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## SYSTEMATIC REVIEW

### A Systematic Review and Meta-analysis of Depression in Postpartum Women in a Low-income Country; Ethiopia, 2020

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#### Abstract:

#### Background:

Maternal mental health in the postpartum period is essential for the optimal development of the newborn. Despite this, a shortage of concrete evidence exists regarding it.

#### Methods:

PubMed, Scopus, and EMBASE were investigated with no time limitation. A manual search for a reference list of articles was also done. Relevant data were extracted using the Meta XL package and analysis was done using Stata-11 meta-prop package. Heterogeneity was checked with Cochran's Q-statistics and the Higgs I 2 test.

#### Results:

Sixteen studies were included. The average prevalence of postpartum depression was 21.9%. The pooled prevalence was found to be higher in studies assessed with SRQ-20, *i.e.* 24.6% than studies assessed using PHQ-9, which was 18.9%. Moreover, the pooled prevalence was slightly higher in southern Ethiopia (22.6%) than Addis Ababa (21.2%). Poor marital relation (pooled aOR= 3.56) (95% CI: 2.50, 4.63), unplanned pregnancy (pooled aOR=3.48) (95% CI: 2.18, 4.79), previous history of depression (pooled aOR= 4.33) (95% CI: 2.26, 6.59), poor social support (pooled aOR= 4.5) (95% CI: 3.34, 5.56), and domestic violence were among the associated factors for postpartum depression.

#### Conclusion:

More than one in five women were found to have postpartum depression and factors such as poor marital relations, history of depression, poor social support, domestic violence, and unplanned pregnancy were observed to be associated with it. Therefore, maternal postnatal care services should integrate this essential health concern.

**Keywords:** Postpartum depression, A low-income country, Ethiopia, Poor social support, Heterogeneity, Risk groups.

#### Article History

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## 1. BACKGROUND

Women with depression in the postpartum period show manifestations like sleep disturbance, change in appetite patterns, feeling of sadness, recurrent guilty feeling, crying, low energy, and unease feelings of anxiety and suicidal ideas [1]. Nowadays, postpartum depression plays a major role in the burden of disease among women of 15 to 49 years of age [2]. Globally, 10-20% of postnatal women develop depression at one point in time [3]. A survey by the World Health

Organization (WHO) identified that 20-40% of childbearing women in the developing world sustained depression in the antepartum and postpartum period at a given time [4]. Besides, 19% of postnatal women in low and middle-income countries [5, 6] and one among twenty postnatal women in Ethiopia [7] develop postpartum depression.

Different studies across the world have reported different prevalence rates for postpartum depression.

A systematic review and meta-analysis study in 2018 by S Shorey *et al.* [8] reported the worldwide estimated prevalence of postpartum depression to be 17%. Besides, a study that assessed 34 studies reported that 19.8% of postpartum women have a common mental disorder [9]. Furthermore, another

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study that incorporated 38412 women and 23 studies in low and middle-income countries [6] reported 19.2% of women as having postpartum depression. Another systematic review and meta-analysis study in India which assessed 38 studies reported a pooled prevalence of postpartum depression to be 22% [10]. Moreover, other individual studies reported earlier showed that the prevalence of postpartum depression was 17.6% in Portugal [11], 27.3% in China [12], 61.4% in Korea [13], 18.6% in Qatar [14], 34.8% in Iraq [15], 34% in Jamaica [16], 15.4% in Turkey [17], 13.5% and 10.3% in Oman [18], 31.7% in South Africa [19], and 43% in Uganda [20]. In Ethiopia, the prevalence of postpartum depression varies between 12.2% to 33.8% [21 - 36].

Poor social support [37], poverty [38], and childbirth without the presence of relatives [39], history of depression [40], and poor woman autonomy [41] due to socio-demographic variables, multi-parity [42], prime-parity [43, 44], multiple children at home [45], negative attitude toward one's pregnancy [22, 46 - 49], depression during pregnancy [42, 50], premarital pregnancy [51, 52], miscarriage [53], and prenatal high anxiety [47] due to pregnancy and newborn related factors, alcohol use in the husband [54], intimate partner violence [22, 55, 56], poor education of the husband [45], husbands' unemployment [46, 57], and psychiatric problems in the husband [58] were among the associated factors for the development of postpartum depression. In the context of Ethiopia too, poor marital relation [27, 29, 32, 34, 35, 59], unplanned pregnancy [21, 22, 24, 27, 29, 32, 34], previous history of depression [21, 27, 28, 34], domestic violence [21, 22, 27, 34], poor social support [21, 32-35], and family history of mental illness [24, 28, 31] were among the documented factors responsible for the development of Postpartum Depression (PPD).

Postpartum depression in women has a great impact on the health of both the mother and her baby. Early discontinuation of breastfeeding [60], negative emotion and poor health care utilization [61], cognitive impairment, and behavioral defects [62], poor mother-infant bonding resulting in rejection of the infant [63], and suicidal behaviors [64] are common complications leading to postpartum depression. Furthermore, a community-based cross-sectional study in Ethiopia [23] revealed that maternal postnatal depression strongly affects a child's nutritional status leading to stunting and underweight as well as inappropriate complementary feeding practices of infants.

Even though maternal mental health problems in the postpartum period are much more prominent in poorly developed nations including Ethiopia, there still exists a gap in the pooled magnitude of postpartum depression and the associated factors. The objective of the present meta-analysis was, therefore [1] to determine the pooled estimated prevalence of postpartum depression among women in the postnatal period in Ethiopia and [2]: to determine the pooled odds ratio of the associated factors for postpartum depression in Ethiopia.

## 2. MATERIALS AND METHODS

### 2.1. Search Strategy

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [65], we performed both an electronic and manual search of eligible

articles. Our search of electronic libraries in Scopus, PubMed, and EMBASE and manual exploration of the reference list of articles was the backbone of the current meta-analysis. For searching articles on postpartum depression among women in the postnatal period using the PubMed database, we used the following search terms: (Prevalence OR Epidemiology OR magnitude AND depression OR PPD OR "depressive disorder" AND mothers OR females OR women AND postpartum period AND factor OR "risk factor" OR determinant AND Ethiopia). Besides, the search for literature in EMBASE and Scopus was done according to database-specific searching guidelines. Furthermore, the reference list of included studies was made and there was no specification for studies based on the study period.

### 2.2. Eligibility Criteria

Data refining was done according to the inclusion and exclusion criteria. Articles were eligible for inclusion if [1] they assessed the outcome of interest among women in the postpartum period, [2] their primary outcome of interest was the prevalence of postpartum depression and its associated factors, [3] the design of the study was community and institution-based cross-sectional, case-control and cohort study design, [3] and [4] the study has been piloted in Ethiopia. Previously studied reviews, studies on women with an already known psychiatric problem, studies on animals, editorials, and studies reporting depression solely during pregnancy were excluded. MN and YG screened the topics and abstracts of searched articles stored in an endnote reference manager depending on the primary and pre-specified eligibility criteria independently. After that, the next stage was a detailed exploration of the screened articles in the first step by the two review authors stated above. Any disagreement between the two authors regarding the eligibility of articles was settled through discussion in line with available logical evidence.

