두통이 있는 학생들에서 두통과 관련된 장애와 예측인자: 군집 기반 연구

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Characterization and Predictors of Headache-Related Disability among School Children: A Population-Based Study

Purpose: Headache is a frequent neurological symptom in school aged individuals and recurrent headache has significant disabling effects among children and adolescents that manifest as school absenteeism, decreased extracurricular activities, and poor academic performance, as shown in previous studies. In Korea, there has not yet been a population-based study of headache-related disability in children and adolescents. We sought to estimate headache-related disability and investigate relevant predictors of disability due to headaches among schoolchildren in South Korea.

Methods: This was a cross-sectional school-based study. We surveyed 5,039 (boys 2,405, girls 2,634) students aged 6–18 years. Among 1,465 students with headache, six hundred sixty-six schoolchildren (225 boys, 441 girls) completed all questionnaires. The questionnaires collected demographic data, in addition to headache specific questions consistent with International Classification of Headache Disorder criteria, 2nd edition. Disability was evaluated using the 6-question Pediatric Migraine Disability Assessment (PedMIDAS).

Results: Six hundred sixty six school children and adolescents (225 boys, 441 girls) among 1,465 students with headaches completed all questionnaires. The percentage of headache sufferers with grade I disability was 88.6%. The mean ($\pm$ standard deviation) PedMIDAS score was 5.11 ± 11.17 . There was a trend towards more severe disability in the older age groups, particularly among the 16 to 18 year-olds. Students with migraine had the highest PedMIDAS scores (6.69 ± 10.66) whereas students reporting other types of headache had the lowest scores (3.81 ± 7.52). The predictors of headache-related disability were intensity ($P=0.028$), frequent headache ($P=0.003$), and longer duration of symptoms prior to presentation ($P=0.008$).

Conclusion: A trend towards a more severe disability was observed in the older age group. Schoolchildren with migraine had the most headache-related disability. The predictors for headache-related disability were intensity, frequent headache, and longer duration of symptoms prior to presentation.

Key Words: Headache, Disability, Schoolchildren, Predictors

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Introduction

Headache is a frequent neurological symptom among school-aged individuals and recurrent headaches have a significant and disabling effect in children and adolescents. The most common types of primary headaches in during the developmental stages are migraine and tension-type headache (TTH). The reported prevalence for primary headache disorders varies considerably, with a prevalence of 1.0–17.0% for migraine and 0.9–72.3% for episodic TTH¹⁾. In a recent survey of South Korean students, 29.1% of schoolchildren reported having recurrent headaches. TTH was more frequent than recurrent migraine headaches (13.7% vs 8.7%) and both migraine and TTH increased with age. Further, the prevalence rate of TTH in urban areas was higher than that in suburban and rural areas²⁾.

Frequent school absenteeism results in decreased academic performance, social interaction with peers, and self-esteem. Headaches among children and adolescents can lead to significant disabilities, by affecting their lives, academic performance, and relationships with family members and peers. Children and adolescents were absent from school activities, did not perform household tasks, and did not participate in leisure activities for an average of 23.9 days, during the last 3 months because of migraine³⁾. Migraine occurs more often in children who report feelings of unhappiness, fear of school failure, or fear of a teacher⁴⁾. Headache frequency and duration have a significant impact on a quality of life of children⁵⁾. Chronic migraine is a severe headache-related disability than episodic migraine. Both the Pediatric Migraine Disability Assessment (PedMIDAS) and the Pediatric Quality of Life Inventory, version 4.0 (Peds QL 4.0) can assess headache-related disability in children and adolescents. The PedMIDAS is an internally consistent tool for assessing the degree of disability^{6,7)}. Prior studies have reported that predictors for moderate and severe headache-related disabilities in children and adolescents were frequent or severe headaches, the presence of migraines, high depression scores^{6,7)} and obesity⁸⁾. This disability has been well documented in adults. However, only a few studies regarding headache-related disability and its predictors exist among schoolchildren^{6,9,16)}.

This present study was sought to estimate headache-related disability using the PedMIDAS and investigate relevant predictors of moderate and severe headache-related disability due to primary headaches among schoolchildren in South Korea.

