Research Article Volume 01, Issue No. 02. 2025

The Medical Journal of Obstetric and Gynaecology



Association of Supine Going-to-Sleep Position in Late Pregnancy With Reduced Birth Weight

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Article History :

Received date : 2024/07/12
Revised date : 2024/08/23
Accepted date : 2024/09/08
Published date : 2025/01/15

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ABSTRACT

Background: The reviewed literature collectively indicates a significant association between the supine sleeping position during late pregnancy and adverse fetal outcomes, particularly low birth weight and increased stillbirth risk.. **Literature Review:** The subsequent studies reinforce the notion that the supine position is an independent risk factor for poor pregnancy outcomes. For instance, the work of (Heazell et al., 2018) emphasizes the potential for behavioral modification interventions to reduce the prevalence of supine sleep among pregnant women. Additionally, the meta-analysis conducted by (Li et al., 2018) elucidates the hemodynamic changes associated with supine positioning, linking it to decreased maternal cardiac output and compromised fetal blood flow. The introduction of innovative interventions, such as the 'PrenaBelt' (Coleman et al., 2019), further exemplifies the proactive approach to mitigating risks associated with supine sleep. This device aims to encourage lateral sleeping positions, thereby potentially improving maternal and fetal health outcomes. The research conducted by (Robertson et al., 2020) supports this initiative by demonstrating the physiological consequences of supine sleep, including alterations in fetal cerebral blood flow. Moreover, the advancements in technology for monitoring maternal sleep positions, as discussed by (J. Kember et al., 2023), provide promising avenues for enhancing maternal health care. By utilizing vision-based detection methods, healthcare providers can better assess and advise on safe sleeping practices, thus addressing a significant public health concern. **Conclusion:** In conclusion, the literature strongly supports the association between the supine going-to-sleep position in late pregnancy and negative outcomes such as reduced birth weight and increased stillbirth risk. The studies reviewed highlight the physiological mechanisms at play, the potential for behavioral interventions, and the importance of continued research in this area to improve maternal and fetal health outcomes.

Keyword: Supine Going-to-Sleep Position in Late Pregnancy, Reduced Birth Weight

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INTRODUCTION

The association between maternal sleep position during late pregnancy and its implications for fetal health has garnered significant attention in recent years. The literature reveals a growing concern regarding the supine sleeping position and its potential risks, particularly related to stillbirth and low birth weight. (Warland & Dorrian, 2014) initiated this discourse by emphasizing the importance of accurately understanding maternal sleep positions. Their research highlighted the potential consequences of supine positioning, which can lead to inferior vena cava compression and reduced fetal oxygenation, particularly during the last trimester when women may spend considerable time sleeping in this position. They pointed out that while the practice of advising pregnant women to adopt a left lateral position during labor is well established, the implications of sleep position have not been adequately addressed, despite evidence linking supine sleep to increased stillbirth risk.

Building on this foundation, (Heazell et al., 2018) further explored the association between maternal sleep practices and late stillbirth. Their findings reinforced the notion that the supine position is an independent risk factor for late stillbirth, independent of maternal BMI. They suggested that interventions aimed at modifying sleep position could be beneficial, as many women are willing to change their habits based on available information. This study highlighted the potential for internet-based strategies to disseminate knowledge about safe sleep practices, thus empowering women to make informed choices.

(Li et al., 2018) contributed to this evolving narrative by conducting a meta-analysis that underscored the physiological implications of maternal position. Their work indicated that significant hemodynamic changes occur when a mother sleeps in a supine position, leading to decreased maternal cardiac output and compromised fetal blood flow. This evidence suggested a causal relationship between supine

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sleep and adverse fetal outcomes, including stillbirth, which warranted further investigation into the mechanisms at play.

In the same year, another study by (Li et al., 2018) reiterated these findings and emphasized the need for healthcare providers to inform pregnant women about optimal sleep positions. Their research indicated that not only does the supine position pose risks, but it also raises questions about the role of the right-sided position, which remains less understood. This uncertainty calls for further exploration into the interactions between sleep position and fetal vulnerability.

