headache, which are described in Table 3.

Table 1. Prevalence of headache in the previous three months (%) (n = 2123)

Age (years)	Headache in the previous three months			Recurrent headache			Recurrent and frequent headache		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
≤ 12	68.4	61.0	75.6	46.3	38.5	53.8	6.0	3.3	8.6
13	77.5	69.4	84.8	47.8	37.9	56.9	4.7	3.2	6.1
14	76.6	63.7	88.3	54.8	39.3	68.9	6.2	4.7	7.5
15	73.3	59.4	87.8	46.6	32.0	61.8	8.8	3.9	1.8
≥ 16	71.5	58.5	88.7	51.4	43.9	61.3	9.7	9.8	9.7
Total	74.5	63.8	84.6	49.7	38.2	60.8	6.2	4.3	8.1
OR 3.10; 95% CI 1.5-3.8			OR 2.51; 95% CI 2.11-2.99			OR 1.99; 95% CI 1.37-2.89			

95% CI - 95% confidence interval; OR - odds ratio.

Headache in the previous three months: at least one episode in three months.

Recurrent headache: more than one episode in three months.

Recurrent and frequent headache: 14 or more episodes in three months.

Table 2. Average intensity of headache in the previous three months (0 to 10 points) (n = 1526)

Age (years)	Total	Male	Female
≤ 12	4.53	4.55	4.52
13	4.42	4.32	4.49
14	4.72	4.36	4.95
15	4.96	4.72	5.12
≥ 16	5.19	4.94	5.42
Total	4.64	4.47	4.77
$p = 0.02$			

Table 3. Pain characteristics (%)

	Total	Male	Female	
Unilateral pain	48.1	50.8	46.1	Non-significant
Usual duration of pain				
< 1 hour	44.1	44.6	43.7	
1-4 hours	46.2	45.7	46.7	Non-significant
4 hours to 3 days	8.4	8.8	8.0	
Kind of pain				
Pounding	39.2	38.6	39.6	Non-significant
Constant/pressure	60.8	61.4	60.4	
Worsens with exercise	67.3	62.3	70.9	OR 1.47 95% CI 1.19-1.82
Nausea or vomiting	33.6	28.4	37.3	OR 1.50 95% CI 1.21-1.86
Photophobia	65.2	56.7	71.3	OR 1.89 95% CI 1.54-2.34
Phonophobia	74.6	66.9	80.1	OR 2.00 95% CI 1.59-2.51

95% CI - 95% confidence interval; OR - odds ratio.

By applying the IHS ICHD-II diagnostic criteria, tension headache was identified in 7.6% (95% CI 6.5-8.7) and probable migraine in 5.4% (95% CI 4.4-6.4) of the subjects ($n = 2123$). While there were no significant differences between genders regarding tension headache (7.0% girls; 8.3% boys), the prevalence of probable migraine was higher among female adolescents (6.4% girls; 4.3% boys; OR 1.51; 95% CI 1.02-2.21) (Figs. 1 and 2).

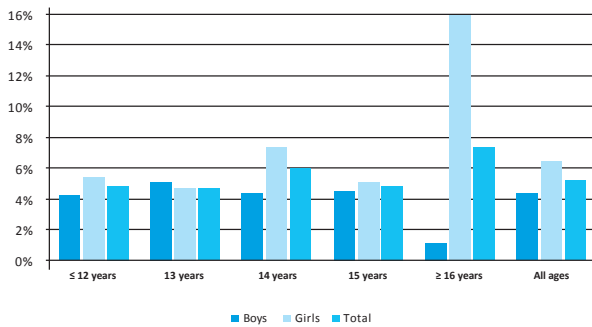


Figure 1. Prevalence of migraine/probable migraine in the previous three months (%).

