



The association between substantiated childhood maltreatment, asthma and lung function: A prospective investigation



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ABSTRACT

Background: Asthma reflects multiple and likely complex causal pathways. We investigate the possibility that childhood maltreatment is one such causal pathway. Childhood maltreatment can be interpreted as a form of early life adversity and like other life adversities may predict a range of negative health outcomes, including asthma.

Methods: A total of 3762 young adults (52.63% female) from the Mater Hospital-University of Queensland Study of Pregnancy (MUSP) participated in this study. MUSP is a prospective Australian birth cohort study of mothers consecutively recruited during their first antenatal clinic visit at Brisbane's Mater Hospital from 1981 to 1983. The study followed both mother-child dyads to the age of 21 years after birth. Participants reported whether they had been diagnosed by a physician with asthma by the 21-year follow-up. Trained research assistants also performed gender- and height-standardized lung function tests using a Spirobank G spirometer system attached to a laptop computer. We linked this dataset with data obtained from the child protection services and which comprised all substantiated cases of childhood maltreatment in the MUSP cohort. Substantiations of childhood maltreatment included children in an age range of 0–14 years.

Results: The experience of any childhood maltreatment, particularly emotional abuse, was independently associated with self-reported physician-diagnosed asthma by the 21-year follow-up. The association was no longer significant after adjustment for a range of confounders and covariates in neglected children. Childhood maltreatment, including multiple events, was not associated with lung function in adjusted models.

Conclusions: Childhood maltreatment, including emotional abuse, was associated with lifetime ever asthma. This was in contrast to the absence of an association with objective measures of lung function. More research is indicated on the effect of childhood maltreatment on lung function using objective measures. In the meantime, there should be a greater awareness of the potential impact of childhood maltreatment on the potential to develop asthma, as well as of the possibility that asthma in adulthood may precede childhood maltreatment.

1. Introduction

Asthma globally is an increasingly common chronic condition [1,2] with an estimated 100 million new adult cases by 2025 [3]. Asthma follows multiple and complex aetiological pathways, which may include in utero [2], environmental [4,5] and occupational [5] exposures [5]. Two meta-analyses of cross-sectional studies, based on self-reported

childhood maltreatment in general [6] and physical abuse in particular [7], reported an increased risk of asthma [6,7], although one reported a non-significant association for childhood neglect [7]. In addition, the association is less marked for self-reported childhood maltreatment and asthma, as opposed to where there is agency involvement [8].

Findings from two longitudinal studies [9,10] are equivocal. In one, children with any substantiated and unsubstantiated childhood

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maltreatment had a 1.73 times higher risk of asthma than non-maltreated children of similar socio-economic status [9]. Importantly, the more frequent the childhood maltreatment the higher the number of hospital visits for asthma treatment. By contrast, in the other study, a composite measure of childhood abuse and family dysfunction was not associated with asthma [10].

The situation is complicated by the fact that childhood maltreatment and asthma share many risk factors, ranging from biological to the overall psycho-socio-environmental. These include prematurity at birth, low birth weight [11,12], breastfeeding [13,14], an increase in body mass index (BMI) [8], cigarette smoking and mental health disorders [8,15], as well as younger parental age at birth, poverty [9], low income [9,16,17], substance use [16–18], poor housing quality [19] and neighborhood violence [20,21].

There may also be variation by gender. For example, maltreated females appear to be at higher risk for asthma and other respiratory diseases than males [6,9,10,22]. Despite these differences, there has been a little research on the effect of the interaction between gender and stressor(s) on asthma outcomes. However, it is also relevant to note that no gender differences have been found in response to asthma and allergy outcomes in maltreated children [20].

There are also differences depending on whether the outcome is self- or parent-reported or objectively measured through spirometry [23–26]. Self-reported diagnoses better predict asthma-related symptoms while spirometrically measured forced expiratory volume in 1 s percentage (FEV1%) predicts asthma severity [23]. Interestingly, self-reported asthma symptoms were found to be consistent with physician diagnosis in adults [27].

In conclusion, there are relatively few studies of the physical health impacts of childhood maltreatment [28] including asthma, using psychobiological data from a longitudinal study [29]. We therefore used a longitudinal design to investigate whether agency-assessed childhood maltreatment was associated with a subsequent asthma diagnosis while adjusting for a range of confounders [6,22] and covariates. We hypothesized that any forms of childhood maltreatment predicted both subsequent asthma and lung function, even after controlling for individual, familial and environmental levels of confounding and covariation.

