Journal of Evidence-Based Psychotherapies,
Vol. 26, No. 1, March 2026, 39-68.

10.24193/jebp.2026.1.3

MATERNAL DEPRESSION AND CHILDREN'S SOCIO-EMOTIONAL DEVELOPMENT IN THE FIRST TWO YEARS OF LIFE: A META-ANALYSIS

Mădălina Ruxandra Costin[1], Diana Tăut[1], Adriana Smaranda Băban[1], and Sebastian Pintea[1]*

[1] Department of Psychology, Babeș-Bolyai University

Abstract

This meta-analysis synthesizes evidence on whether maternal depressive symptoms during pregnancy and the postpartum period are associated with children's socio-emotional development in the first two years of life and examines sources of variability across studies.

Following PRISMA guidelines, we searched PubMed, Web of Science, and Scopus up to 01 December 2025. We included quantitative studies reporting maternal depression and child socio-emotional outcomes assessed at ≤24 months. Random-effects models were used, and we tested potential moderators to account for between-study heterogeneity.

Twenty-nine independent studies (N = 22,655 mother–child dyads) were included. Maternal depression showed a reliable overall small-to-moderate association with less favorable early socio-emotional development. Associations were observed for both prenatal and postnatal depression. Effects were generally stronger when outcomes were mother-reported rather than observational, stronger for socio-emotional problems than for competencies, and tended to increase when outcomes were assessed later within the first two years. Studies with older, more educated, and partnered samples typically reported smaller associations.

Maternal depressive symptoms are reliably linked to children's socio-emotional development in the first two years. Differences across studies indicate that measurement approach, outcome type, timing, and family context shape effect sizes, underscoring the value of perinatal screening and early intervention.

Keywords: Maternal depression, perinatal depression, socio-emotional development, early childhood, meta-analysis

* Correspondence concerning this article should be addressed to Mădălina Ruxandra Costin, Department of Psychology, Babeș-Bolyai University, Str. Republicii, nr. 37, Cluj-Napoca, Cluj, Romania.
Email: madalina.costin@ubbcluj.ro

Children's first life experiences are fundamental for their subsequent short- and long-term development (Likhar et al., 2022). In particular, the first two years of life are not only marked by rapid and major physical changes (Ilyka et al., 2021) but also by cognitive, social, and emotional development, which, in turn, are cornerstones for later psychological adjustment and well-being in the following years. In early childhood, socio-emotional development encompasses three main areas of development. emotion regulation, other-oriented socio-emotional processes, and self-oriented socio-emotional processes (Denham & Zinsser, 2014).

These elements are connected and influence each other (Tervahartiala et al., 2024). Children with harmonious socio-emotional development manage to (1) understand the feelings and behaviors of those around them and respond to the demands of the environment; (2) successfully regulate their own emotions in relation to personal needs and in alignment with interpersonal relational goals; and (3) understand and develop functional relationships with attachment figures and with other persons (Paley & Hajal, 2022; Thümmler et al., 2022; Speidel et al., 2023; Malik & Marwaha, 2024).

In summary, the development of these skills from an early age supports children in forming stronger interpersonal relationships, collaborating effectively with others, maintaining better overall mental health, developing adaptive coping mechanisms, and, more broadly, enhancing their resilience and engagement in prosocial behaviors (Jones et al., 2015; Oberle & Schonert-Reichl, 2017; Izett et al., 2021). Moreover, these skills facilitate greater access to educational and economic opportunities (Frosch et al., 2021) and can serve as protective factors against a range of difficulties, including disruptive behaviors, depression, anxiety, emotion dysregulation, and both externalizing and internalizing problems (Izett et al., 2021; Colomeischi et al., 2022; Anderson et al., 2023; Zięba-Kołodziej & Oliinyk, 2023; Smorti et al., 2024).

In the present study, we operationalize socio-emotional development in the first two years of life as a general measure of early socio-emotional adjustment that spans both strengths and difficulties. This approach is consistent with early-childhood reviews showing that socio-emotional development is typically described in terms of both adaptive competencies and emerging difficulties, alongside the development of self-regulation (Halle & Darling-Churchill, 2016). Specifically, we treat socio-emotional competencies (e.g., emotion regulation, social competence, and prosocial/other-oriented functioning) and socio-emotional problems (e.g., internalizing and externalizing symptoms, withdrawal, or broader socio-emotional difficulties) as two related facets of early socio-emotional development.

Many social determinants, extending beyond biological and genetic aspects, significantly impact children's socio-emotional development (Kirby, 2020; Thijssen et al., 2023). From an ecological perspective (Bronfenbrenner & Morris, 2007), children's development is shaped by interrelated systems that range from broad socio-cultural structures to their most immediate family interactions. Within the microsystem, children are directly influenced by their home and play environments, the immediate settings in which they grow, learn, and play. A particularly crucial component of this system is the parent-child relationship (Frosch et al., 2021). This relationship begins even before birth and continues to shape children's socio-emotional growth across development (Bianciardi et al., 2023). Given its role, any factor affecting this dynamic can have substantial developmental consequences. One such factor is maternal depression in the perinatal period (Goeglein & Yatchmink, 2020; Milgrom et al., 2023; Morales et al., 2023). We operationalize maternal depression to include both depressive symptoms assessed with validated instruments and clinically diagnosed depression in the perinatal period.

During the perinatal period, which includes pregnancy and the postpartum phase, women undergo substantial biological, psychological, and social changes (Balaji et al., 2007; Schaffir, 2016; Atkinson & Teychenne, 2019; Wilson & Lee, 2023). Prenatally, depressive symptoms can alter the intrauterine environment and disrupt the hypothalamic-pituitary-adrenal (HPA) axis, which regulates stress hormone production (Beijers et al., 2014; Brummelte et al., 2017). These effects can make the fetus hypersensitive to stressors in the environment (Bind et al., 2022). In addition, high cortisol levels in depressed mothers during pregnancy can lead to adverse birth outcomes such as prematurity, low birth weight, and intrauterine growth restriction, all of which increase long-term cognitive, emotional, and socio-emotional deficits in childhood (Traylor et al., 2020; Ghimire et al., 2021). Furthermore, depressive symptoms can impair a mother's ability to prepare cognitively and emotionally for motherhood, affecting her sensitivity and attunement to her child postpartum (Pearson et al., 2012; McAndrew, 2019; Hildingsson & Rubertsson, 2022).