Materials and Methods

This is a cross-sectional and school-based study to estimate headache-related disability and investigate the relevant predictors of disability due to headaches among schoolchildren in South Korea. We surveyed a randomized and proportional sample of 5,360 male and female students between June 2009 and December 2009. In South Korea, 0.07% of all students were selected. Schools for mentally or physically disabled children were excluded. Students with recurrent generalized diseases, or known intracranial lesions or mental retardation were excluded. All 180 classes of the 24 sampled elementary, middle, and high schools participated in this study. The schools were located in six regions throughout Korea, including Seoul, Gyeonggi, Chungcheong, Gangwon, Jeolla, and Gyeongsang, with the sample designed to reflect the distribution of the general population. Valid questionnaires were returned by 94.1% (5,039; 2,405 boys, 2,634 girls) of the sample population. The 1 year prevalence of headache among school children was 29.1% (1,465/5,039) in South Korea²⁾. Among 1,465 students with headaches, six hundred sixty-six schoolchildren (225 boys, 441 girls) completed the PedMIDAS questionnaires. These students comprised the final sample for analysis in this study. The questionnaires collected demographic data including age and sex, in addition to specific questions regarding headache according to International Classification of Headache Disorder criteria, 2nd edition (ICHD-2)¹⁰⁾. Intensity of pain was rated as mild (1–3), moderate (4–6), and severe (7–10) by the Visual Analog Scales (VAS). Disability was evaluated by using the 6-question PedMIDAS. The PedMIDAS is based on adult migraine disability scores with developmentally appropriate changes and adjustments for a child's lifestyle. The PedMIDAS is the only validated clinical tool available to estimate migraine disability in the school-aged child¹¹⁾. However, the type of questions utilized in this measure did not necessitate the exclusion of other types of headache from the analysis. The PedMIDAS scale was developed to assess limitations placed on school, home activities, play, social, or leisure activities due to headaches in children and adolescents. We translated the PedMIDAS questionnaire into Korean and included out-of-school studies as play, social or leisure activity. The extent of disability was categorized into four grades based on the total PedMIDAS score. Grade 1 (a PedMIDAS score of 0 to 10) indicates little to no disability while grades 2 (11 to 30), grade 3 (31 to 50) and grade 4 (more than 51) indicate mild, moderate and severe disability, respectively¹²⁾.

Data were stored and statistically analyzed using IBM SPSS

version 17.0 for Windows (SPSS Inc., Chicago, IL, USA). Pearson chi-square (X^2) was used to assess correlations. One-way ANOVA was used to compare the means of continuous variables. Logistic regression analyses were used to determine which variables influenced moderate and severe headache-related disability (PedMIDAS grade of 3 or 4). A *P* value of less than .05 was considered statistically significant.

This study and all forms were approved by the Investigation Review Board of the Chosun University Hospital (IRB-09S-84).

Results

Six hundred sixty-six students comprised the final sample for analysis in this study. The characteristics of subjects are presented in Table 1. The mean age of girls with headaches (14.34 ± 2.87) was significantly higher than that of boys with headaches (13.52 ± 3.31) ($P < 0.001$).

Cronbach's alpha, a measure of internal consistency, was 0.79 for the mean PedMIDAS score of all students with headaches. The mean PedMIDAS score was 5.11 ± 11.17 per 3 months. The

mean PedMIDAS scores according to the age, headache type, frequency, duration of pain, intensity, and duration of symptoms before presentation are shown in Table 2. The mean PedMIDAS scores were 4.42 ± 8.71 in boys, and 5.56 ± 12.23 in girls. There were no statistically significant differences between the sexes with respect to headache-related disability. The mean PedMIDAS score was 4.63 ± 14.01 in students 6–12 years of age with headache, 4.84 ± 9.45 for students 13–15 years of age, and 5.77 ± 10.18 for students 16–18 years of age. Students with migraine had the highest PedMIDAS scores (6.69 ± 10.66) whereas students with other headache had the lowest scores (3.81 ± 7.52) ($P < 0.05$). The correlation between the PedMIDAS score and headache frequency was statistically significant ($P < 0.001$). Students with severe headaches had a higher PedMIDAS score than students with mild or moderate headaches ($P < 0.001$). The mean PedMIDAS score in case with chronic headache was not significantly higher than that of episodic headache ($P = 0.126$) (Table 2).

The percentage of children with headache with grade 1 disability (absent or minimal) was 88.6%, 9.2% with grade 2 (mild), 1.4% with grade 3 (moderate), and 0.9% with grade 4

Table 1. Characteristics of Subjects (n=666)