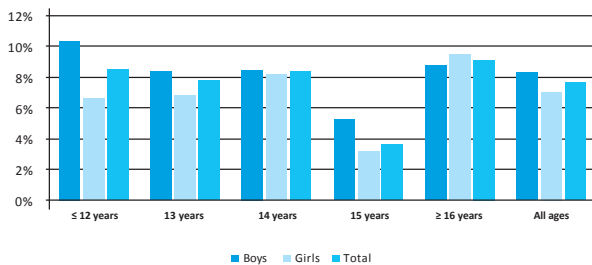


Figure 2. Prevalence of tension headache in the previous three months (%).

According to the IHS criteria, chronic headache is defined by the occurrence of headache on 15 or more days per month for the past three months, which was identified in 26 adolescents (1.2%), five (19.2%) of those with probable migraine criteria and three (11.5%) with tension headache.

There was a positive correlation between increasing age and the prevalence of headache in the previous three months ($p = 0.001$) and probable migraine ($p = 0.016$) among female adolescents. This was not found for tension headache, for the male gender or for both genders together (Figs. 1 and 2).

The rate of school absenteeism, which included students who reported that missed or skipped classes in one or more days in the past three months due to headache, was 21.0%. Of all students, 6.3% missed classes more than one day and 1.1% over five days. Among those who reported at least one episode of headache in the past three months, the rate of school absenteeism was

28.4%, and it was significantly higher in the male gender (girls 25.9%; boys 31.9%; OR 1.34; 95% CI 1.08-1.68). School absenteeism was higher among those with probable migraine (45.5%) in relation to other students with headache with no migraine criteria (27.1%; $p < 0.001$). No significant relationship was demonstrated between those with tension headache and school absenteeism. Of those with at least one episode of headache in the three previous months, 83.0% reported analgesic use (paracetamol 71.5%; ibuprofen 47.4%; other drugs 2.4%), and the use was higher in female students (girls 86.0%; boys 78.8%; OR 1.65; 95% CI 1.26-2.16). The existence of first degree relatives with frequent headache complaints was reported by 48.5% of the adolescents who referred having headache in the three previous months, with significantly higher prevalence in women (girls 54.7%; boys 39.7%; OR 1.84; 95% CI 1.49-2.26). No relationship was shown between family history and primary headache subtype.

Among post-menarche adolescents ($n = 816$), 54.8% showed worsening headache (more intense or frequent pain) during the menstrual period, being this prevalence higher among those with probable migraine (77.0%; $p < 0.001$) when compared with other with headache subtypes. The average intensity of headache was significantly higher among adolescents who reported worsening pain during the menstrual period (5.11) when compared with others (4.59; $p < 0.001$).

Discussion

The present study revealed a high prevalence of headache among the assessed adolescents, confirming the widespread idea of a high prevalence of this condition in this age group.

Almost three-quarters of the adolescents in the studied municipality showed, at least one episode of headache in the three previous months and two-thirds had recurring headaches. Over 6% of the adolescents suffer from recurring headaches, mentioning 14 or more episodes in the previous three months and 2.8%, i.e. almost half of these with severe intensity.

Data on the prevalence of headache among adolescents in Portugal are still very scarce. A prevalence of headache of 78.2% among students between 14 and 17 years was reported in the Viseu county, similar to that found in our study.⁴ There are no other Portuguese studies for this age group.

A meta-analysis published in 2010 examining the prevalence of headache and migraine among adolescents from several Western countries, found an important

variability of prevalence in several published studies.³ According to the authors, the main reason proposed for these inconsistencies is the data collection method and diagnostic criteria. The prevalence of headache in our study (74.5%) was higher than those reported in this meta-analysis and of migraine (5.4%) slightly lower, differences probably explained by the methodological issues referred above.

The prevalence of tension headache, not included in the aforementioned meta-analysis also varies significantly when comparing various non-Portuguese published works.¹⁰⁻¹⁴ In our study, this value was 7.6%, lower than the majority of these studies, probably reflecting the fact that, in our work, ICHD-II criteria were needed for this diagnosis, thus excluding adolescents with probable tension headache.

