Original Article

Global Prevalence of Prenatal Depression: A Meta Analysis from 2016 – 2020

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Abstract

Background: Depression is the utmost common psychological problem affecting women worldwide during the prenatal period. As the pregnancy progresses, the risk of prenatal depression increases considerably, and clinically obvious symptoms of depression are common in 2nd and 3rd trimesters of pregnancy. The occurrence of prenatal depression is different in developing and developed countries.

Objectives: To estimate the pooled prevalence of prenatal depression among women globally through a meta-analysis of studies published between 2016 and 2020, with comparison between developed and underdeveloped countries.

Methodology: The database used for systematic review included Endnote search, PubMed, Google Scholar and Google search engine. For Meta-Analysis, the software 'MetaXL' was used to enter and analyze the findings of literature collected. The application 'Meta-Analysis of Prevalence' was used in this software for the analysis. A total number of 45 studies from last 5 years i-e, from 2016 to 2020 were included in this meta-analysis to measure the pooled prevalence of prenatal depression in different countries.

Results: The pooled prevalence of prenatal depression with fixed effects method was found as 16.9%, whereas, the pooled prevalence of prenatal depression with random effects method was found as 23.69%. There was significant heterogeneity in the meta-analysis with $p < 0.05$ and $I2 > 75\%$. The Egger's test and Begg's test revealed that there was no evidence of publication bias found in this meta-analysis ($p = 0.0007$).

Conclusion: A significantly high pooled prevalence of global prenatal depression suggests the burden of disease a serious public health concern in under developed as well as in developed countries.

Keywords: Meta-analysis; pooled prevalence; prenatal depression; EPDS

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Introduction

Depression is the utmost common psychological problem affecting women worldwide during the perinatal period.[1] It is known that about 15% of women will feel depressed at some point in their lives, and it is extra important during pregnancy and after delivery.[2] As the pregnancy progresses, the risk of prenatal depression increases considerably, and clinically obvious symptoms of depression are common in 2nd and 3rd trimesters of pregnancy. The occurrence of prenatal depression is different in developing and developed countries. Researches from all over the world illustrate that the prevalence of prenatal depression ranges from 4% to 80%.[3]

Depression is considered as the main cause of disease-related disability in women.[4] Many investigators have determined that the lifetime occurrence of major depression in women is twice that of men.[5] This increase in women's vulnerability can be detected early and continued into menopause, representing that women are more prone to depression during the reproductive period. Women of childbearing age are especially important as maternal depression has an important impact on the growth of fetuses, babies, children and families.[6,7] This study is justified because prenatal depression has profound impacts on mothers and infants. Estimates from 2016–2020 need consolidation due to variability in studies. Differences in healthcare infrastructure between developed and underdeveloped settings likely influence reported prevalence. The findings will support better screening, policies and resources tailored to both high- and low-resource countries and aimed to find the pooled prevalence of prenatal depression by meta-analysis on studies conducted from 2016 to 2020 worldwide.

Methods

The pooled prevalence of prenatal depression was measured with the help of meta-analysis. For this purpose, 52 studies were selected from last 5 years i-e, from 2016 to 2020. The database used for meta-analysis included PubMed, Scopus, Web of Science, Google Scholar and Google search engine. The keywords of prenatal depression, antenatal depression, perinatal depression and depression in pregnancy were used to search the relevant articles. From the searched 52 studies, the free access of 3 articles was not available so these were excluded from the study. From remaining 49 articles, the prenatal prevalence of depression was reported separately for 2nd and 3rd trimesters but the overall prevalence of prenatal depression was not reported in 4 articles so these were also excluded from the study. The remaining studies were included for meta-analysis which had free access articles available on Google, had reported the overall prevalence of prenatal depression and the duration of publication of these studies was last 5 years. The included studies had primarily observational study designs, including cross-sectional and cohort studies. The case reports, reviews, editorials and studies without prevalence data, studies focusing on postpartum depression only and duplicate publications were excluded from the study. Studies that involved special population like HIV-positive were only included if they reported overall prevalence of prenatal depression. The meta-analysis was done with 45 studies to find out the pooled prevalence of prenatal depression among pregnant women. The methodological quality of included studies was assessed by using the MOOSE (Meta-analysis of Observational Studies in Epidemiology) checklist. Two reviewers independently assessed study quality and disagreements were resolved through consensus. As it was a meta-analysis, no separate sample size calculation was performed. The total sample size was derived from all eligible included studies. For Meta-Analysis, the software 'MetaXL' was used to enter and analyze the findings of literature collected. The application 'Meta-Analysis of Prevalence' was used in this software for the analysis. The mean prevalence of studies was shown in the form of graph. The Pooled Statistics with fixed effect and random effect were shown in tabular form. The forest plots and funnel plots were presented to show prevalence of prenatal depression by using fixed effect and random effect methods. I^2 and Cochran's Q was calculated to test fixed effect heterogeneity. The I^2 > 75% was considered as showing high heterogeneity.[8] To test publication bias, Egger's test and Begg's test was used. A p-value <0.05 was considered as showing statistically significant results.

