Childhood Abuse, Intimate Partner Violence and Risk of Migraine among Pregnant Women: An Epidemiologic Study

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Abstract

Background—Childhood abuse and intimate partner violence have each been associated with migraine headaches in previous studies, but these associations have not been explored among pregnant women.

Objective—To examine the independent and joint associations of childhood abuse and intimate partner violence with migraine among pregnant women.

Methods—A cross-sectional study was conducted among a cohort of 2,970 pregnant women attending prenatal clinics in Lima, Peru. History of childhood abuse (i.e., physical or sexual abuse) was assessed using the Childhood Physical and Sexual Abuse Questionnaire. Intimate partner violence (IPV) was assessed using the World Health Organization questionnaire. Migraine classification (including migraine and probable migraine) was based on International Classification of Headache Disorders (ICHD)-III beta criteria. Multivariable logistic regression analyses were performed to estimate odd ratios (OR) and 95% confidence intervals (95% CI).

Results—The prevalence of any migraine was 33.5% while approximately 70% of participants reported a history of childhood abuse and 36.7% a history of IPV. Women with a history of any childhood abuse had a 38% increased odds of any migraine compared to women with no history of childhood abuse (OR=1.38; 95% CI 1.15-1.64). The odds of migraine increased with increasing numbers of experienced childhood abuse events ($P_{trend} <0.001$). Additionally, after adjusting for confounders women with a history of IPV had a 43% increased odds of any migraine as compared to women without intimate partner violence (OR=1.43; 95%CI 1.02-2.02). Women with a joint positive history of childhood abuse and IPV as compared with the reference group, had a 88% increased odds of migraine (aOR=1.88, 95%CI: 1.51-2.35).

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Conclusion—Childhood abuse and IPV are associated with increased odds of migraine in pregnant women. Our findings highlight the importance of screening for abuse among pregnant migraineurs to help guide treatment strategies.

Introduction

Childhood abuse is a major global public health problem with serious adverse health and economic consequences across the life course [1-5]. According to a recent report by the Centers for Disease Control and Prevention (CDC), the cost of childhood abuse and other childhood adversities in the United States was estimated to be greater than $120 billion each year [6]. Epidemiologic studies have shown that exposure to childhood abuse is associated with a myriad of health outcomes including asthma [7], early age at menarche [8-10], sleep disturbances [10,11], chronic systemic inflammation [12], substance abuse [13], mood and anxiety disorders [14-16], suicidal behaviors [2], adulthood revictimization [16], preterm delivery [17] and premature mortality [18]. There is also a growing body of literature documenting associations of childhood abuse with migraine headaches [5,19-22]. Moreover, epidemiologic studies have shown that migraine, often debilitating neurologic disorder, is associated with an increased risk of adverse perinatal outcomes including preeclampsia [23], placental abruption [24], and preterm delivery [25]. However, to our knowledge, no prior published study has examined the relationship between childhood abuse and migraine in pregnancy.

Intimate partner violence (IPV), abuse directed towards women by their male partners, is another significant global public health problem with estimated prevalence ranging from 15% to 71%. [26-28] There is a well-established body of literature that documents the relationship between exposure to IPV and subsequent risk of women's physical and mental health, including preeclampsia, abnormal vaginal bleeding, spontaneous abortion or miscarriage [29-33], mood and anxiety disorders [34], hyperarousal and chronic stress [35]. While there is extensive research pertaining to risks of adverse mental, physical and reproductive health outcomes among pregnant women exposed to IPV, few investigators have explored the risk of migraine among victims of IPV [36,37]. Given (1) the existing gap in the literature; (2) the long-term consequences of childhood abuse; (3) the high prevalence of IPV; and (4) the adverse perinatal outcomes associated with migraine, we examined the independent and joint associations of history of childhood abuse and intimate partner violence with migraine among a well-characterized cohort of pregnant women in Peru. We reasoned that evaluation of associations of childhood abuse and IPV with migraine may add greater specificity to an existing literature focused on assessing risks of adverse perinatal risks among migraineurs with a history of childhood abuse and IPV. An understanding of these relationships is of particular interest among Peruvian women given the high burden of gender-based violence and associated adverse mental and physical health outcomes in this population.[10,38]

