

Original Investigation

Childhood Physical Abuse and Respiratory Disease in the Community: The Role of Mental Health and Cigarette Smoking

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Abstract

Introduction: Previous studies have found an association between child abuse and respiratory disease in some populations, but the mechanisms remain unknown, and this association has not been examined in a representative community-based sample. The goal of this study was to examine the relationship between childhood physical abuse and the odds of respiratory disease and to investigate the role of depression, anxiety, and pack-years of smoking in this association.

Methods: Data were drawn from the Midlife Development in the United States Survey ($n = 3,032$), a representative sample of adults aged 25–74 years. Multiple logistic regression analyses were used to determine the association between childhood abuse and current respiratory disease (past 12 months) and to examine whether pack-years of smoking, depression, and anxiety disorders mediated the relationship.

Results: Individuals who often experienced childhood abuse had a significantly increased odds of respiratory disease (odds ratio [OR] = 1.87 [1.21, 2.90]). The association was attenuated, after adjusting for demographic characteristics and pack-years of smoking, and was no longer significant after adjusting for depression and anxiety disorders.

Conclusions: These results are consistent with previous data suggesting a significant association between childhood abuse and respiratory disease and extend existing knowledge by providing initial evidence that demographic differences, depression and anxiety disorders, and lifetime cigarette smoking may mediate this observed relationship. Results require replication with longitudinal data in large community-based samples. Future studies that can explore potential biological mechanisms underlying the observed associations, such as immune factors, are needed next to better understand these relationships.

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Introduction

In recent years, there has been growing interest in the association between maltreatment during youth and childhood physical abuse and physical health problems in adulthood (Drossman et al., 1990; Drossman, Talley, Leserman, Olden, & Barreiro, 1995; Malinosky-Rummell & Hansen, 1993; Mina & Gallop, 1998; Raphael, Widom, & Lange, 2001). A number of studies have documented links between physical abuse and respiratory disease in adulthood (Arnow, Hart, Hayward, Dea, & Taylor, 2000; Dong et al., 2004; Goodwin & Weisberg, 2002; Juang, Wang, Fuh, Lu, & Chen, 2004; Raphael et al., 2001; Thomas, Hypponen, & Power, 2008; Walling et al., 1994; Walsh, Jamieson, Macmillan, & Boyle, 2007). The goal of the current study is to examine the association between childhood physical abuse and respiratory disease and to investigate the possible role of depression and anxiety disorders and lifetime cigarette smoking in this link, by addressing three main questions: (a) is there an association between childhood physical abuse and respiratory disease in adulthood (past 12 months)? (b) does the relationship between childhood abuse and respiratory disease persist independent of depression and anxiety disorders?, and (c) does the relationship between childhood abuse and respiratory disease persist after adjusting for lifetime cigarette smoking (pack-years)? Based on previous findings, we hypothesized that childhood abuse would be associated with significantly elevated levels of respiratory disease. We also predicted that depression and anxiety disorders and cigarette smoking would mediate a substantial portion of this association.

The mechanism of the association between childhood abuse and respiratory disease in adulthood is not known, but several possible explanations have been put forth including neurobiological mechanisms whereby early trauma leads to increased vulnerability (Goodwin, Wamboldt, & Pine, 2003), shared risk factors for both child abuse and physical disease (Anda et al., 2008), and common physiologic mechanisms (e.g.,

immune-related pathways; Cohen, Canino, Bird, & Celedon, 2008; Goodwin & Stein, 2004). Improved understanding of the nature of these links could lead to improved effectiveness of prevention efforts. Specifically, several cross-sectional studies among children (Cohen et al., 2008) and adults (Goodwin & Stein, 2004; Goodwin, Wamboldt, et al., 2003; Scott et al., 2008) and at least one longitudinal study among young persons (Goodwin, Fergusson, & Horwood, 2005) and one among adults in an Health Maintenance Organization (Anda et al., 2008) have shown links between childhood abuse and asthma/respiratory disease.