Variables	Total n	Male n (%)	Female n (%)	P-value
Mean age(M $\pm$ SD)	14.05 $\pm$ 2.97	13.52 $\pm$ 3.31	14.34 $\pm$ 2.87***	<0.001
Age (years)				
6-12	197	89 (45.2)	108 (54.8)	-
13-15	221	64 (29.0)	157 (71.0)***	<0.001
16-18	248	72 (29.0)	176 (71.0)***	<0.001
Headache type				
Migraine	246	91 (37.0)	155 (63.0)*	<0.05
TTH*	277	77 (27.8)	200 (72.2)	-
Others	143	57 (39.9)	86 (60.1)	-
Frequency				
<3/month	454	164 (36.1)	290 (63.9)	-
1/week	58	17 (29.3)	41 (70.7)	-
2-3/week	89	28 (31.5)	61 (68.5)	-
≥ 4 /week	65	16 (24.6)	49 (75.4)	>0.05
Duration				
<1 hour	468	161 (34.4)	307 (65.6)	-
1-72 hour	174	59 (33.9)	115 (66.1)	-
>72 hour	16	3 (18.8)	13 (81.3)*	<0.05
Intensity				
Mild	121	58 (47.9)	63 (52.1)	-
Moderate	464	140 (30.2)	324 (69.8)	-
Severe	79	26 (33.3)	53 (66.7)*	<0.05
Duration of symptoms before presentation				
<6 months	351	134 (38.2)	217 (61.8)	-
≥ 6 months	313	91 (29.1)	222 (70.9)*	<0.05

TTH, tension type headache.

* $P < 0.05$, *** $P < 0.001$.

(severe). Disability was absent or minimal in 88.6% of the schoolchildren with headache, whereas only 0.9% showed

Table 2. Mean Pediatric Migraine Disability Assessment Scale (PedMIDAS) Scores by Demographics and Descriptors

	PedMIDAS (Mean±SD)	P-value
Sex		
Male	4.42±8.71	-
Female	5.56±12.2	>0.05
Age (years)		
6-12	4.63±14.01	-
13-15	4.84±9.45	>0.05
16-18	5.77±10.18	>0.05
Headache type		
Migraine	6.69±10.66	<0.05
TTH	4.46±13.03	-
Others	3.81±7.52	-
Frequency		
<3/month	3.61±6.83	-
1/week	6.70±7.32	-
2-3/week	7.15±12.61	-
≥4/week	11.26±25.38	<0.001
Duration		
<1 hour	4.43±11.51	-
1-72 hour	6.85±9.14	-
>72 hour	8.55±18.32	<0.05
Intensity		
Mild	2.50±5.35	-
Moderate	4.73±10.61	<0.05
Severe	11.96±17.14	<0.001
Episodic headache	3.84±7.51	-
Chronic headache	5.56±12.04	>0.05
Duration of symptoms before presentation		
<6 months	3.31±5.44	-
≥6 months	7.28±15.03	<0.001

PedMIDAS, pediatric migraine disability assessment scale; SD, standard deviation; TTH, tension type headache.

* $P<0.05$, *** $P<0.001$

severe disability. There was a trend towards a more severe disability in older age groups, especially among 16-18 year olds (Fig. 1). Distribution of PedMIDAS disability severity grades by the headache type among the students with headaches is shown in the Fig. 2.

The mean PedMIDAS scores by item are presented in Table 3. The three subscores for the school, home activity, and play, social or leisure or extracurricular activity subdomains were 0.48 ± 0.95 , 2.05 ± 5.47 , and 1.03 ± 2.74 , respectively (Table 3). The profile of disability reveals that students with headaches are predominantly impaired in the home activity.

Predictors of moderate or severe PedMIDAS disability are presented in Table 4. The following variables in the regression model were entered using a forwards stepwise method: gender, age, headache type, pain intensity, duration, headache frequency (≥ 7 days per month vs < 7 days per month), and duration of symptoms before presentation (≥ 6 months vs < 6 months). A migraine headache (compared to other headaches, which were classified in the any headache group) were associated with more than twice the risk for moderate to severe disability (Odds ratio; OR=2.213, $P=0.052$) but TTH (compared to other headaches) was

Table 3. Pediatric Migraine Disability Assessment scale (PedMIDAS) According to the Item

Item (n)	PedMIDAS (Mean±SD)	
School	1 (60)	0.21±0.91
	2 (150)	0.43±1.23
	3 (131)	0.56±2.02
Home activity	4 (320)	2.02±5.44
Play, social or leisure or extracurricular activity	5 (267)	1.45±4.26
	6 (130)	0.67±1.98

PedMIDAS, pediatric migraine disability assessment scale; SD, standard deviation.

Cronbach's alpha; 0.79 for the mean PedMIDAS score of all students with headaches.

Fig. 1. The percentage of schoolchildren with headaches in Pediatric migraine disability assessment scale (PedMIDAS) disability grades by age group.

Fig. 2. The percentage of students with headaches in Pediatric migraine disability assessment scale (PedMIDAS) disability grades by headache type.