Methods

Study Population

The population for the present study was drawn from participants of Pregnancy Outcomes, Maternal and Infant Study (PrOMIS) Cohort. The PrOMIS study was designed to examine maternal social and behavioral risk factors of preterm birth and other adverse pregnancy outcomes among Peruvian women [10,11,16]. The study population consisted of women attending prenatal care clinics at the Instituto Nacional Materno Perinatal (INMP) in Lima, Peru. INMP is the primary reference establishment for maternal and perinatal care operated by the Ministry of Health of the Peruvian government. Women were eligible to be included in this study if they initiated prenatal care prior to 16 weeks gestation, were at least 18 years of age, and could read and speak Spanish. All participants provided written informed consent. Women were ineligible if they were younger than 18 years of age, did not speak and read Spanish, or had completed more than 16 weeks gestation. The eligibility criteria threshold of initiating prenatal care prior to the completion of 16 weeks gestation was set so as to mitigate concerns about reverse causality and recall bias while enrolling as study population that is sufficiently generalizable to the source population of women seeking care at the study site. Study procedures were approved by the institutional review boards of the INMP, Lima, Peru, and the Harvard T. H. Chan School of Public Health Boston, MA.

Analytical Population

Information was collected from participants enrolled in the PrOMIS Cohort Study between February 2012 and March 2014. During this period, 3,775 eligible women were approached, and 3,045 (80.7%) women completed the interview. A total of 89 women were excluded because of missing information for childhood abuse (69) or migraine status (20). A total of 2,970 women were included in the analysis. The excluded participants did not differ from the rest of the cohort with respect to sociodemographic or lifestyle characteristics.

Childhood Abuse Assessment

We used the Childhood Physical and Sexual Abuse Questionnaire to collect information regarding the participants' experiences with physical and sexual abuse in childhood [16,39]. We classified participants as having experienced childhood abuse before the age of 18 years if they reported that an older person touched them, or were made to touch someone else in a sexual way, or intercourse was attempted or completed (sexual abuse); or that they were hit, kicked, or beaten often and/or their life was seriously threatened (physical abuse). Participants who responded 'no' to all questions regarding sexual and physical abuse were categorized as 'no abuse'. Those responding 'yes' to only physical abuse questions were categorized as 'physical abuse only' and those responding 'yes' to only sexual abuse questions were categorized as 'sexual abuse only'. Those responding 'yes' to any physical abuse questions and 'yes' to any sexual abuse questions were categorized as having experienced 'both physical and sexual abuse'. Participants who responded 'yes' to any questions of physical abuse or 'yes' to any questions of sexual abuse or yes to both abuse types were categorized as having experienced 'any abuse'.

Intimate Partner Violence (IPV) Assessment

We assessed IPV exposures using questions adapted from the protocol of Demographic Health Survey Questionnaires and Modules: Domestic Violence Module [40] and the WHO Multi-Country Study on Violence Against Women [27]. Women were asked for a range of physical and/or sexual coercive acts used against them by a current or former spouse or intimate partner without their consent during their life. We classified participants as having experienced physical violence if they endorsed any of the following acts: being slapped, having her arms twisted or something thrown at her, being pushed or shoved, being hit, kicked, dragged or beaten up, being choked or burnt on purpose, or being threatened or hurt with a weapon (such as, gun, knife, or other object). Sexual violence was defined if participants endorsed any of the following: being physically forced to have sexual intercourse, having had unwanted sexual intercourse because of fear of what the partner might do, and being forced to perform other sexual acts that the respondent found degrading or humiliating. In this study, participants were categorized as having experienced any IPV if they experienced one or more acts of physical or sexual violence at any time from a current or former male partner.

Migraine Assessment

Migraine and probable migraine was classified by trained interviewers using a Spanish-language questionnaire, administered during early pregnancy, and based on the International Classification of Headache Disorders (ICHD)-III beta criteria [41]. In addition the combined group of women fulfilling either migraine or probable migraine were categorized as "any migraine".

