Research Submissions

Childhood Maltreatment and Migraine (Part I). Prevalence and Adult Revictimization: A Multicenter Headache Clinic Survey

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Objectives.—To examine the prevalence of childhood maltreatment and adult revictimization in migraineurs and the association with sociodemographic factors, depression and anxiety.

Background.—Population and practice-based studies have demonstrated an association of childhood abuse and headache in adults, although further details on headache diagnoses, characteristics, and comorbid conditions are lacking. There are mounting data suggesting substantial impact of early maltreatment on adult physical and mental health.

Methods.—Electronic surveys were completed by patients seeking treatment in 11 headache centers across the United States and Canada. Physicians determined the primary headache diagnoses based on the International Classification of Headache Disorders-2 criteria and average monthly headache frequency. Self-reported information on demographics (including body mass index), social history, and physician-diagnosed depression and anxiety was collected. The survey also included validated screening measures for current depression (Patient Health Questionnaire-9) and anxiety (The Beck Anxiety Inventory). History and severity of childhood (<18 years) abuse (sexual, emotional, and physical) and neglect (emotional and physical) was gathered using the Childhood Trauma Questionnaire. There were also queries regarding adult physical and sexual abuse, including age of occurrence. Analysis includes all persons with migraine with aura, and migraine without aura.

Results.—A total of 1348 migraineurs (88% women) were included (mean age 41 years). Diagnosis of migraine with aura was recorded in 40% and chronic headache (≥15 days/month) was reported by 34%. The prevalence of childhood maltreatment types was as follows: physical abuse 21%, sexual abuse 25%, emotional abuse 38%, physical neglect 22%, and emotional neglect 38%. Nine percent reported all 3 categories of childhood abuse (physical, sexual, and emotional) and 17% reported both physical and emotional neglect. Overlap between maltreatment types ranged between 40% and 81%. Of those reporting childhood abuse, 43% reported abuse in adulthood, but infrequently (17%) over the age of 30 years. In logistic regression models adjusted for sociodemographic variables, current depression was associated with physical ($P = .003$), sexual ($P = .007$), and emotional abuse ($P < .001$), and physical and emotional neglect ($P = .001$ for both). Current anxiety was also associated with all childhood abuse and neglect categories ($P < .001$ for all). A graded relationship was observed between the number of childhood maltreatment types and remote or current depression and anxiety. In adjusted logistic regression analysis, migraineurs reporting 3 or more categories of childhood trauma were more likely to have received diagnoses of both depression

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and anxiety (odds ratios [OR] = 6.91, 95% confidence interval [CI]: 3.97-12.03), or either depression or anxiety (OR = 3.66, 95% CI: 2.28-5.88) as compared with those without childhood abuse or neglect.

   Conclusion.—Reports of childhood maltreatment, especially emotional abuse and neglect, are prevalent in outpatients with migraine. There is extensive overlap of maltreatment types and a high rate of revictimization in adulthood. All types of childhood abuse and neglect are strongly associated with remote and current depression and anxiety, and the relationship strengthens with an increasing number of maltreatment types.

Key words: migraine, childhood maltreatment, revictimization

Childhood maltreatment is a major public health problem, even in high-income countries.[1] In the United States there are nearly one million substantiated reports of physical and sexual abuse of children each year, and many more unverified or unreported cases.[2] The majority of reported cases involve neglect, followed by physical abuse, then sexual abuse. The interrelatedness of abuse types is high.[3,4] Maltreatment rates are similar for both sexes, although sexual abuse is more common in girls.[2] There is mounting evidence that childhood maltreatment has long-term consequences. In addition to being strongly tied to revictimization in adulthood,[5,6] early abuse has been demonstrated to have a powerful effect on adult health. Much of the focus has been on mental health, with particularly strong associations occurring with depression and anxiety.[7,8] The prevalence of early abuse has also been associated with obesity,[9] impaired physical health,[10,11] and health adverse behaviors, such as cigarette smoking and substance abuse.[12,13] The prevalence of child maltreatment is higher in persons with chronic pain conditions, although the size of the effect is a matter of debate.[14,15]

