



Prevalence of Postnatal Depression in Fathers: A Systematic Review and Meta-Analysis

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Abstract

Background and Aim Postnatal depression (PND) can affect both genders, but the common misconception is that it only affects mothers. Increasing literature reports that 10% of the fathers experience PND after childbirth. This systematic review and meta-analysis aim to determine the pooled estimated prevalence of PND among fathers in the postnatal period and identify its risk factors.

Materials and Methods The electronic databases PubMed, ProQuest, BASE, DOAJ, ResearchGate, Semantic Scholar, and BioMed Central were searched for related open-access articles published between January 2010 and March 2021. Finally, 15 articles met inclusion criteria. A random-effects model was used to calculate pooled estimates and 95% confidence intervals.

Results The pooled prevalence of PND in fathers was 24.06%. Partner's depression, lack of social support, poor marital relationship, low income, and low education were all shown to raise the risk of PND in fathers.

Conclusion PND in fathers is a serious concern. Early identification and treatment decrease the detrimental impact on mother and child while further improving quality of life.

Keywords

- ▶ fathers
- ▶ paternal postnatal depression
- ▶ Edinburgh Postnatal Depression Scale
- ▶ prevalence
- ▶ risk factors

Introduction

Postnatal depression (PND) or postpartum depression (PPD) is a nonpsychotic depressive disorder that occurs within the first year after childbirth.¹ PND can affect both mothers and fathers, although it has been associated with mothers in particular.² However, increasing literature shows that PND is not uncommon in fathers, and 10% or 1 in 10 fathers around the world experience depression after childbirth.³ The prevalence of PND in fathers during the first year after childbirth has been found to range from 4 to 25%, with a 50% rise when the mother is also depressed.^{2,3} PND is most prevalent within 3 to 6 months postpartum.^{1,3,4} A more recent meta-estimate recorded for PND in fathers within the post-

partum period was 8.4%.⁴ This is greater than the overall male adult population's rate of depression (4.8%).³

Several factors that precipitate PND in fathers have been reported by researches including partner's depression, previous history of depression, unemployment, low education, poor marital relationship, lack of social support, and an unplanned pregnancy.^{5,6} The strongest predictor of PND in fathers was found to be their partner's depression during the postnatal period.⁶ A growing body of research suggests that fathers, like mothers, are more likely to experience PPD due to the hormonal fluctuations that occur during their partner's pregnancy and postnatal period. Lower levels of hormones, including the sex hormones testosterone and estrogen, the stress hormone cortisol, and bonding hormones vasopressin and

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prolactin, may contribute to the risk of PND in fathers.⁷ PND in fathers varies from PND in women in several respects, including clinical symptoms and onset. Fathers display greater male-specific symptoms such as indecisiveness, cynicism, avoidance behavior, anger attacks, affective rigidity, self-criticism, and irritability over low mood. Other symptoms of PND in fathers include marital conflict, partner violence, substance use, negative parenting and somatic symptoms such as indigestion, changes in appetite and weight, diarrhea, constipation, headache, toothache, nausea, and insomnia.⁷⁻⁹ These symptoms are more prevalent in fathers than in mothers,¹⁰ and they can mask depression in fathers.^{11,12} PND develops more slowly and gradually in fathers than in mothers.¹

PND has a detrimental influence on the health and well-being of both fathers and their families. Failure to fulfill obligations at home and at work, lack of interest, exhaustion, stress, and an increased risk of suicide in fathers are all negative effects of PND.^{13,14} The negative impact on their family and child includes complications in marital relationships and the development of behavioral and emotional problems in their children.⁷

