



Published in final edited form as:

J Asthma. 2018 April ; 55(4): 430–436. doi:10.1080/02770903.2017.1339243.

Childhood Abuse and Adult Onset Asthma among Peruvian Women

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Abstract

Objective—Childhood abuse has been found to be associated with adult-onset asthma; however, this association has not been studied in low and middle income countries with a high burden of gender-based violence, including childhood abuse. We examined the odds of asthma diagnosed at age 18 or older in relation to history of physical and sexual abuse among Peruvian pregnant women.

Methods—This cross-sectional study collected demographic characteristics, history of abuse and asthma diagnoses from 3081 pregnant women. Logistic regression procedures estimated adjusted odds ratios and 95% confidence intervals (aOR,[95%CI]) for asthma diagnoses in relation to abuse.

Results—Overall, 71% of women reported a history of abuse (<18 years), and asthma was diagnosed among 2.6% of cohort participants. The prevalence of physical only, sexual only and both physical and sexual childhood abuse was 38%, 8% and 24%, respectively. History of physical only (1.16,[0.63–2.17]), sexual only (2.11,[0.92–4.84]) or both physical and sexual childhood abuse (1.75,[0.94–3.29]) were positively associated with increased odds of asthma, although the associations were not statistically significant in the multivariable analysis. However, the odds of asthma increased with increasing numbers of abuse events ($p_{\text{trend}}=0.01$). Women who reported 3 abuse events had an increased odds of asthma (1.88,[1.06–3.34]).

Conclusion—Our results do not provide convincing evidence that childhood abuse is associated with asthma among pregnant Peruvian women; however, we were able to demonstrate that an increased number of abuse events are associated with asthma. Further research is required to better understand the effects of abuse on asthma.

Keywords

Epidemiology; Economics; Quality of Life

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Introduction

The long-term consequences of adverse childhood experiences, including exposure to maltreatment, abuse and household dysfunction, were studied in several populations around the world. [1–6] Exposure to childhood adversity has been found to be associated with poor health during adulthood manifesting in the leading causes of adult morbidities, such as coronary heart disease [2–5, 7], stroke [3], diabetes [3–5, 7, 8], migraine [4, 9], chronic fatigue [4], psychiatric disorders [3, 10], and asthma [3–5, 11]. Asthma is a chronic inflammatory disease of the airways that can develop during childhood or adulthood causing significant burden and reduced quality of life. [12] According to the most recent Global Burden of Disease Study undertaken in 2008–2010, the number of people predicted to have asthma is 334 million worldwide. [13] Although asthma is most often discussed as a childhood illness, 8.6% of adults experience asthma symptoms with only 4.5% with a formal diagnosis. [13] Adult-onset asthma is associated with animal hypersensitivity, allergen hypersensitivity, rhinitis, age, family history and occupational exposure to irritants. [12] Historically, asthma studies were primarily conducted in high-income countries; however, asthma disproportionately affects low and middle income countries due to rapid urbanization. [13, 14] The prevalence of asthma among Peruvian adults is 14.5% in Lima compared to 7.4% of adults in the United States. [14, 15]

Some studies have documented associations between childhood abuse and adult-onset asthma. [4, 16, 17] Though there has not been a direct link found between childhood adversity and asthma, there are several suggested mechanisms that may explain an association. Early life stressors are associated with an increase in smoking and alcohol, which are two lifestyle habits that have been shown to independently increase the risk of asthma. [10] However, in the Adverse Childhood Events Study, smoking was not the primary mediator in the relationship between adverse childhood events and chronic obstructive pulmonary disease. [18] These findings suggested that the role of early life stressors in pulmonary pathophysiology may be explained by an alternate mechanism.

