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Recurrent and chronic headaches in children below 6 years of age

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Abstract The objective was to determine the frequency of headache subtypes, according to International Headache Society (IHS) criteria, in a population of children below 6 years visiting a Center for Diagnosis and Treatment of Headache in Youth. Medical records of the children below 6 years at their first visit, admitted for headache between 1997 and 2003, were studied. Headache was classified according to the IHS criteria 2004. Children with less than three headache attacks or less than 15 days of daily headache were excluded. We found 1598 medical records of children who visited our Headache Center in the study period. One hundred and five (6.5%) were children younger than 6 years. The mean age at the first medical control was 4.8 ± 1.3 years (range 17–71 months). There were 59 males (56.1%) and 46 females (43.9%). The mean age at onset of headaches was 4.3 years (range 14–69 months). According to the IHS criteria we found 37 cases (35.2%) with migraine, 19 cases (18%) with episodic tension headache, 5 cases (4.8%) with chronic daily headache, 13 cases (12.4%) with primary stabbing headache, 18 cases (17.1%) with

post-traumatic headache, 7 cases (6.6%) with other non-dangerous secondary headaches (otorhinolaryngological diseases, post-infectious headaches), 3 cases (2.85%) with dangerous headaches (Arnold-Chiari type 1 malformation, brain tumour) and 9 cases (8.6%) with unclassifiable headaches. Six children (5.7%) reported more than one headache subtype. The prevalence of dangerous headaches was higher than those in school age ($\chi^2=4.70$, $p<0.05$). Our study shows some differences in headaches in this population vs. school children. In fact at this age migraine is the most common headache, but we also found an increase of secondary causes among the chronic/recurrent and daily headaches, especially post-traumatic disorders and potentially dangerous headaches. Finally our study shows the highest prevalence of the idiopathic stabbing headache in pre-school children in comparison with other ages.

Key words Children • Migraine • Secondary headaches • Stabbing headaches

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Introduction

The frequency of chronic or continuous headaches in pre-school children has been evaluated in a limited number of studies, probably because it is difficult to obtain an accurate description of pain features [1]. Several old studies [2, 3] reported migraine as the most common headache subtype, but the headaches in this age group are of particular concern because epidemiological studies show a higher frequency of secondary headaches [1], also dangerous, in this population. Moreover, the earlier onset of headaches can be a predictive factor of an unfavourable clinical course [4]. The old International Headache Society (IHS) criteria [5] for primary headaches were not specifically established for children and many primary headaches remained unclassifiable according to these criteria [6].

We planned to determine, retrospectively, the prevalence of primary and secondary headaches in a population of children younger than 6 years admitted to our Headache Center between 1997 and 2003, to classify them according to the new IHS classification [7] and to outline their main clinical features.

Methods

Medical records of children younger than 6 years, admitted for headache at our Headache Center of the Child Neuropsychiatry Unit, from January 1997 through December 2003, were revised. The data were collected at the initial visits. A clinical interview focused on the main characteristics of the headache (family history of headache, age of onset, temporal course, frequency attacks, pain duration, intensity, location, quality of pain, mode of onset, possible aura, associated symptoms, precipitating and relieving factors, etc.). General and neurologic examinations were carried out for all children. A clinical interview was also carried out for parents. The presence of psychiatric disorders (anxiety disorders, sleep disorders, enuresis and/or encopresis, attention deficit hyperactivity, adjustment disorders and mood disorders) were estimated by clinical evaluations and parents' clinical interviews. Other examinations (blood tests, neurophysiological and neuroradiological examinations and other specialist controls) were carried out when necessary. Headaches were classified according to the new IHS criteria [7]. The recurrent headache was defined as a history of three or more attacks of the same subtype, with the exception of migraine with aura (MWA), when one attack is sufficient for its classification. The primary headaches (MWA, migraine without aura (MwA) and episodic tension headache (ETH)) that had not reached the minimum number of attacks, were coded in the respective group of Probable primary headaches (code 1.6 for migraine and 2.4 for ETH). The new IHS classification classifies primary chronic daily headache (CDH) not in an isolated group but in relation to

their clinical features in the main diagnostic group (Migraine, Tension headache, etc.). However, for a better description of the features of CDH in this age group, considering the small number of patients, we have included these children in an isolated group. Continuous headache was defined as a headache lasting steadily for more than 15 days. In order to rule out the episodic headaches by occasional acute illness according to Hockaday [8] and to study also the chronic or continuous secondary headaches, subjects with less than three attacks or with less than 15 days of constant headache were kept apart, with the exception of MWA.

