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# Maternal common mental disorder over time and asthma control: The role of social support

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## Abstract

**Background:** Despite therapeutic advances, asthma prevalence remains high. Psychosocial factors, including maternal mental disorders, may be involved. This study aims to evaluate the association of maternal common mental disorders (CMDs) and their change over time with asthma morbidity in the child and to observe the effect of social support on this association.

**Methods:** This prospective study involved 189 dyads of mothers and their asthmatic children aged between 2 and 14 years, assisted in specialized outpatient clinics. We measured the association of maternal CMD evolution (absent, maintained, or improved over time) with asthma control and visits to the emergency department (ED) due to asthma attacks through Poisson regression analysis. We further stratified the sample according to social support levels to identify a possible effect of this variable on the association of maternal psychological symptoms with asthma morbidity.

**Results:** Compared with mothers who maintained CMD over time, maternal CMD absence had a protective effect on the occurrence of visits to the ED (RR: 0.45; 95% CI: 0.26-0.79) and maternal CMD improvement was associated with lower risk of uncontrolled asthma in the child (RR: 0.60; 95% CI: 0.37-0.97). There was a stronger association of maternal CMD improvement with asthma control in the child only for the stratum of mothers with high social support in its three dimensions (affective-social interaction, emotional-informational, and material dimensions).

**Conclusions:** Maternal CMD absence and improvement over the study period were protective factors for uncontrolled asthma in the child, mainly in the presence of high social support.

## KEYWORDS

asthma, caregivers, child, chronic illness, mental health

## 1 | INTRODUCTION

Economically disadvantaged people disproportionately affected by asthma and asthma severity are often exposed to chronic psychosocial stressors.<sup>1,2</sup> Within the psychosocial factors, there are studies

assessing the caregiver's mental health, particularly the mother's, as a predictor of asthma morbidity.<sup>3-5</sup>

In this sense, maternal depressive symptoms are associated with increased number of visits to the emergency department (ED),<sup>6,7</sup> higher number of hospitalizations,<sup>3,5</sup> and worsening pulmonary

function in asthmatic children.<sup>4,8-10</sup> Explanations for that may lie on decreased ability to care, especially in situations of socioeconomic disadvantage.<sup>11,12</sup> Parental mental disorder may act as a chronic stressor for the child, increasing his/her vulnerability to environmental stress, by changing the psychobiological pathways of stress.<sup>11,13</sup>

Although depression and anxiety are the most extensively studied maternal mental health problem indicators, other types of disorders may be common in asthmatic children's mothers and caregivers.<sup>14</sup> Mental health screening questionnaires would be more sensitive in identifying mental health problems as a group, including the questionnaires that assess the presence of common mental disorders (CMDs). These include symptoms of depressive-anxious mood, psychosomatic complaints, decreased vital energy, and depressed thoughts.<sup>15,16</sup> Although highly prevalent globally, CMD is quite often overlooked and may not be identified as psychiatric morbidity in up to two-thirds of cases by health professionals in primary care.<sup>16,17</sup>

Other psychosocial factors, such as maternal stress and social support (SS), seem to be associated with asthma morbidity in the child.<sup>3</sup> Maternal exposure to stressful events (SE) appears to be related to worsening asthma symptoms and lower response to bronchodilator therapy.<sup>3,8,18</sup> SS, including the support from relatives and friends, has been associated with better disease control.<sup>3,19</sup> However, investigations into the role of these determinants, particularly maternal SS, as effect modifiers in the association of maternal mental health problems with uncontrolled asthma in the child are lacking. Identifying a third factor as moderator of the effect contributes to a more complex contextualization of this association.<sup>20</sup>

Prospective studies evaluating maternal psychosocial factors in association with child's asthma control are scarce and had focused on maternal depressive and anxiety symptoms.<sup>3,9</sup> The present study aims to assess maternal CMD as a predictor of uncontrolled asthma in the child. To this end, symptoms of CMD were measured over time in order to identify changes in their status and to verify their association with child's asthma control. Secondarily, we aimed to observe whether the maternal SS affects this association. We hypothesized that the absence of maternal CMD is associated with better asthma control and that the high level of maternal SS increases the strength of this association. We also evaluated the occurrence of maternal stressors affecting asthma control in children.