Postnatally, mothers may withdraw, become less physically and emotionally responsive to their child's needs, misinterpret the child's cues, and encounter difficulties in establishing a warm and nurturing relationship (Letourneau et al., 2010; Sidor et al., 2011; McAndrew, 2019).

These adverse dynamics have a major impact on the first two years of children's lives, the stage in which they develop their limbic system and the right hemisphere of the brain (Glynn & Baram, 2019). Previous studies have shown that infants of depressed mothers frequently show signs of anger, defensive coping strategies, and passivity as a result of inadequate maternal support and responsiveness (Field et al., 2006; Tronick & Reck, 2009). These contexts can have

overall negative effects on children, impacting their growth and well-being, diminishing their capacity to develop effective emotion regulation skills, and increasing their risk of developing internalizing and externalizing problems (Goodman et al., 2011; Letourneau et al., 2019; Urizar & Muñoz, 2022; Morales et al., 2023).

While research has concentrated on the influence of postnatal depression on child development, more recent studies have also begun to examine the effects of prenatal depression on children's development (Takács et al., 2020). In this review, prenatal refers to depressive symptoms assessed during pregnancy, whereas postnatal refers to symptoms assessed after childbirth.

Following this direction is both promising and challenging because the relationship between maternal depression across the perinatal period and children's socio-emotional development is multifaceted (Junge et al., 2017). It involves a range of factors, including cultural, socioeconomic, relational, and biological ones (Cui et al., 2018; Chorbadjian et al., 2020; Harris & Santos, 2020). At the same time, this brings new challenges. It is more difficult to come to clear conclusions from individual studies when they differ in design, sampling, how and when maternal depression is assessed, and which socio-emotional outcomes are targeted (Cuijpers et al., 2010; Morales et al., 2023). Furthermore, the strength of associations may be influenced by the child's age at the time of assessment, contextual risks (e.g., socioeconomic disadvantage), and cultural norms (Rogers et al., 2020; Jaramillo et al., 2017).

Consequently, we need to synthesize findings to emphasize overall patterns, identify potential moderators, and evaluate whether the timing of the depression is associated with differences in children's socio-emotional development during their first two years of life (Takács et al., 2020).

Through this meta-analysis, we aim to systematically review existing research on how maternal depression impacts the socio-emotional development of children during their first two years of life. We conceptualize socio-emotional development through three fundamental components: emotion regulation, other-oriented socio-emotional processes, and self-oriented socio-emotional processes. By synthesizing empirical evidence from both prenatal and postnatal periods, we aim to 1) identify and analyze the specific impact of maternal depression on children's socio-emotional development during the first two years of life; 2) differentiate the effects of prenatal and postnatal depression on children's socio-emotional development; and 3) explore potential methodological and sociodemographic moderators that shape the relationship between maternal depression and children's socio-emotional development.

Method

Search strategy

We followed the guidelines outlined in PRISMA for reporting systematic reviews and meta-analyses (Page et al., 2021). A comprehensive search was conducted up to 01 December 2025 in three sources: PubMed, Web of Science, and Scopus for published studies. The search strategy included combinations of the following terms: "postnatal depression" OR "postpartum depression " OR "maternal depression" OR "prenatal depression" OR "perinatal depression" OR "mother's mental health." We combined these terms with the Boolean operator "AND" with terms related to child socio-emotional development, such as "child development" OR "child/infant/young child socio-emotional development" OR "child/infant/ young child social development" OR "child/infant/young child emotional development." Truncation symbols were used in searches when appropriate. Two authors assessed the final eligibility of studies, with the senior author settling any disagreements. The full database-specific search strings and Boolean operators are provided in Supplementary Material Appendix 1.

Inclusion and Exclusion Criteria

For this meta-analysis, studies were included if they met the following criteria: (1) written in English and published as a scientific article; (2) contained at least one analysis investigating the relationship between maternal depression and the child's socio-emotional development; (3) employed validated measurements; and (4) reported adequate statistics to allow for the calculation of effect sizes necessary for the meta-analysis.

Studies were excluded based on the following criteria: (1) systematic reviews and book chapters; (2) articles that assessed socio-emotional development outcomes in children older than 24 months; (3) studies that examined cognitive or physical development and health outcomes in children, rather than socio-emotional outcomes; (4) studies that investigated other mental health problems in mothers (e.g. combined distress, depression scores without separable depression effects) or other family members (e.g., fathers, grandparents); (5) articles focusing on the socio-emotional development of adopted children; and (6) studies where socio-emotional development was only mentioned in the text or discussion, but not directly measured.

The selection process is illustrated in the flowchart diagram (see Figure 1).

