Migration and perinatal mental health in women from low- and middle-income countries: a systematic review and meta-analysis

Short title: Migration and perinatal mental health

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Abstract

Background: Migrant women are at risk of perinatal mental disorders due to stressors experienced before, during and after migration.

Objectives: This systematic review and meta-analysis summarises the prevalence, associated factors and interventions for perinatal mental disorders in migrant women from low- and middle-income countries (LMIC).

Search Strategy: We systematically searched nine electronic databases and the grey literature using a predefined search strategy.

Selection Criteria: Studies were included if they assessed pregnant or post-partum migrants from LMIC, used a structured tool and a case-control, cross-sectional, cohort or intervention study design.

Data Collection and Analysis Data was double-extracted. We calculated pooled prevalence of depression and weighted mean anxiety and depression scores. We calculated crude odds ratios from risk factor studies and summarised intervention studies descriptively.

Main Results: Forty studies were identified from 10,123 references. Pooled prevalence was 31% (95% CI 23%–40%) for any depressive disorder and 17% (95% CI 12%–23%) for major depressive disorder. Previous depression and lower social support were associated with perinatal depression. There was insufficient data to assess the burden of anxiety, post-traumatic stress disorder or psychosis in this population.

Conclusions: One in three migrant women from LMIC experiences symptoms of perinatal depression. Social support is an important protective factor. Evidence on LMIC women relocating to other LMIC is lacking. Given the adverse consequences of perinatal mental illness on women and their children, further research in low-resource settings is a priority.

Keywords: mental health; pregnancy; post-partum; migration; refugee; low- and middle-income countries (LMIC)

'Tweetable Abstract'

One in three migrant women from low- and middle-income countries has symptoms of perinatal depression

Introduction

Migration has been a hallmark of global development over the last millennia. There are currently an estimated one billion migrants globally, with trends increasing dramatically.[1] Migrants constitute a heterogeneous group and reasons for migrating are multifaceted, involving a complex interplay between factors within and beyond individuals' control. Seeking better opportunities for education, employment and health and securing better means to support family are important factors, along with more acute drivers such as natural disasters, violence and conflict.[2] Migrants face higher rates of physical and mental illness than host populations due to a multitude of stressors experienced before, during and after migration.[3–5] Migrant women who are pregnant or post-partum may constitute an especially vulnerable group due to the particular health and social needs during this period.[6,7]

Mental disorders are one of the most common disorders of the perinatal period. In high income countries (HIC), perinatal depression and anxiety affect 8·5–12·9% and 12·3–13·0% of women, respectively, with high co-morbidity between these disorders.[8-10] In low- and middle-income countries (LMIC), rates are higher with an estimated 15·6–19·8% of women experiencing perinatal depression.[11,12] Migrant women may have higher rates as high as 42%.[7] Rates of perinatal post-traumatic stress disorder (PTSD), which is highly co-morbid with depression, are 1-2% in HIC and 6-8% in LMIC.[13] The post-partum period is also a time of increased risk of psychosis with rare but potentially devastating consequences.[13]

Determinants of perinatal mental disorders in migrant women are complex and include economic, psychosocial, obstetric, migration and health systems factors (**Figure S1**). These determinants have never been systematically synthesised. Consequences are potentially serious and long-lasting, predisposing women to chronic depression and suicide, impairing their ability to work and provide care and threatening relationships with partners.[8,14] Children of mothers with mental disorders are at risk of premature birth, low birthweight, stunting, diarrhoeal diseases and impaired emotional, cognitive and behavioural development that may persist into adolescence.[15–18] Consequences are most

severe in LMIC where co-morbidity with diseases such as HIV and exposure to chronic adversities are higher.[15]

This review aims to provide a comprehensive overview of migration and perinatal mental health by summarising and synthesising data on prevalence, associated factors and effectiveness of interventions for any perinatal mental disorder. We focus on women originating from LMIC who have resettled in any other region, including other LMIC regions. We use the term 'migrant' to include refugees, asylum-seekers and economic migrants.