### 2.3. Methods for Data Extraction and Quality Assessment

The two authors (MN and MA) extracted the relevant data from the articles included in the final analysis autonomously using a standardized data extracted template. The included studies were extracted and summarized in the form of a table. Information that was extracted and has been summarized in the table includes the author's name, publication year, study setting, study population, sample size, study design, and the assessment instrument for postpartum depression. Data from incorporated studies was extracted based on a template structured as suggested by PRISMA guidelines [65].

The modified Newcastle-Ottawa Scale (NOS) [66] was employed for the evaluation of the quality of studies. The domains of the NOS scale for assessing the quality of studies include comparability between participants, representativeness of sample and sample size, statistical quality as well as ascertainment of cases.

### 2.4. Data Synthesis and Analysis

In this study, we employed a random-effect model to evaluate the aggregate prevalence of postpartum depression and the associated factors for postpartum depression with their

95% CIs [67]. Meta-XL version 5.3 [68] was employed to extract relevant data from included studies and the STATA11 Meta-prop package [69] was implemented to estimate the pooled prevalence of postpartum depression and pooled odds ratio of the associated factors for Postpartum depression. Cochran *Q*-statistics and Higgs *I*<sup>2</sup> statistics [70] were also used to diagnose heterogeneity. The *I*<sup>2</sup> statistical values of zero, 25, 50, and 75% connote absence, little, moderate, and great heterogeneity, respectively [70]. Furthermore, subgroup analysis and sensitivity analysis tests were also done to explore the source of heterogeneity between the included studies. A funnel plot test [71] and egggers publication bias test were used to detect publication bias.

### 3. RESULTS

#### 3.1. Identification of Studies

Our search with the pre-specified search strategies resulted in an overall of 845 articles. Besides, 5 articles were obtained from the reference list of included articles making the total number of retrieved articles to be 850. Of this, we removed 24 duplicated studies before further screening. In the next stage, we excluded 789 of the articles simply by observing their titles. Therefore the leftover 37 articles had been completely inspected for eligibility to be included in the current systematic

review and meta-analysis study; nevertheless, only 16 articles were tailored in the final meta-analysis since the rest 21 articles were also excluded due to various methodological and technical flaws (Fig. 1).

#### 3.2. Characteristics of Included Studies

In this meta-analysis, a total of sixteen studies that assessed the prevalence of postpartum depression [21 - 36] and fourteen studies that assessed the associated factors [21, 22, 24, 26 - 35, 59] had been analyzed. A total of 11400 postpartum women had participated in this analysis. Region-wise, six [26, 28, 29, 34, 36, 59], six [22 - 25, 32, 35], three [21, 31, 33], one [27] and one [30] of the studies were from the southern part of Ethiopia, Amhara region, Oromia region, Addis Ababa and Tigray, respectively. Of included studies, three [26, 34, 36], ten [21 - 24, 27, 29 - 32, 35], and another three [25, 28, 33] utilized PHQ-9, EPDS, and SRQ-20 to assess depression in the postnatal women. Besides regarding the design of the study, eight [21, 23, 25, 28, 32 - 34, 36], seven [22, 24, 27, 29 - 31, 35] and one [26] were community-based cross-sectional, institution-based cross-sectional and cohort studies in their respective order. Besides, six of the studies [23, 25, 27, 28, 30, 34] employed a multi-stage sampling method during data collection. All of the studies have reported a response rate for the study (Table 1) [21 - 36].

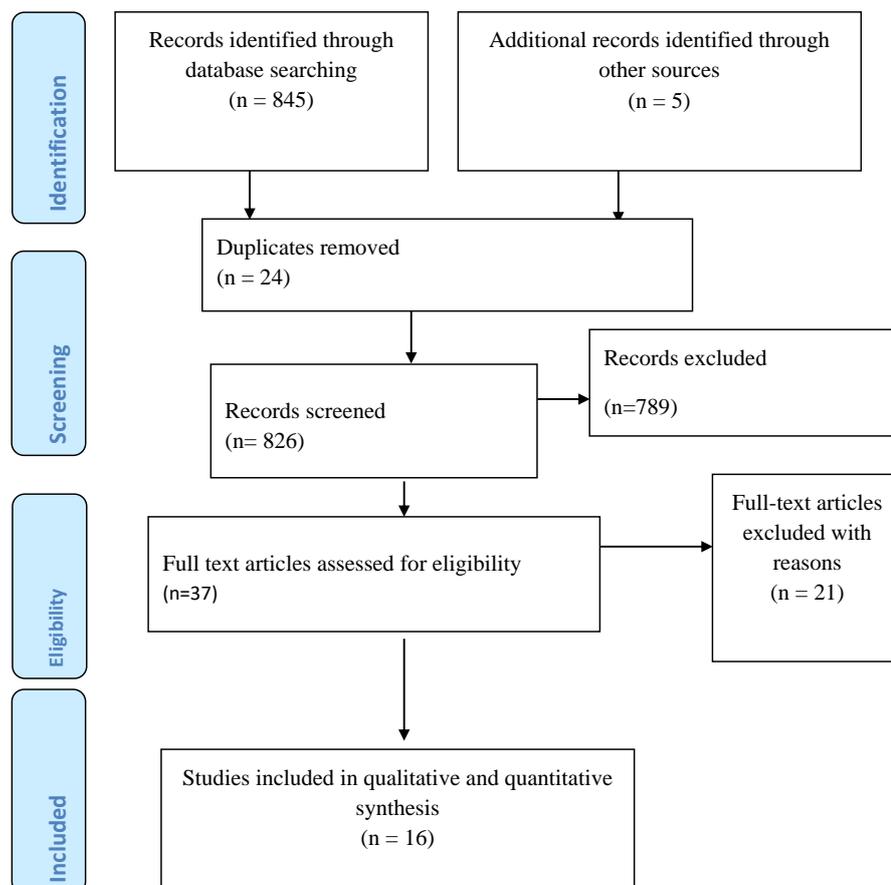


Fig. (1). PRISMA flow chart for the review search process.



(Table 2) contd....

No	Study ID	Representation	Sampling	Random Selection	Non-response Bias	Data Collection	Case Definition	Reliability and Validity	Method of Data Collection	Prevalence Period	Numerator and Denominator	Summary
3	Abadiga,muktar 2019 [3]	0	1	1	1	1	1	1	1	1	1	9
4	Abebe <i>et al.</i> 2019 [4]	1	1	1	1	1	1	1	1	1	1	8
5	MM Asaye et al 2020 [5]	1	1	1	1	1	1	1	1	1	1	10
6	Kerie <i>et al.</i> 2018 [6]	1	1	1	1	1	1	1	1	1	1	10
7	Bitew <i>et al.</i> 2019 [7]	1	1	1	1	1	1	1	1	1	1	10
8	Azale <i>et al.</i> 2018 [8]	1	1	1	1	1	1	1	1	1	1	10
9	Anato et al .2019 [9]	0	1	1	1	1	1	1	1	1	1	9
10	Shewangizaw <i>et al.</i> 2018 [10]	0	1	1	1	1	1	0	1	1	0	7
11	Mariam <i>et al.</i> 2016 [11]	0	1	1	1	1	1	1	1	1	1	9
12	Shitu <i>et al.</i> 2019 [12]	0	1	1	0	1	1	1	1	1	1	8
13	W Dargie <i>et al.</i> 2020 [13]	0	1	1	1	1	1	1	1	1	1	9
14	Teferra benti <i>et al.</i> 2015[14]	0	1	1	1	1	1	1	1	1	1	9
15	G gebremichael <i>et al.</i> 2018 [15]	1	1	1	1	1	1	1	1	1	1	10
16	JN baumgartner <i>et al.</i> 2014 [16]	1	1	1	1	1	1	1	1	1	1	10

