

# The Prognosis of Childhood Headache

## A 20-Year Follow-up

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**Background:** Headaches affect most children and rank third among illness-related causes of school absenteeism. Although the short-term outcome for most children appears favorable, few studies have reported long-term outcome.

**Objective:** To evaluate the long-term prognosis of childhood headaches 20 years after initial diagnosis in a cohort of Atlantic Canadian children who had headaches diagnosed in 1983.

**Methods:** Ninety-five patients with headaches who consulted 1 of the authors in 1983 were previously studied in 1993. The 77 patients contacted in 1993 were followed up in 2003. A standardized interview protocol was used.

**Results:** Sixty (78%) of 77 patients responded (60 of the 95 of the original cohort). At 20-year follow-up, 16 (27%) were headache free, 20 (33%) had tension-type headaches, 10 (17%) had migraine, and 14 (23%) had migraine and tension-type headaches. Having more than 1 headache type was more prevalent than at diagnosis or initial follow-up ( $P < .001$ ), and headache type varied

across time. Of those with headaches at follow-up, 80% (35/44) described their headaches as moderate or severe, although an improvement in headaches was reported by 29 (66%). Tension-type headaches were more likely than migraine to remit ( $P < .04$ ). Headache severity at diagnosis was predictive of headache outcome at 20 years. During the month before follow-up, nonprescription medications were used by 31 (70%) of those with ongoing headaches, and prescription medications were used by 6 (14%). However, 20 (45%) believed that nonpharmacological methods were most effective. Medication use increased during the 10 years since last follow-up. No patient used selective serotonin receptor agonists (triptans).

**Conclusions:** Twenty years after diagnosis of pediatric headache, most patients continue to have headache, although the headache classification often changes across time. Most patients report moderate or severe headache and increasingly choose to care for their headaches pharmacologically.

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**H**EADACHES AFFECT MOST children by early adolescence. Headaches rank third among illness-related causes of school absenteeism and result in substantial impairment among pediatric patients.<sup>1</sup> Short-term studies of childhood headaches suggest a favorable outcome. However, the majority of such studies followed up children for less than 10 years and may not adequately reflect the natural history of childhood headaches into adulthood. The present study was designed to evaluate the long-term prognosis of childhood headaches 20 years after initial diagnosis in a cohort of Atlantic Canadian children who had headaches diagnosed in 1983.

### METHODS

Ninety-five patients with headaches who consulted 1 of us (J.D.) in 1983 were previously studied in 1993.<sup>2</sup> Patients with headaches were referred to the only tertiary care pediatric neu-

rology referral center in Atlantic Canada in 1983 and currently. Only patients who were seen in nonteaching clinics were included to ensure uniformity in diagnosis and treatment approach by 1 pediatric neurologist (J.D.).

The 77 patients contacted in 1993 were followed up in 2003. Hospital and family physician records were used to contact patients for a standardized telephone interview in 2003. We collected data regarding headache symptoms, severity, frequency, treatment, and precipitants. Headache severity was subjectively categorized by the patients as mild, moderate, or severe.

Headaches were classified with Prensky's criteria in 1983.<sup>3</sup> The International Headache Society criteria were used in 1993, and the revised International Headache Society criteria were used in the 2003 study.<sup>4,5</sup>

The headache type, location, frequency, severity, associated features, and aggravating and relieving factors were coded at diagnosis and at 10- and 20-year follow-up. Headache severity was assessed according to patient report of the degree of effect on activities of daily living. Neurological status at diagnosis was documented as normal, mild neurological impairment, or major neurological deficit (eg, cerebral palsy). Pa-

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**Table 1. Primary Headache Diagnosis at Initial Presentation and 10- and 20-Year Follow-up\***

Headache Type	1983	1993	2003
Headache free	0	15 (25)	16 (27)
TTH	15 (25)	18 (30)	20 (33)
MWOA	37 (62)	20 (33)	9 (15)
MA	5 (8)	5 (8)	1 (2)
Migraine and TTH	3 (5)	2 (3)	14 (23)
<b>Total</b>	<b>60 (100)</b>	<b>60 (100)</b>	<b>60 (100)</b>

Abbreviations: MA, migraine with aura; MWOA, migraine without aura; TTH, tension-type headache.

\*Data are given as number (percentage) of patients.

