

ARTICLE INFORMATION

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Maternal behavioral and psychosocial factors associated with preterm birth: A systematic review

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Abstract

Background: Preterm birth (PTB), defined as delivery before 37 weeks of gestation, remains a major global health problem contributing to neonatal morbidity and mortality. Behavioral and psychosocial factors are increasingly recognized as important contributors to PTB incidence.

Purpose: To identify and synthesize evidence regarding behavioral and psychosocial risk factors associated with preterm birth.

Method: This study used a systematic review design based on PRISMA guidelines. Literature searches were conducted through PubMed, ScienceDirect, and Google Scholar using keywords related to preterm birth, behavioral factors, and psychosocial factors. Selected studies were analyzed qualitatively according to inclusion and exclusion criteria.

Results: Five studies met the eligibility criteria. Maternal stress and low health control beliefs were associated with an increased likelihood of preterm birth in some studies. Evidence regarding smoking, alcohol consumption, diet, physical activity, depression, and psychological distress was limited or inconsistent across the included studies.

Conclusion: Behavioral and psychosocial factors contribute to PTB risk. Comprehensive prenatal care should integrate psychosocial screening and behavioral assessment to improve maternal and neonatal outcomes.

Keywords: Behavioral Factors; Maternal Stress; Pregnancy; Preterm Birth; Psychosocial Factors.

INTRODUCTION

Preterm birth (PTB), defined as delivery before 37 completed weeks of gestation, remains one of the major global health problems contributing significantly to neonatal morbidity and mortality (Creswell, Burke, Rolnik, Lindow, Miletin, & O'Gorman, 2025). PTB is recognized as one of the leading causes of death among children under five years old worldwide (Liang, Lyu, Li, Li, & Chi, 2024; Popoola, Ohaeri, Ojo, & Babarimisa, 2023). According to the study preterm birth is categorized based on gestational age into extremely preterm (<28 weeks), very preterm (28–31 weeks), and moderate to late preterm (32–36 weeks).

These conditions are associated with various short-term and long-term health complications in infants (World Health Organization, 2023).

Globally, approximately 15 million babies are born preterm every year, representing around 11% of all live births worldwide (Bradley, Blencowe, Moller, Okwaraji, Sadler, Gruending, & Lawn, 2025; Ohuma, Moller, Bradley, Chakwera, Hussain-Alkhateeb, Lewin, & Moran, 2023). The prevalence of PTB varies across countries, ranging from approximately 4% in several developed countries to more than 18% in low-resource (Swaray-Deen, Sepenu, Mensah, Osei-

Agyapong, Sefogah, Appiah-Sakyi, & Konje, 2024). Indonesia is among the countries with the highest number of preterm births globally. Previous reports indicated that Indonesia, together with India, China, Pakistan, Nigeria, and the United States, contributes nearly half of total preterm birth cases worldwide Marsubrin, Ibrahim, Dilmy, Ariani, Wiweko, Irwinda, & Basrowi, 2024).

Beyond neonatal mortality, preterm birth may also result in long-term complications, including neurodevelopmental disorders, cerebral palsy, impaired cognitive function, visual and hearing impairment, and chronic respiratory disease. In addition, PTB contributes substantially to healthcare expenditure, prolonged hospitalization, and long-term social and economic burden for families and healthcare systems worldwide (Creswell et al., 2025; Popoola et al., 2023).

Preterm infants commonly present with low birth weight, shorter body length, smaller head circumference, and immature organ development (Fenton, Barr, Elmrayed, & Alshaikh, 2024). These conditions increase the risk of respiratory disorders, infections, developmental delays, and neonatal death. Furthermore, women with a previous history of preterm birth have a greater risk of experiencing recurrent PTB in subsequent pregnancies (Rocha, de Cássia Ribeiro-Silva, Fiaccone, Paixao, Falcão, Alves, & Barreto, 2022). Therefore, early identification of risk factors associated with PTB is essential to support preventive interventions and improve maternal and neonatal outcomes.