Methods

Search strategy and selection criteria

We conducted a systematic search of the literature (**Appendix S1**) using pre-specified inclusion criteria (**Appendix S2**). We excluded studies of internal migrants as internal migration is a vast topic in its own right. We excluded qualitative studies and studies using non-validated, unstructured or poorly-described tools to assess outcomes in order to minimise the risk of reporting and selection bias. We placed no language or date restrictions on our search. Two authors (GF, EP) independently screened full-text articles. When pregnancy or migration status was unclear or when results combined different categories of participants (e.g. first and second generation migrants) we asked authors to provide disaggregated results and only included data on participants who met our inclusion criteria. We contacted 81 authors, of whom 65 replied and 21 were able to supply the additional information required. This review was registered on PROSPERO in October 2013 (www.crd.york.ac.uk/PROSPERO; CRD42013005929).

Quality assessment and data extraction

Two authors (GF, EP) independently assessed the quality of each included study. For prevalence and risk factor studies we used a modified version of the Newcastle-Ottawa Scale.[19] We assessed participant selection, participant representativeness and comparability, and outcomes. For intervention studies we used the Cochrane Collaboration GRADE tool to score selection, performance, attrition, and reporting bias.[20] We examined associations between study quality and outcomes in subgroup analyses. Two authors (GF, EP) independently extracted data on study design, participant characteristics and outcome measurement. Summary measures extracted were raw proportions, mean scores and odds ratios. Disagreements were resolved through further discussion of the study and communication with study authors. Results were reported following PRISMA (**Appendix S3**) and MOOSE (**Appendix S4**) guidelines.

Statistical analysis

For prevalence studies, we were able to conduct analyses only for depression due to the small number of studies reporting on other mental disorders. We calculated the pooled prevalence of depression across studies which used standardised and comparable cut-off scores on the Edinburgh Postnatal Depression Scale (EPDS), Center for Epidemiologic Studies Depression Scale (CES-D), Beck Depression Inventory (BDI-II) and Postpartum Depression Screening Scale (PDSS). High correlation between these scales has been shown previously.[14,21] We conducted separate analyses for any depressive disorder (including minor, moderate and major depressive disorders), defined as EPDS≥10, CES-D≥16, BDI-II≥14 or PDSS≥60, and major depressive disorder, defined as EPDS≥13, CES-D≥24, BDI-II≥20 or PDSS≥80. We also calculated weighted mean anxiety and depression scores. We used a DerSimonian and Laird random effects model to account for our assumption that prevalence estimates across different studies would not be identical but follow a normal distribution.[22] We generated Forest plots to show summary measures for each study along with the pooled estimate and corresponding 95% confidence intervals (95% CI). We estimated heterogeneity across studies using the I^2 statistic and investigated possible sources of heterogeneity through subgroup analyses.

Pre-specified sub-group analyses were participants' region of origin, destination country, migration status and study quality. All analyses were carried out using MetaXL.

For risk factor studies, the small number of studies available for each risk factor precluded meta-analysis. For the outcome of depression, we recorded or calculated crude odds ratios and classified these according to Cohen's definitions of small, medium and large effect sizes.[23] Unadjusted odds ratios were used because the majority of included studies presented results in this way, and those which presented adjusted odds ratios controlled for different factors, making comparison of results across studies difficult. We used odds ratios of 1·6, 3·1 and 5·7 as equivalents of Cohen's *d* values of 0·2 (small effect), 0·5 (medium effect) and 0·8 (large effect), respectively.[24] We then examined whether there was any consistency of effects and effect sizes across studies for each given risk factor. For intervention studies, the very small number of studies that met our inclusion criteria precluded further statistical analysis or pooling of results and therefore we present a descriptive summary.

Results

The initial search identified 5,559 articles (excluding duplicates) with 208 articles identified as potentially relevant (**Figure S2**). The majority of these were excluded upon retrieval of the full text as they did not meet inclusion criteria. Forty-five articles reporting on 40 studies with a total of 19,349 (7895 migrant women and 11,454 women in comparison groups) were included in the final analysis.[25–69]. This total includes 566 women whose results were reported in more than one publication. For our results we included each individual woman only once. Of these, 38 studies[25-62] (7,766 migrant women) provided data on prevalence (**Table S1**), 12[28,29,31,37,40,45,46,48,54,58,59,67] (1,977 migrant women) on associated factors (**Table S2**), and two[68,69] (247 participants) on interventions (**Table S3**). Study outcomes were depression (40 studies),[25–62,68,69] anxiety (three studies),[26,38,54] and post-traumatic stress disorder (PTSD; two studies).[38,54] No studies assessed the presence of psychotic disorders. Thirteen different scales were used with the EPDS (23 studies)[25,28,29,31-34,36-40,42,44,46,51-54,57-60] and CES-D (nine studies)[27,34,35,43,47,48,55,56,69] being the most common. Sample sizes ranged from 31[49,54]