**3.4. The Pooled Prevalence of Postpartum Depression in this Study**

Sixteen studies [21 - 36] were incorporated to yield the pooled estimated effect size of postpartum depression. The reported magnitude of postpartum depression among the included studies ranged from 12.2%(36) to 33.8% (29). The average estimated prevalence of postpartum depression using the random effect model was 21.9% (95% CI: 18.98, 24.77). This average prevalence of postpartum depression was found to differ(I<sup>2</sup> = 98%, p-value =0.000) from the included studies (Fig. 2).

**3.5. Subgroup Analysis of the Prevalence of Postpartum Depression by the Tools used to Measure Postpartum Depression.**

Since the average prevalence of postpartum depression was significantly influenced by the difference between the included studies, it was mandatory to conduct a subgroup analysis. Therefore, we used the measurement tools for postpartum depression to perform subgroup analysis. The subgroup analysis by assessment instrument yields that measurement with SRQ-20 provided significantly higher result, 24.6%% (95% CI: 18.42, 30.84) with (I<sup>2</sup> =98%, p < 0.001) than the result with PHQ-9 which was 18.9% (95% CI: 11.52, 26.28) (I<sup>2</sup> =99%, p < 0.001) (Fig. 3).

**3.6. Sub-group Analysis of the Prevalence of Postpartum Depression taking into Account the Setting of the Study.**

Although a subgroup analysis was done based on the setting where the study was done, there was no significant difference in the pooled prevalence of postpartum depression between community-based studies (22%) and institution-based studies (21.7%).

**3.7. Sub-group Analysis of the Prevalence of Postpartum Depression with Regard to the Regional Location of the Study.**

The pooled prevalence of post-partum depression was slightly higher in studies from the southern part of Ethiopia (22.6%) than the central region (Addis Ababa) (21.2%) and this difference was also significant statistically (p =0.001).

**3.8. Sensitivity Analysis**

We performed a leave one out sensitivity analysis to detect the source of heterogeneity. However, our result showed that the average prevalence of postpartum depression when each study was left out from the analysis ranged from 21.08% (18.47, 23.68) to 22.52% (20.34, 24.69). Therefore, the result was not outweighed by the influence of a single study (Table 3).

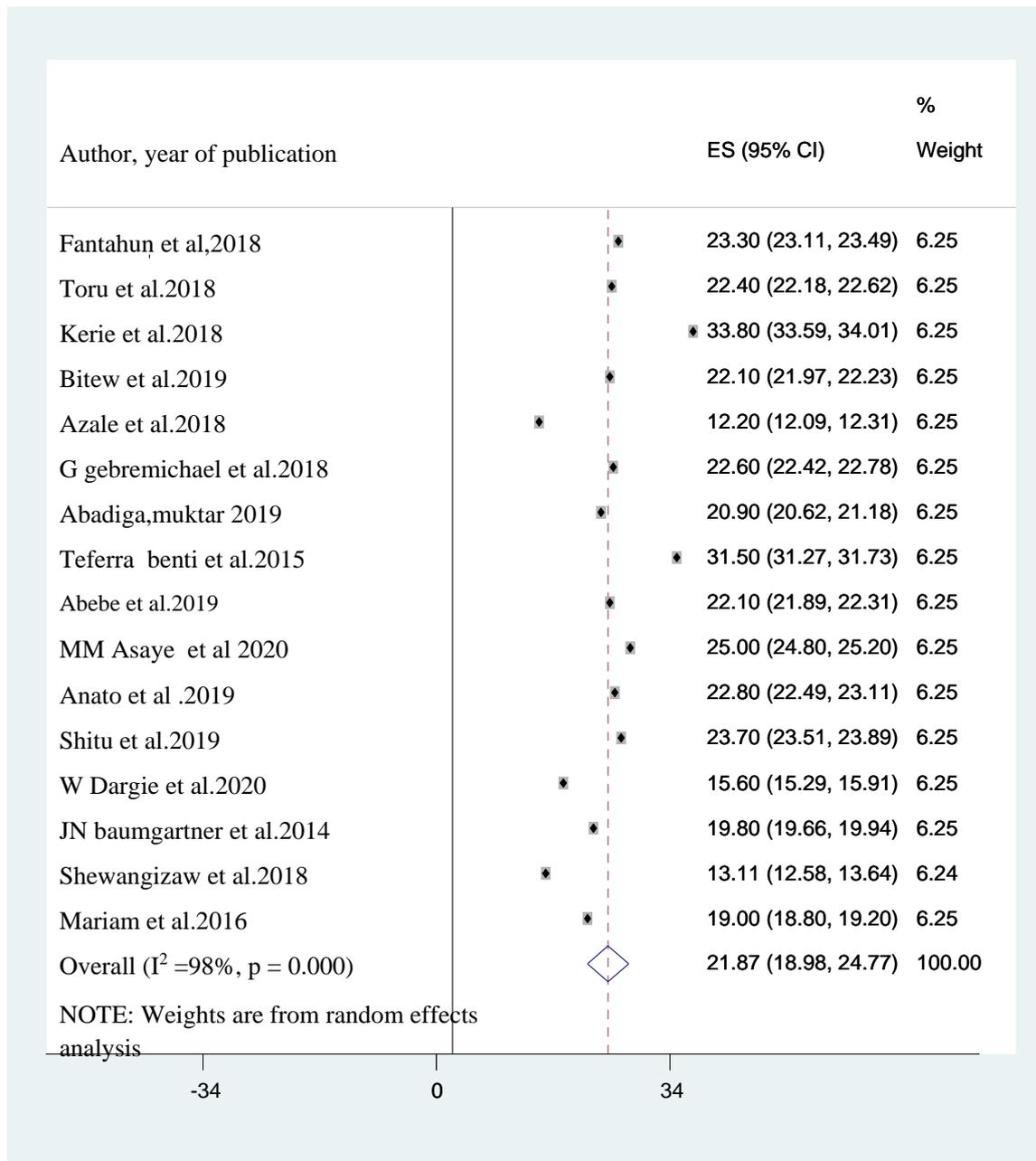


Fig. (2). A forest plot for the prevalence of postpartum depression in Ethiopia.

Table 3. A sensitivity analysis of the prevalence of postpartum depression in women at postnatal period when each indicated studies are removed at a time with its 95% confidence interval.

