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# Oxytocin levels and postnatal depression among Asian postpartum mothers: A scoping review

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**Abstract**
The depression among postpartum mothers has been discussed related to the changes in oxytocin level that would affect the mental health of mothers after childbirth. The review investigated the oxytocin level and postnatal depression among mothers to understand the relationship between oxytocin levels and postnatal depression among postpartum mothers in Asian countries from the existing literature. The selected literature followed the PRISMA framework for identifying, screening, and selecting relevant studies from three databases featuring PubMed, Scopus and Web of Science with 303 studies. A total of nine studies were assessed for eligibility and included in this final review after the literature.

Keywords: Oxytocin level; depression; postpartum mothers


DOI:

## 1.0 Introduction

The postpartum period, beginning with the birth of the newborn, marks profound adaptational changes in women's physiology, endocrine levels, and behaviour. Among the key transformations are changes in oxytocinergic and dopaminergic systems - two key neurohormonal systems implicated in maternal behaviour (Kanekasu et al., 2024). These systems have been associated with the autonomic system, positively influencing the intimate connection between mother and newborn. However, mothers experience varying degrees of decreased mood, anhedonia, fatigue, and sleep disturbance, leading to more severe conditions with the rejection of motherhood and suicidal ideas, known as postpartum depression (PPD). With a worldwide prevalence of 10.8% and the highest rates in low- and middle-income countries, PPD represents a considerable health burden, influencing mother-child bonding, pre-pregnancy mental health, pregnancy, breastfeeding, and the family environment (Abulaiti et al., 2022).

Converging findings suggest a central role for dysregulations in the oxytocinergic and dopaminergic systems, which share several neuroanatomical connections in the mesolimbic reward system, in postpartum maternal behaviour and PPD onset. In peripheral circulation, diminished oxytocin levels, detected in the early postpartum period, and the activation of the stress response, with increased plasma corticosterone levels, have been associated with PPD development in rodents. In this regard, it is important to point out that


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besides the neuroinflammatory process, dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, with elevated levels of cortisol during the first months postpartum, is also associated with PPD in women. However, in the periphery, several studies reported contrasting findings regarding the association between basal oxytocin levels and PPD development following the birth (Cevik & Alan, 2021; Chen et al., 2022; Rawashdeh et al., 2021; Yu et al., 2024; Yu et al., 2021).
Consequently, this conflict in results between studies, together with the broad use of diverse methodological approaches to assess and correlate oxytocin levels with postpartum depressive symptomatology, highlights the necessity of a scoping review to integrate available knowledge on the association between peripheral levels of oxytocin and PPD. To yield the analysis of the association between peripheral oxytocin levels and PPD, as per the eligibility criteria, cross-sectional studies analysing the peripheral levels of oxytocin in women with PPD symptoms following delivery, between the years 2020 and 2024 were meticulously reviewed. This scoping review is the first to synthesize, qualitatively evaluate, and summarize the findings and gaps in the association between oxytocin levels and PPD in the literature between 2020 and 2024 (Cevik & Alan, 2021; Kanekasu et al., 2024; Laili et al., 2024; Nagashi-Araki et al., 2022; Oon-arom et al., 2023; Rawashdeh et al., 2022; Shisido et al., 2021; Shisido & Horiuchi, 2023; Yu et al., 2024).