Adverse events during childhood are associated with chronic diseases including diabetes [3–5, 7, 8] and heart disease [2–5, 7]. These patients are at risk for having poorer baseline health when compared to those who have not experienced childhood adversity. Patients with medical co-morbidities and overall poor health may cause an exacerbation of underlying pulmonary disease. [18]

The hypothalamic pituitary adrenal (HPA) axis can be affected by adverse events during childhood due to chronic stress. [19, 20] Asthmatic women were found to have an inverse relationship between the serum cortisol concentrations and stress levels. [21] This dysregulation of the HPA axis can lead to decreased cortisol and a subsequent increased inflammatory response. [19] An inflamed state from stress may trigger asthma and compromise the respiratory system. [18]

The association between childhood abuse and adult-onset asthma has not been studied in low and middle income countries where there is a high burden of gender-based violence,

including childhood abuse. Peru is an example of a low and middle income country that experiences a high prevalence of childhood abuse, including both physical and sexual abuse. [22] Abuse is a perpetual cycle because victims of childhood abuse have been found to have a greater likelihood of re-experiencing adulthood abuse. [23] Prior studies have found that childhood abuse among pregnant women in Peru is associated with poor perinatal and mental health outcomes. [24] These adverse childhood events may be associated with other medical sequelae manifesting in adulthood. Therefore, we conducted the present study to examine the extent to which history of physical and sexual childhood abuse is associated with adult-onset asthma among pregnant women in Peru. We suspect that abuse during childhood, particularly multiple childhood abuse events, will be associated with adult-onset asthma.

Methods

Study population

The population for this cross-sectional study was drawn from the participants of the Pregnancy Outcomes, Maternal and Infant Study (PrOMIS) cohort, which was initially designed to study the relationship between maternal socio-behavioral characteristics and perinatal health outcomes by interviews conducted from 2012 to 2014. The study population consists of women who attended the prenatal care clinic at the Instituto Nacional Materno Perinatal in Lima, Peru, which is the main health institution for maternal perinatal referral operated by the Ministry of Health of Peru.

Trained research personnel recruited women in prenatal waiting areas by determining their interest and eligibility for study participation. Eligible women included those who were 16 weeks' gestation or less, initiated prenatal care prior to 16 weeks' gestation, were 18 years and older, could speak and read Spanish. A total of 3372 eligible women were interviewed using a structured questionnaire during February 2012 to July 2014. Interviews were conducted during the first prenatal care visits at the hospital in private rooms specifically designed for the study. Women missing information about childhood abuse (n=76) or about asthma (n=41) were excluded. A total of 3081 women remained for analysis. The institutional review boards of the Instituto Nacional Materno Perinatal in Lima, Peru, and the Harvard T.H. Chan School of Public Health Office of Human Research Administration, Boston, MA, approved all study procedures.

Diagnosis of asthma

Women were assessed for the diagnosis of asthma by responding to the question: "Did a doctor ever tell you that you have asthma?" If the respondent answered, "yes" to the initial asthma diagnosis question they were asked the follow-up question: "How old were you, when a doctor first told you that you had asthma?" For the present analysis, we excluded all participants that reported an asthma diagnosis before age 18 in order to ensure that childhood abuse exposure preceded asthma diagnosis. The prevalence of childhood abuse in the participants who were excluded for a pediatric asthma diagnosis and those who remained in the analysis with adult-onset asthma were 74.33% and 79.01%, respectively.

Childhood abuse assessment

We used the Childhood Physical and Sexual Abuse Questionnaire to ascertain information about participants' experience with physical and sexual abuse during childhood. [9,16] We used a set of eight questions adapted from the Centers for Disease Control and Prevention Adverse Childhood Experiences Study to ask participants about their childhood abuse histories. [16] We used the operational definition of childhood abuse consistent with the World Health Organization and Center for Disease Control, which is defined as abuse before age 18.[25, 26] Respondents were considered to have experienced physical childhood abuse if she reported that she was hit, kicked, beaten often and/or her life was seriously threatened before the age of 18 years. Respondents were considered to have experienced sexual childhood abuse if she reported that an older person touched her, she was made to touch someone else in a sexual way, or intercourse was attempted or completed before the age of 18 years. Those who responded "no" to both physical and sexual childhood abuse questions were categorized as "no abuse." Those who only responded "yes" to physical abuse questions were categorized as "physical abuse only." Those who only responded "yes" to sexual abuse questions were categorized as "sexual abuse only." Those who responded "yes" to physical abuse questions and "yes" to sexual abuse questions were categorized as "both physical and sexual abuse." In addition, the number of childhood abuse events was assessed using a summation of the individual abuse questions that created numerical categories: 0, 1, 2, 3, 4, 5, 6, 7, and 8. The number of childhood abuse events were aggregated into four categories: 0, 1, 2, and 3–8.

