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Anxiety, depression and school absenteeism in youth with chronic or episodic headache

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BACKGROUND: Chronic daily headache (CDH) in children has been documented in general and clinical populations. Comorbid psychological conditions, risk factors and functional outcomes of CDH in children are not well understood.

OBJECTIVES: To examine anxiety and depression, associated risk factors and school outcomes in a clinical population of youth with CDH compared with youth with episodic headache (EH).

METHODS: Data regarding headache characteristics, anxiety, depression and missed school days were collected from 368 consecutive patients eight to 17 years of age, who presented with primary headache at a specialized pediatric headache centre.

RESULTS: A total of 297 patients (81%) were diagnosed with EH and 71 were diagnosed with CDH. Among those with CDH, 78.9% presented with chronic tension-type headache and 21.1% with chronic migraine (CM). Children with CDH had a higher depression score than the standardized reference population. No difference was observed for anxiety or depression scores between children with CDH and those with EH. However, children with CM were more anxious and more depressed than those with chronic tension-type headache. Youth experiencing migraine with aura were three times as likely to have clinically significant anxiety scores. Headache frequency and history were not associated with psychopathological symptoms. Children with CDH missed school more often and for longer periods of time.

CONCLUSIONS: These findings document the prevalence of anxiety, depression and school absenteeism in youth with CDH or EH. The present research also extends recent studies examining the impact of aura on psychiatric comorbidity and the debate on CM criteria.

Key Words: *Adolescents; Anxiety; Children; Chronic headache; Depression*

Chronic daily headache (CDH) is characterized by the presence of primary headache on at least 15 days per month for >3 consecutive months without an identifiable organic cause (1). The concept of CDH is now widely accepted, despite the fact that it remains a general description that does not correspond to a specific clinical diagnosis referenced in the International Classification of Headache Disorders (ICHD-II). CDH is a term used to define a type of headache that includes chronic migraine (CM), chronic tension-type headache (CTTH), new daily persistent headache and hemicrania continua (1). Episodic headache (EH) is characterized by the presence of primary headache – episodic migraine (EM) or episodic tension-type headache (ETTH) – that do not meet the criteria of CDH (ie, <15 days per month for >3 consecutive months) (2,3).

While CDH in children is not yet well understood, it is a relatively common condition. Population studies involving children and

L'anxiété, la dépression et l'absentéisme scolaire chez les jeunes ayant des céphalées chroniques ou épisodiques

HISTORIQUE : Les céphalées chroniques quotidiennes (CCQ) sont attestées dans les populations générale et clinique. On comprend mal les problèmes psychologiques comorbides, les facteurs de risque et les résultats fonctionnels des CCQ chez les enfants.

OBJECTIFS : Les chercheurs ont comparé l'anxiété et la dépression, les facteurs de risque connexes et les résultats scolaires d'une population clinique de jeunes ayant des CCQ à ceux de jeunes ayant des céphalées épisodiques (CÉ).

MÉTHODOLOGIE : Les chercheurs ont colligé les données relatives aux caractéristiques des céphalées, à l'anxiété, à la dépression et aux journées d'école manquées chez 368 patients consécutifs de huit à 17 ans qui ont consulté dans un centre spécialisé en céphalées pédiatriques à cause de céphalées primaires.

RÉSULTATS : Au total, 297 patients (81 %) ont obtenu un diagnostic de CÉ et 71, un diagnostic de CCQ. Chez ceux ayant des CCQ, 78,9 % présentaient des céphalées de tension chronique et 21,1 %, des migraines chroniques (MC). Les enfants ayant des CCQ présentaient un indice de dépression plus élevé que la population de référence standardisée. Les indices d'anxiété et de dépression des enfants ayant des CCQ ne différaient pas de ceux des enfants ayant des CÉ. Cependant, les enfants ayant des CÉ étaient plus anxieux et plus déprimés que ceux ayant des céphalées de tension chroniques. Les jeunes souffrant de migraines avec aura étaient trois fois plus susceptibles de présenter des indices d'anxiété significatifs sur le plan clinique. La fréquence et les antécédents des céphalées ne s'associaient pas à des symptômes psychopathologiques. Les enfants ayant des CCQ manquaient l'école plus souvent et pendant de plus longues périodes.

