

# Psycho-educational interventions focused on maternal or infant sleep for pregnant women to prevent the onset of antenatal and postnatal depression: a systematic review

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## Research article

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## Abstract

**Background** This systematic review aimed to evaluate randomized controlled trials (RCTs) to examine the effect of maternal and infant sleep intervention during women's pregnancy for the purpose of preventing perinatal depression. **Method** A systematic search (from inception – January 28 th , 2019) for RCTs using five electronic databases—the Cochrane Controlled Register of Trials (CENTRAL), Embase, PubMed, PsycINFO and Ichushi Web (Japan Medical Abstracts Society)—was conducted. Twelve investigators independently conducted initial screenings based on title and abstract, and then two researchers performed full-text reviews one by one. A meta-analysis would be conducted if at least three studies were found. However, only two articles that met inclusion criteria, and narrative data synthesis was conducted for these two articles. The study protocol has been registered at PROSPERO (CRD42019119999). **Result** A total of 13,644 studies were initially searched. After removing duplicates, 10,537 studies were screened, and finally, two studies met the inclusion criteria. In both studies, the intervention was a one-time face-to-face session during pregnancy to deliver the behavioral knowledge and skills for optimizing sleep hygiene for both infant and mother. Effectiveness of the intervention in improving maternal mood was not significant in one study. In the other, there was a significant difference in maternal mood between the intervention and control group. No mood comparison was made between baseline and post-intervention. **Conclusion** This study found limited evidence to support the effectiveness of sleep intervention for all pregnant women, which means “universal intervention”, to protect maternal mental health. Further well-designed RCTs are needed to confirm these findings.

## Background

Perinatal depression (PND), defined as a major or minor depressive episode that occurs during pregnancy or within the postpartum year [1], imposes a staggering public health burden [2]. PND has become regarded as a significant public health issue because of its high worldwide prevalence among perinatal women; antenatal depression (AND) has a rate of 5% to 15% [3] and postpartum depression (PPD): a rate of 15% [4]. Depression during pregnancy not only severely affects mothers' emotions, but causes difficulty performing usual activities, poor sleep, reduced breastfeeding, and failure to seek prenatal care, as well as an increased risk of PPD [5-7]. Also, PPD creates a risk of tragedy for both mother and infant, that is, suicide, which accounts for 20% of deaths in postpartum women [8]. Higher prenatal depressive symptoms of mothers were also associated with poor infant physical health: preterm birth, low birth weight [9], early gestational age [10], increased risk of infant hospitalization [11], and longer-term temperament and behavioral problems of the child [12]. In addition, because PPD is the strongest predictor of parenting stress [13], it may cause abusive parenting behavior [14], impaired affectional ties (bonding), or poor offspring physical/socioemotional development [15]. These impacts of PPD highlight the need for preventive interventions from the early perinatal phase [5].

Sleep problems in the perinatal period can be a cause of AND and PPD [16], as well as one of its symptoms. Insomnia or poor sleep quality in pregnancy are extremely common. Estimated prevalence of insomnia in pregnancy ranges from 50% to over 60% [17-19]. Poor sleep quality in pregnancy is also predictive of poor postpartum sleep [19, 20]. Fragmented sleep during the perinatal period can be caused by hormonal alterations and a newborn with random/short sleep-wake patterns after childbirth [21-24]. Short sleep duration increases the risk of the onset of depression (RR=1.31) [25], producing negative effects on mental and physical health [26]. Sleep disturbance can cause a variety of physical symptoms and social dysfunctions, and it is also a burdensome and unbearable condition in itself [27]. In this target population (perinatal women), interventions aimed at improving sleep are important to alleviate sleep related symptoms, as well as to prevent depression.