## 2.0 Literature Review

The last few decades have seen a dramatic increase in the recognition of psychiatric diseases concerning their potential lifelong course, early onset, and consequential familial and economic impacts. The setting of most of these disorders, occurring roughly at age 30, tremendously affects their patients, families, and society. An epochal life transition, pregnancy and motherhood, may represent a course risk factor for the emergence of stress-related affective disorders. According to the World Health Organization (WHO), the postpartum period constitutes a major risk factor for mood and anxiety disorders, affecting about 10-20% of all new mothers. The reasons behind these gender disparities are poorly understood, but a combination of biological, psychological, and psychosocial factors is likely involved (Bradshaw et al., 2022; Johansen et al.,2020; Zhao & Zhang, 2020)
Maternal neuroendocrine adaptations to pregnancy and childbirth may contribute to critical alterations of postpartum brain circuits involved in mood and stress regulation. Interestingly, appropriate variations in maternal neuroendocrine responses are species-conserved mechanisms to ensure profound behavioural and emotional changes associated with motherhood. As a result, such adaptations in brain circuitry may either promote alloparental care and emotional and motivational regulation or give rise to maladaptive postpartum processes (Shorey et al., 2023). Alterations of key factors involved in neuroendocrine stress circuits have been associated with the postpartum emergence of mental disorders in susceptible females (Zoubovsky et al.,2020).
Flooding the maternal brain with hormones of pregnancy may induce several up-regulation events concerning oxytocin (OT) circuitry, promoting maternal behaviours and emotional adaptations (Shorey et al., 2023). This peptide is also involved in stress responsiveness, depression-like behaviors, and anxiolytic and antidepressive actions. The involvement of OT in the pathophysiology of postpartum depression (PPD) based on its determinant contribution to neuroendocrine and behavioral adaptations following childbirth has been proposed by many critical reviews.

### *2.1 Oxytocin*

Oxytocin (OT), a peptide synthesized in the supraoptic and paraventricular nuclei of the hypothalamus, has garnered attention in recent years for its potential involvement in social cognition and psychopathology. Initially known for promoting uterine contraction during labour and facilitating milk letdown, its role in various socio behavioural processes has expanded significantly, encompassing attachment, trust, and empathy. Subsequent investigations aimed at understanding OT's etiological contribution to disorders characterized by social deficits and maladaptive behaviours, such as autism, schizophrenia, and social anxiety. Several studies reported that OT levels in plasma, urine, and cerebrospinal fluid correlate negatively with severity in autism, obsessive-compulsive disorder, and psychopathy; however, not all studies support this relationship. Research on oxytocin (OT) levels correlation with depression among mothers has emerged as a critical area of inquiry due to its implications for maternal mental health and child development. The oxytocinergic system, known for its role in childbirth, lactation, and social bonding, has been increasingly studied in relation to postpartum depression (PPD) and maternal caregiving behaviours (Weinstein et al., 2023).
In recent decades, the central role of OT in female reproductive physiology, especially in lactation and maternal care, has been accepted widely. During parturition, substantial increases in plasma OT preceded the onset of uterine contraction, followed by further OT elevation that continues up to 24 hours postpartum. Following normal birth, mothers receive infant oral stimulation, which causes continued OT release from paraventricular and supraoptic hypothalamic nuclei via vagus nerve activation (Chen et al., 2022). As a result, OT is secreted into the blood, reaching different organ systems, including the mammary gland, uterus, heart, adrenal gland, liver, and ovary. Many of these OT-binding organs show functional alterations commonly seen in mothers, such as increased maternal behavior and decreased anxiety, which could facilitate successful maternal care. However, this hormonal surge may paradoxically induce maternal neglect and psychiatric disorders in some mothers who have undergone stress during pregnancy or parturition. Individual susceptibility to dysfunction in OT network signaling in the brain may be a key determinant in the clinical manifestation of such disorders (Yu et al., 2021)
Whether OT is involved in the onset of maternity-associated psychopathological conditions, such as postpartum depression (PPD) and psychosis, has become a subject of active research. Although these disorders largely exhibit hyperactive stress-response systems due to increased life stress, they also exhibit hypofunction of certain hormones, including sex hormones and OT. There is growing evidence of OT dysfunction in PPD and pregnancy-associated infanticide in rodents. Elevated OT levels in the blood, cerebrospinal fluid, or brain are the typical presentation in gestational models of autism, maternal neglect, and infanticide, suggesting different roles of OT systems

in the offspring's wellbeing vs. maternal mental health. Similarly, the potential involvement of prostaglandin E2 to oxytocin-inducing maternal care behavior and inducing postpartum depression-like units was also reported (Chen et al., 2022). Understanding how OT systems affect postpartum emotion, perception, and cognition could illuminate the neuroendocrine mechanisms underlying not only healthy but also abnormal maternal care and foster novel therapeutic approaches for treating PPD mothers.