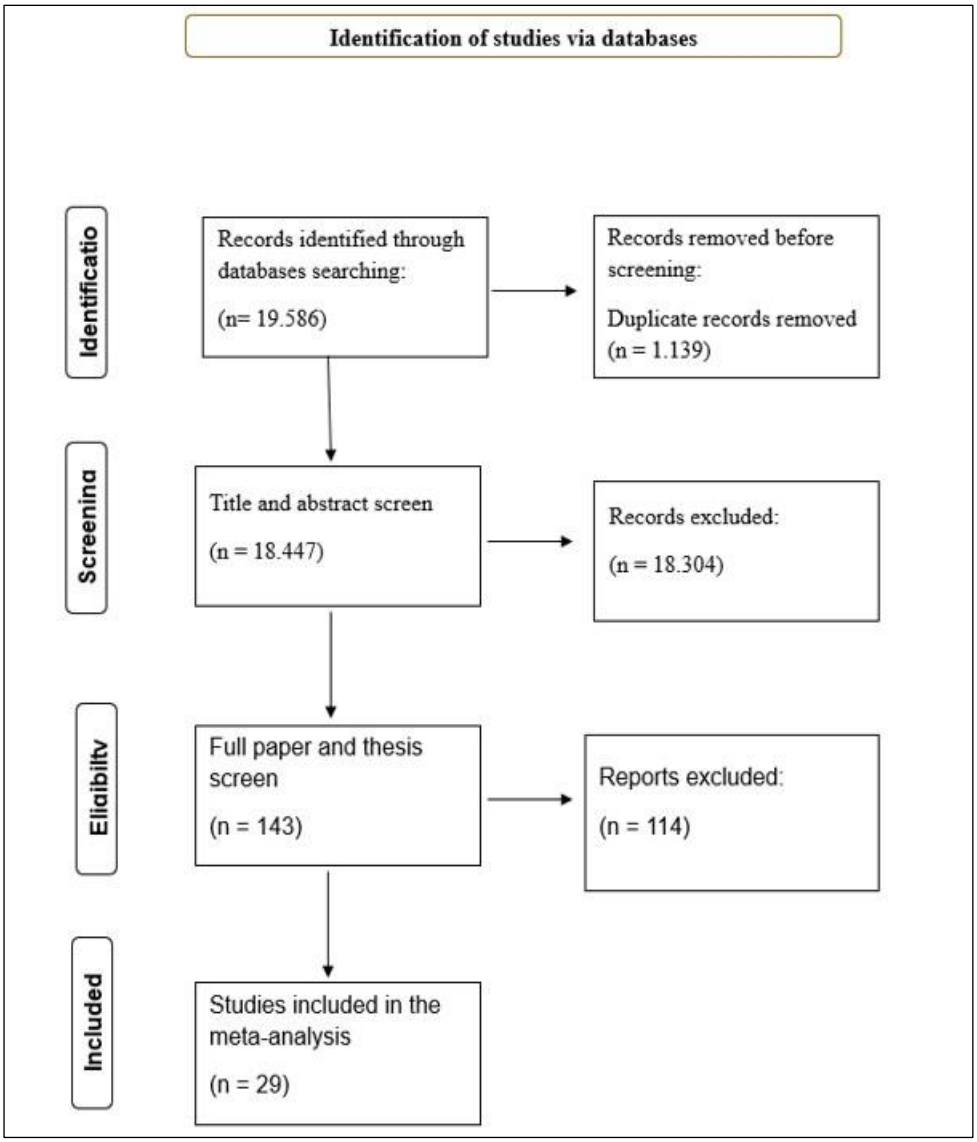

Figure 1. The PRISMA flow chart diagram describing the selection of studies.

Coding procedure

To systematically analyze the studies included in this meta-analysis, we extracted and coded a comprehensive set of variables from each study. The variables coded were: study ID (authorship, year of publication), study design, sample size, and the reported effect size(s) and related statistical information (including odds ratios, confidence intervals, p-values, and other effect-size-related metrics) needed for synthesis and comparability across studies.

Depression variables

Depression-related variables were coded to specify whether depression was prenatal or postnatal, alongside the instrument used to assess depression and the type of measurement (e.g., self-reported). We also coded the timing of depression assessment, recorded in weeks, whenever this information was available.

Children's socio-emotional development variables

For outcomes related to children's socio-emotional development, we coded the instruments used, the type of measurement (e.g., observational vs. reported by the mother), and the timing of the outcome assessment, recorded in weeks, when reported.

Coding of moderators

We initially coded a broad array of potential moderators. However, we focused our analyses on moderators that were reported in a sufficient number of studies and for which the distribution across studies was relatively balanced. The moderators retained for analysis were coded as follows:

Mother's age

This variable was coded as a continuous measure, using the mean age (in years) of mothers reported for each study.

Mother's Education (> 12 years)

Education was coded as a continuous measure reflecting the percentage of mothers with more than 12 years of education. When studies reported education in categories, we extracted the category that best matched >12 years and recorded the corresponding proportion when available.

Mothers living with a partner

Relational status was coded as a continuous measure representing the percentage of mothers living with a partner, typically operationalized as married and/or cohabiting participants, depending on how each study reported relationship status.

Mother's primigravida status

Primigravida (women in their first pregnancy) status was coded as a continuous measure reflecting the percentage of primigravida mothers reported in each study sample.

Study quality assessment

Study quality was assessed using the Newcastle–Ottawa Scale (NOS) (Wells et al., 2013). We used the NOS cohort version for longitudinal/cohort designs and an adapted NOS version for cross-sectional designs. The cohort NOS captures three domains (Selection, Comparability, Outcome; total score range 0–9), and the cross-sectional adaptation captures analogous domains (Selection, Comparability, Outcome; total score range 0–8 in our coding sheet). Each item was coded as 0/1 according to prespecified criteria. We expressed study quality as a percentage of the maximum score: (NOS total / NOS max) × 100, where higher values indicate higher quality. Study quality was also examined as a continuous measure.

Coding of outcome direction

During the coding process, we observed that the children's socio-emotional development variables were typically either child competencies, such as emotional regulation, or child problems, such as internalizing and externalizing behaviors. To maintain consistency in our overall analyses, for all overall analyses, we recoded the direction of correlations such that associations congruent with the existing literature received a positive sign, whereas associations incongruent with the literature received a negative sign. This decision was made to prevent positive correlations with child problems from canceling out negative correlations with child competencies if the original signs were retained. The original signs of the correlations were only preserved in analyses where the type of variable (competencies vs. problems) was treated as a moderating variable.

The studies included in this meta-analysis are described in Table 1.

Table 1

The studies included in the meta-analysis and their main features.

