Prevalence of migraine and tension-type headache in primary-school children in Shiraz

S.M.T. Ayatollahi[1] and A. Khosravi[1]

انتشار الشقيقة (الصداع النصفي)، والصداع التوتُّري بين أطفال المدارس الابتدائية في شيراز

سيد محمد تقي آيت اللهي، أحمد خسروي

الخلاصة: تم في إطار هذه الدراسة تحديد مدى انتشار الأنماط المختلفة للصداع خلال الحقبة الممتدَّة من كانون الثاني/يناير إلى حزيران/يونيو من عام 2003، وذلك بين 2226 تلميذاً بمدارس شيراز (في الفئة العمرية 6 إلى 13 عاماً)، تم انتقاؤهم عشوائياً على عدة مراحل. وقد جُمعت المعطيات من خلال الاستبيانات والفحوصات السريرية، كما استخدمت المعايير التي وضعتها الجمعية الدولية للصداع في تشخيص الحالات المدروسة. وكانت النسبة الإجمالية لانتشار الصداع بصفة عامة هي 31٪، وبلغ معدل انتشار الشقيقة (الصداع النصفي) 1.7٪ وانتشار الصداع التوتُّري 5.5٪. ولوحظ أن معدل انتشار الصداع يزداد مع التقدُّم في العمر؛ كما كانت الفتيات أكثر عرضة للإصابة بالصداع التوتُّري. وكانت سوابق الإصابة بالصداع وباضطراب النوم لدى العائلة من العوامل الرئيسية المرتبطة بالإصابة بالشقيقة.

ABSTRACT From January to June 2003 we determined the prevalence of the various types of headache in 2226 schoolchildren in Shiraz (age 6–13 years) selected by multistage random sampling. Data were collected by questionnaire and clinical examination. International Headache Society criteria were used for diagnosis. The overall prevalence of headache was 31%. Prevalence rates of migraine and tension-type headache were 1.7% and 5.5% respectively. The prevalence of headache increased with age and girls were significantly more likely to report tensions-type headache. Positive family history of headache and abnormal sleep pattern were significantly associated with migraine.

Prévalence de la migraine et de la céphalée de tension chez des écoliers du primaire à Chiraz

RÉSUMÉ De janvier à juin 2003, nous avons déterminé la prévalence des différents types de céphalées chez 2226 écoliers à Chiraz (âge : 6-13 ans) qui avaient été sélectionnés par échantillonnage aléatoire à plusieurs degrés. Des données ont été recueillies par questionnaire et lors d'un examen clinique. Les critères de la Société internationale de la céphalée ont été utilisés pour le diagnostic. La prévalence globale des céphalées s'élevait à 31 %. Les taux de prévalence de la migraine et de la céphalée de tension étaient de 1,7 % et 5,5 % respectivement. La prévalence de la céphalée augmentait avec l'âge et les filles étaient significativement plus susceptibles de faire état d'une céphalée de tension. Des antécédents familiaux positifs de céphalée et un rythme de sommeil anormal étaient significativement associés à la migraine.

[1]Department of Biostatistics and Epidemiology, School of Public Health, Shiraz University of Medical Science, Shiraz, Islamic Republic of Iran (Correspondence to S.M.T. Ayatollahi: ayatolahim@sums.ac.ir).
Received: 26/05/04; accepted: 20/03/05

Introduction

Headaches are common during childhood and in an epidemiological survey of 9000 schoolchildren, one-third of the children who were at least 7 years of age had had headaches and half of those who were at least 15 years of age had had headaches [*1*]. Recurrent headaches adversely affect academic performance, memory, school attendance, personality and peer relations [*2*].

The epidemiology of headaches in children and adolescents has been well studied in Western countries, but very little similar information has been recorded in developing countries [*1,3–6*]. In addition, results from the different studies have varied according to the diagnostic criteria, methods of data collection, specific population and regions involved (Table 1) [*2–12*]. In addition, variations in prevalence rates have been attributed to case definition and the age and sex of population surveyed [*13*].

Headache was reported in 12.1% of adolescent girls (11–18 years) in Shiraz, Islamic Republic of Iran [*12*] but no data are available regarding headache prevalence among Iranian primary-school children (6–13 years). We conducted the present study in Shiraz to determine the prevalence of migraine and tension-type headache and their correlates in primary-school children aged 6–13 years, using the International Headache Society (IHS) criteria [*14*] and validating the questionnaire responses with clinical examination.