Results

A total number of 45 studies from last 5 years were included in this meta-analysis to measure the pooled prevalence of prenatal depression in different countries. The mean prevalence of prenatal depression reported in various studies is presented in Figure 1.

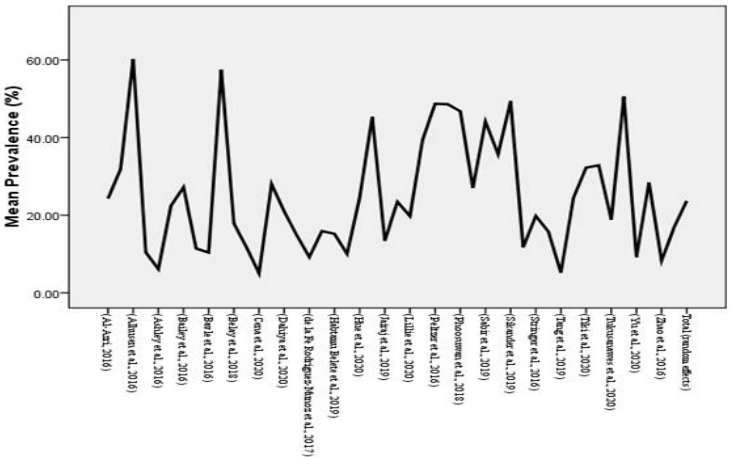

***Figure 1**: Mean prevalence of prenatal depression in various studies*

The 95% confidence interval of prevalence and weighted percentage of fixed and random effects of various studies of meta-analysis are shown in Table 1. The pooled prevalence of prenatal depression with fixed effects method was found as 16.9%, whereas, the pooled prevalence of prenatal depression with random effects method was found as 23.69% (Table 1).

The heterogeneity of meta-analysis was measured by using I2 and Cochran's Q test as shown in Table 2. The results revealed that there was a significant heterogeneity in the meta-analysis with $p < 0.05$ and $I2 > 75\%$. To test the publication bias in this meta-analysis, Egger's test and Begg's tests revealed that there was no evidence of publication bias found in this meta-analysis, with a $p = 0.0007$ (Table 2).

Table 1: *Tabular Presentation of Prevalence of Prenatal Depression in studies of Meta-Analysis (n=45) and Pooled Prevalence of Prenatal Depression with Fixed Effect and Random Effect Method*