Table 4. Logistic Regression of Grade of Disability by Headache

Variables	n (no. of reference)	P-value	OR	Adjusted OR (95% CI)
Sex (ref. = male)	441 (225)	0.083	1.072	0.934-3.103
Age		0.689	0.982	0.937-1.110
Headache type				
Migraine (ref. = other headaches)	199 (467)	0.052	2.213	0.992-4.935
TTH (ref. = other headaches)	258 (408)	0.465	0.732	0.326-1.693
Intensity (VAS, 0-10)				
Moderate (ref. = mild)	464 (202)	0.680	0.845	0.379-1.884
Severe (ref. = mild)	79 (587)	0.028	2.819	1.118-7.111
Duration		0.768	1.096	0.598-2.008
Frequency				
≥7 days/month (ref. = < 7 days/month)	154 (512)	0.003	2.228	1.322-3.963
Duration of symptoms prior to presentation				
≥ 6 months (ref. = < 6 months)	313 (353)	0.008	2.133	1.218-3.735

OR, odds ratio; OR (95% CI), odds ratio (95% confidence interval); TTH, tension type headache; VAS, visual analog scale.

associated with a lower level (OR=0.732). The severe intensity, frequent headaches (≥ 7 days per month), and longer duration of symptoms prior to presentation (≥ 6 months) were predictors of moderate-to-severe disability.

Discussion

School is important for social, emotional, and intellectual development and regular school participation must be a top priority. Recurrent primary headaches are quite prevalent among school-aged children and adolescents and can have a considerable impact on school attendance and social functioning. The prevalence of recurrent primary headaches was 29.1% and increased incrementally with age from 20.8% among children aged 6-12 years to 38.2% among adolescents 16-18 years of age²⁾. Children with headaches have reported higher physical and social functioning as well as lower school and emotional

functioning than those with rheumatoid conditions or cancer¹³⁾. Rocha-Filho, et al.¹⁴⁾ reported that more severe headaches were associated with a lower average grade, indicating that the greater the impact of headache, the poorer the associated academic performance.

Disability is defined as the inability to work and function during a disease process. Headaches interfered with the student's school activities and their play, social, or leisure activities, which affects curricular and extracurricular lives. The disability due to headaches in students is measured by PedMIDAS questions in three domains (school, home and social activities). In a survey of United States high school students, children with headache missed 7.8 instructional days per school year compared with 3.7 days among children without headache¹⁵⁾.

Our study showed that the mean PedMIDAS score among students with headache was 5.11 ± 11.17 per 3 months. This result is similar to that of a previous survey of 3,963 students aged 13-15 with headaches using the same instrument which

showed that the mean PedMIDAS score was $3.0 \pm 9.6^{(7)}$. This was lower than that of a survey at a tertiary outpatient clinic for children with headaches which showed that the mean PedMIDAS score was $15.5 \pm 24^{(16)}$. In the present study, the three subscores for school, home activity, and play, social, leisure or extracurricular activity subdomains were 0.48 ± 0.95 , 2.05 ± 5.47 , and 1.03 ± 2.74 , respectively. This result was similar to those of a Taiwanese study (2.5 ± 5.3 , 1.0 ± 3.4 , 1.8 ± 5.3)⁽⁷⁾. In our study, we found that the frequency of grade 1 disabilities in school age children was 88.6%, which is similar to those in studies from Germany⁽⁶⁾ and in Taiwanese⁽⁷⁾ but is higher than those reported by a Chinese study (61.24%)⁽¹⁹⁾. However, only 0.9% of the children demonstrated severe disability (grade 4) which is also similar to those of other previous studies^(6,7,9).

There was a trend of more severe disabilities among older age groups. Our study found that the mean PedMIDAS scores were 4.63 ± 14.01 , 4.84 ± 9.45 , and 5.77 ± 10.18 among students with headaches aged 6–12, ~13–15, and 16–18 years, respectively. This is concordant with the finding of Jin et al and Slater et al^(9,17). In our study, there were no statistically significant differences between the sexes with respect to headache-related disability. On the other hand, Ferracini reported that girls had worse headache-related disability than the boys in the same group⁽³⁾.

Migraines are neurologically-based headaches that often include additional symptoms such as vomiting, nausea, dizziness, vertigo, and increased sensitivity to light, sound, and smell. Further, migraines can last from 2 to 72 hours and sometimes longer and range in severity from moderate to severe. Many days were lost because of headache. This increased with the severity of the headache and was greater for migraine than TTH⁽¹⁸⁾. Absenteeism from school was reported twice as often in children with migraine than in those with other primary headaches and other types of chronic pain⁽¹⁹⁾. Chronic migraine causes greater headache-related disability and greater impact than episodic migraine. In the present study, students with migraine had the highest PedMIDAS scores, whereas those with other primary headaches had the lowest scores. This is similar to the previous study done in Taiwan⁽⁷⁾. Our study found that the PedMIDAS score in chronic headache was significantly higher than that in episodic headaches.