*2.2 Postpartum depression (PPD)*

Postpartum depression (PPD) is a debilitating mental health disorder associated with childbirth. Characterized by a collection of symptoms lasting more than two weeks and affecting the daily functioning of the individual, it is one of the most underreported and undertreated conditions in the world. Despite being highly prevalent, with some studies suggesting a rate of close to 25 percent in primiparous women, it is misdiagnosed and mistaken for the 'baby blues', which causes a collection of mild symptoms and occurs in the first days after delivery (Banasiewicz et al., 2020; Huang et al., 2023).

## 3.0 Methodology

A scoping review methodology was chosen to investigate the literature on the relationship between oxytocin levels and postpartum depression. Scoping reviews are broader and less structured than systematic reviews and are useful for examining the extent and nature of research on a particular topic and identifying gaps in literature. This scoping review reported using the (PRISMA SCR) and utilised the framework by Arksey and O'Malley (2005) as cited in Md Yakup et al. (2022). The framework included five components: 1) Identifying the research question, 2) identifying the relevant studies, 3) Study selection, 4) Charting the data, and 5) Collating summarizing and reporting the results (Figure 1). The synthesises of existing literature from studies conducted in Asian countries to evaluate the relationship between oxytocin levels and symptoms of postnatal depression. Three databases were explored in the scoping review: PubMed (n = 79), Scopus (n = 108), and Web of Science (n = 116) totalling 303 studies. A total of 125 duplicate studies were excluded. Based on the title and abstract, 150 studies were excluded. Twenty-eight full-text articles were assessed for eligibility, with 19 excluded for non-fulfilment of the predetermined inclusion criteria. Finally, nine studies were included in this final review.

The studies varied in design, including longitudinal, cross-sectional, and retrospective approaches. Oxytocin levels were measured through serum or saliva, while depression symptoms were assessed using validated scales, such as the Edinburgh Postnatal Depression Scale (EPDS), the Patient Health Questionnaire-9 (PHQ-9), and the Maternity Blues Scale. Several studies reported a significant relationship between oxytocin levels and depressive symptoms, particularly in the early postpartum period. Other studies found no statistically significant association. Some investigations focused on related outcomes such as maternal anxiety or mother-infant bonding. Methodological variations, including differences in measurement timing, sample size, and psychological tools, contributed to the heterogeneity of results. Current evidence does not conclusively establish oxytocin as a standalone predictive biomarker for postnatal depression.

*3.1 Identifying the Research Question*

The research question for this scoping review is, "What are the oxytocin level relation to depression among postpartum mothers?"