Other Covariates

Participants completed a structured questionnaire to collect information on sociodemographic characteristics and lifetime intimate partner violence (IPV). Participants' age was categorized as 18-20, 20-29, 30-24, or 35 years. Other sociodemographic variables were categorized as follows: maternal ethnicity (mestizo vs. other); educational attainment (6, 7–12, and >12 years of education); marital status (married or living with partner vs. others); employment status (employed vs. not employed); access to basic foods (hard, not very hard); parity (nulliparous vs. multiparous); planned pregnancy (yes vs. no); gestational age at interview; and early pregnancy BMI (18.5, 18.5-24.9, 25- 29.9, 30 kg/m^2).

Statistical Analysis

Distributions of socio-demographic characteristics and reproductive history were examined according to history of childhood abuse. Characteristics were summarized using means (± standard deviation (SD)) for continuous variables and number (percent, %) for categorical variables. Chi-squared tests were used to evaluate distribution differences for categorical variables, and the one-way analysis of variance (ANOVA) was used to evaluate differences in means for continuous variables. Multivariable logistic regression procedures were used to estimate odds ratios (OR) and 95% confidence intervals (95% CI) of migraine in relation to childhood abuse. Potential confounders were considered *a priori* on the basis of the hypothesized relationship with childhood abuse and migraine. Multivariable logistic

regression models were adjusted for covariates including maternal age, ethnicity, and history of IPV. We examined the association between migraine and type of childhood abuse (i.e., no abuse, physical abuse only, sexual abuse only, physical and sexual abuse). Participants reporting no abuse served as the reference group. In multivariable logistic regression models, significance for monotonic trends in risk between odds of migraine and number of childhood abuse events were assessed by treating the number of childhood abuse events as a continuous variable. In addition, given evidence of high risks of IPV among women with a history of childhood abuse [16,42,43], we examined the independent and joint effects of childhood abuse and IPV exposure on the risk of migraine. For these analyses we categorized participants into four groups based on combinations of childhood abuse and IPV. The four resulting categories were as follows: (1) no childhood abuse and no IPV, (2) childhood abuse only, (3) IPV only, and (4) childhood abuse and IPV. Participants with no childhood abuse and no IPV comprised the reference group, against which participants in the other three categories were compared. All reported p-values are two-sided and have a statistical significance set at 0.05. All analyses were computed using SAS 9.4 (SAS Institute, Cary, NC, USA) and Stata version 13.0 (StataCorp, College Station, TX, USA).

Results

Sociodemographic and Participant Characteristics

Socio-demographic, lifestyle and reproductive characteristics of the study sample are summarized in Table 1. Pregnant women between the ages of 18 and 35 years were included in the analysis. The majority of the cohort was married or living with a partner (80.7%), unemployed (53.9%), and with less than 12 years of education (54.7%).

The prevalence of any migraine was 33.5% (migraine 12.5%; probable migraine 21%). A total of 71.8% of the cohort experienced childhood abuse and 36.8% IPV. Women with a positive history of childhood abuse reported a mean of 2 abuse events (SD=1.8). Of the participants with childhood abuse, 38.7% reported childhood physical abuse only, 7.8% reported sexual childhood abuse only; and 25.3% reported both physical and sexual abuse. Age, access to basic foods, parity, and exposure to IPV were statistically significantly associated with childhood abuse (Table 1).

Childhood Abuse and Migraine

A history of childhood abuse was statistically significantly associated with the migraine in this study cohort (Table 2). After adjusting for confounders, women who experienced any childhood abuse had 1.38-fold increased odds of migraine (aOR=1.38; 95% CI 1.16-1.64) as compared to women with no history of childhood abuse. Women who experienced both childhood physical and sexual abuse had 1.71-fold increased odds of migraine (aOR=1.71; 95% CI 1.34-2.10) compared to women with no abuse history. These associations remained statistically significant even after adjusting for lifetime IPV experiences. Women who experienced childhood sexual abuse only (aOR=1.24; 95% CI 0.98-1.68) or childhood physical abuse only (aOR=1.22; 95% CI 1.01-1.48) had increased odds of migraine, although statistical significance was not achieved for sexual abuse only.