Methods

This was a cross-sectional, questionnaire-based study of schoolchildren (aged 6–13 years) performed between January 2003 and June 2003. A total of 2400 schoolchildren were selected by a two-stage random sampling procedure. In the first stage, 43 primary schools from the 4 educational regions of Shiraz were randomly selected. Then systematic random sampling was used whereby 1 student was randomly selected in every 5 students using the class list. All the children's parents were invited to come for interview at the school medical room, of which 2226 attended (response rate = 93%). This constituted 2% of the total schoolchild population in Shiraz.

A face-to-face interview was conducted by qualified nurses trained for this study for all pupils in the presence of their parents and details of headache history and sleep patterns (sleep disturbances including insufficient sleeping, co-sleeping, difficulty getting to sleep at night, sleepwalking and nightmares) were recorded. Variables such as family social class (unemployed/housewife, unskilled manual, semi-skilled manual, skilled manual, clerical, managerial and professional) and educational level (illiterate, primary school, intermediate, high school and higher education) of the parents were also recorded. A semi-structured questionnaire [*12*] was used to screen headache among the children, applying the IHS classification for migraine and tension-type headache (Box 1) [*14*]. Questions about headache were about experience of headache over the past year, severity, duration, times, signs and symptoms, location, quality of pain and cause of it. Any child who had had at least 5 episodes of headache over the past year and the headache was not attributable to an infectious illness, trauma or specific illness (hay fever, medicines and so on) was invited for a free clinical examination to establish a diagnosis, which included blood pressure measurement, a detailed neurological examination, ophthalmoscopy and otoscopy [*2,3,8,9,14*]. This was conducted by a paediatrician in April and June 2003 and all the children with recurrent headache attended.

Box 1 **Diagnostic criteria for tension-type headache and migraine (adapted from the International Headache Society [*14*]**

Tension-type headache	Migraine headache
A. At least 10 previous headache fulfilling criteria below	A. At least 5 attacks fulfilling criteria below
B. Headache lasting from 30 minutes to 7 days	B. Headache lasting 4 to 72 hours(2 to 48 in children)
C. At least 2 of the following pain characteristics: 1. Pressing (non pulsating) quality 2. Mild or moderate intensity (may inhibit but doesn't prohibit activities) 3. Bilateral location. 4. Not aggravated by climbing stairs or similar routine physical activity.	C. Headache characterized by at least two of the following: 1. Unilateral location 2. Pulsating quality 3. Moderate or severe intensity (inhibits or prohibits daily activity) 4. Aggravated by climbing stairs or similar routine physical activity
D. Both of the following: 1. No nausea or vomiting 2. Photophobia and phonophobia are absent, or only one is present	D. Headache accompanied by at least 1 of the following: 1. Nausea or vomiting, or both. 2. Photophobia and phonophobia

The chi-squared test for nominal variables and Cochrane–Armitage test for linear trend were used [*15*]; the 5% level of statistical significance was chosen. The Student *t*-test (two-tailed) was used to test the significance of difference between 2 numerical variables. A logistic regression analysis [*16*] was performed to estimate the association between each variable and migraine/tension-type headache.

Results

Of the total sample, 691 (31%) reported headache over the previous year (1-year prevalence of headache). Of these, 228 children (10.2%) reported recurrent headache and underwent a free general health examination. Of these, 38 were diagnosed as migraine and 122 as tension-type headache giving overall prevalence rates of 1.7% and 5.5% respectively: 68 had headache which could not be attribute to either of these. The sex- and age-specific 1-year prevalence of migraine and tension-type headache are presented in Table 2. Increasing age and headache types correlated positively ($P < 0.05$). There was no statistical difference between the sexes with regard to migraine ($P = 0.191$) but tension-type headache was more common in females ($P = 0.008$). The prevalence of migraine with aura was estimated to be 0.7% (15/2226).