Study	Sample Size	Proportion (%)	95% CI	Weight (%)	
				Fixed	Random
(Al-Azri, 2016)	959	24.29	21.61 to 27.13	2.46	2.26
(Al-Hejji et al., 2019)	357	31.93	27.12 to 37.04	0.92	2.23
(Alhusen et al., 2016)	166	60.24	52.36 to 67.74	0.43	2.16
(Alqahtani et al., 2018)	575	10.43	8.05 to 13.22	1.48	2.25
(Ashley et al., 2016)	3010	6.11	5.28 to 7.02	7.73	2.28
(Ayele et al., 2016)	388	22.42	18.36 to 26.90	1.00	2.23
(Bailey et al., 2016)	180	27.22	20.86 to 34.34	0.46	2.17
(Bangma et al., 2020)	245	11.42	7.73 to 16.093	0.63	2.20
(Bavle et al., 2016)	318	10.37	7.25 to 14.26	0.82	2.22
(Bawahab et al., 2017)	320	57.50	51.87 to 62.98	0.82	2.22
(Belay et al., 2018)	357	17.92	14.08 to 22.30	0.92	2.23
(Bisetegn et al., 2016)	527	11.76	9.14 to 14.82	1.36	2.24
(Cena et al., 2020)	1471	5.03	3.97 to 6.27	3.78	2.27
(Dagklis et al., 2016)	157	28.02	21.15 to 35.74	0.41	2.16
(Dahiya et al., 2020)	200	21.00	15.57 to 27.30	0.52	2.18
(de Jesus Silva et al., 2016)	209	14.83	10.30 to 20.38	0.54	2.19
(de la Fe Rodriguez-Munoz et al., 2017)	445	9.21	6.69 to 12.29	1.14	2.24
(Govender et al., 2020)	132	15.90	10.12 to 23.28	0.34	2.14
(Habtamu Belete et al., 2019)	342	15.20	11.56 to 19.45	0.88	2.22
(Harrington et al., 2018)	299	10.03	6.87 to 14.01	0.77	2.22
(Hue et al., 2020)	1260	24.52	22.17 to 26.99	3.24	2.27
(Jafri et al., 2017)	300	45.33	39.60 to 51.15	0.77	2.22
(Jairaj et al., 2019)	5000	13.42	12.48 to 14.39	12.84	2.28
(Kaiyo-Utete et al., 2020)	375	23.46	19.26 to 28.09	0.97	2.23
(Lillie et al., 2020)	374	19.78	15.86 to 24.19	0.96	2.23
(Nyamukoho et al., 2019)	198	39.39	32.54 to 46.57	0.51	2.18
(Peltzer et al., 2016)	663	48.71	44.85 to 52.59	1.70	2.25
(Peltzer et al., 2018)	681	48.60	44.79 to 52.43	1.75	2.25
(Phoosuwan et al., 2018)	449	46.77	42.07 to 51.50	1.15	2.24
(Redinger et al., 2018)	937	27.00	24.18 to 29.96	2.41	2.26
(Sabir et al., 2019)	417	44.12	39.29 to 49.03	1.07	2.23
(Sheeba et al., 2019)	280	35.71	30.10 to 41.63	0.72	2.21
(Sikander et al., 2019)	1154	49.39	46.47 to 52.32	2.96	2.27
(Srinivasan et al., 2020)	9204	11.72	11.07 to 12.39	23.63	2.28
(Stringer et al., 2016)	212	19.81	14.66 to 25.82	0.55	2.19
(Szegda et al., 2017)	1545	15.79	14.00 to 17.70	3.97	2.27
(Tang et al., 2019)	1215	5.18	4.00 to 6.58	3.12	2.27
(Thompson et al., 2016)	314	24.52	19.86 to 29.66	0.81	2.22
(Tiki et al., 2020)	862	32.25	29.13 to 35.48	2.21	2.26
(Tsakiridis et al., 2019)	73	32.87	22.32 to 44.86	0.19	2.03
(Tukusanawes et al., 2020)	402	18.90	15.19 to 23.08	1.03	2.23
(Umuziga et al., 2020)	85	50.58	39.52 to 61.61	0.22	2.06
(Yu et al., 2020)	813	9.22	7.32 to 11.42	2.09	2.26
(Zhang et al., 2020)	605	28.43	24.86 to 32.20	1.56	2.25
(Zhao et al., 2016)	842	8.31	6.53 to 10.38	2.16	2.26
Pooled Prevalence					
Total (fixed effects)	38917	16.903	16.532 to 17.279	100.00	100.00
Total (random effects)	38917	23.693	19.690 to 27.943	100.00	100.00