There was a strong positive linear relationship between odds of migraine with the number of childhood abuse events (P_{trend}<0.001) (Table 2 and Figure 1). Compared with women who experienced no abuse during childhood, those who experienced six or more childhood abuses had a 2.1-fold increased odds of migraine (aOR=2.14; 95%CI 1.50-3.06).

Intimate Partner Violence (IPV) and Migraine

A history of IPV was also statistically significantly associated with migraine in this cohort (Table 2). After adjusting for confounders, women who experienced any childhood abuse had 1.52-fold increased odds of migraine (aOR=1.52; 95% CI 1.29-1.78) as compared to women with no history of IPV; and this association remained significant even after adjusting for history of childhood abuse (OR=1.46; 95% CI 1.25-1.72).

Independent and Joint Effects of Childhood Abuse and IPV

Finally, we explored the independent and joint effect of history of childhood abuse and experiences of IPV with the odds of migraine. As compared to the reference group (women with no history of childhood abuse and IPV)), women who experienced childhood abuse alone (i.e., no IPV) had 1.28-fold elevated odds of migraine (aOR=1.28, 95% CI 1.03-1.58). The corresponding odds of migraine for women who reported IPV exposure alone (i.e., no childhood abuse) was 1.43 (aOR=1.43, 95% CI 1.02-2.02). Women with a joint positive history of childhood abuse and IPV, as compared with the reference group, had 1.88-fold increased odds of migraine (aOR=1.88, 95%CI: 1.51-2.35).

Discussion

To our knowledge, this is the first study to examine the relationship between history of childhood abuse and migraine among pregnant women. Childhood abuse was reported by a majority of participants (71.7%), and among those with a history of child abuse. Women who reported any childhood abuse had a 38% increased odds of migraine compared to women with no history of childhood abuse. Furthermore, the odds of migraine also increased with increased number of childhood abuse events experienced. Likewise, after adjusting for confounders women with a history of IPV had a 43% increased odds of any migraine as compared to women without history of IPV. Furthermore, compared with the reference group, women with a joint positive history of childhood abuse and IPV had 88% increased odds of migraine.

Our results are consistent with prior studies conducted among non-pregnant women and men [37,44,45]. In a recent study by Brennenstuhl et al. [45], women who reported childhood physical abuse (OR=1.61; 95% CI 1.42-1.83), childhood sexual abuse (OR=1.32; 95% CI 1.11-1.57) and parental domestic violence (OR=1.64; 95% CI 1.39-1.93) had increased odds of migraine compared to those without a history of abuse [45]. Other investigators have reported similar findings [21]. We found that women who experienced six or more childhood abuse events had 2.14-fold increased odds (aOR=2.14; 95% CI 1.50-3.06) of migraine compared with women who experienced no childhood abuse. Others have reported similar increased migraine risk with increasing numbers of childhood abuse events studies of men and non-pregnant women [44-46]. For example, Brennenstuhl and Fuller-Thomson, in

their study of Canadians, found that experiences of three or more adverse childhood experiences was associated with increased odds of migraine in women (OR=2.82;95%CI: 2.25-3.60) and men (OR=3.26;95%CI: 2.09-5.07) [45]. Our study results showing women who experienced IPV had increased odds of migraine are also consistent with prior studies. For instance, Domino and Haber [47] in their study of community-based survey found that women who experienced adult physical violence had increased odds (OR=1.62, 95% CI 1.07–2.70) of headaches/migraine. Similarly Romans *et al.* [48] in New Zealand examined physical and/or sexual violence history and chronic headache, reported headache pain developed in all the abused women after trauma began. Finally, Cripe *et al.* [36] in a Peruvian study found that compared with pregnant women without a history of IPV, women with experiences of IPV were associated with 1.44-fold increased odds (aOR=1.44, 95% CI 1.19–1.75) of any migraine.