CONCLUSIONS : Ces observations étayaient la prévalence d'anxiété, de dépression et d'absentéisme scolaire chez les jeunes ayant des CCQ ou des CÉ. Elles s'inscrivent également dans le prolongement d'études récentes sur les répercussions des céphalées avec aura sur la comorbidité psychiatrique et sur le débat sur les critères de CÉ.

adolescents indicate a prevalence ranging from 0.2% to 7.1% (4-6), with girls being more likely to experience CDH than boys (7,8). CDH is a complex, multifaceted syndrome (9), making it one of the most difficult-to-treat headache types in children, in particular due to its overlap with psychopathology (10). Anxiety and depressive symptoms are the most frequent comorbid conditions (2,11-13). Slater et al (14) observed that 29.6% of CDH youth met criteria for at least one current psychiatric diagnosis. A study involving the general population demonstrated a strong association between CDH and suicide risk (20%) in adolescents 12 to 15 years of age, who were found to have at least one anxiety or depressive disorder in 47% of cases (15). In addition, the presence of aura, a neurological phenomenon often associated with migraine, is described as a major predictor of comorbid anxiety and depression (15,16). The prevalence of psychiatric comorbidity can reach 90% in adults with CDH (17). This comorbidity may predict the

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persistence of CDH (3,13), especially if it is present early in the patient's illness (18). Psychiatric comorbidity with headache also has functional consequences. In one study, an association was observed between depression scores and school absences caused by CDH (19).

In children and adolescents, CDH significantly impairs quality of life (12,20). Specifically, CDH is associated with learning disabilities (21), school absenteeism (22) or dropout (10), impaired activities of daily living (11) and sleep disorders (23). Thus, CDH has important psychological consequences, but also economic repercussions because children with CDH are more likely to consult specialists than children with EH (18,24).

To our knowledge, only one clinical population study involving children with CDH has been conducted in France that examined nonspecific psychiatric comorbidity and risk factors associated with this population (8). This population, however, is reported to account for 5.8% to 40% of neurology consultations (3,20). The high prevalence of pediatric CDH patients indicates that new treatment challenges are emerging. Risk factors need to be identified to provide better-adapted treatment plans and to avoid perpetuating the illness. Several studies involving adults indicate that the presence of headache or CDH was initially reported in childhood (25,26). These data indicate that, in a clinically significant number of children, CDH does not improve over time or disappear (27). Charles et al (28) suggest that patients with a high risk for CDH should be targeted early and intensely for prevention and treatment.

The objectives of the present study were to describe the pediatric CDH population, to examine the presence of comorbid anxiety and depressive symptoms, to investigate the risk factors associated with CDH and with psychiatric comorbidity and, finally, to assess the influence of CDH on school attendance. The data regarding children with CDH were compared with data regarding children with EH.

METHODS

Participants and procedure

From September 2007 to July 2008, 617 consecutive new patients were seen at the Children's Migraine Center (*Centre de la Migraine de l'Enfant* [CME], Paris, France). The centre is part of an outpatient pediatric pain management unit.

Before the medical consultation, the child and parent received a headache diary in the mail to be completed for approximately three months, which was the average length of time between scheduling an appointment and the date of the appointment. At the first appointment at the CME, the family was seen by a pediatric headache specialist who conducted a semistructured medical interview using a standardized questionnaire based on the ICHD-II criteria. A physical examination was also performed. An additional neurological examination was conducted, as well as brain imaging when necessary, to rule out secondary headache.

To be included in the study, children had to be between eight and 17 years of age, visiting the CME for the first time and presenting with a diagnosis of primary headache according to ICHD-II criteria (1) and the more recent appendix for CM (29).