Psycho-educational interventions for sleep problems among perinatal women can be differentiated into two approaches: those focusing on maternal sleep and those focusing on infant sleep. For maternal sleep, in general, sleep hygiene education (SHE) and cognitive behavioral therapy for insomnia (CBT-I) have been shown to be effective for improving sleep problems [28, 29], although SHE was reported to be less effective than CBT-I for insomnia in general population [29]. For pregnant women with insomnia, a group based CBT-I intervention achieved significant reductions in insomnia symptoms and increases in subjective sleep quality [30]. Digital CBT-I program was also revealed its significant improvements for insomnia symptoms using a randomized controlled design [31]. For infant sleep, interventions to improve infant sleep quality have been based on developmental and behavioral psychology. The contents include supplying information such as normal infant sleep and crying patterns, settling techniques, medical causes of crying, and are delivered via face-to-face sessions, booklets, media, or telephone consultation [32]. A previous meta-analysis of randomized controlled trials (RCTs) indicated that interventions focused on infant sleep improved infant nocturnal total sleep time and reduced the number of night-time awakenings [33]. Enhancement of infant sleep promotes maternal sleep, because the majority of sleep disturbances are caused by the newborns' sleep and feeding schedules [34]. Sleep focused psycho-educational interventions would reduce health burdens of maternal sleep in the perinatal period.

Maternal mood might also be protected by sleep interventions. CBT-I has been shown to be effective for reducing depressive symptoms not only among people with insomnia in general [35-39], but also among postpartum women with insomnia [40], although research on cognitive-behavioral sleep interventions is still in its infancy. One RCT designed study of postnatal education focusing on maternal and infant sleep showed significant effectiveness for the reduction of risk of high depression scores (adjusted odds ratio = 0.57, 95% confidence interval; 0.34 to 0.94) [32]. However, evidence regarding prevention of AND and PPD is still limited. In 2016, a systematic review of five RCTs [33] investigated the effectiveness of psychosocial sleep interventions among pregnant or postnatal women for improving maternal mood after childbirth, showing improvements (Hedge's  $g=0.15$ ,  $p=0.01$ ). The studies reviewed included the article above [32]. However, all participants in the included studies were postnatal women and a funnel plot suggested a publication bias.

Postnatal women with insomnia have been targeted by preventive interventions, but pregnant women are also an important population to be approached. While the most potent overall clinical predictor of PND is a previous depressive episode [41], AND is regarded as an especially significant risk factors for

PPD [13]. Poor sleep quality in pregnancy is also predictive of poor postpartum sleep [19, 20]. In addition, universal prevention for the entire pregnant population, including no-risk and high-risk groups, has been noted as a new strategy to prevent PND. The collective frequency of any risk factors in women of reproductive age is relatively high, suggesting the difficulty of effective screening [2]. As a universal prevention strategy during pregnancy, psychosocial interventions have much to recommend them because they can be delivered at low cost and with minimal invasiveness [42]. It compels consideration of whether all pregnant women, including high-risk populations, should have the opportunity to receive preventive psychosocial intervention as a standard of practice in maternity care [2]. In addition, pregnant women have more spare time to learn than postnatal women, thus pregnancy is a good time to introduce interventions. However, it is still unknown whether universal psycho-educational intervention targeted at sleep problems would have the potential to effectively prevent depression, considering the high prevalence of sleep problems among perinatal women. The research discussed above, suggests that it is very relevant to investigate whether psycho-educational intervention (ie., CBT-I and sleep education) can prevent PND for all pregnant women.

The aim of this study is to evaluate published RCTs to examine the effectiveness of universal intervention focused on sleep problems and started during pregnancy for preventing PND. This result will help care workers and policymakers in public health to decide whether psycho-educational sleep interventions for prenatal women are worth promoting or not.

## Methods

### Study design

The method was reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines [43]. The PRISMA checklist document showed this in more detail (see **Appendix 1**). The study protocol has been registered at PROSPERO (CRD42019119999).

### Data sources and searches

Search terms were constructed, referring to previous comprehensive meta-analysis [44]. Search terms used in this study are listed in **Appendix 2**. Article extraction was conducted on January 28th, 2019. There was no restrictions or limitations for search dates or publication period before the first screening. Studies published as original articles written in English or Japanese that were published prior to January 29<sup>th</sup> in 2019 were included. The databases defined as information sources were MEDLINE, EMBASE, the Cochrane Central Register of Controlled Trials (CENTRAL), PsycINFO and Ichushi Web (Japan Medical Abstracts Society). The search strategy for all sources is included in the relevant section. The following relevant information was extracted from the selected studies: author, year of publication, country, number of participants, details of the intervention and control conditions, age of participants, duration of follow-up, measurement tool, scores for postpartum depression and other outcomes, and attrition. If there was missing information in the article, authors asked the corresponding author to provide it.