to 909[25] migrant women and mean ages ranged from 24[34] to 33[30,60] years. Thirty-three studies included post-partum women. Only two studies included refugees or asylum seekers.[38,59] Fourteen studies[26,31,32,35-40,48,53,55,59,62] included a non-migrant comparison group and of these, nine (64%)[26,31,32,36,38,39,53,55,59] reported higher rates of mental illness in the migrant groups. North America (22 studies)[27,30,34,35,37-39,41,42,46–52,55,56,59,61,68,69] was the most heavily represented destination region, followed by Europe (six studies)[28,36,40,43,60] and Australasia (six studies).[25,26,53,54,57,58] Thirty-seven studies were conducted in high income countries, four in middle income countries and none in low-income countries. The most common regions of origin of participants were Latin America and Southeast Asia. Quality scores for prevalence, risk factor and intervention studies are summarised in **Tables S4-S6**.

Prevalence of mental disorders

Depression

Thirty-four studies including 12,326 participants (7,348 migrant women and 4,978 women in comparison groups) were included in quantitative analyses of the prevalence of depression. The pooled mean EPDS score across 12 studies (2,861 participants) was 6·41 (95% CI 6·22–6·59; I^2 96%). The range of possible scores on the EPDS is 0 to 30 with scores above 10 and 13 indicative of any depressive disorder and major depressive disorder, respectively. The pooled mean CES-D score across six studies (1,057 participants) was 13·21 (95% CI 12·66–13·76; I^2 86%). The range of possible scores on the CES-D is 0 to 60 with scores above 16 and 24 indicative of any depressive disorder and major depressive disorder, respectively.

The pooled prevalence of any depressive disorder across 16 studies (3,492 participants) was 31·4% (95% CI 23·2%–40·2%, p=0·00, I^2 96·4%) (**Figure 1**).The pooled prevalence of major depressive disorder across 17 studies (3,186 participants) was 17·3% (95% CI 12·4%–22·8%, p=0·00, I^2 92·5%) (**Figure 2**). Results of subgroup analyses are summarised in **Table 1**. Pooled prevalence rates did not

differ significantly according to the scale used, study design, pregnancy status, type of migrant, region of origin (**Figure S3**) or destination region (**Figure S4**). Pregnant women constituted a highly homogenous group, as did women from Latin America (I^2 0·0%). Study quality scores were highly correlated with study design and we therefore present only the subgroup analysis results for the latter.

Anxiety

Three studies assessed the prevalence of anxiety. Pooling of results was not possible due to the different measurement tools used across these studies. Alati *et al*. (2004) studied anxiety in pregnancy in 78 Philippines-born women living in Australia. After adjustment for maternal age and years of education, the mean number of reported anxiety symptoms on the Delusions-Symptoms-States-Inventory: States of Anxiety and Depression (DSSI-SAD) scale was 2.42 in women from the Philippines compared to 1.47 in Australian-born women ($p<0.001$). Matthey *et al.* (1999) examined anxiety in Cambodian mothers in Australia in the first year post-partum. Forty-eight percent (15/31) of women reported symptoms consistent with anxiety as assessed on the Hopkins Symptoms Checklist (HSCL-25). In a third study, Gagnon *et al*. (2013) report that 37.3% of refugee women, 41.8% of asylum-seeking women and 20.9% of immigrant women living in Canada experienced symptoms of depression, somatisation or anxiety on the HSCL-25.

PTSD

Two studies used the Harvard Trauma Questionnaire (HTQ) to measure the prevalence of PTSD. Matthey *et al.* (1999) found that 16% (5/31) of their sample of Cambodian women living in Australia reported symptoms of PTSD. These five women also had significantly higher mean EPDS scores than those without symptoms of depression. Gagnon *et al*. (2013) found considerably higher rates among refugee and asylum-seeking women (33.8% and 48.2%, respectively) but similar rates (15%) among immigrant women living in Canada.