## 2 | METHOD

### 2.1 | Participants and study design

This prospective study was conducted in two pediatric referral outpatient clinics from June 2015 to December 2017. The interviews, directed at the mothers, were held at baseline, 3 months, and 6 months later, with the same questionnaires for psychosocial factors (exposure) and asthma control in the child (outcome). This subsample of a previous cross-sectional study involved initially 362 dyads, 189 of which completed the follow-up. Asthma control

### Key Message

Interventions in the mother's mental health may benefit asthma management in the child. Social Support might contribute to asthma control by modifying the effect of maternal Common Mental Disorders.

measures were obtained by averaging data from the two follow-up interviews.

Dyads of mothers and children/adolescents aged 2-14 years with medical diagnosis of asthma<sup>21</sup> were selected. Generally speaking, in adolescents and children older than 5 years, this medical diagnosis was based on recurrent or persistent symptoms characteristic of asthma and confirmed with a spirometer indicating airflow limitation and reversibility (rapid improvement in forced expiratory volume in one second—FEV1—measured after inhalation of a salbutamol). As variable airflow limitation cannot be documented by spirometer in children under five, patients with typical recurrent or persistent symptoms, with or without past or family history of allergic disease, started a trial of treatment for at least 2-3 months with as-needed short-acting beta2-agonist (SABA) and regular low-dose inhaled corticosteroids (ICS). Marked clinical improvement during treatment, and deterioration when treatment was stopped, supported a diagnosis of probable asthma in this age-group.<sup>21</sup> Asthmatic children with associated severe comorbidities (another severe chronic lung disease, heart disease, or severe gastroesophageal reflux disease, for example) were excluded.

### 2.2 | Instruments of measurement and definition of variables

#### 2.2.1 | Asthma control

To define the primary outcome variable, the Asthma Control Symptom Screening Questionnaire suggested by the Global Initiative for Asthma (GINA) was used. This questionnaire contained four questions about daytime and nighttime symptoms, activity limitation, and use of relief medications in the four previous weeks.<sup>21</sup> For the purposes of analysis, the asthmatic children were classified as controlled (including partially controlled) and uncontrolled. As a secondary outcome, the report of visits to the emergency department (ED) in the 3 months prior to the consultation was also considered.

#### Common Mental Disorders

CMDs were measured through the screening Self-Report Questionnaire (SRQ-20), which consists of 20 questions including symptoms of insomnia, anxiety, fatigue, irritability, depressive moods, difficulty concentrating, and somatic complaints in the 30 previous days. These can be grouped into symptoms of anxiety and

depression, somatic symptoms, reduced vital energy, and depressive thoughts.<sup>16</sup>

The presence of maternal CMD was identified as the affirmative answer to eight or more questions, which corresponded to a cut-off point with 83% sensitivity and 80% specificity in its validation in Brazil.<sup>22</sup> Three exposure levels were considered for our study: (0) maternal CMD absence (the absence of maternal CMD at baseline and follow-up), (1) maternal CMD maintenance (the presence of maternal CMD at baseline and follow-up), and (2) maternal CMD improvement (the presence of maternal CMD at baseline and the absence at follow-up).

#### Maternal Social Support

The social support scale from the Medical Outcomes Study Questions–Social Support Survey (MOS-SSS), which has been validated for the Brazilian population,<sup>23</sup> was applied to evaluate the level of social support. This consists of 19 questions answered on a five-item Likert scale ("never," "rarely," "sometimes," "almost always," and "always"). The organization of the items covers originally five dimensions of social support: material, affective, emotional, information, and positive social interaction.

As defined in two previous studies carried out in Brazil, the questions were grouped into three SS dimensions: affective and social interaction dimension, emotional-informational dimension, and material dimension.<sup>23,24</sup> In each dimension, high or low SS levels were defined by using the first quartile of the distribution as a cutoff point.<sup>25</sup> Support of relatives, a separate question from the MOS-SSS questionnaire, was also measured as a psychosocial exposure variable, classified as absent or present.