Depression in fathers is often detected by using clinical diagnostic interviews and/or self-report measures. The clinical diagnostic interviews are done by using the Diagnostic & Statistical Manual of Mental Disorders (DSM-5, APA) and the International Classification of Diseases (ICD-10, WHO). DSM-5 defines PND in mothers as a major depressive disorder that begins within 4 weeks of childbirth,¹⁵ while the ICD-10 defines it as a depressive episode that occurs within 6 weeks of childbirth.¹⁶ Several researches, however, show that PND in fathers occurs throughout the first 12 months following childbirth, with the highest rates observed at 3 to 6 months postpartum,^{1,3,17} and men might display distinct depressive symptoms than women,^{10,17} which aren't in the diagnostic criteria's list.¹⁸ Self-report measures used to detect PND in fathers include Edinburgh Postnatal Depression Scale (EPDS), Beck Depression Inventory (BDI), Patient Health Questionnaire-9, and Centre for Epidemiologic Studies-Depression.⁷ These tools may be less effective in assessing PND in fathers as they are gender-biased and overlook significant symptoms that depressed fathers exhibit.¹² EPDS is the most commonly used screening tool to detect PND in mothers and it has been validated for fathers as well.⁷

There are no known comprehensive clinical interventions that have been designed especially for fathers with PND. The existing evidence suggests that fathers with PND would benefit from pharmacological and psychological therapies alone or in combination.¹⁷ Antidepressants are used to treat moderate-to-severe levels of depression in fathers. Psychological therapies for treating mild-to-moderate depression include supportive psychotherapy, cognitive behavior therapy, interpersonal therapy, and mindfulness-based interventions.¹⁹ Other interventions include educational programs for fathers and their spouses, as well as support and recognition of the father's role and feelings from other family members to reduce or prevent PND in fathers.⁷

PND in fathers is a clinically significant problem with higher community-based care costs.²⁰ Despite this, PND in

fathers is under-screened, under-diagnosed, and under-treated.²¹ Various scholars and countries have investigated PND in fathers, but it is still in its early stages in India. The goal of this review is to raise the understanding regarding PND in fathers and its associated risk factors. Thus, this review aims to determine the pooled estimated prevalence of PND in fathers and to determine its risk factors.

Methodology

The systematic review reporting follows Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) guidelines.

Search Strategy

PubMed, ProQuest, BASE, DOAJ, ResearchGate Semantic Scholar, and BioMed Central electronic databases were searched for articles published between 2010 to March 2021 by using the following terms with Boolean operators ("OR"/"AND"): "father" OR "paternal" AND "Postnatal depression" OR "postpartum depression."

Inclusion and Exclusion Criteria

Articles were chosen for inclusion based on the following criteria: 1) Journal articles that examined the prevalence of PND in fathers and its associated factors, 2) Cross-sectional research design, 3) Published in the English language, 4) Published between 2010 and October 2021, 5) Original research articles, and 6) Full free and open-access articles. Exclusion criteria were 1) Journal articles abstracts, Review articles, Commentaries, Conference Reports, and Thesis, 2) Interventional articles, 3) Duplication, and 4) Articles not relevant to the study.

Data Extraction

Two authors extracted data from the studies that were included: one extracted the data, while the other validated it. Any disagreements between the authors were settled through discussion. The data extracted from the eligible studies were year of citation, author, country, research design, sample size, response rate, recruitment setting, assessment points, assessment instrument, cutoff score, and prevalence.

Methodological Quality Assessment

Two independent authors used the Mirza and Jenkins checklist to determine the methodological quality of the included studies. The critical appraisal checklist included the following criteria: 1) clear study objectives, 2) adequate sample size (or justification), 3) representative sample (with justification), 4) clear inclusion and exclusion criteria, 5) depression measure used is reliable and valid, 6) reported response rate and/or losses explained, 7) adequate description of data, 8) appropriate statistical analyses, and with additional criterion 9) appropriate informed consent.²² Each criterion of the checklist is answered by "yes" (1 point) or "no" (no point). Based on the points obtained by the studies were graded between 1 and 9. Regardless of their quality, all of the studies were included.

Data Analysis

In this review, the random-effects model was used to estimate the pooled prevalence of PND in fathers with a 95% confidence interval (CI). The heterogeneity of the included studies was measured by using I^2 statistics. Visual assessment of a funnel plot and Egger's regression test was used to detect publication bias.

Results

Search Results and Inclusion of Articles

A total of 2,857 articles were found through a database search. A total of 2,769 articles were excluded after an initial screening for a variety of reasons (►Fig. 1). A total of 43 full-text articles were chosen and screened against inclusion criteria. Finally, 15 articles met the inclusion criteria.