Factors associated with mental disorders

Depression

Thirteen studies assessed factors associated with mental illness. Age was identified as an associated factor in two studies: one found women aged >30 years to be at greater risk[28] while another found women aged <25 years to be at greater risk.[58] Pakistani women in Norway were significantly more likely to be depressed if they were single,[28] while three other studies found no association between co-habitation or marital status and depression.[48,58,59] A closer relationship with partners was protective against the development of postpartum depression in three studies.[28,37,67] Local language ability and a longer duration of residence in the destination country were also protective.[29,31,58] A higher number of significant adverse life events experienced or witnessed was associated with higher levels of depression, anxiety and PTSD.[28,54] One study found that adherence to traditional post-partum practices was protective against postpartum depression by, it was suggested, empowering women and enhancing family integration.[31] Primiparity,[28,58] operative delivery,[28] formula feeding of infants,[28] and poor satisfaction with the birth experience[53] were identified as obstetric risk factors associated with higher rates of depression.

A personal or family history of depression greatly and significantly increased the risk of postpartum depression in three studies[28,45,48] with odds ratios as high as 24·9[48] and 29·7[28] Women with more anxious personality traits were also more likely to develop postpartum depression.[40] Significantly, women with a history of psychiatric morbidity had lower levels of social support, highlighting the complex and likely bi-directional association between these variables.[45] Social support was defined and measured using a wide range of methods. The most common approach was an assessment of emotional, practical and informational support received from partners, family, friends and the community. Nine studies assessed social support and all found that higher levels of support were protective against the development of postpartum depression.[28,29,31,37,45,54,58,59,67] Effect sizes and trends

of effect for five studies (1153 participants)[28,31,45,48,58] which provided odds ratios are summarised in **Table 2**.

Anxiety

Only one study measured factors associated with anxiety. Matthey *et al*. (1999) found statistically significant associations between anxiety and the number of pre-migration traumatic events experienced or witnessed. History of living in a refugee camp (prior to resettlement), the number of support people available and the length of time in Australia were not associated with anxiety.

PTSD

Matthey *et al*. (1999) found statistically significant associations between PTSD and the number of traumatic events experienced or witnessed. As with anxiety, PTSD was not associated with having lived in a refugee camp, the number of support people or length of time in Australia. No other studies assessed factors associated with PTSD.

Interventions for mental disorders

Depression

Only two intervention studies were identified. Both studies were randomised controlled studies of an intervention called *Mamás y Bebés/Mothers and Babies* (MB), to treat deprssion.[68,69] Both were conducted in the USA. The intervention consists of group-based cognitive behaviour therapy and psychoeducational sessions. Participants were pregnant Latin American women in the USA who had CES-D scores ≥16 or self-reported a past history of depression. Muñoz *et al*. (2007) provided 12 weekly 2-hour sessions during pregnancy and booster sessions at one, three, six and 12 months post-partum.[69] Le *et al*. (2011) evaluated an eight-week version, providing eight weekly two-hour sessions

during pregnancy with booster sessions at six weeks, four months and 12 months post-partum.[68] In each study, control groups received usual care. In Muñoz *et al*.'s (2007) study, differences in mean CES-D scores between intervention and control groups were not statistically significant. However, the difference in cumulative incidence of depression was significantly lower in the intervention group (14%) than in the control group (25%), suggesting a small beneficial effect of the intervention. In the study by Le *et al*. (2011), women in the intervention group had significantly lower symptoms of depression than those in the control group, but the cumulative incidence of depression did not differ significantly between groups.

Discussion

Main findings

Our review reveals a number of important findings. Our results suggest perinatal depression is a major problem among migrant women, affecting as many as one in three. Major depressive disorder may affect up to one in five women. With few exceptions, studies showed that migrant women experience higher rates of depression than their non-migrant counterparts in the destination country, highlighting this group's particular vulnerability to developing mental illness. Risk factors for developing mental disorders are complex and likely to be context-specific. Previous depression and poor social support were strongly associated with higher rates of perinatal depression, consistent with findings from non-migrant populations.[8] Social isolation faced by migrant communities may be exacerbated by language and cultural barriers and can pose a significant hardship for new mothers who need support in a country that is not their own.

