Review Article

The Relationship Between Maternal Depression and Stunting in Children: A Systematic Review

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A B S T R A C T

Background: Maternal health is essential for the growth and development of the child. Mothers' depression can cause great harm to their children. Many studies have investigated stunting in children and its relationship with maternal depression. However, these studies have yielded different results. This systematic review aims to answer the question of "what is the relationship between maternal depression and stunting in children" in published articles.

Methods: This study used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. The databases used included ScienceDirect, PubMed, ProQuest, and Cochrane Library setting the publication period between 2010 and 2021. The studies with observational designs, measuring maternal depression at any stage after childbirth, and examining child (under five) stunting status, using z-score or percentile were included. The quality of the studies was assessed using the Downs and Black tool, and the risk of bias was evaluated by the Cochrane Collaboration's Risk of Bias Tool. Two authors extracted the data independently and the findings were synthesized qualitatively.

Results: The literature search yielded 611 articles, and only 14 articles were found to meet the inclusion criteria after removing duplicates, dissertations, editorials, comments, not full texts, and case reports. A total of eight articles showed a significant relationship between maternal depression and stunting. In contrast, the remaining six studies did not show an association between these variables. It seems that the tools for measuring depression and the age difference of children participating in the studies were important factors that affected the outcome of the relationship between maternal depression and children's stunting. Also, episodic maternal depression does not appear to be associated with stunting.

Conclusion: The findings suggest that to prevent childhood stunting, initiatives may be needed to identify and support mothers with chronic depression. Future systematic reviews are suggested to investigate the relationship between maternal depression and children's stunting in urban and rural communities or in high- and low-income countries in a broader time frame.

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Highlights

- Proper nutrition is essential for a child's growth and development.

- Children who have been malnourished for a long time may suffer from stunting.

- The mother's inattention to the baby's nutrition can be due to her depression and as a result harm the child's growth.

- This systematic review showed that there may be a link between postpartum depression and stunting in children.

Plain Language Summary

Stunting is a condition, in which a person's height is below the normal range for their age. It is a chronic malnutrition problem caused by a prolonged lack of nutritional intake, starting when the child is still in the womb until the first 1000 days of a child's life. This systematic review showed that there may be a link between postpartum depression and stunting in children

1. Introduction

S tunting is a condition, in which a child is not reaching their full height potential due to a lack of food or water. Chronic malnutrition results from undernourishment often associated with poverty, poor maternal health, and nutrition, frequent illness, or inappropriate feeding and care in early life (World Health Organization, 2020). Stunting is a nutritional deficiency problem that can be caused by not getting enough food, starting when the child is still in the womb until the first 1000 days of a child's life (Anato et al., 2020; Brentani & Fink, 2016)evidence on children's early life outcomes remains mixed. We analyze the empirical relationship between maternal depression and children's development at age one using data from the São Paulo Western Region Cohort project. METHOD: Seven hundred and ninety-eight (798. This condition can be detected by measuring the nutritional status of children based on height for age with the results of Z -score of 3.0 SD to <-2.0 SD (short) and Z-score <-3.0 SD (very short), which indicates a short or very short body condition caused by growth failure (Salma, ETAL., 2020; Salma & Harleli, 2021a).

Stunting has both short-term and long-term effects. These adverse effects may include decreased intelligence, susceptibility to disease due to inadequate immune systems, and increased risk of chronic diseases (Berhe et al., 2019; Vilcins, Sly, & Jagals, 2018).

In 2020, 149.2 million children under five years of age worldwide were stunted, 45.4 million were wasted, and 38.9 million were overweight. The number of stunted children is dropping in all regions, except Africa. Most children with severe stunting are living in South Asia, and Asia accounts for more than three-quarters of all children suffering from intense depletion (World Health Organization, 2020).

