Prevalence of antenatal depression in South Asia: a systematic review and meta-analysis

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ABSTRACT

OBJECTIVE

To estimate the prevalence of antenatal depression in South Asia and to examine variations by country and study characteristics to inform policy, practice and future research.

METHODS

We conducted a comprehensive search of 13 data bases including international data bases and databases covering scientific literature from South Asian countries in addition to Google Scholar and grey sources from 1·1·2007 to 31·5·2018. Studies reporting prevalence estimates of antenatal depression using a validated diagnostic/ screening tool were identified, screened, selected, and appraised. Primary outcome was proportion (%) of pregnant women identified as having antenatal depression.

RESULTS

Thirty-three studies involving 13,087 pregnant women were included in the meta-analysis. Twelve studies were rated as of high quality and 21 studies were of moderate quality. Overall pooled prevalence of antenatal depression was 24·57% (95% CI: 19·34, 30·69). Studies showed a high degree of heterogeneity (I^2=97·55%) and evidence of publication bias (p=0·722). Prevalence rates for India (17·74%, 95% CI: 11·19, 26·96) and Sri Lanka (15·87%, 95% CI: 14·04, 17·88) were lower compared to the overall prevalence whereas prevalence rates for Pakistan (32·2%, 95% CI: 23·11, 42·87) and Nepal (50%, 95% CI: 35·64,64·36) were higher.

CONCLUSIONS

While robust prevalence studies are sparse in most South Asian countries, available data suggests one in four pregnant women is likely to experience antenatal depression in the region. Findings highlight the need for recognition of the issue in health policy and practice and for

resource allocation for capacity building at regional and national levels for prevention, diagnosis and treatment.

KEY WORDS

Antenatal depression, South Asia, Systematic Review, Meta-analysis

What is already known on this topic?

- Individual studies have reported great variations in prevalence of antenatal depression both within and across countries in South Asia.
- Previous descriptive reviews have provided limited prevalence estimates of antenatal depression in South Asia.

What this study adds?

- Our study is the first meta-analysis that synthesised the prevalence rates of antenatal depression in South Asia and examined variations by country and study characteristics.
- The findings highlight the need for robust nationally representative prevalence studies, especially in Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, and Sri Lanka, where studies are extremely sparse.
- The study concludes that antenatal depression can be argued to be a significantly prevalent issue in South Asia based on available data, likely to be experienced by one in four pregnant women.

INTRODUCTION

Depression in pregnancy, known as antenatal depression, is characterised by symptoms of depression - a persistent depressed mood, loss of interest, low energy and appetite, feelings of guilt or low self-worth and disturbed sleep or concentration.[1] Antenatal depression carries significant adverse implications for the health and wellbeing of women, babies and their families.[2-7] Women with antenatal depression are more likely to develop a number of complications during pregnancy including an increased risk of nausea, vomiting, miscarriage, preterm birth, and poor foetal growth.[2-4] Babies of mothers who were depressed in pregnancy are at higher risk of low birth weight and poor cognitive development in infancy and childhood that may get carried over into adulthood.[5] While untreated antenatal depression itself is a significant contributor to the development of depression during the postnatal period,[6] women who suffer antenatal depression are at an increased risk of developing other psychological problems such as bipolar, anxiety, and panic disorders.[7] Despite its significant adverse impact on the health and wellbeing of women, babies, families and the society at large, the issue remains unrecognised in many countries and regions of the world partly due to the lack of reliable prevalence estimates.[2,8]

Prevalence of perinatal mental disorders in low-and lower-middle-income countries tends to be higher compared to their prevalence in high-income countries[9] and wide variations have been reported between countries in some regions.[10] South Asia is the most densely populated region in the world with a high pregnancy rate. The region accounts for the second highest maternal mortality rate globally.[11] Countries in South Asia - Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka - are predominantly economically underprivileged. Despite a number of initiatives to improve maternal health,[12] maternal mental health remains largely overlooked in the region.[13]

Existing prevalence studies on antenatal depression in South Asian countries have reported great variation in prevalence, with rates ranging from 16·2%in India[14] to 9·5%in the neighbouring Sri Lanka.[15] In Pakistan, the reported prevalence rates varied from 18%[16] to 25% between rural-urban areas.[17] While individual studies provide some insights about the likely magnitude of the problem in the countries of the region, the issue remains largely unrecognised in the region as a whole, and individual studies do not provide sufficient evidence on their own to warrant appropriate action. A previous review that has attempted a descriptive synthesis of the evidence on prevalence, associated factors and cultural aspects of perinatal depression in some of the Asian countries reported that the prevalence of antenatal depression ranged from 8·7% in Hong Kong to 45·5% in Iran.[10] This review included studies from two countries in South Asia, India and Pakistan, and has reported descriptive prevalence estimates on antenatal depression. The review, however, found only two studies from South Asia (India and Pakistan) and was limited in scope and methodological approaches in terms of search strategy, quality appraisal and synthesis.

Our systematic review and meta-analysis aimed to derive a pooled estimate of the prevalence of antenatal depression in South Asia and to examine variations by individual country and study characteristics to inform policy, practice and future research.