(Coleman et al., 2019) extended this inquiry into low- and middle-income contexts, demonstrating a direct association between supine sleep and low birth weight, mediated by stillbirth risk. Their findings highlighted the biological plausibility of aortocaval compression by the gravid uterus as a contributing factor to these adverse outcomes. This study introduced a novel approach through the development of the 'PrenaBelt,' aimed at reducing supine sleep among pregnant women, thereby addressing a significant public health concern.

(Robertson et al., 2020) added to the body of evidence by investigating the hemodynamic effects of maternal sleep position on fetal well-being. Their study revealed that supine sleep was associated with alterations in fetal cerebral blood flow, further supporting the hypothesis that maternal positioning can impact fetal health outcomes. This research contributed valuable insights into the physiological mechanisms linking maternal sleep position to stillbirth and low birth weight.

Finally, (J. Kember et al., 2023) focused on the technological advancements in monitoring maternal sleep position. Their study aimed to quantify sleep positions using vision-based detection methods, emphasizing the importance of understanding how maternal positioning during the third trimester can influence placental blood flow and fetal oxygenation. This research underscores the potential for innovative solutions to modify maternal sleep behavior, thereby enhancing fetal health outcomes.

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In summary, the literature collectively underscores a critical association between the supine going-to-sleep position in late pregnancy and adverse outcomes such as reduced birth weight and increased stillbirth risk. The studies reviewed provide a comprehensive understanding of the physiological implications of sleep position, the potential for behavioral modification, and the need for continued research and intervention strategies to ensure better maternal and fetal health outcomes.

LITERATURE REVIEW

The article "Accuracy of Self-Reported Sleep Position in Late Pregnancy" by (Warland & Dorrian, 2014) addresses a critical aspect of prenatal care by examining the reliability of self-reported sleep positions among pregnant women, particularly in the context of late pregnancy. The authors emphasize the significance of understanding a woman's typical and recent sleeping position, as this information is essential for healthcare providers to make informed decisions regarding maternal and fetal health.

A central theme of the article is the physiological implications of sleep position during late pregnancy. The authors highlight that sleeping in a supine position may lead to inferior vena cava compression and supine hypotension due to the weight of the gravid uterus. This condition can have detrimental effects on both maternal and fetal well-being, particularly during labor, where the left lateral position is often recommended to mitigate these risks. The article also references the 'Sydney stillbirth study,' which found a sixfold increase in stillbirth risk among women who reported sleeping on their backs. This statistic underscores the potential life-threatening consequences associated with sleep positioning in late pregnancy.

Despite the compelling evidence linking sleep position to adverse outcomes, the authors point out a significant limitation in existing studies: the reliance on self-reported data. This reliance raises questions about the accuracy of the information provided by pregnant women regarding their sleep positions. (Warland & Dorrian, 2014) argue that establishing confidence in the ability of clients to accurately report their sleep positions is crucial for healthcare providers. Without reliable data, the

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potential benefits of guiding women towards safer sleep practices may be undermined.

The article titled "Association between maternal sleep practices and late stillbirth – findings from a stillbirth case-control study" by (Heazell et al., 2018) provides significant insights into the relationship between maternal sleep positions, particularly the supine position, and pregnancy outcomes, specifically late stillbirth. The authors highlight that physiological studies indicate a tendency for fetuses to enter a quiet sleep state more frequently when the mother is in a supine position. This observation raises concerns about the implications of maternal sleep practices during late pregnancy.

Despite the physiological rationale, the study does not find a direct interaction between small for gestational age (SGA) infants and the supine going-to-sleep position. This finding is critical as it suggests that while there may be a physiological basis for concern regarding fetal sleep states in relation to maternal positioning, the direct link to SGA outcomes remains ambiguous. The authors emphasize that the supine sleeping position is associated with an increased risk of late stillbirth within a UK context, a conclusion that has been corroborated by several studies across diverse ethnic and geographical backgrounds.