No	Study Excluded	Prevalence of Postpartum Depression	95% Confidence Interval
1	Fantahun et al.,2018	21.77	18.69, 24.86
2	Toru et al.2018	21.83	18.77, 24.90
3	Kerie et al. 2018	21.08	18.47, 23.68
4	Bitew et al.2019	21.85	18.66, 25.05
5	Azale et al.2018	22.52	20.34, 24.69
6	G gebremichael et al.2018	21.82	18.72, 24.93

(Table 3) contd....

No	Study Excluded	Prevalence of Postpartum Depression	95% Confidence Interval
7	Abadiga,muktar 2019	21.93	18.97,24.90
8	Teferra benti et al.2015	21.23	18.41, 24.05
9	Abebe et al.2019	21.85	18.78, 24.93
10	MM Asaye et al 2020	21.66	18.62, 24.70
11	Anato et al .2019	21.81	18.78,24.84
12	Shitu et al.2019	21.75	18.67, 24.82
13	W Dargie et al.2020	22.29	19.29,25.29
14	JN baumgartner et al.2014	21.87	18.98, 24.77
15	Shewangizaw et al.2018	22.45	19.47, 25.43
16	Mariam et al.2016	21.87	18.98, 24.77

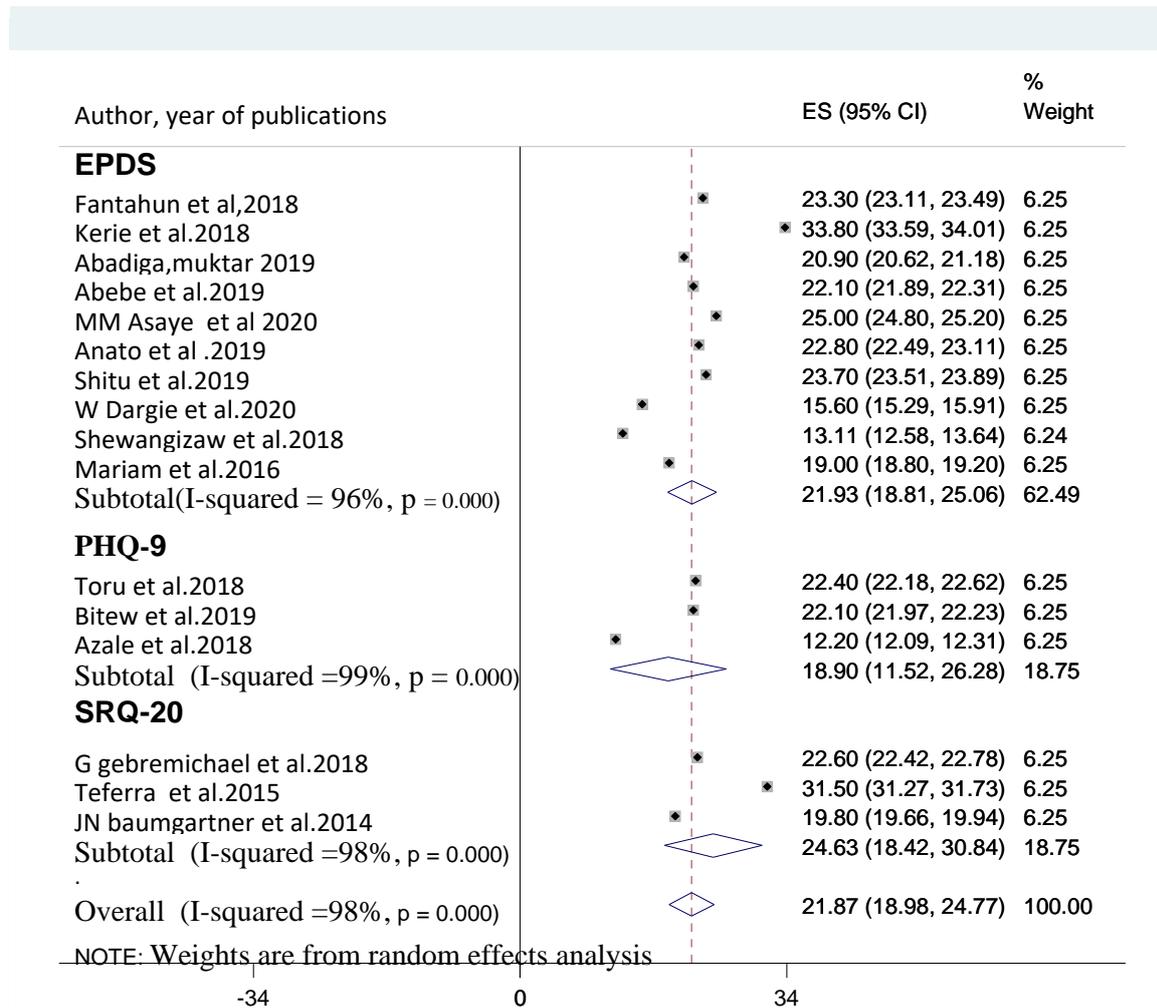
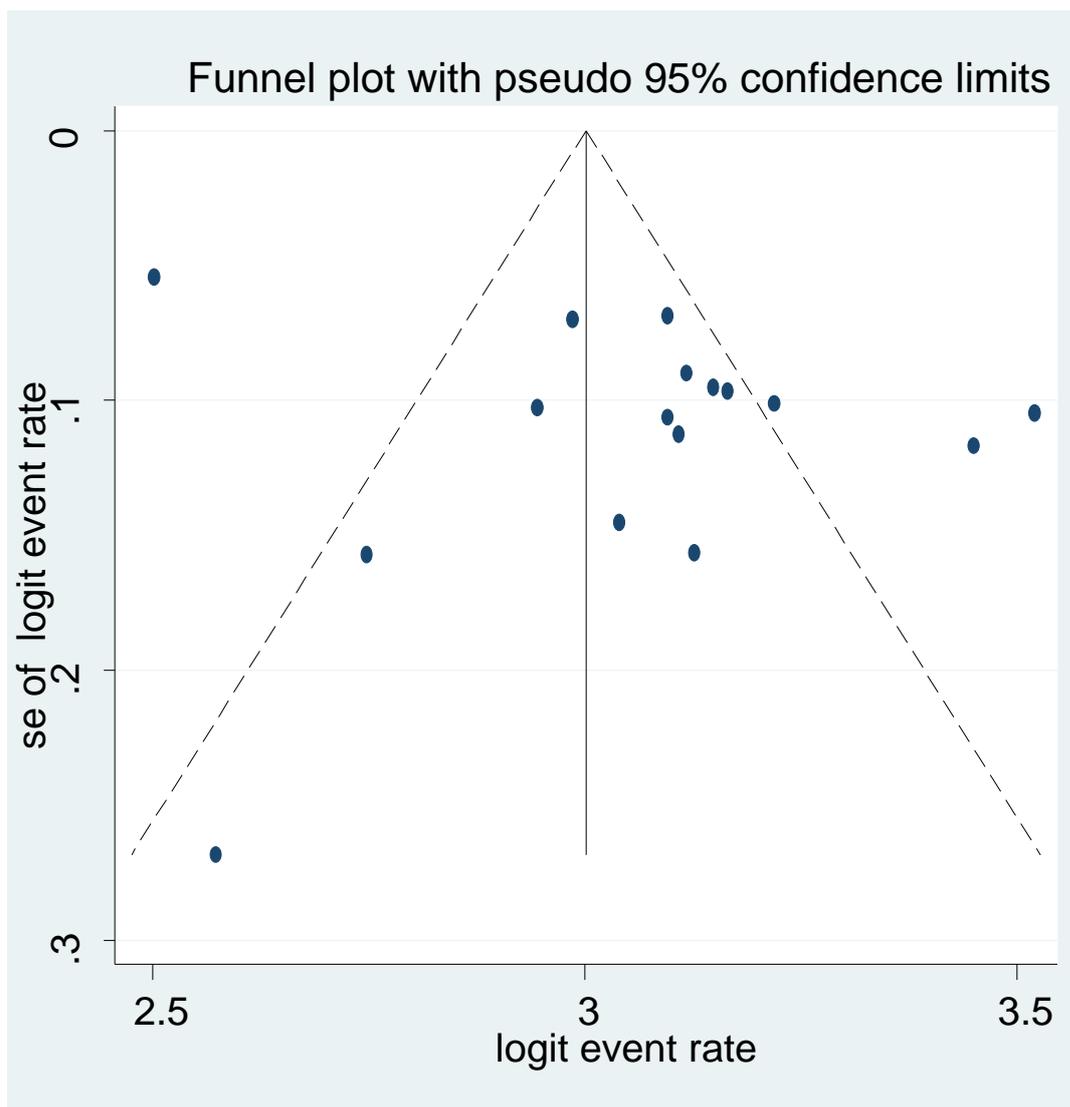