Study Characteristics

All the 15 cross-sectional studies selected²³⁻³⁷ investigated the prevalence of PND and its associated factors. Included studies were conducted in India (3)^{25,28,29} Iran (2),^{23,26} Japan (1),²⁴ Italy (1),²⁷ Sweden (1),³⁰ Ethiopia (1),³⁵ Saudi Arabia (3),^{33,34,36} Ireland (1),³¹ Chile (1),³² and China (1).³⁷ The key features of the studies included are briefly listed in ►Table 1.

Quality Assessment

According to the previously stated criterion, the quality of the included studies varied from 7 to 9 out of a possible maximum of 9, suggesting that these studies were of high methodological quality in general. ►Table 2 summarizes the findings of this assessment.

Description of Study Subjects

Only fathers were the research subjects in 10 of the 15 studies,^{23,25,26,30,31,33-37} while couples were the study subjects in the remaining studies.^{24,27,28,32}

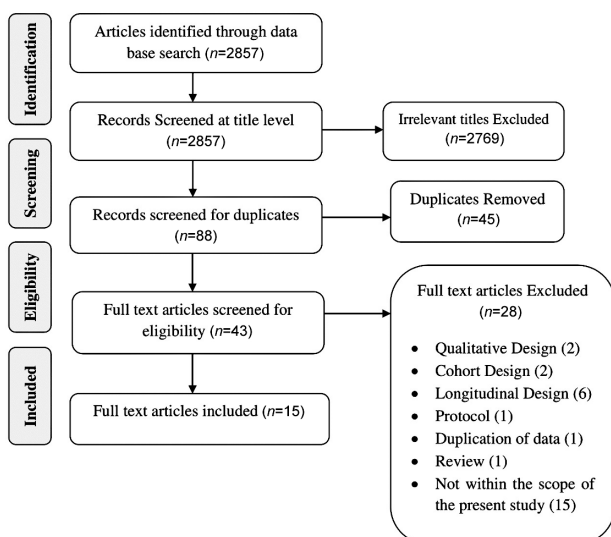


Fig. 1 Literature search flow chart based on PRISMA.

Sample Size and Sampling Technique

In studies with only fathers as a sample, the sample size ranged from 100 to 80,112^{23,25,26,30,31,33-36} and in studies with couples as a sample, the sample size ranged from 75 to 2032^{24,27-29,32}. Four of the 15 studies used probability sampling techniques,^{23,31,33,35} five used nonprobability sampling techniques,^{25,26,28,29,34} and the others did not mention.

Study Setting

The studies included in this review varied in terms of the time and setting in which participants were recruited. The participants of the studies were recruited at different time points from childbirth to 12 months of postpartum. Participants were recruited in five studies within 3 months of postpartum.^{23,26-28,36} Three studies between 3 and 6 months,^{24,25,30} four studies between birth and 12 months,^{31,32,34,35} and two studies within 6 months of childbirth.^{33,37} Eleven studies recruited a sample from institutional-based setting,^{23,25-28,32-37} and four studies from community-based setting.^{24,29-31}

Tool Used to Measure Paternal Postnatal Depression

The EPDS was used in all of the studies to screen fathers for PND. However, the cutoff score for the PND screening varied. For positive PND screening, five studies used an EPDS cutoff score of more than or equal to 12,^{23,26,27,30,31} six studies used a cutoff score of more than or equal to 10,^{29,30,32-37} three studies used a cutoff score of more than or equal to 9,^{25,31,34} two study used a EPDS cutoff score of more than or equal to 8,^{24,33} and one study used an EPDS cutoff score of more than or equal to 11.²⁸ The BDI with a cutoff score of 13/14³² and the Gotland Male Depression (GMD) Scale with a cutoff score of more than or equal to 13³⁰ were also used as screening measures. To compare the screening findings, two studies used the BDI and GMD with EPDS.^{30,32} After screening with EPDS, one study used the DSM-5 to determine a PND diagnosis.³³

Prevalence of Postnatal Depression

The Pooled Prevalence of Postnatal Depression

Fifteen studies with a total of 13285 fathers were examined. The prevalence of PPD in the included studies ranged between 5.7 and 59.8%.²³⁻³⁷ The pooled prevalence of PPD in fathers was estimated to be 24.06% (95% CI: 19.35, 28.77; ►Fig. 2). The studies included in the review had a high degree of heterogeneity between them ($I^2 = 97%$, $p < 0.00001$).