Our review also highlights important evidence gaps. Although we identified a large body of evidence on migrant perinatal mental health, the breadth of this evidence is limited. Only two intervention studies were identified, and not a single study was conducted in a low-income setting. Despite estimates of 59.5 million forcibly displaced persons worldwide, very few studies explicitly focused on

refugee and asylum-seeking women.[70] Finally, while depression has been studied extensively, few studies have assessed other mental disorders such as anxiety and PTSD. We found no study reporting on psychotic or bipolar disorders.

Strengths and limitations

To our knowledge, this is the first systematic review and meta-analysis of migrant perinatal mental illness. We provide the first pooled prevalence rate of perinatal depression amongst migrant women, building upon the review by Collins *et al*. (2011) which was limited to eight studies of postnatal depression in migrant women in HIC.[7] Our review includes a diverse group of women from LMIC across four continents and provides a comprehensive overview of prevalence, associated factors and interventions. Importantly, we also highlight areas in which further research is needed.

There are a number of limitations to our review. Firstly, there was high statistical heterogeneity between studies. A degree of statistical heterogeneity is inevitable in meta-analysis due to clinical and methodological differences between studies.[22] In our review, differences in study design, setting and outcome assessment are likely to have contributed to the heterogeneity. The high heterogeneity is also unsurprising given the vastly diverse populations included, all with different backgrounds, exposures and drivers for migrating. We explored possible reasons for the high heterogeneity through subgroup analyses. Our assessment of differences between economically-driven migrants and refugees and asylum-seeking women was complicated by two issues. The first is that participants in studies describing migrant women may, in fact, have been women with refugee status. For example, Shafiei *et al*. (2011) describe women from Afghanistan living in Australia as 'immigrants' when in fact they are likely to meet the definition for refugees. The second issue is that definitions vary, their use is inconsistent and even when widely-used definitions are adhered to, there is substantial overlap between categories.[71,72] The term 'forced displacement', for instance, is commonly used to describe population movement due to acute events such as conflict or natural disaster. However, economic migrants arguably have also been 'forced' to relocate as a result of long-term or extreme poverty and

unemployment. In LMIC in particular, drivers of migration overlap: poverty and lack of employment opportunities may, for example, be the result of local conflict or environmental factors such as drought, flooding or more extreme natural disasters. Subgroup analyses only partially decreased heterogeneity and did not significantly affect pooled prevalence estimates of depression.

A second limitation to our review is that screening tools rather than diagnostic interviews were commonly used to assess mental health status. More diverse methods of data collection including the use of culturally-sensitive instruments and qualitative approaches may have resulted in a more accurate picture of participants' mental health status. Eliciting somatic symptoms, which have been correlated with depression in pregnant and post-partum women and are common in LMIC settings, could also improve detection of mental disorders.[73] Thirdly, observational studies are by design more prone than randomised studies to bias (such as participant selection bias) and confounding, either because confounders have not been assessed or because residual confounding remains.[74,75]

Interpretation

Our pooled estimate of depression suggests that migrant women from LMIC experience higher rates of depression than non-migrant women in both HIC and LMIC. Results from individual studies suggest that rates of anxiety and PTSD are also high, though the scarcity of data precluded pooling of results for these conditions. Past traumas, the process of migration in itself and on-going stressors in the destination country are likely contributors, though the relative importance of various determinants and the mechanisms by which they act is not fully understood. These associated factors are not unique to migrant women, but the intensity or frequency with which they are experienced by this group may place these women at greater risk than others.

Social support is a well-known protective factor for mental disorders, and our finding that it is important among migrant women is not surprising. However, it emphasises the need to ensure that these women are sufficiently helped and encouraged to develop wide personal and community

networks. Health and allied professionals across all tiers of care should be aware of the challenges faced by migrant women, encourage the involvement of extended family if possible. Isolation and the lack of family or peer support should be considered a 'red flag', prompting the involvement of child and social care services. Policies such as free childcare provision for vulnerable communities, the availability of interpretation services, peer support groups can help to support new mothers and enable early identification of those in need of further care. Routine screening of pregnant women for depression and anxiety has been recommended.[76] Provided adequate support structures are in place, this screening recommendation is particularly pertinent to migrant women given their high risk profiles and their continued stresses in destination countries.

The scarcity of high-quality evidence on interventions to prevent or treat perinatal mental disorders among migrant women is notable. Studies from non-migrant settings have shown that evidence-based psychological and psychosocial interventions can significantly improve maternal as well as child physical and mental health.[8,18,77] In LMIC settings, trained non-specialists (e.g. community health workers or local women) can effectively deliver these interventions.[78,79] Given the high prevalence rates of perinatal depression described in this review, the identification of effective and culturally-appropriate interventions to prevent and treat mental disorders in migrant populations is an urgent research priority.