### 2.3 | Maternal exposure to stressful events

Maternal exposure to SEs was measured through the Stressful Events Questionnaire, which comprised questions about unpleasant events or situations that occurred in the 12 previous months.<sup>26</sup> The questions included the exposure to serious illness, hospitalization, death of close relative, severe financial problems, forced change of residence, separation or divorce, robbery physical aggression, and discrimination, with answers dichotomized (yes/no). In order to determine a dose response, we categorized the exposure to events in 3 categories: none, 1-2 events, and 3 or more events. We decided to use this categorization because median of exposure to events was 2 and 75% of the sample has up to 3 reported events.

### 2.4 | Adjustment variables

The adjustment variables were child's age and gender; adherence to asthma treatment; asthma treatment severity and duration; and maternal age, schooling, and smoking. Asthma severity was categorized as mild and moderate to severe, according to the type of medication

**TABLE 1** Sociodemographic characteristics and clinical and maternal factors of the dyads that completed the prospective study (n = 189) in relation to the initial sample of 362 participants in the first phase

| Characteristics (n = 189)              | Initial sample (n = 362) | Follow-up sample (n = 189) | P              |
|----------------------------------------|--------------------------|----------------------------|----------------|
| Child's gender, male                   | 232 (64.09%)             | 74 (39.15%)                | <b>&lt;.01</b> |
| Child's age (<5 y)                     | 124 (34.25%)             | 61 (32.28%)                | .64            |
| Asthma severity (moderate to severe)   | 146 (40.33%)             | 87 (46.03%)                | .20            |
| Maternal age (>35 y)                   | 116 (32.04%)             | 61 (32.28%)                | .96            |
| Maternal education (<4 y of schooling) | 43 (11.88%)              | 21 (11.11%)                | .79            |
| Family income (≤1 MW) <sup>a</sup>     | 191 (52.76%)             | 105 (55.56%)               | .53            |
| Maternal smoking, present              | 18 (4.97%)               | 12 (6.35%)                 | .50            |

Note: Values in bold are statistically significant at  $P < .05$ .

<sup>a</sup>Minimum wage.

that the child was taking.<sup>21</sup> The question "How many days in the last 15 days did your child stop taking asthma medication?" was used as an indicator of adherence to the treatment.

### 2.5 | Statistical analysis

The statistical package Stata version 13.0 was used to analyze the data. In the descriptive analysis, the frequency of covariables and other psychosocial variables between maternal CMD and the asthma morbidity groups was observed.

The outcome asthma control was tested in association with maternal CMD evolution (absence, maintenance, or improvement), exposure to SEs, and SS. This association was estimated through the relative risk measure (RR). The level of significance was  $P < .05$ , and the confounding variables were adjusted by Poisson regression with a robust variance.

To analyze effect modification, the sample of dyads was stratified according to SS levels in its three dimensions, and the association of asthma morbidity indicators with maternal CMD was analyzed in each stratum. The presence of effect modification was characterized by non-overlap between the RR and the 95% confidence intervals (95% CI) at the specific stratum.

### 2.6 | Ethical considerations

The Research Ethics Committee of the Federal University of Alagoas, under protocol number 1 091 863, approved the study. Participating mothers and children aged 8 years and over signed the respective informed and free consent after receiving detailed information about the research and its objectives.

### 3 | RESULTS

Table 1 shows the descriptive analysis of the sample of dyads that were included in the study. The final descriptive data were compared with the descriptive data recorded for the initial sample of 362 dyads that participated in the first interview only. The only difference founded referred to gender: Boys predominated in the initial sample.

At follow-up, 46% of the mothers improved CMD. The CMD score ranged from 10.65 (DP: 2.61) at the baseline to 4.25 (DP: 2.17) in the follow-up, a drop of 50%. In the analysis by maternal CMD, only the psychosocial variables differed between the groups. Exposure to SEs and low SS were more frequent among the mothers who maintained CMD as compared to mothers with absent or improved CMD (Table 2).

The frequency of uncontrolled asthma in the child was 40.74%, and 29.10% of the mothers reported visits to the ED during the three previous months. In the multivariate analysis, mothers who improved CMD had a 40% lower risk of having children with uncontrolled asthma than mothers who maintained CMD. On the other hand, mothers with absent CMD had a 55% lower risk of non-scheduled visits due to asthma (Table 3).