For estimation of risk, students with no recurrent headache (691–228 = 463) who were not examined were removed from the analysis. Odds ratios for migraine and tension-type headache in students who had abnormal sleep patterns were 4.2 (95% CI: 2.1–8.4) and 3.8 (95% CI: 2.5–5.8) times higher than those with normal sleeping pattern respectively. Headache types correlated with family history of headache ($P < 0.05$) (Table 3).

As regards socioeconomic background, which was assessed by several variables

Table 1 **Headache prevalence in children: comparison with published studies**

Country/city	No. of subjects	Sex	Age (years)	Type of study	Migraine (%)	Tension-type headache (%)
Egypt/Assuit [***7***]	1568	All	9–13	N	16.6	–
USA/Cleveland [***8***]	2572	All	5–13	I	8.6	–
Hong Kong [***11***]	2120	All	6–13	N	1.2[a]	1.2
India/Jaipur [***2***]	1305	All	11–15	I	11.0	3.6
	750	M			9.0	–
	555	F			14.0	–
Iran, IR/Shiraz [***12***]	1868	F	11–18	N	6.1	12.1
Iran, IR/Shiraz (present study)	2226	All	6–13	N	1.7	5.5
	1171	M			1.4	4.3
	1055	F			2.1	6.8
Saudi Arabia/Riyadh [***10***]	1181	All	6–15	N	6.2	–
	573	M			5.2	–
	608	F			7.0	–
UAE/Al Ain, Dubai, Sharjeh [***5***]	1159	All	6–14	N	3.8	–
Italy/Monereale [***6***]	1445	All	11–14	N	3.0	–
	738	M			2.7	–
	707	F			3.3	–
UK/Aberdeen [***3***]	2165	All	5–15	N	10.6	0.9
	888	M			9.7	–
	866	F			11.5	–
UK/Birmingham [***9***]	1083	All	3–11	N	3.7	–
		M			4.1	–
		F			2.9	–

[a]***Migraine plus probable migraine.***
N = semi-structured questionnaire plus clinical examination using IHS criteria.
I = Using IHS criteria without clinical examination.

such as education and occupation of parents, 23.3% of the families were upper class, 46.7% middle class and 23.9% lower class; 6.1% did not response to this question. The parents' level of education and socioeconomic status was not significantly associated with migraine and tension-type headache in the child ($P > 0.05$). Only 40% of children had been diagnosed for their headache before the study.

Table 4 lists the characteristics of different types of childhood headache. In 23.7% of children with migraine, the duration of headache was less than 2 hours. The majority of children reported bilateral headaches.

Discussion

This study examined the prevalence of various headache syndromes and their frequen-

Table 2 **Sex- and age-specific prevalence of migraine and tension-type headache in the schoolchildren**

Variable	No. studied	Migraine No. (%)	Tension-type headache No. (%)
Age (years)			
6–	207	0 (0)	7 (3.4)
7–	405	3 (0.7)	12 (3.0)
8–	414	8 (1.9)	15 (3.6)
9–	424	5 (1.2)	30 (7.1)
10–	484	13 (2.7)	31 (6.4)
≥11	292	9 (3.1)	27 (9.2)
All	2226	38 (1.7)	122 (5.5)
95% CI		1.2–2.2	4.6–6.4
P-value		0.001	0.0001
Sex			
Male	1171	16 (1.4)	50 (4.3)
Female	1055	22 (2.1)	72 (6.8)
P-value		0.191	0.008

P ***< 0.05 was considered significant.***
CI = confidence interval.

cy of occurrence in accordance with the IHS criteria [*14,17*]. With the IHS classification, we chose subjects lifetime prevalence of headache for our survey, and recall bias undoubtedly influenced the results, particularly for less severe headache and lower age groups. However direct patient interview and examination in the presence of parents is a more reliable means of establishing a diagnosis of primary headache disorders than reliance on a questionnaire only.

In our sample 31% of the children reported headache over the previous year. We found a prevalence of migraine of 1.7% and tension-type headache of 5.5%.

The rates of recurrent headache are considerably higher, ranging between 20% and 50% [*4,18*]. One-year prevalence of headache in our study (31%) is lower than studies in the Emirates (37%) [*5*], Saudi Arabia (44%) [*10*] and England (39%) [*9*].

