

The incidence of post-traumatic stress disorder (PTSD) following traumatic childbirth: a systematic review and meta-analysis

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Abstract

Background Birth trauma may be a risk factor for postpartum post-traumatic stress disorder (PTSD). However, no systematic review on postpartum PTSD in women with traumatic childbirth has been reported. **Objective** This study aimed to estimate the incidence of PTSD following traumatic childbirth through systematic review and meta-analysis. **Search strategy** Six databases (CINAHL, PsycINFO, Embase, PubMed, CNKI and Wanfang) were searched from inception to 28 February 2022. **Selection criteria** Cohort studies and cross-sectional studies related to the incidence of PTSD following traumatic childbirth were included. **Data collection and analysis** Two reviewers independently conducted studies selection, quality evaluation of studies, and data extraction. The Random-effects meta-analysis was conducted to derive the pooled incidence using Stata 16.0 software. **Main results** A total of nine studies with 1,823 women experienced traumatic birth were included. Of them, 353 were identified as PTSD. The pooled incidence of PTSD after traumatic childbirth was 19.2% (95%CI: 11.9%~26.5%). Subgroup analyses showed that the incidence of PTSD varied with traumatic birth/PTSD assessment scales and time, and type of study participants. Meta-regression analyses indicated that the study country was a significant source of heterogeneity, and the sample size birth trauma/PTSD were potential predictors of incidence of PTSD after a traumatic birth. Sensitivity analysis by deleting one study at a time yielded similar results. **Conclusions** The incidence of PTSD in women with traumatic childbirth is about 19%, which is much higher than that in general postpartum population. **Keywords** post-traumatic stress disorder, incidence, traumatic childbirth, postpartum, meta-analysis

Title page

The incidence of post-traumatic stress disorder (PTSD) following traumatic childbirth: a systematic review and meta-analysis

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Conclusions The incidence of PTSD in women with traumatic childbirth is about 19%, which is much higher than that in general postpartum population.

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Tweetable abstract This systematic review findings show the incidence of PTSD in women with traumatic childbirth is much higher than that in general postpartum population.

Introduction

Childbirth is generally considered a natural process. However, 19.74% ~ 45.03% of women think it as a trauma^[1]. Beck ^[2,3]believed that traumatic childbirth could be defined as delivery with a feeling of intimidating damage or serious harm, or even death to the mother, baby, or both, during labor, including physiological trauma and psychological trauma. Greenfield et al ^[4]indicated that psychological trauma was the necessary condition of childbirth trauma, namely, childbirth trauma included either psychological and physical trauma or just psychological trauma. Previous studies^[5,6] focused on physiological trauma caused by mechanical factors in a mother, fetus, or newborn during childbirth. Gradually, the focus of childbirth trauma shifted from physiological trauma to psychological trauma which was a subjective painful birth experience^[4]. A systematic review^[7] with 13studies revealed that the incidence of psychological distress experienced by childbirth trauma was 9% to 44%. Traumatic childbirth experiences could affect the mother-child bond, the general adaptability^[3, 8-10], as well as the partnership^[2, 11, 12], and also negatively impact the decision

to have more children^[2,11, 13-15]. Moreover, a traumatic childbirth experience also has adverse effects on postpartum woman's mental health. A prospective longitudinal study^[16] reported that PTSD could result from a traumatic birth experience, and develop symptoms of PTSD at 4–6 weeks after traumatic birth events.

PTSD has three distinct types of symptoms consisting of re-experiencing the event, avoidance of reminders of the event, and hyperarousal, which must be presented together for at least one month to meet the diagnostic criteria for PTSD^[17].

PTSD is one of the common mental health disorders in women after birth. A systematic review^[18] including 21 studies with 8,511 general postpartum women showed that childbirth-related PTSD was 4.0%. Birth trauma may be a key risk factor for postpartum PTSD. Beck^[8] indicated that the psychological trauma of childbirth might lead to postnatal PTSD. Ford et al^[19] also showed that negative post-traumatic cognition appeared a predictive factor of the early development of PTS symptoms after childbirth. However, no systematic review on the incidence of postpartum PTSD in women who have experienced traumatic childbirth has been conducted. Thus, the aim of this study is to estimate the incidence of PTSD following traumatic childbirth through a systematic review and meta-analysis.