Fig. (3). A forest plot for the sub-group analysis of the prevalence of postpartum depression by measurement tool used.

### 3.9. Publication Bias

A scatter plot of the logit event rate of postpartum depression on the X-axis and its standard error on the Y-axis was done, which showed that there was a publication bias since

the graph was slightly asymmetrical (Fig. 4). However, the eggers publication bias test revealed that there was no significant publication bias (B=71.2, SE = 44 and P-value = 0.13).



**Fig. (4).** A funnel plot for the pooled adjusted odds ratio of poor marital relationship.

### 3.10. Associated Factors for Postpartum Depression in Ethiopian Women

As stated previously, fourteen studies [21, 22, 24, 26 - 35, 59] had reported one or more factors related to the development of depression in postnatal women. Our narrative synthesis revealed that poor marital relation [27, 29, 32, 34, 35, 59], unplanned pregnancy [21, 22, 24, 27, 29, 32, 34], previous history of depression [21, 27, 28, 34], domestic violence [21, 22, 27, 34], poor social support [21, 32 - 35], family history of mental illness [34, 28, 31], use of substance [21, 27, 34] and low income [27, 28, 59] were among the most commonly reported factors contributing to development of postpartum depression in postnatal women (Table 4).

The pooled odds ratio of the poor marital relationship among the above-mentioned studies was 3.56 (95% CI: 2.50, 4.63) (Fig. 5). This implied that women with poor marital relationships were 3.56 times at higher risk of developing PPD than women with good marital relationships. Also, the pooled

odds ratio for unplanned pregnancy for the nine studies reported above was found to be 3.48 (95% CI: 2.18, 4.79) (Fig. 6). This showed that women who gave birth from an unplanned pregnancy were 3.5 times more likely to be depressed than women with a planned pregnancy. The previous history of depression was also an associated factor for the development of PPD with a pooled estimate odds ratio of 4.33 (95% CI: 2.26, 6.59); [21, 27, 28, 34]. Besides, domestic violence and poor social support were also found to have a significant association with the development of PPD with the estimated pooled odds ratio of 3.77 (95% CI: 2.62, 4.92) [21, 22, 27, 34], 4.5 (95% CI: 3.34, 5.56) [21, 32-35], respectively.

Furthermore, the pooled odds ratio of family history of mental illness [24, 28, 31], use of substance [21, 27, 34] and low income [27, 28, 59], stressful life event [22, 59] and perinatal complications [28, 59] was 4 (95% CI: 1.56, 6.56), 4.67 (95% CI: 4.00, 5.34), 2.87 (95% CI: 1.59, 4.14), 3.5 (95% CI: 1.39, 5.87) and 3.8 (95% CI: 1.45, 6.15), respectively (Table 5).

**Table 4. Characteristics of associated factors for postpartum depression in Ethiopia by their Odds ratio, Confidence interval, association strength, author and year of publication.**

Associated Factors	Odds Ratio (AOR)	95% CI	Strength of Association	Author, Year of Publication
Being unmarried	2.5	1.20, 4.90	Strong and positive	Fantahun et al,2016
Income difficulty	2.3	1.30, 4.00	Strong and positive	Fantahun et al,2016
Death of a child	3.2	1.30, 8.00	Strong and positive	Fantahun et al,2016
Unplanned pregnancy	2.9	1.60, 5.00	Strong and positive	Fantahun et al,2016
Substance use	4.9	1.10, 21.30	Strong and positive	Fantahun et al,2016
Previous depression	4.2	2.30, 7.80	Strong and positive	Fantahun et al,2016
Domestic violence	3.1	1.60, 5.90	Strong and positive	Fantahun et al,2016
18 up to 23 years age	3.9	1.53, 9.90	Strong and negative	Toru et al.2018
Unplanned pregnancy	3.4	1.71, 6.58	Strong and negative	Toru et al.2018
Sleeping problem of child	3.7	1.79, 7.72	Strong and negative	Toru et al.2018
Domestic violence	2.9	1.72, 8.79	Strong and negative	Toru et al.2018
Unsatisfied marital relation	2.7	1.32, 5.62	Strong and negative	Toru et al.2018
Poor social support	4.3	1.79, 10.60	Strong and negative	Toru et al.2018
History of depression	7.4	3.12, 17.35	Strong and negative	Toru et al.2018
Substance use	5.2	2.52, 10.60	Strong and negative	Toru et al.2018
Unplanned pregnancy	7.8	3.19, 19.26	Strong and negative	abadiga, 2019
Primi-parity	4.99	1.54,16.09	Strong and negative	abadiga, 2019
History of depression	3	1.06, 8.82	Strong and negative	abadiga, 2019
Domestic violence	5.9	2.44, 14.40	Strong and negative	abadiga, 2019
Substance use	3.9	1.52,10.30	Strong and negative	abadiga, 2019
Poor social support	6.6	2.25, 19.29	Strong and negative	abadiga, 2019
Stressful life event	4.5	2.64, 7.54	Strong and negative	Abebe et al.2019
Domestic decision making	4.3	2.54, 7.14	Strong and negative	Abebe et al.2019
Unplanned pregnancy	1.9	1.02, 3.41	Strong and negative	Abebe et al.2019
Partner violence	3.2	1.76, 5.67	Strong and negative	Abebe et al.2019
Associated factors	Odds ratio(AOR)	95% confidence interval	Strength of association	Author, year of publication
Hospitalization of the baby	2.2	1.17, 4.31	Strong and positive	Abebe et al.2019
Abortion history	1.8	1.07,2.96	Strong and positive	MM Asaye et al 2020
Low birth weight of baby	3.1	1.78, 5.48	Strong and positive	MM Asaye et al 2020
GA of baby< 36 weeks	2.2	1.22, 3.88	Strong and positive	MM Asaye et al 2020
Unplanned pregnancy	2	1.24, 3.31	Strong and positive	MM Asaye et al 2020
Relative mental illness	1.2	1.09, 3.05	weak and positive	MM Asaye et al 2020
Has no ANC visit	4.05	1.81, 9.05	Strong and positive	MM Asaye et al 2020
Has no PNV	1.8	1.11, 3.00	strong and positive	MM Asaye et al 2020
Unplanned pregnancy	4.5	2.31, 8.71	Strong and positive	Kerie et al.2018
Age 15-24 years	0.4	0.18, 0.98	Weak and negative	Kerie et al.2018
Chronic illness	7.7	2.34, 25.44	Strong and positive	Kerie et al.2018
Death of the infant	4.1	1.78, 9.51	Strong and positive	Kerie et al.2018
Unstable marriage	6	2.79, 12.99	Strong and positive	Kerie et al.2018
Intimate partner violence	aRR=1.06	1.00, 1.12	Strong and positive	Bitew et al.2019
Depression in pregnancy	aRR=1.3	1.15, 1.45	Strong and positive	Bitew et al.2019
Premature baby	11.4	NA	Strong and positive	Shewangizaw et al.2018
Poor satisfaction with care	8.7	NA	Strong and positive	Shewangizaw et al.2018
Family hx of mental illness	7.4	NA	Strong and positive	Shewangizaw et al.2018
Single/divorced/widowed	3.5	1.35, 8.82	Strong and positive	Shitu et al.2019
Unwanted pregnancy	1.9	1.14, 3.33	Strong and positive	Shitu et al.2019
Undesired infant sex	1.8	1.13, 2.86	Strong and positive	Shitu et al.2019
Infant illness	2.1	1.30, 3.34	Strong and positive	Shitu et al.2019
Poor social support	3.2	1.55, 6.43	Strong and positive	Shitu et al.2019
Rural residence	2.6	2.56, 4.19	Strong and positive	Azale et al.2018
Grand multi-parity	2.0	1.22, 3.26	Strong and positive	Azale et al.2018