Table 2: *Test for Heterogeneity of Meta-Analysis and Publication Bias*

Test for Heterogeneity of Meta-Analysis	
Q	3863.2667
DF	44
Significance level	P < 0.0001
I² (inconsistency)	98.86%
95% CI for I²	98.73 to 98.98
Egger's test	
Intercept	8.4530
95% CI	3.7907 to 13.1153
Significance level	P = 0.0007
Begg's test	
Kendall's Tau	0.1748
Significance level	P = 0.0904

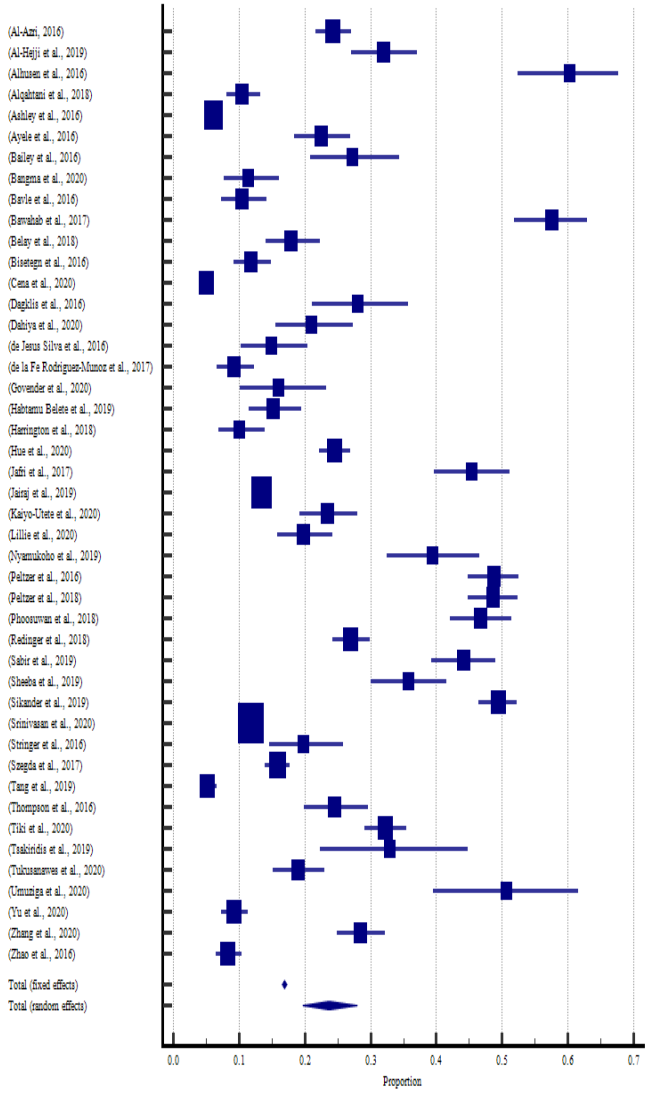

Figure 2: Forest Plot presenting Prevalence of Prenatal Depression in various studies using Fixed Effect Model

The Forest plot presenting prevalence of prenatal depression in various studies using fixed effect model is shown in Figure 2. The Funnel plot presenting prevalence of prenatal depression in various studies using fixed effect model is shown in Figure 3:

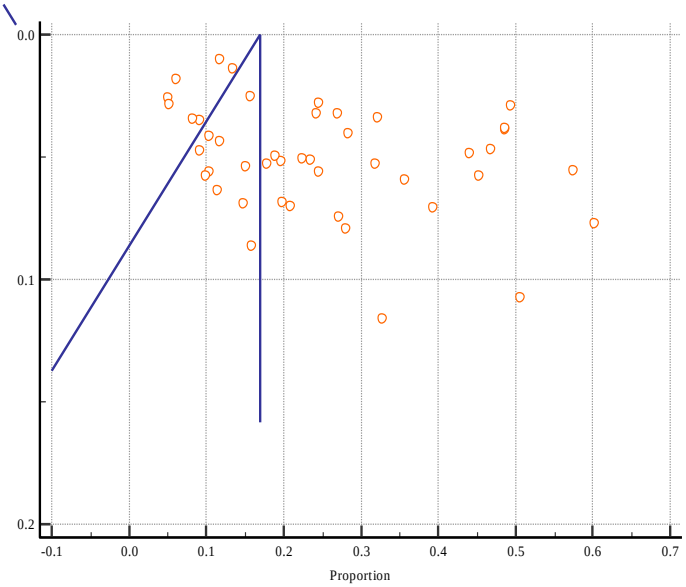

Figure 3: *Funnel Plot presenting Prevalence of Prenatal Depression in various studies using Fixed Effect Mode.*