### Eligibility criteria

Eligible studies were those that (1) were conducted to evaluate the association between sleep intervention and PND; (2) used a randomized controlled trial design; (3) were not restricted to a high-risk population as a target; (4) were published in English or Japanese; (5) were published up to the data extraction day, January 28th, 2019; and (6) were not protocol papers or conference abstracts. To formulate research questions and facilitate the literature search, the PICO framework (participants, interventions, comparisons and outcomes; PICO) [45] of the current study in the systematic review and meta-analysis was defined as follows:

### Participants

All adult pregnant women over 18 years old, with no restrictions in terms of psychological diagnosis, sleep problems, age, ethnicity, race and other demographic characteristics. Studies that only included a high-risk population (selective/indicated target) were excluded.

### Interventions

Psycho-educational intervention focused on maternal or infant sleep, with at least one session provided during pregnancy. There was no restrictions in terms of setting, timing, or content; interventions could be conducted at every levels of healthcare or at participant's home; interventions could be continued after childbirth if they started during pregnancy; and interventions of any sort could be adopted if they were focused on maternal or infant sleep. The contents of perinatal sleep-focused intervention can be considered to involve two approaches: 1) sleep education for the mother and 2) childcare education for improving infant sleep.

#### 1) sleep education for the mother

Psycho-educational sleep intervention could include, for instance, stimulus control (e.g., to use their bed only for sleeping, to go to bed only when they were sleepy); sleep restriction (e.g., reducing time in bed with the aim of enhancing homeostatic sleep pressure); cognitive therapies (e.g. regarding dysfunctional attitudes and beliefs towards sleep); and sleep hygiene and relaxation training [35, 37].

#### 2) childcare education for improving infant sleep

Infant sleep interventions included for example: supplying information about normal development patterns of infant sleep and crying; settling techniques (with emphasizing the importance of baby's self-settling or self-regulation of sleep); creating sleep time rituals (e.g., bath, massage, swaddling, soft music, infant self-soothing); safe sleep practices (e.g., to prevent sudden unexpected death in infancy); and medical causes of crying and parent self-care [32, 46, 47].

## Comparisons

A wait-list or information only condition. The intervention was compared to no treatment, wait list control, treatment as usual (TAU) or active control. TAU is standard management for perinatal women, established according to current norms or according to the criterion of the clinician at the relevant level of healthcare, conducted naturalistically.

## Outcomes

Antenatal or postnatal depression/depressive symptoms. The primary outcome measured was antenatal or postnatal reduction in depressive symptoms after intervention, which was determined by diagnostic interview or validated self-reported psychological questionnaire. The secondary outcome was maternal sleep related outcome, if primary outcome was evaluated in the included study.

## Study selection

All the records yielded by the database search was compiled and managed using Microsoft Excel (Washington, USA). Duplicate studies were excluded by NY before screening. Thereafter, twelve investigators (NS, NY, DN, EO, ZN, JS, TI, AI, YY, RY, AM, TS) were divided into six groups of two people.

They excluded studies which did not meet the eligibility criteria based on a title and abstract assessment (first screening). Then, NS and DN individually conducted full text reviews of those studies for which the eligibility criteria could not be judged only by the title and the abstract. Studies which did not meet the eligibility criteria after full text review were discussed by all investigators, and we recorded the reasons for excluding studies at the full text review phase. Studies meeting the eligibility criteria were selected for inclusion in the review.

## Risk of bias: individual studies

NS and DN independently conducted quality assessment by using the GRADE approach, which is Cochrane Collaboration's risk of bias tool containing information about sequence generation, allocation concealment, blinding of outcome assessors, incomplete outcome data, selective outcome reporting, and other sources of bias [48]. This approach classifies levels of quality into three categories (high, low and uncertain).