(Table 4) contd....

Associated Factors	Odds Ratio (AOR)	95% CI	Strength of Association	Author, Year of Publication
Associated factors	Odds ratio(AOR)	95% confidence interval	Strength of association	Author, year of publication
Perinatal complications	2.6	1.89, 3.44	Strong and positive	Azale et al.2018
Past history of abortion	1.5	1.07, 2.11	Moderate and positive	Azale et al.2018
Hunger in past 1 month	2.4	1.75, 3.23	Strong and positive	Azale et al.2018
Lower perceived wealth	2.1	1.19, 3.76	Strong and positive	Azale et al.2018
Poor marital relation[12]	2.5	1.79, 3.42	Strong and positive	Azale et al.2018
stressful event in past	2.4	1.82, 3.06	Strong and positive	Azale et al.2018
Being widowed	4.2	1.14, 15.20	Strong and positive	Wubetu et al.2020
Poor social support	5.1	1.00, 26.18	Strong and positive	Wubetu et al.2020
Hospitalization of a child	3.3	1.39, 7.93	Strong and positive	Wubetu et al.2020
Death of family member	2.9	1.101, 8.50	Strong and positive	Wubetu et al.2020
Have no death of one's child	0.3	0.11,0.86	Strong and Negative	Teferra et al.2015
Poor support from family	3.3	1.11, 9.52	Strong and positive	Teferra et al.2015
Low income	4.2	1.90,9.30	Strong and positive	G Gebremichael et al.2018
Pregnancy complications	5	2.50, 10.40	Strong and positive	G Gebremichael et al.2018
Smoking in husband	4.1	1.60, 10.60	Strong and positive	G Gebremichael et al.2018
Previous depression	2.7	1.54, 4.80	Strong and positive	G Gebremichael et al.2018
Family hx of psychiatry illness	3.6	1.40, 9.10	Strong and positive	G Gebremichael et al.2018

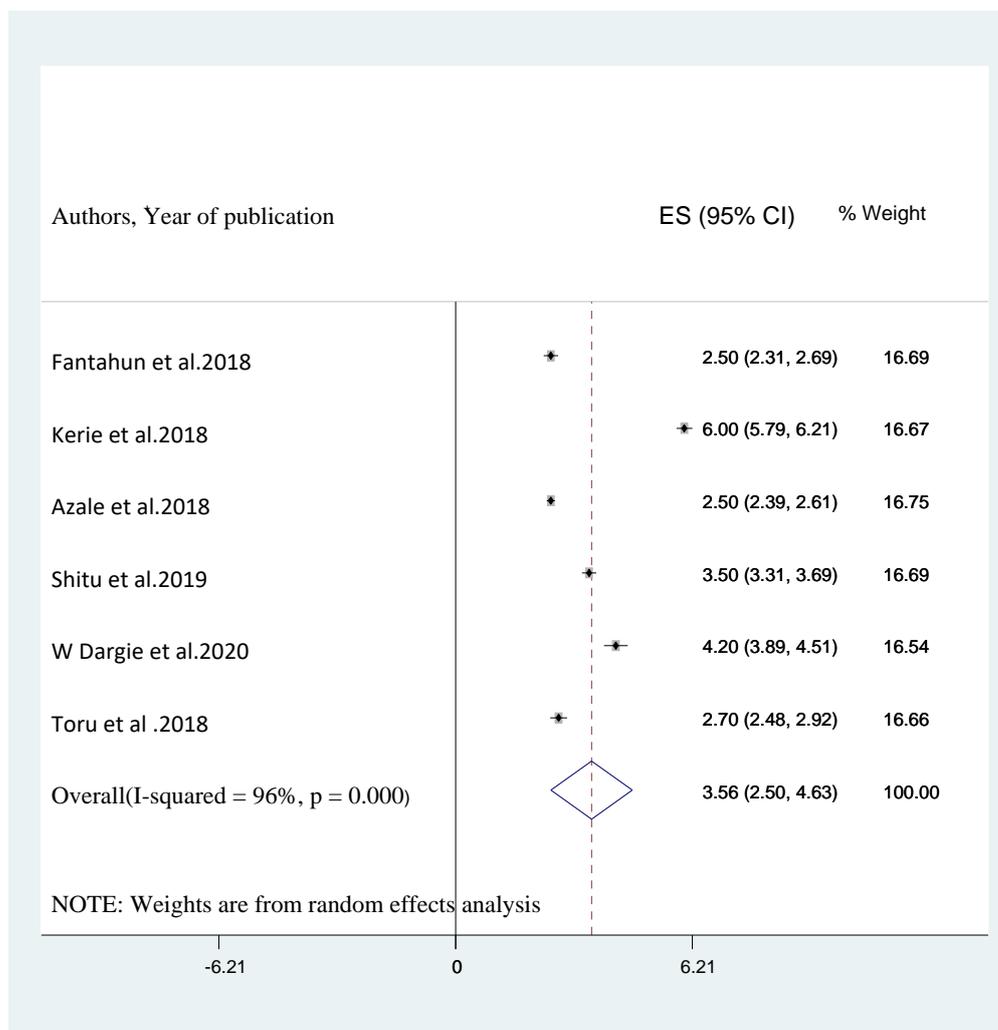


Fig. (5). A forest plot for the pooled adjusted odds ratio of poor marital relationship.

