Maternal depression and early childhood growth in developing countries: systematic review and meta-analysis

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Objective To investigate the relationship between maternal depression and child growth in developing countries through a systematic literature review and meta-analysis.

Methods Six databases were searched for studies from developing countries on maternal depression and child growth published up until 2010. Standard meta-analytical methods were followed and pooled odds ratios (ORs) for underweight and stunting in the children of depressed mothers were calculated using random effects models for all studies and for subsets of studies that met strict criteria on study design, exposure to maternal depression and outcome variables. The population attributable risk (PAR) was estimated for selected studies.

Findings Seventeen studies including a total of 13 923 mother and child pairs from 11 countries met inclusion criteria. The children of mothers with depression or depressive symptoms were more likely to be underweight (OR: 1.5; 95% confidence interval, CI: 1.2–1.8) or stunted (OR: 1.4; 95% CI: 1.2–1.7). Subanalysis of three longitudinal studies showed a stronger effect: the OR for underweight was 2.2 (95% CI: 1.5–3.2) and for stunting, 2.0 (95% CI: 1.0–3.9). The PAR for selected studies indicated that if the infant population were entirely unexposed to maternal depressive symptoms 23% to 29% fewer children would be underweight or stunted.

Conclusion Maternal depression was associated with early childhood underweight and stunting. Rigorous prospective studies are needed to identify mechanisms and causes. Early identification, treatment and prevention of maternal depression may help reduce child stunting and underweight in developing countries.

Abstracts in عربي, 中文, Français, Русский and Español at the end of each article.

Introduction

Research in developing countries suggests that poor maternal mental health, in particular maternal depression, may be a risk factor for poor growth in young children.[1] In addition, the risk of depression in women is approximately twofold higher than in men[2] and women are particularly prone in the postpartum period because of hormonal changes associated with childbirth and stressors associated with parenting.[3,4] The combination of women's vulnerability to depression, their responsibility for childcare and the high prevalence of maternal depression in developing countries[5] means that maternal mental health in these countries could have a substantial influence on growth during childhood.

Childhood growth is a key indicator of child health and nutritional status. According to recent estimates from developing countries, stunting and underweight have an overall prevalence of 32% and 20%, respectively.[6] Inadequate growth during childhood can result in reduced adult stature, low educational performance, reduced economic productivity, impaired work capacity and heightened disease risk.[7–12] Rapid physical growth and development occur in early life when infants are dependent on the primary caregiver for their social and nutritional needs,[13] which makes young children vulnerable to the effects of their caregivers' mental health problems.

Recent research on the relationship between maternal depressive symptoms and child stunting or underweight has produced inconsistent results. Two descriptive reviews have provided a summary of research findings[14,15] but, to the best of our knowledge, no quantitative synthesis of research results has been produced. Our study goals were to review systematically the literature on maternal depression and childhood growth in developing countries and to summarize and compare any associations found across populations using meta-analytical techniques.

Methods

The study used standard methods for systematic reviews and meta-analyses in accordance with PRISMA (Preferred reporting items for systematic reviews and meta-analyses) and MOOSE (Meta-analysis of observational studies in epidemiology) statements.[16,17]

Study inclusion criteria

A study was included in the meta-analysis if it: (i) quantitatively assessed the relationship between maternal depression or depressive symptoms (or mental disorders in which depression was a major component) and child growth using an odds ratio (OR) or included data that could be used to calculate an OR; (ii) was published in a peer-reviewed journal up until April 2010; and (iii) was not an intervention study. We restricted our search to developing countries but applied no other population or language restrictions.

Maternal depression and childhood growth can both be assessed using several methods. Depression can be diagnosed through standardized diagnostic interviews, such as the Structured Clinical Interview of the *Diagnostic and statistical manual of mental disorders, 4th edition*[18] or the interview for the Schedules for Clinical Assessment in Neuropsychiatry,[19] while depressive symptoms can be assessed directly using a question-

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naire, such as the Edinburgh Postnatal Depression Scale[20] or assessed as a major component of mental disorders using, for example, the World Health Organization (WHO) Self-Reporting Questionnaire.[21] Childhood growth can be quantified in terms of weight-for-age or height-for-age. Underweight and stunting are commonly defined using WHO criteria: more than two standard deviations (SDs) below the mean weight-for-age and the mean height-for-age, respectively (i.e. a *z*-score < -2). In this analysis we also included studies with more relaxed or more stringent criteria. Overall, the studies included in the analysis measured maternal depression or depressive symptoms and childhood growth in a variety of ways.

Search strategy and study selection

The following online computer databases were searched for studies on maternal depression and child growth: PubMed, PsycINFO, CINAHL Plus, Web of Science, SCOPUS and EMBASE. Medical Subject Heading (MeSH) terms in PubMed were used to identify a string of search terms that were applied in the six databases: ("mother" OR "maternal") AND ("depression" OR "depressive disorder" OR "mental health") AND ("child" OR "infant") AND ("nutritional disorders" OR "growth disorders" OR "nutritional status" OR "body size"). Where available, full-text searches and explosion-of-terms searches were carried out. In an explosion-of-terms search, the initial search terms are linked to a web of similar search terms provided by the database. A search of secondary references was conducted by scanning the reference lists of relevant articles and by cross-referencing with previous reviews on the topic. In addition, experts in the field were contacted to identify additional citations.

Studies that were clearly not relevant were excluded by reviewing their titles and abstracts. The remaining studies were then read in full by at least two authors of this study and selected for inclusion in the analysis by consensus. Articles identified as relevant by both authors were invariably included; those considered relevant by only one author were discussed among all authors to assess their suitability for inclusion.

Data extraction

A systematic coding form was used to record each study's objective, location, population, design and sample size; the children's ages; exposure and outcome measures; confounding variables; and the study's method of analysis, results, conclusions and limitations. Discrepancies in coding were resolved by consensus. The rigour of each study was evaluated using an adaptation of the Newcastle–Ottawa Scale for assessing the quality of nonrandomized studies in meta-analyses.[22] Each study was classified by design as either a longitudinal cohort, case–control or cross-sectional study and each was assessed to determine if it satisfied four criteria: (i) the women and children were representative of the community studied; (ii) the response rate (i.e. the percentage of individuals in the selected population sample who agreed to participate in the study and completed follow-up) was 80% or higher; (iii) a diagnostic measure of depression had been used; and (iv) the results had been adjusted for at least two confounding variables.