Study	Country	Design	N	Depression phase	Depression measure	Depression time (wks)	Outcome domain	Outcome measure	Outcome method	Outcome time (wks)	Mother age (M)	Edu >12y (%)	Partner (%)	Primigravida (%)	Quality (%)
Schiavo & Perosa, 2020	Brazil	prospective longitudinal	139	Postnatal	BDI	26–61	Personal social delay	DDST-II	Observational	26–61	NS	66	83	40	77.78
Arikan & Kumru, 2021	Turkey	cross sectional	537	Postnatal	BSI	101	Internalizing behaviors; Externalizing behaviors	CBCL	Reported by mother	101	32.03	74	NS	NS	60.0
Bates et al., 2020	The United States	prospective longitudinal	142	Postnatal	EPDS	48	Self regulation	IBQ-R VSF	Reported by mother	48	26.3	96.9	50.6	NS	100.0
Behrendt et al., 2019	Germany	cross-sectional (correlational)	61	Postnatal	BDI	57	Social Emotional problems; Social Emotional competencies	BITSEA	Reported by mother	57	31.89	45	NS	61	60.0
Black et al., 2007	Banglades h	longitudinal	221	Postnatal	CES-D	26–52	Orientation/ Engagement; Emotional Regulation	BSID-II	Observational	26–52	28.1	NS	98.2	27.5	100.0
DiPietro et al., 2006	The United States	longitudinal	94	Prenatal	POMS; CES-D	24–32	Orientation/En gagement; Emotional Regulation	BSID-II	Observational	24.8	32.0	NS	95.7	NS	100.0
Duguay et al., 2022	Canada	longitudinal	468	Prenatal; Postnatal	EPDS	25.5; 10.5	Social Emotional development	ASQ SE-2	Reported by mother	10.5	30.0	NS	98.5	63.9	55.56
Edwards & Hans, 2016	The United States	longitudinal	196	Prenatal; Postnatal	CES-D	27.6; 104	Social Emotional problems	BITSEA	Reported by mother	104	18.3	NS	69	NS	77.78

Fredriksen et al., 2019	Norway	longitudinal	387	Prenatal; Postnatal	EPDS	NS	Internalizing problems; Externalizing problems	ITSEA	Reported by mother	78	30.3	77.1	95.9	54.8	77.78
Gao et al., 2007	New Zealand	longitudinal	1021	Postnatal	EPDS; GHQ-12	6–104	Internalizing problems; Externalizing problems	CBCL	Reported by mother	104	NS	63.6	80.8	27.4	77.78
Gravener et al., 2012	The United States	cross sectional	198	Postnatal	BDI	88	Internalizing problems; Externalizing problems	CBCL	Reported by mother	88	31.68	198	87.9	NS	40.0
Guyon-Harris et al., 2016	The United States	longitudinal	120	Prenatal; Postnatal	EPDS; BDI	33.5; 14-104	Internalizing problems; Externalizing problems; Social Emotional problems	BITSEA	Reported by mother	104	26.2	95.8	27.5	25	88.89
Koutra et al., 2013	Greece	longitudinal	470	Prenatal; Postnatal	EPDS	28-32; 8	Social Emotional development	BSID-III	Reported by mother	8–78	30.31	40.8	99.6	42.7	88.89
Hails et al., 2018	The United States	longitudinal	650	Postnatal	CES-D	104	Internalizing problems; Externalizing problems	CBCL	Reported by mother	104	NS	73	NS	NS	77.78
Hummel & Kiel, 2015	The United States	longitudinal	91	Postnatal	CES-D	104	Internalizing problems	ITSEA	Reported by mother	104	31.81	100	97	NS	66.67
Kamal & Kalita, 2010	India	longitudinal	10	Postnatal	EPDS	26	Social development	CSBS-DP	Reported by mother	26	28.05	61.1	100	27.8	44.44
Martucci et al., 2021	Italy	cross sectional	74	Postnatal	EPDS	74	Social Emotional development	BSID-III	Reported by mother	NS	NS	NS	88.5	NS	40.0
Mason et al., 2011	The United States	longitudinal	219	Postnatal	EPDS	12	Social Emotional development	ASQ SE-2	Reported by mother	30	23.5	77.7	22.7	NS	44.44

McDonald et al., 2018	Canada	longitudinal	1596	Postnatal	CES-D	104	Social Emotional delay	BITSEA	Reported by mother	104	NS	77.5	96.24	NS	77.78
Nix et al., 2021	Ireland	longitudinal	61	Prenatal; Postnatal	HAM-D	NA; 112	Social Emotional development; Social adaptive behaviour	BSID-III	Reported by mother	112	36.0	98.4	91.8	NS	66.67
Okitundu-Luwa et al., 2021	Congo	cross sectional	458	Postnatal	GDAS	38	Social withdrawal behavior	ADBB	Observational	38	28.0	98	100	NS	40.0
Pacheco & Figueiredo, 2012	Portugal	prospective	110	Prenatal	EPDS	NS	Regulation of state	NBAS	Observational	1	NS	NS	92.8	100	77.78
Palmer et al., 2013	The United States	longitudinal	697	Postnatal	EPDS	4–52	Social Emotional problems	BITSEA	Reported by mother	52	NS	36.8	41	NS	100.0
Smith-Nielsen et al., 2019	Copenhagen	longitudinal	69	Postnatal	EPDS	17	Social withdrawal behavior	ADBB	Observational	17	NS	100	97.1	100	55.56
The APrON Team et al., 2019	Canada	longitudinal	634	Postnatal	EDS	13	Social withdrawal behavior; Aggressive behaviour; Externalizing behaviour; Internalizing behaviour	CBCL	Reported by mother	13	33.2	92.5	98	68	88.89
Almeida et al., 2012	Portugal	longitudinal	204	Prenatal	IACLIDE	NS	Social Emotional development	BITSEA	Reported by mother	52	29.0	24.8	71.5	NS	66.67
Korja et al., 2024	Finland	longitudinal	59	Prenatal; Postnatal	EPDS	NS	Externalizing behaviour; Internalizing behaviour	BITSEA	Reported by mother	107	31.7	96	NS	53	77.78