METHODS

Search strategy and selection criteria

The review followed the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA) guidelines.[18] We conducted a comprehensive search of the following 13 databases: PubMed, Science Direct, Scopus, Web of Science, PsycINFO, CINAHL, Global Health, Bangladesh Journals Online, Indian Citation Index, Index Medicus for South-East Asia

Region, LILACS, Nepal Journals Online, and PakMediNetfor articles published between 1·1·2007and 31·5·2018. Additional sources searched included Google Scholar, authors' institutional libraries, conference proceedings, and the reference list of identified articles and reports. Key journals from the region such as the Asia Pacific Journal of Public Health, World Health Organization South-East Asia Journal of Public Health, and Journal of South Asian Development were also hand searched for potentially relevant articles.

South Asian countries were classified according to the World Bank classification and included Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka.[19]A combination of text words and MeSH terms were used to conduct the searches as follows: (prevalen* OR occurren* OR inciden* OR frequen* OR rate*) AND (antenatal* OR prenatal OR perinatal OR antepartum OR maternal OR pregnan*) AND (depress* OR mood disorder*) AND (South Asia* OR Afghan* OR Bangladesh* OR Bhutan* OR India* OR Maldiv* OR Nepal* OR Pakistan* OR Sri Lanka*).

Studies were included if they have reported quantitative prevalence estimates of antenatal depression using a validated diagnostic/ screening tool in any of the South Asian countries between 1·1·2007and 31·5·2018.Studies conducted in specific groups such as pregnant women living with Human Immunodeficiency Virus or any chronic diseases were excluded. The screening was conducted in two stages. The first stage involved screening the titles and abstracts for relevance followed by the retrieval of the full texts of all 'included' and 'may be included' articles. In stage 2, a comprehensive assessment of the full-text articles was undertaken.

Quality appraisal and data extraction

The selected studies were critically appraised for methodological quality using a modified version of 'Guidelines for evaluating prevalence studies[20] which consists of eight items (Box 1). The quality assessment was done on three main domains: sampling, measurement and analysis. These three domains were further divided into sub-categories and for each category, one point was given if the answer was 'yes', and zero points for the answer 'no'. Two authors (RM, SP) rated the methodological quality of each of the reviewed studies, calculating a total score for each study ranging from 0-8. Studies that achieved a score of 0-2 were regarded as of 'low quality'; a score of 3-5 were regarded as of 'moderate quality'; and a score of 6-8 were regarded as 'high quality'. Alongside quality appraisal, each study was assessed for the risk of bias using a modified risk of bias tool for prevalence studies[21] and was rated as high or low risk of bias for each component in the tool.

To extract data, a sample data extraction form from the Centre for Reviews and Dissemination(CRD), University of York (https://www.york.ac.uk/media/crd/Systematic_Reviews.pdf) was adapted and employed. Following data were extracted: study characteristics - authors, year of publication, aims and objectives, design, setting, and duration; methodological characteristics - sample size and response rate, sampling method, data collection method; and outcome measures particularly prevalence estimates of antenatal depression. Two reviewers (RM, SP) undertook the data extraction, with RM taking the lead in extracting data from the articles and SP cross-checking for accuracy.

Box1 Criteria for assessment of study quality

Sampling (maximum score = 3)

1. Was the target population defined clearly by shared characteristics such as age, sex, language, ethnicity, income and residency?
2. Was probability sampling including sampling frame used to identify potential respondents?
3. Were the characteristics of respondents match the target population and was the response rate higher than 80%?

Measurement (maximum score = 3)

1. Was the data collection method standardized, including identical methods of assessment with all the respondents, interviewer training and supervision?
2. Were the study instruments reliable?
3. Were the study instruments valid?

Analysis (maximum score = 2)

1. Were special features such as design-effect of the sampling design accounted for in the analysis?
2. Was the study included confidence intervals for statistical estimates or the information needed to calculate them?

Statistical analysis

Meta-analysis was conducted to estimate the pooled prevalence and forest plot was generated using prevalence data for South Asia as a whole and for individual countries with 95% CI. Heterogeneity was assessed across studies using I^2 statistics; I^2greater than 50% indicated substantial heterogeneity.[22]We used a random-effects model to combine prevalence data of

individual studies, assuming that variance exists between individual studies.[23]Sub-group analysis was conducted to assess the sources of heterogeneity, using univariate comparisons and meta-regression. First, we tested individual associations between the pooled estimate and the following covariates: individual countries, study settings, screening instruments, study quality, sampling strategies and risk of bias. Significant covariates (R^2 not equal to zero) were entered into a multivariate meta-regression model. Publication bias was assessed using funnel plot in which log-transformed prevalence rates were plotted against standard error and Egger test. The 'Meta' package 4·9-2 and 'Metafor' package 2·0-0 in R statistical software and R Studio as Integrated Development Environment was used for the meta-analysis.[24]

Ethics approval was obtained from the Institute for Health Research Ethics Committee at the University of Bedfordshire. A review protocol was developed and published (PROSPERO 2017 CRD42017078795).

Public and patient involvement

No patients or public were involved in formulating the research question, defining the outcome, analysis and interpretation, or writing up of results. No data were directly collected from patients during the course of the study. Where possible, results of the study will be disseminated to the public and patient community by the authors.