Meta-analysis

We converted different estimates of effect size to the common metric of an OR since most studies compared two groups and reported dichotomous outcomes. However, three studies reported outcomes as continuous variables.[23–25] We converted data from the first of these three studies to ORs using Comprehensive Meta-Analysis V2.2 software (Biostat Inc., Englewood, United States of America). For the other two studies, the original authors either re-analysed the primary data to generate ORs or provided data for us to calculate them. We used standard meta-analytical methods to estimate the standardized effect sizes using the inverse variance approach and random effects models.[26] The heterogeneity of the different studies' findings was assessed using the Q-statistic. Publication bias was assessed from funnel plots of the standard error against the log OR using both Begg and Mazumdar's rank correlation test and Egger's test of the intercept to determine statistical significance.

Meta-analysis was conducted for the two outcomes of interest – underweight and stunting – using weight-for-age and height-for-age as variables, respectively. When different follow-up times were used in a given study, we used the longest follow-up time. If a study assessed depression at several time points, we used the assessment closest to delivery. We conducted subanalyses of studies that used strict criteria of underweight and stunting (i.e. a weight-for-age and height-for-age *z*-score < -2 or a weight-for-age and height-for-age below the fifth percentile given in WHO and Centers for Disease Control and Prevention growth charts[27]), studies that used a measure of depression or depressive symptoms but not of mental disorders of which depression was a major component, and longitudinal studies.

The population attributable risk (PAR) for underweight and stunting was calculated on the basis of four studies that were selected because they reported significant findings and a prevalence of maternal depressive symptoms near the lower or higher end of the range. For each study, the overall relative risk (RR) of child underweight was calculated using the adjusted OR obtained in that study and the prevalence of underweight in children with depressed mothers. The RR for stunting was similarly obtained. These RRs were then used to calculate the PARs.[28]

Results

The computer database search yielded 312 citations and two additional records were identified through other sources. After removing duplicates, 210 citations were available for assessment. The initial screening of titles and abstracts identified 51 citations that potentially met the inclusion criteria. After the texts were reviewed in full, 14 articles reporting on 17 separate studies met the inclusion criteria.

The studies came from several regions: four from Africa, six from South America and the Caribbean, six from southern Asia and one from south-eastern Asia. Although the studies covered a mix of urban and rural settings, most were carried out among participants with a low socioeconomic status (Table 1, available from: http://www.who.int/bulletin/volumes/89/8/11-088187).

Seven studies were cross-sectional, six were case–control studies and four used a longitudinal cohort design. Nine of the 17 studies were based on representative community samples, four used a diagnostic measure of depression and 15 controlled for at least two confounding variables (Table 2, available from: http://www.who.int/bulletin/volumes/89/8/11-088187). In addition, 10 of the 13 studies that reported a response rate had a rate ≥ 80%.

Most studies used the WHO criterion of a weight-for-age or height-for-age *z*-score < -2 to identify underweight or stunting, respectively. All 17 studies as-

Table 2. **Quality[a] of studies included in systematic review of maternal depression and child growth in developing countries, 1996–2010**

Study design	Selection		Exposure	Comparability
	Representative study sample[b]	Response rate ≥80%[c]	Depression assessed using diagnostic test[d]	Adjustment for 2 or more demographic variables[e]
Prospective longitudinal cohort				
Patel et al. 2003[31]	No	Yes	No	No
Rahman et al. 2004[33]	Yes	Yes	Yes	Yes
Tomlinson et al. 2006[35]	Yes	No	Yes	No
Santos et al. 2010[38]	Yes	Yes	No	Yes
Case–control				
Adewuya et al. 2008[34]	No	NA	Yes	Yes
Anoop et al. 2004[29]	NA	NA	Yes	Yes
Baker-Henningham et al. 2003[f,25]	No	Yes	No	Yes
Carvalhaes et al. 2002[36]	Yes	Yes	No	Yes
de Miranda et al. 1996[37]	No	NA	No	Yes
Rahman et al. 2004[32]	No	NA	No	Yes
Cross-sectional				
Black et al. 2009[g,24]	No	No	No	Yes
Harpham et al. 2005[30]	Yes	Yes	No	Yes
Harpham et al. 2005[30]	Yes	Yes	No	Yes
Harpham et al. 2005[30]	Yes	Yes	No	Yes
Harpham et al. 2005[30]	Yes	No	No	Yes
Stewart et al. 2008[23]	No	Yes	No	Yes
Surkan et al. 2008[39]	Yes	Yes	No	Yes

NA, not available (data were either incomplete or not reported); OR, odds ratio.

[a] Study quality was assessed using a checklist adapted from the Newcastle–Ottawa Scale for assessing the quality of nonrandomized studies in meta-analyses.

[b] Women and children included in the study were representative of the community.

[c] Individuals who refused to participate and those lost to follow-up were included in calculating the response rate.

[d] Individuals who were not assessed using a diagnostic test for depression were assessed using a measure of depressive symptoms or of common mental disorders.

[e] The analysis of the relationship between maternal depression and child growth was adjusted for at least two demographic variables.

[f] In this study, multivariate adjustments were made for more than two demographic variables. However, the data used in our meta-analysis were based on crude estimates because maternal depressive symptoms were not included in the final adjusted model due to the stepwise procedure.

[g] In this study, multivariate adjustments were made for growth outcomes as continuous variables but only the crude OR was presented in the paper. For the meta-analysis, ORs were based on an adjusted analysis of data obtained from the authors of the original study.

sessed underweight. They used a variety of measures: nine used a weight-for-age *z*-score < −2; three used a weight-for-age below the fifth percentile given in WHO and Centers for Disease Control and Prevention growth charts;[27] one used a weight-for-age below the equivalent 10th percentile; one used a weight-for-age below the third percentile; one used a weight-for-age of 50% to 80% of the expected value; one used a weight-for-age < 75% of the expected value and one used the combined measure of a current weight-for-age *z*-score < −1.5 plus a history of a weight-for-age *z*-score < −2. Twelve studies assessed stunting: nine used a height-for-age *z*-score < −2; two used a height-for-age below the fifth percentile given in WHO and Centers for Disease Control and Prevention growth charts; and one used a height-for-age below the 10th percentile.

Studies used a wide range of indicators of maternal depression. Four used a diagnostic measure of depression based on either the *Diagnostic and statistical manual of mental disorders*[18] ($n = 3$) or the *International classification of diseases*[40] ($n = 1$); five used a measure of depressive symptoms such as the Edinburgh Postnatal Depression Scale[20] ($n = 2$) or the Center for Epidemiologic Studies Depression Scale[41] ($n = 3$); and eight used a measure of mental disorders such as the 20-item WHO Self-Reporting Questionnaire[21] ($n = 7$) or the Adult Psychiatric Morbidity Questionnaire[42] ($n = 1$). Some deviations from the standard use of these measures were observed: for example, one study analysed only items related to depression on the Self-Reporting Questionnaire.