Patients with headache were classified into four diagnostic categories: EM (code 1); ETTH (code 2); combined EM + ETTH (code 1 + code 2); and CDH. The combined diagnosis (EM + ETTH) was included in the study in response to ICHD-II recommendations that advise conserving the two headache categories when both are present in the same patient. The CDH group, a diagnosis that is not referenced in the ICHD-II, included patients with CM (code 1.5.1) according to the 2006 criteria (29) as well as those with CTTH (code 2.3). Aura, the reversible focal neurological phenomenon often associated with migraines, was coded as migraine with aura (MwA) (code 1.2).

Measures

At the first medical appointment, sociodemographic information was recorded including age, sex, grade and school absenteeism. Parents were asked to report absenteeism as the number of school days missed in the preceding year due to headache. Data were then transformed

into categories including none, >7 days and >1 month. It has been shown that there is a strong association between official school records, and parent and adolescent reports of attendance (30,31). The age range for the study allowed patients to be classified into two groups: children (eight to 11 years of age) and adolescents (12 to 17 years of age).

Two psychological tests were used to measure comorbid conditions:

The Revised Children's Manifest Anxiety Scale (R-CMAS) is a scale for evaluating anxiety symptoms. It has been validated and standardized in the French population for children six to 19 years of age (32). The R-CMAS has good reliability and validity (33,34). It is composed of 37 yes/no items that assess the level of generalized anxiety and four subtypes: physiological anxiety, worry/hypersensitivity, social preoccupation/concentration and deceit.

The Multiscore Depression Inventory for Children (MDI-C) is a scale commonly used for evaluating levels of depressive symptoms (35,36). The MDI-C includes 79 yes/no items that sum to a total score corresponding to a general measure of the severity of depression. The items are grouped into eight subscales including low energy, anxiety, self-esteem, sad mood, hopelessness, social introversion, pessimism and provocation. The MDI-C has been standardized and validated in the French population for children eight to 17 years of age (37).

Both the R-CMAS and the MDI-C are considered to be dimensional scales and rely on self-report. Both questionnaires were alternately presented to patients before or after the medical appointment. Patients completed the scales in the presence of a psychologist who was not aware of the headache diagnosis.

The psychological tests were used for two reasons. First, a score could be calculated for the average level of anxiety and depressive symptoms for each headache diagnosis, which could then be compared across headache groups and with standardized scale norms. Second, scores from the two scales could be used to determine whether a patient scored above a clinical threshold, suggesting more serious anxious or depressive tendencies. A threshold score of ≥ 66 was chosen to represent clinical levels of anxiety or depression. This score corresponds to 5% on the Gauss curve, which identifies the 5% of the French pediatric population with the highest scores, reflecting clinically significant anxiety or depression symptoms (35,36). Average scores on the two tests were also compared across categories of patient characteristics such as age, sex, school absenteeism, duration of headache history and presence of aura.

In agreement with the hospital's ethics committee, written consent was obtained from every child and parent/guardian participating in the study before completing the anxiety and depression scales. If a child's score on either psychological test revealed clinical symptom levels, a referral was made for the child and the parents for an evaluation with a staff psychologist.

A second medical consultation occurred three to six months following the first, and provided a confirmation of all diagnoses. According to ICHD-II criteria, 25 subjects were no longer eligible because their diagnosis of primary headache was not confirmed at the follow-up appointment.

Statistical analyses

Data were analyzed using Student's *t* tests to compare mean scores, ANOVAs to examine the influence of risk factors on psychiatric comorbidity, a post hoc Tukey test for pairwise comparisons and χ^2 tests to compare proportions of 'clinical' anxiety and depression scores; $P < 0.05$ was considered to be statistically significant. A Bonferroni correction was used to account for multiple comparisons. Statistical analyses were conducted using the R program, version 2.5.1 (38).

