Exposure to community violence is associated with asthma hospitalizations and emergency department visits

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Background: Exposure to community violence (ECV) has been associated with asthma morbidity of children living in inner-city neighborhoods.

Objective: To examine with prospective longitudinal data whether ECV is independently associated with asthma-related health outcomes in adults.

Methods: Adults with moderate-severe asthma, recruited from clinics serving inner-city neighborhoods, completed questionnaires covering sociodemographics, asthma severity, and ECV and were followed for 26 weeks. Longitudinal models were used to assess unadjusted and adjusted associations of subsequent asthma outcomes (emergency department [ED] visits, hospitalizations, FEV_1, quality of life).

Results: A total of 397 adults, 47 ± 14 years old, 73% women, 70% African American, 7% Latino, mean FEV_1 66% ± 19%, 133 with hospitalizations and 222 with ED visits for asthma in the year before entry, were evaluated. Ninety-one reported ECV. Controlling for age, sex, race/ethnicity, and household income, those exposed to violence had 2.27 (95% CI, 1.32-3.90) times more asthma-related ED visits per month and 2.49 (95% CI, 1.11-5.60) times more asthma-related hospitalizations per month over the 26-week study period compared with those unexposed. Violence-exposed participants also had 1.71 (95% CI, 1.14-2.56) times more overall ED visits per month and 1.72 (95% CI, 0.95-3.11) times more overall hospitalizations per month from any cause. Asthma-related quality of life was lower in the violence-exposed participants (−0.40; 95% CI, −0.77 to −0.025; $P = .04$). Effect modification by depressive symptoms was only statistically significant for the ECV association with overall ED visits and quality-of-life outcomes ($P < .01$).

Conclusion: In adults, ECV is associated with increased asthma hospitalizations and emergency care for asthma or any condition and with asthma-related quality of life. (J Allergy Clin Immunol 2010;126:552-7.)

Key words: *Asthma, quality of life, emergency department visits, community violence, inner-city asthma*

Asthma morbidity is high in low-income inner-city neighborhoods.[1] Among exposures that could link environment to poorer health, chronic psychosocial stress has received attention, particularly in youth.[2-8]

One marker of psychosocial stress is exposure to community violence (ECV), described by Wright and Steinbach[9] as proximity to violence, either through direct victimization or observing arguments, fights, or crime in one's neighborhood. ECV is disproportionately experienced by the poor, people of color, and those living within the inner-city, the same population disproportionately affected by asthma.[3,10,11] Much of the research on ECV has focused on youth and their caretakers and the effect of ECV on mental health.[3,5,12,13] We focus on the impact of ECV on a chronic health problem in adults: moderate or severe asthma.

Exposure to community violence also has been considered a marker for neighborhoods with concentrated disadvantage: segregated communities where there is poorer access to health care—for example, fewer pharmacies less likely to have adequate medication supplies,[5,14] fewer grocery stores with healthy foods,[15] and increased exposure to environmental pollutants.[2,16,17] Evidence is accumulating that living in concentrated disadvantage contributes to health disparities,[5] although the reasons are unclear. One possibility for persons with asthma living in concentrated disadvantage is that they could be exposed to physical or social conditions that contribute to the development of their disease, exacerbate their symptoms, and interfere with successful treatment and management of their condition. Another possibility, and not mutually exclusive, is that the psychological stress of living in concentrated disadvantage directly affects the health of persons with asthma.

In asthma ECV has been associated, mostly in children, with poorer outcomes.[2,3,18-20] For example, Wright et al,[3] in a landmark article, found that caretakers of children with asthma who reported more ECV also reported more symptom days among their children and more caretaker lost sleep. However, Cohen et al[21] reported no association between witnessing community violence and increased risk of asthma in Puerto Rican children, although a history of physical or sexual abuse was associated with an increased risk of asthma. One limitation of these studies in children is that most of the asthma outcomes were self-reported or caretaker-reported.

The impact of ECV on health outcomes in adults, particularly those with increased asthma morbidity, has received little attention. Therefore, our goal was to examine the effect of ECV on several health outcomes in adults with moderate or severe asthma: emergency department (ED) visits, hospitalizations, asthma-related quality of life (AQOL), and lung function. We hypothesized that exposure to violence is associated with poorer asthma

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Abbreviations used
AQOL: Asthma-related quality of life
CES-D: Center for Epidemiologic Studies Depression Scale
ECV: Exposure to community violence
ED: Emergency department

outcomes and that the effect might be moderated by other contributors to psychosocial stress such as depressive symptoms and lack of social support.

METHODS

We conducted a prospective cohort study within a large randomized controlled trial. The ongoing parent study, Individualized Interventions to Improve Adherence in Asthma (NCT00115323, R01 HL073932), compares an individualized problem-solving strategy with standard asthma education in adults with moderate or severe asthma. The problem-solving intervention addresses and integrates solutions to a problem of the participant's choosing, tailoring problem-solving to the participant's needs with ways to maintain or improve adherence to inhaled steroid regimens. The primary outcome is electronically monitored adherence to inhaled steroids. Other outcomes are changes in asthma-related health status, including FEV_1, quality of life, hospitalizations, and ED visits.

Subjects

Participants were English-speaking or Spanish-speaking adults with moderate or severe persistent asthma according to National Heart Lung and Blood Institute Expert Panel Report 3 guidelines.[22] Inclusion criteria were (1) age at least 18 years, (2) physician's diagnosis of asthma, (3) prescription for an inhaled corticosteroid-containing medication for asthma, and (4) evidence of reversible airflow obstruction (eg, an FEV1 <80% predicted with an increase in FEV1 after bronchodilator of at least 12% and 200 mL at time of enrollment or within the past 3 years).