Overall, most studies found a null or marginally significant relationship between maternal depression and poor child growth. However, the direction of the association was always the same: the worse the depression, the greater the growth deficit. Only 6 of the 17 studies on underweight and 5 of the 12 on stunting found a statistically significant relationship with maternal depression.

Underweight meta-analysis

The meta-analysis of the relationship between maternal depression and child underweight included effect size estimates from 17 studies (Fig. 1),[23–25,29–39] covering a combined study population of 13 923 mother and child pairs. The pooled data showed a moderate, statistically significant relationship between maternal depression and underweight (OR: 1.5; 95% confidence interval, CI: 1.2–1.8). The heterogeneity of the findings was substantial (Q-statistic: 39.94;

$P = 0.001$) across the studies. The funnel plot showed a statistically significant relationship between the standard error and the log OR using both tests of significance, an indication of a publication bias against small studies reporting non-significant findings.

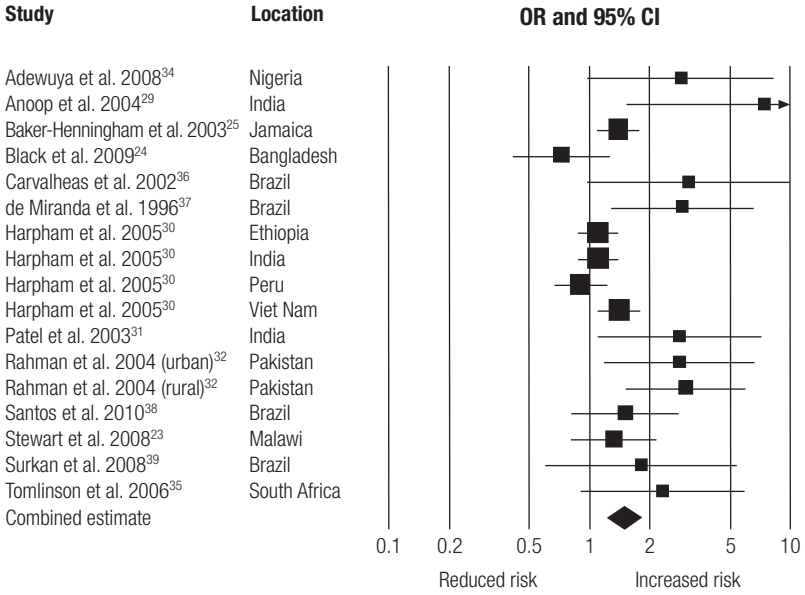
Fifteen studies used a strict definition of underweight: a weight-for-age z-score < -2 or a weight-for-age at or below the fifth percentile given in WHO and Centers for Disease Control and Prevention growth charts.[23,24,29–34,36–39] Meta-analysis of these studies showed that the relationship between maternal depression and underweight (OR: 1.5; 95% CI: 1.2–1.8) remained similar to that in the meta-analysis of all studies and the heterogeneity persisted ($Q = 37.83$, $P = 0.001$). When the meta-analysis was restricted to the nine studies that used measures of depression or depressive symptoms,[24,25,29,31,33–35,38,39] the relationship between maternal depression and underweight strengthened and remained statistically significant (OR: 1.7; 95% CI: 1.2–2.4), and the findings remained heterogeneous ($Q = 18.70$; $P = 0.017$). Finally, when the meta-analysis was restricted to the four longitudinal cohort studies,[31,33,35,38] the relationship strengthened further (OR: 2.2; 95% CI: 1.5–3.2) and high homogeneity was noted (Q: 2.47; $P = 0.48$).

Stunting meta-analysis

The meta-analysis of the relationship between maternal depression and child stunting included effect size estimates from 12 studies (Fig. 2)[23,24,30,31,33–35,38,39] with a combined study population of 13 214 mother and child pairs. The pooled data showed a moderate, statistically significant relationship between maternal depression and stunting (OR: 1.4; 95% CI: 1.2–1.7). Substantial heterogeneity across studies was noted (Q: 26.85; $P = 0.005$). The relationship between the standard error and the log OR in the funnel plot was statistically significant using both tests of significance.

Eleven studies used a strict definition of stunting: a height-for-age z-score ≤ -2 or a height-for-age at or below the fifth percentile given in WHO and Centers for Disease Control and Prevention growth charts.[23,24,30,31,33,34,38,39] Meta-analysis of these studies showed that the relationship between maternal depression and stunting (OR: 1.4; 95% CI: 1.2–1.7) remained similar to that in the meta-analysis of all studies and the heterogeneity persisted ($Q = 25.00$; $P = 0.005$). When the meta-analysis was restricted to the seven studies that used measures of depression or depressive symptoms,[24,31,33–35,38,39] the relationship between maternal depression and stunting strengthened (OR: 2.0; 95% CI: 1.4–2.9) and homogeneity was noted (Q: 11.55; $P = 0.073$). Finally, when the meta-analysis was restricted to the four longitudinal cohort studies,[31,33,35,38] the relationship was strengthened slightly (OR: 2.0; 95% CI: 1.0–3.9) and modest heterogeneity was found (Q: 9.30; $P = 0.026$).

Fig. 1. **Effect of maternal depression on child underweight reported in studies from developing countries included in meta-analysis, 1996–2010**



CI, confidence interval; OR, odds ratio.
Note: The position of the square indicates the OR for the relationship between maternal depression and child underweight for the study and its size is proportional to the weight of that study in the meta-analysis. The length of the line represents the 95% CI for the OR. The diamond shape indicates the pooled OR for all studies included in the meta-analysis.

Population attributable risk

The PAR for underweight was calculated for two studies: the study of Patel et al., which reported a low prevalence of depressive symptoms,[31] and that of Surkan et al., which reported a high prevalence of depressive symptoms and a low prevalence of underweight (Table 3).[39] The PAR in these studies was 22.5% and 29.4%, respectively.

Similarly, the PAR for stunting was calculated for two studies: the study of Patel et al., which reported a relatively low prevalence of depressive symptoms,[31] and that of Black et al., which reported a high prevalence (Table 3).[24] The PAR was 27.5% and 27.0% for the two studies, respectively.

Discussion

Our analysis revealed a positive and significant association between maternal depression or depressive symptoms and impaired child growth in developing countries. Our meta-analysis of 17 studies, based on adjusted estimates when possible, showed that the children of depressed mothers were at an increased risk of both underweight and stunting: the combined OR was approximately 1.4. This finding emerged after combining the results of studies that had very different designs, came from a wide range of locations and included children of different ages.