One alternative explanation for the association between childhood abuse and respiratory disease in adults is the role of behavioral or lifestyle factors associated with childhood abuse, which may lead or contribute to the development of poor respiratory health outcomes in adulthood. Several health risk behaviors, which are often associated with both childhood abuse and respiratory illness, may mediate a relationship between the two. For instance, there are well-documented associations between (a) childhood abuse and major depression and anxiety disorders (Al-Modallal, Peden, & Anderson, 2008; Danese et al., 2008; Downs & Rindels, 2004; Fletcher, 2009); (b) childhood abuse and adult smoking (Anda et al., 1999; Spratt et al., 2009); (c) depression/anxiety disorders and smoking (Anda et al., 1999; Breslau, Novak, & Kessler, 2004; Fergusson & Lynskey, 1997); and (d) smoking and respiratory disease. Childhood abuse may increase the risk of onset of depression/anxiety disorders and smoking thereby increasing the risk of later respiratory disease via various biologic pathways. However, previous studies have not assessed the role of depression and anxiety disorders or lifetime cigarette smoking in the relationship between childhood abuse and respiratory disease.

Methods

Sample

The Midlife Development in the United States (MIDUS) Survey is a nationally representative survey of 3,032 persons aged 25–74 years in the noninstitutionalized civilian population of the 48 coterminous United States (Brim et al., 2010; Kessler, DuPont, Berglund, & Wittchen, 1999; Kessler, Mickelson, & Zhao, 1997). The MIDUS Survey was carried out by the John D. and Catherine T. MacArthur Foundation Network on Successful Midlife Development between January 1995 and 1996. All respondents completed a 30-min telephone interview (70.0% response rate) and filled out two mailed questionnaires estimated to take a total of about 90 min to complete (86.8% conditional response rate in the subsample of telephone respondents). The overall response rate was 60.8%. More details on the MIDUS Survey design, field procedures, and sampling weights are available elsewhere (Brim et al., 2010; Kessler et al., 1997, 1999). Analyses were conducted in SAS 9.2 (Cary, NC) using the survey procedures (survey means, survey freq, survey logistic) to adjust standard errors in accordance with the sampling and weight our estimates to adjust for differential probabilities of selection and nonresponse to derive estimates representative of the U.S. adult population. The sample for this analysis is 3,010 individuals with complete information on covariates of interest.

Diagnostic Assessment

Current Respiratory Disease

Data on physical illnesses were obtained through self-report. Respondents were presented with a list of illnesses and asked whether they had experienced or been diagnosed by a physician with any of the illnesses within the past 12 months. This included “asthma, bronchitis, or emphysema.”

Self-Reported Child Physical Abuse

A history of self-reported childhood abuse was assessed by responding *often*, *sometimes*, *rarely*, or *never* to one of the following statements: Did your mother or father *often*, *sometimes*, or *rarely*: “kicked, bit, or hit you with a fist; hit or tried to hit you with something; beat you up; choked you; burned you or scalded you” or “pushed, grabbed, or shoved you; slapped you; threw something at you.” Those who answered *never* to all four inquiries were used as the reference group. Respondents were assigned to a frequency of abuse category based on the highest frequency of abuse for any of the four responses.

Current Mental Disorders

The MIDUS Survey diagnoses were based on the Composite International Diagnostic Interview—Short Form (CIDI-SF) scales (Kessler et al., 1994), a series of diagnostic-specific scales that were developed from item-level analyses of a modified version of the World Health Organization CIDI (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998), and a structured interview designed to determine *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, clinical and subclinical mental disorders in the National Comorbidity Survey (Kessler et al., 1994, 1998; Wittchen, 1994). The CIDI-SF scales were designed to reproduce the full CIDI as exactly as possible, with only a small subset of the original questions. We collected current CIDI-SF diagnoses (past 12 months) of major depression, panic attacks, and generalized anxiety disorder (GAD).

Cigarette Smoking

Detailed smoking histories for each subject were ascertained. Pack-years of smoking was calculated by determining the number of years each participant had been a “regular smoker,” multiplying by the “average number of cigarettes smoked per day” and dividing by 20.

Demographic Characteristics

We assessed age, gender, race (White, Black, Other), marital status (married, separated/divorced/widowed, never married), and education (less than high school, high school graduate or equivalent, some college, college graduate, or greater) as potential confounders.