Several maternal and medical factors have been associated with PTB, including multiparity, intrauterine infections, chronic maternal diseases, hypertension, and genetic predisposition (Azo, Senior, & Piro, 2023). In addition to medical conditions, behavioral factors such as smoking, alcohol consumption, poor dietary habits, obesity, and inadequate physical activity are also considered important contributors to PTB incidence (Rajia, 2024). Psychosocial factors, including maternal stress, depression, anxiety, lack of social support, and mental health problems during pregnancy, have also been increasingly recognized as determinants influencing pregnancy outcomes (Tama et al., 2025).

Previous studies have shown that pregnant women experiencing high psychosocial stress are more likely to experience preterm delivery (Tama, Kusrini, Adnani, Susiarno, & Adepoju, 2025). However, findings regarding the relationship between behavioral and psychosocial factors and PTB remain inconsistent across studies (Koivu, Näsänen-Gilmore, Hunter, Muthiani, Isojärvi, Heimonen, & Ashorn, 2023). Some studies demonstrated significant associations, while others reported limited or non-significant relationships. In addition, most previous studies focused only on specific factors separately rather than comprehensively evaluating both behavioral and psychosocial risk factors within a single review.

RESEARCH METHOD

This study used a systematic review design based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The literature search process was conducted from June 2010 to June 2025 using several electronic databases, including PubMed, ScienceDirect, and Google Scholar.

Population and Sample: The population in this study consisted of published articles discussing behavioral and psychosocial risk factors associated with preterm birth. The study selection process used inclusion and exclusion criteria. Articles included in this review were original research articles published in English within the last 15 years and discussing behavioral risk factors such as smoking, alcohol consumption, tobacco use, obesity, dietary patterns, and physical activity, as well as psychosocial risk factors including stress, family support, and maternal mental health issues related to preterm birth. Narrative reviews, systematic reviews, meta-analyses, conference abstracts, scientific posters, editor responses, and study protocols were excluded from the analysis. Articles without full-text availability, non-English articles, and studies with irrelevant topics were also excluded.

Search Strategy and Study Selection: The literature search was performed using relevant keywords combined with Boolean operators. All identified studies were collected and managed using

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Rayyan.ai software. Duplicate articles were removed before screening. The researchers screened titles and abstracts according to the eligibility criteria, followed by full-text assessment of potentially relevant studies. Any discrepancies during the selection process were resolved through discussion among the review team. The study selection process was documented using the PRISMA flowchart.

Study Quality Assessment and Data Extraction: The quality of the selected studies was independently assessed using the Joanna Briggs Institute (JBI) critical appraisal tool. Data from the included studies were extracted and organized using Microsoft Excel 2016 (Microsoft Corporation, USA) and Rayyan.ai. Extracted data included author names, publication

year, country, study design, study objectives, population characteristics, behavioral and psychosocial risk factors assessed, and outcomes related to preterm birth incidence. A total of 502 articles were identified from three electronic databases, namely PubMed, Google Scholar, and ScienceDirect. After removing 15 duplicate articles, 487 articles remained for title and abstract screening. Articles that did not meet the inclusion criteria were excluded. Full-text screening was conducted on potentially relevant studies, resulting in five eligible articles included in this systematic review. Four studies were obtained from database searching and one study was identified through hand-searching.