One of the factors influencing the incidence of stunting in children is maternal depression (Adhikari et al., 2020; Avan et al., 2010; Wemakor & Mensah, 2016), both prenatally and postnatally, which has a negative impact on child growth (Surkan et al., 2011), especially in developing countries (Lima et al., 2017). A British study has linked depressive symptoms during pregnancy to deficient nutrition and cognition in children (Barker et al., 2013). Depressed women may be negligibly able to focus on their own and their children's needs, including the ability to comprehend and react to the child's appetite (Pottinger, Trotman-Edwards, & Younger, 2009). Also, maternal weight loss and poor nutritional status make it difficult to breastfeed (Emerson et al., 2017).

Given the impact of maternal depression on infant development, we decided to assess the extent of available data on the relationship between maternal depression and the incidence of stunting in children through a systematic review.

Previous systematic reviews and meta-analytical studies have reported an association between stunting and several risk factors (Mohseni, Aryankhesal, & Kalantari, 2018). However, data regarding the risk of stunting in

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children are still conflicting. Several studies have demonstrated this risk, while others have revealed a negative association. This systematic review aims to answer the question "what is the relationship between maternal depression and stunting in children".

2. Materials and Methods

This study used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and tried to answer the question "what is the relationship between maternal depression and stunting in children". We used PICO criteria for asking a focused review question (Table 1).

Data sources and Search Strategy

We used databases commonly used in literature search, including ScienceDirect, PubMed, ProQuest, and Cochrane Library by setting the publication period between 2010 and 2021. We applied the MeSH terms and their validated keyword combinations to MeSH to identify relevant articles, in addition to narrowing the results. We used Boolean Operators (AND, OR, NOT or AND NOT) as conjunctions to combine or exclude keywords in our search to obtain more focused and productive results, including ("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"). In addition, in several databases, including ProQuest, Cochrane, and ScienceDirect, we used other alternative keywords, such as "Maternal Mental Health" OR "Maternal Depression" AND Stunting OR "Child Growth".

Articles obtained from the databases were then screened through two stages: title and abstract search (reviewed simultaneously) and full-text search. Two experts in the field of stunting and psychiatric studies were involved in the assessment of the keywords used and the articles included. Data were extracted through one of the authors of this evaluation and proven by every other author.

Eligibility criteria and study selection

Articles on the subject that met the subsequent criteria:

1. Using an anthropometric assessment for stunting children

2. Assessment of maternal depression

3. Full text published in peer-reviewed journals

4. Articles in English

5. Cross-sectional, case-control, and cohort studies

Also, review articles, editorials, comments, not full texts, case reports, proceedings, dissertations, and meta-analytical or systematic review articles were excluded.

Maternal depression and stunting in children had been assessed using a variety of methods in the articles included. Depression had been diagnosed through typical diagnostic interrogation, such as the Structured Clinical Interview for DSM-5 (SCID-5) (First et al., 2015), or interviews for the Schedule of Clinical Assessments in Neuropsychiatry (Rehman, 2011). At the same time, depressive symptoms had been assessed directly using a questionnaire, such as the Edinburgh Postnatal Depression Scale (Montazeri, Torkan, & Omidvari, 2007), or using the Center for the Study of the Epidemiology of Depression Scale (CES-D) (Shaffer, 2014), Patient Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001), the Pitt Inventory, the Aga Khan University Anxiety and Depression Scale (AKUADS) (Ali et al., 1998), Pitt Depression Inventory (PDI) (Pitt, 1968), The Self-Reporting Questionnaire (SRQ-20) (Netsereab et al., 2018), The Hopkins Symptom Checklist-25 (HSCL-25) (Derogatis et al., 1974), and Mini International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998).

Table 1. PICO criteria

Criteria	
Population	Children under five years of age
Intervention/Exposure	Maternal depression and postnatal depression
Comparison	Healthy mothers or no comparison
Outcome	Stunting

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A child's weight gain can be measured by age or peak for age. Underweight and stunting commonly use the World Health Organization (WHO) criteria, which include deviations greater than Standard Deviation (SD) below the recommended weight for age and the suggested peak for age, respectively (i.e., Z-score <2) (de Onis, & Branca, 2016).