Methods

This systematic review was conducted following the guidelines of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement^[20]. The study protocol was registered in PROSPERO (the International Prospective Register of Systematic Reviews) as CRD42022314868.

Search strategy

Four English databases (CINAHL, PsycINFO, Embase and PubMed) and two Chinese databases (China National Knowledge Infrastructure [CNKI] and Wanfang) were searched from inception to 28 February 2022. Advanced searches were performed using a combination of two groups of terms according to the syntax rules of each database: (1) birth trauma-related terms including birth trauma, traumatic delivery, perceived birth trauma, physical birth trauma, and psychological birth trauma, and (2) PTSD-related terms including stress disorders, post-traumatic, post-traumatic stress disorder, PTSD, delayed onset post-traumatic stress disorder, chronic post-traumatic stress disorder, and acute post-traumatic stress disorder. The reference lists of all the related reviews and guidelines as well as electronically retrieved articles selected for inclusion in the present review were hand-searched to ensure comprehensive coverage of all relevant literature. Prior to the final analyses, the search was repeated to allow the inclusion of any newly published studies. As an example, the search strategy used with PubMed is presented (see Appendix S1).

Selection criteria

To be eligible, studies had to meet the following criteria: (1) postpartum women aged over 18 years with singleton live birth; (2) postpartum women experienced birth trauma (including physical birth trauma and/or psychological birth trauma); (3) postpartum women presented the three types of symptoms of PTSD (re-experiences, avoidance reminders, and hyperarousal) together for at least one month; (4) be published in English or Chinese; and (5) cohort study and cross-sectional study.

Studies were excluded for the following reasons: (1) participants with a history of PTSD or a PTSD prior to childbirth; (2) trauma events other than birth related, mental illness or psychological disease, personality disorder, intellectual disability, and cognitive impairment or brain diseases; (3) participants with severe pregnancy complications such as pregnancy with heart disease, hypertensive disorder complicating pregnancy, and gestational diabetic mellitus; and (4) unable to obtain relevant data (e.g. the number of trauma birth/PTSD).

Study selection

The software EndNote X9 was used to import all the references and remove duplicates. Titles and abstracts of the retrieved articles were evaluated independently by two reviewers (X.L.L and H.Q.L). Abstracts that

did not provide sufficient information regarding the eligibility criteria were retained for full-text evaluation. Two reviewers (X.L.L and H.Q.L) independently evaluated full texts and determined study eligibility based on the inclusion and exclusion criteria. Any discrepancies were resolved by the third reviewer (R.H.X).

Quality assessment

The quality of studies was assessed using The Joanna Briggs Institute (JBI)^[21]. Two independent reviewers (X.L.L and H.Q.L) assessed the quality of the studies, and any disagreements were resolved through consensus adjudication, otherwise, we consulted the third reviewer (R.H.X).

Data extraction

Two reviewers (X.L.L and H.Q.L) independently extracted the relevant data from the eligible articles using standard forms. The data extracted included information about the first author, the year of publication, country, study setting, study design, type of participants, age of study participants, overall sample size, scales used to ascertain traumatic birth or PTSD, time of traumatic birth/ PTSD ascertainment, and the number of events (trauma birth and PTSD). Two reviewers resolved discrepancies through discussion, and any disagreements between the two reviewers were resolved by the third reviewer (R.H.X).

Data synthesis and analysis

The analysis was conducted using Stata16.0 software. Heterogeneity across studies was assessed using the Chi² test (significance set at $P < 0.1$) and the I^2 statistic (I^2 statistic $< 25\%$ was considered a low level of heterogeneity, 25% to 50% a moderate level, and $> 50\%$ a high level). If $P > 0.1$ and $I^2 < 50\%$, the fixed effect model was selected for statistical analysis, while $P < 0.1$ and $I^2 \geq 50\%$, the random effect model was selected for statistical analysis. Subgroup analyses were performed to explore the sources of heterogeneity, and meta-regression was further conducted to examine the impact of potential covariates on the effect size. The effect size was the incidence of postpartum PTSD after traumatic birth. Then, sensitivity analysis by removing one study at a time was conducted to explore the stability of the results. Finally, publication bias was assessed by Egger's test. For all analyses, p values < 0.05 were deemed as statistically significant.

Patient involvement

None, because study was based on published literature.