## Statistical methods

For the main analysis, we synthesized all types of sleep interventions and all types of outcomes related to depression or depressive symptoms. Meta-analysis would be conducted if at least three eligible studies were found. If a meta-analysis was not appropriate (i.e., only two or fewer studies were eligible and included), the results would be presented in a narrative format.

# Results

## Database searching

Database searching yielded 13,644 abstracts (CENTRAL n=734, PubMed n=3,211, EMBASE n=5,387, PsycINFO n=3,689, Japan Medical Abstracts Society n=618). After removing 3,107 duplicates, 10,537 records were included in the first screening, after which 10,528 records were excluded and nine records proceeded to full-text screening. Subsequently, seven studies that did not meet the criteria for article type (n = 3), participant (n = 3) and study design (n = 1) were excluded. Finally, two studies [22, 49] were included in the qualitative systematic review. The study selection flowchart is shown in **Figure 1**.

## Study description

A summary of the included studies is shown in **Table 1**. One study [49] was conducted in the U.S.A in 2014 and the other [22] in New Zealand in 2017. The included U.S. study (Bhati, 2014) was a preliminary RCT of Ph.D. thesis. Participants were not restricted to high-risk pregnant women, and participants were divided into two groups (both third trimester) in terms of number of weeks' gestation, 36-42 [49] and 28-30 [22], respectively. The total number of participants in the two studies was 34 [49] and 802 [22], respectively. Interventions were focused on infant and maternal sleep in both studies and conducted one session during the antenatal period and another session postpartum. Outcome was measured with the EPDS for depressive symptoms in both studies and with an original questionnaire for sleep outcomes, including refreshed sleep [49], sleep quantity and quality, sleep duration (hour), and sleep latency (>30 min) [22]. Effectiveness of the intervention for both maternal mood and sleep outcome was not significant in one study [22]. The other study found a statistically significant difference between the intervention and control groups; however, baseline data before intervention were not obtained [49]. Effectiveness for perinatal depression and sleep outcome was not reported in either article.

**Table 1. Selected characteristics of included randomized controlled trials.**

Author, Year, (ref)	Country	Participant	Number of participants (intervention/control)	Intervention type	Number of sessions	Time of one session	Control type	Duration of follow-up	Outcome measures	Primary Outcome (depression)	Secondary Outcome (maternal sleep)
Bhati, 2014 [49]	U.S.A.	36-42 weeks' gestation	Total 34	Maternal and infant sleep individual education	2 sessions Antenatal face-to-face education + weekly text message of cellular phone in postpartum	45 min	Active control (education)	6 weeks (postnatal)	EPDS	t(32)=2.2, p=0.037	†t (32) = 2.904, p = .007
Galland, 2017 [22]	New Zealand	28-30 weeks' gestation	1)209 2)205 3)192 4)196	1) control 2) food, activity and breastfeeding intervention 3) maternal and infant sleep group education 4) combined intervention group receiving both 2) and 3)	2 sessions 3) sleep Antenatal group session + 3) maternal home visit at 3 weeks postpartum (with a booklet)	1 hour	Usual care	6 months (postnatal)	EPDS	N.S.	‡N.S.

†Refreshed sleep, defined as non-restorative sleep which is a core symptom of insomnia, was measured by these two items; 1) how many hours of sleep do you need per night to feel refreshed, and 2) on an average how many hours of sleep did you obtain per night since your baby was born?

‡Sleep quantity and quality, sleep duration (from sleep onset to offset), and sleep latency (time taken to fall asleep) were measured by original questionnaire.

N.S.; not significant

### Risk of bias assessment

The result for risk of bias and quality assessment are shown in **Table 2**. Participant blinding could not be guaranteed within each of these studies as the interventions were psychosocial; this item therefore was rated as high risk in all studies.

