



## Research article

# The association of intrafamilial violence against children with symptoms of atopic and non-atopic asthma: A cross-sectional study in Salvador, Brazil<sup>☆</sup>



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## ABSTRACT

This study aims to describe the types of intrafamilial violence perpetrated against children according to living conditions, family factors, and child characteristics, and to identify the association between types of intrafamilial violence and asthma symptoms in atopic and non-atopic children. A cross-sectional study was carried out with 1,370 caregivers as part of the Social Changes, Asthma and Allergy in Latin America (SCAALA) study, conducted in 2006 in Brazil. The study population was selected by random sampling. The main outcome measures were atopic and non-atopic asthma. We investigate the association between intrafamilial violence and asthma symptoms in atopic and non-atopic children. A backward multivariate logistic polytomous regression was performed to verify the main association. Nonviolent discipline (NVD) and maltreatment nonviolent discipline (MNVD) were positively associated with non-atopic asthma symptoms (NVD: odds ratio (OR) = 1.95/95% confidence interval (CI) = 1.17–3.25; MNVD: OR = 1.95/95% CI = 1.19–3.20). However, for the most severe intrafamilial violence, this association was not found after control of potential confounders. This study demonstrates the effect of types of intrafamilial violence on non-atopic asthma. Intrafamilial violence against children represents one more component in the determination of non-atopic asthma in Latin America.

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## Introduction

Asthma is a chronic disease and its prevalence is increasing in Latin America (Anandan, Nurmatov, Van Schayck, & Sheikh, 2010). This is a multifactorial condition with a heterogenic profile that presents at least two phenotypes: atopic and non-atopic. Atopic asthma is more common in developed countries and it is associated with allergic inflammation related to intestinal infections, crowding, and older siblings at home (Cooper, Rodrigues, Cruz, & Barreto, 2008). Non-atopic asthma is more common in developing countries and it is associated with poverty, indoor and outdoor pollution, diet, and stress (Cooper et al., 2008; Cooper, Rodrigues, & Barreto, 2012). The increase in non-atopic asthma in Latin America needs to be understood and seems to be associated with a Western lifestyle and urbanization (Barreto et al., 2006; Cassol et al., 2005; Cooper et al., 2008), including psychosocial and environmental risk factors (Maia, Marcopito, Amaral, Tavares, & Santos, 2004;

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Strina, Barreto, Cooper, & Rodrigues, 2014), since genetic factors alone cannot explain the observed increase over such a short duration (Boechat, Rios, Sant'anna, & França, 2005; Cassol et al., 2005). Intrafamilial violence against children might be one of these stressors associated with asthma and the severity of this condition (Wright, 2011; Wright & Steinbach, 2001). Despite few studies about asthma phenotypes (Strina et al., 2014), there is evidence that stress is a risk factor for the non-atopic phenotype and intrafamilial violence might be one of them. Furthermore, some studies have suggested that dysfunctional family interaction, especially early parental interaction, might influence the course of asthma (Gustafsson, Kjellman, & Bjorksten, 2002). Intrafamilial violence may play a role in asthma development as a stress factor through inflammatory effects produced by an increase in cortisol (Wright, 2011). Moreover, serious damage to the cell structure can be caused by the action of neutrophilic airway inflammation that may dramatically increase the reaction to stress (Wright, 2005).

An association between intrafamilial violence against children and asthma has been found mainly in populations exposed to dysfunctional family relationships, regardless of socioeconomic status. Data from North American cross-sectional studies have shown a 1.48 times greater risk of asthma developing in schoolchildren (Graham-Bermann & Seng, 2005) and a 1.73 times greater risk in very young children (Berz et al., 2007). A cross-sectional study of 2,771 Swedish schoolchildren aged 4–9 years reported that the risk of asthma was 3.9 times greater among those who suffered from intrafamilial violence (Jernbro, Svensson, Tindberg, & Janson, 2012). A recent wide-ranging study with 95,677 American children found a significant association of intrafamilial adverse childhood experiences (ACE) exposures and the odds of reporting asthma. As numbers of ACE events increase, we can observe a rise in the odds of reporting asthma. There was a 2.42 times increase in the odds ratio when children were exposed to at least five ACE (Wing, Gjelsvik, Nocera, & McQuaid, 2015).