**Table 2. Primary Headache Diagnosis at Initial Presentation and 10-Year Follow-up in the Patients Lost to Follow-up in 2003\***

Headache Type	1983	1993
Headache free	0	4 (24)
TTH	5 (29)	4 (24)
MWOA	10 (59)	7 (41)
MA	1 (6)	2 (12)
Migraine and TTH	1 (6)	0
<b>Total</b>	<b>17 (100)</b>	<b>17 (100)</b>

Abbreviations: MA, migraine with aura; MWOA, migraine without aura; TTH, tension-type headache.

\*Data are given as number (percentage) of patients.

tients were asked to identify headache precipitants at diagnosis and follow-up. For each patient, the most effective method of headache control was recorded, including pharmacological and non-pharmacological methods. Data were collected about the presence of associated symptoms including motion sickness, somnambulism, rushes and "Alice in Wonderland" syndrome, and other health problems and recent physician visits.<sup>6,7</sup>

Data processing and analysis were performed (Epi Info version 6.04b; Centers for Disease Control and Prevention, Atlanta, Ga).<sup>8</sup>

## RESULTS

Sixty (63%) of 95 patients initially seen with a complaint of headaches in 1983 and interviewed in 1993 were again contacted by telephone in 2003. Thirty five (58%) were male, and 25 (42%) were female. At initial presentation, 53 (88%) were neurologically normal, 4 (7%) were mildly impaired, and 3 (5%) had major neurological impairment. The mean (SD) age at diagnosis was 11.1 (3.0) years. Mean (SD) duration of follow-up was 20.1 (0.4) years.

When first seen in 1983, 15 (25%) patients had tension-type headache (TTH), 37 (62%) had migraine without aura (MWOA), 5 (8%) had migraine with aura, and 3 (5%) had both TTH and migraine. At 10-year follow-up, 15 (25%) patients were headache free, 18 (30%) had TTH, 20 (33%) had MWOA, 5 (8%) had migraine with aura, and 2 (3%) had both TTH and migraine. At 20-year follow-up, 16 (27%) were headache free, 20 (33%) had TTH, 9 (15%) had MWOA, 1 (2%) had migraine with aura, and 14 (23%) had both TTH and migraine (**Table 1**). Hav-

ing more than 1 headache type was more prevalent in 2003 than at diagnosis or 10-year follow-up ( $P < .001$ ). From 1993 to 2003, 17 patients were lost to follow-up. There were no significant differences in distribution of headache types in those patients lost to follow-up during this period (**Table 2**).

When categorized according to headache type, those with only TTH were most likely to be headache free at 10- or 20-year follow-up (7 [47%] and 8 [53%] respectively,  $P < .04$ ); whereas only 7 (19%) patients with MWOA at diagnosis were headache free at both 10- and 20-year follow-up. Seventeen (46%) patients with MWOA at diagnosis continued to have MWOA at 10-year follow-up, and 7 (19%) had exclusively MWOA at 20-year follow-up.

Fifteen (25%) patients were headache free at 10-year follow-up, but 6 (40%) of these patients had headache recurrence by 20 years. Of those whose headaches persisted at 10-year follow-up, headaches in only 7 (16%) of 45 patients remitted during the following 10 years. At 20-year follow-up, 16 patients (27%) were headache free; 9 (56%) remained headache free from 1993, suggesting resolution of their headaches.

The initial headache diagnosis was not a useful predictor of headache type at follow-up. Of the 45 patients with an initial diagnosis of migraine, 11 (24%) had exclusively TTH at 10-year follow-up, and 14 (3%) had TTH at 20 years. An additional 11 (24%) with an initial diagnosis of migraine had both TTH and migraine at 20-year follow-up. Only 1 patient (7%) with an initial diagnosis of TTH had migraine at 20-year follow-up; 6 (40%) continued to have TTH, and 8 (53%) were headache free (**Table 3**).

As assessed by the patients, headache severity was moderate or severe for 40 (67%) at diagnosis, for 29 (48%) after 10 years, and for 35 (58%) after 20 years (**Table 4**). The pattern of headache severity was similar in the 17 patients lost to follow-up; 6 (35%) reported mild headaches, and 7 (42%) reported moderate or severe headaches at 10-year follow-up. Of those with mild headaches at diagnosis, 9 (45%) were headache free at 20 years; whereas of those with moderate or severe headaches at diagnosis, only 7 (18%) were headache free after 20 years ( $P < .05$ ). Of those with moderate or severe headaches at diagnosis, 29 (72%) continued to have moderate or severe headaches at 20 years. When contacted in 2003, 40 (67%) of 60 felt their headaches had gotten better during the previous 10 years, 11 (18%) reported worsening of their headaches, and 9 (15%) thought their headaches were unchanged.