A group of 100 children with headache onset after seven years, observed consecutively in 2003 at our department, was selected also for comparison with our population.

Data were analysed using standard statistical methods. Chi squared statistics was used.

Results

The study population consisted of 105 children, about 6.5% of the entire screened population ($n=1598$) with headache observed in our Department between January 1997 and December 2003. The mean age was 4 years 8 months \pm 1 year 3 months (range 1 year 5 months–5 years 11 months). There were 59 males (56.1%) and 46 females (43.9%); the mean age at the onset of headaches was 4 years 3 months (range 1.2–5.9), but the interval of time between the onset and our first observation was very different in several headache subgroups: shorter in secondary, daily headaches and idiopathic stabbing headaches (ISH), intermediate in migraine, and longer in the ETH. The classified headaches were: 35.2% migraine, 18% ETH, 4.8% CDH, 12.4% primary stabbing headache (PSH), 17.1% post-traumatic headache (PTH), 6.6% other non-dangerous secondary headaches (otorhinolaryngological (ORL) diseases, post-infectious headaches), 2.85% dangerous headaches (Arnold-Chiari type I malformation, brain tumour) and 4.8% unclassifiable headaches. 5.7% of children had more than one headache subtype. Table 1 shows the distribution of our population. The age distribution is shown in Table 2. We compared the distribution of the different headache syndromes in this age with that observed in the first 100 consecutive headache patients older than 6 years (range 7–17 years), admitted to our department in 2003 (Table 3).

We examined the clinical features in primary and secondary headaches and mainly observed:

1. Migrainous children showed a very low prevalence of migrainous aura, low prevalence of unilateral lateralisation, and many attacks of brief duration (max 1–2 h) and severe intensity. Vomiting was reported in about 32% while nausea was more rare (21%), maybe because of the difficulty in explaining the word "nau-

Table 1 Age- and sex-specific prevalence and distribution of recurrent and daily headaches in children younger than 6 years of age (total subjects 105/1598 general headache population)

Headache type	No. of patients/prevalence (male/female)	Median age at first observation, years/months	Mean time interval between headache onset and first neurological observation, months	Notes
Migraine	37/35.2% (22M/15F)	4.8	6	
ETH	19/18% (12M/9F)	4.10	8	
PTH	18/17.1% (11M/7F)	4.5	2	10 tension-type headache, 2 migraine type, 1 facial algia, 4 non-classifiable type
PSH	13/12.4% (7M/10F)	4.5	3	Also 5–10 attacks/day
CDH	5/4.8% (2M/3F)	4.11	6	
Other secondary headaches	10/9.52% (7M/3F)	4.6	3	4 sinusitis, 3 post-infective headache, 2 Arnold-Chiari type 1 malformation, 1 cerebellar astrocytoma
C. not classif.	9/8.6%	4.7	2	

ETH, episodic tension headache; *CDH*, chronic daily headache; *PTH*, post-traumatic headache; *ISH*, idiopathic stabbing headache

Table 2 Age- and sex-specific distribution of headaches

Age, years	Male, <i>n</i>	Female, <i>n</i>	Both sexes, <i>n</i> (%)
<1	0	0	0
1<2	2	1	3 (2.8)
2<3	5	5	10 (9.5)
3<4	7	6	13 (12.4)
4<5	14	8	22 (20.9)
5<6	31	26	57 (54.3)

Table 3 Comparison between the headache population younger than 6 years of age and 100 consecutive school headache patients older than 6 years of age selected in 2003

Headache type	Headache children younger than 6 years	Headache children older than 6 years
Migraine, %	35.2	57.0
Episodic tension headache, %	18.1	17.0
Chronic daily headache, %	4.8	13.0
Idiopathic stabbing headache, %	12.4	3.0
Post-traumatic headache, %	17.1	8.0
Other secondary headaches, %	9.5	2.0

sea” to a young child. A higher prevalence of migraine familiarity (70%) was observed compared to ETH ($\chi^2= 4.49$, $p<0.05$). Psychological disorders were frequently reported (51.35%) in this group. They were distributed as 26.3% anxiety disorders, 26.3% adjustment disorders, 15.7% hyperactivity, 31.5% sleep disorders and 21% nocturnal enuresis. Some disorders coexisted in the same child.