The occurrence of three or more SEs in the previous year increased the risk of uncontrolled asthma and visits to the ED by twofold. Specific exposure to situations of serious illness, hospitalization, separation or

divorce, assault or robbery, physical aggression, and discrimination was associated with uncontrolled asthma (Appendix ). Low maternal affective-social interaction support was associated with higher occurrence of visits to the ED, but not with asthma control, at the end of the study (Table 3).

To determine whether SS modified the association of maternal CMD with child's asthma control, the sample of dyads was stratified according to the SS levels in each dimension, and the association between maternal CMD and asthma control and occurrence of ED visits were estimated (Tables 4 and 5). The protective effect of maternal CMD improvement was only present among the dyads with high maternal SS in its three dimensions (Table 4). However, the CIs overlapped in each stratum, indicating that this was not statistically significant. The results were similar considering the outcome visits to the ED and involved the material and emotional-informational support dimensions (Table 5).

### 4 | DISCUSSION

The present study demonstrates that the improvement of maternal CMD is associated with asthma control in the child. For the two asthma outcomes investigated herein, a different behavior for the association with maternal CMD emerges: Maternal CMD improvement exerts a protective effect on asthma control, and maternal CMD absence at baseline reduces the risk of ED visits. Because the

| Characteristics (n = 189)                         | N   | CMD, absent<br>(n = 76) | CMD, maintained<br>(n = 61) | CMD, improved<br>(n = 52) | P              |
|---------------------------------------------------|-----|-------------------------|-----------------------------|---------------------------|----------------|
| Child's gender, male                              | 74  | 26 (35.14%)             | 23 (31.08%)                 | 25 (33.78%)               | .28            |
| Child's age (<5 y)                                | 61  | 26 (42.62%)             | 18 (29.51%)                 | 17 (27.87%)               | .84            |
| Time to start asthma treatment (<6 mo)            | 90  | 40 (44.44%)             | 25 (27.78%)                 | 25 (27.78%)               | .40            |
| Asthma severity (moderate to severe)              | 87  | 34 (39.08%)             | 28 (32.18%)                 | 25 (28.74%)               | .93            |
| Maternal age (>35 y)                              | 61  | 19 (31.15%)             | 25 (40.98%)                 | 17 (27.87%)               | .14            |
| Maternal education (<4 y of schooling)            | 21  | 8 (38.10%)              | 7 (33.33%)                  | 6 (28.57%)                | .98            |
| Family income (≤1 MW)                             | 105 | 40 (38.10%)             | 32 (30.48%)                 | 33 (31.43%)               | .40            |
| Maternal smoking (present)                        | 12  | 4 (33.33%)              | 5 (41.67%)                  | 3 (25%)                   | 0.77           |
| Exposure to stressful events in the previous year |     |                         |                             |                           |                |
| None                                              | 38  | 24 (63.16%)             | 2 (5.26%)                   | 12 (31.58%)               | <b>&lt;.01</b> |
| 1 or 2                                            | 93  | 41 (45.16%)             | 26 (27.96%)                 | 25 (26.88%)               |                |
| 3 or more                                         | 58  | 10 (17.24%)             | 33 (56.90%)                 | 15 (25.86%)               |                |
| Affective/social interaction support, low         | 48  | 2 (4.17%)               | 30 (62.50%)                 | 16 (33.33%)               | <b>&lt;.01</b> |
| Emotional/informational support, low              | 53  | 11 (20.75%)             | 24 (45.28%)                 | 18 (33.96%)               | <b>&lt;.01</b> |
| Material support, low                             | 56  | 10 (17.86%)             | 27 (48.21%)                 | 19 (33.93%)               | <b>&lt;.01</b> |
| Support of relatives, none                        | 37  | 8 (21.62%)              | 19 (51.35%)                 | 10 (27.03%)               | <b>.01</b>     |

**TABLE 2** Demographic, clinical, and maternal characteristics of the dyads according to the evolution of maternal CMD (absence, maintenance, or improvement), n = 189

Note: Values in bold are statistically significant at  $P < .05$ .