A number of population[16-18] and practice-based studies[8,19] have demonstrated an association of childhood abuse and headache, but there remains a paucity of data specific to migraine, using either physician diagnosis or validated diagnostic instruments with standardized criteria.[20] Recent headache clinic-based studies have reported increased frequency[21,22] and disability[22] of headache associated with physical and sexual abuse, but the questionnaire tools were not validated, and the specific impact of childhood neglect, and emotional abuse were not considered. Emotional abuse, a more elusive and insidious form of maltreatment than physical and sexual abuse, has received little scientific and public attention, and only recently is being recognized as a distinct form of maltreatment.[4] Considered a reflection of a disordered family environment, emotional abuse may have more lasting consequences than physical or sexual abuse, and can be particularly deleterious when combined with other abuse types.[23]

The purpose of this multicenter headache clinic survey study was to evaluate in men and women with migraine the frequency of different types of abuse, to assess their associations with migraine characteristics, and with comorbid mental and physical health conditions. In this first paper we examine childhood maltreatment prevalence and severity, interrelatedness of abuse types, as well as the rates of revictimization in adulthood. We report on the relationship of abuse with demographic variables, and confounding conditions, including body mass index (BMI), substance abuse, depression, and anxiety.

METHODS

Patient Selection.—This multicenter study was conducted by the members of the Women's Issues Section research consortium of the American Headache Society. A detailed explanation of patient recruitment, data collection, and some of the measures of this study were reported previously.[24] The recruitment of the cross-sectional survey of headache clinic patients occurred between February 2006 and June 2008 at 11 outpatient headache centers, after each center separately obtained approval from the Institutional Review Boards (IRB). Participants were examined by a headache specialist, who determined the patient's eligibility and obtained informed consent per the IRB protocol. Participation in the study was offered to consecutive patients, men or

women, using the following inclusion criteria: primary headache disorder as defined by the International Classification of Headache Disorders (ICHD)-2 criteria,[20] 18 years and older, willingness to complete a self-administered electronic questionnaire on a Personal Digital Assistant (PDA), eg, the Palm® handheld device. Exclusion criteria included the following: not physically well enough to complete an electronic questionnaire on a PDA, and not literate in English. The physician or the study personnel provided the subjects with verbal instructions and a brief demonstration of the technology to complete the survey.

Data Collection.—The electronic questionnaire used in this study was designed with Pendragon® Forms 5.0 computer software (Pendragon Software Corporation, Libertyville, IL, USA). The questionnaire collected information on sociodemographic variables (age, gender, race, household income, highest educational level attained, BMI, caffeine use, smoking status, substance abuse), current depression and anxiety, childhood abuse and neglect, and abuse in adulthood. Questions on substance abuse inquired about the abuse of prescription medications, alcohol, and illegal drugs. Participants were asked if they currently abused these substances or if abuse occurred in the past.

Table 1 provides the demographic details of the study population. Surveys were collected from 11 centers, which recruited participants during periods ranging from 6 weeks to 12 months. Analysis in this study includes all persons with migraine with aura, and migraine without aura, whether episodic or chronic. Diagnosis of probable medication overuse was recorded in 6% (n = 84) of the total sample with migraine and these individuals were also included in the analysis. In <1% of the surveys, information on height or weight was missing and BMI could not be calculated. Physician-determined data for all participants included the primary headache diagnoses based on the ICHD-2 criteria and the average monthly headache frequency over the prior 3 months.