*3.2 Identifying Relevant Studies*

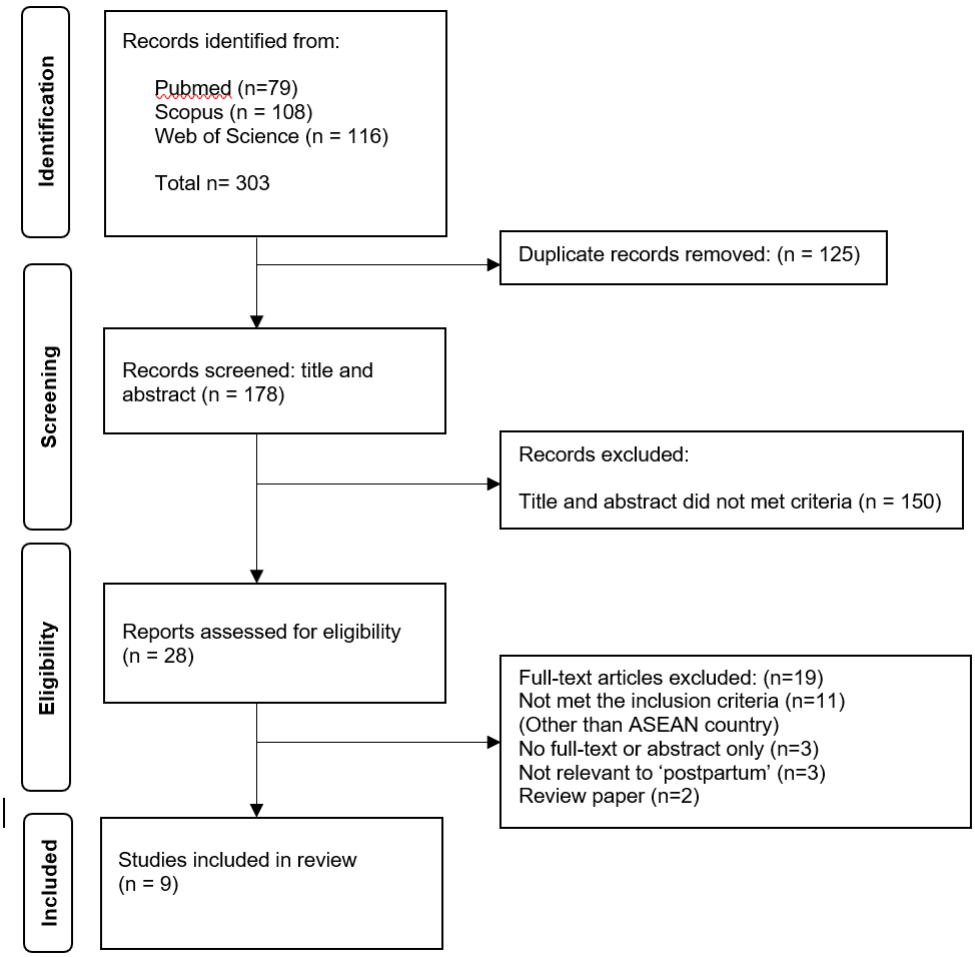
Relevant studies were identified by searching through the database, including PubMed, Scopus, and Web of Science. The following MeSH headings and key terms such as oxytocin, postpartum, mother, maternal, depression were used to optimize the search. This scoping review was limited to articles written in English, conducted with human participants, published in Asian countries, and available in full text. Criteria for restriction may be loosened if there are not sufficient articles identified. PICO components were used to develop the search strategies were population, intervention, comparison, outcome, and inclusion and exclusion criteria. Willingness to consider additional inclusion criteria in search strategies if identified in the literature search is also indicated.

*3.3 Selection of the Study*

Studies were only included if they had adult human participants, accurately gauged the hormonal levels of oxytocin through plasma, urinary, or saliva tests, measured the conditions of postpartum depression through validated questionnaires or clinical interviews, and published quantitative results/data. Only studies using the English language for data collection or publication were included as translators and interpreters can add potential for discussion outside of the research context. There is a need for transparent reporting of the changes made to the pre-registered protocol to adequately appraise the influence and bias of any published study. Search strategies from one database were used and altered to accommodate the requirements of each individual database. Keyword combinations were used as well as subject headings and filters. Other than Asian country studies were excluded from the literature on postpartum depression and oxytocin search. Opioids, cough medicine consumption, and miscarriage/post-abortion were considered irrelevant to the research question. Review papers, meta-analyses, editorials, and commentaries were excluded, as were publications deemed out of the time frame. Therefore, titles were screened individually first, then abstracts, and finally full-text articles. Each research paper selected was cross-checked against the inclusion and exclusion criteria and assessed for potential bias. The authors analysed all the above studies that were included.

**Figure 1**

*PRISMA Flow Diagram*




*3.4 Data Extraction and Analysis*

The reviewed articles were downloaded, and a standard data extraction form created using Excel was filled. The following data were collected: author name, publication year, country, study design, sample characteristics, measurement methods to assess oxytocin levels, statistics, main findings (including correlation and significance), and limitations of the study.

*3.5 Search Strategy*

Three broad categories of search terms were developed: oxytocin, postpartum depression, and related factors. A combination of Medical Subject Headings (MeSH) and text-based key terms was used to ensure comprehensive coverage of the subject area. Three online research databases were used: PubMed, Scopus and Web of Science. PubMed was chosen for its specialization in the health-related area and the American National Library of Medicine. Scopus was chosen because it is one of the largest abstract and citation databases of peer-reviewed literature in scientific research and is very diverse with journals from the fields of science, technology, medicine, social science, and more. Peer-reviewed articles published from January 2020 to June 2024 and available in English were included. These criteria were applied to the original search strategy to reduce the number of records while trying to prevent exclusion of any relevant literature. Two independent researchers screened this set of records against the eligibility criteria. Disagreement was resolved through discussion. A total of 54 records were excluded, leaving 29 records for full article screening. Two independent researchers screened the full texts of the articles against the eligibility criteria and two records were again independently screened. After discussion, nine records were included in the synthesis. These records were imported into Excel for spreadsheet analysis and reviewed in detail in terms of study design, sample size and sampling method, country of origin, hormonal assay method, measurement of postpartum depression symptoms, and assessment of the relationship between hormonal levels and postpartum depression symptoms to identify both gaps in

the literature and areas for further research.