Biological mechanisms underlying consistently observed statistical associations of childhood abuse and IPV with migraine have not been fully examined. However, neurodevelopmental and neurobiological changes secondary to abuse experiences have been posited [5]. For example, Teicher et al have hypothesized that early life trauma leads to reduced size of the mid-portions of the corpus callosum and attenuated development of the left neocortex, hippocampus, and amygdala [49]. Furthermore, investigators have noted that early life traumatic exposures such as sexual and physical abuse are associated with long-term changes in neural circuits involved in emotional learning [46]. Early life traumatic experiences have been shown to activate the hypothalamic-pituitary-adrenal (HPA) axis and lead to increased synthesis and release of corticotrophin releasing hormone (CRH) from the hippocampus. For example, authors have noted that childhood abuse may cause increased expression of CRH receptors in the amygdala, known to be involved in threat detection and response [46], thus may contribute to migraine. Another potential explanation is that childhood abuse predisposes to conditions such as obesity, depression and anxiety that in turn influence migraine [22].

The present study has several strengths, namely the large sample size and the high prevalence of childhood abuse and IPV, giving us ample statistical power to study the associations of interest. We employed a rigorous analytic approach that accounted for potential confounding socio-demographic factors as well as experiences of adulthood abuse. However, some important limitations should be considered when interpreting our findings. The first primary limitation is experience of childhood abuse and IPV were assessed based on self-report in this cross-sectional study. Therefore, these measures may be subjected to non-systematic errors in recall, as well as systematic non-disclosure leading to misclassification. Investigators have noted that individuals are likely to minimize experiences of past abuse rather than suggest that they had experienced abuse in their lifetime [50]. Such errors in recall may have led to an underestimation of reported odds ratios. To help mitigate the likelihood of systematic reporting errors, well-trained interviewers used a standard questionnaire to collect information from all study participants. [39] In addition, neither the interviewers nor study participants were aware of any of the specific study hypotheses. Second, migraine diagnosis was made based on information collected using a well-established structured questionnaire based on ICHD-III criteria [41]. Use of structured interviews is the most feasible method of data collection for large-scale

epidemiologic studies. Studies that systematically use screening and confirmatory diagnostic evaluations will attenuate greatly concerns about misclassification of migraine diagnoses in epidemiological studies. We were also unable to differentiate migraineurs on the basis of features such as migraine with aura, migraine frequency and timing of most recent attacks. Finally although we used multivariable logistic regression procedures to adjust for putative confounders, we cannot exclude the possibility of residual confounding.