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RESEARCH RESULTS

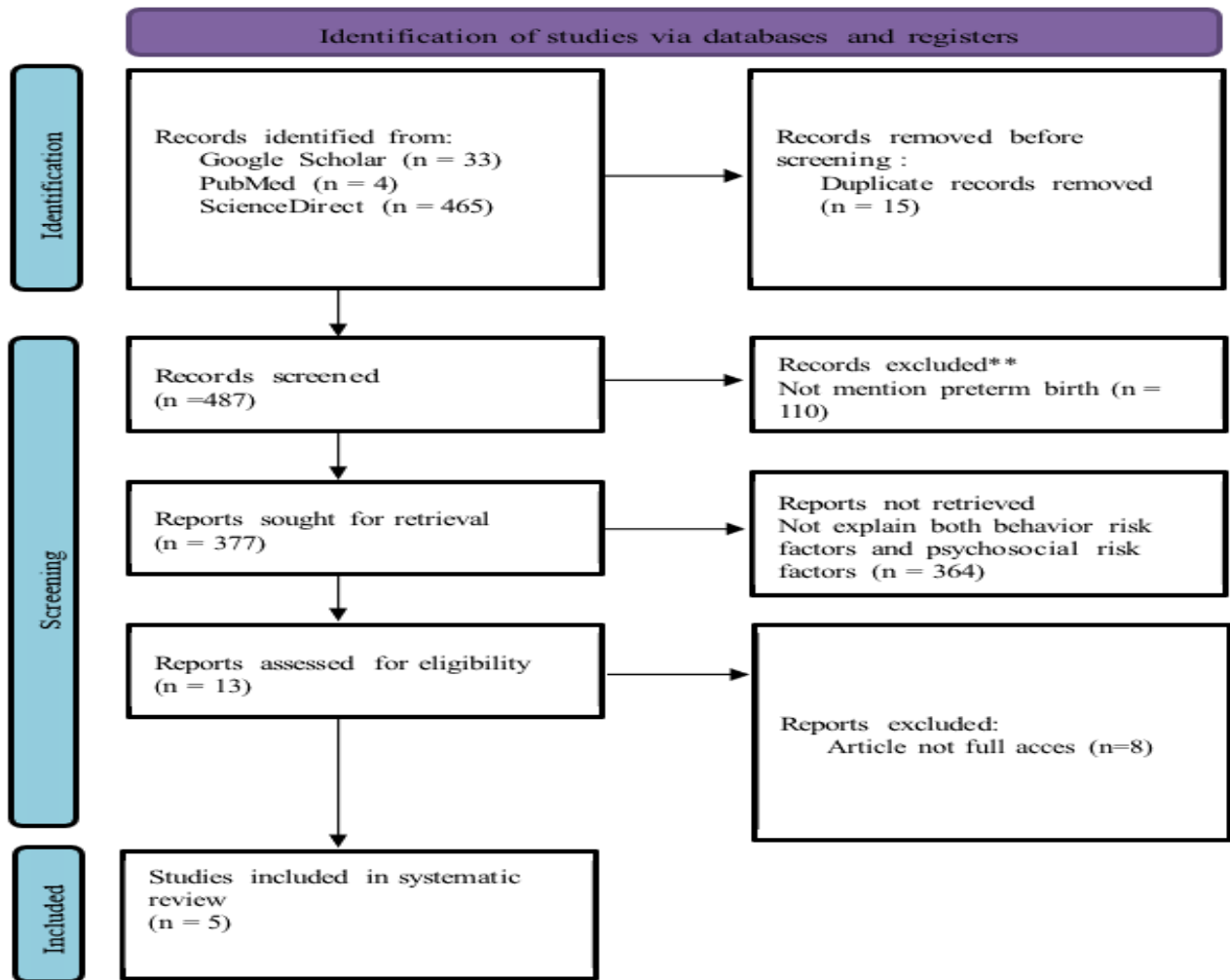


Figure 1. PRISMA 2020 Flow Diagram

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Table Summary of Selected Articles