Because the findings varied across studies, we conducted subanalyses to explore how they might be altered by applying stricter definitions of maternal depression and of child growth outcomes or by restricting the analysis to longitudinal studies alone. When strict definitions of underweight and stunting were used, the magnitude of the pooled estimate for the relationship between maternal depression and inadequate growth was almost unaffected. When a strict definition of maternal depression was used, the OR for poor child growth increased. Finally, when the analysis was restricted to longitudinal studies, the pooled results showed strong associations with maternal

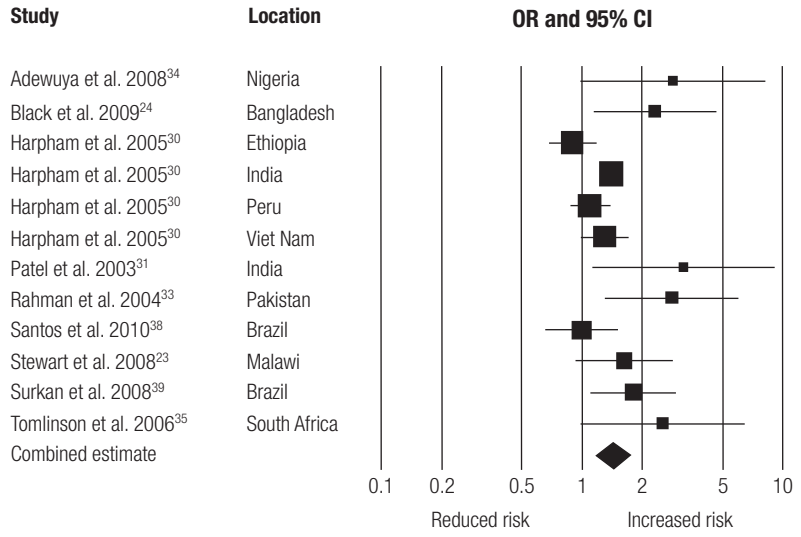
depression: the ORs for underweight and stunting were approximately 2.2 and 2.0, respectively. However, because this subanalysis was based on only four longitudinal studies, its findings must be considered preliminary and need to be confirmed by more prospective studies.

Using data from four selected studies, we estimated a PAR for inadequate growth in the range of 23–29%. However, this estimate is imprecise because the four studies used different measures of depressive symptoms and controlled for different confounding variables.

The mechanisms responsible for the association between maternal depression and inadequate child growth are not clear. Nor is it known whether these mechanisms vary between countries and regions. Cultural differences in caregiving and feeding and the degree of food insecurity may all play a role. Previous research suggests that maternal depression is associated with compromised parenting behaviour,[43,44] nonresponsive caregiving practices[43] and a lower likelihood or shorter duration of breastfeeding.[45–47] The time at which child growth is measured may also influence the observed association with maternal depression: Stewart et al. hypothesized that, because caregivers other than the mother often become more involved after weaning, the effect of maternal depression may be more pronounced in the immediate postpartum period.[14] Of the articles included in the meta-analysis, only two evaluated the influence of other factors on the relationship between maternal depressive symptoms and child growth. Black et al. found that the effect of maternal depressive symptoms on infant height-for-age was partially mediated by the home environment, whereas maternal perceptions of infant temperament had no effect.[24] Surkan et al. found no evidence that the relationship between maternal depressive symptoms and stunting was mediated by parenting self-efficacy, which reflects the belief parents have in their ability to care for their children.[39] Future research should examine the mechanisms linking maternal depressive symptoms and child growth.

The review was limited by the modest number of studies included: only 17 were available overall and only four were included in the subanalysis of longitudinal studies. Additionally, the studies varied in quality, as reflected in the way they adjusted for potential confounding variables: one study adjusted for covariates individually while another made no adjustments. In some regions, most studies were from the same country; for example, four of the five studies from South America were conducted in Brazil. As in any systematic review, publication bias may have affected our findings; significant findings may have been disproportionately reported in the literature, as suggested by the funnel plots for both underweight and stunting in the meta-analysis. Consequently, our meta-analysis may have overestimated the

Fig. 2. **Effect of maternal depression on child stunting reported in studies from developing countries included in meta-analysis, 1996–2010**



CI, confidence interval; OR, odds ratio.

Note: The position of the square indicates the OR for the relationship between maternal depression and child stunting for the study and its size is proportional to the weight of that study in the meta-analysis. The length of the line represents the 95% CI for the OR. The diamond shape indicates the pooled OR for all studies included in the meta-analysis.

Table 3. **Effect of maternal depressive symptoms on child underweight or stunting in selected studies from developing countries, 1996–2010**

Study	Measure of depressive symptoms	Mothers with depressive symptoms (%)	Underweight or stunted children (%)	Underweight or stunting prevalence (%) in children of mothers with depressive symptoms	Adjusted OR	RR[a]	PAR (%)
Underweight							
Patel et al. 2003[31]	EPDS	23.0	16.4	30.0	2.8	2.26	22.5
Surkan et al. 2008[39]	CES-D	55.0	4.0	5.8	1.8	1.75	29.4
Stunting							
Patel et al. 2003[31]	EPDS	23.0	12.3	25.0	3.2	2.65	27.5
Black et al. 2005[24]	CES-D	52.0	36.9	45.3	2.3	1.71	27.0

CES-D, Center for Epidemiologic Studies Depression Scale; EPDS, Edinburgh Postnatal Depression Scale; OR, odds ratio; PAR, population attributable risk; RR, relative risk.

[a] The relative risk for each study was calculated from the adjusted OR and the prevalence of underweight or stunting, as appropriate, in children of depressed mothers.

association between maternal depression and inadequate child growth. However, this is unlikely because most studies reported null results.

Although the definitions of underweight and stunting differed between the studies, height and weight were measured, not self-reported. In contrast, the diagnosis of maternal depression and its severity may have been less precise owing to the use of depression scales that were not validated in the study populations, particularly since different cultures have differing concepts of depression. In addition, there may be a reciprocal relationship between maternal mental health and child health given that a child's poor health could generate depressive symptoms in the mother.[48] Subsequent research should investigate the possibility that poor child growth increases the risk of maternal depression.

Estimates of the incidence of depression in women in developing countries vary widely, from 15–57%.[49] Depression in these women has a complex etiology involving factors as diverse as poverty, marital conflict, domestic violence and lack of control over economic resources.[50] However, recent studies suggest that depression can be affordably treated in developing countries.[51] Varied interventions, such as social support, group therapy or home visits, which are often delivered by lay community workers, have led to a reduction in maternal depressive symptoms in a range of countries, including China, Jamaica, Pakistan, South Africa and Uganda.[52–57] Interventions aimed at improving parenting and the mother–infant relationship have been effective in reducing depressive symptoms in postpartum women,[55–57] which suggests that maternal depression is modifiable. Our findings indicate that a reduction in the incidence of maternal depressive symptoms in developing countries would not only have a beneficial effect on mothers, but would also improve child growth substantially, and this could in turn influence the children's future health, development and socioeconomic status.[7–12] ■

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Competing interests: None declared.