Intrafamilial violence is also related to asthma in adolescents. Health status in general and the risk of developing asthma in particular are more likely to be affected in adolescents subjected to corporal punishment (Lau, Liu, Cheung, Yu, & Wong, 1999; Turyk et al., 2008). A longitudinal retrospective study employing secondary data for 6,282 subjects aged 12–18 years with low socioeconomic status found a 1.73 times greater risk of asthma when the children suffered an episode of family violence during childhood (Lanier, Jonson-Reid, Stahlschmidt, Drake, & Constantino, 2010).

Evidence about association between intrafamilial violence and asthma in the Latin American context has been demonstrated in only one study. A total of 40 Mexican children with bronchial asthma who were exposed to family violence within a more disorganized environment had a greater number of episodes of asthma throughout the year (Bolaños-Rodriguez, Loredó-Abdalá, Trejo-Hernández, & Huerta-López, 2010). In Brazil, although intrafamilial violence has also been suggested as a trigger factor for health problems in children and adolescents (Reichenheim, Hasselman, & Moraes, 1999), unfortunately, there has been no investigation into its influence on asthma symptoms.

In spite of the advances highlighted in international studies, there are few observational studies to evaluate the association between intrafamilial violence and asthma in Latin America. Furthermore, the relationship between non-atopic asthma and intrafamilial violence against children in the Brazilian context has not been addressed, despite being a common phenomenon (Cooper et al., 2012; Rates, Melo, Mascarenhas, & Malta, 2015; Reichenheim et al., 1999).

In order to extend the biomedical model of asthma, to understand the relationship between asthma phenotypes and intrafamilial violence, and considering the relevance of this subject and a lack of study in Latin American context, this study was carried out. This research aims to describe the types of intrafamilial violence perpetrated against children according to living conditions, family factors, and child characteristics, as well as to estimate the association between intrafamilial violence and asthma symptoms in atopic and non-atopic children.

## Methods

### *Study Design, Population, and Setting*

This is a cross-sectional study carried out as part of the Social Changes, Asthma and Allergy in Latin America (SCAALA) program, conducted in 2006 in the city of Salvador, Bahia, Brazil. SCAALA is a program of research activities conducted in Brazil and Ecuador. In Brazil, the main objective of this study was to investigate the association between the prevalence of asthma and other allergic disorders and their potential risk factors, such as exposure to infections in childhood, and environmental, nutritional, immunological, and psychosocial factors (Barreto et al., 2006).

The study population was selected by random sampling and was recruited from 24 micro-regions located in different sewage system basins within Salvador. Out of 1,445 caregivers who answered the questions for asthma symptoms, 1,370 answered the intrafamilial violence questionnaire. The non-response rate was 5.19%, without differential bias.

### *Instruments*

Asthma and risk factors were measured using the International Study of Asthma and Allergies in Childhood, largely based on ISAAC Phase II, adapted and standardized for the Brazilian population (Table 1) (Camelo-Nunes, 2002).

Blood samples were used to measure specific IgE levels and were analyzed by radioimmunoassay (RAST) using the enzyme-linked immunosorbent assay (ELISA) technique with commercially available kits (Indoor Biotechnologies, Charlottesville, VA, EUA).

Intrafamilial violence against children was measured using the Conflict Tactics Scales: Parent–Child (CTSPC) (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998), which was validated for a Brazilian population (Reichenheim & Moraes, 2003).

**Table 1**  
ISAAC questions for 6- to 7-year-old children.

Items	
1	Has your child had wheezing or whistling in the chest in the past 12 months?
2	In the past 12 months, how often on average has your child had his/her sleep disturbed due to wheezing?
3	In the past 12 months, has wheezing ever been severe enough to limit your child's speech to only one or two words at a time between breaths?
4	Has your child ever had asthma?
5	In the past 12 months, has your child's chest sounded wheezy during or after exercise?