Results

Search results

The search strategies yielded 3,196 potentially relevant citations from the six databases searched. After excluding duplicates and screening titles and abstracts for eligibility, 65 studies were retained for full-text evaluation. Of them, 56 studies were excluded according to the inclusion and exclusion criteria. A total of nine studies^[22-30] were included in the final analysis (Figure 1).

Characteristics of included studies

This systematic review included one cohort study^[22] and eight cross-sectional studies^[23-30] with 3,821 postpartum women. A total of 1,823 with traumatic birth and 353 with postpartum PTSD were included in the final analysis. The included nine studies^[22-30] were conducted in Turkey, the United Kingdom, Iran, Serbia, Australia and the United States and published between 2003 and 2020. The overall sample sizes ranged from 77 to 950, the number of traumatic childbirth and PTSD respectively from 15 to 675 and from 2 to 127. For the assessment scales for birth trauma, five studies^[22,24,26,28,29] used DSM-IV/V A criterion, three studies^[26,28,30] were based on maternal self-report and one study^[23] was unknown. For the evaluation time of traumatic birth/postpartum PTSD, six studies^[22,25-28,30] were within the 4-8 weeks after birth, one study^[29] was at postpartum 1-4 months, one study^[24] was at postpartum 1-12 months, and one study^[23] was unknown. Two types of scales for screening PTSD were used in eligible studies^[22-30], including structured interview diagnostic scales and self-assessment scales. Of them, seven studies used PTSD

assessment scales^[22-24,27-30] that belonged to the self-assessment scale, including Post-traumatic Diagnostic Scale (PDS)^[22,23,27], Trauma Experience Survey (TES)^[24,28], Post-traumatic Stress Disorder Checklist for DSM-5 (PCL-5)^[29], Post-traumatic Stress Symptom Scale-Self-report (PSS-SR)^[30]. And one with the Post-traumatic Symptom Scale-Interview (PSS-I)^[25] and one with the Clinician-Administered PTSD Scale (CAPS)^[26], which were classified as structured interview diagnostic scale. The characteristics of the included studies are showed in Table 1.

Quality Assessment

The nine of the included studies^[22-30] were assessed for methodological quality using The Joanna Briggs Institute (JBI)^[21]. Of them, one study^[22] was assessed using the JBI Critical Appraisal Checklist for Cohort Studies^[21], and the checklist contained a total of 11 assessment criteria (Table 2). Five studies^[23,25,26,28,30] were evaluated by the JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies^[21], and the checklist contained 8 assessment criteria (Table 3). Three studies^[24,27,29] were evaluated through the JBI Critical Appraisal Checklist for Prevalence Studies^[21], and the checklist contained 9 assessment criteria (Table 4). Every criterion was given a rating of ‘yes’, ‘no’, ‘unclear’, or ‘not applicable’, and the overall scores in each study were the percentage of the number of ‘yes’ in the number of assessment criteria in each checklist. The percentage of overall scores in each study ranged from 78%^[24,29] to 100%^[23,25,26,28]. The higher of the percentage was meant that the better the quality of each study. Finally, no studies were excluded based solely on the assessment of methodological quality.

Meta-analysis

The pooled incidence of PTSD after traumatic childbirth is presented in Figure 2. In the included nine studies^[22-30], the incidence of PTSD following traumatic childbirth ranged from 5.7% to 36.7%, and the highest incidence of PTSD in Iran^[25] was 36.7% (95% CI: 30.3%~43.5%). The pooled incidence of PTSD after traumatic childbirth was 19.2% (95% CI: 11.9%~26.5%).

Subgroup analysis

A series of subgroup analyses were performed to uncover more information about the heterogeneity according to the study country, assessment scales and evaluation time of traumatic birth/PTSD, type of participants (Table 5). The results found that considerable heterogeneity (I²[?]=82%) existed in each subgroup analysis.

Meta-regression analysis

The meta-regression analysis was done to investigate whether the variables of geographical location, assessment scales and evaluation time of traumatic birth/PTSD, the type of participants, study design, year of publication, and the number of events (birth trauma and PTSD) had impacted on the effect size (Table 6). A significantly different incidence of postpartum PTSD after birth trauma was identified in Asia ($P = 0.03$, 95% CI: 1.03 ~ 1.60) compared to Europe, North America, and Oceania. Meta-regression was also conducted to check the difference in rates in the samples sizes of birth trauma and PTSD. And the sample sizes of birth trauma ($P = 0.02$) and PTSD ($P = 0.02$) were potential variables for effect size, while no significant association was found in study design, the year of publication, and the type of participants of studies. Furthermore, scales and time of assessment for birth trauma and postpartum PTSD had no statistical significance in the effect size, indicating that assessment scales and evaluation time were not the sources of heterogeneity.