In conclusion, our results indicate that childhood abuse and IPV are highly prevalent and important risk factors for migraine. These findings have important clinical and public health implications. First, clinicians may consider inquiring women about history of abuse during prenatal visits and appropriately refer them to intervention programs. Second, evidence-based public health efforts aimed at preventing childhood and adulthood abuse, identifying women with a history of abuse and providing assistance with management and ongoing care are urgently needed. Finally, development and rigorous evaluation of targeted and cross-culturally acceptable trauma-informed care for pregnant migraineurs who have been victimized by physical and sexual violence is warranted.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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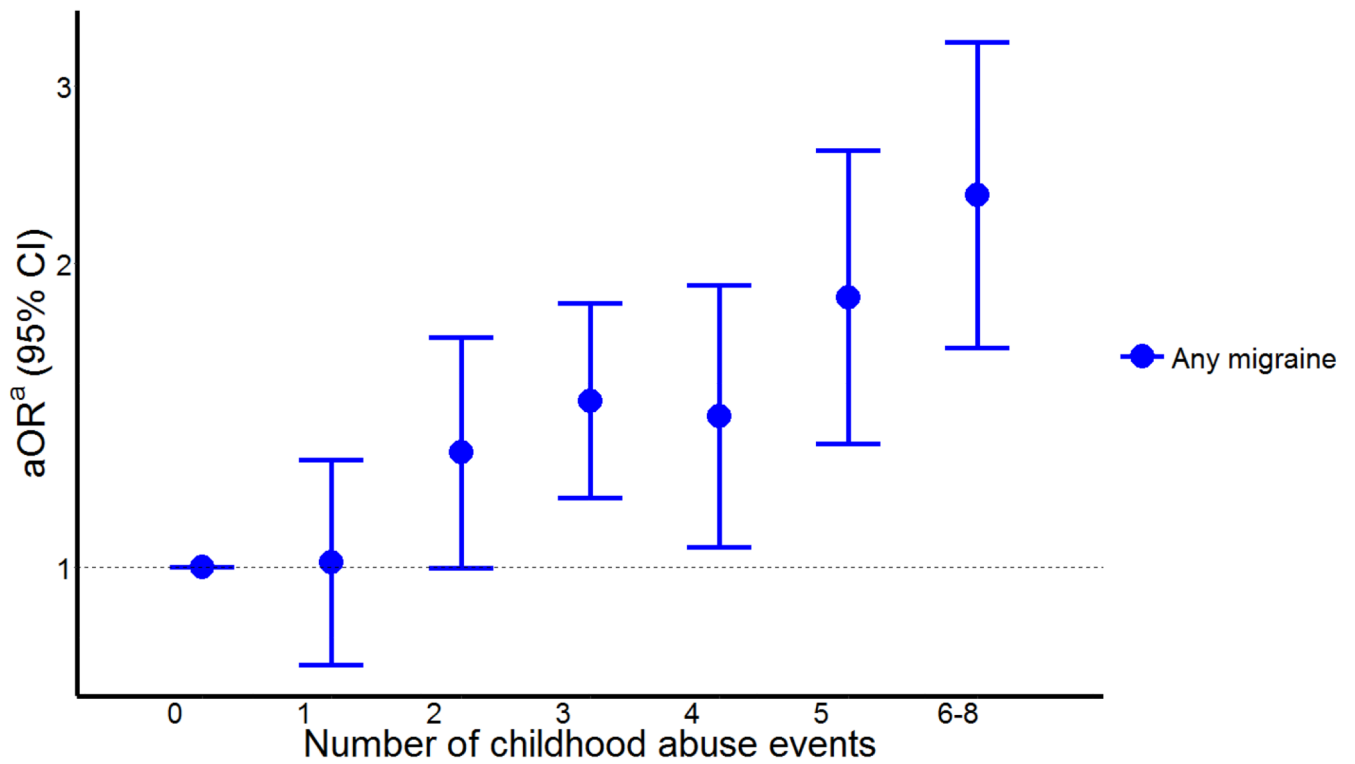
Figure 1. Odds ratio (aOR) and 95% confidence intervals (95%) of any migraine in relation to number of childhood abuse events

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval.

[a] Adjusted for age, ethnicity, and IPV history.