**Table 2**  
Original and new dimensions after confirmatory factor analysis from CTSPC.

Items	New dimension after CFA	Original dimension
A – Explained why something was wrong	NVD	NVD
B – Put in “time-out”	NVD	NVD
E – Gave him something else to do instead of what he was doing	NVD	NVD
Q – Took away privileges or grounded him	NVD	NVD
F – Shouted, yelled, or screamed	MNVD	PA
N – Threatened to spank or hit	MNVD	PA
D – Hit with hard object	MNVD	CP
H – Spanked him	MNVD	CP
P – Slapped on the hand, arm, or leg	MNVD	CP
O – Hit other part of body besides the bottom with a hard object	MNVD	PM
J – Swore or cursed at	MVD	PA
L – Said you would send him away or kicked him out of the house	MVD	PA
U – Called him dumb or lazy	MVD	PA
C – Shook him	MVD	CP
R – Pinched him	MVD	CP
V – Slapped on the face, head, or ears	MVD	CP
G – Hit with a first or knocked hard	MVD	PM
T – Threw or knocked down	MVD	PM
I – Grabbed around neck and choked	MVD	SPM
K – Beat up as hard as you could	MVD	SPM

Note: CFA: confirmatory factor analysis; MNVD: maltreatment nonviolent discipline; MVD: maltreatment violent discipline; NVD: nonviolent discipline; PA: psychological aggression; CP: corporal punishment; PM: physical maltreatment; SPM: severe physical maltreatment.

This instrument is composed of 22 dichotomous items and it evaluates three intrafamilial violence dimensions: Nonviolent discipline (four items), psychological aggression (five items), and physical violence (13 items). The last dimension is composed of three subtypes of physical violence, according to violence severity: corporal punishment (six items), physical maltreatment (three items), and severe physical maltreatment (four items) (Table 2). A Brazilian study found appropriate reliability and internal consistence with Cronbach's alpha ranging from .48 to .67 (Reichenheim & Moraes, 2006), in line with international studies.

A socio-demographic questionnaire was employed to evaluate the nature of the socio-environmental context of the child through variables such as maternal schooling, family income, habits, such as smoking and drinking (Masur & Monteiro, 1983), basic sanitation, living conditions, history of parental asthma, and the demographic characteristics of the child.

### Outcome Measures

The presence of asthma was defined as the presence of asthma symptoms in the last 12 months and at least one of the following conditions: having a medical diagnosis of asthma, difficulty talking due to wheezing, waking at night due to wheezing one or more times a week, and wheezing during or after physical exercise (Simões, Cunha, Barreto, & Cruz, 2008).

Atopy was defined as the presence of specific IgE for at least one of the most important allergens, such as *Dermatophagoides pteronyssinus*, *Blomia tropicalis*, *Blattella germanica*, cat, and dog. The adopted cut-off point was 0.70 kU/l.

Atopic asthma was defined as the presence of asthma symptoms and IgE below 0.70 kU/l, while non-atopic asthma was defined as the presence of asthma symptoms but an absence of IgE. The reference group for atopic asthmatics was atopic non-asthmatic children, while healthy children formed the reference group for non-atopic asthmatics. A similar procedure was followed by other authors (Santos, Santos, Rodrigues, & Barreto, 2012).

### Main Exposure Measures

Intrafamilial violence against children was defined through confirmatory factor analysis (CFA) (Bonfim, Santos, Menezes, Reichenheim, & Barreto, 2011) of the CTSPC scale in line with the international literature (Windham et al., 2004). This

procedure was done because the original CTSPC does not consider correlations among different types of violence despite the fact that the majority of studies consider this co-occurrence (Windham et al., 2004; Clément & Bouchard, 2005). Therefore, an exploratory factor analysis (EFA) was conducted to verify clusters of CTSPC items. As expected, items from different original dimensions were correlated. On the basis of the results from EFA, a CFA was performed and three factors were found. Factor 1, named maltreatment violent discipline (MVD), contained original items from physical maltreatment, severe physical maltreatment, corporal punishment, and psychological aggression dimensions. Factor 2, named MNVD, included original items from corporal punishment and psychological aggression dimensions. Factor 3 had the same items from NVD original dimension. Two items from severe physical maltreatment dimension (burned or scalded on purpose and threatened with a knife or gun) were excluded from the analysis because of the lack of response. This rearrangement of items demonstrated the levels of severity of the violence. MVD dimension is the most severe level, MNVD dimension is an intermediate level, and NVD dimension is the least severe level (Table 2). Details about these procedures can be seen in a previous publication (Bonfim et al., 2011).