Subjects were recruited from practice sites that serve inner-city neighborhoods with high rates of asthma morbidity. Clinical sites included outpatient primary care and asthma specialty practices of the University of Pennsylvania Health System, Woodland Avenue Health Center, the Comprehensive Health Center at Episcopal Hospital, and Philadelphia Veterans Affairs Medical Center. Charts or electronic medical records of participating practices were prescreened for patients with asthma who were prescribed an inhaled corticosteroid. Potential subjects were then approached by telephone or at the time of a clinic visit and asked to sign consent for further screening. Those satisfying all enrollment criteria were then asked to sign a second informed consent to participate in the study. The protocol was approved by the Institutional Review Boards of the University of Pennsylvania and the Philadelphia Veterans Affairs Medical Center.

Procedures

Participants were interviewed to determine sociodemographics, asthma status, exposure to community violence, asthma-specific quality of life, depressive symptoms, and social support. Spirometry was obtained according to American Thoracic Society procedures.[23] Participants were then seen monthly for the parent trial; spirometry, AQOL, report of hospitalizations, and ED visits were obtained as part of data collected at these visits.

Data collection and measures

All questions were read to the participant while the participant looked at the written questionnaire. For patients whose primary language was Spanish, bilingual research coordinators administered the questionnaires. All validated questionnaires were available in English and Spanish. Participants chose whether to have the questionnaires read in English or Spanish.

Dependent variables. The dependent variables were asthma-related outcomes: self-reported asthma-related ED visits, self-reported asthma-related hospitalizations, AQOL, and FEV_1. Except for AQOL, which was assessed at baseline and weeks 14 and 26, they were assessed monthly over the 26-week period. We similarly recorded any hospitalizations and ED visits that did not result in a hospitalization for any cause over the 26-week period. Some patients had more than 1 hospitalization or ED visit.

Asthma-related quality of life was measured by using the Mini–Asthma Quality of Life Questionnaire at baseline and weeks 14 and 26.[24-26] This questionnaire has been validated in low-income adults.[27] It contains 15 items each scored on a scale ranging from 1 (maximum impairment) to 7 (no impairment). The score of the overall questionnaire is given by the mean of the 15 responses. FEV_1 was obtained by spirometry using American Thoracic Society criteria.[23]

Independent variables. The primary independent variable of interest was ECV. Participants' sociodemographic variables were controlled for as potential confounders, and depressive symptoms and the availability of social support were analyzed as moderators of the effect of ECV on outcomes.

ECV. Exposure to community violence was measured at baseline by using a question modified from Wright et al[3]: "In the past 6 months, did you witness any violence in your neighborhood (yes/no)?" This was used in the primary analysis. For positive responses to this question, participants were asked to check all that applied by using the options of Wright et al.[3] That is, they were asked to indicate all they had witnessed: "a fight in which a weapon was used, a violent argument between neighbors, a gang fight, a sexual assault or rape, a robbery or mugging."[3] We also added an "other" category. Although we did not use these options in the primary analysis, they allowed both participants and researchers to understand better what was meant by witnessing violence. Although there are several other measures of ECV,[28,29] we used this question because of the importance of this study in the asthma literature, because it was brief, and because it could be used for adults.

Other independent variables. Depressive symptoms were measured at baseline by using the Center for Epidemiologic Studies Depression Scale (CES-D), a validated 20-item scale, developed to measure self-reported depression in community populations.[30,31] Each item uses a 0 to 3 response scale with responses summed to provide a score ranging from 0 to 60. Scores of 16 or more are considered indicative of possible major depression, but the instrument is not diagnostic of depression and is most accurately construed as a measure of depressive symptoms, demoralization, or general distress.[32] It has been used in cross-cultural research in minority patients.[30,33]

Social support was assessed at baseline by using the Medical Outcomes Study Social Support Survey.[34] The Survey has 19 items on a 5-point Likert scale. The overall score of the survey is given by the mean of all 19 items, rescaled to a range of 0 to 100. A higher score indicates more support.

Demographic characteristics—age, race, ethnicity, educational attainment, and household income—were ascertained by self-report. Household income was asked in categories to make responses by participants more acceptable and feasible: <$10,000/year, $10,000 to $19,999/year, $20,000 to $29,999/year, $30,000 to $49,999/year, $50,000 to $99,999/year, and >$100,000/year.

Statistical analysis

Descriptive statistics and data analyses were performed by using STAT 11.0 (STATA Corp, College Station, Tex) and SAS V9.2 (SAS Corp, Cary, NC). Logistic regression was used for assessing pairwise associations of ECV with demographic factors, depressive symptoms, and social support. Log-linear regression with offsets for logged months of follow-up was used to assess the pairwise and multivariate rate ratios between ECV as the primary exposure and ED or hospital admissions over the entire follow-up period as the dependent variable. Demographic factors were analyzed as confounders. Depressive symptoms and social support were analyzed as effect modifiers of the ECV-visits associations by including interactions between ECV and the effect modifiers in the models. For the longitudinal FEV_1 and AQOL outcomes, we used longitudinal random effects linear models with random intercepts and slopes specified for each participant to account for longitudinal correlations. Fixed effects were specified for baseline covariates, ECV, each visit except baseline (time treated as categorical), and separate interactions between