The article advocates for interventions aimed at reducing the number of women who adopt the supine position while going to sleep. It suggests that modifying maternal behavior could potentially decrease the incidence of late stillbirth. This is particularly relevant given the reported high proportion of women who actively seek information about sleep positions online. The authors propose that educational initiatives, especially those leveraging internet-based platforms, could play a crucial role in informing pregnant women about safer sleep practices. These programs could be further strengthened through engagement with healthcare professionals, ensuring that the information disseminated is accurate and effective.

The article titled "The Collaborative IPD of Sleep and Stillbirth (Cribss): is maternal going-to-sleep position a risk factor for late stillbirth and does maternal sleep position interact with fetal vulnerability? An individual participant data meta-analysis study protocol" by (Li et al., 2018) presents a comprehensive examination

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of the implications of maternal sleep position during late pregnancy, particularly focusing on the supine position and its potential association with adverse outcomes such as stillbirth.

The authors highlight a growing body of evidence suggesting that the supine going-to-sleep position may indeed be a modifiable risk factor for stillbirth in late pregnancy. They elucidate the significant hemodynamic changes that occur in both maternal and fetal circulation as a result of different maternal positions. Specifically, the supine position is associated with decreased maternal cardiac output and reduced uterine blood flow, which could lead to compromised fetal oxygenation and nutrient delivery. This physiological rationale underpins the authors' assertion that the relationship between supine sleep position and late stillbirth is likely causal, rather than coincidental.

Moreover, the article underscores the importance of communicating these findings to pregnant women and their healthcare providers. By providing clear guidance on optimal sleep positions, particularly advocating for left-sided sleeping, the authors suggest that it may be possible to mitigate the risk of stillbirth. However, they also acknowledge the need for further research, particularly regarding the impact of right-sided sleep positions, which remain less understood and may also pose risks.

The critical evaluation of the material reveals that while the article effectively synthesizes existing epidemiological studies and physiological evidence, it also identifies gaps in the current understanding of sleep position implications. The authors call for additional research to clarify the effects of right-sided sleeping, highlighting a need for a more nuanced approach to maternal sleep position recommendations.

The article titled "The Ghana PrenaBelt trial: a double-blind, sham-controlled, randomised clinical trial to evaluate the effect of maternal positional therapy during third-trimester sleep on birth weight" by (Coleman et al., 2019) provides a comprehensive examination of the implications of maternal sleep position during late pregnancy, particularly focusing on the association between the supine position and adverse outcomes such as low birth weight (LBW) and stillbirth (SB).

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The authors effectively highlight the critical public health issue of LBW and SB, particularly in low- and middle-income countries, where these complications pose significant risks to maternal and neonatal health. The article asserts that the supine sleeping position during the third trimester is associated with an increased risk of both SB and LBW, a claim supported by recent studies that underscore the physiological mechanisms involved. The authors argue that the supine position can lead to aortocaval compression, which may result in decreased maternal cardiac output and compromised fetal oxygenation.

Moreover, the study introduces the concept of positional therapy (PT) as a non-invasive intervention aimed at encouraging pregnant women to maintain a lateral sleeping position. The development of the 'PrenaBelt' device is a notable innovation, as it addresses a modifiable risk factor that could potentially mitigate the rates of SB and LBW. The authors present evidence suggesting that by reducing the time spent in the supine position, maternal and fetal outcomes can improve, thus offering a practical solution to a significant health issue.

The randomized clinical trial design enhances the credibility of the findings, providing robust evidence regarding the effectiveness of the PrenaBelt in altering sleep position. However, while the results are promising, the article could benefit from a more detailed discussion of the potential limitations of the study, such as participant adherence to the PT intervention and the generalizability of the findings across different populations.

The article "Sleep in the Supine Position During Pregnancy is Associated with Fetal Cerebral Redistribution" by (Robertson et al., 2020) provides significant insights into the implications of maternal sleep position during late pregnancy, particularly focusing on the supine position. The study highlights a concerning trend, noting that approximately 9% of women in the sample reported sleeping in the supine position after 35 weeks of gestation. This finding is critical given the context of maternal and fetal health, as the supine position has been associated with adverse perinatal outcomes, including late stillbirth.