Analytic Strategy

First, the distribution of respiratory disease, mental disorders, smoking status, and demographic characteristics across categories of frequency of child abuse was assessed using the Rao–Scott chi-square *F* tests for independence. The Rao–Scott chi-square is a design-adjusted version of the Pearson chi-square test. For two-way tables, the null hypothesis is no association between the row and column variables.

Second, a series of bivariate and multivariate logistic regressions were used to investigate the odds of respiratory disease given sets of covariates. Child physical abuse was entered first and modeled as a series of dummy variables with *never abused* the reference category. Next we adjusted for demographic differences between participants. Demographics were modeled categorically as indicated above except age, which was entered continuously. To assess whether smoking mediated the relationship between childhood physical abuse and adult respiratory disease, our third model adjusted for pack-years of smoking, which was divided into four categories: never smoked regularly and tertiles of pack-years among those that ever smoked regularly. Last we adjusted for depression, GAD, and panic attacks to assess whether these disorders additionally mediated the association between childhood physical abuse and adult respiratory disease; they were modeled as binary indicator variables.

Results

Bivariate Associations of Childhood Abuse With Respiratory Disease, Mental Disorders, and Cigarette Smoking Among Adults in the Community

Table 1 shows the weighted distribution of respiratory disease, major depression, GAD, panic attacks, and pack-years of smoking by level of childhood physical abuse. Individuals who reported childhood abuse *often* had an increased prevalence of respiratory disease (19.4% vs. 11.4%, $p = .04$), major depression (27.8% vs. 12.7%, $p < .0001$), GAD (12.4% vs. 2.3%, $p < .0001$), and panic attacks (14.1% vs. 4.7%, $p < .0001$) compared with individuals who never experienced childhood abuse. There was a positive association between mean pack-years of smoking and frequency of childhood abuse.

Adjusted Associations Between Childhood Abuse and Respiratory Disease Among Adults in the Community

Childhood abuse was associated with a significantly increased likelihood of respiratory disease (odds ratio [OR] = 1.87 [1.21, 2.90]), compared with adults without a history of childhood abuse (see Table 2). This association persisted after adjusting for differences in demographic characteristics (OR = 1.78 [1.14, 2.78]) and additionally for pack-years of smoking (OR = 1.65 [1.06, 2.57]). After adjusting for depression, GAD, and panic attacks in the final model, the association between childhood abuse and respiratory disease was no longer statistically significant, though the OR remained substantial (OR = 1.42 [0.91, 2.22]). In the final model, the two highest tertiles of pack-years of smoking emerged as independent predictors of respiratory disease (OR = 1.45 [1.02, 2.05]; OR = 1.95 [1.37, 2.77]), as did major depression (OR = 1.41 [1.01, 1.98]) and panic attacks (OR = 2.04 [1.37, 3.05]).

Discussion

These data suggest that childhood abuse is associated with a significantly increased likelihood of respiratory disease during adulthood, consistent with findings from previous samples (Anda et al., 2008). Our results further provide new evidence indicating that demographic characteristics, depression and anxiety disorders, and cigarette smoking contribute substantially to this association. These findings provide initial data suggesting that depression and anxiety disorders, as well as smoking, may explain to the previously observed relationship between abuse and respiratory illness.

These findings are consistent with previous results showing links between childhood adversity and later asthma/respiratory diseases (Anda et al., 2008; Nomura & Chemtob, 2007; Scott

Table 1. Weighted Distribution of Respiratory Disease, Major Depression, Generalized Anxiety Disorder (GAD), Panic Attacks, and Pack-Years by Level of Childhood Physical Abuse Among 3,010 Respondents in the Midlife Development in the United States Study 1995/1996