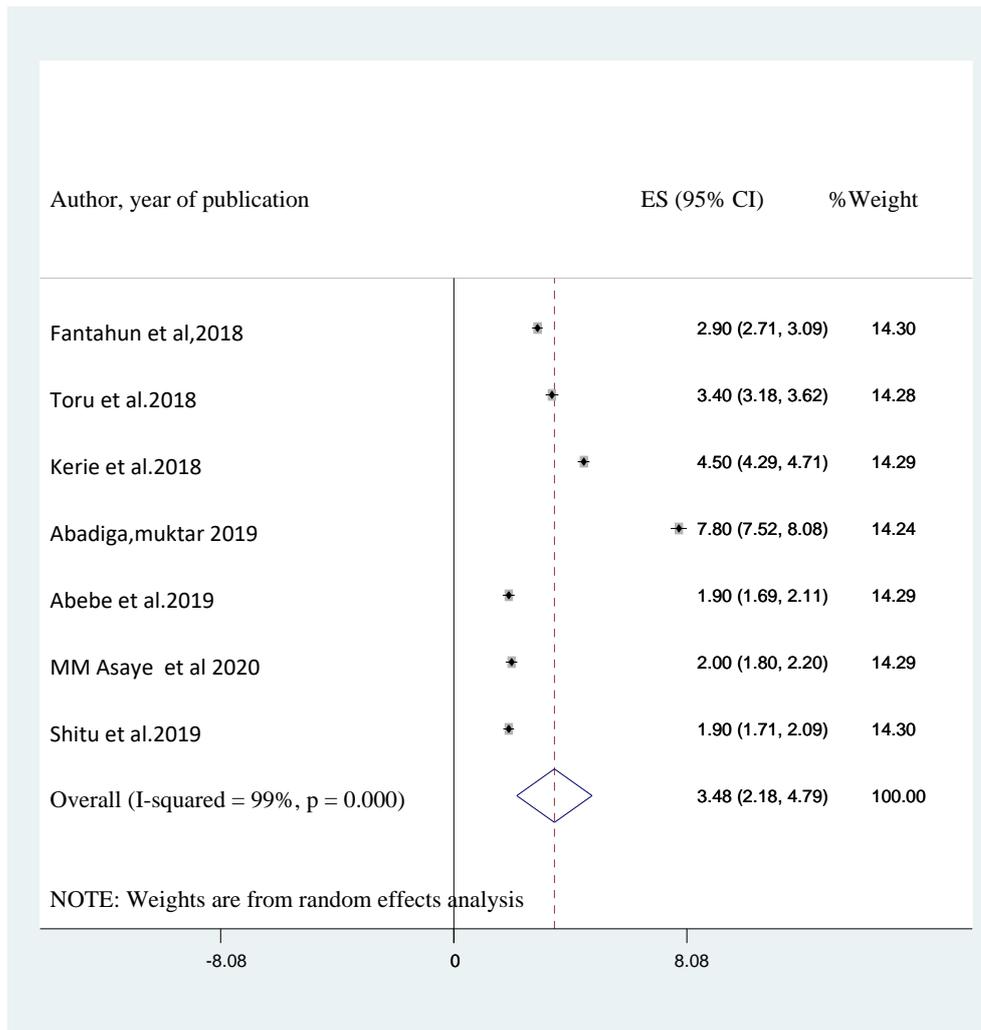


Fig. (6). A forest plot for the pooled adjusted odds ratio of unplanned pregnancy.

Table 5. Pooled estimate of the associated factors for postpartum depression in Ethiopia.

Associated Factors	Risk Groups	Pooled Effect Size & 95% CI	I <sup>2</sup>	Studies Pooled
Unplanned pregnancy	Women who have unplanned pregnancy	3.48 (2.18, 4.79)	90%	[1-6, 12]
Previous history of depression	Women having history of depression	4.33 (2.26, 6.59)	94%	[1-3, 15]
Poor social support	Women with poor social support	4.5 (3.34, 5.56)	96%	[2, 3, 12-14]
Domestic violence	Women who faced domestic violence	3.77 (2.62, 4.92)	94.6%	[1-4]
Poor marital relation	Single/divorced/widowed& dissatisfied marriage	3.74 (2.47, 5.00)	92%	[1, 2, 6, 12, 13, 17]
Substance use	Those women who are using substances	4.67(4.00, 5.34)	90.6%	[1-3]
Low income	Women with insufficient income	2.87(1.59, 4.14)	84%	[1, 15, 17]
Family history of mental illness	Women with history of mental illness in the family	4 (1.56, 6.56)	92.6%	[5, 10, 15]
Stressful life-event	Women who faced stressful event	3.5 (1.39, 5.87)	97%	[4, 17]
Perinatal complications	Women with perinatal complications	3.8 ( 1.45, 6.15)	98%	[15, 17]

#### 4. DISCUSSION

To date, this review and meta-analysis on depression and the related factors in women in the postnatal period are the first of its kind in the context of Ethiopia. Therefore, the pooled effect size of postpartum depression and related factors would be an added advantage for the scientific community and other

diverse stakeholders who intend to intervene in this significant public health issue. We gathered data from a total of 11400 postpartum women and a total of sixteen studies from both institutional and community settings and the estimated pooled prevalence of postpartum depression was found to be 21.9% (95% CI: 18.98, 24.77).

The result of the pooled estimated prevalence of postpartum depression in this study (21.9%) was in line with a systematic review and meta-analysis on depression in the postpartum period in India (22%) which analyzed 38 studies and 20043 women [10]. It was also consistent with the result of a systematic review and meta-analysis study on women from low and middle-income countries which assessed 34 studies and 19.8% of them were found to have a postpartum common mental disorder [9]. Furthermore, another study that incorporated 38412 women and 23 studies from low and middle-income countries [6] reported 19.2% of women as having postpartum depression, which was also supportive of the current finding.

However, the result of the pooled estimated prevalence of postpartum depression in Ethiopia exceeds the worldwide estimated prevalence of postpartum depression, such as 17% reported in 2018 by S Shorey *et al.* [8]. The possible reason for the higher estimated prevalence in the earlier study as compared to our study could be due to the inclusion of a larger number of studies and participants in the analysis (26 cross-sectional, 30 prospective cohort and 2 case-control studies with an overall 58 studies and 37294 participants); however, only 16 studies were included in our study. Moreover, women in the previous study were healthy subjects having no history of depression previously but our study found that a previous history of depression was among the factors responsible for the increased prevalence of postpartum depression. Moreover, the rate of prevalence in our study was higher than the result of a systematic review and meta-analysis in 11 high-income countries reported in 2005, in which the pooled estimated prevalence of postpartum depression was 12.9% [72].