After CFA, the answers for each item were summed up in each dimension and were considered three continuous variables. In order to dichotomize the variables, we used a cut-off point defined by the median. Variables above the median value were considered exposed and those below were considered non-exposed (reference group). However, children can be exposed to more than one type of intrafamilial violence at the same time.

### Covariables

The potential confounders or effect modifiers were identified according to the literature. These variables were the child's sex and age, schooling and maternal age, family income (ownership of electronic appliances and motorized vehicles), history of parental asthma, smoking at home, suspected maternal alcoholism, running water at home and garbage collection, connection to a sewage system in the past and present, parasitic infection, and a history of pneumonia (Cooper et al., 2008; Masur & Monteiro, 1983).

The collected data were entered into the Epi Info software program, version 6.0, using double data entry, and statistical analyses were performed using the STATA software program, version 12.0.

### Data Analysis

Frequencies, proportions, and percentages of the covariables were calculated to compare the exposed and non-exposed subjects.

Following this, a bivariate analysis was performed using contingency tables and Pearson's chi-square test to identify possible differences between proportions and possible confounding factors. *p*-Values <.05 were considered to be statistically significant.

Finally, a backward multivariate logistic polytomous regression was performed to verify the main association between atopic and non-atopic asthma (dependent variables) and three dimensions of CTSPC (independent variables). Statistical inference was based on a 95% confidence interval and an alpha of .05. The backward model selection procedure was initiated with the saturated model containing all the potential confounding factors (Rothman & Greenland, 1998). Since the intraclass correlation coefficient was  $9.3 \times 10^{-8}$ , indicating that the prevalence of asthma does not change according to micro-regions, we opted not to correct for the cluster effect.

### Ethical Considerations

The research protocol was submitted to and approved by the Internal Review Board of the Institute of Collective Health, Federal University of Bahia. The study was approved by the National Ethics Committee in 2005, under registration number 047-05/CEP-ISC FR-78168.

## Results

The study population was composed of 731 boys (53.40%) and 639 girls (46.6%) with a mean age of 7.07 years (SD 1.7; range of 4–12 years). The mean age of mothers was 32.08 years (SD 6.68; range of 18–56 years), and 48.0% of them had had 5–8 years of schooling. The prevalence of suspected maternal alcoholism over the previous 12 months was 12.3%, while that of smoking in the same period was 12.5%.

The prevalence rates of atopic and non-atopic asthma were 10.66% and 11.39%, respectively and these decreased as the child's age increased ( $p < .05$ ) (Table 3). Atopic asthma was more prevalent among boys with a middle socioeconomic status, whereas non-atopic asthma predominated among girls with a lower socioeconomic status. A history of pneumonia, parental asthma, and suspected maternal alcoholism were more common in both atopic and non-atopic asthma ( $p < .05$ ) (Table 3). Living conditions and basic sanitation were not associated with atopic and non-atopic asthma.

A prevalence of 69.93% was found for MNVD and 47.15% for MVD (data not shown). However, the most common conflict resolution strategy between parent and child was NVD at 73.8%, and this was more common among mothers aged between 18 and 28 years with a higher socioeconomic status.

**Table 3**

Distribution of atopic and non-atopic asthma considering children, family, living conditions, basic sanitation, and genetic characteristics (N = 1,370).