Subgroup Analysis

Subgroup Analysis: Pooled Prevalence of PND among Fathers in India and Other Countries

The pooled prevalence of PND among fathers in India was 19.41%^{25,28,29} (95% CI: 16.74, 22.08), whereas the pooled prevalence of PND among fathers in Saudi Arabia was 25.31%^{33,34,36} (95% CI: 12.69, 20.51) and Iran it was 35.72%^{23,26} (95% CI: 11.42, 82.86). The studies that were included for PND

Table 1 Methodological characteristics of studies included in the systematic review

Study	Study design	Sample size	Study setting	Time of data collection (postpartum)	Study tool	Cutoff score	Prevalence
Kamalifard et al, ²³ Iran, 2014	Cross-sectional	230 fathers	Institution	At 6–12 week	EPDS	≥ 12	11.7%
Nishimura et al ¹ Japan, 2015	Cross-sectional	2,032 couples	Community	At 4 months	EPDS	≥ 8	13.6. %
Thilagavathy ²⁵ India, 2015	Cross-sectional	129 fathers	Institution	At 4–5 months	EPDS	9	59%
Ahmadi et al, ²⁶ Iran, 2015	Cross-sectional	328 fathers	Institution	At 8th week	EPDS	> 12	59.8%
Epifanio et al, ²⁷ Italy, 2015	Cross-sectional	75 couples	Institution	At first month	EPDS	> 12	5.7%
Goyal et al, ²⁸ India, 2017	Cross-sectional	480 couples	Institution	At 48 hours	EPDS	>11	12.94%
Salian and Shah, ²⁹ India, 2017	Cross-sectional	128 couples	Community	Not mentioned	EPDS	>10	30%
Carlberg et al, ³⁰ Sweden, 2018	Cross-sectional	8,011fathers	Community	At 3–6 months	EPDS GMDS	≥ 10 ≥ 13	13.3% 8.6%
Philpott and Corcoran ³¹ Ireland, 2018	Cross-sectional	100 fathers	Community	Up to 12months	EPDS	≥ 9	28%
Pérez et al, ³² Chile, 2018	Cross-sectional	382 couples	Institution	At 2 months	EPDS BDI	≥ 10 13/14	18.5 10.5
Shaheen et al, ³³ Saudi Arabia, 2019	Cross-sectional	347 fathers	Institution	Up to 6 months	EPDS DSM-5	8/9	16.6%
AlHaisoni and Ayman, ³⁴ Saudi Arabia, 2019	Cross-sectional	226 fathers	Institution	Up to12 months	EPDS	≥ 9	32.7%
Markos and Arba ³⁵ Ethiopia, 2020	Cross-sectional	423 fathers	Institution	Above 4 weeks	EPDS	≥10	17%
Alghamdi et al, ³⁶ Saudi Arabia, 2020	Cross-sectional	182 fathers	Institution	At 4–8 weeks	EPDS	>10	27.3%
Cui et al, ³⁷ China, 2021	Cross-sectional	212 fathers	Institution	Up to 6 months	EPDS	10	24.1%

Abbreviations: BDI, Beck Depression Inventory; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; EPDS, Edinburgh Postnatal Depression Scale; GMDS, Gotland Male Depression Scale.

prevalence estimates in India ($I^2=98\%$; $p<0.00001$), Saudi Arabia ($I^2=91\%$, $p<0.00001$), and Iran ($I^2=97\%$, $p<0.00001$) had higher heterogeneity.