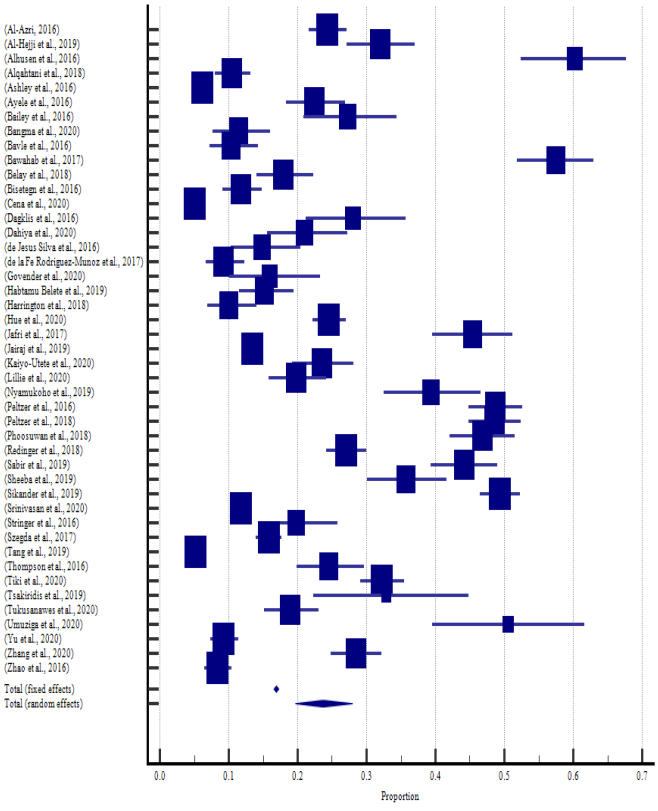

Figure 4*: Forest Plot presenting Prevalence of Prenatal Depression in various studies using Random Effect Model*

The Forest plot presenting prevalence of prenatal depression in various studies using random effect model is shown in Figure 4. The Funnel plot presenting prevalence of prenatal depression in various studies using random effect model is shown in Figure 5:

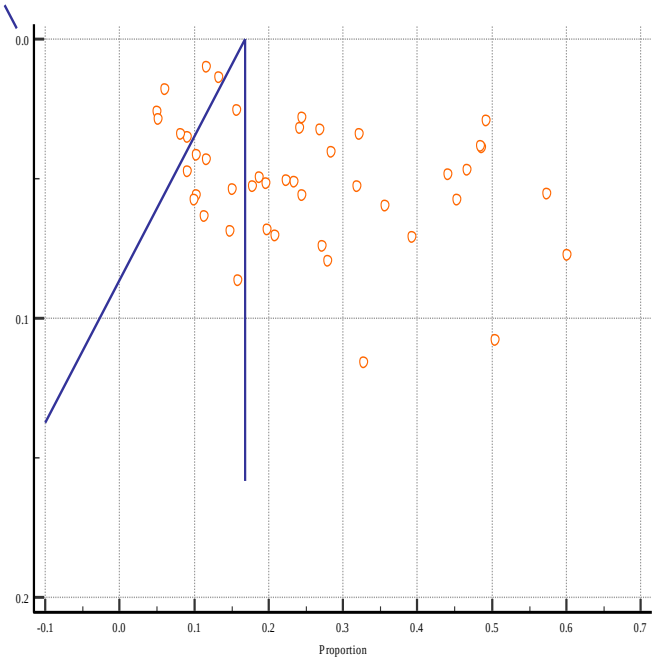

Figure 5: *Funnel Plot presenting Prevalence of Prenatal Depression in various studies using Random Effect Model*