Disability was predicted by the frequency, duration, type, and intensity of headache, by the presence of depression, and obesity^(6–8). Kroner, et al.⁽⁶⁾, reported that the predictors for moderate to severe headache-related disability were migraine, severe intensity of headache, and frequent headaches. Fuh, et al⁽⁷⁾, reported that the predictors for moderate to severe headache-related disability were migraine or probable migraine,

a higher depression score, severe intensity of headache, and frequent headaches. American Headache Society demonstrated a trend of obesity associated with increased frequency of headache and disability. Hershey, et al⁽⁹⁾, reported that elevated body mass index (BMI) significantly correlated with increased disability. Our results indicate that predictors for moderate to severe headache-related disability were severe intensity of headache, frequent headaches, and longer duration of symptoms prior to presentation. This is similar to other studies^(6,7,16). In contrast to other studies^(6,7,16), migraine was not a predictor for disability in our study. This result is consistent with previous study⁽³⁾.

Evaluation of the headache-related disability among children and adolescents with headaches is important in order to identify the effect on the headache on all aspects of the patient's life. It improves outcome by helping school nurses and physicians to develop treatment plans that match the severity of headache, and the treatment response. A combination of effective medication and behavioral techniques can improve headache and its associated disability in most children and adolescents⁽¹⁶⁾.

This is the first study to estimate the headache-related disability and to investigate the predictors of disability due to headaches among schoolchildren in South Korea. The study has some limitations. First, it was a questionnaire based study, and did not have a clinical face-to-face interview to diagnose headaches. Therefore, we may have under-estimated the prevalence of migraine and over-estimated that of TTH. Second, the information about headaches and related disability was collected at a single point in time. Therefore, it is not possible to claim that there is a relationship between headaches and headache-related disability.

We suggest that the PedMIDAS is suitable for epidemiologic and clinical research, but there remains a need to adapt items according to the country in which it is utilized. Headache frequency and intensity ratings did not differ between time periods. However, the mean headache disability score was significantly different between school days and non-school days as well as during the school year compared to the summer holiday. These potential differences should be considered when using the PedMIDAS.

Our study demonstrated that recurrent headaches among schoolchildren could interfere with their school, play, social, and leisure activities. There is a trend for more severe disabilities among older age groups and students with migraine headaches. The study demonstrated that the predictors for moderate to severe headache-related disabilities were severe intensity of headache, frequent headaches, and longer duration of symp-

toms prior to presentation. We strongly recommend that physicians actively should manage students with headaches who have severe intensity of headache, frequent headaches, and longer duration of symptoms prior to presentation.

요약

목적: 두통은 학생들이 흔하게 경험하는 신경학적 증상이며, 반복적으로 두통이 있으면 학교 결석이나 학업 및 과외 활동에도 지장을 초래할 수 있다. 국내에서는 아직 이에 연구가 없는 실정이다. 본 연구는 우리나라 학생들의 두통에 의한 장애 정도를 평가하고 두통에 의한 장애 예측인자를 알아 보고자 하였다.

방법: 이 연구는 횡단적 단면 학교 기반 연구로 총 5,039명(남자 2,405, 여자 2,634명)이 참여 하였으며, 나이 범위는 6-18세 이었다. 설문지는 국제두통분류 제 2판에 따라 구성하였고 학교에서 선생님을 통해 배포하고 수집하였다.

결과: 두통이 있는 학생 1,465명 중 이 연구를 위한 질문에 온전히 답한 학생은 666명이었다. Grade 1의 장애를 보인 학생은 88.6%이었으며, 평균 PedMIDAS는 5.11 ± 11.17 이었다. 나이가 들수록 두통에 의한 장애가 더 심해지는 경향이였으며, 16-18세에서 가장 심했다. 편두통이 있는 학생이 다른 두통이 있는 학생보다 두통에 의한 장애가 더 심했다. 두통에 의한 장애 예측인자는 심한 두통($P=0.028$, 빈번한 두통($P=0.003$), 방문 전 병력이 긴 두통이었다($P=0.008$).

결론: 두통에 의한 장애는 나이가 들수록 더 심하였으며, 편두통이 있는 학생이 가장 심했다. 두통에 의한 장애 예측인자는 심한 두통, 빈번한 두통, 방문 전 병력이 긴 두통이었다.

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