Prevalence studies of migraine among schoolchildren have been reported in different countries (Table 1), such as India [*2*], Italy [*6*], Saudi Arabia [*10*], United Arab Emirates [*5*], United Kingdom [*3,9*] and United States of America [*8,19*]. These reports suggest that prevalence rates vary between 3% and 10%, depending on the age range investigated and method of investigation. The estimated migraine prevalence of 1.7% found in our study is half the prevalence reported by Bener [*5*], Bille [*1*], Mortimer [*9*] and Raieli [*6*], but concurs with Kong [*11*]. Sex- and age-related prevalences of migraine in our study were quite similar to the findings of others [*1,3*].

Migraine prevalence also varies by race and geography. In the USA, it is highest in Caucasians, intermediate in African–Americans and lowest in Asian–Americans [*20*]. Similarly, prevalence is highest in North and South America, lower in Africa, and often lowest in studies from Asia [*20*].

The higher prevalence of tension-type headache in our subjects compared with other studies may reflect age-related psychological differences [*21*]. However, our culture is different and explanation for these prevalence rates may vary. Somatization is common in the Middle East, and parents (particularly women) often complain of headache as a representation of psychological symptoms [*5*]. Children are likely to use their parents as role models, as shown by our findings as there was a family pattern of tension-type headache, especially in girls [*5*]. For tension-type headache, linear trend for age-related prevalence was significant in our study, as has been found in other studies [*10*]. Sex difference in headache is well known [*22*] and this was confirmed in our study for tension-type headache. In girls stress of social restrictions, particularly on teenage girls, social expectations and more attention to boys in the family can be associated with headache [*3*].

As with other studies we found a familial pattern for headache, especially in migraine,

Table 3 **Factors associated with migraine and tension-type headache in the schoolchildren**

Variable	Migraine (*n* = 38) No. (%)	Tension-type headache (*n* = 122) No. (%)	No headache or recurrent headache not classified as migraine or tension-type (*n* = 1535 + 68) No. (%)
Sleep pattern			
Abnormal	13 (34.2)	39 (32.0)	176 (11.0)
Normal	25 (65.8)	83 (68.0)	1424 (88.8)
Unidentified	0 (0.0)	0 (0.0)	3 (0.2)
Odds ratio	4.2	3.8	1
95% CI	2.1–8.4	2.5–5.8	
Family history of headache			
Positive	29 (76.3)	78 (63.9)	572 (35.7)
Negative	6 (15.8)	42 (34.4)	961 (59.9)
Unidentified	3 (7.9)	2 (1.6)	70 (4.4)
Odds ratio	8.1	3.0	1
95% CI	3.4–19.8	2.0–4.4	

CI = confidence interval.

which is similar to the findings of Bener [*5*], Ayatollahi [*12*], Bille [*1*] and Lee [*8*]. Some studies have examined the family relative risk of chronic tension-type headache in first-degree relatives and in spouses. Over 1 year, the relative risk was 3.2 in first-degree relatives and 1.23 in spouses [*23,24*]. These findings support a role for genetic factors as spouses share some environmental but not genetic risk factors.

A relationship between migraine and sleep disturbances has been found in adults but research with paediatric populations remains limited [*25*]. One case–control study demonstrated that children with headaches had a higher prevalence of a variety of sleep problems compared to the healthy controls [*26*]. In our study, 34.2% of children with migraine and 32.0% with tension-type headache reported sleep disturbances and there was a relationship between sleep pattern and headache type (Table 3). Those findings concur with other studies [*26–29*].

The relationship between migraine prevalence and socioeconomic status is uncertain. In physician- and clinical-based studies, migraine appears to be associated with high intelligence and social class [*30,31*]. However, data from samples of general population studies do not report increased prevalence in more privileged or educated societies [*1,32*]. We found no relationship between socioeconomic status and educational level of parents with headache type which is similar to the other studies [*1,12,33*].