**TABLE 3** Indicators of uncontrolled asthma and its association with maternal sociodemographic, clinical, and psychosocial factors, n = 189

| Characteristics (n = 189)                                   | Uncontrolled asthma <sup>b</sup> |            |                                   |            | Emergency department visits <sup>c</sup> |            |                                   |                |
|-------------------------------------------------------------|----------------------------------|------------|-----------------------------------|------------|------------------------------------------|------------|-----------------------------------|----------------|
|                                                             | Unadjusted RR (95% CI)           | P          | Adjusted RR (95% CI) <sup>a</sup> | P          | Unadjusted RR (95% CI)                   | P          | Adjusted RR (95% CI) <sup>a</sup> | P              |
| Sociodemographic variables                                  |                                  |            |                                   |            |                                          |            |                                   |                |
| Child's gender, male                                        | 1.16 (0.82-1.64)                 | .34        |                                   |            | 1.29 (0.83-2.02)                         | .25        |                                   |                |
| Child's age (<5 y)                                          | 1.20 (0.84-1.70)                 | .31        |                                   |            | 1.30 (0.82-2.03)                         | .26        |                                   |                |
| Family income (≤1 MW)                                       | 0.96 (0.68-1.36)                 | .82        |                                   |            | 0.67 (0.43-1.04)                         | .08        |                                   |                |
| Maternal age (>35 y)                                        | <b>1.41 (1.01-1.98)</b>          | <b>.04</b> |                                   |            | 0.94 (0.58-1.52)                         | .80        |                                   |                |
| Maternal education (<4 y of schooling)                      | <b>1.62 (1.10-2.39)</b>          | <b>.01</b> |                                   |            | 0.63 (0.25-1.56)                         | .32        |                                   |                |
| Maternal smoking, present                                   | 1.47 (0.88-2.46)                 | .14        |                                   |            | 0.85 (0.31-2.33)                         | .75        |                                   |                |
| Clinical variables                                          |                                  |            |                                   |            |                                          |            |                                   |                |
| Time to start asthma treatment (<6 mo)                      | 1.25 (0.89-1.77)                 | .20        |                                   |            | 1.32 (0.84-2.07)                         | .22        |                                   |                |
| Asthma severity (moderate to severe)                        | <b>1.48 (1.05-2.10)</b>          | <b>.03</b> |                                   |            | 1.05 (0.67-1.64)                         | .83        |                                   |                |
| Adherence to treatment, two or more days without medication | 1.29 (0.89-1.89)                 | 0.18       |                                   |            | 1.35 (0.82-2.20)                         | .23        |                                   |                |
| Maternal psychosocial variables                             |                                  |            |                                   |            |                                          |            |                                   |                |
| CMD                                                         |                                  |            |                                   |            |                                          |            |                                   |                |
| Maintained                                                  | 1.00                             |            | 1.00                              |            | 1.00                                     |            | 1.00                              |                |
| Absent                                                      | 0.73 (0.50-1.06)                 | .09        | 0.76 (0.52-1.11)                  | .16        | <b>0.46 (0.27-0.79)</b>                  | <b>.01</b> | <b>0.45 (0.26-0.79)</b>           | <b>&lt;.01</b> |
| Improved                                                    | <b>0.59 (0.36-0.94)</b>          | <b>.03</b> | <b>0.60 (0.37-0.97)</b>           | <b>.04</b> | 0.63 (0.37-1.08)                         | .09        | 0.61 (0.34-1.07)                  | .08            |
| Exposure to SEs in the previous year                        |                                  |            |                                   |            |                                          |            |                                   |                |
| None                                                        | 1.00                             |            | 1.00                              |            | 1.00                                     |            | 1.00                              |                |
| 1 or 2                                                      | 1.63 (0.87-3.06)                 | .12        | 1.70 (0.92-3.16)                  | .09        | 1.12 (0.56-2.30)                         | .75        | 1.08 (0.53-2.22)                  | .83            |
| 3 or more                                                   | <b>2.33 (1.26-4.32)</b>          | <b>.01</b> | <b>2.19 (1.19-4.03)</b>           | <b>.01</b> | <b>2.05 (1.03-4.06)</b>                  | <b>.04</b> | 1.98 (0.97-4.06)                  | .06            |
| Social Support                                              |                                  |            |                                   |            |                                          |            |                                   |                |
| Affective/social interaction support, low                   | 1.17 (0.81-1.70)                 | .39        | 1.25 (0.87-1.80)                  | .23        | 1.43 (0.90-2.26)                         | .13        | <b>1.60 (1.00-2.56)</b>           | <b>.05</b>     |
| Emotional/informational support, low                        | 1.09 (0.75-1.58)                 | .64        | 1.29 (0.86-1.95)                  | .21        | 1.05 (0.64-1.72)                         | .84        | 1.17 (0.69-1.99)                  | .56            |
| Material support, low                                       | 1.07 (0.74-1.55)                 | .70        | 1.19 (0.81-1.75)                  | .37        | 1.06 (0.66-1.72)                         | .80        | 1.16 (0.71-1.88)                  | .56            |
| Support of relatives, none                                  | 1.34 (0.92-1.96)                 | .12        | 1.39 (0.93-2.08)                  | .11        | 1.03 (0.59-1.79)                         | .92        | 1.11 (0.63-1.96)                  | .71            |