Discussion

The meta-analysis done on 45 studies revealed that the pooled prevalence of prenatal depression with fixed effects method was found as 16.9%, whereas, the pooled prevalence of prenatal depression with random effects method was found as 23.69%. The prevalence observed during this study is similar to the ones reported by previous meta-analyses that reported pooled prevalence estimates ranging between 15 and 25 percent yet direct comparison cannot be done because the study periods, study populations, and procedures used differ. There was also a regional difference with the prevalence being reported in South Asia and African countries relative to the developed regions. Such disparities can be related to the socio-economic differences, inaccessibility of maternal mental health services, cultural stigma, low social support, as well as variations in the healthcare infrastructure.

In a meta-analysis done on 33 studies of South Asia, the pooled prevalence of antenatal depression was found as 24.3%.[9] A meta-analysis done on 28 African studies reported the pooled prevalence of antenatal depression as 26.3%.[10] The pooled prevalence of antenatal depression in Ethiopia was reported as 24.2%[11] and 21.28%.[12] A systematic review done on 26 studies revealed a prevalence of antenatal depression as 15% and after removing confounding the rate was 16.4%.[13] A study conducted in India found the prevalence of prenatal depression as 35.7.[14] In a study conducted in rural South Africa the prevalence of prenatal depression was found among 48.7% of women on EPDS (cut-off ≥13).[15] A hospital based cross sectional study carried out by Al-Azri et al[16] in Oman found the prevalence of prenatal depression as 24.3% calculated on EPDS. The hospital based studies conducted in Saudi Arabia by Al-Hejji et al,[17] Alqahtani et al[18] and Bawahab et al[19] found the prevalence of prenatal depression (measured on EPDS) as 31.9%, 10.5% and 57.5% respectively. Alhusen et al[20] found the prevalence of prenatal depression as 59% in Maryland. Bangma et al[21] in a prospective cohort study, found the prevalence of prenatal depression as 11% (measured on EPDS) in Netherland. Bavle et al[22] in a cross sectional study found the prevalence as 12.3% (measured on EPDS) in India. Bisetegn et al[23] conducted a community based cross sectional study and found the prevalence of prenatal depression as 11.8% (measured on EPDS) in Northwest Ethiopia. The hospital based cross sectional studies found the prevalence of prenatal depression (measured on EPDS) 6.4% in Italy[24], 28% in Greece[25], 21% in North India[26], 15.9% in South Africa[27], 24.5% in Vietnam[28], 15.8% in Ireland.[29] Kaiyo et al found the prevalence of prenatal depression as 23.47% in Zimbabwe, measured by Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders (SCID-I).[30] The Goldberg's depression scale (GDS) was used by Sabir et al who found the prevalence of prenatal depression as 40.89% in Lahore, Pakistan.[31] Tang et al[32] used Self-Rating Depression Scale (SDS) and found the prevalence of prenatal depression as 5.2% in China. Center for Epidemiologic Studies Depression Scale (CESD) was used by Tuksanawes et al[33] and Zhang et al[34] which measured the prevalence of prenatal depression as 18.9% in Thailand and 28.4% in China. Zhao et al[35] measured the prevalence of prenatal depression as 8.3% in China by using Postpartum Depression Screen Scale (PDSS).