ملخص

اكتئاب الأمهات والنمو المبكر للأطفال في البلدان النامية: مراجعة منهجية وتحليل تلوي

الغرض تقصي العلاقة بين اكتئاب الأمهات ونمو الأطفال في البلدان النامية عن طريق مراجعة منهجية للنشريات وتحليل تلوي لها.

الطريقة أجرى بحث في ست قواعد معطيات عن دراسات البلدان النامية المتعلقة باكتئاب الأمهات ونمو الأطفال والتي نُشرَت حتى شهر 2010. تبع ذلك إجراء تحليل تلوي معياري وحُسِبَت نسب الأرجحية الجماعية لنقص الوزن والتقزّم لدى أطفال الأمهات المصابات بالاكتئاب باستخدام نماذج التأثيرات العشوائية لجميع الدراسات وللفئات الفرعية للدراسات التي لبّت المعايير الصارمة لتصميم الدراسة، والتعرّض للاكتئاب الأمومي، ونتيجة المتغيرات. وجرى تقدير الاختطار السكاني المعزوّ لدراسات مُنتقاة.

النتائج لبّت سبع عشرة دراسة تضمنت 13923 زوجاً من الأمهات والأطفال من 11 بلداً معايير الإدراج في البحث. وكان أطفال الأمهات المصابات بالاكتئاب أو أعراض الاكتئاب يعانون في الأرجح من نقص الوزن (نسبة الأرجحية: 1.5؛ وفاصلة الثقة 95%: 1.2-1.8) ومن التقزّم (نسبة الأرجحية: 1.4؛ فاصلة الثقة 95%: 1.2-1.7). وأظهر تحليل فرعي لثلاث دراسات طولانية تأثيراً أقوى: حيث كانت نسبة الأرجحية لنقص الوزن 2.2 (فاصلة الثقة 95%: 1.5-3.2) وبالنسبة للتقزم فكانت نسبة الأرجحية 2.0 (فاصلة الثقة 95%: 1.0-3.9). ويدل الاختطار السكاني المعزوّ في الدراسات المُنتقاة أنه إذا لم يتعرّض مجمل جمهور الرضّع لأعراض اكتئاب الأمهات فسيكون نقص الوزن أو التقزّم أقل بنسبة 23% إلى 29%.

الاستنتاج ارتبط اكتئاب الأمهات بنقص الوزن والتقزّم المبكرين في الأطفال. وهناك حاجة إلى دراسات مستقبلية دقيقة لاستكشاف الآليات والأسباب. وقد يساعد الاكتشاف والعلاج المبكران والوقاية من اكتئاب الأمهات في الحد من التقزّم ونقص الوزن لدى الأطفال في البلدان النامية.

摘要

发展中国家母亲抑郁和儿童早期发育:系统评价和荟萃分析

目的 旨在通过系统文献评价和荟萃分析调查发展中国家母亲抑郁和儿童发育之间的关系。

方法 本研究检索了六个数据库,查找发展中国家截至2010年发表的关于母亲抑郁和儿童发育的研究文献。运用标准荟萃分析方法进行分析,并且运用随机效应模型计算所有研究以及满足研究设计严格标准的研究子集中,母亲患有抑郁症或者暴露在母亲抑郁的儿童出现体重不足和发育不良的总体相对危险度(ORs)。同时还估计了研究所选的人群特异危险度(PAR)。

结果 来自11个国家的17项研究满足入选标准,包括了13923对母亲和儿童。患有抑郁症或有抑郁症状的母亲的孩子更易出现体重不足(相对危险度OR:1.5;95%可信区间CI:1.2-1.8)或发育不良(相对危险度OR:1.4;95%可信区间CI:1.2-1.7)。三项纵向研究的再分析表明影响较强:体重不足的相对危险度为2.2(95%可信区间CI:1.5-3.2),发育不良危险度为2.0(95%可信区间CI:1.0-3.9)。研究选定的人群特异危险度(PAR)表明:如果幼儿群体完全没有暴露在母亲抑郁症状中,则体重不足或发育不良的儿童可减少23% – 29%。

结论 母亲抑郁与早期儿童体重不足和发育不良相关。需要进行严格的前瞻性研究以确定机制和原因。母亲抑郁的早发现、早治疗和早预防将有助于减少发展中国家儿童发育不良和体重不足。

Résumé

Dépression maternelle et croissance de la petite enfance dans les pays en développement: examen systématique et méta-analyse

Objectif Étudier la relation entre dépression maternelle et croissance infantile dans les pays en développement par un examen systématique de la documentation et une méta-analyse.

Méthodes Six bases de données ont été consultées pour les études sur la dépression maternelle et la croissance des enfants dans les pays en développement, publiées jusqu'en 2010. Les méthodes standard de méta-analyse ont été suivies et les odds ratios (OR, rapports des chances) mis en commun pour l'insuffisance pondérale et le retard de croissance des enfants de mères déprimées ont été calculés en utilisant des modèles à effets aléatoires pour toutes les études et pour les sous-ensembles d'études qui répondaient aux critères stricts de conception d'étude, d'exposition à la dépression maternelle et de variables de résultat. Le risque attribuable dans la population (RAP) a été estimé pour des études sélectionnées.

Résultats Dix-sept études, incluant un total de 13 923 paires de mère et enfant de 11 pays, remplissaient les critères d'inclusion. Les enfants de mères souffrant de dépression ou de symptômes dépressifs étaient plus susceptibles de présenter une insuffisance pondérale (IP: 1,5; intervalle de confiance, IC, de 95%: 1,2–1,8) ou un retard de croissance (IP: 1,4; IC de 95%: 1,2–1,7). La sous-analyse de trois études longitudinales a montré un effet plus important: l'OR pour insuffisance pondérale était de 2,2 (IC de 95%: 1,5–3,2) et pour retard de croissance, de 2,0 (IC de 95%: 1,0–3,9). Le RAP des études sélectionnées a indiqué que si la population infantile était entièrement non-exposée à des symptômes dépressifs maternels, 23 à 29% d'enfants en moins souffriraient d'insuffisance pondérale ou de retard de croissance.

Conclusion La dépression maternelle est associée à l'insuffisance pondérale et au retard de croissance de la petite enfance. De rigoureuses études prospectives sont nécessaires pour en identifier les mécanismes et les causes. L'identification précoce, le traitement et la prévention de la dépression maternelle peuvent aider à réduire le retard de croissance et l'insuffisance pondérale des enfants dans les pays en développement.

Резюме

Материнская депрессия и рост детей в раннем возрасте в развивающихся странах: систематический обзор и мета-анализ

Цель Исследовать связь между материнской депрессией и ростом ребенка в развивающихся странах с помощью систематического обзора литературы и мета-анализа.