Variables	Healthy (reference group) N = 685 N (%)	Non-atopic asthmatic N = 156 N (%)	Atopic non-asthmatic (reference group) N = 383 N (%)	Atopic asthmatic N = 146 N (%)
Characteristics of the child				
Sex**				
Male	327 (47.74)	76 (48.72)	240 (62.66)	88 (60.27)
Female	358 (52.26)	80 (51.28)	143 (37.34)	58 (39.73)
Age of the child (years)**				
4–6	278 (40.58)	95 (60.90)	147 (38.38)	76 (52.05)
7–8	231 (33.72)	41 (26.28)	125 (32.64)	39 (26.41)
9–12	176 (25.69)	20 (12.82)	111 (28.98)	31 (21.23)
History of pneumonia**				
Yes	87 (12.70)	42 (26.92)	57 (14.88)	42 (28.77)
No	598 (87.30)	114 (73.08)	326 (85.12)	104 (71.23)
Characteristics of the mother				
Age of the mother (years)				
18–28	256 (37.37)	62 (39.74)	133 (34.73)	50 (34.25)
29–35	216 (31.53)	55 (35.26)	128 (33.42)	55 (37.67)
36–56	213 (31.09)	41 (28.08)	122 (31.85)	41 (28.08)
Years of schooling				
≤4	216 (31.53)	36 (23.08)	119 (31.07)	41 (28.08)
5–8	324 (47.30)	76 (48.72)	189 (49.35)	69 (47.26)
≥9	145 (21.17)	44 (28.21)	75 (19.58)	36 (24.66)
Suspected alcoholism**				
Yes	78 (11.39)	32 (20.51)	36 (9.40)	23 (15.75)
No	607 (88.61)	123 (84.25)	347 (90.60)	123 (84.25)
Smoking (last 12 months)				
Yes	87 (12.70)	22 (14.38)	41 (10.70)	21 (14.38)
No	598 (87.30)	125 (85.62)	342 (89.30)	125 (85.62)
Family income (tertile)**				
Lowest	256 (37.37)	71 (45.51)	118 (30.81)	46 (31.51)
Middle	212 (30.95)	50 (32.05)	119 (31.07)	56 (38.36)
Highest	217 (31.68)	35 (22.44)	146 (38.12)	44 (30.14)
Living conditions and basic sanitation				
Running water in the household				
Yes	580 (84.67)	124 (79.49)	327 (85.38)	123 (84.25)
No	105 (15.33)	32 (20.51)	56 (14.62)	23 (15.75)
Frequency of garbage collection				
Daily	514 (75.04)	119 (76.28)	272 (71.02)	109 (74.66)
Occasionally	171 (24.96)	37 (23.72)	111 (28.98)	37 (25.34)
Sewage system				
Past/present	595 (86.86)	130 (83.33)	339 (88.51)	133 (91.10)
Never	90 (13.14)	26 (16.67)	44 (11.49)	13 (8.90)
<i>Ascaris lumbricoides</i> infection				
Yes	48 (7.01)	18 (11.54)	31 (8.09)	10 (6.85)
No	637 (92.99)	138 (88.46)	352 (91.91)	136 (93.15)
<i>Trichuris trichiura</i> infection				
Yes	49 (7.15)	13 (8.33)	24 (6.27)	7 (4.79)
No	636 (92.85)	143 (91.67)	359 (93.73)	139 (95.21)
Genetic characteristics				
Family history of asthma (father or mother)**				
Yes	63 (9.20)	22 (14.10)	21 (5.48)	19 (13.01)
No	622 (90.80)	134 (85.90)	362 (94.52)	127 (86.99)

\*\*  $p < .05$ .

MNVD predominated in children aged between 4 and 6 years with a history of pneumonia whose mothers had smoked in the last 12 months and were suspected alcoholics. These maternal habits were also more frequent among mothers who used MVD as a conflict resolution strategy, who were also younger and had a lower socioeconomic status ( $p < .05$ ). Living conditions, basic sanitation, genetic conditions, and the child's sex were not found to be associated with intrafamilial violence against children (Table 4).

NVD and MNVD were positively associated with non-atopic asthma symptoms only (NVD: OR = 1.95/95% CI = 1.17–3.25; MNVD: OR = 1.95/95% CI = 1.19–3.20), even after controlling for potential confounding factors (Table 5). MVD was also associated with non-atopic asthma, although the statistical significance disappeared after controlling for confounders (MVD: OR = 1.47/CI = 0.98–2.20) (Table 5).

**Table 4**  
Child, family, living conditions, and basic sanitation characteristics by types of intrafamilial violence (N = 1,370).