The observational selection technique was modified to match the above inclusion criteria. After removing duplicates, the titles and abstracts of the articles were screened for inclusion in this systematic review. We then evaluated the full text of the ultimate articles for the very last inclusion. Any disagreement was resolved via consultation with different researchers.

Assessment of article quality

To maintain the quality of this review, we selected the articles that met the required criteria. We adopted the Downs and Black assessment tool (Downs & Black, 1998) to rank/sequence the quality of articles based on the high, moderate, and low categories. Only high- and moderate-quality studies were included in the review. Two authors independently checked the quality of the studies and conflicting judgments were resolved by the first author.

Risk of bias

The Cochrane Collaboration's Risk of Bias Tool (Higgins, Altman, Sterne, 2011) was used to evaluate the risk of bias in the included studies. It was performed by two reviewers independently. More reviewers were consulted to judge unresolved disputes. Judgments were classified as "low risk of bias", "some concerns", and "high risk of bias".

Data extraction

A systematic coding was used to report every statement's objective, location, populace, layout, and pattern size, the kid's ages, publicity, and final results measures, confounding variables, and the observation's analysis approach, results, conclusions, and limitations. Discrepancies in coding were resolved with the aid of using consensus. Studies that met the desired standards were then categorized primarily based totally on their layout (longitudinal, cohort, case–manipulated, or cross-sectional studies), and each was assessed to decide whether the standards were satisfied: (i) Studying the girls and young people; (ii) the reaction rate (i.e., the proportion of people who agreed to take part and finished the follow-up) is 80% or higher; (iii) using a diagnostic degree of depression.

3. Results

Search results

A total of 611 references were found and after duplicates were removed (186 studies), 425 potentially relevant sources remained. A total of 396 articles were removed due to reasons, such as being irrelevant, review/report, no full text available, and book chapters, and 14 articles were finally reviewed. The main focus of this systematic literature review was the relationship between maternal depression and child stunting.

The authors developed a table for a description of the data, including study design, characteristics of the subjects (sample size, nutritional status, and depression screening), and the main findings (Table 2). The PRISMA flowchart for study selection can be seen in Figure 1.

Characteristics of the studies

The studies included in this review were from several countries, especially countries with many stunting cases, and countries with upper middle income and low state income. The countries included four studies in Ethiopia (Ali et al., 2013; Anato et al., 2020; Girma, Fikadu, & Abdisa, 2019; Medhin et al., 2010) but maternal depression, which could contribute to child undernutrition by interfering with the mother's child caring practice and ability, has been received little attention. The objective of this study was to assess the association between maternal postpartum depression symptoms and infant (5-10 months of age, two studies in South Africa (Avan, , Raza, & Kirkwood, 2015; Slemming et al., 2017), and one study each in Nepal (Adhikari et al., 2020), Ghana (Wemakor & Mensah, 2016), Kenya (Haithar et al., 2018), Pakistan (Saeed et al., 2017), India (Upadhyay & Srivastava, 2016), Uganda (Ashaba et al., 2015), Tanzania (Kaaya et al., 2016), Bangladesh (Ali et al., 2013), Vietnam (Ali et al., 2013), and Mexico (Freak-Poli et al., 2017). The study designs used were cross-sectional (n=6), cohort (n=3), retrospective cohort (n=1), longitudinal (n=1), and case-control (n=3). In general, the number of participating subjects ranged between 74 and 11,372 mother-child pairs.