Методы Проведен поиск в шести базах данных для выявления исследований из развивающихся стран по тематике материнской депрессии и роста ребенка, опубликованных за период по 2010 года. Авторы использовали стандартные методы мета-анализа и производили расчет суммарного отношения шансов (ОШ) по пониженной массе тела и задержке роста у детей, чьи матери страдали депрессией, с использованием моделей случайных эффектов для всех исследований и подгрупп исследований, которые удовлетворяли точным критериям в отношении плана исследования, экспозиции к воздействию материнской депрессии и переменных показателей исхода. Для некоторых исследований проводилась оценка популяционного добавочного риска (ПДР).

Результаты Критериям включения в обзор удовлетворяли 17 исследований, которые в сумме охватывали 13 923 пары «мать – ребенок» из 11 стран. У детей матерей с депрессией или отдельными ее симптомами была выше вероятность пониженной массы тела (ОШ: 1,5; 95% доверительный интервал, ДИ: 1,2–1,8) или задержки роста (ОШ: 1,4; 95% ДИ: 1,2–1,7). При субанализе трех лонгитюдных исследований отмечен более сильный эффект: ОШ для пониженной массы тела составляло 2,2 (95% ДИ: 1,5–3,2), а для задержки роста – 2,0 (95% ДИ: 1,0–3,9). Оценка ПДР для некоторых исследований показала, что если популяция детей в возрасте до 1 года совершенно не подвержена воздействию симптомов материнской депрессии, то в ней детей с пониженной массой тела или задержкой роста на 23–29% меньше.

Вывод Отмечена корреляция между материнской депрессией и пониженной массой тела и задержкой роста детей в раннем возрасте. Для выявления механизмов и причин этого необходимо проведение строгих проспективных исследований. Помочь снизить долю детей с задержкой роста и пониженной массой тела в развивающихся странах могут ранние выявление, лечение и профилактика материнской депрессии.

Resumen

Depresión materna y crecimiento durante la primera infancia en los países en vías de desarrollo: revisión sistemática y metaanálisis

Objetivo Investigar la relación entre la depresión materna y el crecimiento infantil en países en vías de desarrollo a través de una revisión bibliográfica sistemática y un metaanálisis.

Métodos Se realizó una búsqueda en seis bases de datos para hallar estudios realizados en países en vías de desarrollo sobre la depresión materna y el crecimiento infantil que hubieran sido publicados antes de 2010. Se emplearon métodos metanalíticos y se calculó el conjunto de oportunidades relativas (OR) del bajo peso y el retraso del crecimiento infantil en los hijos de madres con depresión, empleando modelos de efectos aleatorios para todos los estudios y subconjuntos de estudios que cumplieron los estrictos criterios de diseño de estudio, exposición a la depresión materna y variables de resultados. Se calculó el riesgo atribuible a la población (RAP) en los estudios seleccionados.

Resultados Los criterios de inclusión se cumplieron en 17 estudios que incluyeron a un total de 13 923 parejas de madres e hijos procedentes de 11 países. Los hijos de madres con depresión o síntomas depresivos resultaron ser más proclives a tener peso bajo (OR: 1,5; intervalo de confianza del 95%, IC: 1,2–1,8) o un retraso del crecimiento infantil (OR: 1,4; IC del 95 %: 1,2–1,7). El subanálisis de tres estudios longitudinales evidenció un efecto más contundente: la OR del peso insuficiente fue de 2,2 (IC del 95%: 1,5–3,2) y para el retraso en el crecimiento infantil, 2,0 (IC del 95%: 1,0–3,9). El RAP para los estudios seleccionados mostró que si se mantuviera la población infantil completamente al margen de los síntomas de depresión de las madres, entre un 23% y un 29% menos de niños tendría bajo peso o retraso en el crecimiento infantil.

Conclusión La depresión materna se asoció al bajo peso y al retraso en el crecimiento en la primera infancia. Es necesario realizar estudios prospectivos rigurosos para identificar los diversos mecanismos y causas. La detección temprana, el tratamiento y la prevención de la depresión materna podrían ayudar a reducir el retraso en el crecimiento infantil y el peso insuficiente en los niños de los países en vías de desarrollo.

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Table 1. **Studies included in systematic review of maternal depression and child growth in developing countries, 1996–2010**

Geographical region and study	Country, study design and sample size[a]	Depression measure and timing of assessment	Growth measure and timing of assessment	Findings	Notes
Southern or south-eastern Asia					
Anoop et al. 2004[29]	India, case–control (matched); $n=144$ (72 malnourished cases and 72 well nourished controls)	Measure: major depression diagnosis using the DSM III R (SCID). Timing: postpartum depression 1 month after birth. Current depression during the past month – after growth assessment	Measure: 50–80% versus >80% of expected weight-for-age. Timing: 6–12 months postpartum	Significant finding: postpartum depression, underweight: adjusted OR: 7.4, 95% CI: 1.6–38.5. Non-significant finding: current major depression, underweight: adjusted OR: 3.1, 95% CI: 0.9–9.7	Note: Interactions between current maternal depression and low birth weight and between postpartum depression and low maternal intelligence were statistically significant. The severity of malnutrition was significantly associated with postpartum depression and low maternal intelligence. Covariates included maternal intelligence, low birth weight, socioeconomic status, duration of exclusive breastfeeding, duration of supplementary breastfeeding, immunization status and mother's literacy.
Black et al. 2009[b,24]	Bangladesh, cross-sectional, $n=221$	Measure: CES-D using a cut off of ≥16. Timing: 12 months postpartum	Measure: underweight, height-for-age *z*-score and weight-for-height *z*-score; stunting, height-for-age *z*-score < –2. Timing: 6 and 12 months postpartum	Significant findings: 12-month height-for-age *z*-score, adjusted β: –0·01 ($P=0·01$); stunting, unadjusted OR: 2.2, 95% CI: 1.3–3.8. Non-significant finding: 12-month weight-for-height *z*-score, adjusted β: –0·01 ($P>0.05$)	Note: The relationship between depressive symptoms and infant growth was partially mediated by caregiving. Covariates at 12 months included 6-month weight-for-height *z*-score, maternal education, poverty status, infant sex, birth order, receipt of zinc or iron, HOME score, maternal perceptions of infant temperament and months of breastfeeding (models were also presented without either infant temperament or the HOME score or both).
Harpham et al. 2005[30]	India, cross-sectional, $n=1\,823$	Measure: SRQ-20 using a cut off of 7–8. Timing: 6–18 months postpartum	Measure: underweight, weight-for-age *z*-score < –2; stunting, height-for-age *z*-score < –2. Timing: 6–18 months postpartum	Significant finding: stunting, adjusted OR: 1.4, 95% CI: 1.2–1.6. Non-significant finding: underweight, adjusted OR: 1.1, 95% CI: 0.9–1.4	Note: Covariates included maternal age and education, child sex, age and birth weight, and household composition, wealth index and geographical location.
Harpham et al. 2005[30]	Viet Nam, cross-sectional, $n=1\,570$	Measure: SRQ-20 using a cut off of 7–8. Timing: 6–18 months postpartum	Measure: underweight, weight-for-age *z*-score < –2; stunting, height-for-age *z*-score < –2. Timing: 6–18 months postpartum	Significant finding: underweight, adjusted OR: 1.4, 95% CI: 1.1–1.8. Non-significant finding: stunting, adjusted OR: 1.3, 95% CI: 0.9–1.7	Note: Covariates included maternal age and education, child sex, age and birth weight and household composition, wealth index and geographical location
Patel et al. 2003[a,31]	India, hospital-based cohort, $n=171$ (23% of infants had depressed mothers)	Measure: EPDS using a cut off of 11–12. Timing: 6–8 weeks postpartum	Measure: underweight, weight-for-age <5th percentile; stunting, height-for-age <5th percentile. Timing: 6–8 weeks and 6 months postpartum	Significant findings: underweight, adjusted OR range: 2.7–3.6; stunting, adjusted OR range: 3.2–3.8	Note: Significant findings remained after adjusting for the following confounding variables one by one: maternal and paternal education, infant birth weight, sex and feeding practice, infant illness in the first 6 weeks of life and prematurity.