RESULTS

Descriptive data

The final sample consisted of 368 patients (201 girls, 167 boys; ratio 1.2:1; mean [\pm SD] age 11.9 \pm 2.3 years; range eight to 17 years) who

TABLE 1
Sample characteristics

Characteristic	Total sample	Episodic headache	Chronic daily headache	Chronic migraine	Chronic tension-type headache
Total n	368	297	71	15 (21.1)	56 (78.9)
Age, years, mean ± SD	11.9±2.3	11.5±2.3	11.2±2.3	10.9±2.0	11.3±2.4
Age					
Children (8–11 years of age)	197 (53.5)	156 (52.5)	40 (56.3)	8 (53.3)	32 (57.1)
Adolescents (12–17 years of age)	171 (46.5)	141 (47.5)	31 (43.7)	7 (46.7)	24 (42.9)
Sex					
Female	201 (54.6)	151 (50.8)	50 (70.4)	9 (60.0)	41 (73.2)
Male	167 (45.4)	146 (49.2)	21 (29.6)	6 (40.0)	15 (26.8)
Headache history, months, mean ± SD	39.3±28.5	39.9±27.7	36.9±31.7	24.2±27.6	40.1±32.1

Data presented as n (%) unless otherwise indicated

TABLE 2
Psychological test scores for the standardized population, and episodic headache and chronic headache samples

	Anxiety (R-CMAS)	Depression (MDI-C)	Low energy
Standardized population	50.0±10.0*	50.0±10.0††	50.0±10.0†††
Episodic headache (n=297)	52.2±11.0*	51.8±9.2‡	55.0±9.5††‡
Chronic daily headache (>15 days/month; >3 months) (n=71)	52.3±10.7	53.1±8.7†	57.9±10.5††‡
Chronic migraine (n=15)	57.7±11.9§§	59.5±7.0§	64.8±5.7††
Chronic tension-type headache (n=56)	50.8±10.1§§	51.4±8.4§	56.0±10.7††

Data presented as mean ± SD. *†‡§¶††† Categories with the same symbols were significantly different at $P<0.001$ according to pairwise t tests; †† Significantly different at $P<0.05$; §§ Significantly different at $P=0.03$. MDI-C Multiscore Depression Inventory for Children; R-CMAS Revised Children's Manifest Anxiety Scale

met the inclusion criteria and completed the psychological tests. Sample characteristics are presented in Table 1. In this sample, 297 patients presented with EH, 88 of whom presented with migraine (23.9%), 19 with tension-type headache (5.2%), and 190 with migraine and tension headache (51.6%). The remaining 71 patients presented with CDH (19.3%).

Among the 71 patients with CDH (mean age 11.2±2.3 years), 56 were diagnosed with CTTH (14.2% of total, 78.9% of CDH) and 15 with CM (3.8% of total, 21.1% of CDH). Girls were significantly more likely than boys to be in the CDH group (ratio 2.4:1) whereas in the EH groups, girls and boys were approximately equally represented ($\chi^2=8.86$; $P<0.001$) (Table 1). The mean age at first consultation did not differ for CDH patients compared with the rest of the sample, nor between types of CDH (CTTH and CM) (Table 1). A delay of three years and one month was observed between symptom onset and the first medical consultation for CDH patients, compared with three years and four months for the rest of the sample (not statistically significant). The time period between symptom onset and first consultation for CM versus CTTH was not statistically significant, although it did reach what could be considered to be clinically significant (CM: two years, two months, versus CTTH: three years, five months; $t[69]=1.70$; $P=0.09$). The age distributions were comparable across all headache diagnoses, as were the distributions for sex, age and headache diagnosis groups between study participants and nonparticipants.

Association of CDH and psychopathology

First, regarding depression, the mean level of depressive symptoms was significantly higher for children with CDH (mean total score = 53.13±8.75) compared with population norms (mean total score = 50.00±10.00) ($t[70]=3.01$; $P<0.001$), but did not differ significantly between children with CDH and children with EH (Table 2), between children and adolescents, or between girls and boys. However, among CDH patients, those with CM had significantly higher mean depression scores than those with CTTH ($t[69]=3.39$; $P<0.001$) (Table 2).

Among the 71 patients with CDH, 7.0% (n=5) had depression scores that were clinically significant, indicating severe symptoms (≥ 66); however, this percentage was not statistically different compared with the standardized population norms (5.0%).