Rogers et al., 2023	Australia	longitudinal	1539	Prenatal; Postnatal	EPDS	8	Social Emotional development	BSID-III	Reported by mother	53	32.89	80	92	56	100.0
Chen et al., 2025	China	prospective	12130	Prenatal	PHQ-9	7–34	Personal social delay	ASQ-3	Reported by mother	23	30.35	83.4	NS	69.64	88.89

Note. Study = author, year; N = mother–child dyads; Depression phase = prenatal vs postnatal; Depression measure = depression instrument; Depression time (wks) = timing of depression assessment in weeks; Outcome domain = socio-emotional development domain; Outcome measure(s) = outcome instrument(s); Outcome method = observational vs reported by mother; Outcome time (wks) = timing of outcome assessment in weeks; Mother age (M) = mothers' mean age; Edu >12y (%) = percentage of mothers with >12 years of education; Partner (%) = percentage of mothers living with a partner; Primigravida (%) = percentage of primigravida mothers; Quality (%) = study quality percentage. For studies including both prenatal and postnatal depression, values separated by semicolons correspond to prenatal; postnatal assessments. Ranges (e.g., 26–61) indicate the time window reported in the original study. NS = not specified. BDI = Beck Depression Inventory; BSI = Brief Symptom Inventory; CES-D = Center for Epidemiologic Studies Depression Scale; EDS = Edinburgh Depression Scale; EPDS = Edinburgh Postnatal Depression Scale; GDAS = (as reported in the original study); GHQ-12 = General Health Questionnaire–12; HAM-D = Hamilton Depression Rating Scale; IACLIDE = (as reported in the original study); PHQ-9 = Patient Health Questionnaire–9; POMS = Profile of Mood States. ADBB = Alarm Distress Baby Scale; ASQ:SE-2 = Ages and Stages Questionnaire: Social-Emotional, Second Edition; ASQ-3 = Ages and Stages Questionnaire, Third Edition; BITSEA = Brief Infant–Toddler Social and Emotional Assessment; BSID-II/BSID-III = Bayley Scales of Infant Development, Second/Third Edition; CBCL = Child Behavior Checklist; CSBS-DP = Communication and Symbolic Behavior Scales–Developmental Profile; DDST-II = Denver Developmental Screening Test II; IBQ-R VSF = Infant Behavior Questionnaire–Revised Very Short Form; ITSEA = Infant–Toddler Social and Emotional Assessment; NBAS = Neonatal Behavioral Assessment Scale.

Data analysis

Statistical analyses were conducted using Comprehensive Meta-Analysis software, version 2. Given the heterogeneity of the studies presented below, we applied a random-effects model.

To evaluate publication bias, we employed two approaches: Rosenthal's Classic Fail-safe N and Begg and Mazumdar's rank correlation test. Rosenthal's Classic Fail-safe N estimates the number of unidentified or unpublished studies that would be required to render the meta-analysis non-significant ($p > 0.05$) (Rosenthal, 1979). Begg and Mazumdar's rank correlation test ranks studies by effect size and standard error and then calculates the correlation between these two variables (Begg & Mazumdar, 1994). This method helps determine if larger studies are consistently included regardless of effect size, whereas smaller studies may be included only if they show a significant effect size.

For moderator analysis, we used two strategies: heterogeneity tests for categorical variables (e.g., depression phase) and meta-regression tests for continuous variables (e.g., mothers' age), following the guidelines of Borenstein and colleagues (Borenstein et al., 2021).

Results

Study Characteristics

The present meta-analysis included 29 independent studies in total. The sample sizes of the included studies varied, ranging from 10 to 12,130 participants, comprising a total sample of 22,655 mother-child dyads. Regarding the study design, the majority ($n = 24$) utilized a longitudinal design, monitoring the same dyads over time, while 5 studies employed a cross-sectional design.

The included studies were taken in a diverse range of geographical contexts, although Western samples predominated. Most studies were conducted in North America ($n = 12$; primarily the United States and Canada) and Europe ($n = 9$; Denmark, Finland, Germany, Greece, Ireland, Italy, Norway, and Portugal), with fewer studies from Asia ($n = 3$; Bangladesh, China, India), Oceania (n = *2*; Australia, New Zealand), South America ($n = 1$; Brazil), Africa ($n = 1$; Congo), and Turkey ($n = 1$).

Maternal depression was assessed exclusively during the prenatal period in 4 studies, during the postnatal period in 17 studies, and 8 studies included assessments at both time points. When the timing of assessment was reported in weeks, prenatal assessments ranged from 7 to 34 gestational weeks (median = 29.8), and postnatal assessments ranged from 4 to 112 weeks postpartum (median = 52).

All studies used standardized self-report depression measures. For prenatal depression (n = 12), EPDS was most common (n = 7), followed by CES-D (n = 2), with other instruments used in single studies (HAM-D, POMS, IACLIDE, and PHQ-9 variants). For postnatal depression, EPDS was again most frequently used (n = 13), followed by CES-D (n = 5) and BDI (n = 4), with additional measures used in single studies (GHQ-12, BSI, GDAS, and HAM-D).

Child socio-emotional development variables were assessed between 1 and 112 weeks post-birth (median = 57 weeks). Most studies relied on maternal-report measures (n = 23), whereas fewer used observational or clinician-administered assessments (n = 6). The most frequently used measure was BITSEA (n = 7), followed by CBCL (n = 5) and the Bayley Scales (BSID-III: n = 4; BSID-II: n = 2). Other measures included ADBB (n = 2), ASQ:SE-2 (n = 2), and ITSEA (n = 2), while ASQ-3, CSBS-DP, DDST-II, IBQ-R VSF, and NBAS were each used in one study.

