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Chronic Daily Headache, Medication Overuse, and Obesity in Children and Adolescents

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Abstract

Obesity and headaches are common in children and adults. Adult studies suggest obesity is a risk factor for chronic daily headache and increased migraine frequency and severity. Pediatric studies have suggested a relationship between obesity, increasing headache frequency, and disability. The authors retrospectively evaluated 925 children from their Pediatric Headache Clinic between July 2004 and July 2008, assessing headache frequency, medication overuse, and body mass index compared to population-based norms. The pediatric headache group as a whole had a greater percentage of overweight than the general population. This was also true with the subgroup of patients with chronic tension-type headache, although the numbers were small. Data did not show increased incidence of overweight in children with medication overuse or chronic migraine. This contrasts with adult data, which have suggested a closer link between chronic migraine and obesity and have not supported a link with chronic tension-type headache.

Keywords

headache; migraine; obesity; medication overuse; tension-type

Obesity in children and adolescents is a significant public health problem at the current time. Data from 2003 to 2006 demonstrated that 16.3% of children and adolescents had a body mass index at or above 95% for age, fulfilling criteria for overweight (≥95th percentile).[1] According to recent epidemiologic studies, 31.1% of adult men and 33.2% of adult women fulfill criteria for obesity.[2] Rates appear to be increasing over time, with poor dietary choices and an increasing sedentary lifestyle playing a significant role. Obesity has been linked to numerous other medical conditions in the pediatric and adult populations, including psychologic issues, hypertension, diabetes mellitus, sleep issues, benign

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Authors' Contributions

The authors contributed equally to study design, data collection, and writing of the manuscript.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Ethical Approval

Our study was approved by our institution's Investigational Review Board, and informed consent was not deemed necessary since this was a retrospective chart review.

intracranial hypertension, and secondarily increased long-term risk of cerebrovascular and cardiovascular disease.[3–5]

In the adult headache population, obesity appears to be a risk factor for transformation from episodic to chronic migraine headaches.[6] This correlation has not been noted between obesity and chronic tension-type headache in adults. Increased body mass index has been noted to negatively affect migraine frequency in adults with episodic migraine.[7] One small study reported greater comorbidity between obesity and migraine with aura, specifically in women.

Information regarding effects of obesity and pediatric headache are more limited. A study by Hershey et al[8] found a positive correlation between body mass index and headache frequency and disability, evaluating children and adolescents 3 to 18 years of age enrolled from 7 outpatient pediatric headache clinics. Overall, prevalence of obesity was 17.1%, which is similar to population norms (17.5%), but as body mass index percentile increased, so did headache frequency and disability. The population-based norms referenced in this study date from a 2006 study that included older data than population-based norms referenced in our study. Weight loss appeared to improve headache frequency and disability over time.

A bidirectional relationship was noted with a recent study by Pinhas-Hamiel et al.[9] They noted an almost 4-fold excess risk of headaches was present in girls being followed at a pediatric obesity clinic compared to non-overweight population-based controls. This relationship was not noted in boys. In their prospective study, 7.7% of normal-weight girls had headaches compared to 20.3% of overweight girls. Blood pressure elevation was not independently related to headaches.

The relationship between chronic daily headache and obesity in children and adolescents has not been well delineated. In particular, the relationship between chronic daily headache with medication overuse and child/adolescent obesity has not been evaluated. To address these issues, we retrospectively studied headache patients from our multidisciplinary headache clinic evaluating body mass index and headache type diagnosed according to *International Classification of Headache Disorders–Second Edition* criteria, comparing the incidence of obesity within our headache patients and population-based norms. Patients with medication overuse associated with chronic daily headache can be inherently difficult to manage. To fulfill the revised International Classification of Headache Disorders–Second Edition criteria for medication overuse headache, these individuals medicate their chronic daily headache with simple or combination analgesics equal to or greater than 15 days per month for at least 3 months or use triptans, opioids, or ergot combination analgesics equal to or greater than 10 days per month for 3 months.[10]

Methods and Materials

This retrospective study analyzed patient data collected over a 4-year time period between July 2004 and July 2008 in children and adolescents between 5 and 17 years of age visiting our Pediatric Headache Clinic at Nationwide Children's Hospital. Approval was obtained from our institution's Human Subjects Investigation Review Board. International Classification of Headache Disorders–Second Edition criteria were used for headache diagnosis.[11]

Headache frequency was obtained from parent report diaries. In addition, demographic data, including age, sex, and body mass index (using height and weight recorded at visits), were obtained. Body mass index was plotted on the standard Centers for Disease Control and Prevention (CDC) growth curve and was assessed as at risk for overweight (85th–95th

percentiles) and overweight (≥95th percentile).[12] Statistical analyses were performed using chi-square analyses for differences between headache diagnoses and body mass index. Confidence intervals for at risk or overweight were analyzed for individual headache groups and body mass index.

Results

Of the 942 patients between 5 and 17 years of age who presented to our headache clinic during this 4-year time interval, 925 had analyzable data. Mean age of patients was 12.5 years, and 533 of 925 (58%) were girls. Body mass index was calculated as normal in 66% of total headache patients, 14% at risk for overweight, and 20% overweight. This was not significant compared to population norms (Table 1). In total, 252 patients had chronic daily headache according to criteria (15 or more headache days per month retrospectively over a 3-month time interval). Mean age was 14.0 years, and 70% of the patients were girls. One hundred patients in this chronic daily headache group had medication overuse. Medication overuse was more prevalent in girls (72% vs 28% boys; Table 1). No significant differences were noted between chronic daily headache patient groups with and without medication overuse and other factors such as body mass index, gender, or age.