(Author, Year)(Country)	Purpose	Design & Method	Results
(Shaw et al., 2019) (USA)	to assess whether distinct latent profiles of co-occurring medical and psychosocial factors have implications for preterm birth and low birthweight.	Data are from the Pregnancy Risk Assessment Monitoring System, a cross-sectional survey constituting representative data on pregnancies from 2012 to 2013. Latent class analysis derived classes of pregnant women potentially at risk for low birthweight and/or preterm birth.	Latent class analysis identified five homogenous profiles of interrelated psychosocial and medical factors. Risk was greatest for the profile marked by high rates of medical factors, followed by a high risk for a profile marked by a combination of very low income and psychosocial factors. Two profiles involving low income and very low income also indicated greater risk for adverse birth outcomes related to socioeconomic status.
(Baron et al., 2017) (Canada)	to investigate the relationships of self-reported maternal health behaviour and psychological characteristics in nulliparous women with spontaneous preterm birth in prenatal primary care.	The data of our prospective study was obtained from the nationwide DELIVER multicentre cohort study (September 2009-March 2011), which was designed to examine perinatal primary care in the Netherlands. In our study, consisting of 2768 nulliparous women, we estimated the relationships of various self-reported health behaviours (smoking, alcohol consumption, folic acid supplementation, daily fruit, daily fresh vegetables, daily hot meal and daily breakfast consumption) and psychological characteristics (anxious/depressed mood and health control beliefs) with spontaneous	Low health control beliefs was the sole characteristic significantly associated with spontaneous preterm birth (odds ratio 2.26; 95 % confidence interval 1.51, 3.39) after being adjusted for socio-demographics, anthropometrics and the remaining health behaviour and psychological characteristics. The other characteristics were not significantly associated with spontaneous preterm birth.

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		preterm birth as a dichotomous outcome. Due to the clustering of clients within midwife practices, Generalized Estimating Equations was used for these analyses.	
(Sania et al., 2017) (South Africa)	to evaluate the effects of psychosocial stressors and alcohol abuse on birth outcomes in HIV-infected women.	Antenatal depression and non-specific psychological distress, periconception IPV and alcohol consumption were measured during the second trimester among HIV+ women initiating antiretroviral treatment with efavirenz + emtricitibine + tenofovir in Cape Town, South Africa. Log binomial regression models were used to estimate the risk ratios (RR) and 95% CIs of the effects of psychosocial stressors and periconception alcohol consumption on birth outcomes: SGA (birth weight <10th centile for gestational age) and preterm (<37 weeks) births.	Of the 571 mother–infant pairs, 26% of women reported hazardous alcohol consumption (Alcohol Use Disorders Identification Test-C score ≥ 3) periconception periods, 11% reported depressive symptoms, 7% reported non-specific psychological distress and 15% reported experiencing physical or psychological IPV. 14% of infants were born preterm and 12% were SGA. Infants born to women reporting hazardous drinking were twice (adjusted RR 2.00 (95% CI 1.13 to 3.54)) as likely to be SGA compared with women reporting low alcohol intake.
(Lilliecreutz et al., 2016) (Sweden)	to investigate the effect of maternal stress during pregnancy on the risk of.	A case–control study that included 340 women; 168 women who gave birth preterm and 172 women who gave birth at term. Data were manually extracted from standardized medical records. If the medical record contained a psychiatric diagnosis or a self-reported stressor e.g., depression or	Maternal stress during pregnancy was more common among women who gave birth preterm compared to women who gave birth at term ($p < 0.000$, AOR 2.15 (CI = 1.18–3.92)). Among the women who experienced stress during pregnancy 54 % gave birth preterm with stress as an attributable risk factor. Among all of the women the percentage was 23 %.

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(Abeyseena et al., 2010) (Sri Lanka)	To determine trimester-specific effects of risk factors for preterm birth (PTB).	anxiety the woman was considered to have been exposed to stress during pregnancy.	Standing equal to or less than 2.5 h/day during the first or second or both trimesters (OR 1.83, 95%CI 1.03, 3.25), maternal age of <25 years (OR 1.73, 95%CI 1.02, 2.95), education up to primary school level (OR 3.30, 95%CI 1.3, 8.36) and past history of low birth weight (OR 2.52, 95%CI 1.16, 5.48) were risk factors for PTB. Psychosocial stress was not found to be a risk factor for PTB.
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DISCUSSION

This systematic review aimed to identify and synthesize evidence regarding behavioral and psychosocial risk factors associated with preterm birth (PTB). Based on the findings from five included studies, several behavioral and psychosocial factors were identified as contributors to PTB incidence, although not all factors demonstrated statistically significant associations.