Other evidence gaps highlighted by our review are also significant. The dearth of studies from low-income regions is striking given that over three quarters of migration flows occur in LMIC.[2] It also confirms previous findings that migrant and mental health research from LMIC is hugely under-represented.[1,2,80,81] The experiences and circumstances of women from LMIC who relocate within low-income regions is likely to differ greatly from those who relocate to HIC in terms of pre-existing health status, co-existing adversities and availability of mental health services.[2,15] Identifying the specific needs of women in low-income regions is therefore of considerable importance.

The post-partum period carries an elevated risk of psychosis – with rare but potentially devastating effects for mothers and babies – for specific sub-groups. The complete lack of studies on prevalence, risk factors or interventions for perinatal psychosis in migrant populations illustrates the urgent need to conduct more research in this area. In acute refugee settings, exposure to severe trauma, exploitation, trafficking and sexual violence is common.[3] With population displacement in the Middle East currently at unprecedented levels, the association of refugee and asylum seeking women's experiences with mental health is a topical and priority issue for research and policy-making.[3]

Conclusion

A better understanding of migrant mental health is a priority given the rising numbers of women on the move, the vulnerabilities women face during the perinatal period and the serious and long-term negative consequences of perinatal mental disorders on women and their children. Pregnancy represents a period of increased contact between women and health services, providing a valuable opportunity to identify and support at-risk women. It should be the responsibility of all health and allied professionals to ensure migrant women with mental disorders are identified and appropriately supported across the individual, family, community and societal spectrum. Future research should seek to redress the evidence gaps by focusing on women relocating within LMIC, refugee and asylum-seeking women, severe mental disorders such as psychosis and interventions to prevent and treat mental disorders. Our comprehensive summary of the current evidence highlights how important and prevalent depression is and reveals how little is known on the range of other mental health disorders. Given the ever-increasing global migration trends, the mental health needs of migrants must be raised high on the research agenda and the development of policy and health services must be prioritised.

Acknowledgments

We thank Nia Roberts for her help developing the search strategy and the authors of individual studies who provided additional data which allowed us to include their results in our review.

Disclosure of Interests

All authors declare no conflicts of interest.

Contributors

GF, MF and EP conceived of the study and developed the search strategy. GF and EP co-ordinated the review activities including carrying out searches, study selection, data extraction and quality assessment. GF planned and ran the meta-analyses. GF, EP and MF wrote up the report. All authors reviewed the study findings and read and approved the final version before submission.

Details of Ethics Approval

No ethical approval was required for this systematic review and meta-analysis.

Funding

MF is funded by an NIHR post-doctoral fellowship. No funding was received for this systematic review and meta-analysis.

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Figure 1. Forest plot of prevalence estimates of any depressive disorder