Regarding sociodemographic characteristics, reporting varied across studies. Mean maternal age was available in 21 studies, ranging from 18.3 to 36.0 years, with a mean of 29.60 across reporting studies. The proportion of mothers with >12 years of education was reported in 24 studies (range 24.8%–100.0%); in 21 studies, more than 50% of the sample had >12 years of education. The proportion with <8 years of education was reported in 19 studies (range 0.0%–55.6%). The proportion of mothers living with a partner was reported in 24 studies (range 22.7%–100.0%), and the proportion of primigravida mothers was reported in 15 studies (range 25.0%–100.0%).

Heterogeneity analysis

The heterogeneity analysis performed for the distribution of effect sizes in our meta-analysis indicated a significant heterogeneity, Q (28) = 369.45, $p < .001$, I^2 = 92.42. Taking into account also the diversity related to the research designs and participants, we decided to perform all the data analysis using a random-effects model.

The overall effect size

In Figure 2, the forest plot of all studies included in the meta-analysis is presented. As can be seen, the correlation varies from -0.24 (Nix et al., 2021) to 0.914 (Kamal & Kalita, 2010). The overall effect size is r = 0.204, 95% CI [0.147, 0.260], and statistically significant (Z = 6.86, $p < 0.001$), indicating a small to moderate effect size between maternal depression and children's socio-emotional development during the first two years of life.

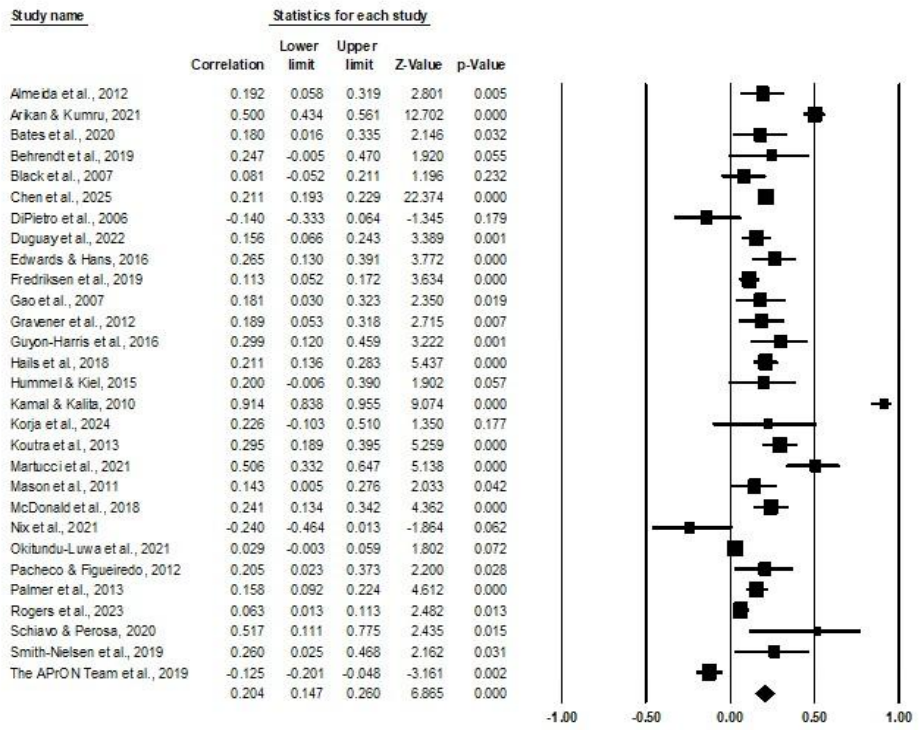

Figure 2. The forest plot of all studies included in the analysis and the overall effect size.

Publication bias analysis

To evaluate publication bias, we employed three approaches: Rosenthal's Classic Fail-safe *N,* Begg and Mazumdar's rank correlation test, and visual inspection of a funnel plot.

The Classic Fail-safe *N* of Rosenthal. Our meta-analysis incorporates data from 29 studies, which yields a *z* value of 19.70 and a corresponding two-tailed *p* value of 0.0001. The fail-safe *N* is 2902. This means that we would need to locate and include 2902 'null' studies in order for the combined two-tailed *p* value to exceed 0.05. In other words, there would be needed 100.1 missing studies with a null effect for every observed study for our effect to be nullified.

Begg and Mazumdar's rank correlation. This test was concerned with the potential relationship between the size of the studies and the effect size obtained by each one. The results revealed a nonsignificant Kendall's tau *b* of 0.21, with a two-tailed *p* value of 0.106 (based on continuity-corrected normal approximation), suggesting there is no tendency for studies that are more precise (and implicitly larger) to generate larger effect sizes.

Funnel plot inspection

The funnel plot appears largely consistent with an overall symmetrical distribution of studies around the pooled effect size, particularly among the more precise studies clustered at the top. While there is a slight visual imbalance, with somewhat more studies on the right side, this asymmetry is relatively modest and may be attributable to natural heterogeneity or random variation rather than clear evidence of publication bias. The majority of studies fall within the expected funnel boundaries, and although a few points lie further from the center, such dispersion is not uncommon in meta-analyses and does not necessarily indicate systematic bias. Overall, the plot suggests that the findings are reasonably robust, with no strong indication of substantial publication bias.

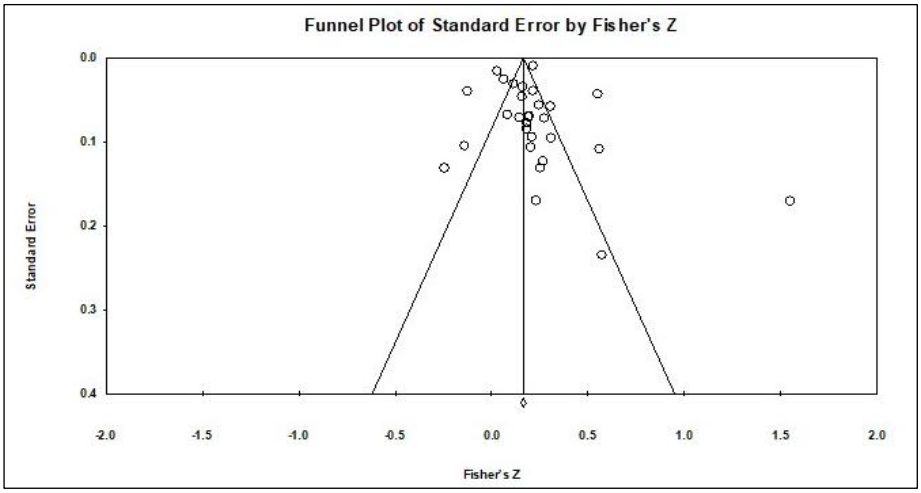

Figure 3. Funnel plot for the studies included in the meta-analysis.