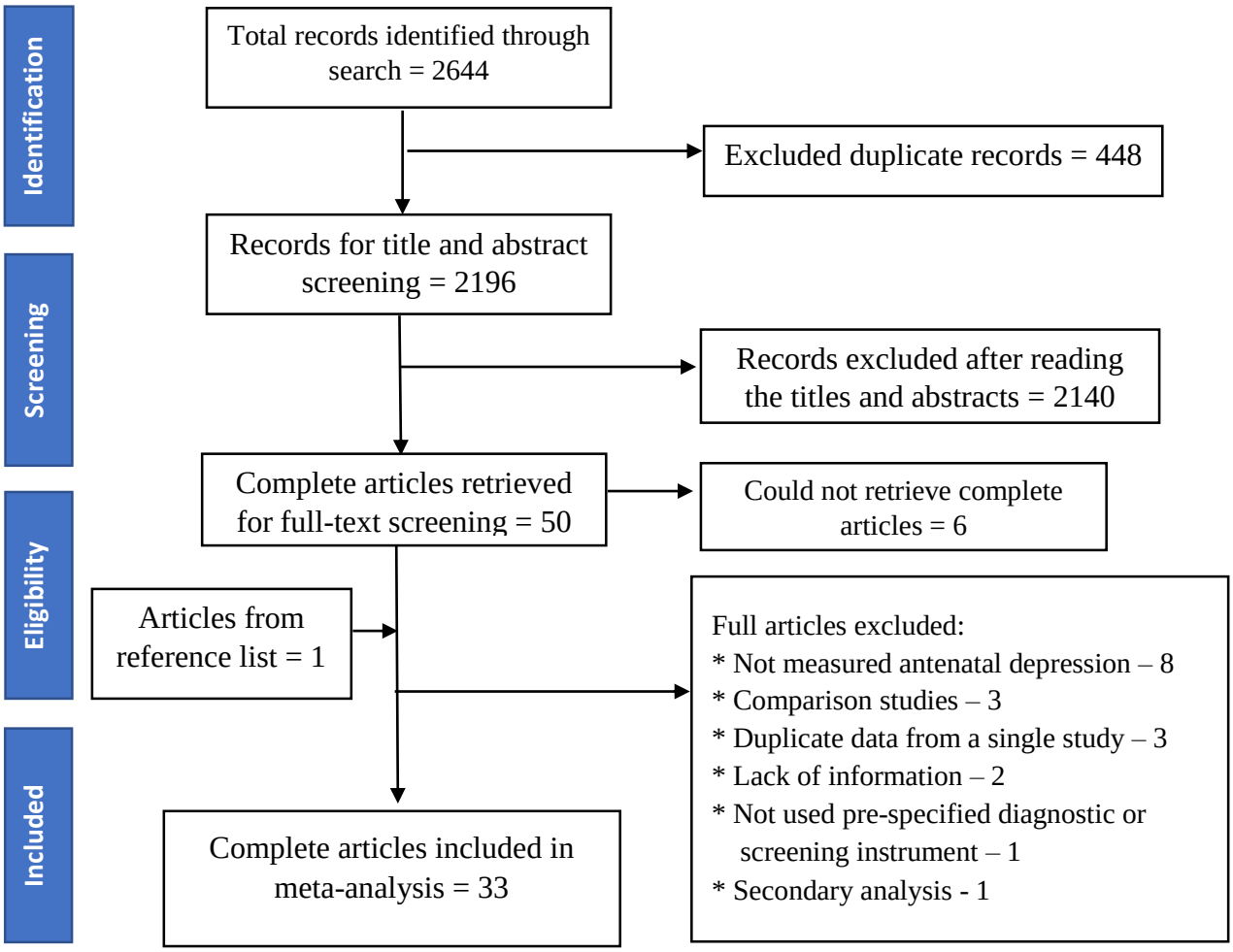
RESUTLS

Characteristics of included studies

The initial search process produced 2,644titles and 2,196 records were retrieved after removing duplicates (Figure 1). After the exclusion of 2,140 articles due to discordance with the inclusion criteria, 56 articles were identified for full-text screening of which full texts of six articles were inaccessible. One additional full text article was retrieved following reference list searches. Fifty one full-text articles underwent stage 2 screening and 33 were selected[25-57]after further

exclusions of 18due to the following reasons: not reported antenatal depression prevalence (*n* = 8); comparison studies (*n* = 3); duplicate publication from a single study (*n* = 3); inadequate information to measure prevalence of antenatal depression (*n* = 2); not used a standardised diagnostic or screening instrument (*n* = 1), and situation analysis using secondary data (*n* = 1).

Figure 1 Flow diagram of the study selection process



Majority of the studies were conducted in Pakistan (14), followed by India (12). Fewer studies were conducted in Bangladesh (3), Sri Lanka (2), Maldives (1) and Nepal (1). There were no studies from Afghanistan and Bhutan. Majority (25) of the studies were cross-sectional studies whereas seven studies[25,26,34,48,50,53,54] used a prospective cohort design to determine the prevalence.