Other covariates

Other collected information pertaining to maternal sociodemographic and medical characteristics include age, body mass index, ethnicity, marital status, reproductive history, education, employment, difficulty paying for basics, difficulty paying for medical care, as well as smoking and alcohol consumption. Age was measured continuously and in the following categories: 18–19, 20–29, 30–34, 35 years. An early pregnancy body mass index (based on measured weight and height during the study visit) was categorized into <18.5, 18.5–24.9, 25–29.9, and 30.0 kg/m². Level of education was categorized as 6, 7–12, and 12 completed years of schooling. The remaining covariates were binary variables: ethnicity (mestizo vs. other), marital status (married/living with partner vs. other), nulliparous (yes vs. no), planned pregnancy (yes vs. no), employment (yes vs. no), difficulty paying for basics (yes vs. no), difficulty paying for medical care (yes vs. no), ever smoking before index pregnancy (yes vs. no), and ever alcohol consumer before index pregnancy (yes vs. no).

Statistical analysis

Logistic regression procedures were used to estimate the odds ratios (OR) and 95% confidence intervals (CI) for adult-onset asthma diagnosis in relation to categories of childhood abuse (i.e., no abuse, physical abuse only, sexual abuse only, and both physical and sexual abuse). We also estimated the odds of adult-onset asthma diagnosis in relation to number of childhood abuse events experienced. We adjusted for potential confounding covariates using *a priori* information from a study assessing childhood abuse and adult-onset asthma in the Black Women's Health Study.[16] The final multivariable logistic regression

model included age, body mass index, difficulty paying for basics, education, as well as smoking and alcohol consumption. Multivariable logistic regression procedures were also used to estimate the trend for odds of adult-onset asthma diagnosis in relation to the number of childhood abuse events. Reported *p*-values are 2-tailed with an alpha level set to 0.05. All statistical analyses were performed using SAS 9.4 (SAS Institute, Cary, NC, USA).

Results

Age-adjusted sociodemographic characteristics of the study participants are presented in Table 1. A total of 3081 participants were included in the current analysis. The mean age was 28.3 years. Approximately 2.6% of participants were diagnosed with adult-onset asthma. The majority of the participants were Mestizo (75.4%), married (81.2%) and received more than 7 years of education (95.3%). Nearly half of the participants were employed (45.9%) and had difficulty paying for the basic foods (49.0%) and medical care (52.8%). Only 20% of the women reported ever smoking while 45.8% of them reported alcohol consumption before this pregnancy. Nearly half the women were nulliparous (48.4%) and less than half of them reported the current pregnancy as planned (42.2%). Nearly 71.5% of study participants reported a history of physical or sexual abuse in childhood (<18 years of age) with a mean number of different childhood abuse events of 2. The prevalence of childhood physical only, sexual only and both physical and sexual abuse was 38.3%, 7.9% and 24.3%, respectively. More than a third of the participants experienced intimate partner violence during their lifetime (36.3%). Age-adjusted characteristics according to adult-onset asthma diagnosis are described in Table 1. The mean age of participants who reported adult-onset asthma was 31.8 years compared with 28.2 years for those who did not. Women with adult-onset asthma (78.3%) had a higher prevalence of childhood abuse than women without adult-onset asthma (70.2%). The mean number of different childhood abuse events was 2.4 in participants with adult-onset asthma and 2.0 in participants without adult-onset asthma.