The results of this review showed that maternal stress and heavy smoking during pregnancy were the most consistent factors associated with increased risk of preterm birth. Studies conducted demonstrated significant relationships between psychosocial stress, smoking behavior, and PTB incidence ($p < 0.05$). Pregnant women who experienced high levels of psychosocial stress were more likely to experience preterm delivery compared to women without significant stress exposure. Similarly, smoking more than 10 cigarettes per day significantly increased the risk of PTB (Baron, Te Velde, Heymans, Klomp, Hutton, & Brug, 2017; Shaw, Herbers, & Cutuli, 2019).

Maternal stress during pregnancy may activate the hypothalamic-pituitary-adrenal (HPA) axis, resulting in increased cortisol secretion and inflammatory cytokine production. Elevated stress hormones may stimulate uterine contractions, impair placental blood flow, and increase susceptibility to spontaneous preterm labor. Chronic psychosocial stress may also negatively affect maternal coping behavior, sleep quality, and nutritional intake during pregnancy.

Another study identified several psychosocial and medical risk profiles associated with PTB using data from the Pregnancy Risk Assessment Monitoring System (PRAMS). Women with high psychosocial stress, including domestic violence, housing instability, food insecurity, and low socioeconomic status, had increased PTB risk. The study also reported that women with combined psychosocial and medical risk factors had the highest probability of experiencing PTB. These findings support the importance of integrating psychosocial assessment into routine prenatal care (Shaw et al., 2019).

The findings are consistent with recent recommendations from the American College of Obstetricians and Gynecologists (ACOG), which

emphasize the importance of mental health and psychosocial screening during pregnancy and postpartum care (American College of Obstetricians and Gynecologists, 2023). However, previous studies by Corathers et al. (2023) reported that psychosocial screening is still not universally implemented in clinical practice, particularly regarding domestic violence and mental health assessment. Also reported that psychosocial problems negatively affect maternal functioning during both antenatal and postpartum periods. Therefore, evidence-based psychosocial screening protocols are essential to improve healthcare providers' ability to identify and manage psychosocial risks during pregnancy (Cafiero & Zabala, 2024).

Early psychosocial screening during antenatal care may help healthcare providers identify pregnant women at higher risk of adverse pregnancy outcomes. Integrating psychosocial assessment into routine prenatal services may support earlier intervention, counseling, stress management, and referral for mental health support.

This review also found that low maternal health control beliefs were significantly associated with PTB incidence. Another study reported that pregnant women with lower perceptions of health control were more likely to experience spontaneous PTB compared to women with stronger health control beliefs (Baron et al., 2017). Previous studies also demonstrated associations between low maternal health control beliefs and preterm birth outcomes (Ashford & Rayens, 2015). Stress has also been consistently associated with PTB incidence in previous studies. Efforts to improve maternal feelings of control and stress management during pregnancy have been suggested to reduce adverse pregnancy outcomes (Mirzaei, Hiller, Stelzer, Thiele, Tan, & Becker, 2024). Other research further reported that stronger maternal health control beliefs may reduce postpartum psychological problems. In addition, group prenatal care interventions such as Centering Pregnancy TM have been shown to improve birth outcomes and reduce PTB incidence (Barut & Güney, 2022).

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Smoking behavior remained one of the strongest behavioral risk factors identified in this review. Heavy smoking during pregnancy significantly increased PTB risk, consistent with findings reported previous studies demonstrated inconsistent findings ranging from no association to significant associations with very early PTB and medically indicated PTB. Tobacco exposure during pregnancy may reduce placental blood flow and oxygen delivery to the fetus, thereby increasing the likelihood of premature labor and fetal growth restriction (Sulistiyani, Kusmiyati, Sunartono, & Sari, 2026).

Cigarette smoke contains nicotine, carbon monoxide, and other toxic substances that may reduce oxygen transport to the fetus and impair placental circulation. These mechanisms can increase oxidative stress, fetal hypoxia, placental dysfunction, and inflammatory responses, thereby increasing the risk of premature rupture of membranes and spontaneous PTB.