MEASURES

Abuse and Neglect in Childhood.—In this study, maltreatment exposure occurring in childhood was assessed using the Childhood Trauma Questionnaire

Table 1.—Characteristics of the Study Population

	n (%)†
International Headache Society Diagnosis (ICHD-II)	
Migraine (1.0)	1348 (100)
Migraine with aura (1.2)	543 (40)
Migraine without aura (1.1)	805 (60)
Headache frequency (Mean ± SE)	14 ± 0.7
≥15 days/month	458 (34)
Age, years (Mean ± SE)	41 ± 0.5
Gender	
Male : Female	161 (12): 1187 (88)
Race	
Caucasian	1202 (89)
African American	71 (5)
Hispanic	37 (3)
Asian	20 (2)
Other	18 (1)
Education	
Not a high school graduate	38 (3)
High school graduate	328 (24)
Undergraduate	223 (17)
College graduate	498 (37)
Post graduate	261 (19)
Household Income	
<$20,000	134 (10)
$20,000-$50,000	326 (24)
$50,000-$100,000	497 (37)
>$100,000	391 (29)

†Values may not add to the total due to missing/unavailable information (see methods).
SE = standard error of mean.

(CTQ).[25] This questionnaire is a 28-item self-reported quantitative measure that provides brief, reliable, and valid screening for history of childhood abuse and neglect. In both clinical and community samples, CTQ has demonstrated good internal consistency (0.63-0.95) and criterion-related validity (0.50-0.75).[26] High convergent validity with therapist assessed abuse histories is also reported. It measures 5 categories of childhood maltreatment that include physical, sexual, and emotional abuse, and physical, and emotional neglect. Each of the 5 categories of maltreatment is measured using 5 items. Responses to each of the items is recorded on a 5-point Likert scale as "never true," "rarely true," "sometimes true," "often true," and "very often true." Quantitative score for each maltreatment category is computed and based on a validated cut-off score, severity of each category of maltreatment is quantified as "none or minimal,"

"low to moderate," "moderate to severe," and "severe to extreme." In this study, to capture cases with even the lowest severity of childhood trauma, cut-off scores for "low to moderate" exposure was used to classify study participants as positive for history of specific trauma category. The CTQ cut-off scores were as follows: physical abuse ≥8, sexual abuse ≥6, emotional abuse ≥9, physical neglect ≥8, emotional neglect ≥10. The reported sensitivity and specificity for these cut-off scores reached 89% and 97% respectively.

Abuse in Adulthood.—Information on physical abuse occurring in adulthood was collected using the question "After the age of 18 years, have you ever been hit, punched, slapped, kicked, bitten, grabbed, choked by a family member, current or former spouse, or significant other at any point in the past?," and for sexual abuse in adulthood using the question "After the age of 18 years, have you ever been sexually assaulted or abused?" Those who responded affirmatively were asked to report the age at occurrence of abuse.

Depression.—The Patient Health Questionnaire (PHQ-9) is a self-reported diagnostic and severity measure for current depression (in the prior 2 weeks) using criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM) IV.[27] PHQ-9 scores of ≥15 are associated with 68% sensitivity and 95% specificity in diagnosing "major depressive disorder" using the DSM-IV criteria.[28] PHQ-9 scores between 10 and 14 are associated with "other depressive disorder" and scores ≤10 represented "no depressive disorder." Other depressive disorder is defined as a depressive disorder whose criteria encompass fewer symptoms than are required for any specific DSM-IV diagnoses. For the analytical purpose of this study, participants with PHQ-9 score >10 were considered positive for current depression.

Anxiety.—The Beck Anxiety Inventory (BAI) was used to assess severity of current anxiety.[29] The questionnaire consists of both physiological and cognitive components of anxiety addressed in the 21 items describing subjective, somatic, or panic-related symptoms. A person is asked to rate how much he or she has been bothered by each symptom over the past week on a 4-point scale. Total scores range from 0 to 63 with 4 levels of anxiety: minimal (0-7), mild (8-15), moderate (16-25), and severe (26-63). For the analytical purpose of this study, participants with BAI score ≥8 were considered positive for current anxiety.