Variables	NVD		MNVD		MVD	
	<Median N = 359 N (%)	≥Median N = 1,011 N (%)	<Median N = 412 N (%)	≥Median N = 958 N (%)	<Median N = 724 N (%)	≥Median N = 646 N (%)
<b>Characteristics of the child</b>						
<b>Sex</b>						
Male	179 (49.86)	522 (54.60)	209 (50.73)	522 (54.49)	370 (51.10)	361 (55.88)
Female	180 (50.14)	459 (45.40)	203 (49.27)	436 (45.51)	354 (48.90)	285 (44.12)
p value		.122		.201		.077
<b>Age (years)</b>						
4–6	159 (44.29)	437 (43.22)	177 (42.96)	419 (43.74)	317 (43.78)	279 (43.19)
7–8	109 (30.36)	327 (32.34)	113 (27.43)	323 (33.72)	229 (31.63)	207 (32.04)
9–12	91 (25.35)	247 (24.43)	122 (29.61)	216 (22.55)	178 (24.59)	160 (24.77)
p value		.784		<b>.009</b>		.975
<b>History of pneumonia</b>						
Yes	53 (14.76)	175 (17.31)	55 (13.35)	173 (18.06)	121 (16.71)	107 (16.56)
No	306 (85.24)	836 (82.69)	357 (86.65)	785 (81.94)	603 (83.29)	539 (83.44)
p value		.266		<b>.032</b>		.941
<b>Characteristics of the mother</b>						
<b>Age (years)</b>						
18–28	107 (29.81)	394 (38.97)	129 (31.31)	372 (38.83)	243 (33.56)	258 (39.94)
29–35	120 (33.43)	334 (33.04)	137 (33.25)	317 (33.09)	235 (32.46)	219 (33.90)
36–56	132 (36.77)	283 (27.99)	146 (35.44)	269 (28.08)	246 (33.98)	169 (26.16)
p value		<b>.020</b>		<b>.008</b>		<b>.004</b>
<b>Years of schooling</b>						
≤4	93 (25.91)	319 (31.55)	123 (29.85)	289 (30.17)	221 (30.52)	191 (29.57)
5–8	175 (48.75)	483 (47.77)	192 (46.60)	466 (48.64)	345 (47.65)	313 (48.45)
≥9	91 (25.35)	209 (20.67)	97 (23.54)	203 (21.19)	158 (21.82)	142 (21.98)
p value		.064		.610		.926
<b>Suspected alcoholism</b>						
Yes	37 (10.31)	132 (13.06)	36 (8.74)	133 (13.06)	58 (8.01)	111 (17.18)
No	322 (89.69)	879 (86.94)	376 (91.26)	825 (86.94)	666 (91.99)	535 (82.82)
p value		.173		<b>.008</b>		<b>.000</b>
<b>Smoking (last 12 months)</b>						
Yes	44 (12.26)	127 (12.56)	65 (15.78)	106 (11.06)	76 (10.50)	95 (14.71)
No	315 (87.74)	884 (87.44)	347 (84.22)	852 (88.94)	648 (89.50)	551 (84.29)
p value		.880		<b>.016</b>		<b>.019</b>
<b>Family income (tertile)</b>						
Lowest	150 (41.78)	341 (33.73)	139 (33.74)	352 (36.74)	243 (33.56)	248 (38.39)
Middle	95 (26.46)	342 (33.83)	132 (32.04)	305 (31.84)	222 (30.66)	215 (33.28)
Highest	114 (31.75)	328 (32.44)	141 (34.22)	301 (31.42)	259 (35.77)	183 (28.33)
p value		<b>.009</b>		.489		<b>.012</b>
<b>Living conditions and basic sanitation</b>						
<b>Running water in the household</b>						
Yes	304 (84.68)	850 (84.08)	349 (84.71)	805 (84.03)	613 (84.67)	541 (83.75)
No	55 (15.32)	161 (15.92)	63 (15.29)	153 (15.97)	111 (15.33)	105 (16.25)
p value		.787		.752		.640
<b>Frequency of garbage collection</b>						
Daily	275 (76.60)	739 (73.10)	108 (26.21)	248 (25.89)	183 (25.28)	173 (26.78)
Occasionally	84 (23.40)	272 (26.90)	304 (73.79)	710 (74.11)	541 (74.72)	473 (73.22)
p value		.193		.899		.526
<b>Sewage system</b>						
Past/present	311 (86.63)	886 (87.64)	357 (86.65)	840 (87.68)	631 (87.15)	566 (87.62)
Never	48 (13.37)	125 (12.36)	55 (13.35)	118 (12.32)	93 (12.85)	80 (12.38)
p value		.289		.604		.575
<b>Ascaris lumbricoides infection</b>						
Yes	25 (6.96)	82 (8.11)	35 (8.50)	72 (7.52)	47 (6.49)	60 (9.29)
No	334 (93.04)	929 (91.89)	377 (91.50)	886 (92.48)	677 (93.51)	586 (90.71)
p value		.487		.536		.054
<b>Trichuris trichiura infection</b>						
Yes	20 (5.57)	73 (7.22)	27 (6.55)	66 (6.89)	50 (6.91)	43 (6.66)
No	339 (94.43)	938 (92.78)	385 (93.45)	892 (93.11)	674 (93.09)	603 (93.34)
p value		.286		.821		.854