Geographical region and study	Country, study design and sample size[a]	Depression measure and timing of assessment	Growth measure and timing of assessment	Findings	Notes
Rahman et al. 2004[32]	Pakistan, case–control, $n=172$ (82 cases, 90 controls). Adjusted analyses: $n=107$ (48 cases, 59 controls) due to missing data	Measure: SRQ-20 using a cut off of ≥10. Timing: infant at mean 9.7 months (SD: 0.9) postpartum	Measure: underweight, cases, weight-for-age <3rd percentile; controls, weight-for-age >10th percentile. Timing: mean 9.7 months (SD: 0.9) postpartum	Significant findings: underweight, unadjusted OR: 3.9, 95% CI: 1.9–7.8; adjusted OR: 2.8, 95% CI: 1.2–6.8	Note: Covariates included infant birth weight, number of young children in the household and socioeconomic status.
Rahman et al. 2004[33]	Pakistan, prospective cohort, $n=320$ infants (160 with depressed mothers,160 with psychologically well mothers)	Measure: diagnosis of depressive disorder using SCAN. Timing: third trimester and 2, 6 and 12 months postpartum	Measure: underweight, weight-for-age *z*-score <–2; stunting, height-for-age *z*-score <–2. Timing: 2, 6 and 12 months postpartum	Significant findings: prenatal depression, underweight at 6 months, adjusted OR: 3.5, 95% CI: 1.5–8.6; stunted at 6 months, adjusted OR: 3.2, 95% CI: 1.1–9.9; underweight at 12 months, adjusted OR: 3.0, 95% CI: 1.5–6.0; stunted at 12 months, adjusted OR: 2.8, 95% CI: 1.3–6.1	Note: Chronic depression carried a greater risk for a poor child growth outcome than episodic depression. Covariates included low birth weight, early breastfeeding cessation <6 months, ≥5 diarrhoeal episodes per year, mother's and father's education, maternal financial empowerment and relative poverty. Other analyses included calculations of the relative risks of stunting and underweight in children of depressed mothers. Relative risks were also calculated for underweight and stunting in children aged 6 and 12 months of chronically depressed mothers (at four time points) versus depressed at no time point.
Africa					
Adewuya et al. 2007[34]	Nigeria, longitudinal case–control, $n=242$ (120 depressed cases and 122 non-depressed matched controls)	Measure: major depression diagnosis using the DSM-III-R (SCID-NP). Timing: 6-weeks postpartum	Measure: malnutrition, <5th percentile of weight-for-age or height-for-age. Timing: 6 weeks and 3, 6 and 9 months postpartum	Significant findings: malnutrition, weight for age at 3 months, unadjusted OR: 3.2, 95% CI: 1.2–8.4; height for age at 3 months, unadjusted OR: 3.3, 95% CI: 1.03–10.5; weight for age at 6 months, unadjusted OR: 4.2, 95% CI: 1.4–13.2; height for age at 6 months, unadjusted OR: 3.3, 95% CI: 1.2–9.6. No statistically significant results at 6 weeks or 9 months	Note: Depressed mothers were more likely to stop breastfeeding early and their infants were more likely to have episodes of diarrhoea or other infectious illnesses. Covariates were not included in the models.
Harpham et al. 2005[30]	Ethiopia, cross-sectional, $n=1722$	Measure: SRQ-20 using a cut off of 7–8. Timing: 6–18 months postpartum	Measure: underweight, weight-for-age *z*-score <–2; stunting, height-for-age *z*-score <–2. Timing: 6–18 months postpartum	Non-significant findings: underweight, adjusted OR: 0.9, 95% CI: 0.6–1.2; stunting, adjusted OR: 1.1, 95% CI: 0.9–1.4	Note: Unadjusted and adjusted associations between maternal mental health and infant growth were not significant. Covariates included maternal age and education, the child's sex, age and birth weight, and household composition, wealth index and geographical location.