Measurements

In general, several variables had been measured in the studies included in this review. However, in order to maintain the stability of this study, we only referred to and focused on the nutritional status of children and the mental state of mothers. However, in some studies, these variables
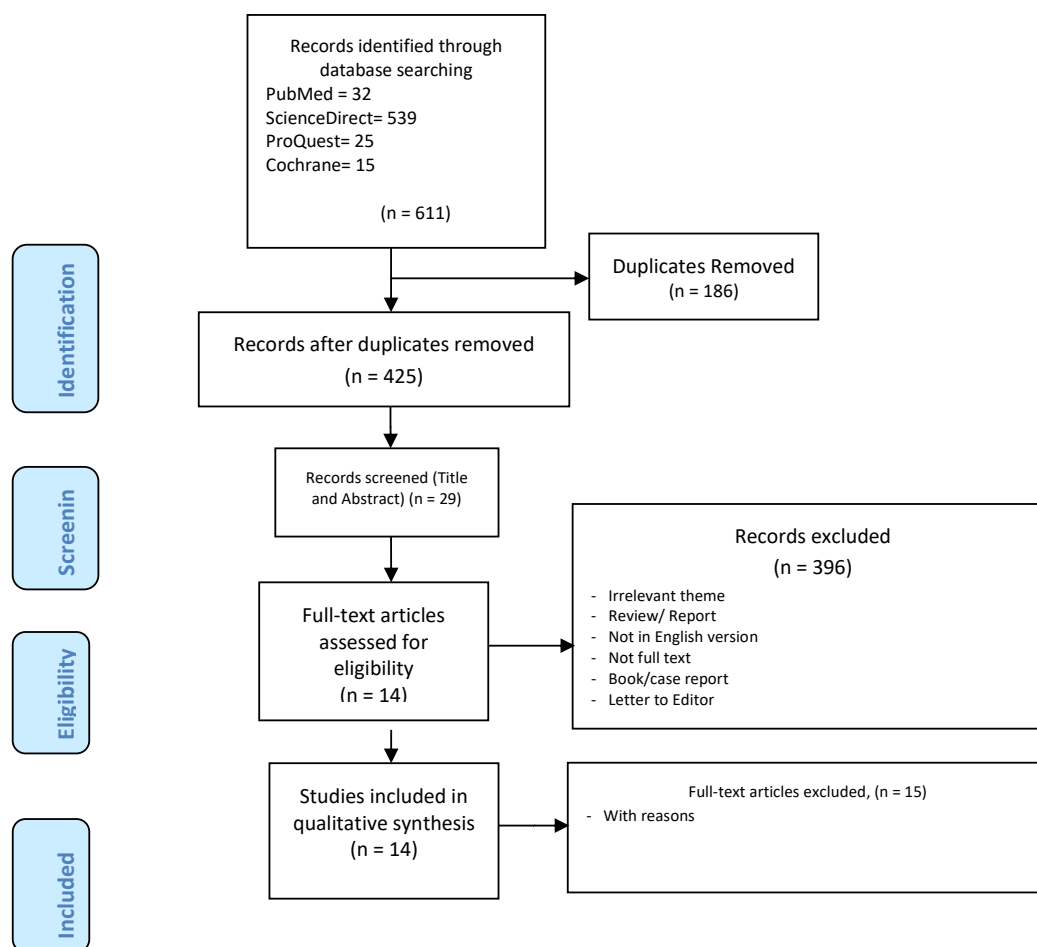
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Figure 1. PRISMA flowchart for study selection

were secondary outcomes. Anthropometric methods based on the WHO guidelines had been used to assess the children's stunting. The recumbent period had been measured for kids over two years, and the status peak for the rest of the kids was as much as the closest 0.1 cm.

The mother's mental status had been measured using various tools, including the nine-question Patient Health Questionnaire (PHQ-9) (Adhikari et al., 2020; Haithar et al., 2018), the Centre for Epidemiologic Depression Screening (CEDS) (Wemakor & Mensah, 2016), Pitt Depression Inventory (Avan et al., 2015; Slemming et al., 2017), Aga Khan University Anxiety and Depression Scale (AKUADS) (Saeed et al., 2017), the Edinburgh Postnatal Depression Scale (EPDS) (Anato et al., 2020)but maternal depression, which could contribute to child undernutrition by interfering with the mother's child caring practice and ability, has been received little attention. The objective of this study was to assess the association between maternal postpartum depression symptoms and infant (5-10 months of age, Self-Reporting Questionnaire (SRQ-20) (Ali et al., 2013; Girma et al., 2019; Medhin et al., 2010; Upadhyay & Srivastava, 2016), the Mini International Neuropsychiatric Interview (MINI) (Ashaba et al., 2015), the Hopkins Symptom Checklist (HSCL-25) (Kaaya et al., 2016), and the Center for Epidemiological Studies-Depression (CES-D)(Freak-Poli et al., 2017).