Sensitivity analysis

The sensitivity analysis of the eligible nine studies^[22-30] is presented in Figure 3. The pooled incidence of the PTSD after traumatic childbirth ranged from 16.6% (95% CI: 9.9%~23.2%) to 21.2% (95% CI: 13.2% ~ 29.2%) when excluding one study at a time, and I² was between 91.7% and 94.6%.

Assessment of publication bias

In this systematic review, the publication bias was assessed using the Egger bias test ($P = 0.30$), showing no signs of publication bias in the included studies (as shown in Figure 4).

Discussion

Main findings

Our systematic review and meta-analysis indicated that the incidence of PTSD following traumatic childbirth was 19.2%. This figure was much higher than the 4% in the general postpartum population^[18], suggesting that traumatic childbirth is a strong risk factor for postpartum PTSD. The effect size varied greatly in different countries, especially in developing countries, the incidence of PTSD following traumatic childbirth was higher.

Strengths and limitations

To the best of our knowledge, this is the first comprehensive systematic review/meta-analysis on the incidence of PTSD following traumatic childbirth. The consistent findings from subgroup and sensitivity analyses indicated the robustness of the estimated incidence of postpartum PTSD.

Several limitations to this systematic review should be acknowledged. First, only 9 studies were included in the meta-analysis, and the number of studies within some subgroup analyses was further reduced. Second, traumatic birth events and PTSD were ascertained at the same time in the included studies, exaggerating the PTSD rate as women with traumatic events may have poorer moods and therefore more likely to report PTSD related symptoms. However, the sensitivity analysis excluding one study at a time yielded almost identical results. Third, it was difficult to isolate the effect of emergency cesarean section on the incidence of PTSD after traumatic childbirth, because emergency cesarean section and traumatic delivery might overlap.

Interpretation

The incidence of PTSD following traumatic childbirth varied in different countries. Two studies^[31,32] reported that in the resource-poor countries, women of reproductive age typically have socioeconomic and health challenges that interplay in mutually reinforcing ways, and indeed the incidence of common perinatal mental disorders in low-income and lower-middle-income countries were higher than in high-income countries^[33]. According to this systematic review, a subgroup analysis for different countries, the incidence of PTSD following traumatic childbirth in Asia was highest, including in Turkey^[22] and in Iran^[25]; meta-regression analysis also indicated that Asia was different from other countries such as Europe^[23,24,26], Oceania^[27,30], and North America^[28,29] in the incidence of PTSD following traumatic childbirth. One study^[34] has found that a PTSD development was associated with childbirth in a non-western culture, which may be related to the economic development, cultural background, and medical level of different countries in the treatment of postpartum women.

Currently, there are no specific assessment tools for screening for traumatic birth. A review^[35] reported that most studies were based on the DSM-A criterion, while a few were based on self-report from postpartum women. Therefore, this study conducted a subgroup analysis to determine the impact of the two different types of assessment tools on the incidence of PTSD in postpartum women after a traumatic birth. The result found that the incidence of screening using the DSM-A was higher than self-report. An RCT has shown that the assessment scale based on DSM-A criterion was validated by psychiatrists for effectiveness in screening for traumatic birth and compatibility with the definition of traumatic birth^[36]. Moghadam et al^[37] also confirmed the rationality and validity of this scale. However, compared with the self-report, participants were only asked whether they would describe their birth as traumatic (yes/no)^[25,27,30], lacking reliability and effectiveness. Therefore, it is considered that based on DSM-A assessment scale is more stringent for screening traumatic childbirth, and the included participants are more likely to develop postpartum PTSD.

Two types of PTSD assessment scales, including structured interview diagnostic scales and self-assessment scales are widely used in the world and have good reliability and validity. In this systematic review of subgroup analysis, we found that different assessment tools for postpartum PTSD women after traumatic childbirth could develop different incidences. However, meta-regression analysis did not show that the difference in assessment tools for postpartum PTSD were the source of heterogeneity. A previous systematic

review^[18] has shown that the impact of measurement type on postnatal PTSD rate estimates was not detectable, and Grekin et al^[38] have indicated that differences in incidence were not found between studies that used self-report and clinical assessment measures to diagnose PTSD. These results should be treated with a degree of caution. This may be since above half of included studies used self-assessment scales^[22-24,27-30] to assess PTSD symptoms, so making it difficult to reveal differences between the two methods, which is an limitation of the current research. Therefore, further research should target the evaluation effects of different assessment scales on postpartum PTSD.