Note: Values in bold are statistically significant at  $P < .05$ .

<sup>a</sup>Adjusted for: adherence to treatment, asthma severity, time of asthma treatment, child's age and gender, maternal age, schooling, and smoking.

<sup>b</sup>Obtained through the asthma symptoms questionnaire in the four previous weeks (GINA, 2015).

<sup>c</sup>Occurrence of visits to the emergency department in the three months prior to the consultation.

follow-up period of the study was 6 months, there may not have been enough time for maternal CMD improvement to affect the latter outcome. The follow-up time in the present study includes the interval that is generally necessary to observe symptom improvement in the routine follow-up of asthmatic children.<sup>21</sup>

Improved maternal CMD associated with better asthma control in the child may be related to improved care, increasing adherence

to treatment.<sup>11,12</sup> Furthermore, maternal CMD would no longer be a stressful event for the child,<sup>11,13</sup> thus contributing to the reduction in disease morbidity. Effects of stressors and maternal social support on child's asthma control can be measured separately from maternal mental status, as evaluated here and observed in previous studies.<sup>1,3,8,19,27</sup> In the present study, we observed the protective effect of maternal CMD absence or improvement on asthma morbidity

| Maternal CMD | Uncontrolled asthma                  |                               |                                      |                               |                                      |                               |
|--------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|
|              | Affective/social interaction support |                               | Affective/social interaction support |                               | Affective/social interaction support |                               |
|              | High, RR <sup>a</sup> (95% CI)       | Low, RR <sup>a</sup> (95% CI) | High, RR <sup>a</sup> (95% CI)       | Low, RR <sup>a</sup> (95% CI) | High, RR <sup>a</sup> (95% CI)       | Low, RR <sup>a</sup> (95% CI) |
| Maintained   | 1.00                                 |                               | 1.00                                 |                               | 1.00                                 |                               |
| Absent       | 0.91<br>(0.37-2.22)                  | 0.84<br>(0.52-1.37)           | 0.69<br>(0.45-1.05)                  | 1.44<br>(0.68-3.06)           | 0.81<br>(0.53-1.24)                  | 0.57<br>(0.20-1.63)           |
| Improved     | 0.44<br>(0.19-0.99)*                 | 0.67<br>(0.36-1.26)*          | 0.46<br>(0.24-0.89)**                | 0.81<br>(0.36-1.82)**         | 0.44<br>(0.22-0.87)***               | 0.87 (0.43-1.77)***           |

<sup>a</sup>Adjusted for: treatment adherence, asthma severity, asthma treatment time < 6 mo, child's age < 5 y, gender, maternal age, maternal schooling < 4 y, and maternal smoking.

\*P = .88 for difference (likelihood-ratio test).

\*\*P = .58 for difference (likelihood-ratio test).