In our study 13.2% reported migraine headache lasting less than 1 hour and 52.6% reported bilateral headache as reported in other studies [*34,35*]. Thus the IHS diagnostic criteria for childhood migraine (2-hour

Table 4 **Characteristics of headaches in the schoolchildren**

Characteristic	Migraine (*n* = 38) No. (%)	Tension-type headache (*n* = 122) No. (%)
Quality		
Throbbing/pulsating	34 (89.5)	32 (26.2)
Sharp/stabbing	0 (0)	4 (3.3)
Tight/pressing	3 (7.9)	61 (50.0)
Heaviness	1 (2.6)	25 (20.5)
Intensity		
Mild	2 (5.3)	38 (31.1)
Moderate	18 (47.4)	27 (22.1)
Severe	18 (47.4)	57 (46.7)
Location		
Bilateral	20 (52.6)	52 (42.6)
Unilateral	11 (28.9)	25 (20.5)
Occipital	1 (2.6)	7 (5.7)
Frontal	5 (13.2)	23 (18.9)
Whole head	1 (2.6)	15 (12.3)
Associated symptoms[a]		
Nausea	24 (63.2)	38 (31.1)
Vomiting	17 (44.7)	9 (7.4)
Phonophobia	33 (86.8)	78 (63.9)
Photophobia	24 (63.2)	40 (32.8)
Anorexia	22 (57.9)	55 (45.1)
Abdominal pain	2 (5.3)	6 (4.9)
Aggravation by physical examination		
Yes	33 (86.8)	34 (27.9)
No	5 (13.2)	88 (72.1)
Duration of pain (hours)		
< 1	5 (13.2)	52 (42.6)
1–2	4 (10.5)	21 (17.2)
2–23	25 (65.8)	46 (37.7)
≥ 24	4 (10.5)	3 (2.5)
Mean (SD)	18.0 (14.0)	16.8 (14.1)
95% CI for mean	13.4–22.6	14.3–19.3
Frequency of pain per month (no. of episodes)		
1–3	18 (47.4)	69 (56.6)
4–10	18 (47.4)	46 (37.7)
>10	2 (5.3)	7 (5.7)
Mean (SD)	4.7 (3.9)	4.2 (4.5)
95% CI for mean	3.4–6.0	3.4–5.0

[a]***Not mutually exclusive.***
SD = standard deviation.
CI = confidence interval.

minimal duration and unilateral location) seem rather stringent and modification may be required as has been suggested by Mortimer, Kay and Jaron [*9*], De Grauw and colleagues [*34*] and Abu-Arefeh and Russell [*35*].

It is concluded that sleep disturbances and family history of headache were most significantly associated with the occurrence of migraine and tension-type headache.

Acknowledgements

This study was supported by grant 82-1888 from Shiraz University of Medical Sciences Research Council. Appreciation is expressed to Dr M. Zahmatkeshan for her neurological assistance. The authors are also grateful to the referees for their comments which greatly improved this paper.

References

1. Bille B. Migraine in school children. A study of the incidence and short-term prognosis, and a clinical, psychological and electroencephalographic comparison between children with migraine and matched controls. ***Acta paediatrica***, 1962, 1:1–51.
2. Shivpuri D, Rajesh MS, Jain D. Prevalence and characteristics of migraine among adolescents: a questionnaire survey. ***Indian pediatrics***, 2003, 40:665–9.
3. Abu-Arefeh I, Russel G. Prevalence of headache and migraine in schoolchildren. ***British medical journal***, 1994, 308:765–9.
4. Sillanpaa M. Changes in prevalence of migraine and other headaches during the first seven schools years. ***Headache***, 1983, 23:15–9.
5. Bener A et al. Prevalence of headache and migraine in schoolchildren in the United Arab Emirates. ***Annals of Saudi medicine***, 1998, 18(6):522–4.
6. Raieli V et al. Migraine headache in adolescents: a student population-based study in Monreale. ***Cephalagia***, 1995, 15:5–12.
7. Ahmed HN et al. Prevalence of migraine among schoolchildren (primary and preparatory) in Assuit city, Egypt. ***Eastern Mediterranean health journal***, 1999, 5:402–3 (abstract).
8. Lee LH, Olness KN. Clinical and demographical characteristics of migraine in urban children. ***Headache***, 1997, 37:269–76.
9. Mortimer MJ, Kay J, Jaron A. Epidemiology of headache and childhood migraine in an urban general practice using Ad hoc, Vahlquist and IHS criteria. ***Developmental medicine and child neurology***, 1992, 34(12):1095–101.
10. Al Jumah M, Awada A, Al Azzam S. Headache syndromes amongst schoolchildren in Riyadh, Saudi Arabia. ***Headache***, 2002, 42:281–6.
11. Kong CK, Cheng WW, Wong LY. Epidemiology of headache in Hong-Kong primary-level schoolchildren: questionnaire study. ***Hong Kong medical journal***, 2001, 7(1):29–33.
12. Ayatollahi SM, Moradi F, Ayatollahi SA. Prevalence of migraine and tension-type headache in adolescent girls of Shiraz. ***Headache***, 2002, 42:287–90.
13. Stewart WF et al. Population variation in migraine prevalence: a meta analysis. ***Journal of clinical epidemiology***, 1995, 48:268–80.
14. Headache classification committee of the International Headache Society. Classification and diagnostic criteria for headache disorders, cranial neuralgias and