Although lacking reliable evidence of significant changes between the incidence of postpartum PTSD after traumatic birth and assessment tools, the incidence at different time points might provide some insights into the course of postpartum PTSD.

In this study, we also found that the PTSD rate was highest in postpartum 1-4 months and the incidence declined gradually over time, which coincided with a systematic review by Dikmen-Yildiz^[18]. While, Andersen et al^[39] has reported that the incidence of PTSD was 1.3% - 2.4% at 1-2 months postpartum and 0.9% - 4.6% at 3 - 12 months postpartum, suggesting that the rate of PTSD increase gradually over time. Thus, it can be considered that there are certain differences in the results of measuring the incidence of postpartum PTSD at different time points. However, the results on the relationship between several key time points and PTSD incidence are different. This might be related to differences in participants and study sites, or during postpartum PTSD, part of women might develop acute PTSD symptoms (3 months postpartum), delayed PTSD symptoms (6 months postpartum), or self-healing.

From this systematic review, due to the limited number of studies included in the measurement of PTSD at 1-4 and 1-12 months postpartum, we were short of sufficient evidence to support its relationship with the rate of postpartum PTSD. Hence, this result should be critically treated. Meanwhile, the relationship between the rate of postpartum PTSD and the evaluation time points should be further researched to provide a basis for the subsequent measurement of postpartum PTSD. In addition, the evaluation time of traumatic birth was the same as PTSD, and it was not analyzed in this systematic review. However, previous studies^[40,41] also have shown that the evaluation time of traumatic birth should be measured within 48h or 72h after birth to avoid retrospective bias that results from a too long time.

This systematic review demonstrated that postpartum women whose babies were hospitalized in NICU (neonatal intensive care unit) had the highest incidence of PTSD. However, the evidence recommendation grade of this result was not sufficient to support those postpartum women whose babies were hospitalized in NICU had the greatest influence on the rate of PTSD because only one study^[29] was included in the subgroup analysis, although Grekin et al^[38] indicated that infant complications, including NICU hospitalization, had a large association with postpartum PTSD symptoms. Therefore, a series of related studies can be performed to explore the impact of neonatal complications, a moderating variable, on the incidence of postpartum PTSD after traumatic birth, and provide ideas for reducing the rate of postpartum PTSD.

Conclusion

Our systematic review and meta-analysis found that about 19% of women with traumatic birth developed PTSD, suggesting that we, as health care providers, should care more about women who have experienced a traumatic birth. In addition, further research should target the evaluation effects of different assessment scales/evaluation time points on postpartum PTSD.

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Disclosure of interests

None declared. Completed disclosure of interest forms are available to view online as supporting information.

Contribution to authorship

XLL and HQL designed the study and RHX provided important feedback on the proposed study design. XLL and HQL conducted the systematic literature search, data extraction, and quality assessment; XLL conducted the meta-analyses and interpreted the results. XLL drafted the initial manuscript, which was thoroughly reviewed for important intellectual content and revised by LPZ, SWW, and RHX. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Details of ethics approval

Not applicable.

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Table1 Characteristics of studies included (n=11)