Relationship between maternal depression and stunting

Eight out of fourteen included studies showed a significant relationship between maternal depression and the incidence of stunting in children under five years of age. The other six studies showed no significant relationship between these two variables. Studies that showed no relationship between the variables had been conducted in Nepal (Adhikari et al., 2020), Mexico (Freak-Poli et al., 2017), Vietnam (Ali et al., 2013), one of two studies in South Africa (Slemming et al., 2017), and two of the four studies in Ethiopia (Ali et al., 2013; Medhin et al., 2010).

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Table 2. Characteristics of the studies

Author, Year	Country	Participants	Study Design	Nutritional Status	Depression Screening	Main Findings
Adhikari et al., 2020	Nepal	Households with children <5 years of age (N=3158)	Cross-sectional	Child: three anthropometric indicators of stunting, wasting, and under-weight Mother: underweight (BMI[**]<18·5) and overweight/obesity (BMI of 25 or more)	The nine-question Patient Health Questionnaire (PHQ-9)	Maternal depression was associated with child stunting (OR[*]=1.5, P<0.01)
Wemakor & Mensah, 2016	Ghana	384 mothers (aged 15-45 years) with apparently healthy children under 5 years old	Cross-sectional study	Anthropometry (Height-for-age, weight-for-age, and weight-for-height Z-scores based on WHO Multicenter Growth Standard	The Centre for Epidemiologic Depression Screening (CEDS)	The prevalence of child stunting and maternal depression was 16.1% and 27.8%, respectively Increased risk of stunting in children of depressed mothers (AOR[***] 2.48, CI: 1.29 –4.77) P=0.0011
Avan et al., 2010	South Africa	1860 women with children aged 6 and 24 months old (1142 children)	Longitudinal study (6 months postnatal)	Richman Child Behavior Scale Anthropometry using Stadiometer to assess the height	The Pitt Inventory	Children of depressed mothers were at 1.61 times higher risk for being stunted compared to non-depressed mothers (P=0.04)
Haithar et al., 2018	Kenya	37 cases and 37 controls. The case group was malnourished children ages 6 – 60 months The Control group was children with normal weight Mothers' age ranged from 16 to 46 years	Case-control	Anthropometry using Nomogram	The nine-question Patient Health Questionnaire (PH Q-9)	Infant malnutrition is significantly associated with maternal depression (P<0.001) The odds of maternal depression were markedly higher in cases than in controls (AOR=53.5, 95% CI: 8.5-338.3)
Saeed et al., 2017	Pakistan	325 Mothers aged 18-44 with children <2 years old	Cross-sectional	Anthropometry using standard 'Infant Weighing Scale' and 'Infantometer'	Aga Khan University Anxiety and Depression Scale (AKUADS)	Symptomatic mothers were more likely to have stunted children (OR=2.70, 95% CI 1.69–4.30, p< .001)
Anato Anato et al., 2020	Ethio-pia	238 mother-infant pairs with an age range of 25-34 years	Cross-sectional	Anthropometry using portable wooden and electronic scale	The Edinburgh Postnatal Depression Scale (EPDS)	Maternal depression symptoms were associated with inappropriate complementary feeding and stunting (P=0.011)
Girma et al., 2019	Ethiopia	234 (78 cases and 156 controls) mothers and children aged 24–59 months	Case-control	Anthropometric measurement tools (MUAC tape, stadiometer, digital weight scale, and salter scale)	Self-Reporting Questionnaire (SRQ-20)	Children whose mothers had CMD[****] were three times more likely to be stunted than children whose mothers had no CMD (AOR=3.24,95% CI: 1.14-9.21)
Upadhyay & Srivastava, 2016	India	2011 households (with 2011 children) in the younger cohort and 1008 households (with 1008 children) in the older cohort (aged 5-21 months)	Cohort	Anthropometry	Self-Reporting Questionnaire (SRQ-20)	Children of women who showed symptoms of postnatal depression were 1.53 times (AOR-1.5 3; 95 % CI: 1.21-1.92) more likely to be stunted than non-depressed women