Statistical Analysis.—All statistical analyses in this study were performed using SAS version 9.1 (SAS Institute, Inc., Cary, NC, USA). To account for the survey design and unforeseen differences between centers, the data were weighted and appropriate analytical procedures in SAS such as surveymeans, surveyfreq, and surveylogistic were used for the weighted data. The weight was estimated in proportion to the number of surveys completed at each of the centers. A correction to the *P* value for multiple testing was applied using the Bonferroni method as appropriate. Rao-Scott chi-square analysis was performed to test the association of childhood abuse and neglect with other categorical variables. Logistic regression models (GLOGIT) was used to examine the relationship between childhood abuse and neglect and the variables of interest that included obesity, smoking status, substance abuse, depression, and anxiety. All models were adjusted for age, gender, race, education, and household income. Adjusted odds ratios (ORs) and 95% confidence intervals (CI) were used to measure the strength of the relationships, and the significance of the OR's was examined using the Wald's χ^2 test statistic.

RESULTS

A total of 1348 patients diagnosed with migraine completed the surveys. The ICHD-2 diagnosis and the demographic characteristics of the respondents are presented in Table 1. Childhood trauma either abuse or neglect was reported by 58% of the study population (n = 781). Table 2 presents the average score derived from the CTQ for each category of childhood trauma and also the frequencies by severity of childhood trauma. Among the 5 categories of childhood trauma, emotional abuse was reported most commonly (38%) and in higher severity (12% with "severe to extreme" abuse).

Significant linear correlations were noted between the CTQ scores of all 5 categories of childhood maltreatment (*P* < .0001 for all possible bivariate combinations). The strongest of the correlations

Table 2.—Childhood Abuse and Neglect

	Physical abuse	Sexual abuse	Emotional abuse	Physical neglect	Emotional neglect
CTQ score					
Mean ± SE	6.81 ± 3.1	6.68 ± 3.9	8.86 ± 4.8	6.53 ± 2.6	9.48 ± 5.0
Range	5-24	5-25	5-25	5-22	5-25
Severity, n (%)					
None/minimal	1070 (79)	1010 (75)	841 (62)	1057 (78.4)	837 (62)
Low to moderate	109 (8)	104 (8)	238 (18)	146 (11)	258 (19)
Moderate to severe	79 (6)	113 (8)	107 (8)	86 (6.3)	120 (9)
Severe to extreme	90 (7)	121 (9)	162 (12)	59 (4.3)	133 (10)

CTQ = Childhood Trauma Questionnaire; SE = standard error of mean.

was observed between emotional abuse and emotional neglect (r = 0.75) followed by the correlation between emotional and physical neglects (r = 0.64). The weakest correlations were observed between sexual abuse and the other childhood trauma categories [physical neglect (r = 0.33), emotional neglect (r = 0.34), physical abuse (r = 0.35), emotional abuse (r = 0.38)].

Prevalence of childhood abuse and neglect, and the significant overlap between each of the categories is shown in the Figure. Exposure to childhood maltreatment was considered positive if CTQ score was above the cut-off for "low-moderate" trauma. About 9% (n = 117) of the study population reported all 3 categories of childhood abuse (physical, sexual, and emotional), 10% (n = 136) reported physical and sexual abuse, and 17% (n = 235) reported physical and emotional neglect. The percentage of study participants within each category of childhood trauma that also reported other forms of abuse or neglect ranged between 40% and 81%. Frequencies of emotional abuse and emotional neglect were highest in all the other categories of childhood maltreatment.
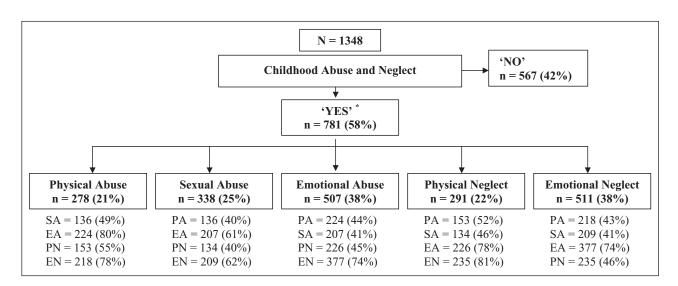

Figure.—Relationship between categories of childhood abuse and neglect. *Number (percentage) of study participants reporting childhood abuse and neglect. Exposure based on CTQ cut-off scores (physical abuse ≥8, sexual abuse ≥6, emotional abuse ≥9, physical neglect ≥8, emotional neglect ≥10). (PA, physical abuse; SA, sexual abuse; EA, emotional abuse; PN, physical neglect; EN, emotional neglect).