Author (year)	Country	Study site	Study design	Participant (post-partum women)	Age (mean±SD)	Sample Size	Traumatic birth assessment scales	Traumatic birth/PTSD evaluation time	PTSD assessment scales	Traumatic birth (n)
Dikmen-Yildiz et al 2017 [22]	Turkey	Community	Cohort study	Normal	27.47±5.08	950	DSM-IV A criterion	4-6 weeks postpartum	PDS	287
Harris et al 2012 [23]	The United Kingdom	Network	Analytical cross-sectional study	With traumatic birth	31.55±6.58	675	N/A	N/A	PDS	675
King et al 2017 [24]	The United Kingdom	Network	Prevalence study	Normal	29.82±5.13	157	DSM-IV A criterion	1-12 months postpartum	TES	41
Modarres et al 2012 [25]	Iran	Health care centers	Analytical cross-sectional study	With traumatic birth	26.9±4.83	400	Self-report	6-8 weeks postpartum	PSS-I	218
Milosavljević et al 2016 [26]	Serbia	Hospital/Community	Analytical cross-sectional study	Normal	29.7±4.0	126	DSM-IV A criterion	4 weeks postpartum	CAPS	15
O'Donovan et al 2014 [27]	Australia	Hospital	Longitudinal study	Normal	28.6±5.64	933	Self-report	4-6 weeks postpartum	PDS	394
Soet et al (2003) [28]	The United States	Childbirth classes	Analytical cross-sectional study	Normal	29.2±4.99	103	DSM-IV A criterion	4 weeks postpartum	TES	35
Sharp et al 2020 [29]	The United States	Network	Prevalence study	With NICU	39.64±5.78	77	DSM-V A criterion	1-4 months postpartum	PCL-5	52
White et al 2006 [30]	Australia	Hospital	Analytical cross-sectional study	Normal	27.6±5.3	400	Self-report	6 weeks postpartum	PSS-SR	106

NICU: Neona- tal Inten- sive Care Unit DSM: Diag- nostic and Sta- tisti- cal Man- ual of Men- tal Disor- ders N/A: Not Avail- able PDS: Post- traumatic Diag- nostic Scale TES: Trauma Expe- rience Sur- vey PSS-I: Post- traumatic Symp- tom Scale- Interview CAPS: Clinician- Administered PTSD Scale PCL- 5: Post- traumatic Stress Disor- der Check- list for DSM- 5										
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Table 2 Quality assessment of cohort study included (n=1)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Overall (%)
Dikmen-Yildi et al 2017 ^[22]	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	82

Abbreviation: Y: Yes N: No U: Unclear NA: Not Applicable

Q1: Were the two groups similar and recruited from the same population? Q2: Were the exposures measured similarly to assign people to both exposed and unexposed group? Q3: Was the exposure measured in a valid and reliable way? Q4: Were confounding factors identified? Q5: Were strategies to deal with confounding factors stated? Q6: Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)? Q7: Were the outcomes measured in a valid and reliable way? Q8: Was the follow up time reported and sufficient to be long enough for outcomes to occur? Q9: Was follow up complete, and if not, were the reasons to loss to follow up described and explored? Q10: Were strategies to address incomplete follow up utilized? Q11: Was appropriate statistical analysis used?

Table 3 Quality assessment of analytical cross-sectional studies included (n=5)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Overall (%)
Harris et al 2012 ^[23]	Y	Y	Y	Y	Y	Y	Y	Y	100
Modarres et al 2012 ^[25]	Y	Y	Y	Y	Y	Y	Y	Y	100
Milosavljevic et al 2016 ^[26]	Y	Y	Y	Y	Y	Y	Y	Y	100
White et al 2006 ^[30]	Y	Y	Y	Y	Y	N	Y	Y	88
Soet et al 2003 ^[28]	Y	Y	Y	Y	Y	Y	Y	Y	100

Abbreviation: Y: Yes N: No U: Unclear NA: Not Applicable

Q1: Were the criteria for inclusion in the sample clearly defined? Q2: Were the study subjects and the setting described in detail? Q3: Was the exposure measured in a valid and reliable way? Q4: Was the exposure measured in a valid and reliable way? Q5: Were confounding factors identified? Q6: Were strategies to deal with confounding factors stated? Q7: Were the outcomes measured in a valid and reliable way? Q8: Was appropriate statistical analysis used?

Table 4 Quality assessment of longitudinal and prevalence studies included (n=3)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Overall (%)
King et al 2017 ^[24]	Y	U	Y	Y	Y	Y	Y	Y	N	78
O'Donovan et al 2014 ^[27]	Y	U	Y	Y	Y	Y	Y	Y	Y	89
Sharp et al 2020 ^[29]	Y	U	N	Y	Y	Y	Y	Y	Y	78

Abbreviation: Y: Yes N: No U: Unclear NA: Not Applicable

Q1: Was the sample frame appropriate to address the target population?

Q2: Were study participants sampled in an appropriate way?

Q3: Was the sample size adequate?

Q4: Were the study subjects and the setting described in detail?

Q5: Was the data analysis conducted with sufficient coverage of the identified sample?

Q6: Were valid methods used for the identification of the condition?