**Table 2. GRADE Risk of bias assessment**

Galland, B. C., 2017		
Bias	Authors' judgment	Support for judgment
Random sequence generation	Low	A computerized random-number generator was used to assign blocks of participants to the four arms
Allocation concealment	Low	Allocation was concealed by opening an opaque pre-sealed envelope
Blinding of participants and researchers	High	Not blinded to participants or researchers
Blinding of outcome assessment	High	Using a self-report questionnaire
Incomplete outcome data	High	Not declared conducting intent-to-treat (ITT) analysis
Selective reporting	Low	Outcomes were the same as reported in protocol paper
Other bias	Low	No other bias
Bhati, S. R., 2014		
Random sequence generation	Low	Using the computerized randomizer which generated the numbers for randomization
Allocation concealment	Uncertain	Not described in detail
Blinding of participants and researchers	High	Not blinded to participants or researchers
Blinding of outcome assessment	High	Using a self-report questionnaire
Incomplete outcome data	High	Not declared conducting ITT analysis
Selective reporting	Uncertain	No protocol paper
Other bias	Low	No other bias

### Results of individual intervention

The contents of each intervention are summarized in **Table 3**. Both interventions provided explanation about benefit of sleep, sleep hygiene principles and acceptance of help offers. One study included information the prevention of infant sudden death and making babies settle by themselves [22]. The other discussed the importance of sunlight and bright light to establish normal circadian rhythm [49].

**Table 3. Intervention details**

Bhati, S. R., 2014	Galland, B. C., 2017
Sleep Support for Moms Intervention (SSMI)	The sleep intervention
45 minutes, face-to-face education	1 hour, group education
<p><b>Role of sleep</b> In health and wellness</p> <p>stores and repairs the cells in the body  reases stress and increases energy  reases emotional well-being  aintains normal blood pressure  Lack of Sleep</p> <p>pairs cognition  reases propensity for accidents, motor vehicle injuries and death  Postpartum sleep deprivation is linked to:  Postpartum depression / Fatigue / Obesity  Postpartum depression (PPD) is:</p> <p>e most common complication of childbirth second only to postpartum hemorrhage.  statistics: 12-15% of women suffer with PPD. Incidence is higher than breast cancer  me simple ways to prevent postpartum depression maybe to get enough of sleep.  Negotiating sleep with partners and family:</p> <p>ver refuse offers of help from partner, family, and friends  n't stay up to finish chores like laundry, dishes, and chores for your baby  Sleep hygiene principles for postpartum woman:</p> <p>oid stimulants like caffeine 6 hours before bedtime  oid alcohol 4 hours before bedtime  ercise regularly but not 2 hours before bedtime  ow one hour to unwind before bedtime  aintain a regular sleep schedule  ep the bedroom dark and quiet -Use a nightlight when feeding and changing the baby  oid bright light at bedtime  nsider having the infant in a bassinet by your bed so minimal sleep disruption is achieved  your infant sleeps in a separate room,  □Try to get the infant on a regular sleep schedule  □Keep the infants room dark and quiet at night  □Minimize noise around the infants room at night  Sunlight/Bright light is by far the most effective anti-depressive measure</p> <p>ercise may also play a role  nlight is important in regulating the circadian rhythm  ylnight increases melatonin which helps in regulating sleep.  ake sure you and your infant get at least one-two hours of sunlight each day.  ke your infant out with you and sit on the porch etc or you can sit in a room where there is sunlight  able to sit in sunlight, turn on the bright lights in your home for most of the morning or at least 2 hours  u can also open all the shades in your home during the day so your baby and you get plenty of sunshine  Summary:</p> <p>y to get 7-8 hours of sleep each night  ke the offers of family and friends to help out  ep as soon as you are drowsy, don't wait to finish one more thing as the urge to sleep will wane off and it  ll be difficult to fall asleep.  t some daylight every day.</p>	<p><b>Why sleep?</b></p> <ol style="list-style-type: none"> <li>1. Critical to a child's development, health and quality of life</li> <li>2. Good for parents' wellbeing and more</li> </ol> <p><b>What's normal</b></p> <ol style="list-style-type: none"> <li>1. Waking frequently during the night</li> <li>2. Active and quiet sleep cycles</li> <li>3. Sleeping through the night - a milestone to look forward to</li> <li>4. Babies can learn their sleep routines</li> <li>5. Babies need to be given a chance to learn to settle themselves • Some babies learn easily - others need more help</li> </ol> <p><b>Healthy sleep patterns</b></p> <ol style="list-style-type: none"> <li>1. Try to set some limits on 'handling' of baby</li> <li>2. Establish some regular pattern</li> <li>3. Notice and act on baby's tired signs early</li> <li>4. Darken sleeping place day and night ('cue' for sleep time)</li> <li>5. Try to put baby into their bed awake</li> <li>6. Give baby a brief chance to settle by themselves/learn to go to sleep on their own</li> <li>7. Keep night time quiet time - no 'play'</li> </ol> <p><b>Safe sleeping</b></p> <ol style="list-style-type: none"> <li>1. Own sleep place in your room</li> <li>2. On back</li> <li>3. Clean firm tightly fitting mattress</li> <li>4. Keep bed clear of "extras"</li> <li>5. Co-sleeping is unsafe <ul style="list-style-type: none"> <li>- If mother smoked during pregnancy</li> <li>- Adults (either) have been drinking, taking drugs, sedatives</li> <li>- Baby is less than 3 months old (for smoking and non-smoking mothers)</li> </ul> </li> </ol> <p><b>Looking after yourselves</b></p> <ol style="list-style-type: none"> <li>1. Your rest and sleep is important too</li> <li>2. Try to get a nap during the day</li> <li>3. Meals in freezer</li> <li>4. Limit visitors and looking after them</li> <li>5. Accept offers of help</li> <li>6. Go to bed early...soon after baby</li> </ol>