Moderators analysis

Depression phase. In Table 2, we present the comparison between the overall effect size obtained in the prenatal phase and the overall effect size obtained in the postnatal phase of maternal depression.

Table 2. Comparison of effect sizes between postnatal and prenatal maternal depression

Phase of measurement	No. of studies	*r*	Limits of confidence interval (95%)		*Z*	*p*
			Lower	Upper		
Postnatal	25	0.229	0.157	0.298	6.12	0.001
Prenatal	12	0.141	0.076	0.204	4.26	0.001

As can be seen in Table 2, the effect sizes obtained in the prenatal and the postnatal phase are both statistically significant ($r = 0.14$, $p = 0.001$) for the prenatal phase and ($r = 0.22$, $p = 0.001$) for the postnatal phase, with no statistically significant differences between them Q (1) = 3.027, $p = 0.070$. Consequently, we conclude that the depression phase does not moderate the effect size.

Socio-emotional development measurement (observational vs reported by mother).

In Table 3, we present the analysis of the effect sizes as a function of the outcome measurement.

Table 3. The analysis of the effect sizes as a function of the children's socio-emotional development measurement method (observational vs. reported by mother).

Children's socio-emotional development measurement	No. of studies	*r*	Limits of confidence interval (95%)		*Z*	*p*
			Lower	Upper		
Observational	6	0.101	-0.012	0.212	1.75	0.079
Reported by mother	23	0.225	0.161	0.286	6.81	<.001

As Table 3 shows, when the outcomes were measured by observation, the effect size is small and non-significant ($r = 0.101$, $p = 0.079$). When children's socio-emotional development was reported by mothers, the effect size was moderate and statistically significant ($r = 0.225$, $p < .001$). The heterogeneity test between categories revealed marginally statistically significant differences, Q (1) = 3.60, $p = 0.058$. Consequently, we conclude that the way the outcomes were measured (observational vs. reported by mothers) has a tendency to moderate its relationship with maternal depression.

Children's socio-emotional development time (weeks post-birth)

The moderation analysis for outcome time was performed using a meta-regression procedure in which the outcome time was treated as a predictor and the effect size as a criterion. A total of 28 studies reported the timing of the outcome, and to standardize the data, we transformed all reported times into weeks. The analysis revealed that the outcome time is a significant positive predictor of the effect size ($b = 0.004$, $Z = 2.95$, $p = 0.003$). This finding suggests that as the time of outcome measurement increases, the strength of the relationship between maternal depression and child outcomes also increases. Therefore, outcome time plays a significant moderating role in this relationship.

Mother's age

Because most of the studies did not report their results as a function of age, we quantified the mean age of mothers and tested through a meta-regression to see if it predicted the effect size from each study. Our analysis revealed that age was a significant negative predictor of the effect sizes ($b = -0.015$, $Z = -6.37$, $p < .001$).

This finding suggests that as the age of the mother increases, the strength of the relationship between maternal depression and children's socio-emotional outcomes decreases. Thus, the mother's age is an important moderating variable in understanding this relationship.

Percentage of mothers with more than 12 years of education

The moderation analysis for the percentage of mothers with more than 12 years of education was conducted using a meta-regression procedure, with education level as the predictor and effect size as the criterion. The analysis revealed that the percentage of mothers with higher education was a significant negative predictor of the effect size (b = -0.0009, Z = -3.99, p < .001). Thus, as the percentage of mothers with more than 12 years of education increases, the effect size decreases. Therefore, the level of maternal education moderates the relationship between depression and child socio-emotional development.

Percentage of mothers living with a partner

We also conducted a meta-regression to assess the percentage of mothers living with a partner as a potential moderator. The percentage of partnered mothers was treated as the predictor and effect size as the criterion. The results showed that this variable was a significant negative predictor of the effect size (b = -0.002, Z = -8.80, p < .001). This suggests that as the percentage of mothers living with a partner increases, the effect size decreases. Consequently, the relationship between maternal depression and child outcomes is moderated by whether the mother is living with a partner.

Percentage primigravida mothers

The meta-regression analysis for the percentage of primigravida mothers (treated this variable as the predictor and effect size as the criterion). The analysis found that the percentage of primigravida mothers was not a significant predictor of the effect size (b = 0.0002, Z = 0.61, p = 0.539). Therefore, we found no evidence that primigravida status moderates the relationship between maternal depression and child socio-emotional outcomes.

Competencies vs problems

Table 4. The effect size as a function of competencies vs problems

Competences vs problems	No. of studies	*r*	Limits of confidence interval (95%)		*Z*	*p*
			Lower	Upper		
Competences	13	-0.142	-0.278	-0.001	-1.97	0.048
Problems	17	0.206	0.134	0.276	5.54	<.001

As Table 4 shows, when competencies were correlated with maternal depression, the effect size was small and significant (r = -0.142, p = 0.048). When problems were associated with depression, the effect size was small to moderate and statistically significant (r = 0.206, p < .001). The heterogeneity test between categories revealed statistically significant differences, Q (1) = 18.56, p < .001. Consequently, we will state that the type of outcome (competencies vs. problems) moderates its relationship with depression.

Study quality

The meta-regression analysis indicated that study quality was a statistically significant predictor of effect size, with a positive regression coefficient (B = 0.001, Z = 4.49, p < .001). This suggests that higher-quality studies tended to report slightly larger effect sizes.