Second, regarding anxiety, there was no statistically significant difference observed ($t[70]=1.79$; $P=0.08$) between mean levels of anxiety symptoms for CDH patients (mean total score = 52.28±10.75) compared with population norms (mean total score = 50.00±10.00). Mean symptom levels for anxiety also did not differ significantly between children with CDH and children with EH (Table 2), between children and adolescents, or between girls and boys. However, among CDH patients, those with CM had significantly higher mean anxiety scores than those with CTTH ($t[69]=2.25$; $P<0.05$) (Table 2).

Among patients with CDH, 11.3% (n=8) had anxiety scores that were clinically significant, indicating severe symptoms (≥ 66). Children with CDH were more likely to have clinically significant anxiety scores (≥ 66) compared with the standardized population norms (5.0%) ($\chi^2=5.87$; $P<0.05$).

Psychopathology and headache diagnosis

In the overall sample, an ICHD-II diagnosis (1) of MwA was associated with anxious and depressive symptoms. Children with this diagnosis had significantly higher mean anxiety and depression scores than children not presenting with aura (54.02±11.01 versus 49.21±10.31, $t[347]=4.01$, $P<0.001$; 53.24±9.17 versus 50.07±8.80, $t[347]=3.15$, $P<0.001$, respectively). Patients experiencing MwA were more likely to have clinically severe anxiety scores (≥ 66) compared with those without aura (OR 3.60 [95% CI 1.56 to 8.32]). Frequency of headache and duration of headache history were not associated with anxiety ($F[2, 335]=2.19$, $P=0.11$; $F[2, 335]=0.48$, $P=0.62$, respectively) or depression ($F[2, 335]=0.51$, $P=0.60$; $F[2, 335]=0.94$, $P=0.39$, respectively).

Functional consequences

Twice as many children with CDH compared with children with EH (46.5% versus 20.5%) had missed at least seven days of school because of their headaches during the academic year preceding the medical consultation ($\chi^2=18.39$; $P<0.001$). Children who had missed >1 month of school were four times as likely to be in the CDH group compared with the EH group (16.9% versus 4.0%; $\chi^2=15.86$; $P<0.001$). The mean depression score for CDH patients was significantly higher among children with at least one month of missed school compared with children with no school absences ($t[35]=2.52$; $P<0.05$) (Table 3).

TABLE 3
School absenteeism according to headache type and comorbidity with anxiety or depression

Headache type	No absenteeism	Time absent over the past year	
		≥7 days	≥1 month
Episodic headache (n=297)	106 (35.7)	61 (20.5)	12 (4.0)
Anxiety score, mean ± SD total score	49.8±10.5*	54.5±10.0*	55.7±8.4
Depression score, mean ± SD total score	50.6±8.9†‡	53.4±8.3†	57.0±8.2‡
Chronic daily headache (n=71)	25 (35.2)	33 (46.5)	12 (16.9)
Anxiety score, mean ± SD total score	50.7±9.9	53.0±10.6	55.4±10.9
Depression score, mean ± SD total score	51.2±7.7§	53.6±7.5	57.8±7.0§

Data presented as n (%) unless otherwise indicated. *Significantly different at $P<0.01$ according to pairwise t tests; †‡§Significantly different at $P<0.001$

Similar results were found for the overall sample. Youth with high anxiety scores were more likely to have missed school (77.1% versus 62.5%; $\chi^2=3.87$; $P<0.05$) and the mean depression score was significantly higher among youth with the most school absences (Table 3). None of the patients with CDH had completely stopped attending school. These children reported lower energy than those with EH ($t[366]=2.22$; $P<0.05$) and those with EH reported lower energy than the population norm ($t[296]=9.15$; $P<0.001$) (Table 2).

DISCUSSION

Children and adolescents with CDH were at increased risk for anxiety and the mean level of depressive symptoms were found to be significantly higher than population norms. However, this mean level of depression in CDH was still well within the average range, and children with CDH were not more likely to report clinically significant symptoms of depression.

The association between CDH and anxious and depressive symptoms has been demonstrated in previous studies. For example, in a sample of 143 children, Seshia (39) found that 6% had clinically significant anxiety symptoms and 9% had clinically significant depressive symptoms. We found comparable rates of anxiety and depressive symptoms in our sample of children and adolescents with CDH (11.3% and 7%). The rates of anxiety and depression in the standardization sample to which we compared our sample were 5.0% on average.