	Frequency of childhood physical abuse				F value ^a	p value
	<i>Often</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>		
Respiratory disease, <i>n</i> (%)						
Yes	38.90 (19.39)	82.48 (12.78)	122.20 (12.97)	136.96 (11.37)	2.6956	.0443
No	161.68 (80.61)	563.11 (87.22)	820.24 (87.03)	1067 (88.63)		
Major depression, <i>n</i> (%)					9.3852	<.0001
Yes	55.83 (27.78)	101.08 (15.54)	114.56 (12.11)	154.78 (12.72)		
No	145.12 (72.22)	549.45 (84.46)	831.19 (87.89)	1062 (87.28)		
GAD, <i>n</i> (%)					14.3056	<.0001
Yes	24.84 (12.36)	23.66 (3.64)	21.64 (2.29)	27.98 (2.30)		
No	176.11 (87.64)	626.87 (96.36)	924.12 (97.71)	1189 (97.70)		
Panic attacks, <i>n</i> (%)					7.0795	<.0001
Yes	28.35 (14.11)	46.36 (7.13)	75.47 (7.98)	57.19 (4.70)		
No	172.60 (85.89)	604.17 (92.87)	870.28 (92.02)	1159 (95.30)		
Pack-years, mean (95% CI)	21.11 (16.76, 25.46)	17.74 (15.49, 19.99)	13.01 (11.50, 14.53)	13.34 (11.93, 14.75)		

^aRao-Scott chi-square F value.

Table 2. Bivariate and Multivariate Logistic Regression Models Predicting the Odds of Respiratory Disease Among 3,032 Participants in the Midlife Development in the United States Study 1995/1996

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI						
Childhood abuse (never referent)								
<i>Often</i>	1.87	1.21, 2.90	1.78	1.14, 2.78	1.65	1.06, 2.57	1.42	0.91, 2.22
<i>Sometimes</i>	1.14	0.83, 1.57	1.16	0.84, 1.61	1.12	0.81, 1.57	1.09	0.78, 1.52
<i>Rarely</i>	1.16	0.86, 1.55	1.21	0.90, 1.63	1.21	0.89, 1.63	1.16	0.86, 1.57
Gender (male referent)			1.68	1.30, 2.16	1.86	1.43, 2.41	1.71	1.32, 2.23
Age			1.00	0.99, 1.01	1	0.99, 1.01	1.00	0.99, 1.01
Race (White referent)								
Black			0.67	0.39, 1.16	0.74	0.43, 1.28	0.81	0.47, 1.40
Other			1.37	0.83, 2.26	1.46	0.88, 2.42	1.46	0.88, 2.43
Marital status (married referent)								
Separated/divorced/widowed			1.48	1.11, 1.98	1.4	1.05, 1.87	1.29	0.96, 1.73
Never married			1.06	0.69, 1.61	1.05	0.68, 1.61	1.06	0.68, 1.63
Education (college graduate or more referent)								
Less than HS			1.21	0.79, 1.84	1.02	0.67, 1.57	0.94	0.62, 1.44
HS graduate or equivalent			1.00	0.72, 1.38	0.9	0.65, 1.24	0.89	0.64, 1.23
Some college			1.08	0.79, 1.46	0.99	0.73, 1.35	0.95	0.70, 1.31
Pack-years of smoking (0 reference)								
0–13.5					1.34	0.95, 1.90	1.28	0.91, 1.82
13.5–36					1.55	1.10, 2.19	1.45	1.02, 2.05
36+					2.05	1.44, 2.91	1.95	1.37, 2.77
Mental disorders								
Major depression							1.41	1.01, 1.98
GAD							1.27	0.71, 2.26
Panic attacks							2.04	1.37, 3.05

Note. OR = odds ratio, HS = higher secondary; and GAD = generalized anxiety disorder.

et al., 2008) and between earlier mental disorders and asthma in adulthood (Goodwin, Kroenke, Hoven, & Spitzer, 2003; Katon, Richardson, Lozano, & McCauley, 2004; Scott et al., 2007). But they also shed new light on possible factors that may contribute to this association by suggesting that depression and anxiety disorders and cigarette smoking may both contribute to the relationship between childhood abuse and adulthood respiratory disease. Previous studies have shown a link between respiratory disease and depression (Jones, 2011; von Leupoldt, Taube, Lehmann, Fritzsche, & Magnussen, 2011) although the possible pathways explaining this association are not known. One possibility is that childhood abuse may increase the risk of onset of depression/anxiety disorders and smoking initiation, which then may increase the risk of later respiratory disease through various biologic pathways.