Of those with headaches at 20-year follow-up, 24 (55%) believed nonprescription medication was the best treatment for their headaches. Eleven (25%) preferred a period of sleep to treat their headaches, 4 (9%) used some form of relaxation therapy, 3 (7%) avoided precipitants, and 1 (2%) required no treatment for their headaches. Thirty-one patients (70%) were using nonprescription analgesics for headache relief, and 6 (14%) had used prescription analgesics in the month before follow-up. None of the patients were using selective serotonin receptor agonists, or triptans, at 20-year follow-up.

The most commonly reported precipitants at 20-year follow-up were stress (19 patients [32%]), sleep deprivation (8 [13%]), bright light (8 [13%]), and specific foods (6 [10%]). Stress was identified increasingly as a head-

**Table 3. Evolution of Childhood Headache Diagnosis Across 20-Year Follow-up\***

Headache Diagnosis in 2003	Headache Diagnosis in 1983 (n = 60)			
	TTH	MWOA	MA	Migraine and TTH
Headache free	8	7	1	0
TTH	6	12	2	0
MWOA	0	7	1	1
MA	0	0	1	0
Migraine and TTH	1	11	0	2
<b>Total</b>	<b>15</b>	<b>37</b>	<b>5</b>	<b>3</b>

Abbreviations: MA, migraine with aura; MWOA, migraine without aura; TTH, tension-type headache.

\*Data are given as number of patients.

ache precipitant at long-term follow-up from 7 patients (12%) at diagnosis to 19 (32%) at 20 years ( $P=.01$ ). During the month before the follow-up telephone interview, 4 patients (7%) had seen a physician because of headaches; 37 (62%) reported other health problems; and 23 (38%) had syncope, light-headedness, or dizziness.

Associated headache symptoms were common in patients with migraine and TTH. Twenty-three (38%) reported motion sickness at 20-year follow-up vs 14 (23%) at 10 years. Only 1 patient (2%) had somnambulism in 2003. Eight patients (13%) had the rushes sensory disturbance at 20 years and 10 (17%) at 10 years, whereas the Alice in Wonderland syndrome occurred in 4 (7%) patients at 20 years and 6 (10%) at 10 years.

#### COMMENT

The prognosis and natural history of childhood headaches have not been well defined. Results of previous short-term follow-up studies have shown improvement and resolution among children with headache diagnoses. When patients were followed up for 10 years or less, headaches were shown to improve or remit in 60% to 80%.<sup>2,9-11</sup> However, we observed that remission of headaches at short-term follow-up does not predict long-term resolution. Persistence of headaches at 10 years appears to be more predictive of headache persistence into adulthood, particularly if the primary headaches are migraine. Guidetti and Galli<sup>11</sup> also found that migraine had a lower tendency than TTH to remit (28.1% vs 44.4%). Similarly, Bille<sup>12,13</sup> followed up a group of 73 schoolchildren with migraine for 40 years and found that 23% were migraine free at 23 years, and more than 50% continued to have migraines at 50 years. This finding was supported by our 10-year follow-up study, which showed remission rates of 50% and 18% for TTH and migraine, respectively.<sup>2</sup>

The International Headache Society classified headaches in childhood according to primary diagnosis, but there may be considerable overlap and headache patterns may evolve across time. The criteria for diagnosing primary headache disorders were revised during follow-up, but the major clinical features of migraine and TTH have remained relatively constant. The revisions were designed to allow increased sensitivity for identifying childhood migraine by accepting brief and bifrontal headaches within the migraine diagnosis.<sup>5</sup> Therefore, using the 2004 International

**Table 4. Headache Severity at Initial Diagnosis and Follow-up\***

Headache Severity	1983	1993	2003
No headache	0	15 (25)	16 (27)
Mild	20 (33)	16 (27)	9 (15)
Moderate or severe	40 (67)	29 (48)	35 (58)
<b>Total</b>	<b>60 (100)</b>	<b>60 (100)</b>	<b>60 (100)</b>

\*Data are given as number (percentage) of patients.