2. The children with ETH showed a brief duration of attacks (70% <1 h), a rarity of neurovegetative signs (phono- or photophobia), common difficulties in describing the quality of pain (31.5%) and the presence of psychiatric disorders in 63.15% of this population. These psychiatric disorders were subdivided into 33.3% anxiety disorders, 33.3% adjustment disorders, 25% hyperactivity, 25% sleep disorders and 16.6%

nocturnal enuresis. Some disorders coexisted in the same child. Four children were classified ETH 2.4 (*probable tension headache*), because two showed mild nausea, one did not satisfy the criterion A (less than 10 attacks) and one showed attacks shorter than 30 min.

3. The CDHs followed episodic migrainous attacks in two cases, which could show migraine-type features (pulsating quality, possible severe intensity and associated symptoms). In these cases chronic migraine was coded. The other three cases were coded chronic tension headaches (CTH). The CDH patients showed a high prevalence of psychiatric disorders (80%). These psychiatric disorders were subdivided into 40% anxiety disorders, 40% adjustment disorders, 20% hyperactivity and 20% sleep disorders. Some disorders coexisted in the same child.
4. The PSH was present in 12.4%, a higher prevalence than that observed in the older age group [9]. The main features were: the very brief duration of attacks (maximum of a few seconds), the painful intensity associated with sudden painful grimace, the precise focal loca-

tion pointed to by the child and the frequency of episodes (Table 4). We want to underline that in these cases the PSH was the main reason for referral at our department and not an occasional report. Another interesting feature was the higher prevalence of specific EEG abnormalities (30.7%) in this group than in the other primary headaches, although the difference was not statistically significant. In three subjects the pain location was extratrigeminal. Four children were excluded from this group because they were not able to define the quality of pain, however they showed features like abrupt onset and end of pain, brief duration of attacks, severity of pain associated with sudden painful grimace, and precise focal location pointed by the child, which could suggest a jab-like pain.

Table 4 summarises the main features of primary headaches.

Among the secondary headaches, the post-traumatic was the most prevalent one. It was classified as tensive headache type in 55.5%, migraine-type in 16.6% and unclassifiable in 22.2%. The main characteristics were brief duration and high frequency in the tensive type,

Table 4 Clinical characteristics of primary headaches

Clinical characteristics	MWA and MwA (n=37)	ETH (n=19)	CDH (n=5)	ISH (n=17)
Attack frequency	54% >1/week 32.4% >1/month 13.5% <1/month	57.9% >1/week 42.1% >1/month	100% daily	58.9% >1/day 41.1% >1/week
Duration of attacks (mean)	43.2% max 2 h 18.9% max 1 h 16.2% 2–4 h 21.6% >4 h	73.6% <1 h 26.3% <2 h	100% >4 h	100% 1–10 s
Intensity	70.2% severe 29.8% moderate	57.9% moderate	60% mild 40% moderate/severe	35.3% severe 64.7% moderate
Bilaterality	75.6%	100%	100%	23.5%
Location	94.6% frontotemporal	84% frontotemporal	60% frontotemporal 40% vertex	55.5% frontotemporal 17.6% vertex
Pulsating pain	43.2%	5.2%	20%	–
Pressing/non-pulsating pain	37.8%	63.15%	80%	–
Stabbing pain	–	–	–	100%
Undefined pain quality	19%	31.5%	–	–
Aggravation for routine efforts	51.35%	–	20%	–
Nausea	24.3%	10.5%	20%	–
Vomiting	32.4%	–	–	–
Photo/phonophobia	59.4%	10.5% photophobia 5.2% phonophobia	40% only photophobia	5.9%
Aura	8.1%	–	–	–
Family history of migraine	70.2%	36.8%	40%	30.8%
Psychological disorders	51.3%	63.15%	80%	38.4%

severe intensity, pulsatile quality of pain and few neurovegetative signs in the migraine type. The onset of all headaches followed a mild head trauma.