Note: NVD = nonviolent discipline; MNVD = maltreatment nonviolent discipline; MVD = maltreatment violent discipline. In bold we indicate statistically significant p values.

**Table 5**  
Non-adjusted and adjusted OR for atopic and non-atopic asthma symptoms, according to types of intrafamilial violence.

Intrafamilial violence types	Atopic asthma symptoms			Non-atopic asthma symptoms		
	N (%)	Crude OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)	N (%)	Crude OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)
Non-violent discipline	105 (10.39)	1.00		131 (12.96)	1.00	
<Median		0.87 (0.52–1.28)	0.77 (0.46–1.28)		<b>2.09 (1.32–3.31)</b>	<b>1.95 (1.17–3.25)</b>
≥Median						
Maltreatment non-violent discipline	104 (71.23)	1.00		126 (80.77)	1.00	
<Median		1.28 (0.82–1.98)	1.38 (0.83–2.29)		<b>1.91 (1.24–2.96)</b>	<b>1.95 (1.19–3.20)</b>
≥Median						
Maltreatment violent discipline	76 (52.05)	1.00		92 (58.97)	1.00	
<Median		1.33 (0.90–1.98)	1.29 (0.83–2.01)		<b>1.75 (1.23–2.51)</b>	1.47 (0.98–2.20)
≥Median						

Note: OR = odds ratio CI = confidence interval. In bold we indicate statistically significant OR.

<sup>a</sup> Adjusted for: child's sex and age, mother's age, maternal schooling, family income, smoking in house in the last 12 months, suspected alcoholism, basic sanitation, and living conditions.



## Discussion

NVD was the most common conflict resolution strategy between parent and child and it was more prevalent among mothers who were younger and had a higher socioeconomic status. MNVD was the second most common type of intrafamilial violence and it predominated among younger children with a history of pneumonia whose mothers were also younger and had smoked and had consumed alcohol in the year. Although MVD was also common in this group, it was more prevalent among families of low socioeconomic status. NVD and MNVD are associated with only non-atopic asthma, although following adjustment for potential confounders. This finding confirms the literature in that the non-atopic phenotype of asthma is associated with psychosocial factors and it is very common in the Western lifestyle of developing countries (Cooper et al., 2008; Strina et al., 2014). Intrafamilial violence against children is one of the stressors associated with non-atopic asthma. Parental difficulties in adequately caring for their children may develop into chronic stress factors, leading to psychoneuroimmunological dysfunction, which plays a significant role in the development of non-atopic asthma (Kaugars, Klinnert, & Bender, 2004). Difficulty caring for their children was aggravated by the mother's profile, if they were young, had low socioeconomic status, and suspected alcoholism. MVD was also associated with non-atopic asthma despite there being no statistical significance after adjustment for confounders. This adverse effect could be because of a lack of response or caregivers who might use this more severe tactic to sort out conflict would pay less attention to the child's wheezing.

An association between intrafamilial violence against children and asthma has also been reported in studies carried out in the United States (Berz et al., 2007; Graham-Bermann & Seng, 2005; Haavet, Straand, Saugstad, & Grünfeld, 2004; Lanier et al., 2010; Turyk et al., 2008; Wing et al., 2015; Wright et al., 2004), Mexico (Bolaños-Rodriguez et al., 2010), and Sweden (Jernbro et al., 2012), but the instruments used in such studies did not consider types of violence and atopic and non-atopic phenotypes, which makes it difficult to compare the results with our findings.