Compared to population-based norms, significance was noted outside 95% confidence intervals for body mass index in patients with chronic daily headache in general.[1] When specified subtypes were studied, this occurred only for those children and adolescents with chronic tension-type headache (Table 2).

Discussion

Obesity appears to be more prevalent in our series of headache patients in general compared to population-based norms. Significant differences were noted only in those patients with chronic daily headache in general and in the subgroup of chronic tension-type headache, although this was a small group of patients studied. Previous pediatric studies have suggested a correlation between frequent headache and obesity, and we also obtained similar data with our chronic daily headache patients compared to episodic migraine as controls.[8]

Obesity has been thought to be a risk factor in adult patients for headache transformation from episodic to chronic migraine.[13] A relationship between chronification and obesity has not been noted in adult individuals with chronic tension-type headaches. A definitive causal relationship underlying the association between obesity and chronic headache is unclear. This shared occurrence is probably multifactorial and can be influenced by environmental risk factors such as decreased physical activity levels, which are seen more frequently in the pediatric population with recurrent headaches, and possibly certain genetic factors.[14] Biochemical markers may also play a role, such as orexins, adiposal tissue function, and estrogen levels.[14,15] Psychologic factors have greater comorbidity in those patients with frequent headache and also can affect issues of overweight. This association is particularly noted with depression, anxiety, and substance abuse.[16] In our patients, chronic tension-type headache was the specific chronic daily headache subtype with a higher frequency of body mass index greater than the 95th percentile than the general population. This contradicts the adult literature, which noticed a relationship between obesity and chronic migraine, not chronic tension-type headache.[6] An association with obesity and medication overuse headache was not noted in our patient sample, which would seem to differ from the comorbidity noted between obesity and substance abuse. This may be related to dysfunction of certain neurologic centers involved in drive and impulse regulation. Our patient group was small, and the above risks noted with obesity and chronic migraine in adult patients may

be related to the cumulative time effects and progressive nature of transformed or chronic migraine not seen as readily in the pediatric migraine population.

Because obesity is a modifiable risk factor for chronic daily headache and multiple medical problems leading to long-term health problems, a weight management program would likely be beneficial to recommend as part of therapy for obese children and adolescents presenting for treatment of their headaches. Dietary instruction and emphasis on increased physical activity should be encouraged. A recent study has shown that unfavorable lifestyles such as decreased physical exercise and smoking were correlated with frequent headache in adolescents.[17] If comorbid psychological issues such as depression are present, they should be aggressively addressed for best overall therapeutic outcomes regarding headache frequency and weight. Future studies regarding weight loss and its effects on headache frequency, specifically chronic daily headache, would be beneficial.

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Table 1

Chronic Daily Headache, Medication Overuse, and Overweight Risk

Type	No.	Mean Age, y	Male/ Female	Body Mass Index (at Risk or Overweight)
With medication overuse	100	14.0	28/72	19
Chronic tension-type headache	56	14.0		
Chronic migraine	44	14.0		
No medication overuse	152	14.0	73/79	28
Chronic tension-type headache	79	13.5		20
Chronic migraine	73	15.0		8

Chi-square test for differences in body mass index: 0.1753. Chi-square test for differences in gender: 0.6316. Kruskal-Wallis test for differences in age: 0.9041.

Table 2

Headache Diagnosis and Body Mass Index (BMI)

Diagnosis	Total No.	Category	No.	Estimate (95% Confidence Interval), %	Population Estimate, %
All patients studied	925	BMI at or above 85%	314	34.0 (30.9–37.1)	31.9
		BMI at or above 95%	185	20.0 (17.5–22.7)	16.3
Chronic daily headache	252	BMI at or above 85%	86	34.3 (28.3–40.3)	31.9
		BMI at or above 95%	56	22.2 (17.1–27.4)	16.3*
Medication overuse	100	BMI at or above 85%	41	33.6 (25.3–42.7)	31.9
		BMI at or above 95%	27	22.1 (15.1–30.5)	16.3
Chronic or probable chronic migraine without medication overuse headache	79	BMI at or above 85%	26	32.9 (22.8–44.4)	31.9
		BMI at or above 95%	16	20.3 (12.0–30.8)	16.3
Chronic or probable chronic tension without medication overuse headache	73	BMI at or above 85%	28	39.7 (28.5–51.9)	31.9
		BMI at or above 95%	19	26.0 (16.5–37.6)	16.3*
Episodic or probable episodic migraine	532	BMI at or above 85%	178	33.5 (29.5–37.7)	31.9
		BMI at or above 95%	101	19.0 (15.7–22.6)	16.3
Episodic or probable episodic tension	141	BMI at or above 85%	25	32.9 (22.5–44.6)	31.9
		BMI at or above 95%	12	15.8 (8.4–26.0)	16.3

Reference for population norms: Ogden et al.[1]

*Significant (outside 95% confidence interval).