In our population we observed three patients with *potentially* dangerous headaches.

The first case was due to a brain tumour (astrocytoma) located in the posterior cranial fossa. The headache was the only complaint reported by the child's parents. It had started about 15–20 days before and was sub-continuous. The principal characteristic was the worsening during the night with frequent nocturnal awakenings, while during the day the child was often able to play if amused by the presence of other children. Paracetamol minimised the intensity of the headache. The first vomiting episode occurred in hospital. The neurologic examination was negative while the brain magnetic resonance imaging (MRI) showed a solid neof ormation (probable astrocytoma) in the right cerebellar hemisphere with oedematous compression of IV ventricle and initial obstructive hydrocephalus. The child was sent to a Child Neurosurgery Department where he was submitted for radical neurosurgery.

The second child had a history of severe headache (probably occipital) provoked by coughing, sneezing or crying. The duration was only a few minutes and during the intercritical time behaviour was normal. The headache started on September 2000 but the frequency worsened in the winter. Previous ophthalmological and ORL examinations were negative. The neurologic examination was negative. The brain MRI showed a major descent of the cerebellar tonsillae in the occipital foramen (near the superior border C3) and mild bulbar compression. The cervical MRI did not show syringomyelia. A few days following the MRI the child had two transitory stiff neck episodes. The neurosurgeon advised a decompression intervention, which was performed some months later. At one-year follow-up at our department, a decrease in pain frequency was reported, however the descent of the cerebellar tonsillae appeared unchanged in the brain MRI.

The third child had a history of severe frontal headache starting in June 2003 and sometimes provoked by physical effort. The duration of attacks was usually a few minutes; the frequency was initially sporadic but there was a progressive worsening with multiday attacks, often with nocturnal onset, at the time of our first referral. The neurologic examination was negative. The brain MRI showed the herniation of cerebellar tonsillae across the occipital foramen to the epistropheus, while the cervical MRI did not show syringomyelia.

We also reviewed the patients with *potentially* dangerous headache in our school and adolescent headache population (1493 patients) from January 1997 to December 2003 and we found 8 (0.53%) affected subjects: 3 had a

brain tumour, 1 an arteriovenous malformation, 1 a hydrocephalus and 3 had large septum pellucidum cysts.

The prevalence (2.85%) of *potentially* dangerous headaches in the pre-school age was higher than the other group and it was statistically significant ($\chi^2=4.70$, $p<0.05$).

The last group consisted of the unclassifiable headache (8.6%) subjects. In this group one child had a headache with tension-like features but the number of attacks and the reported duration of pain did not satisfy criteria A and B of the IHS classification. Four other children reported daily headaches with prevalent tension-type features but the pain did not last for hours in any of them and none were affected for more than 3 months. These are the reasons why these headaches could not be classified as CTH. The last four children had brief attacks of severe focal pain with abrupt onset and end that could suggest a jab-like pain, but they were not able to define the quality of pain and we decide to included them in the unclassifiable headaches.

Discussion

Headache is common in the paediatric age group and there are many epidemiologic and clinical studies about primary and secondary headaches in school-age children. However, we must underline the rarity of headache studies in the pre-school age group if we consider that secondary and potentially dangerous headaches increase with a decrease in children's age [1].

We know little about the prevalence of primary and secondary headaches in the general pre-school population, about the clinical characteristics of primary headaches, about the warning signs of the dangerous secondary headaches, and about the criteria to use for neuroradiological examinations.

Also, most clinical studies are old [2, 3], having been done before the IHS classification and have mainly examined small populations. The only study performed on a large population has been reported by Chu and Shinnar [10].