Our finding of a greater prevalence of intrafamilial violence in the children of younger mothers is in agreement with a study carried out on 7,725 women in the United States (Giles-Sims, Straus, & Sugarman, 1995) and also with the findings of a meta-analysis conducted in the United States on 12 studies (Connelly & Straus, 1992). Young maternal age, together with low education level and suspected alcoholism, has been linked to inadequate mothering conditions (Cecconello, De Antoni, & Koller, 2003) and associated with both high asthma prevalence rates (Kaugars et al., 2004) and intrafamilial violence (Connelly & Straus, 1992).

Intrafamilial violence can play a role in asthma disruption through a mechanism common in chronic stress. Stressors that are known to result in lasting neuroendocrine disruption (e.g., to the hypothalamic–pituitary–adrenal (HPA) axis) and consequent immunomodulation merit further exploration (Wright & Enlow, 2008). Chronic stress may interfere in the HPA axis response and alter the production of cortisol, potentially generating inflammatory effects common to the asthmatic disease (Wright, 2011). Furthermore, there is another type of inflammation, a neutrophilic airway inflammation, more common in non-atopic phenotype (Wright, 2011). The hypothesis of oxidative stress would explain the relationship between stress, HPA axis alteration, and the immune system. Inflammatory diseases are often mediated by reactive oxygen species (ROS), a natural by-product of the metabolism of oxygen, which may increase dramatically in reaction to environmental stress, causing serious damage to the cell structure (Wright, 2005; Wright, Rodrigues, & Cohen, 1998). Exposure to environmental pollutants, common in Latin American poverty contexts, are risk factors for asthma, and psychological stress has been considered an additional environmental factor in both an elevation of oxidative stress and a growth in inflammation of the respiratory airways, which may increase the prevalence of non-atopic asthma in this context (Wright, 2011).

Certain study limitations should be taken into consideration. The cross-sectional design renders it impossible to analyze the temporal sequence of events and to identify reverse causation. Nevertheless, the triggering of asthma following stressful events has already been documented (Sandberg et al., 2000; Sandberg, Järvenpää, Penttinen, Paton, & McCann, 2004), although these researchers did not study the specific effect of intrafamilial violence against children.

Because this topic is subject to the effect of social desirability, bias may have occurred in the data, since the respondents may not have answered the questions completely truthfully. Further studies should be carried out to evaluate the frequency of these acts of violence, an aspect that could not be assessed in the present study, since the method used for this type of evaluation has not yet been validated for Brazil. Future studies should also be conducted to classify the asthma according to respiratory capacity as measured by lung function. The mothers' reports of asthma symptoms may be imprecise, given their erroneous interpretations of perceptions of these symptoms, as well as problems understanding questions, particularly when we consider that this population has a low socioeconomic status. Difficulties reported by the mothers in understanding the term "wheezing," as used in the ISAAC questionnaire, have already been reported (Frota, Martins, & Santos, 2008).

## Conclusion

This study demonstrates the effect of NVD and MNVD on non-atopic asthma and proceeds towards an understanding of the psychosocial factors involved in the occurrence of this condition. As previously reported in studies carried out in the United States, Sweden, and Mexico, intrafamilial violence is also widespread in Brazil, highlighting the importance of understanding this phenomenon in order to enable the implementation of future public health interventions. Preventing intrafamilial violence involves not only parents but also a whole system of culture and beliefs that surrounds it.

These findings are in agreement with the hypothesis about the effect of urbanization and Western lifestyle in developing countries on asthma, given that intrafamilial violence is a potential stressor for the child (Cooper et al., 2012).



Although this study has confirmed the importance of psychosocial factors in the occurrence of non-atopic asthma, the multifactorial characteristics of this condition require further interdisciplinary studies. This suggests that intrafamilial violence against children represents one more component in the explanation of the causality of non-atopic asthma in Latin America within the hypothesis of urbanization and Western lifestyle of developing countries.

## Ethical Approval

The study was approved by the National Ethics Committee in 2005, registration number 047-05/CEP-ISC FR-78168.

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