Subgroup Analysis Based on the Time of Data Collection

The pooled prevalence of PND in fathers was found to be 19.26% (95% CI: 17.32, 21.21) within 3 months after the childbirth,^{23,26–28,36} 13.64% (95% CI: 12.98, 14.30) between 3 and 6 months^{24,25,30} and 18.97% (95% CI: 15.73, 20.21) within 6 months,^{33,37} and 20.60% (95% CI: 18.26, 22.93) from birth up to 12 months postpartum.^{31,32,34,35} There was a substantial heterogeneity in the studies that were included for PND prevalence estimates between birth and 3 months ($I^2=99\%$, $p<0.00001$), 3 to 6 months ($I^2=98\%$, $p<0.00001$), birth to 6 months ($I^2=78\%$, $p=0.03$), and birth to 12 months postpartum ($I^2=87\%$, $p<0.0001$). PND was shown to be more prevalent in fathers within the first year after childbirth, with the highest prevalence occurring within 3 months after childbirth.

Subgroup Analysis of the Prevalence of PND in Fathers Based on the Setting of the Study

The pooled prevalence of PND among fathers was 19.46% (95% CI: 18.09, 20.83) for the studies conducted in the institution-based setting (95% CI: 13.99, 13, 59)^{23,25–28,32–37} and 13.49% for the studies conducted in the community setting (95% CI: 12.77, 14.22).^{24,29–31} Studies conducted in institutional-based settings showed significant heterogeneity ($I^2=97\%$, $p<0.00001$) as well as in the community setting ($I^2=99\%$, $p<0.00001$).

Subgroup Analysis of Pooled Prevalence of Postnatal Depression by the EPDS Cutoff Scores

Studies that utilized EPDS cutoff scores more than or equal to 9, more than or equal to 10, and more than or equal to 12 to estimate the prevalence of PND found 38.39% (95% CI: 34.07, 42.71),^{25,31,34} 14.07% (95% CI: 13.37, 14.77),^{29,30,32,35–37} and 8.80% (95% CI: 8.21, 9.38),^{23,26,27,30,31} respectively. Considerable heterogeneity was found in studies used cutoff scores more than or equal to 9 on EPDS ($I^2=94\%$, $p<0.00001$), cutoff score

Table 2 Methodological quality assessment of studies included in the systematic review

Sl. No.	Study	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	C ₉	Total score
1	Kamalifard et al ²³	1	1	1	1	1	1	1	1	1	9
2	Nishimura et al ²⁴	1	1	1	0	1	1	1	1	1	8
3	Thilagavathy ²⁵	1	0	1	1	1	1	1	1	1	9
4	Ahmadi et al ²⁶	1	1	1	0	1	0	1	1	1	7
5	Epifanio et al ²⁷	1	0	1	0	1	1	1	1	1	8
6	Goyal et al ²⁸	0	1	1	1	0	1	1	1	1	8
7	Salian and Shah et al ²⁹	1	0	1	1	1	0	1	1	1	7
8	Carlberg et al ³⁰	1	1	1	0	1	1	1	1	1	8
9	Philpott and Corcoran ³¹	1	0	1	0	1	0	1	1	1	7
10	Pérez et al ³²	1	1	1	1	1	1	1	1	1	9
11	Shaheen et al ³³	1	0	1	1	1	1	1	1	1	8
12	AlHaisoni and Ayman ³⁴	1	1	1	1	1	0	1	1	1	8
13	Markos and Arba ³⁵	1	1	1	1	1	1	1	1	1	9
14	Alghamdi et al ³⁶	1	0	1	1	1	1	1	1	1	8
15	Cui et al ³⁷	1	1	1	1	1	1	1	1	1	9

C₁-Clear study objectives; C₂-Adequate sample size or justification; C₃-Representative Sample (with justification); C₄-Clear inclusion and exclusion criteria; C₅-Depression measure used is reliable and valid; C₆-Reported response rate and /or losses explained; C₇-Adequate description of data; C₈-Appropriate statistical analyses; C₉-Appropriate informed consent.

more than or equal to 10 ($I^2 = 91\%$, $p < 0.00001$), and cutoff score more than or equal to 12 on EPDS ($I^2 = 99\%$, $p < 0.00001$).