Q7: Was the condition measured in a standard, reliable way for all participants?

Q8: Was there appropriate statistical analysis?

Q9: Was the response rate adequate, and if not, was the low response rate managed appropriately?

Table 5 Subgroup analyses of the incidence of PTSD following traumatic childbirth

Subgroup analysis	No.of studies	Incidence of PTSD(%) 95%CI	Z statistic	P value
Study country				<.001
Asia	2	30.7 (0.27~0.35)	15.0	<.001
Europe	3	19.0 (0.16~0.22)	13.1	<.001
Oceania	2	7.3 (0.05~0.10)	6.3	<.001
North American	2	13.3 (0.07~0.20)	3.9	<.001
Traumatic birth assessment scales				<.001
DSM-A	5	21.6 (0.11~0.33)	3.8	<.001
Self-report	3	16.5 (0.02~0.31)	2.2	0.03
PTSD assessment scales				<.001
Structured interview diagnostic scale	2	35.2 (0.09~0.23)	11.3	<.001
Self-assessment scale	7	16.3 (0.29~0.41)	4.6	<.001
Postpartum traumatic birth/ PTSD evaluation time				<.001
4-8 weeks	6	16.9 (0.07~0.27)	3.2	0.001
1-4 months	1	34.6 (0.22~0.49)	5.2	<.001
1-12 months	1	22.0 (0.11~0.38)	3.4	0.001
Participants (postpartum women)				<.001
Normal	6	13.7 (0.06~0.22)	3.4	0.001
With traumatic birth	2	21.9 (0.19~0.25)	16.1	<.001
With NICU	1	34.6 (0.22~0.49)	5.2	<.001
DSM-A: Diagnostic and Statistical Manual of Mental Disorders A criterion NICU: Neonatal Intensive Care Unit	DSM-A: Diagnostic and Statistical Manual of Mental Disorders A criterion NICU: Neonatal Intensive Care Unit	DSM-A: Diagnostic and Statistical Manual of Mental Disorders A criterion NICU: Neonatal Intensive Care Unit	DSM-A: Diagnostic and Statistical Manual of Mental Disorders A criterion NICU: Neonatal Intensive Care Unit	DSM-A: Diagnostic and Statistical Manual of Mental Disorders A criterion NICU: Neonatal Intensive Care Unit

Table 6 Meta-regression analysis of the potential variables among studies

Potential covariates		No. of studies	Exp(b)	Standard error	t	P	95%CI
Geographical location	Asia	9	1.28	0.11	2.90	0.03*	1.03 ~1.60
	Europe		1.14	0.10	1.58	0.17	0.92~1.41
	North American		1.12	0.10	1.23	0.27	0.88~1.41
	Oceania		Ref	Ref	Ref	Ref	Ref
Traumatic birth assessment scales	DSM-A	8	1.05	0.11	0.51	0.63	0.82~1.35
	Self-report		Ref	Ref	Ref	Ref	Ref
PTSD assessment scales	Structured interview diagnostic scale	9	1.15	0.11	1.49	0.18	0.92~1.45
	Self-assessment scale		Ref	Ref	Ref	Ref	Ref
Postpartum traumatic birth/ PTSD evaluation time	4-8 weeks	8	0.84	0.13	-1.14	0.31	0.56~1.25
	1-12 months		0.88	0.18	-0.62	0.56	0.52~1.49
	1-4 months		Ref	Ref	Ref	Ref	Ref
Participants (postpartum women)	Normal	9	0.81	0.10	-1.65	0.15	0.60~1.10
	Traumatic birth NICU		0.93	0.13	-0.53	0.62	0.66~1.30
Study design	Analytical cross-sectional study	9	1.10	0.15	0.69	0.52	0.78~1.55
	Cohort study		1.21	0.21	1.10	0.32	0.78~1.89
	Prevalence study		1.23	0.19	1.31	0.25	0.82~1.83
	Longitudinal study		Ref	Ref	Ref	Ref	Ref
Year of publication		9	1.01	0.00	3.20	0.07	/
NO. of birth trauma		9	1.00	0.00	-4.90	0.02*	/

NO. of PTSD		9	1.00	0.00	5.41	0.02*	/
* <i>P</i> <0.05							
DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders	DSM: Diagnostic and Statistical Manual of Mental Disorders
NICU: Neonatal Intensive Care Unit							

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