The participants included 13,087 pregnant women reported in 33 studies. The overall sample size in individual studies ranged from45to1400. Among the 13studies that reported sampling methods, three used simple random sampling,[32,41,49]oneused stratified random sampling,[51]and the remaining used either cluster or convenient sampling techniques. Participants were recruited from a health facility such as a hospital or antenatal clinic in 26studies.[25,26,28-31,33-48,50,53,56,57] Among the rest, six studies[27,32,49,51,54,55] recruited pregnant women from the community and one study[52]recruited women from both community and health-facility. Edinburgh Postnatal Depression Scale (EPDS) was the most frequently used screening tool reported in 17 studies.[26,27,29,30,32,34,35,37,40,42,43,47-49,51,53,54] Other tools included Beck Depression Inventory (BDI),[41]Hospital Anxiety Depression Scale (HADS),[28,38,44,45,56] the Aga Khan University Anxiety Depression Scale (AKUADS),[46,55] Kessler Psychological Distress Scale (K-10),[25,39] the Montogomery and Asberg Depression Rating Scale (MADRS),[36]Hamilton Depression Scale (HAM-D),[50,57]Centre for Epidemiological Studies – Depression (CES-D) Scale,[52] Patient Health Questionnaire (PHQ-9),[33] and Depression Anxiety Stress Scale (DASS-42).[31] There were variations in the threshold scores for identifying antenatal depression both among the tools used and among the studies that used the same tool. The cut-off score ranged from 9 to 13 for EPDS (Table 1).

Fourteen studies included pregnant women in all three trimesters, while ten studies sampled pregnant women in their third trimester only. A few studies recruited pregnant women in either first (n = 1) or second (n = 3) or first and second (n = 1), or second and third (n = 4) trimesters. Based on the quality appraisal scores (Supplementary Table S1) [INSERT A LINK TO SUPPLEMTNARY TABLE S1 HERE], nearly one third of the included studies were rated as of high quality, and the remaining 21 studies were moderate quality (Table 1).

[INSERT TABLE 1 HERE]

Table 1 Summary of study characteristics

Study	Country	Study setting	Study design	Study instrument and cut-off score	Pregnancy trimester	Total participants	No. of women with depression	Study quality
Shakya et al, 2008[57]	Nepal	Health-facility	Cross-sectional	HAM-D Score >7	All three	44	22	Moderate
Hamid et al, 2008[56]	Pakistan	Health-facility	Cross-sectional	HADS Score not reported	All three	100	18	Moderate
Karmaliani et al, 2009[55]	Pakistan	Community	Prospective cohort	AKUADS Score ≥13	Second	1369	246	High
Gausia et al, 2009[54]	Bangladesh	Community	Prospective cohort	EPDS Score ≥10	Third	361	119	High
Imran and Haider, 2010[53]	Pakistan	Health-facility	Prospective cohort	EPDS Score >12	Third	213	91	Moderate
Zahidie et al, 2011[52]	Pakistan	Both	-	CES-D Score ≥16	Second	375	229	Moderate
Shah et al, 2011[51]	Pakistan	Community	Cross-sectional	EPDS Score ≥ 3	All three	128	60	Moderate
Sadaf et al, 2011[50]	Pakistan	Health-facility	Prospective cohort	HAM-D Score not reported	All three	150	15	Moderate
Nasreen et al, 2011[49]	Bangladesh	Community	Cross-sectional	EPDS Score ≥10	Third	720	132	High
Husain et al, 2011[48]	Pakistan	Health-facility	Cohort	EPDS Score ≥12	Third	1357	350	Moderate

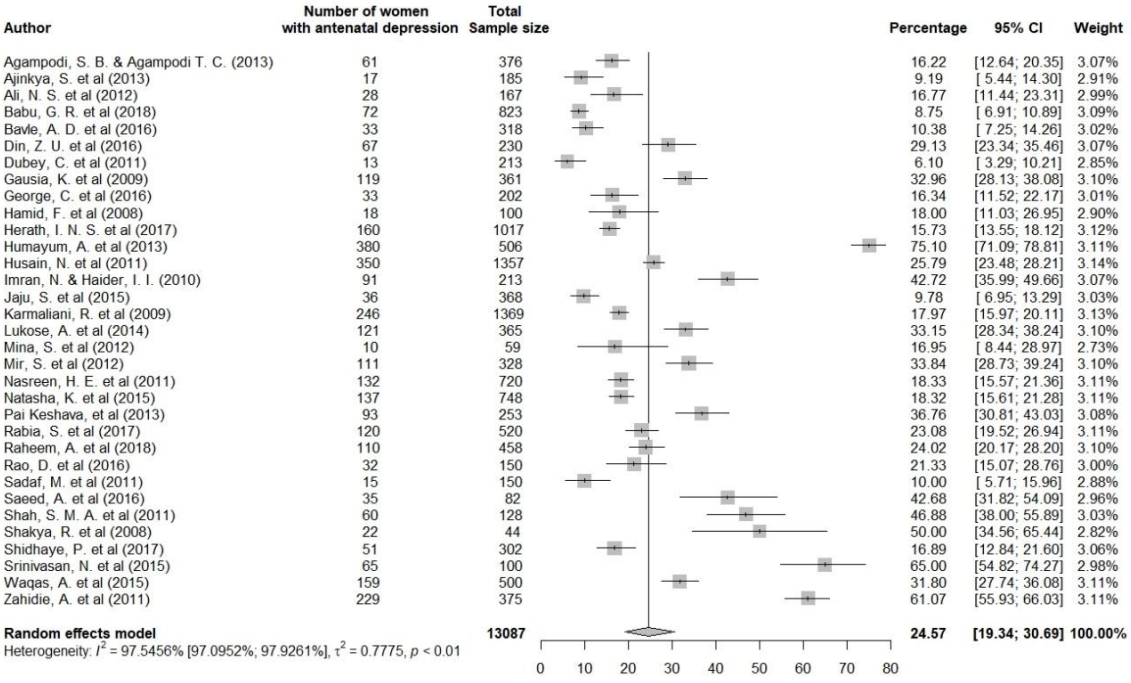
Dubey et al, 2011[47]	India	Health-facility	Cross-sectional	EPDS Score ≥10	Third	213	13	Moderate
Mir et al, 2012[46]	Pakistan	Health-facility	Cross-sectional	AKUADS Score >13	Second & third	328	111	High
Mina et al, 2012[45]	India	Health-facility	Cross-sectional	HADS Score ≥11	Third	59	10	Moderate
Ali et al, 2012[44]	Pakistan	Health-facility	Cross-sectional	HADS Score ≥ 8	All three	167	28	Moderate
Pai Keshava et al, 2013[43]	India	Health-facility	Cross-sectional	EPDS Score ≥13	All 3	253	93	Moderate
Humayum et al, 2013[42]	Pakistan	Health-facility	Cross-sectional	EPDS Score ≥10	Third	506	380	Moderate
Ajinkya et al, 2013[41]	India	Health-facility	Cross-sectional	BDI Score ≥17	All three	185	17	High
Agampodi&Agampodi, 2013[40]	Sri Lanka	Health-facility	Cross-sectional	EPDS Score >9	Second & third	376	61	High
Lukose et al, 2014[39]	India	Health-facility	Cross-sectional	K-10 Score ≥ 6	First	365	121	Moderate
Waqas et al, 2015[38]	Pakistan	Health-facility	Cross-sectional	HADS Score ≥ 8	All three	500	159	Moderate
Srinivasan et al, 2015[37]	India	Health-facility	Cross-sectional	EPDS Score ≥13	All three	100	65	Moderate
Natasha et al, 2015[36]	Bangladesh	Health-facility	Cross-sectional	MADRS Score ≥13	First & second	748	137	Moderate
Jaju et al, 2015[35]	India	Health-facility	Cross-sectional	EPDS Score ≥12	Third	368	36	High