In a study involving 59 children with CDH, Galli et al (13) found anxiety to be the most common comorbid psychological problem. This is consistent with our finding that 11.3% of children had clinically significant anxiety scores compared with 7% of children with clinically significant depression scores. In a similar study by Moore and Shevell (21), 10% of the clinical sample, which consisted of youth between seven and 16 years of age, also had anxiety or depressive disorders. However, several other studies among clinical populations found much higher rates of psychological problems associated with CDH, ranging from 46% to 66% (3,13,40).

Contrary to our findings that levels of anxiety and depressive symptoms did not differ between children with CDH and those with EH, other studies have found the opposite. Guidetti et al (3), for example, revealed that psychiatric comorbidity was higher among the 19 subjects with CTTH compared with 61 subjects with ETTH (87.5% versus 30.5%). Raieli et al (2) found similar results in 105 children <6 years of age with 80% of those with CDH having psychiatric comorbidities compared with 38.4% in those with tension-type headache. In a recent study, Masruha et al (41) observed that in the CM group the mean score for social phobia was higher than in the EM group. However, the methods for collecting psychological data were different (categorical DSM-IV diagnoses versus dimensional scales with mean score); therefore, it is difficult to make comparisons across these studies.

Among patients with CDH, those with CM had higher levels of anxious and depressive symptoms than those with CTTH. This difference was expected because CM typically evolves from migraine by an increase in the frequency of migraine episodes (42). Silberstein et al (42) even used the term 'transformed migraine' to describe CM. Epidemiological studies have shown higher levels of psychiatric

comorbidity in children with migraine compared with those with a diagnosis of ETTH (3,43). However, three studies using clinical samples found no difference in psychiatric comorbidity between these two groups of CDH (12,44,45). It is difficult to compare findings across studies when subjects were not diagnosed based on identical criteria or classifications. The earliest studies used ICHD criteria from 1988, whereas more recent studies used the revised criteria from 2004 (1). In addition, some authors (8,46) used the Silberstein classification (41,47) rather than the ICHD-II. Similar to Guidetti et al (3), we did not observe any difference in anxiety and depressive symptoms between girls and boys with CDH.

Our results showed that a diagnosis of MwA was associated with anxious and depressive symptoms and tripled the risk of having severe anxiety symptoms among all children with headache. For the group of children with CDH, there was a similar trend, but the number of children was too small to draw any firm conclusions. This risk factor of MwA has also been highlighted in a recent study, in which the diagnosis of MwA was associated in 64.3% of cases with at least one psychiatric disorder. This diagnosis also had the highest prevalence and the highest risk of having comorbid psychiatric disorders (15). This result is much higher than what we observed in our sample. This may partly be explained by differences in methodology because their sample came from the general population and consisted of adolescents 12 to 15 years of age, and psychiatric diagnoses were established according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (48). However, psychiatric comorbidity appears to increase with age, with the prevalence being much higher in adults with CDH than in children, ranging from 64% to 90% in clinical and general populations (17,49,50). Aura symptoms were also found to be a risk factor for depression in adults with CDH (51). The association between MwA and psychiatric comorbidity has rarely been studied in children and adolescents. This may be due to the fact that for the diagnosis of CM, according to the ICHD-II criteria (1) and the appendix added in 2006 (29), only the frequency of migraine without aura is taken into account, not that of MwA.

Girls were twice as likely (70.4%) to experience CDH. These results are comparable with other studies that have focused on subjects with CDH in clinical populations of this age group (eight to 17 years), such as research by Koenig et al (11) (70% girls), Hershey et al (52) (68% girls) and Pakalnis et al (7) (70% girls). In contrast, for children with EH, the number of girls (50.8%) was equivalent to the number of boys. In a study by Seshia (39), 65% of CDH patients and 46% of patients with EH were girls.