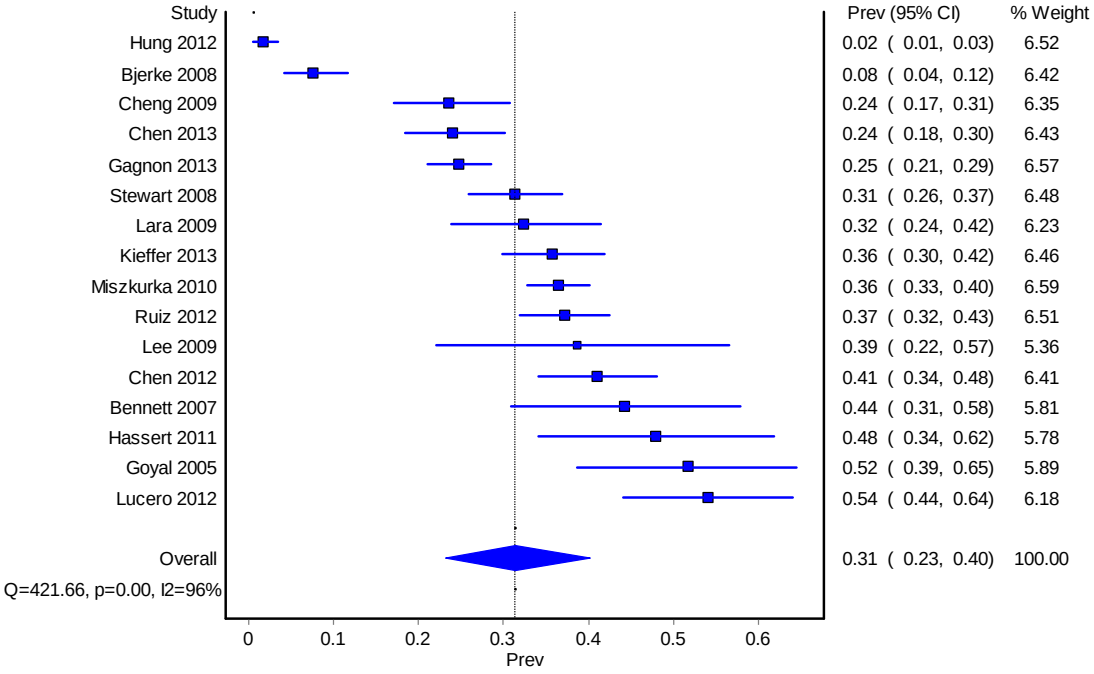

Figure 2. Forest plot of prevalence estimates of major depressive disorder

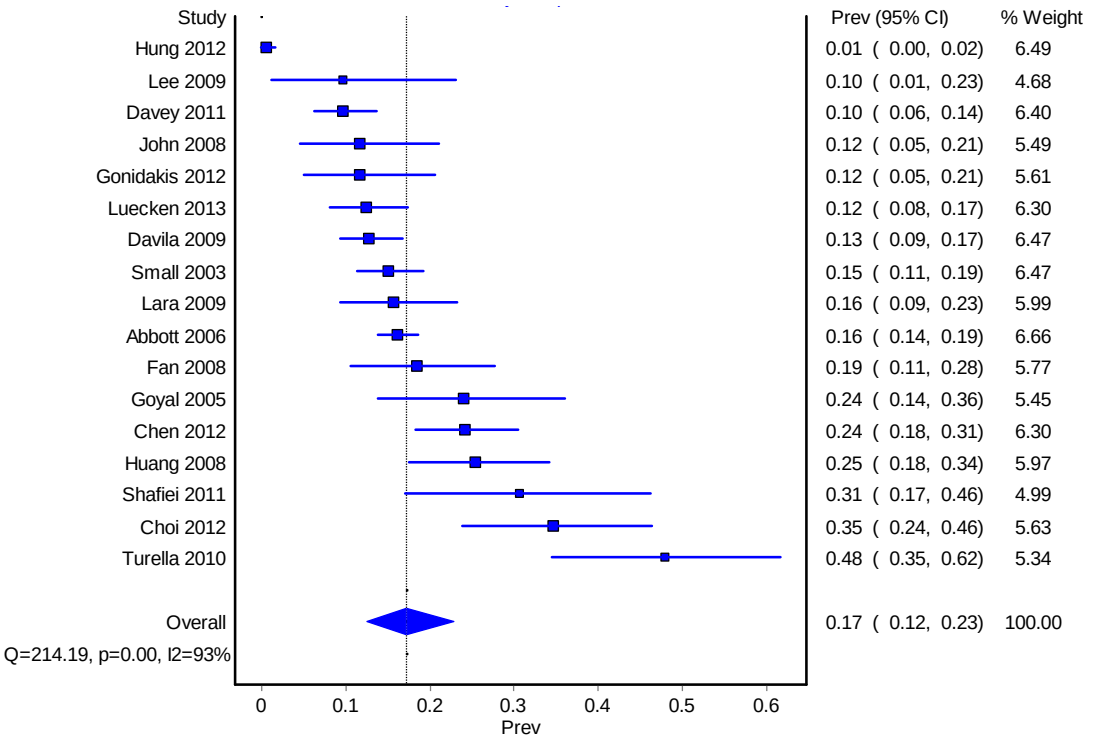

Table 1. Pooled prevalence of perinatal depressive disorders stratified by study and participant characteristics