## Discussion

This is the first review to investigate the effectiveness of universal prenatal intervention focused on sleep for preventing PND. The effectiveness for AND and PPD or for maternal sleep is still unknown, because the available evidence has not been sufficient to draw conclusions. Further RCT studies should be done in the future, because sleep focused interventions can be expected as a preventive strategy based on theoretical support. The present study achieved new insights about universal sleep-related interventions during pregnancy and suggested the further research directions.

The effectiveness of the interventions in PND prevention was inconsistent between the two studies included in the current review. Although the effectiveness of sleep intervention during pregnancy is unclear at this time, it may be more difficult to improve postpartum outcomes by interventions started during pregnancy, because there is a time lag between pregnancy and the postpartum period. Considering the evidence that postpartum interventions of CBT-I and sleep hygiene education for mothers with insomnia showed effectiveness for reducing PND [36], postnatal women or patients with insomnia possibly be more eligible than pregnant women. However,

the fact that two RCTs in THE antenatal period were included in this study might indicate that prevention in the antenatal period has gradually attracted attention, although the number of RCT designed studies provided for all pregnant women remains limited. Considering the high prevalence of sleep problems in pregnancy, one would expect to see an increase in RCTs of evidence-based sleep intervention (i.e., CBT-I) focusing on maternal sleep during pregnancy in the future.

From the narrative review of intervention contents in Table 2, overviews in recent trends are illustrated. The contents of education about maternal and infant sleep has been established since the 1980s as parent training [50]. Tips for making good sleep-waking patterns (i.e., independent infant sleep, feeding in daytime) have not been significantly updated. However, new options on how to convey intervention can be adapted in novel ways, such as

internet-delivered programs, SMS text message and Apps. Bhati (2014) applied weekly text message to postpartum women for the intervention group. Digital health preventive interventions for pregnant individuals may be studied in the future. [42]. Additionally, complex interventions mixed with other kinds of childcare (e.g., breast feeding, vaccination, skin care) or a psychological approach (e.g., CB based) are options which may promote maternal and child health. Additionally, offering two or more sessions may prove beneficial, as both studies conducted only a single session during pregnancy. Evidence-based approaches (e.g., CBT-I) for maternal care should be studied. There is currently no study using CBT-I for pregnant women in a RCT design. Further study is imperative to optimize the most appropriate intervention (i.e., delivery, contents, the number and duration of the session).

This study has some limitations. The number of included studies was only two. The total number of participants was too few to conduct synthesis with meta-analysis. The languages were restricted to only English and Japanese. The included American study (Bhati, 2014) was a preliminary RCT for a Ph.D. thesis and was not published in a peer-review journal. The pre- and post-intervention results for depressive symptoms cannot be compared, because the baseline survey did not include the EPDS. Despite these limitations, these studies provide preliminary evidence suggesting that sleep interventions during pregnancy for all pregnant women would be theoretically beneficial for effective prevention of PND. Universal prenatal intervention has advantages of saving money on cost of screening and of targeting clients with more spare time to learn than new mothers [2]. Further well-designed studies are needed to firmly establish the benefits of prenatal sleep interventions.