Over 33% of the participants reported abuse in adulthood, predominantly (70%) between the ages of 18 and 30 years old. Physical abuse in adulthood was reported by 20% (n = 292), sexual abuse by 22% (n = 272), physical or sexual by 24% (n = 321), and both physical and sexual by 9% (n = 118) of the study population. About three-quarters of those reporting abuse in adulthood reported maltreatment in childhood, most commonly emotional abuse. Table 3 demonstrates the association between abuse and neglect occurring in childhood with abuse occurring in adulthood. For example, 56% of those reporting physical abuse and 61% of those reporting sexual abuse in adulthood, also reported childhood emotional abuse. From an alternate perspective, of those reporting childhood maltreatment, 43% were revictimized in adulthood.

Prevalence of childhood maltreatment types did not differ according to race or adult household income. Emotional abuse ($\chi^2 = 8.04$, $P = .045$), physical neglect ($\chi^2 = 12.3$, $P = .006$), and emotional neglect ($\chi^2 = 10.1$, $P = .018$) were all related to lower level of education. Table 4 presents the sociodemographic characteristics of migraineurs that reported childhood maltreatment. About 55% of the study population (n = 741) was over 40 years of age. Reports of physical abuse ($\chi^2 = 8.07$, $P = .0445$), physical neglect ($\chi^2 = 16.39$, $P = .0009$), and emotional neglect ($\chi^2 = 14.24$, $P = .002$) were more common in the older age groups, particularly above 40 years. Sexual ($\chi^2 = 11.42$, $P = .0007$) and emotional abuse ($\chi^2 = 5.8$, $P = .016$) was more commonly reported in women. About 30% (n = 399) of the study population were obese with a BMI $\geq 30 \, \text{kg/m}^2$. Obesity was more common in those with history of neglect, physical and emotional, and emotional abuse. Current depression was noted in 28% (n = 381) and current anxiety in 56% (n = 761) of the study population, and more prevalent in those with childhood maltreatment.

Table 5 presents the results from adjusted logistic regression models for the associations of childhood trauma categories with obesity, smoking status, substance abuse, depression, and anxiety. All models were adjusted for age, gender, race, education, household income levels, obesity (BMI $\geq 30 \, \text{kg/m}^2$), smoking status, and substance abuse. The models

Table 3.—Association of Childhood Abuse and Neglect With Abuse in Adulthood

Abuse in adulthood (>18 years)	Childhood abuse and neglect									
	Physical abuse		Sexual abuse		Emotional abuse		Physical neglect		Emotional neglect	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Physical abuse, n = 292	109 (37) $\chi^2 = 33.04$, $P < .0001$	183 (63)	121 (41) $\chi^2 = 17.43$, $P < .0001$	171 (59)	164 (56) $\chi^2 = 16.71$, $P < .0001$	128 (44)	95 (33) $\chi^2 = 5.39$, $P = .020$	197 (67)	153 (52) $\chi^2 = 13.32$, $P = .0003$	139 (48)
Sexual abuse, n = 272	99 (36) $\chi^2 = 44.65$, $P < .0001$	173 (64)	125 (46) $\chi^2 = 43.00$, $P < .0001$	147 (54)	165 (61) $\chi^2 = 54.42$, $P < .0001$	107 (39)	86 (32) $\chi^2 = 8.85$, $P = .002$	186 (68)	143 (53) $\chi^2 = 173.74$, $P < .0001$	129 (47)