Surprisingly, our results also suggest that lifetime smoking contributed but did not completely explain this relationship. As childhood adversity is associated with an increased risk of cigarette smoking and nicotine dependence in adolescence (Anda et al., 1999; Fergusson & Lynskey, 1997), and cigarette smoking is clearly linked in a well established, dose-dependent fashion with the development of respiratory disease (Ebihara, Ebihara, Okazaki, & Sasaki, 2005; Khan, Tandon, Khan, Pandey, & Idris, 2002), we expected cigarette smoking to play a significant role in this relationship. To our knowledge, previous studies that have examined the link between childhood abuse and respiratory

disease in adulthood have not examined the role of lifetime cigarette smoking in this relationship, though some have examined current/past year smoking (Scott et al., 2008) that may account for why this study finds that smoking explains some of the relationship between abuse and respiratory disease whereas others have not found a significant contribution.

Our results also suggest that after adjusting for childhood abuse, the relationship between GAD and adult respiratory disease was no longer significant, but that the link between depression and panic attacks and respiratory disease remained after this adjustment with the strongest relationship between panic and respiratory disease. This finding is consistent with previous studies showing strong links between panic and asthma (Carr, 1998; Carr, Lehrer, & Hochron, 1992; Davies, Jackson, & Ramsay, 2001; Feldman, Siddique, Thompson, & Lehrer, 2009), panic and respiratory disease (Abelson, Weg, Nesse, & Curtis, 2001; Gorman, Liebowitz, Fyer, Fyer, & Klein, 1986; Martinez et al., 2001; Papp et al., 1997), and with the previously put forth hypothesis that there is a specific common physiologic vulnerability to both (Klein, 1993). It is interesting to note that both panic (Isensee, Wittchen, Stein, Hofler, & Lieb, 2003) and respiratory disease are strongly tied to cigarette smoking yet the association between panic and respiratory disease persists even after adjusting for smoking (and childhood abuse) suggesting this relationship may operate through some other mechanism. One possibility is that central nervous system respiratory control

processes may be altered in the presence of panic disorder resulting in dysfunctional breathing patterns (e.g., tendency to hyperventilate) that could directly increase respiratory symptoms through known physiological mechanisms (e.g., via cooling and drying of airways).

Limitations of this study should be considered when interpreting results. First, the data on child abuse are retrospective and therefore subject to recall bias. It is difficult to predict in what direction this might influence these results, but prospective studies are needed to confirm these relationships. Still, with few exceptions, prospective studies measure childhood abuse with self-report among those aged 18 years and older (i.e., retrospectively) and are therefore still subject to this limitation to varying degrees. Second, it is generally accepted that traumatic stress, such as physical abuse, occurs in clusters over time rather than in isolated single incidents. We were unable to measure other traumatic exposures here but it may be that these outcomes are associated with a more complex nexus of traumatic experiences, rather than just physical abuse alone. Future studies that can better measure and thereby untangle the potential role of a range of trauma in respiratory and other chronic health conditions are needed. Third, the response rate was 60.8% that may result in limited generalizability. Fourth, the assessment of respiratory disease was not specific to one disease, and therefore it remains unclear whether these relationships may differ by disease (e.g., asthma vs. emphysema). In particular, whereas the onset of emphysema occurs during adulthood with few exceptions, asthma onset frequently occurs during childhood. The vague measure of respiratory disease may combine, for instance, those with early onset persistent asthma and emphysema. Although both have been shown to be independently associated with childhood abuse/trauma in previous studies (e.g., Cohen et al., 2008; Romans, Belaise, Martin, Morris, & Raffi, 2002), this could partly explain why the role of smoking was not as prominent as expected in the relationship between childhood abuse and respiratory disease as this would predictably relate to emphysema but not necessarily childhood onset asthma. Future studies that include more precise measurement of specific respiratory diseases in adulthood will be needed next. Finally, the complexities observed in the relationships among smoking, respiratory illness, depression, and panic disorder deserve further scrutiny.

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Declaration of Interests

None declared.

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