The few studies on the prevalence of pre-school headaches using a population-based design are contradictory [1, 2] and report prevalence with a range of 3%–19.5%. In a population-based study the prevalence of migraine is low, about 1.4% [1], while another study limited to the age group of five year olds reported a prevalence of about 3%–4% [11]. A clinical-based population study [10] reported migraine as the most common headache (75%), while PTH was reported in 12% and unclassifiable headache in 9%. Our clinical-based study shows some differences in the recurrent and continuous headaches in this population vs. school children and ado-

lescents (Table 3). In fact, in this age group the migraine is the most common headache leading to specialist examination, but we also find an increase of primary paroxysmal headaches, such as PSH, and secondary causes, especially post-traumatic disorders. It is important to underline the major prevalence of dangerous headaches in this age group in comparison with the successive ages. These results are different from those reported by Chu and Shinnar [10] where migraine has a larger prevalence, tension headache and psychogenic headaches are much lower (4%), PSH and dangerous headaches are not reported, and PTHs have a lower prevalence. However, this difference is probably explained by the different methods used for the selection of patients. In fact, Chu and Shinnar [10] reviewed the clinical charts of children whose headache started before 7 but were observed for the first time by a child neurologist at 9 years of age. This data collection probably included recurrent and severe headaches, such as migraine, which remains stable in the temporal course; while secondary transitory headaches (sinusitis, infections, etc.), chronic but mild headache, such as ETHs, and dangerous but therapeutical reversible headaches (brain tumour, hydrocephalus, etc.) can be missed by a medical review made years after their appearance.

Our data are supported both by the few population-based studies [1], which showed about 30% of secondary headaches in seven-year-old children, and by a recent short communication by Binelli et al. [12], which showed a mild prevalence of ETH vs. migraine (42%>36%) and a moderate prevalence of PSH (10%) in a clinical population (160 subjects).

We also report the prevalence of different headache syndromes in a population of 100 consecutive cases of children older than 6 years admitted to our department for the first time in 2003. This population shows a distribution of headache characterised by clear prevalence of migraine, and clear decrease of PSH and secondary headaches. These data are similar to those shown by Chu and Shinnar and support the reported increase of migraine in the school age group [13]. Therefore, it seems probable that in the younger age group migraine remains the first reason for medical referral for headache but other primary headaches and secondary dangerous headaches are more frequent than in the following paediatric ages.

The temporal interval between the onset of painful symptomatology and the first referral to a specialist centre is on average 5 months but we observed a great variability among the different headache syndromes, with a brief interval in PTHs and secondary headache by visual, ORL and brain tumour diseases; intermediate in PSH migraine and CDH; and longer in ETH. The causes of these different behaviours are probably medical legal in PTH, and common parents' and general practitioners'

opinion about the organic pathogenesis in continuous headaches. In the presence of a scarce symptomatology, like in tension headaches, a common opinion ascribes the headaches to psychological factors, delaying a full medical evaluation.

However, this clinical approach can be dangerous in this younger headache population, especially in children below 4 years, because the secondary headaches increase as age decreases [1] and the life-threatening headaches are more likely in this pre-school age than school and adolescent ages, as reported by our data and in the literature [14, 15]. In our series the early referral of the brain tumour case was due to the nocturnal worsening of pain that provoked the parents' fear, while in the first symptomatic Arnold-Chiari I case the diagnostic delay, even with the typical headache, was also due to the parents' opinion about the child's possible jealousy of his brother who had just been born.

We found a significant prevalence (2.85%) of potentially dangerous headaches in the pre-school age in comparison with successive ages, and believe that the appearance of headache in children younger than 6 years should receive much attention and can also be the only reason to undergo the child to neuroradiological examination in accordance with others [14, 15].

In our population the clinical picture of migraine attacks at an early age differs from that in older ages for the very infrequent aura, the rare unilaterality, not infrequent gravative pain quality and the difficulty in describing the quality of pain [16], while the frequent brief duration of attacks (<2 h) is also witnessed in this age group [6, 16, 17]. The high rate of positive family history for migraine was consistent with Chu and Shinnar's study [10]. Nausea is less present than other neurovegetative signs in comparison with the school children and adolescents [18], probably because of children's incapability of describing this symptom.