CTTH was the most frequent diagnosis in our cohort. It was the diagnosis for 78.9% of patients, followed by CM (21.1%). No patient in our study presented with new daily persistent headache or hemicrania continua, the latter being rare in children (53). In a recent study on CDH in the general population, the latter two diagnoses were also absent (24).

Three studies have also found a higher prevalence of CTTH than CM (7,54,55). Depending on which diagnostic criteria are used (Silberstein's or the ICHD-II) and the version, the distribution of diagnostic categories and patients affected by them differs greatly. Several authors (13,18,39), responding to the clinical experience that CTTH and CM frequently co-occur, have used a dual diagnosis

referred to as the 'mixed syndrome' or 'comorbid pattern' by Gladstein and Holden (44). It corresponds to the category that includes comorbid CM and CTTH. This mixed syndrome is not included in the ICHD-II. In our study, we did not include a 'mixed syndrome' diagnosis. The main reason for this was that the criteria for the CM diagnosis were recently reviewed by the Headache Classification Committee. The previous criteria were very restrictive, which meant that very few patients received the diagnosis of CM. The new criteria for defining CM adopted in the 2006 appendix state that CM can be diagnosed when headache (tension-type headaches and/or migraine) is present at least 15 days per month for at least three months (29). This most recent version now allows the inclusion of some of the patients who had previously received a 'dual diagnosis' to now be diagnosed with CM, which is what was applied in the present study but was not possible in studies published before 2006.

The two aspects of quality of life evaluated in the present study were school absenteeism and low energy. Children with CDH were significantly more likely to experience low energy than children with EH. In a study involving adults, low energy was reported on at least eight days per month by patients with CDH (56). This result is difficult to explain using a simple pathophysiological perspective. It may be related to the impact of CDH on the lives of children and associated with psychiatric symptoms. Surprisingly, despite the frequency of headache reported here, no child in the sample had completely stopped attending school, contrary to the findings of Wang et al (18), who found that 6% of subjects had left school, and Wiendels et al (22), who found that 9% had stopped attending school. However, children with CDH in our study were out of school more often and for longer periods because of their headaches than children with EH. Among those who experienced anxiety symptoms, it was rare to have never been absent from school. Depression scores were associated with elevated school absenteeism as well. Breuner et al (19), in a study involving a population of adolescents, also found that those who missed the most school because of their headaches had higher depression scores. Our results showed a trend in this direction, with the mean scores of anxiety and depression increasing with increasing days of school missed. It would be overly simplistic to explain these results in a linear fashion in which anxiety and CDH are responsible for school absenteeism. The link between psychological problems, CDH and truancy is complex, and causal relationships cannot be determined from the present research.

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Our study had several limitations, some of which were mentioned above. Patients were recruited in a specialized medical centre, which means there was a selection bias of the sample and the results should not be generalized to the general population. In addition, the sample size – particularly for CM (n=15) – limits the extent of our conclusions. Moreover, we used self-report measures to assess anxiety and depression, meaning that only the severity of self-reported symptoms was assessed and not genuine psychiatric diagnosis. Finally, although it has been previously shown that teachers, parents and children generally agreed on the number of days of school missed (30,31), no official data from schools were obtained to verify that information.

Despite these limitations, in addition to the typical limitations associated with clinical population studies, our results showed an association between anxiety and depression and CDH in children and adolescents, with aura being the most important risk factor. Moreover, there was a significant impact of this association on children's school absenteeism.

The information presented in the current study should set the stage for future research endeavours including studies investigating the psychiatric comorbidity in children with CDH using categorical measures and larger sample sizes to confirm the findings of the present study. Studies of psychological factors that may influence school attendance and functioning, especially in CDH children, should be developed. An additional area for future research may be the role of parent and family factors in children with CDH compared with EH.

Psychiatric comorbidity is considered to play a major role in patients with CDH, especially in children, when it is associated with the onset of headache but also with increasing severity and duration of the condition. These factors should be considered to be targets for treatment in efforts to prevent CDH and especially its duration into adulthood. Primary CDH should be treated with a biopsychosocial approach because of the complexity of the diagnosis and its potential to co-occur with psychological problems.

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