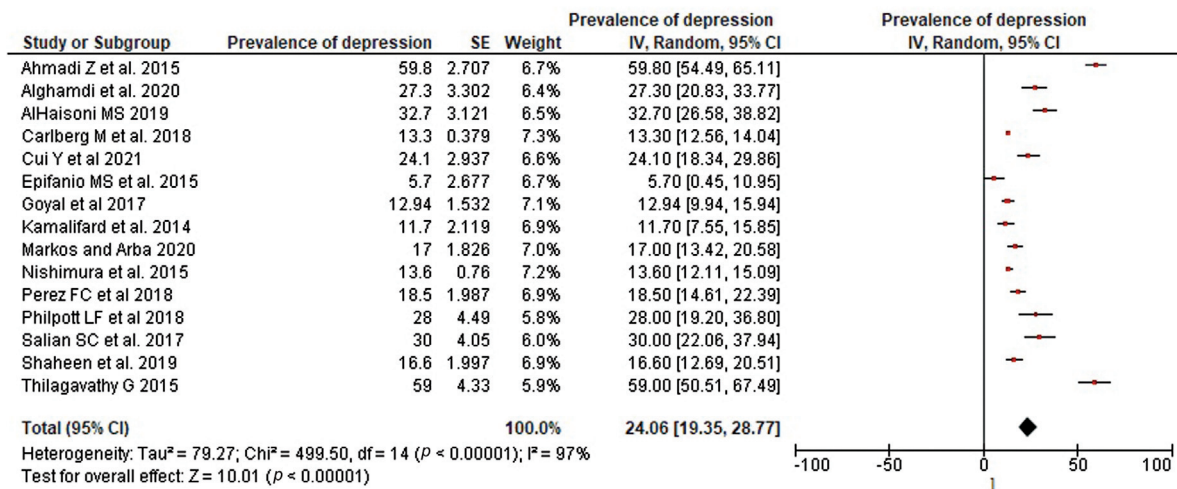
Publication Bias

Subjective visualization of the funnel plot demonstrated asymmetry (► **Fig. 3**) and p -value for Egger's test ($p = 0.015$) indicated possible publication bias.

Risk Factors

Out of 15 studies, 11^{23,24,26,28,30-33,35-37} studies reported risk factors for PND in fathers. Partner's depression,^{24,32}

lack of social support,^{23,31,35} poor marital partnership satisfaction,^{24,35,36} low income,^{30,31,35} low education,^{26,30} perceived stress,^{23,36} and infant sleep problems^{31,35} were the most frequently identified risk factors. Other factors reported were history of infertility treatment, economic anxiety, the experience of visiting medical institutions due to mental health problems,²⁴ unemployment,^{26,37} maternal distress,²⁷ family livelihood situation,²⁸ history of depression, no paternity leave,³¹ feeling isolated and disconnected from partner,³³ substance use, unplanned pregnancy,³⁵ family and work-related problems, family related problems, work-family conflict, trouble sleeping, low self-esteem,³⁶ and vulnerable personality traits.³⁷

**Fig. 2** A forest plot of prevalence of postnatal depression among fathers. CI, confidence interval; IV, intravenous; SE, standard error.

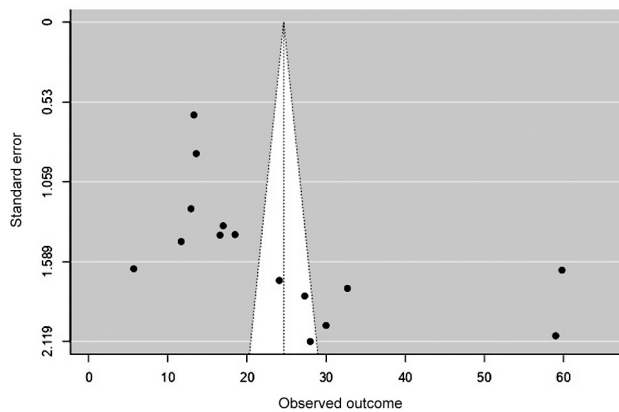


Fig. 3 Funnel plot for publication bias.