	Major Depressive Disorder			Any depressive disorder		
	No. of studies	Prevalence (95% CI)	I^2	No. of studies	Prevalence (95% CI)	I^2
Scale						
CES-D	2	13.6% (10.6-17.1%)	0%	6	34.5% (30.4%-38.9%)	61%
EPDS	12	19.9% (15.6%-24.7%)	84%	6	27.8% (18.0%-38.3%)	94%
PDSS	2	18.0% (5.0%-33.0%)	63%	3	50.6% (42.9%-58.3%)	10%
BDI-II	1	0.6% (0.0%-1.8%)	N/A	1	1.8% (0.00%-3.5%)	N/A
Study design						
Cross-sectional	14	19.0% (12.0%-27.0%)	94%	12	31.4% (20.2%-43.5%)	97%
Cohort	3	13.0% (9.0%-17.0%)	74%	4	30.6% (23.2%-40.2%)	83%
Pregnancy status						
Pregnant	4	13.1% (10.8%-15.9%)	0%	4	36.1% (33.7%-38.8%)	0%
Post-partum	13	18.8% (12.1%-26.3%)	94%	12	30.1% (19.2%-42.0%)	97%
Type of migrant						
Economic migrant	17	17.3 (12.4-22.8)	93%	14	32.0% (22.0%-42.8%)	97%
Refugee/asylum-seeker	0	N/A	N/A	2	27.6% (21.4%-34.3%)	74%
Region of origin						
South or Southeast Asia	13	18.8% (12.1%-26.3%)	94%	11	27.2% (17.2%-38.2%)	97%
Latin America	4	13.1% (10.8%-15.9%)	0%	5	40.4% (33.7%-47.4%)	71%
Destination region						
North America	10	16.3% (11.8%-21/5%)	78%	11	36.9% (31.4%-42.6%)	84%
Europe	0	N/A	N/A	2	20.3% (0.0%-55.7%)	99%
Asia	4	17.9% (0.0%-42.7%)	98%	3	18.6% (0.0%-50.4%)	99%
Australasia	3	17.2% (13.0%-21.9%)	62%	0	N/A	N/A

Table 2. Effect sizes of factors associated with perinatal depression

Variable	N	Odds ratios (95% CI) for depression	Effect size†	Trend of effect
Age (older)	623	Bjerke 2008: 4.6 (1.4-15.0)* Lara 2009: 4.47 (0.26-75.78) Small 2003: 0.69 (0.15-2.76)	+ + + + –	No consistent effect
Relationship status (single)	623	Bjerke 2008: 22.5 (3.4-147.8)* Lara 2009: 1.73 (0.26-11.31) Small 2003: 0.68 (0.10-3.28)	+ + + + –	No consistent effect
Education (higher levels)	963	Bjerke 2008: 1.28 (0.42-3.90) Hung 2012: 0.90 (p=0.75) Lara 2009: 5.37 (1.27-22.60)* Small 2003: 0.50 (0.22-1.02)	+ – + + + –	No consistent effect
Physical illness (yes)	515	Bjerke 2008: 0.3 (0.0-2.2) Small 2003: 3.71 (1.63-8.48)*	– – + +	No consistent effect
Parity (primiparous)	963	Bjerke 2008: 3.0 (0.6-13.6) Hung 2012: 1.13 (p=0.69) Lara 2009: 0.311 (0.05-1.85) Small 2003: 2.35 (1.22-4.76)*	+ + + – – +	No consistent effect
Mode of delivery (operative)	855	Bjerke 2008: 3.1 (0.9-11.0) Hung 2012: 0.79 (p=0.46) Small 2003: 1.50 (0.74-3.11)	+ + – +	No consistent effect
Infant feeding (breastfeeding)	855	Bjerke 2008: 0.2 (0.4-12.0) Hung 2012: 1.56 (p=0.19) Small 2003: 1.05 (0.33-3.57)	– – – + +	No consistent effect
Prior depression (yes)	305	Bjerke 2008: 29.7 (7.1-124.1)* Lara 2009: 3.84 (0.40-36.69)	+ + + + +	Prior depression positively associated with perinatal depression
Social support (higher levels)	705	Bjerke 2008: 0.3 (0.6-1.6) Chien 2012: 0.96 (0.93-0.998)* Small 2003: 0.34 (0.16-0.73)*	– – – – –	Social support negatively associated with perinatal depression

*statistically significant at $p<0.05$ level

†Cohen's *d* values of effect size: + (small positive); ++ (medium positive); +++ (large positive); – (small negative); – – (medium negative); – – – (large negative)