P_{trend}= <0.0001

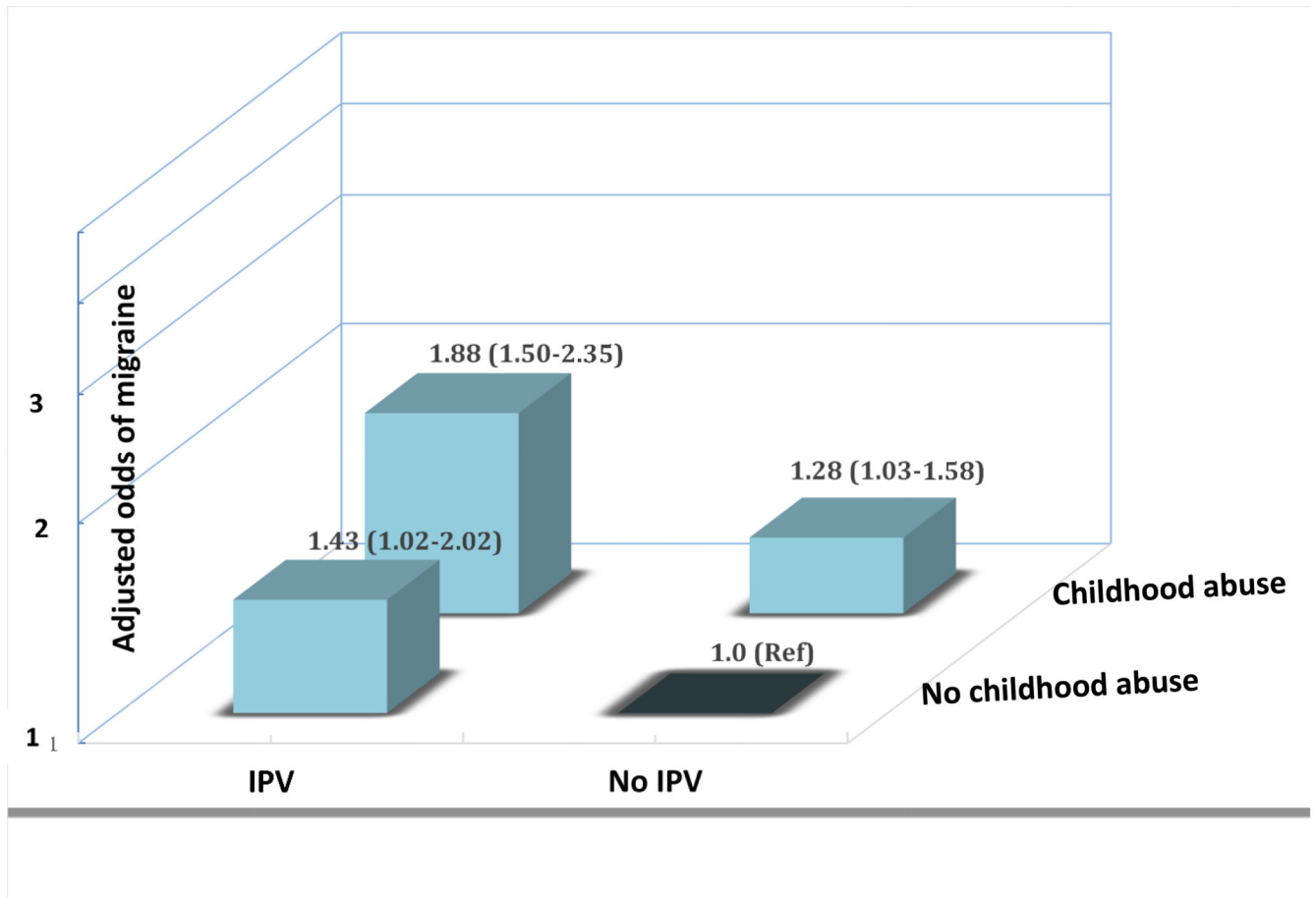**Figure 2. Adjusted odds ratios and 95% confidence intervals of migraine in relation to childhood abuse and intimate partner violence exposure histories**
Odds ratios and 95% confidence intervals are adjusted for age, and ethnicity

Table 1

Socio-demographic and reproductive characteristics of the study population according to types of childhood abuse in Lima, Peru

Characteristics	All participants (N = 2970)		No abuse (N = 839)		Physical abuse only (N = 1148)		Sexual abuse only (N = 233)		Physical and sexual abuse (N = 750)		P-value
	n	%	n	%	n	%	n	%	n	%	
Age (years) [a]	28.1 ± 6.3		27.7 ± 6.1		28.1 ± 6.4		28.2 ± 6.5		28.7 ± 6.3		0.02
Age (years)											
18-20	162	5.5	39	4.6	67	5.8	15	6.4	41	5.5	0.01
20-29	1662	56.0	514	61.3	635	55.3	129	55.4	384	51.2	
30-34	610	20.5	155	18.5	235	20.5	40	17.2	180	24.0	
35	536	18.0	131	15.6	211	18.4	49	21.0	145	19.3	
Education (years)											
6	127	4.3	37	4.4	49	4.3	5	2.1	36	4.8	0.66
7-12	1625	54.7	469	55.9	624	54.4	125	53.6	407	54.3	
>12	1211	40.8	331	39.5	473	41.2	101	43.3	306	40.8	
Mestizo ethnicity	2228	75.0	641	76.4	854	74.4	180	77.3	553	73.7	0.45
Married/living with a partner	2396	80.7	691	82.4	930	81.0	179	76.8	596	79.5	0.21
Employed	1370	46.1	383	45.6	515	44.9	113	48.5	359	47.9	0.53
Access to basic foods		0.0		0.0		0.0		0.0		0.0	
Hard	1475	49.7	350	41.7	560	48.8	127	54.5	438	58.4	<0.0001
Not very hard	1493	50.3	489	58.3	586	51.0	106	45.5	312	41.6	
Nulliparous	1446	48.7	452	53.9	547	47.6	116	49.8	331	44.1	0.001
Planned pregnancy	1225	41.2	368	43.9	482	42.0	92	39.5	283	37.7	0.09
Gestational age at interview [a]	9.2 ± 3.5		9.3 ± 3.4		9.3 ± 3.5		9.3 ± 3.3		9.2 ± 3.6		0.94
Early pregnancy body mass index (kg/m^2)											
<18.5	59	2.0	21	2.5	23	2.0	4	1.7	11	1.5	0.49
18.5-24.9	1425	48.0	385	45.9	563	49.0	121	51.9	356	47.5	
25-29.9	1087	36.6	323	38.5	414	36.1	77	33.0	273	36.4	
30	366	12.3	93	11.1	143	12.5	26	11.2	104	13.9	
Intimate partner violence [b]	1090	36.7	202	24.1	383	33.4	101	43.3	404	53.9	<0.0001