In contrast, several behavioral factors, including alcohol consumption, dietary habits, physical activity, passive smoking, and fruit and vegetable consumption, showed limited or non-significant associations with PTB incidence. Previous studies suggested that fruit and vegetable intake might reduce PTB risk; however, the present review found only weak or non-significant associations (Gete, Waller, & Mishra, 2020). Another study also reported that harmful alcohol consumption did not significantly increase PTB risk. Although some studies suggested that alcohol exposure before pregnancy recognition may still affect fetal development, the statistical association with PTB remained limited in this review (Schmidt, Wey, Harding, Fortier, Atkinson, Tough, & Bocking, 2023).

Psychosocial conditions such as depression, intimate partner violence, and psychological distress were also evaluated in several included studies. Other reported that maternal stress significantly increased PTB risk (OR 2.94; 95% CI 1.76–4.92; $p < 0.05$). Psychological stress during pregnancy has been associated with hormonal changes, inflammatory responses, and impaired maternal coping mechanisms that may contribute to spontaneous preterm labor. In addition, tobacco use also showed a

significant relationship with PTB incidence (OR 2.43; 95% CI 1.27–4.64; $p = 0.007$) (Sanchez, Puente, Atencio, Qiu, Yanez, Gelaye, & Williams, 2013).

However, other research found no significant association between psychological distress measured using GHQ scores and PTB incidence (Lalani, Premji, Shaikh, Sulaiman, Yim, & Forcheh, 2023). In contrast, research identified a direct relationship between higher psychological distress scores during the second trimester and increased PTB risk. Physical activity also demonstrated inconsistent findings across studies. While Abeysena et al. found no significant association, Teitelman et al. reported increased PTB incidence among women who stood for prolonged periods during occupational activities. Prolonged standing may reduce venous return, uterine blood flow, and increase uterine contractions, potentially contributing to adverse pregnancy outcomes (Tama, Kusriani, Adnani, Susiarno, & Adepoju, 2025).

The findings of this review highlight the importance of multidisciplinary prenatal care approaches involving obstetricians, midwives, mental health professionals, and public health practitioners. Preventive strategies focusing on smoking cessation, psychosocial support, and maternal mental health promotion may contribute to reducing PTB incidence and improving neonatal outcomes.

The main strength of this systematic review is its ability to synthesize findings from multiple studies conducted in different countries and populations, providing a broader understanding of behavioral and psychosocial factors associated with PTB. The review also comprehensively evaluated both behavioral and psychosocial risk factors within a single framework, which remains limited in previous studies.

However, several limitations should also be considered. The included studies used different study designs, psychosocial assessment tools, and definitions of behavioral risk factors, which may contribute to variability in the findings. This review was also limited by the relatively small number of included studies and the restriction to English-language publications, which may introduce language bias. In addition, several behavioral and psychosocial factors demonstrated inconsistent or non-significant

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associations across studies, limiting direct comparison between findings.

Therefore, further studies involving broader populations and standardized measurement methods are needed to strengthen the evidence regarding behavioral and psychosocial risk factors associated with preterm birth.

CONCLUSION

Based on the findings from five included studies, it can be concluded that behavioral and psychosocial factors contribute to the incidence of preterm birth (PTB). Maternal stress and heavy smoking during pregnancy were the most consistently significant factors associated with increased PTB risk. In addition, lower maternal health control beliefs were also significantly associated with PTB occurrence. Several other factors, including alcohol consumption, dietary habits, physical activity, passive smoking, depression, and psychological distress, showed limited or non-significant associations with PTB incidence. However, comprehensive prenatal care remains important to improve early identification and prevention of behavioral and psychosocial risks during pregnancy. Therefore, healthcare providers are expected to integrate psychosocial screening, behavioral assessment, and maternal mental health support into prenatal care services. Further studies with broader populations and standardized measurement methods are also recommended to strengthen the evidence regarding behavioral and psychosocial risk factors associated with preterm birth.

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