Based on the answers of the questionnaire, 13.0% of students had primary headache syndrome, probable migraine or tension headache. The remaining 61.5% had non-classifiable headaches. It is possible that the high prevalence of non-classifiable headache reflects the relatively low sensitivity of IHS criteria when applied in the context of a cross-sectional epidemiological study. Similarly to what is reported in non-Portuguese studies, our prevalence of headache and probable migraine is higher in girls when compared to boys in the evaluated sample.³ In addition to the total prevalence, the average intensity and frequency of episodes was also significantly higher in the female gender. For those with tension headache criteria, no statistically significant differences were found, in accordance to what has been previously published. Hormonal changes as a result of puberty have been pointed out as a possible explanation for this association, with special focus on the prevalence of migraines.¹⁵ In our study, this association is supported by the positive correlation observed between increasing age and, consequently, the number of pubescent adolescents and the prevalence of headaches and migraines in three months and probable migraines in females.

More than one quarter of the students (28.4%) who mentioned having at least one episode of headache in the three previous months admitted missing classes or leaving school earlier due to the pain experienced. Interestingly, the rate of school absenteeism was significantly higher among boys (31.9%).

This was an expected finding since most often young females resort to emergency services with psychosomatic complaints. The rate of school absenteeism was also significantly higher among students with migraine criteria (45.5%), which can be easily understood by the greater intensity of pain and associated symptoms, such as vomiting, phonophobia or photophobia, which are

frequent in this syndrome. Furthermore, there are few published works with a focus on the impact of headache on school attendance of children and adolescents.²

This study has several strengths. Its size and composition, comprising adolescents from every year between 7th and 9th grade, of all school types and teaching methods. In Portugal, compulsory education extends up to the age of 18 and, therefore, the application of the questionnaire in school environment was aimed at enhancing the sample representativeness and the possibility to generalise results for the general population. Since we applied the questionnaire in almost every school of the municipality, we believe that the sample correctly reflects the socio-economic reality of the studied population.

The size of the selected sample made it impossible to carry out clinical interviews to every adolescent with headache, which may be identified as the main limitation of the study. Therefore, we opted for the application of a questionnaire which comprised every IHS ICHD-II diagnostic criteria, both of migraine and tension headache.

The lack of a validated questionnaire in Portuguese led us to create a specific questionnaire for this study. It was built based in questions and previously validated instruments in other languages.⁵⁻⁷ Specific questions were also included to better characterise the population and its social and demographic characteristics. The high valid response rate (94.1%) and the absence of systematic errors of interpretation or filling difficulties, both in the pilot phase and during the study, favour the applicability of the questionnaire.

According to the IHS ICHD-II criteria for the diagnosis, there is a need for, at least, five episodes of headache to fulfill the migraine criteria for the diagnosis. However, the applied questionnaire was based only in the three previous months, which were possibly insufficient for the occurrence of those five episodes. Adolescents who met these criteria were classified as showing probable migraine.

A migraine can occur with and without aura, which is defined as a set of complex neurological symptoms that arise before or simultaneously with the onset of the headache. We decided not to include this characteristic of migraine in the study. The wide variety of symptoms of aura would make it difficult to question the presence of this clinical manifestation and, thus, it would be a possible source of errors when filling out the questionnaire. The present study confirms the high prevalence of headaches among adolescents who attend 7th to 9th grades in a Portuguese urban municipality, something that is probably extensible to the rest of our country's adoles-

cent population. The high rate of school absenteeism secondary to this condition is an indicator of the high socio-economic burden associated with headache. The scarcity of studies that characterize this pathology in the Portuguese paediatric population is evident, and application of preventive efforts, both diagnostic and therapeutic, is essential to mitigate the impact of headache on the daily life of Portuguese adolescents.

WHAT THIS STUDY ADDS

- Headache is a very common symptom among adolescents who are attending the 7th to 9th grades in a Portuguese urban municipality.
- Headache is an important cause of school absenteeism
- Further studies are needed to correctly assess the impact of headache in the paediatric population.

Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

Funding Sources

There were no external funding sources for the realization of this paper.

Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

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