In our study the ETH group shows a duration of pain briefer than migraine, a difficulty in describing the pain and scarce associated symptoms. These data are hard to compare with other studies in this age because there are no studies that describe in a clear fashion the features of ETH in children at this age [19]. In two clinical-based studies [18, 20] in school paediatric age the duration of headaches was reported more than in our data and there was more prevalence of associated symptoms and pulsatility. However, the duration of pain was the main limiting factor to classify the ETH according to the IHS criteria. In our study retrospective data collection is obviously a limit and prospective studies are mandatory to better establish the difference of ETH in different age groups. There is a significant statistical difference for positive migraine familiarity between migraine and ETH, while there is no difference for psychological factors and sleep disorders.

Recently Balottin et al. [21] have described 26 children under 6 years of age with primary headaches (10 cases of migraine and 16 cases of ETH). In this group several cases were included in *probable* migraine or *probable* tension headache, maybe because the old IHS criteria [5] were used. Interestingly, they found a high number of early developmental disorders, interictal somatic disorders and psychosocial stressors. These authors suggested that “migraine and tension headache in this age can be considered also as indices of individual or family related problems requiring appropriate psychiatric or psychological intervention”.

In our clinical population the high reported prevalence of psychological factors supported this hypothesis, but the absence of a standardised instrument in collecting data on psychiatric comorbidity in the children and their families is a limit of our study and other larger studies with specific psychological tests are needed to confirm it. In population-based studies of children younger than 6 years of age, the reported prevalence of CDH is about 0.2%–0.5% [1, 11] and therefore it is not surprising to find a 4.8% prevalence in our clinical population. We want to underline four interesting characteristics: (a) the possibility of distinguishing two forms for the presence or absence of migraine-like symptoms; (b) the high prevalence of psychological disorders in this group, as in the data by Guidetti et al. [22]; (c) daily frequency of attacks; (d) the presence of four children, classified as unclassifiable headaches, that showed daily headache with tension-type features but that could not be classified as CDH because the duration of pain was less than one hour daily.

In this population the criterion of hours for the duration of pain is perhaps an excessive limiting factor to classify this headache type and the duration should be specified better. However, the small group of children does not allow clear statements and we need to do other studies with larger populations of children.

Finally, our study shows the highest prevalence of the ISH in pre-school children in comparison with other ages, such as paediatric and adults [9, 23, 24].

This headache syndrome is probably more common than is believed. A recent population-based study in adults

reported a prevalence for PSH of about 35% [25], but this type of headache reaches clinical relevance only in a smaller group of patients. In our study the frequency of multiday or weekly attacks, the abrupt occurrence and ending of attacks in healthy children and the moderate or severe pain intensity provoked the parents’ fear and led to an earlier referral to a child neurologist unlike primary headaches, such as migraine or ETH.

We find a higher prevalence of EEG abnormalities in PSH than in other primary headaches and, even if it does not reach statistical significance, probably because of the small sample, this result is similar to that reported in the literature [26]. However, Fusco et al. [27] recently reported different data finding only non-specific EEG changes in 23.8% of the children with PSH. The very brief duration of attacks, the abrupt onset and ending, the frequent multifocal localisation, the frequent association with other primary headaches [23] and possible presence of paroxysmal EEG abnormalities may suggest a central neural hyperexcitability [28] in this syndrome that can trigger the change of an innocuous or unperceptible stimulus into a painful one. The major prevalence of PSH in this age may be related to the incomplete maturation of the central nervous system (reduction of inhibitory controls) that may make central hyperexcitability easier. However, Pareja et al. [29] have recently suggested a periferic theory of PSH, called “epicranial headaches”. Other epidemiological, clinical and neurophysiological studies are needed to cast light on this interesting syndrome.

In conclusion our study shows that recurrent and chronic headaches are not rare in children younger than 6 years of age; migraine is the most common reason for neurological referral, but there is an increase of secondary headaches; potentially dangerous headaches are more frequent at this age, the duration of attacks of primary headaches is shorter; the clinical prevalence of ISH is higher at this age than at other paediatric ages; and CDH are less rare than was previously believed.

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