Table 4.—Characteristics Associated With Childhood Abuse and Neglect in the Study Population†

	Physical abuse		Sexual abuse		Emotional abuse		Physical neglect		Emotional neglect	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Age (mean ± SE)	43 ± 0.8*	40 ± 0.5	42 ± 1.1	41 ± 0.5	42 ± 0.8	40 ± 0.6	43 ± 0.9*	40 ± 0.6	43 ± 0.7**	39 ± 0.6
18-30 years	40 (14)	239 (22)	45 (13)	234 (23)	82 (16)	197 (23)	36 (12)	243 (23)	67 (13)	212 (25)
31-40 years	67 (24)	261 (24)	98 (29)	230 (23)	129 (25)	199 (24)	82 (28)	246 (23)	122 (24)	206 (25)
41-50 years	97 (35)	318 (30)	116 (34)	299 (30)	170 (34)	245 (29)	91 (31)	324 (31)	177 (35)	238 (28)
≥51 years	74 (27)***	252 (24)	79 (23)	247 (24)	126 (25)	200 (24)	82 (28)****	244 (23)	145 (28)**	181 (22)
Gender (female)	235 (84)	952 (89)	314 (93)**	873 (86)	455 (90)***	732 (87)	251 (86)	936 (89)	444 (87)	743 (89)
BMI (mean ± SE)	28.5 ± 0.5	27.6 ± 0.3	28.2 ± 0.5	27.7 ± 0.3	28.4 ± 0.4	27.4 ± 0.4	28.9 ± 0.5***	27.5 ± 0.3	28.2 ± 0.4	27.5 ± 0.4
Obesity	101 (36)	298 (28)	120 (35)	279 (27)	173 (34)***	226 (27)	99 (34)*	300 (28)	174 (34)***	225 (27)
Smoking										
Ever	127 (46)***	375 (35)	162 (48)**	340 (34)	219 (43)	283 (34)	126 (43)	376 (36)	230 (45)***	272 (32)
Current	36 (13)	92 (9)	45 (13)	83 (8)	67 (13)*	61 (7)	36 (12)	92 (9)	58 (11)	70 (8)
Substance abuse										
Ever	85 (31)****	157 (15)	97 (29)****	145 (15)	128 (26)	114 (14)	84 (30)***	158 (15)	136 (27)**	106 (13)
Current	21 (8)	45 (4)	24 (7)	42 (4)	31 (6)	35 (4)	19 (7)	47 (4)	34 (7)	32 (4)
Current depression	110 (39)***	271 (25)	132 (39)***	249 (25)	205 (40)****	176 (21)	121 (42)*	260 (25)	201 (39)****	180 (21)
Current anxiety	194 (70)****	567 (53)	238 (70)****	523 (52)	370 (73)****	391 (46)	213 (73)*	548 (52)	353 (69)****	408 (49)

*$P < .01$, **$P < .001$, ***$P < .05$, ****$P < .0001$.

†Values reported are number (percentage) in each group of childhood trauma.

SE = standard error of mean.

Table 5.—Adjusted Logistic Regression Analysis for Association of Childhood Abuse and Neglect†