\*\*\*P = .46 for difference (likelihood-ratio test).

in the high SS stratum only. Albeit not statistically significant, our findings point to a possible SS effect on the impact of maternal CMD evolution on asthma control in the child. As a distal factor in the association between maternal CMD and asthma in the child, the existence of SS could provide parents with practical or emotional resources to deal with the occurrence of stressors and parental adaptation to the consequences of these events.

This study has some limitations. First, there were losses of follow-up, with differences between the initial and follow-up samples in terms of the gender variable. To minimize its effect on the results, the gender variable entered the adjusted analysis as a confounding factor. Also, there may have been differences regarding the number

of severe patients, who may not have returned for economic reasons, and the patients with mild asthma, who may not have returned because they underestimated the need for treatment.<sup>28</sup> Comparison between the two samples, however, does not show any differences in terms of asthma severity. Another limitation is the dependence on maternal report regarding psychosocial factors and measures of asthma control. Parents tend to underestimate the symptoms, with low expectations of asthma control.<sup>12</sup> On the other hand, mothers with depression or other symptoms of negative affection may provide distorted reports of subjective events, with a tendency to overestimate the symptoms.<sup>29,30</sup> The use of the outcome visits to the ED may have minimized the subjectivity of asthma symptom

**TABLE 4** Effect modification for the association of maternal CMD with uncontrolled asthma according to the social support level in the affective-positive social interaction, emotional-informational, and material dimensions

| Maternal CMD | Visits to the emergency department   |                               |                                      |                               |                                      |                               |
|--------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|
|              | Affective/social interaction support |                               | Affective/social interaction support |                               | Affective/social interaction support |                               |
|              | High, RR <sup>a</sup> (95% CI)       | Low, RR <sup>a</sup> (95% CI) | High, RR <sup>a</sup> (95% CI)       | Low, RR <sup>a</sup> (95% CI) | High, RR <sup>a</sup> (95% CI)       | Low, RR <sup>a</sup> (95% CI) |
| Maintained   | 1.00                                 |                               | 1.00                                 |                               | 1.00                                 |                               |
| Absent       | 0.56<br>(0.29-1.09)                  | <sup>b</sup>                  | 0.48<br>(0.27-0.87)                  | 0.24<br>(0.04-1.57)           | 0.47<br>(0.26-0.86)                  | 0.25<br>(0.04-1.70)           |
| Improved     | 0.66<br>(0.31-1.38)*                 | 0.43<br>(0.18-1.02)*          | 0.44<br>(0.21-0.95)**                | 0.93<br>(0.40-2.12)**         | 0.51 (0.25-1.04)***                  | 0.81<br>(0.37-1.74)***        |

<sup>a</sup>Adjusted for: treatment adherence, asthma severity, time asthma treatment < 6 mo, child's age < 5 y, gender, maternal age, maternal schooling < 4 y, and maternal smoking.

<sup>b</sup>Analysis not performed by the reduced number of subjects (results by subgroups less than zero).

\*P = .61 for difference (likelihood-ratio test).

\*\*P = .41 for difference (likelihood-ratio test).

\*\*\*P = .55 for difference (likelihood-ratio test).

**TABLE 5** Effect modification for the association between maternal CMD and visits to the emergency department, according to the social support level (SS) in the affective-positive social interaction, emotional-informational, and material dimensions

reporting because reports of objective events like the use of health services can be more accurate even in situations of maternal negative affection.<sup>31</sup> Finally, two situations limit extrapolation of the results: The study sample came from outpatient clinics and belongs to a predominantly low-income population. The involvement of other scenarios at the community level and the inclusion of samples with different socioeconomic strata would probably allow for greater generalization.

The present study highlights some important points. The use of a screening instrument for maternal CMD can detect association of maternal mental health symptoms with asthma control in the child. Because this instrument is short, simple, easy to apply, and highly sensitive, it is very useful for screening in clinical settings where the demand for care and timely issues make the application of long and complex questionnaires more difficult. Improvement in maternal mental health problems associated with decreased risk of uncontrolled asthma in the child suggests that interventions in the mother's mental health may benefit disease management in the child. In addition, observing that SS might contribute to asthma control by modifying the effect of maternal CMD corroborates the hypothesis that distal psychosocial determinants modify the child's response to parental care and related stress to the disease.

## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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