The association between childhood abuse history and adult-onset asthma is presented in Table 2. In age-adjusted analysis, maternal history of childhood sexual abuse (aOR=2.42 ; 95% CI 1.11–5.25) was found to be statistically significantly associated with increased odds of adult-onset asthma. This association was attenuated and was no longer statistically significant after further adjustments for confounding variables. History of physical abuse alone and both physical and sexual abuse in childhood was not statistically significantly associated with adult-onset asthma in both age-adjusted and multivariable analyses. As shown in the bottom panel of Table 2, we observed evidence of a positive linear trend in odds of adult-onset asthma with increasing numbers of childhood abuse events ($p_{\text{trend}} = 0.01$). Women who reported experiencing 3 childhood abuse events, as compared with those who did not experience any childhood abuse, had an increased odds of adult-onset asthma (aOR=1.81; 95% CI 1.03–3.19). This association remained statistically significant after further adjustment for confounding variables (aOR=1.88; 95% CI 1.06–3.34). All models in Table 2 had good overall model fit.

Discussion

Asthma is considered the 14th most burdensome disease in the world in terms of extent of duration and disability and therefore poses a global public health concern. [13] The results of our study provide some evidence suggestive of an association between history of childhood abuse with adult-onset asthma. Associations were particularly evident among women who reported multiple abuse events. Overall, findings from our study are generally consistent with reports from prior studies. [3, 5, 11, 16, 27–29] In their multi-country cross-sectional survey of adults (N=18 303) Scott and colleagues reported that physical abuse during childhood was associated with an increased risk of adult-onset asthma (HR=1.92; 95% CI 1.32–2.81), and the authors noted that risk increased with number of abuse events. [5] Recently, Coogan et al in their study of the Black Women's Health Study (N=28 456) reported a 1.24-fold increased risk of adult-onset asthma among women who experienced any childhood abuse compared with women with no abuse during childhood (incident rate ratio (IRR) =1.24; 95% CI 1.06–1.45). Coogan also reported that exposure to physical abuse during childhood is associated with 1.26-fold increased risk of adult-onset asthma (IRR=1.26; 95% CI 1.07–1.49) while there was no evidence of increased risk of adult-onset asthma among those who reported childhood sexual abuse only (IRR=1.15; 95% CI 0.88–1.49) compared with the referent group (women with no abuse during childhood). [16] The discordance between our study findings and those of others could be due to a low statistical power from our small numbers of adult-onset asthma due to both, a decreased disease prevalence or undiagnosed cases. Future studies that investigate the relation between childhood abuse and adult-onset asthma are warranted because of the body of evidence suggesting an association among distinctly different populations.

Some caveats should be considered when interpreting our study findings. The nature of our study selection criteria may have biased the results because we sought out participants who were seeking prenatal care suggesting that they were more likely to see a doctor and receive an asthma diagnosis. However, a previously reported prevalence of adult-onset asthma in Peru was 2.9%, which was very similar to our reported 2.6%. [30] Our data is susceptible to misclassification of participants' medical histories. We did not have information pertaining to the participants' family history of asthma and environmental descriptors, which are two known risk factors for developing asthma. In addition, our study results should be interpreted with caution given the relatively small number of adult-onset asthma cases. However, the study participants were at a young age and may have not yet had the opportunity to develop asthma in adulthood. Despite these limitations, our findings are generally consistent with reports from other cohorts and extend the extant literature by demonstrating associations of adult-onset asthma with frequent childhood abuse events in a low and middle income country.

Several mechanisms have been proposed to explain observed associations of adverse childhood experiences with increased risks of adult-onset asthma. Early life stressors are associated with increased risks of adverse health behaviors such as smoking and alcohol abuse, which may contribute to increased asthma risk. [18] Alternatively, prior studies have reported associations of adverse childhood experiences with a myriad of chronic disorders including ischemic heart disease [2–5, 7], diabetes [3–5, 7, 8], obesity [2, 31], and

respiratory disorders [3–5, 11, 18] which may contribute to increased risks of asthma. Finally, mouse models illustrate histopathological inflammatory changes of the respiratory tract when exposed to stressors. The mice demonstrated stress-induced narrowed airways and goblet cell hyperplasia, which are known features of human asthma pathogenesis. [32, 33] Regardless of the pathophysiologic processes involved, a small but growing literature supports the thesis that adversity during childhood, particularly, childhood physical and sexual abuse, may be associated with chronic lung disorders including adult-onset asthma. [18]

In conclusion, our study is the first to examine the association between exposures to childhood abuse specifically and adult-onset asthma in a low and middle income country setting. The high burden of childhood abuse in Peru and other low and middle income countries makes studying the long-term health consequences of childhood adversity a highly important global public health priority. [22] Further research is required to better understand factors that buffer or mitigate lasting health effects of early life adversity, including childhood abuse, on adult-onset asthma and other chronic conditions.