Saeed et al, 2016[34]	Pakistan	Health-facility	Prospective cohort	EPDS Score ≥9	Second	82	35	High
Rao et al, 2016[33]	India	Health-facility	Cross-sectional retrospective	PHQ-9 Score ≥5	Second & third	150	32	High
George et al, 2016[32]	India	Community	Cross-sectional	EPDS Score ≥ 10	All three	202	33	High
Din et al, 2016[31]	Pakistan	Health-facility	Cross-sectional	DASS-42 Score ≥ 9	Third	230	67	Moderate
Bavle et al, 2016[30]	India	Health-facility	Cross-sectional	EPDS Score ≥10	All three	318	33	Moderate
Shidhaye et al, 2017[29]	India	Health-facility	Cross-sectional	EPDS Score >12	All three	302	51	Moderate
Rabia et al, 2017[28]	Pakistan	Health-facility	Cross-sectional	HADS Score >8	All three	520	120	Moderate
Herath et al,2017[27]	Sri Lanka	Community	Cross-sectional	EPDS Score >9	Second & third	1017	160	High
Raheem et al, 2018[26]	Maldives	Health-facility	Cohort	EPDS Score ≥13	Third	458	110	High
Babu et al, 2018[25]	India	Health-facility	Cohort	K-10 Score ≥20	All 3	823	72	Moderate

Primary outcomes

Among the 13,087 pregnant women included, 3,226 were identified as depressed with prevalence rates ranging from 6·1% in India[47] to 75·1% in Pakistan.[42] The pooled prevalence of antenatal depression was 24·57% (CI: 19·34, 30·69; Figure 2). Higgins I^2= 97·55% showed the presence of substantial heterogeneity between individual studies.