Author, Year	Country	Participants	Study Design	Nutritional Status	Depression Screening	Main Findings
Ashaba et al., 2015	Uganda	83 cases and 83 controls of mother-children pairs. The mother's age was >18 years and children aged 1 to 5 years	Case-control	Anthropometry	The Mini International Neuropsychiatric inter-view (M.I.N.I.)	A strong association between malnutrition in children and maternal depression (P=0.015) Maternal depression was significantly associated with malnutrition in children with a crude OR of 2.23 (1.08-1.89) and an AOR of 2.4 (1.11-5.18)
Kaaya et al., 2016	Tanzania	699 mother-child pairs. Women: HIV-positive pregnant women less than 27 weeks of gestation (15 to 40 years old)	Retrospective cohort	Anthropometry	The Hopkins Symptom Checklist (HSCL-25)	Cumulative depression post-delivery was positively associated with underweight (RR[*****]: 1.03, P<0.01), stunting (RR: 1.03, P<0.01), and wasting (RR: 1.11,P<0.01)
Nguyen et al., 2013	Bangladesh, Vietnam, and Ethiopia	11,372 mothers with children aged 0–5 years	Cross-sectional	Anthropometry using electronic scales The Household Food Insecurity Access Scale Infant and young child feeding practices	Self-Reporting Questionnaire (SRQ-20)	Mothers with high levels of CMD had significantly higher odds of having a stunted child compared to mothers with low levels of CMD in Bangladesh (adjusted OR=1.21; 95% CI: 1.03-1.41), but not in Vietnam and Ethiopia Similarly, mothers with high CMD was 1.27 times (95% CI: 1.01-1.61) more likely to have underweight children than mothers with low CMD in Vietnam.
Medhin et al., 2010	Ethiopia	1045 women in the third trimester of pregnancy	Cohort	Anthropometry (height-for-age and weight-for-age)	Self-Reporting Questionnaire (SRQ-20)	CMD was not significantly associated with infant underweight and stunting at either six or twelve months of age (OR=1.71; 95% CI: 1.05-2.80)
Slemming et al., 2017	South Africa	1098 mother-infant pairs	Cohort	Anthropometry (height-for-age) using Harpenden Stadiometer and recorded to the nearest 0.1 cm	Pitt Depression Inventory (PDI).	There is no association between maternal depression and stunting 0.72 [0.40, 1.31] OR: 0.72 [95% CI 0.40 -1.31]
De castro et al., 2017	Mexico	4240 children younger than 5 years old and their mothers	Cross-sectional	Anthropometry (stunting means low height-for-age)	The Center for Epidemiological Studies-Depression (CES-D)	No relationship between maternal depressive symptoms and stunting (P=0.6335)

Client- Centered Nursing Care

OR[*]: Odds Ratio, BMI[**]: Body Mass Index, AOR[***]: Adjusted Odds Ratio, CMD[****]: Common Mental Disorder, RR[*****]: Relative Risk

4. Discussion

The main aim of this systematic evaluation was to find whether maternal depression is related to stunting in children. Eight studies reported an association between maternal depression and toddler weight and it suggested that maternal depression may also play an important role in children's stunting. This is consistent with theories linking maternal depression to stunting via parenting practices. Maternal depression influences a child's weight via parenting practices, which are associated with toddler diet (Miller et al., 2021), screen time behaviors (Park et al., 2018), and physical activity (Lampard, Franckle, & Davison, 2014). Long-term depression will have a greater impact on the behavior of parents and toddlers and, consequently, a more chance of influencing toddler weight and height in the long run (Kamis, 2021). A previous review also found that maternal melancholia was associated with being underweight and short stature in early adolescence. (Surkan et al., 2011). This finding