Acknowledgments

This research was supported by an award from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (R01-HD-059835). The NIH had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication. The authors wish to thank the dedicated staff members of Asociacion Civil Proyectos en Salud (PROESA), Peru, and Instituto Especializado Materno Perinatal, Peru, for their expert technical assistance with this research.

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Key Findings

Our study demonstrated a positive linear trend in risk of adult-onset asthma and increasing number of childhood abuse events. When adjusting for known confounders, women who reported 3 childhood abuse events have 1.9-fold increased odds of adult-onset asthma compared to women who did not experience childhood abuse.

Table 1

Age-adjusted demographics characteristics of the study population according to asthma diagnosis

Characteristics	All participants	No adult-onset asthma	Adult-onset asthma
Number of participants	3081	3000	81
Mean age (years)	28.30	28.20	31.77
Mestizo, %	75.37	75.20	78.26
Married, %	81.18	81.26	78.26
Education, %			
6	4.68	4.65	5.91
7–12	54.77	54.97	47.57
>12	40.55	40.39	46.68
Employed, %	45.92	45.87	47.83
Difficulty paying for basics, %	48.98	48.89	52.17
Difficulty paying for medical care, %	52.83	52.62	60.87
Ever smoke, %	20.07	20.26	13.04
Alcohol consumption, %	45.80	45.63	52.17
Nulliparous, %	48.41	48.66	39.13
Planned pregnancy, %	42.18	42.26	39.13
Body mass index, % ^a			
<18.5	1.95	1.94	2.06
18.5–24.9	48.06	48.49	32.23
25–29.9	36.77	36.49	47.21
30.0	13.25	13.11	18.66
Childhood abuse, %			
No abuse	29.48	29.69	21.74
Physical only	38.32	38.42	30.43
Sexual only	7.94	7.68	13.04
Both physical and sexual	24.26	24.10	34.78
Mean number of different childhood abuse events	1.96	1.95	2.36
Lifetime intimate partner violence, %			
No abuse	63.27	63.45	56.52
Physical only	23.81	23.86	26.09
Sexual only	3.63	3.61	0.00
Both physical and sexual	8.84	8.61	17.39

^aEarly pregnancy body mass index

Percentages may add up to less than 100% due to missing data

Table 2
Association between childhood abuse and adult-onset asthma in Peruvian women (N=3081)

Childhood abuse	No Asthma (N=3000)		Asthma (N=81)		Age-adjusted OR (95% CI)	Multivariable OR (95% CI) ^a
	n	%	n	%		
No abuse	879	29.30	17	20.99	Reference	Reference
Physical abuse	1159	38.63	26	32.10	1.12 (0.60 – 2.08)	1.16 (0.63 – 2.17)
Sexual abuse	226	7.53	11	13.58	2.42 (1.11 – 5.25)	2.11 (0.92 – 4.84)
Both physical and sexual abuse	736	24.53	27	33.33	1.73 (0.93 – 3.21)	1.75 (0.94 – 3.29)
<i>Overall model fit p-value</i>					0.42	1.00
Number of child abuse events						
0	879	29.30	17	20.99	Reference	Reference
1	580	19.33	11	13.58	0.97 (0.45 – 2.09)	0.83 (0.37 – 1.89)
2	359	11.97	8	9.88	1.13 (0.48 – 2.64)	1.13 (0.48 – 2.67)
3+ ^b	1182	39.40	45	55.56	1.81 (1.03 – 3.19)	1.88 (1.06 – 3.34)
<i>Overall model fit p-value</i>					$P_{trend} = 0.02$	$P_{trend} = 0.01$
					0.72	1.00

Abbreviations: OR, odds ratio; CI, confidence interval

^a Adjusted for age, body mass index, difficulty paying for basics, education, smoking history and alcohol consumption history

^b 3+ refers to number of child abuse events ranging from three to eight