The hospital based cross sectional studies conducted by Nyamukoho et al[36] and Phoosuwan et al[37] found the prevalence of prenatal depression as 39.4% in Zimbabwe and 46.8% in Thailand respectively. Redinger et al[38] conducted a community based prospective cohort study and found the prevalence of prenatal depression as 27% in South Africa. Srinivasan et al,[39] Stringer et al[40] and Szegda et al[41] carried out hospital based prospective cohort studies and found the prevalence of prenatal depression (on EPDS) as 12% in Southwest England, 20% in United States and 15.79% in United States respectively. The hospital based cross sectional studies carried out by Thompson et al,[42] Tsakiridis et al[43] and Umuziga et al[44] found the prevalence of prenatal depression as 24.5% in Nigeria, 32.9% in Greece and 37.6% in Rwanda respectively. All these studies used EPDS to measure prenatal depression. The patient health questionnaire (PHQ-9) was used by Ashley et al,[45] Harrington et al,[46] Lillie et al,[47] Sikander et al,[48] Tiki et al[49] and Yu et al[50] to measure prenatal depression, which found the prevalence of prenatal depression as 6.1% in USA,[45] 10% in Malawi, [46] 19.7% in Northern Ghana,[47] 49.4% in Pakistan,[48] 32.3% in Ethiopia[49] and 9.2% in China[50] respectively. Another study conduc-ted in Spain revealed a prevalence of prenatal depression as 14.8% on Patient Health Question-naire.[55] Bailey[51] et al used PHQ-2 and found the prevalence of prenatal depression as 27% in Ukraine. Other scales included BDI which measured the prevalence of prenatal depression as 23%,[52] 17.9%[53] and 15.2%[54] in Northwest Ethiopia. The prenatal depression measured by hospital anxiety and depression scale (HASD) was found as 14.8% in a community based cross sectional study carried out in Brazil.[56] George et al used Clinical Interview Schedule-Revised (CIS-R) in a community based cross sectional study and found the prevalence of prenatal depression as 16.3% in South India.[57] The Hamilton rating scale for depression (HRS) was used by Jafri et al in a hospital based cross sectional study carried out in Karachi, Pakistan, and found the prevalence of prenatal depression as 45.3%.[58]

One interesting result of this meta-analysis was that the heterogeneity of the studies included in it was significant (I^2>75%), as it is in line with other literature.[59] We can ascribe this heterogeneity to the difference in study design, sample traits, screening tools, cut-off scores and settings (community-based versus hospital-based studies). Moreover, varying prevalence estimates might have been a result of various depression screening instruments that were used to assess depression, including EPDS, PHQ-9, CES-D and SDS because the instruments vary in terms of sensitivity, specificity, and diagnostic cut points. The majority of studies were based on self-reported screening measures, as opposed to clinical diagnostic interviews, and, thus, under- or over-estimated real prevalence. The meta-analysis on South Asian studies reported that their studies showed high degree of heterogeneity (I^2 =97.7%) and evidence of publication bias was also found (P=0.67).[60] Another meta-analysis done in Ethiopia also reported that there was a significant heterogeneity in their studies (I^2 =92.5%) and there was also an evidence of publication bias ($p<0.05$).[11]

Conclusion

The findings of this meta-analysis are of value to the general population regarding their health. Considering the current burden of prenatal depression and its negative consequences that are well-documented, the routine screening of depression in the context of the antenatal care should be regarded as a priority. This can be implemented by early detection and prompt intervention that can minimize the negative consequences of pregnancy and enhance maternal wellbeing, especially in resource-constrained environments.

Strengths and Limitations

The advantages of this meta-analysis involve the fact that many studies were included in it covering various geographical areas, and both fixed and random-effects models were used. Nevertheless, there are a number of constraints that are to be considered. To begin with, the pooled estimates cannot be generalized because of the existence of a high level of heterogeneity. Second, studies written in English were considered only, which could bring about language bias. Third, included studies were mostly observational and based on the use of screening tools instead of diagnostic interviews. In spite of these shortcomings, this paper presents a new and elaborate estimation of the prevalence of prenatal depression prevalence across the world.

Future Directions

The future studies are to aim at standardizing screening instruments and cut-off values,

longitudinal studies and the context-specific risk factors so as to understand prenatal depression context-specific to the region.

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Authors' Contribution:

UH: Conception and design; acquisition, analysis and interpretation of data; manuscript writing, critical revisions for important intellectual content

MA: Acquisition of data; manuscript writing.

MB: Conception and design; acquisition of data; manuscript writing.

AHK: Acquisition of data; manuscript review and revisions.

SK: Acquisition of data; manuscript review and revisions.

NH: Conception and design; analysis and interpretation of data; manuscript review, final approval of the version to be published

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