Discussion

This systematic review and meta-analysis included 15 studies with a total of 13,285 participants. The pooled estimated prevalence of PND in fathers was found to be 24.06% during first year postpartum and studies had higher degree of heterogeneity between them. This study's pooled estimate is relatively higher and not consistent with previous systematic review and meta-analysis findings (10.4 and 8.4%).^{3,4} The possible reason for the observed difference in the estimate of PND in fathers might be due to the variations in the cutoff score, sample size, cultural context, assessment time, and measures used in the studies included for the analysis. The other reason for the wide variation in the prevalence estimate of this study was the use of self-reporting measures to estimate the prevalence of PND in the included studies. It has been observed that self-reporting measures provide high prevalence estimates than the interview-based methods.³⁸ A systemic review and meta-analysis involving 14 studies with 3,819 participants found that the estimated prevalence of PND in fathers was 16.8% when self-rating scales were used to measure PND and 4.1% when interview-based method was used.³⁹

In the subgroup analysis, the pooled prevalence of PND among fathers in India was found to be 19.41% that was relatively higher than the estimated prevalence of PND among fathers in China (13.6%)³⁹ and surpasses the world-wide estimated prevalence of PND in fathers.^{3,4,38} However, the estimated prevalence of PND in India was lower than Saud Arabia and Iran.

The higher prevalence rates of PND were observed within the 3 months of childbirth (19.26%) in this study and the finding was consistent with a systematic review and meta-analysis conducted in China (28.7%)³⁹ and inconsistent with study findings of Paulson and Bazemore, they reported higher prevalence rates of PND during 3 to 6 months of postpartum.³ The pooled prevalence of PND in fathers for studies conducted in institutional-based setting was 19.46% and for community setting it was 13.49%. This difference might be due to the large standard error and small sample size in the majority of the included studies for the analysis. The cutoff score used on the EPDS scale including more than

or equal to 9, more than or equal to 10, and more than or equal to 12 reported different prevalence rates and the studies used the cutoff score more than or equal to 9 reported the higher pooled prevalence rate (38.39%) compared with the other studies used other two cutoff scores. The possible reason for this might be the use of unvalidated cutoff scores. The Matthey et al in their study found that use of empirically not validated cutoff score on EPDS might lead to significant difference in the interpretation of rates of PND.³⁸

The most frequently found risk factors in the current review were partner's depression, lack of social support, poor marital partnership satisfaction, low income, and low education. Other common risk factors identified by previous researches such as unemployment and previous history of depression were not reported by the majority of the studies (10/15) under the current review.

It is evident from the current review and meta-analysis that prevalence rate of PND among fathers in India is higher than the global PND estimates. According to a systematic review undertaken in India, 22% of mothers experience PND.⁴⁰ Mothers' PND is a strong indicator of PND in their partners. Furthermore, when their partners were depressed in the postpartum period, PND in fathers ranged from 24 to 50%.² Nonetheless, PND in mothers gains more emphasis. There is a need for focusing on the mental health of fathers during the postnatal period, as fathers currently are under screened, underdiagnosed, and undertreated for mental health problems.

The findings of this study might benefit healthcare workers and policy makers to understand the magnitude and risk factors of PND so that necessary guidelines and protocols can be developed to screen and treat PND.

Conclusion

PND in fathers is a serious concern and must be regarded as a public health issue. The mental health of fathers should be included in postpartum mental health assessments as early diagnosis and treatment decrease the detrimental impact on mother and child while further improving quality of life.

Limitations

A small number of open-access cross-sectional studies were included in the systematic review and meta-analysis. The pooled estimate of PND in fathers from this study must be interpreted in light of the considerable heterogeneity found across the studies, and the inclusion of two or three studies in the subgroup analysis might affect the estimates' accuracy. Furthermore, only open-access peer-reviewed articles were considered for this study. The inclusion of non-open-access articles, gray literature, and book chapters might have an impact on the current study's findings.

Conclusion

PND in fathers is a serious concern and must be regarded as a public health issue. The mental health of fathers should be

included in postpartum mental health assessments as early diagnosis and treatment decrease the detrimental impact on mother and child while further improving quality of life.

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Conflicts of Interest

None declared.

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