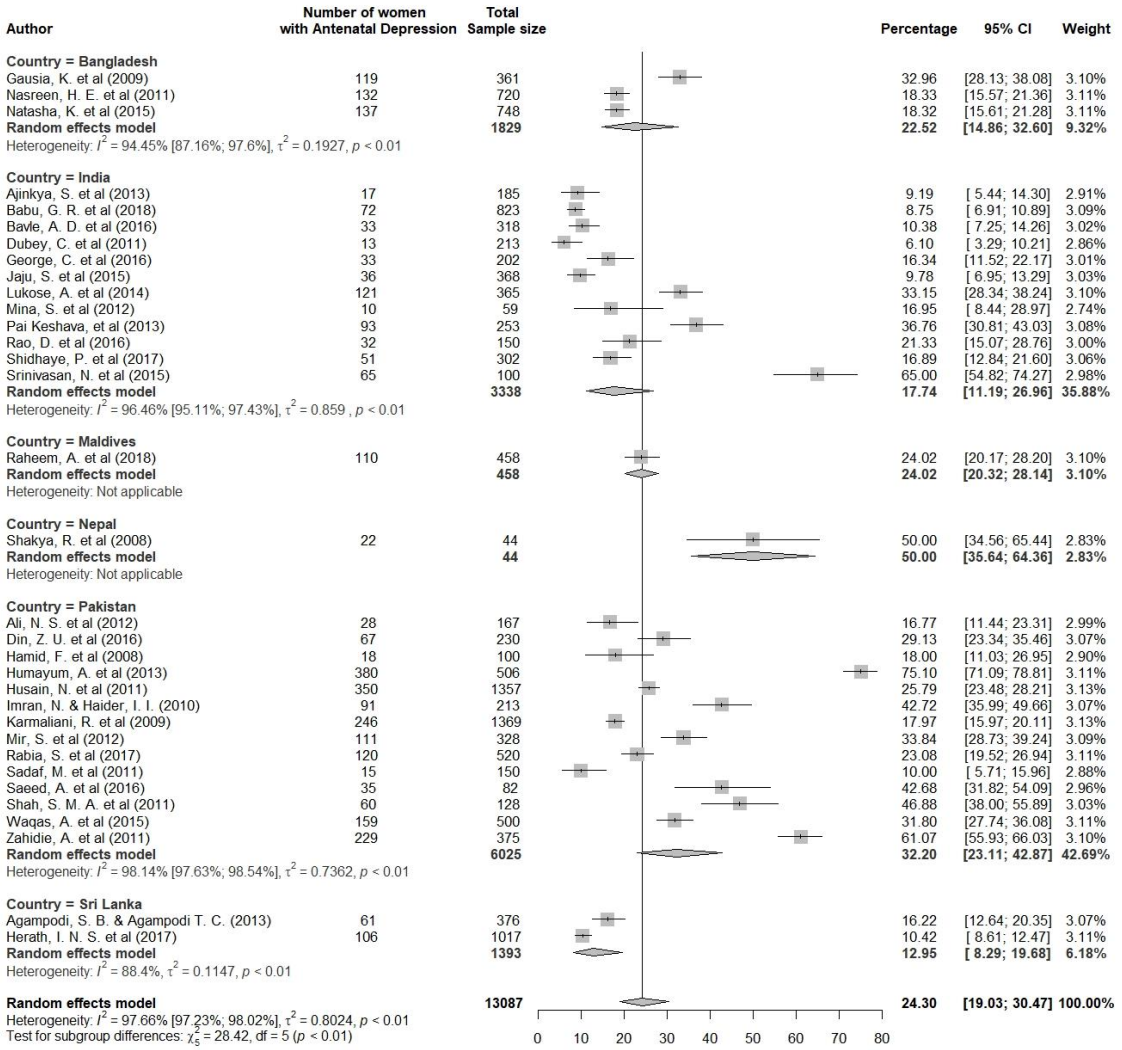
Figure 2 Pooled prevalence of antenatal depression in South Asia



The pooled prevalence for individual countries, except Maldives (24·02%, CI:20·32, 28·14) and Bangladesh (22·52%, CI: 14·86, 32·6), showed substantial variations compared with the overall pooled prevalence. Compared with the overall pooled prevalence, the estimates for India (17·74%, CI: 11·19, 26·96) and Sri Lanka (15·87%, CI: 14·04,17·88) were lower

whereas the estimates for Pakistan (32·2%, CI: 23·11,42·87) and Nepal (50%, CI: 35·64,64·36) were higher (Table 2; Figure 3).

Figure 3 Prevalence of antenatal depression by country in South Asia



There was no significant difference in pooled prevalence between studies conducted in health-facilities (23·75%) and community settings (23·15%) (Table 2). The pooled prevalence was higher, but not significantly, for studies using EPDS (26·29%) as the screening instrument

compared with studies that have used HADS (21·82%), AKUADS (24·98%), HAM-D (24·93%) and other instruments (22·86%) such as K-10, CES-D-20, PHQ-9, BDI, MADRS and DASS-42) (Table 2).

The pooled prevalence from high-quality studies was lower [20·12% (CI: 15·36, 25·91), 12 studies, *n* = 5616] compared with moderate quality studies [27·42% (CI:19·62, 36·89), 21 studies, *n* = 7471]. None of the included studies used nationally representative samples. Of the thirteen studies that have reported sampling strategies, pooled prevalence was lower for studies that used simple random sampling (14·66%) and cluster sampling (15·87%) compared to studies that used convenient sampling 34·91%) and stratified random sampling (46·88%) techniques. Exclusion of studies with higher risk of bias lowered the prevalence estimates to 15·87% (CI: 8·57-27·5) and 19·88% (CI: 14·72,26·3) respectively. (Table 2).