Geographical region and study	Country, study design and sample size[a]	Depression measure and timing of assessment	Growth measure and timing of assessment	Findings	Notes
Stewart et al. 2008[23]	Malawi, cross-sectional, $n=501$	Measure: SRQ-20 using a cut off of 7–8. Timing: median infant age at time of survey: 9.9 months postpartum	Measure: mean weight-for-age *z*-score, mean height-for-age *z*-score. Timing: depended on child	Significant findings: height-for-age *z*-score: adjusted β: −0.27 ($P=0.01$). Non-significant findings: weight-for-age *z*-score: adjusted β: −0.02 ($P=0.87$)	Note: Multivariate analyses adjusted for maternal height, maternal weight, wealth index, education to Standard 6 or above, ≥ 4 surviving children, maternal occupation, marital status, paternal occupation, mother able to confide in husband or relative, recent infant diarrhoea, recent infant fever, infant age, infant sex and weight-for-age *z*-score at first postnatal weighing.
Tomlinson et al. 2006[35]	South Africa, prospective cohort, $n=147$ at baseline; $n=98$ at 18 months	Measure: major depression diagnosis using the DSM-IV (SCID). Timing: 2 and 18 months postpartum	Measure: height-for-age *z*-score < 10th percentile; weight-for-age *z*-score < 10th percentile; height *z*-score and weight *z*-score (using Tanner scales). Timing: 2 and 18 months postpartum	Non-significant findings: using depression at 2 months to predict infant growth at 18 months, height-for-age *z*-score < 10th percentile, unadjusted OR: 2.3, 95% CI: 0.9–6.0; weight-for-age *z*-score < 10th percentile, unadjusted OR: 2.5, 95% CI: 0.98–6.5; weight-for-age *z*-score adjusted for birth weight, β: 0.2, 95% CI: −0.21 to 0.78; height-for-age *z*-score, unadjusted β: 0·56, 95% CI: −0·16 to 1·3	Note: The attrition rate was 33%. Birth weight was a covariate in one model.
South America and the Caribbean					
Baker-Henningham et al. 2003[25]	Jamaica, case–control (matched), $n=210$ (139 malnourished cases and 71 well nourished controls)	Measure: CES-D (adapted) used as a continuous variable. Timing: after initial growth assessment	Measure: underweight, cases, history of weight-for-age *z*-score < −2 plus current weight-for-age *z*-score < −1.5; controls, weight-for-age *z*-score > −1 plus no history of undernutrition. Timing: 9–30 months postpartum	Non-significant adjusted findings: underweight, mean = 26; normal weight, mean = 16.5; unadjusted comparison, $P<0.01$	Note: In crude analyses, maternal depression was related to underweight. The relationship became non-significant after adjusting for confounding variables. Covariates included maternal height, economic stress, work skill level, absent father and possessions.
Carvalhaes and Benício 2002[36]	Brazil, case–control, $n=301$ (101 cases and 200 controls)	Measure: selected SRQ-20 subset of items: (i) three depressed mood items (scored 0/1–2/3), and (ii) four depressive symptoms (scored 0/1–2/3–4). Timing: sometime after initial screening of children at 12–23 months postpartum	Measure: underweight, cases, < 5th percentile of weight-for-age; controls, > 25th percentile of weight-for-age. Timing: sometime after initial screening of children at 12–23 months postpartum	Underweight, significant or marginally significant findings: maternal depressive symptoms, unadjusted OR: 4.1 ($P<0.01$), adjusted OR: 3.1, 95% CI: 1.0–10.3. Non-significant findings: maternal depressed mood, unadjusted OR range: 1.8–1.9 ($P=0.3$); adjusted results not shown	Note: Models were adjusted for per capita household income, maternal education, presence of the partner, child's age when the mother returned to work, hospitalization during gestation and alcoholism in the family.

Geographical region and study	Country, study design and sample size[a]	Depression measure and timing of assessment	Growth measure and timing of assessment	Findings	Notes
De Miranda et al. 1996[37]	Brazil, case–control, *n* = 139 for unadjusted analyses; *n* = 105 for adjusted analyses (60 controls and 45 cases)	Measure: QMPA score > 6. Timing: cases, mean: 10.9 months (SD: 6.9) postpartum; controls, mean: 8.4 months (SD: 4.8) postpartum	Measure: underweight, cases < 75% expected weight for age. Timing: cases, mean: 10.9 months (SD: 6.9); controls, mean: 8.4 months (SD: 4.8) postpartum	Significant findings: underweight, unadjusted OR: 2.8, 95% CI: 1.2–6.9; adjusted OR: 2.9, 95% CI: 1.3–6.8	Note: Individual adjustments were made for the number of siblings, maternal age, infant birth weight, income and maternal education. The number of siblings, maternal age and infant birth weight were included in multivariate models.
Harpham et al. 2005[30]	Peru, cross-sectional, *n* = 1949	Measure: SRQ-20 using a cut off of 7–8. Timing: 6–18 months postpartum	Measure: underweight, weight-for-age *z*-score < –2; stunting, height-for-age *z*-score < –2. Timing: 6–18 months postpartum	Non-significant findings: underweight, adjusted OR: 0.9, 95% CI: 0.6–1.2; stunting, adjusted OR: 1.1, 95% CI: 0.9–1.4	Note: Unadjusted and adjusted associations between maternal mental health and infant growth were not significant. Covariates included maternal age and education, the child's sex, age and birth weight and household composition, wealth index and geographical location.
Santos et al. 2010[38]	Brazil, longitudinal, *n* = 4 287 initially enrolled (3 748 remained at the 48-month follow-up)	Measure: EPDS using a cut off of ≥ 13. Timing: 12, 24 and 48 months postpartum. (Meta-analysis included depression at 1–2 time points in relation to anthropometry at 48 months)	Measure: underweight, weight-for-age *z*-score < –2; stunting, height-for-age *z*-score < –2. Timing: 48 months postpartum	Non-significant findings: underweight, adjusted OR: 1.5, 95% CI: 0.8–2.8; stunting, adjusted OR: 1.0, 95% CI: 0.6- 1.5	Note: Models adjusted for family income, maternal skin colour, maternal schooling, parity, pre-pregancy body mass index, smoking during pregnancy, preterm birth and hospitalization in the first year of life. The underweight analysis also adjusted for the duration of breastfeeding and the stunting analysis adjusted for age.
Surkan et al. 2008[39]	Brazil, cross-sectional, *n* = 595	Measure: CES-D using a cut off of ≥ 16. Timing: 6–24 months postpartum	Measure: stunting, height-for-age *z*-score < –2. Timing: 6–24 months postpartum	Significant findings: stunting, adjusted OR: 1.8, 95% CI: 1.1–2.9	Note: Covariates included the child's gender, birth weight and age, breastfeeding duration, maternal education, sanitation score, socioeconomic status, living conditions, the number of children living in the household and participation in the Family Health Programme.

CES-D, Center for Epidemiologic Studies Depression Scale; CI, confidence interval; DSM-III-R (SCID), *Diagnostic and statistical manual of mental disorders, third edition, revised* Structured Clinical Interview; DMS-III-R (SCID-NP), *Diagnostic and statistical manual of mental disorders, third edition, revised* Structured Clinical Interview – non-patient version; DSM-IV (SCID), *Diagnostic and statistical manual of mental disorders, fourth edition*, Structured Clinical Interview; EPDS, Edinburgh Post-natal Depression Scale; HOME, Home Observation for Measurement of the Environment; OR, odds ratio; QMPA, Adult Psychiatric Morbidity Questionnaire; SCAN, Schedules for Clinical Assessment in Neuropsychiatry; SD, standard deviation; SRQ-20, 20-item Self-Reporting Questionnaire.

[a] Each sample comprised a mother and child pair.

[b] Although the paper presented continuous outcomes and did not report adjusted results for underweight or stunting, we obtained the data from the authors and re-analysed it using multivariate logistic models to obtain the adjusted ORs for stunting and underweight included in the meta-analysis.