Discussion

We aimed to examine the relationship between maternal depression and the socio-emotional development of children during their first two years of life and explore the potential moderators explaining the variability of the results. We analyzed a total of 29 studies. Our results indicated a statistically significant, small to moderate effect size. These results are consistent with previous findings in other research papers, showing that both prenatal and postnatal depression can negatively impact children's socio-emotional development (Goodman et al., 2011; Letourneau et al., 2019). Although both phases of maternal depression were detrimental and the postnatal effect size was numerically larger, the difference between postnatal and prenatal effects was not statistically significant. Consequently, our findings support the idea that depressive symptoms across the whole perinatal period represent a relevant risk for early socio-emotional development, rather than clearly indicating one period as more harmful than the other. One possible explanation is the continuity of depressive symptoms across pregnancy and postpartum, such that early symptoms may signal a more persistent vulnerability. In addition, prenatal and postnatal depression may operate through partially different pathways that converge on similar outcomes (e.g., prenatal biological sensitivity and postnatal caregiving disruptions) (Beijers et al., 2014; Bind et al., 2022). In particular, when depressive symptoms persist into the postpartum period, the risk may be expressed more directly through the early caregiving environment. During this challenging period of significant changes, mothers experiencing depressive symptoms may struggle to provide nurturing and supportive interactions or establish healthy routines, essential aspects for a child's development (Milgrom et al., 2023; Saharoy et al., 2023). These findings emphasize the need for comprehensive support throughout the perinatal period to support the balanced development of children and the well-being of the mothers.

The moderator analysis accentuated the complexity of the relationship between maternal depression and children's socio-emotional development, being influenced by several factors.

One significant factor was the method used to assess socio-emotional development. When mothers reported their children's socio-emotional development, the association with maternal depression was stronger; in contrast, observational assessments had smaller, non-significant results. This may suggest a negative bias in mothers' reporting, possibly influenced by depressive symptoms, which can affect attention and cognitive processes (Li et al., 2023). To increase the validity of the measurements and have a more comprehensive understanding of children's socio-emotional development, the studies should use both self-report and observational methods.

Another significant factor was the timing of socio-emotional development measurement, the effect of depressive symptoms having a greater impact as the children get older. As children grow older, the cumulative exposure to maternal depressive symptoms and prolonged disruptions in caregiving interactions may lead to socio-emotional difficulties becoming more observable and stable, particularly in domains such as emotion regulation and externalizing behavior. This aligns with Morales and colleagues (Morales et al., 2023), who found that mothers with a higher chronicity of depressive symptoms reported more significant externalizing and internalizing problems in their children.

Additionally, maternal age also moderated the relationship. The older age of mothers buffered the adverse effects of depressive symptoms on the socio-emotional development of children. Previous research supports this direction; advancing in age brings greater life experience, psychological maturity, and resources, important aspects that help parenting skills (Trillingsgaard & Sommer, 2018; Morales et al., 2023).

Similarly, mothers' education plays a moderating role. Mothers with higher levels of education showed weaker associations between depression and socio-emotional development of children. More educated mothers may have increased access to resources and knowledge about children's needs and development, and they are better informed about mental health, allowing them to seek professional help when they need it (Augustine & Crosnoe, 2010).

Living with a partner decreased the effects of maternal depression on the children's socio-emotional development. In the analyzed studies, data only captured whether the mothers were living with their partner, but did not include information on the level of support provided by them. However, the findings still align with previous research, emphasizing that partners can emotionally support mothers and practically assist them, creating a healthier mental environment for both mother and child (Martin & Brock, 2023).

Interestingly, primigravida status did not significantly moderate the association between maternal depression and children's socio-emotional development in the present meta-analysis, suggesting it did not explain the variability in effect sizes across studies and may not be a consistent vulnerability marker.

The type of socio-emotional development outcomes also influenced the strength of the association with maternal depression. The relationship was stronger when examining child problems, such as internalizing and externalizing behaviors, than child competencies like emotion regulation. This pattern suggests that maternal depressive symptoms are more consistently associated with elevations in children's socio-emotional difficulties than with reductions in competencies, implying a stronger link with problem-focused indicators than with positive socio-emotional skills during the first two years of life.

While this meta-analysis offers valuable insights, several limitations must be acknowledged. Many studies used mothers' self-reports to measure the children's socio-emotional development, which can introduce bias. Mothers with depressive symptoms, in particular, tend to evaluate things more negatively and passively, perhaps, than objectively.

Additionally, the heterogeneity of the studies in terms of design, measurement tools, and sample characteristics may limit the generalizability of the findings. Although we accounted for some variability through moderator analyses, future research should continue to explore other contextual factors, including social support and cultural and socioeconomic influences.

Looking forward, longitudinal studies monitoring children from the prenatal period through early childhood are needed to fully understand the temporal dynamics of the relationship between maternal depression and child socio-emotional development. Furthermore, intervention studies should address maternal mental health issues in more vulnerable populations, such as younger, less-educated, or first-time mothers. Another important factor to explore is the role of fathers and other caregivers in reducing the effects of maternal depression and supporting a healthy environment for the children.

Conclusion

This meta-analysis highlights the significant impact of maternal depression on the socio-emotional development of children during their first two years of life. The findings underscore the need for early identification and intervention for mothers experiencing depression, as well as monitoring young children whose mothers have experienced perinatal mental health difficulties. By addressing maternal mental health problems as early as possible, we can support children in developing in the most balanced and healthy way from the very beginning.

Authors' Notes

Conflict of Interest: All authors have no conflicts of interest to disclose.

Authors' Contributions:

Mădălina-Ruxandra Costin: Conceptualization; Methodology; Formal analysis; Investigation; Resources; Writing – original draft; Writing – review & editing.

Diana Tăut: Data curation; Writing – review & editing.

Adriana Smaranda Băban: Writing – review & editing.

Sebastian Pintea: Formal analysis.

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