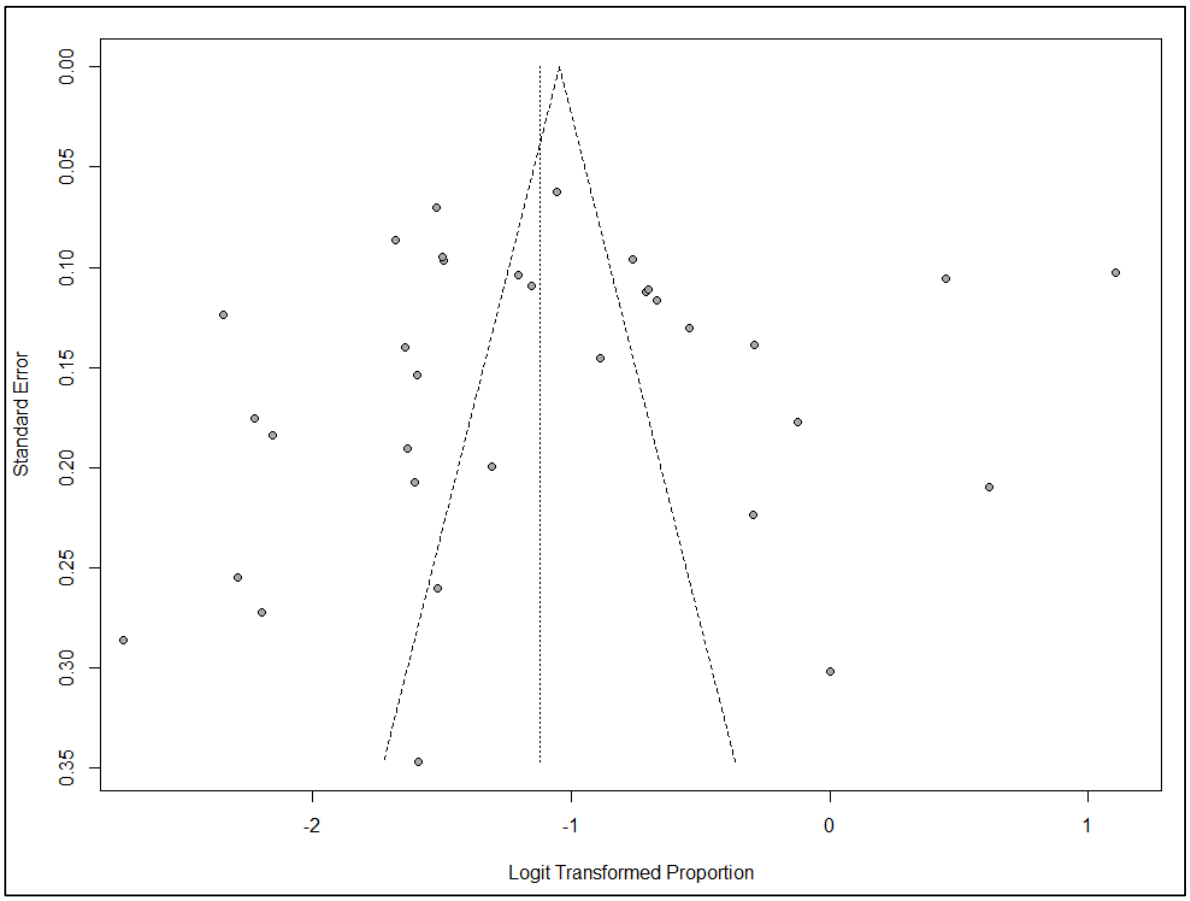
Table 2 Sub-group analysis of the prevalence of antenatal depression in South Asia

Study characteristic	No. of women	No. of studies	Pooled prevalence (%)	95% CI
All	13087	33	24·57	19·34- 30·69
Country				
Bangladesh	1829	3	22·52	14·86- 32·6
India	3338	12	17·74	11·19- 26·96
Maldives	458	1	24·02	20·32- 28·14
Nepal	44	1	50	35·64- 64·36
Pakistan	6025	14	32·2	23·11- 42·87
Sri Lanka	1393	2	15·87	14·04- 17·88
Setting				
Health-facility	8915	26	23·75	17·91- 30·69
Community	3797	6	23·15	15·49- 33·1
Both	375	1	61·07	56·03- 65·87
Screening instrument				
EPDS	6974	17	26·29	18·03- 36·64
HADS	1346	5	21·82	16·5- 28·28
AKUADS	1697	2	24·98	12·67- 43·33
HAM-D	194	2	24·93	3·71- 74·09
Other instruments	2876	7	22·86	12·59- 37·86
Study quality				

Moderate	7471	12	20·12	15·36- 25·91
High	5616	21	27·42	19·62- 30·69
Sampling strategy				
Simple random sampling	1107	3	14·66	9·89- 21·2
Stratified random sampling	128	1	46·88	38·41- 55·53
Cluster sampling	1393	2	15·87	14·04- 17·88
Convenient sampling	2014	7	34·91	24·81- 46·57
Not reported	8445	20	23·28	16·5- 31·77
Risk of bias in sampling				
Low	2121	6	15·87	8·57- 27·5
High	10966	27	26·87	20·89- 33·83
Risk of bias in reliability and validity of instruments				
Low	5015	11	19·88	14·72- 26·3
High	8072	22	27·18	19·76- 36·12

A high degree of heterogeneity (I^2 = 97·55%) was seen in included studies. Initial univariate regression analysis (Supplementary Table S2) [INSERT A LINK TO SUPPLEMTNARY TABLE S2 HERE] guided the selection of covariates for inclusion in the meta-regression model. The final meta-regression model quantified the impact of country, study setting, study quality, risk of bias and the reliability and validity of the study instruments on prevalence of antenatal depression. The attributable variance to these covariates was 16% (R^2=16%, p<0.1) (Supplementary Table S2). The analysis showed country, study setting and risk of bias in sampling method as statistically significant sources of heterogeneity on prevalence estimates while study quality and risk of bias in reliability and validity of study instruments were not statistically significant. Both the funnel plot (Figure 4) and Egger test (p = 0·722) showed evidence of publication bias.