Headache Society criteria, one might expect increased detection of migraine headache but not increased TTH as observed in our 20-year data. Camarda et al<sup>14</sup> followed up a group of 64 adolescents with migraine across 5 years; they observed that many children have changes in their headache patterns when followed up into adolescence. Migrainous disorder evolved into MWOA in 27.8% and remitted in 44.5% of patients, and nonclassifiable headaches evolved into MWOA in 14.3%, migrainous disorder in 21.4%, and TTH in 14.3%. In their 8-year longitudinal study, Guidetti and Galli<sup>11</sup> also observed changes across time in headache diagnosis: MWOA persisted in 43.8%, remitted in 28.1%, and evolved into TTH in 26.3%. We also found that headache diagnosis in childhood did not reliably predict diagnosis in adulthood: MWOA evolved into TTH in 12 (32%), 7 (19%) continued to have MWOA, and 11 (30%) had both TTH and MWOA at long-term follow-up. Only 1 patient (7%) with TTH at diagnosis later developed migraine. Initial headache diagnosis, however, may be helpful in predicting which child's headaches are more likely to remit. As observed in previous studies, TTH was more likely than migraine to remit.

Critics of headache classification systems have argued that TTH and migraine occur on a continuum.<sup>15</sup> In contrast, the patients with migraine in our study often developed TTH across time, but those with TTH in childhood tended to have headaches remit or remain pure TTH long term, suggesting inherent differences in the origin of migraine and TTH. As adults, 4 (23%) of the patients in our study fulfilled criteria for both migraine and TTH. Similarly, in a Canadian population-based study,<sup>16</sup> 22% of respondents with headaches reported both migraine and TTH. Although reports of headache severity are subjective and complicated by recall bias, our results sug-

gest that childhood headache severity may be helpful in predicting long-term outcome. Patients with mild headaches at diagnosis were more likely to have remission than those with moderate or severe headaches at diagnosis (9 [45%] vs 7 [18%], respectively). Those with moderate or severe headaches often continue to have moderate or severe headaches into adulthood. Arguably, the population in our study represents only a selected subset of children with headache because it was derived from a single pediatric neurology consultation practice. The prevalence of moderate or severe headaches in this group may reflect a selection bias for more severe headaches among the study cohort.

From the time of diagnosis, all patients were encouraged to identify headache triggers in an attempt to reduce headache frequency. Stress, sleep deprivation, and bright light were the most frequently reported precipitants in 2003 for both migraine and TTH. During the 20 years of follow-up, stress was increasingly identified as a headache trigger (32% in 2003 vs 12% in 1983). This could reflect underreporting or underrecognition of stress as a provoking factor in childhood headaches, or it may relate to increased burden of stress in adulthood. The increase in TTH at 20-year follow-up may correlate with increasing levels of stress. Overall, 34 (57%) patients had TTH in 2003, whereas only 18 (30%) had TTH in 1983. Other health complaints were common in our study, but we did not identify specific associated somatic symptoms. Light-headedness, dizziness, and syncope were the most commonly reported symptoms among the population in our study.

We observed an increasing trend toward use of nonprescription analgesics for headache relief. In addition, many patients continued to use other methods of headache control. In 1993, only 30% of the study group were using nonprescription medications to control headaches.<sup>2</sup> Current rates of nonprescription analgesic use (70%) now approach the national average according to population surveys of Canadians with headaches.<sup>16</sup> However, 45% believed that nonpharmacological methods were most effective for headache relief. Despite some minor advances in treatment of headaches throughout the study, evidenced-based support for pharmacological treatment is still limited in pediatrics. The only new evidence-based acute treatment in children is nasal sumatriptan. Most pediatric neurologists continue to try a nonpharmacological approach initially. The use of prescription medications was uncommon in the population in our study when compared with population averages among adults with headaches.<sup>16</sup> Of particular interest is the absence of triptan use among the population in our study, even into adulthood. These treatment observations may reflect encouragement to learn nonpharmacological approaches to coping with headaches from the time of diagnosis. Twenty years after diagnosis, many prefer nonpharmacological approaches for managing their headaches. As observed in population studies, only a few had

consulted a physician about their headaches in the 3 months before follow-up.<sup>17</sup>

We have studied the long-term prognosis of childhood headaches in a clinic-based cohort of Atlantic Canadian children. Follow-up was achieved in 60 (78%) of the 1993 study group (63% of the original cohort). Twenty years after diagnosis of pediatric headache, most patients continued to have headache, although the headache classification often changed across time. Headaches persisted in 44 (73%), with most reporting moderate or severe headache intensity. Patients increasingly chose to manage their headaches pharmacologically as adults, although 20 (45%) believed that nonpharmacological methods were most effective for headache control.

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