facial pain. ***Cephalagia***, 1988, 8(suppl. 7):1–96.

15. Neuhauser M, Hothern LA. An exact Cochrane–Armitage test for trend when dose–response shapes are ***a priori*** unknown. ***Computational statistics & data analysis***, 1999, 30:403–12.

16. Kleinbaum DG. ***Logistic regression: A self-learning text***. New York, Springer–Verlag Inc., 1994.

17. Olesen J, Lipton RB. Migraine classification and diagnosis. International Headache Society criteria. ***Neurology***, 1994, 44(suppl. 4):S6–10.

18. Carlsson J. Prevalence of headache in schoolchildren: relation to family and school factors. ***Acta paediatrica***, 1995, 85:692–6.

19. Scher AI, Stewart WF, Lipton RB. Migraine and headache: a meta analytic approach. In: Crombic IK et al., eds. ***Epidemiology of pain***. Seattle, IASP Press, 1999:159–70.

20. Stewart WF et al. Prevalence of migraine headache in the United States. ***Journal of the American Medical Association***, 1992, 267:46–9.

21. Levton A et al. Age-related headache characteristics. ***Archives of neurology***, 1984, 41:762–4.

22. Wober-Bingol C et al. IHS criteria and gender: a study on migraine and tension-type headache in children and adolescents. ***Cephalagia***, 1996, 16(2):107–12.

23. Russel MB et al. Inheritance of chronic tension-type headache investigated by complex segregation analysis. ***Human genetics***, 1998, 102:138–40.

24. Ostergaard S et al. Comparison of first–degree relatives and spouses of people with chronic tension headache. ***British medical journal***, 1998, 314:1092–3.

25. Paiva T et al. Sleep disturbances in chronic headache patients: a comparison with healthy controls. ***Headache quarterly***, 1994, 5:135–41.

26. Bruni O et al. Prevalence of sleep disorders in childhood and adolescent with headache: a case–control study. ***Cephalalgia***, 1997, 17:492–8.

27. Bruni O, Galli F, Guidetti V. Sleep hygiene and migraine in children and adolescents. ***Cephalagia***, 1999, 19(suppl. 25):57–9.

28. Blader JC et al. Sleep problems of elementary school children. A community survey. ***Archives of pediatric and adolescent medicine***, 1997, 151(5):473–80.

29. Smeyers P. Cefaleas en la infancia: asociacion a trastornos del sueño e implicaciones psicologicas. [Headaches in childhood: associations with sleep disorders and psychological implications.] ***Revista de neurologia***, 1999, 28(suppl. 2): S150–5.

30. Lipton RB et al. Undiagnosed migraine headaches. A comparison of symptom-based and reported physician diagnosis. ***Archives of internal medicine***, 1992, 152(6):1273–8.

31. Friedman AP, Merritt HH. ***Headache: diagnosis and treatment***. Philadelphia, FA Davis, 1959.

32. Rasmussen BK. Migraine and tension-type headache in a general population: psychosocial factors. ***International journal of epidemiology***, 1992, 21:1138–43.

33. Mavromichalis J et al. Prevalence of Migraine in schoolchildren and some clinical comparisons between migraine with and without aura. ***Headache***, 1999, 39:728–36.

34. De Grauw TJ et al. Diagnosis of migraine in children attending a pediatric headache clinic. ***Headache***, 1999, 39(7):481–5.

35. Abu-Arefeh I, Russell G. Prevalence of headache and migraine in school children. ***British medical journal***, 1994, 309(6957):765–9.