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was obtained after combining research results with exceptional designs from different places and young people of exceptional ages. The mechanisms responsible for the association between maternal melancholy and insufficient infant growth are unclear. It has not been addressed whether those mechanisms differ among nations and regions. Cultural variations in caregiving and feeding, the diploma of meals, and lack of confidence can also all play a role. Previous studies have indicated that maternal melancholy is related to compromised parenting behavior (Lovejoy et al., 2000; McLearn et al., 2006b), unresponsive care practices (Lovejoy et al., 2000), and a lower likelihood or shorter duration of breastfeeding (McLearn et al., 2006a; Turner & Papinczak, 2000).

Although depictions of underweight and short stature were inconsistent between studies, height and weight were measured by actual instruments, not by self-report. On the other hand, the diagnosis of maternal depression and its severity may be slightly straightforward due to the use of depression scales that were not validated in the study population, especially since different civilizations may have diverse visions of depression. Moreover, there may be a mutual relationship between the mother's mental health and the child's health, as the child's poor health can cause depressive manifestations in the mother (von Salmuth et al., 2021).

All six studies examining the association between episodic maternal depression and risk of stunting found no association, suggesting that episodic maternal depression is not associated with stunting. The inconsistency of the study results is likely due, at least in part, to significant differences in the screening instruments used to measure depression, study designs, age groups of children and mothers, and attitudes (e.g. there are many different factors that influence a person's choice of living location, including culture and other factors).

The causes of depression in women are complex and include poverty, marital conflict, domestic violence, and a lack of economic resources (Anato et al., 2020) but maternal depression, which could contribute to child undernutrition by interfering with the mother's child caring practice and ability, has been received little attention. The objective of this study was to assess the association between maternal postpartum depression symptoms and infant (5-10 months of age. However, depression can be managed with several interventions, such as social support, group therapy, and home visits. It has been proved that these interventions might reduce maternal depressive symptoms in various countries, including the USA, South Africa, and Canada (Burgess et

al., 2021; Sampson, Villarreal, & Rubin, 2016; Wozney et al., 2017). Interventions aimed at improving parenting and mother-infant relationships have effectively reduced depressive symptoms in postpartum women (Nath et al., 2020; Raine et al., 2016), which suggests that maternal depression can be modified.

5. Conclusion

In conclusion, we identified mixed results for the association between maternal depression and child stunting. Notably, preliminary evidence suggests that maternal depression may increase the risk of stunting in children. Therefore, it is necessary to identify and support mothers who are chronically depressed to prevent childhood stunting. Beyond just focusing on chronic depression, we also specified clear priorities for future research. Studies with more extended follow-up periods are required to determine the long-term effects of exposure to maternal depression during adolescence and beyond. Maternal depression during early development can have long-term consequences for a child's growth and development. Investigating potential mediating and moderating factors is vital to understanding the relationship between a mother's depression and child stunting.

Limitation

Examinations at the review level may have limitations in terms of the identification of relevant studies. We did not attempt to analyze quantitative data from studies in this study due to considerable heterogeneity between studies in the measurement and categorization of maternal depression exposure, child age at exposure, and child age at the outcome.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article. The participants were informed of the purpose of the research and its implementation stages. They were also assured about the confidentiality of their information and were free to leave the study whenever they wished, and if desired, the research results would be available to them.

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Authors' contributions

Contributed to conducting the project: All authors; Conducted searching and data collection: Sukurni Sukurni and Heriviyatno J.Siagian; Analyzed the data and compiled and revised the paper: La Ode Alifariki and Heriviyatno J.Siagian.

Conflict of interest

The authors declared no conflict of interest.

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