Figure 4 Funnel plot of publication bias



DISCUSSION

To our knowledge, this is the first systematic review and meta-analysis that has quantitatively synthesised the prevalence of antenatal depression in South Asia and for individual countries in the region from estimates derived using a comprehensive search. We found an overall pooled prevalence of 24·57% (CI: 19·34, 30·69), with the rates ranging from 6·1% to 75·1% in individual studies. The overall prevalence found in our meta-analysis was higher compared to existing global estimates as well as estimates from low- and middle-income countries for perinatal mental disorders in general.[1,8,58] For example, globally approximately 10% of pregnant women were estimated to suffer from depression,[1]with prevalence rates of 15·6% in low- and lower-middle income countries.[8] A recent meta-analysis has reported a 19·2% prevalence of antenatal depression in low- and middle-income countries.[58]The higher

prevalence found in our meta-analysis may reflect a high prevalence of risk factors within the pregnant population of the region as a whole. The South Asia region includes both low and middle-income countries, and the rampant poverty in the region coupled with factors such as food insecurity, inadequate housing, low socio-economic status, high cost of living, financial stress, breakdown of traditional family structures and increased out-of-pocket expenditure on health care could all be risk factors in this respect.[59]We found variations in pooled prevalence rates when study quality was taken into consideration. Two thirds of the included primary studies were of moderate methodological quality with a high risk of selection and measurement bias. We also found substantial heterogeneity among the included studies that could be attributed to the variations in methodological approaches including sample size, sampling approach, study setting and the characteristics of pregnant women such as age, socio-economic status and level of education, pregnancy trimester, and previous history of psychiatric illnesses although the information was not reported in some studies.[60]

With respect to individual countries, India and Sri Lanka had lower rates compared to the overall prevalence for the region whereas the rates for Pakistan and Nepal were higher. The variation in rates with respect to individual countries appeared to correspond with their progress in terms of overall maternal health indicators.[61] We found very little difference in the pooled prevalence rates between studies conducted in health-facilities and community settings. The pooled prevalence was higher, but not significantly, for studies that used EPDS as the screening instrument compared with studies that have used other instruments and with the overall pooled prevalence rate. However, the estimated pooled prevalence from studies conducted in Sri Lanka with EPDS as study instrument with low cut-off scores of 9 was significantly lower compared to the overall pooled prevalence. There were wide variations in prevalence rates in individual studies from India that used the EPDS tool ranging from 9.78% to 65% with an

overall pooled prevalence of 17.74%. The variations could be attributed to different cut-off scores used in different studies. While it is evident that various screening tools for antenatal depression produce broader rates overall[62], it has been argued the tool's sensitivity improves when used with lower cut-off scores.[63] Although EPDS is one of the most widely used screening tools for assessing symptoms of depression, most of the local language versions of the EPDS from non-English speaking low and middle-income countries had lower precision for identifying true cases of depression among women compared to the original English version.[64]

Although robust prevalence studies are sparse, our review indicated relatively high prevalence rates of antenatal depression which would imply that antenatal depression is of common occurrence among pregnant women in South Asia. The rigorous methodological approach followed in our study focused on a well-defined research question with a comprehensive search strategy involving a wide range of international and regional databases and other grey literature sources, clear inclusion and exclusion criteria, and structured data extraction and quality assessment using standardised techniques make our findings robust and reliable. The methodological precision was also enhanced by the use of PRISMA guidelines.[18]

The review has certain limitations, however. More than three fourth of the included studies were confined to two countries, India and Pakistan. A few studies were conducted in other countries with the exception of Afghanistan and Bhutan where we could not identify any eligible studies for inclusion. This points to an important evidence gap, but the lack of evidence from some counties may limit the generalisability of the findings to the region as a whole. Many of the included studies were of moderate methodological quality with high risk of bias although we were able to carry out sub-group analysis to assess how the risk of bias influenced the results.[23] There was also significant heterogeneity across the studies, and this should be

taken into consideration while interpreting the pooled estimates to draw overall conclusions. [22,61] Although no language restriction was applied in our search, all the eligible studies were published in English which might imply inadvertent exclusion of relevant papers published in other languages. This is likely to be minimum as English is the official language in the region.

CONCLUSION

Our meta-analysis concludes that antenatal depression can be argued to be a significantly prevalent issue in South Asia based on available data, likely to be experienced by one in four pregnant women. However, determining an overall, synthesised accurate prevalence rate of antenatal depression in this region based on existing evidence presents a challenge due to the lack of evidence from some countries and the wide-ranging and, in many cases, problematic methodological approaches adopted by some studies. The findings from this review have important implications for a range of stakeholders such as planners, policymakers, academics and researchers in medical and public health both at regional and individual country levels towards developing appropriate preventive, diagnostic, and treatment interventions for antenatal depression and calls for increased investment to improve maternal mental health in South Asian countries.

The study shows that there is a dearth of robust nationally representative data in many of the countries of the region to inform concerted action to tackle the issue, especially in Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, and Sri Lanka where studies are extremely sparse. Future research should employ scientifically rigorous methodological approaches to boost our ability both to derive accurate country level prevalence estimates and to make comparisons across countries in the region as well as with other regions and countries internationally. There is also a need for more in-depth understanding of the associated cultural, social, and environmental factors of antenatal depression. Qualitative studies can be of great value in this

respect. Evidence about any existing interventions to deal with the issue in the country also appears to be very limited. Progress on both of these fronts will boost the development of local, national and regional policies and practice guidelines.

Contributors

RM and SP designed the study and SP oversaw its implementation. RM did the searches, study selection, and RM and SP did the data extraction and quality appraisal. MA developed and conducted the meta-analyses and developed the tables. RM and SP wrote the manuscript. All authors reviewed and approved the final draft of the manuscript before submission.

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Competing interests

All authors have completed the ICMJE uniform disclosure form and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Transparency Statement

The manuscript is an honest, accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

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Data Sharing Statement

As this is a systematic review and meta-analysis, the data used in the study has already been published by the authors of the included studies. Further information can be obtained from the corresponding author.

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