	Physical abuse	Sexual abuse	Emotional abuse	Physical neglect	Emotional neglect
No abuse and neglect	1.00	1.00	1.00	1.00	1.00
Obesity‡	1.39 (0.89-2.14)	1.23 (0.77-1.97)	1.35 (0.88-2.05)	1.59 (0.98-2.59)	1.33 (0.87-2.03)
Smoking‡					
Ever	1.52 (0.99-2.34)	1.79 (1.13-2.83)	1.23 (0.81-1.86)	1.08 (0.68-1.71)	1.29 (0.87-1.91)
Current	1.92 (0.97-3.75)	2.00 (0.99-4.03)	1.85 (0.97-3.53)	1.13 (0.56-2.27)	1.53 (0.82-2.85)
Substance abuse‡					
Ever	2.64 (1.55-4.49)§	2.58 (1.53-4.36)§	1.51 (0.93-2.47)	2.02 (1.20-3.39)§	1.97 (1.22-3.17)§
Current	1.04 (0.44-2.43)	0.98 (0.42-2.29)	0.70 (0.31-1.57)	0.75 (0.33-1.71)	0.92 (0.41-2.05)
Depression	1.94 (1.25-3.03)§	1.83 (1.18-2.83)§	2.12 (1.41-3.19)§	2.12 (1.34-3.34)§	1.94 (1.29-2.92)§
Anxiety	3.02 (2.00-4.55)§	3.04 (1.95-4.74)§	2.98 (2.01-4.41)§	2.76 (1.68-4.52)§	2.57 (1.75-3.78)§

Values reported are adjusted odds ratios (95% confidence intervals) with group reporting none/minimal childhood trauma for all categories of abuse and neglect (n = 567) as the referent.
†All models were adjusted for age, gender, race, education, and household income.
‡Models additionally adjusted for current depression and anxiety.
§Significant after Bonferroni correction for multiple hypotheses testing ($P < .01$).

were additionally adjusted for current depression and anxiety. Odds ratios for the relationships between particular childhood abuse and neglect (compared with those without exposure to any trauma category) and the variables of interest are reported in Table 5. Obesity, current smoking, and current substance abuse were not associated with any of the childhood trauma categories. Prior substance abuse (which included medication overuse) was, however, associated with physical, sexual abuse ($P = .0004$ for both), and physical ($P = .007$), emotional neglect ($P = .005$). Current depression was associated with physical ($P = .003$), sexual ($P = .007$), and emotional abuse ($P < .001$), and physical and emotional neglects ($P = .001$ for both). Current anxiety was associated with all childhood abuse and neglect categories ($P < .001$ for all).

A graded relationship of childhood maltreatment was observed with current depression and anxiety (Table 6). Eighteen percent of the study population reported 1, 15% reported 2, and 25% reported 3 or more categories of childhood trauma. With an increase in the number of maltreatment types, the likelihood of current depression, anxiety, or both, also increased significantly. For migraineurs reporting 3 or more types of maltreatment in childhood there was a 4-fold prevalence of depression and anxiety compared with those not reporting maltreatment.

Prevalence of self-reported physician diagnosis of depression and anxiety was also higher in persons reporting childhood maltreatment. In this study, 41% (n = 538) had been diagnosed with depression and 31% (n = 410) with anxiety. Diagnosis of both depression and anxiety were significantly higher in migraineurs reporting childhood abuse and neglect ($P < .001$ for all categories of abuse and neglect). In adjusted logistic regression analysis, migraineurs reporting 3 or more types of maltreatment were more likely to have had a physician-diagnosis of both depression and anxiety in the past (OR = 6.91, 95% CI: 3.97-12.03, $P < .001$), or either depression or anxiety (OR = 3.66, 95% CI: 2.28-5.88).

DISCUSSION

This is the largest study to date of abuse in a migraine clinic population. We made the following observations: (1) childhood maltreatment, especially emotional abuse and neglect, was reported by a majority of participants, (2) there is extensive overlap of maltreatment types, with emotional abuse and neglect being reported in the majority of those recounting physical and sexual abuse history, (3) in those reporting childhood maltreatment almost half reported physical or sexual abuse in adulthood, (4) childhood abuse is strongly associated with current

Table 6.—Graded Relationship of Childhood Abuse and Neglect With Current Depression and Anxiety