## Conclusion And Implications

High prevalence of sleep problems (i.e., low sleep efficiency, poor sleep maintenance, and fragmented sleep) in the antenatal and postnatal period has been recognized as a critical health issue, which must be focused on for preventing PPD. Interventions to improve maternal sleep quality and teach mothers how to manage newborns' random/shortened sleep-wake patterns after childbirth would be worth disseminating during pregnancy because it is time-efficient and low in cost. This study found limited evidence to support the effectiveness of universal sleep interventions for pregnant women to protect maternal mental health. Further well-designed studies are needed to firmly establish the reliability of these effects.

## Abbreviations

AND: antenatal depression

CBT-I: cognitive behavioral therapy for insomnia

PICO: participants, interventions, comparisons and outcomes

PND: perinatal depression

PPD: postpartum depression

RCT: randomized controlled trial

SHE: sleep hygiene education

TAU: treatment as usual

## Declarations

### Ethics approval and consent to participate

The systematic review was not reviewed by ethics board because the study was on previously published literature.

### Consent for publication

Not Applicable.

### Availability of data and materials

All data in systematic review can be available upon request.

### Competing interests

None declared.

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## Authors' contributions

The corresponding author was in charge of this study design. The first author wrote the first draft. Twelve investigators (NS, NY, DN, EO, ZN, JS, TI, AI, YY, RY, AM, TS) conducted the screening of the literatures. All authors contributed to finalize the manuscript.

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## Figures

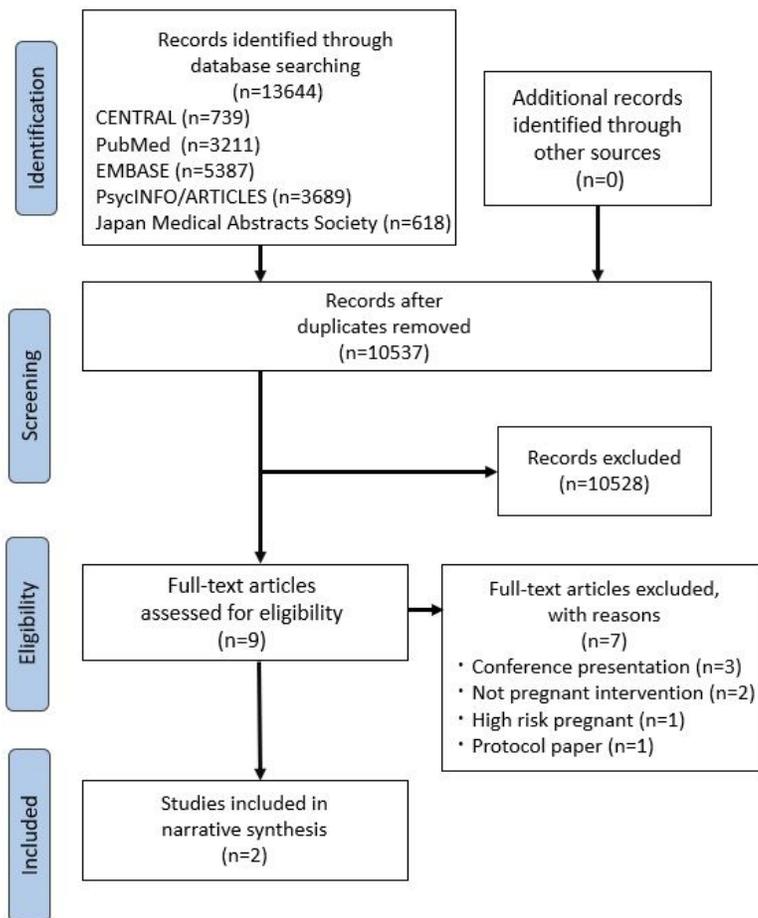


Figure 1

PRISMA 2009 Flow Diagram; Flowchart of systematic review search results

## Supplementary Files

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