## 4.0 Results

The findings from the scoping review, based on nine studies published between 2020 and 2024, revealed significant insights regarding the relationship between oxytocin levels and postpartum depression (PPD). Most of the studies published in 2021 till 2024 provided compelling evidence for a possible predictive relationship between low oxytocin levels and PPD emergence post-birth (Table 1). The reviewed studies revealed mixed evidence regarding the association between oxytocin (OT) levels and postpartum depression (PPD). Several studies demonstrated a significant inverse relationship, suggesting a protective role of OT. For instance, Laili et al. (2024) in Indonesia found that higher OT levels on the first postpartum day were significantly associated with lower EPDS scores, while Yu et al. (2024) in China reported a similar negative correlation between serum OT levels and depression scores measured by the PHQ-9. Likewise, Shishido et al. (2021) in Japan observed that OT levels were significantly associated with maternity blues, a known proxy for early postpartum depressive symptoms. Conversely, other studies found no significant associations. Rawashdeh et al. (2022) in Jordan reported no link between third-trimester OT and PPD, and Oon-arom et al. (2023) in Thailand concluded that OT was not predictive of PPD, identifying corticotropin-releasing hormone (CRH) as a better predictor. Similarly, Cevik and Alan (2021) in Turkey found no significant postpartum correlation between OT and depressive symptoms, although their findings add geographic diversity. Some studies reported mixed or indirect associations. Nagahashi-Araki et al. (2022) found OT levels to be associated with postpartum anxiety rather than depression, while Kanekasu et al. (2024) identified a link between salivary OT and maternal bonding, indirectly implying mood implications. Furthermore, Shishido and Horiuchi (2023) noted that OT changes following emergency Caesarean sections were associated with maternity blues, indicating that OT's emotional impact may vary based on birth circumstances.

Table 1

*Synthesis of Articles Based on PICO*

| No. | Author(s) & Year | Country | Sample Size | Measurement Tools (OT/Depression) | Key Findings | PICO Alignment |
|---|---|---|---|---|---|---|
| 1 | Cevik & Alan (2021) | Turkey | 70 | Saliva / EPDS, BDI | Weak negative correlation with late pregnancy OT; none postpartum | Partial |
| 2 | Shishido et al. (2021) | Japan | 69 | Saliva / Maternity Blues, Fatigue Scale | Postpartum OT decrease associated with higher maternity blues | Full |
| 3 | Rawashdeh et al. (2022) | Jordan | 172 | Serum / EPDS | No significant association between OT and PPD | Full |
| 4 | Nagahashi-Araki et al. (2022) | Japan | 24 | Saliva / STAI | Higher OT change linked to lower state anxiety; no clear depression link | Partial |
| 5 | Oon-arom et al. (2023) | Thailand | 200 | Serum / EPDS, PHQ-9, DASS-21 | CRH but not OT predicted PPD | Full |
| 6 | Shishido & Horiuchi (2023) | Japan | 65 | Saliva / Maternity Blues, Fatigue Scale | Greater OT decrease linked to higher maternity blues | Partial |
| 7 | Kanekasu et al. (2024) | Japan | 66 | Saliva / EPDS, STAI, MIBS | OT linked to maternal–infant bonding, not clearly to PPD | Partial |
| 8 | Laili et al. (2024) | Indonesia | 30 | Serum / EPDS | Significant OT–EPDS correlation on Day 1; not Day 3 | Full |
| 9 | Yu et al. (2024) | China | 157 | Serum / PHQ-9, GAD-7 | OT negatively correlated with depression and anxiety scores | Full |

Note. OT = Oxytocin; EPDS = Edinburgh Postnatal Depression Scale; PHQ-9 = Patient Health Questionnaire-9; STAI = State-Trait Anxiety Inventory; PPD = Postpartum Depression; CRH = Corticotrophin-Releasing Hormone.