	Number of childhood abuse and neglect categories			
	None (n = 567)	One (n = 248)	Two (n = 202)	Three or more (n = 331)
Model 1				
Depression	18%	25%	35%	44%
	1.00	1.22 (0.73-2.01)	1.86 (1.10-3.14)†	2.11 (1.36-3.27)†
Model 2				
Anxiety	43%	54%	65%	76%
	1.00	1.19 (0.79-1.79)	2.27 (1.43-3.60)†	3.56 (2.17-5.82)†
Model 3				
Depression or anxiety	28%	34%	33%	38%
	1.00	1.24 (0.79-1.97)	1.94 (1.15-3.21)†	3.81 (2.15-6.76)
Depression and	16%	22%	33%	41%
anxiety	1.00	1.25 (0.72-2.18)	2.60 (1.44-4.70)†	4.07 (2.26-7.33)†

Values reported are percentage with depression and/or anxiety in each group and adjusted odds ratios and 95% confidence intervals for the association with number of childhood abuse and neglect categories.
†Significant after Bonferroni correction for multiple hypotheses testing ($P < .025$).

depression and anxiety, and the relationship strengthens with the number of maltreatment types.

The prevalence of physical and sexual abuse in our population of men and women with migraine is similar to that reported in the literature for clinic and community populations[4,30] and to what we reported in an earlier study in a female migraine clinic population.[22] We found, however, that the prevalence of emotional abuse in our population was substantially higher than in other clinic-based[30] and community studies,[4] and more prevalent in women, as has been previously reported.[4] Multicategory abuse was common; of the 58% of participants reporting any childhood maltreatment, 40% reported experiencing at least 2 types of maltreatment. The overlap of physical and sexual abuse was considerably higher than in a population sample with face-to-face interview using a different survey tool,[31] and was most often associated with emotional maltreatment. All childhood maltreatment types are linked to revictimization in adulthood, predominantly under the age of 30 years.

The nature of the relationship between childhood abuse and adult migraine remains speculative. One hypothesis is that abuse predisposes to conditions that in turn influence migraine prevalence. Without a non-headache control group, our study cannot support or refute a relationship of headache and abuse. However, similar to reports from large general population-based studies,[7-10,13] we identified a number of factors associated with a history of childhood maltreatment in migraineurs, including lower educational status, obesity, substance abuse, depression, and anxiety. These factors have also been associated with migraine, particularly chronic migraine.[32,33] Our finding that in a migraine population, all types of maltreatment are associated with major depression and anxiety raises the possibility that psychiatric illness mediates the link of maltreatment and migraine.

Another hypothesis is that abuse independently impacts migraine. A recent population study of over 32,000 adolescents found that in the migraine subjects without a strong genetic predisposition, low household income was a marker of increased prevalence, suggesting a role for environmental risk factors.[34] It is well established that abuse is more prevalent in low-income households.[1,2] The social causation theory is strengthened by the vast scientific work being conducted on the neurobiological effects of early maltreatment, which range from neurohumoral to structural and functional.[35-37]

The evaluation and diagnosis by headache specialists according to ICHD-2 criteria is a strength of this study. The geographic diversity and inclusion of both men and women allows some generalization to other headache clinic populations. In our evaluation of the associations of abuse with obesity, smoking, and substance abuse, all of which may influence migraine, we were able to control for major depression and anxiety, common confounders in this population. This study adds new insights regarding abuse prevalence in migraine, but there are certain limitations. Potential participants were informed that there were questions regarding domestic violence, and it is possible that persons not wishing to answer such questions declined participation, creating a selection bias. The overall number of invitees who declined is estimated at <5%. Also inherent in the retrospective self-report design of our study is reporting bias. Studies suggest, however, that it is more common to deny abuse than to state that it happened when in fact it did not.[38] While it is true that retrospective self-report studies constitute a vast majority of the literature on effects of early abuse on adults, prospective studies confirming the impact are emerging.[39,40] One prospective study in abused and neglected children with a matched cohort found that at 20 years after abuse, women had poorer health.[40] Another concern in retrospective, self-report studies is recall bias. Counter to our expectation, we found childhood abuse to be more commonly reported by older individuals than their younger counterparts, and thus we controlled for age in our analysis. It is possible that this reflects a downward trend in abuse over the last 2 decades.[1]

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