Possible grounds for the difference could be due to a long time gap between the previous study and the present study. The difference in the time point for the assessment of postpartum depression could also be a reason. The previous study included studies that screened PPD only in the three months of the postpartum period but in the present study, assessment period was far beyond this. Moreover, a socio-economic and cultural difference between high-income study subjects of the earlier study and low-income study subjects of the present study could be a root cause for the variation.

Contrary to the subgroup analysis result of a worldwide meta-analysis study [8] that observed the pooled estimated prevalence of postpartum depression to be similar across the different measurement tools for PPD, the present study revealed that pooled prevalence of postpartum depression was higher in studies as measured with SRQ-20 (24.6%) (95% CI: 18.42, 30.84) than the result with PHQ-9 (18.9%) (95% CI: 11.52, 26.28). This could be because most studies that utilized SRQ-20 delineated a lower cut-off point (SRQ-20 score  $\geq 6$ ), which might result in an overestimation of postpartum depression.

In line with the result of an earlier meta-analysis study [8], the pooled estimated size of postpartum depression showed a geographical difference. The pooled estimated post-partum depression was slightly higher in studies from the southern part of Ethiopia (22.6%) than the central region (Addis Ababa) (21.2%), which could be due to the relatively improved socio-

economic and cultural advances in the central region of Ethiopia. This was, however, in contrast to the result of a meta-analysis conducted in India [10].

However, no significant variation in the magnitude of PPD was noticed between the community and institutional settings of the studies. This was consistent with a review and meta-analysis study in India [10] in which little but insignificant variation was observed across the community and institutional setting studies. Even though heterogeneity was a problem in the present study, the 95% confidence interval of the average prevalence of postpartum depression was narrow. This might be due to the small standard error in the included studies, a large number of included studies with a large number of participants.

Regarding the associated factors of postpartum depression, fourteen studies [21, 22, 24, 26-35, 59] had reported different factors and poor marital relation [27, 29, 32, 34, 35, 59], unplanned pregnancy [21, 22, 24, 27, 29, 32, 34], previous history of depression [21, 27, 28, 34], domestic violence [21, 22, 27, 34], poor social support [21, 32-35], family history of mental illness [24, 28, 31], use of substance [21, 27, 34] and low income [27, 28, 59] were among the most commonly reported factors.

The pooled odds ratio of the poor marital relationship among the above-mentioned studies was 3.56 that implies women with poor marital relationships were 3.56 times at higher risk of developing PPD than women with good marital relationships. A meta-analysis study in India showed a similar conclusion supporting this [10]. The possible reason for this could be poor marital relationship increasing the burden of psychosocial responsibility of child care and other household responsibility in the postpartum period as compared to the shared psychosocial responsibility of women with good marital relation.

Besides, the pooled odds ratio for unplanned pregnancy for the nine studies reported above was found to be 3.48. This showed that women who gave birth from an unplanned pregnancy were 3.5 times more likely to be depressed than women with a planned pregnancy. A consistent finding was reported in studies conducted in Turkey [17], Qatar [14], northwestern Brazil [73], and Iran [74]. This might be due to the common factor involved in the development of PPD in Ethiopia too.

Another additional possible reason for this could be the absence of psychological readiness in mothers with unplanned pregnancy predisposing them to be vulnerable to physiological, psychosocial challenges of pregnancy and the postpartum period.

The previous history of depression [21, 27, 28, 34] and stressful life events [22, 59] was also an associated factor for the development of PPD with a pooled estimate odds ratio of 4.33 and 3.5, respectively. A consistent finding was observed in an Indian meta-analysis study [10]. Furthermore, other several studies [6, 75, 76] reported the presence of depression during pregnancy, facing stressful life events during pregnancy, and prior history of depression as related to postpartum depression, which was also in line with the current study.

Besides domestic violence was also found to have a significant association with the development of PPD with the estimated pooled odds ratio of 3.77 [21, 22, 27, 34]. A report by the World Health Organization in 2013 [77] suggested a similar conclusion in terms of intimate partner violence in women predisposed to various mental health problems in the postpartum period.

Poor social support with a pooled odds ratio of 4.5 [21, 32-35] also increases the vulnerability to postpartum depression. This also supports the findings of the Indian review study [10]. Multiple earlier studies have also reported that good interpersonal relationships across the social support networks increase flexibility to stress and subsidize enormously women from developing postpartum depression [78 - 81], hence decreasing the risk of postpartum depression. A study in Ghana on interventions for women with postpartum depression revealed that psychosocial support interventions are the most effective treatments implying an underlying psychosocial deficit in this target population [82].

Furthermore, the pooled odds ratio of family history of mental illness [24, 28, 31], use of a substance [21, 27, 34] and low income [27, 28, 59] and perinatal complications [28, 59] was 4, 4.67, 2.87, 3.5 and 3.8, respectively. A systematic review and meta-analysis study in which 17 articles were reviewed and postpartum depression between 3 and 52 weeks postpartum periods was assessed [83] reported substance use as a contributing factor for postpartum depression, being in line with the current study.

## 5. STRENGTHS AND LIMITATIONS

Regarding strength, this study utilized a pre-specified search strategy through the mentioned libraries that are intended to reduce the assessor's bias. The subsequent strength was that the independent extraction of data and quality assessment of the included studies by two autonomous reviewers also lessened the reviewer's bias. Furthermore, the employment of subgroup analysis and sensitivity analysis to distinguish the foundation of heterogeneity was also a strength. On the contrary, the limits of this meta-analysis study emanate from the presence of a high difference between the included studies that might disrupt the deduction of the study results. Besides, the use of two or three studies in the sub-group analysis might diminish the accuracy of the estimates.

## CONCLUSION

This review and meta-analysis study obtained a high pooled estimated prevalence of postpartum depression (21.9%), suggesting that more than one in five women experience postpartum depression. The pooled estimate of postpartum depression was higher in studies that used SRQ-20 (24.6%) than studies that used PHQ-9 (18.9%). Moreover, the pooled prevalence of postpartum depression was slightly higher in the southern part of Ethiopia (22.6%) than Addis Ababa (21.2%). However, no significant difference in pooled prevalence was noticed across study settings (community versus institutional). Poor marital relations, unplanned pregnancy, previous history of depression, poor social support, domestic violence, family history of mental illness, use of the substance, low income,

stressful life event, and perinatal complications were among the associated factors for postpartum depression. Therefore, postnatal antenatal care services should consider this significant mental health problem of women and its associated factors basically by delivering integrated postnatal care services for women.

## LIST OF ABBREVIATIONS

<b>AOR</b>	= Adjusted Odds Ratio
<b>CI</b>	= Confidence Interval
<b>CS</b>	= Cross-Sectional
<b>EPDS</b>	= Edinburgh Postnatal Depression Scale
<b>OR</b>	= Odds Ratio
<b>PHQ-9</b>	= Patient Health Questionnaire-9
<b>PPD</b>	= Postpartum depression
<b>PRISMA-P</b>	= Preferred Reporting Items for Systematic Reviews and Meta-analysis
<b>SRQ-20</b>	= Self Reporting Questionnaire-20

## CONSENT FOR PUBLICATION

Not applicable

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## CONFLICT OF INTEREST

We authors have no competing interests regarding this meta-analysis study.

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