2. Method

2.1. Study participants

The Mater-University of Queensland Study of Pregnancy (MUSP) is a prospective pre-birth cohort recruited from all public patients presenting at the Mater Misericordiae Hospital for their first obstetrical visit in Brisbane, Australia from 1981 to 1983. A total of 8556 mothers were initially approached and 8458 accepted the invitation, of whom 7223 gave birth to a live, singleton baby [30]. We linked these data to agency substantiated cases of childhood maltreatment (ages 0–14 years). The sample for this study comprised 3762 (52.63% female) with respondent reports of asthma at 21 years of age. A subset of 2642 had also data on lung function. The MUSP has been approved by the Human Ethics Review Committee of the University of Queensland and the Mater Hospital. Parents provided consent up to the 14-year follow-up. Participants provided informed consent at the 21-year follow-up.

2.2. Substantiated childhood maltreatment

Suspected cases of childhood maltreatment (including physical, sexual and emotional abuse and neglect) up to 14 years of age were identified from state-wide child protection records. Notifications of childhood maltreatment were derived from mandatory reports from medical practitioners, as well as referrals received from the general public. Notified cases of childhood maltreatment were screened, investigated and substantiated by Families, Youth and Community Care

Queensland (FYCCQ). Substantiated cases of childhood maltreatment included those confirmed cases by FYCCQ with evidence of “reasonable cause to believe that the child had been, was being, or was likely to be abused or neglected.” The definition of sexual abuse included “exposing a child to or involving a child in inappropriate sexual activities.” Physical abuse was defined as “any non-accidental physical injury inflicted by a person who had care of the child.” Emotional abuse included any act resulting in a child’s suffering any kind of emotional deprivation or trauma. Finally, childhood neglect was defined as a “failure to provide conditions that were essential for the healthy physical and emotional development of a child.” Childhood experiences of “neglect” were intended to incorporate both physical and emotional neglect by those who were taking care of the child [31]. Substantiation of childhood maltreatment was determined by child protection case workers of Queensland’s child protection agency. These data were anonymously linked to the MUSP longitudinal database in September 2000 (details are presented elsewhere [13]). The present study uses exposure to any multiple forms and hierarchical categories of substantiated childhood maltreatment cases (i.e., sexual, physical, emotional abuse, and/or neglect) [32] to explicitly examine the association between each form of childhood maltreatment and asthma, as well as lung function. Maltreated children usually experienced one or more forms of childhood maltreatment. As a result, we created a composite variable to assess the specific effects of each form of childhood maltreatment, to adjust for possible overlaps. For example, a variable that excluded substantiated physical abuse was created from one or more combinations of sexual abuse, emotional abuse and neglect to adjust for sexual abuse and so on to control for co-occurring forms of childhood maltreatment. Moreover, we used the frequency of recurrent childhood maltreatment substantiations, as proxy indicators of severity, to predict asthma diagnosis and lung function.

2.3. Asthma report and lung function

At the 21-year follow-up, participants were asked if they had ever been told by a physician that they had asthma (no/yes). A history of physician-diagnosed asthma has been used both in maltreated [8,16,19,20] and large epidemiological surveys [33] to determine asthma prevalence. Trained research assistants also performed gender and height standardized lung function tests using a Spirobank G spirometer system attached to a laptop computer based on the American Thoracic Society guidelines [34]. Some 3–5 trials were attempted, and the reason(s) were noted on the record sheets if testing was unsatisfactory for any reason. For the purpose of this study, we used forced vital capacity (FVC), FEV1 and forced expiratory flow, mid-expiratory phase (FEF_{25–75}). These spirometric values were computed based on all-age reference ranges for spirometry [35].

2.4. Early maternal characteristics

We included maternal age and marital status at entry to the study as well as family income as reported by mothers. Age of mothers at pregnancy was recoded as 20+ vs. 13–19 years. Their marital status was dichotomised into married and single-separated-divorced-widowed. Mothers’ report of family income was measured from pregnancy through to 5 years (4 follow-ups). The mean income of each phase was taken and dichotomized as mid-to-high income vs. consistent poverty. These thresholds were based on estimates of the poverty level from 1981 to 1983 [36]. Data on maternal prenatal and postnatal cigarette smoking were obtained at the first prenatal clinic visit and 6 months postpartum as both factors were found to predict later asthma [37]. Mothers were asked how frequently they smoked cigarettes in the previous week at both follow-ups and these data were recoded as did not smoke cigarettes at all = 0; once or so a week = 1; every few days = 2; and every day = 3. Respondents were also asked how many cigarettes they smoked per day. The responses were recoded as nil = 0;

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