Due to missing data, percentages may not add up to 100%.

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a mean ± SD (standard deviation)

b Lifetime intimate partner violence

For continuous variables, *P*-value was calculated using the ANOVA; for categorical variables, *P*-value was calculated using the Chi-square test.

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Table 2

Association between childhood abuse and migraine during pregnancy

Childhood abuse	No migraine (N = 1973)		Migraine (N = 997)				
	n	%	n	%	Unadjusted OR (95% CI)	Adjusted OR (95% CI) [a]	Adjusted OR (95% CI) [b]
No abuse	599	30.4	240	24.1	Reference	Reference	Reference
Any abuse	1374	69.6	757	75.9	1.38 (1.15, 1.64)	1.38 (1.16, 1.64)	1.28 (1.08, 1.53)
Types of abuse							
No abuse	599	30.4	240	25.9	Reference	Reference	Reference
Physical abuse only	771	39.1	377	37.8	1.22 (1.00, 1.48)	1.22 (1.01, 1.48)	1.17 (0.97, 1.43)
Sexual abuse only	156	7.9	77	7.7	1.23 (0.90, 1.68)	1.24 (0.90, 1.68)	1.14 (0.84, 1.57)
Physical & sexual abuse	447	22.7	303	30.4	1.69 (1.37, 2.08)	1.71 (1.34, 2.10)	1.55 (1.24, 1.92)
Number of childhood abuse events							
0	599	30.4	240	24.1	Reference	Reference	Reference
1	407	20.6	165	16.5	1.01 (0.80, 1.28)	1.01 (0.79, 1.27)	0.99 (0.78, 1.26)
2	240	12.2	125	12.5	1.30 (1.00, 1.69)	1.30 (1.00, 1.69)	1.26 (0.97, 1.64)
3	387	19.6	277	27.8	1.46 (1.17, 1.83)	1.47 (1.18, 1.84)	1.37 (1.10, 1.72)
4	159	8.1	90	9.0	1.41 (1.05, 1.90)	1.42 (1.05, 1.91)	1.29 (0.96, 1.76)
5	101	5.1	75	7.5	1.85 (1.32, 2.58)	1.89 (1.35, 2.64)	1.70 (1.21, 2.39)
6-8	80	4.1	75	7.5	2.34 (1.65, 3.31)	2.38 (1.68, 3.43)	2.14 (1.50, 3.06)
P-value for linear trend					<0.0001	0.0006	<0.0001
Intimate Partner Violence (IPV)							
No	1,305	66.3	565	57.0	Reference	Reference	Reference
Yes	663	33.7	427	43.0	1.48 (1.27, 1.74)	1.52 (1.29, 1.78)	1.46 (1.25, 1.72) [c]

Odds ratios were calculated using logistic regression. Abbreviations: OR, odds ratio; CI, confidence interval

[a] Adjusted for maternal age, maternal ethnicity

[b] Adjusted for maternal age, maternal ethnicity, and lifetime intimate partner violence

[c] Adjusted for maternal age, maternal ethnicity, and childhood abuse