In term of the alignment with PICO, three studies having a positive significant association between oxytocin levels and PPD (Laili et al., 2024; Shishido et al., 2021; Yu et al., 2024). While three studies show no significant association (Cevik & Alan, 2021; Oon-arom et al., 2023; Rawashdeh et al., 2022), the other three studies indicate mixed or indirect association (Kanekasu et al., 2024; Nagahashi-Araki et al., 2022); Shishido & Horiuchi, 2023)

## 5.0 Discussion

The findings from the reviewed studies present a complex but insightful picture of the relationship between oxytocin (OT) levels and postpartum depression (PPD). Several studies reported a significant inverse association, suggesting that elevated OT levels may confer a protective effect against depressive symptoms in the postpartum period. For instance, Laili et al. (2024) in Indonesia demonstrated that higher OT concentrations on the first postpartum day were significantly correlated with lower Edinburgh Postnatal Depression Scale (EPDS) scores. Similarly, Yu et al. (2024) in China found a significant negative correlation between serum OT levels and depression severity as measured by the Patient Health Questionnaire-9 (PHQ-9). Shishido et al. (2021) in Japan also reported a significant association between OT levels and maternity blues, often considered a precursor to or early indicator of PPD.

In contrast, several studies found no significant relationship between OT levels and postpartum mood disturbances. Rawashdeh et al. (2022) in Jordan reported no association between third-trimester OT levels and subsequent PPD symptoms. Oon-arom et al. (2023) in Thailand similarly concluded that OT was not a predictive biomarker for PPD, noting instead that corticotropin-releasing hormone (CRH) showed stronger predictive validity. Cevik and Alan (2021) in Turkey also did not observe a significant correlation between postpartum OT levels and depressive symptoms, although their study contributes valuable insight from a non-Asian context.

Other studies presented mixed or indirect associations. Nagahashi-Araki et al. (2022) found that OT levels were significantly associated with postpartum anxiety rather than depression, highlighting potential emotional specificity in OT's effects. Kanekasu et al. (2024) identified a significant relationship between salivary OT and mother-infant bonding, suggesting indirect implications for maternal emotional well-being. Additionally, Shishido and Horiuchi (2023) reported that changes in OT levels following emergency Cesarean delivery were associated with maternity blues, indicating that OT's role may be context-dependent and influenced by birth-related stress.

### *5.1 Conclusion and recommendation*

This scoping review not only provides the most up-to-date summary of the relationship between oxytocin levels and PPD emergence but also touches upon the PPD diagnosis proposed in the supplemental material. In five studies, critical limitations regarding PPD diagnosis were accumulated and analysed. Overall, the existing literature suggests a potential but inconsistent association between oxytocin (OT) levels and postpartum depression (PPD). While several studies indicate that higher OT levels may offer a protective effect against depressive symptoms, others report no significant association or highlight indirect links through maternal anxiety and bonding. These discrepancies may be attributed to variations in study design, timing of OT measurement, biological samples used, and contextual factors such as mode of delivery or psychosocial stressors. Despite its promise, OT alone may not serve as a definitive biomarker for PPD, underscoring the need for a multidimensional approach to understanding postpartum mental health. Future research should prioritize broader geographic representation, as current evidence is predominantly drawn from Asian populations. Expanding investigations to include diverse cultural and ethnic contexts—particularly from underrepresented regions such as Africa, Europe, and the Americas—would enhance the generalizability of findings. Moreover, longitudinal studies with standardized protocols for OT measurement and assessment of depressive symptoms are essential to clarify temporal relationships and causal pathways. Integrating oxytocin analysis with other biological, psychological, and social markers may also improve the predictive accuracy and clinical utility in identifying mothers at risk for PPD.

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## Paper Contribution to Related Field of Study

This scoping review contributes by mapping existing evidence on the relationship between oxytocin levels and postnatal depression among postpartum mothers in Asian countries, highlighting inconsistencies and research gaps, and recommending more standardised, multidimensional future studies.

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