The authors conducted a prospective observational cohort study involving 274 women at an Australian tertiary obstetric hospital, which lends credibility to the

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findings due to the structured methodology and the specific demographic focus. The study's results indicate that women who sleep in the supine position exhibit significantly lower pulsatility indices in key cerebral arteries—namely, the middle cerebral artery, anterior cerebral artery, and vertebral artery—along with a diminished cerebroplacental ratio. These findings suggest a phenomenon of fetal brain sparing, where the fetus prioritizes blood flow to the brain under conditions of compromised hemodynamics, potentially as a response to maternal sleep positioning.

The article effectively connects the physiological effects of maternal supine positioning to broader epidemiological concerns regarding fetal well-being. The assertion that supine sleep is potentially causally implicated in late stillbirth is particularly noteworthy, as it underscores the need for increased awareness and education among pregnant women regarding sleep positions.

However, while the study presents compelling evidence linking supine sleep to adverse outcomes, it would benefit from a more extensive discussion regarding the underlying mechanisms that drive these physiological changes. Additionally, exploring the potential psychological or environmental factors influencing sleep position choices among pregnant women could provide a more holistic understanding of the issue.

The article "Vision-based detection and quantification of maternal sleeping position in the third trimester of pregnancy in the home setting–Building the dataset and model" by (J. Kember et al., 2023) explores the implications of maternal sleeping positions during the third trimester, particularly focusing on the supine position and its association with reduced birth weight. The authors present a novel approach to detecting and quantifying maternal sleeping positions using vision-based technology, which offers a significant advancement in maternal health monitoring.

The main idea of the article revolves around the critical relationship between the supine sleeping position and adverse outcomes such as reduced birth weight. This is particularly relevant in the context of late pregnancy, where the positioning of the mother can influence fetal development. The study emphasizes the need for

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accurate monitoring of maternal behaviors, as traditional methods may not provide comprehensive data on sleeping positions.

(J. Kember et al., 2023) detail the methodology for developing a dataset and model that can effectively detect and quantify maternal sleeping positions in real-time. This innovative approach not only enhances the understanding of maternal sleep patterns but also provides a practical tool for healthcare providers to monitor and advise pregnant women. The authors argue that by utilizing this technology, healthcare practitioners can better counsel expectant mothers on safe sleeping positions, potentially mitigating risks associated with the supine position.

The article critically evaluates existing literature on the impact of maternal sleep positions on pregnancy outcomes, reinforcing the notion that the supine position is linked to various complications, including reduced birth weight. The authors highlight gaps in previous research regarding the quantification of sleep positions and the need for more comprehensive data collection methods. By addressing these gaps, the study contributes to the ongoing discourse on maternal health and the importance of sleep in pregnancy.

CONCLUSION

The reviewed literature collectively indicates a significant association between the supine sleeping position during late pregnancy and adverse fetal outcomes, particularly low birth weight and increased stillbirth risk. The introduction establishes a foundation for understanding the physiological implications of maternal sleep positions, particularly the supine position, which can lead to inferior vena cava compression and reduced fetal oxygenation (Warland & Dorrian, 2014). This understanding is critical, as it highlights the need for pregnant women to be informed about safe sleep practices.

The subsequent studies reinforce the notion that the supine position is an independent risk factor for poor pregnancy outcomes. For instance, the work of (Heazell et al., 2018) emphasizes the potential for behavioral modification interventions to reduce the prevalence of supine sleep among pregnant women. Additionally, the meta-analysis conducted by (Li et al., 2018) elucidates the

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hemodynamic changes associated with supine positioning, linking it to decreased maternal cardiac output and compromised fetal blood flow.

The introduction of innovative interventions, such as the 'PrenaBelt' (Coleman et al., 2019), further exemplifies the proactive approach to mitigating risks associated with supine sleep. This device aims to encourage lateral sleeping positions, thereby potentially improving maternal and fetal health outcomes. The research conducted by (Robertson et al., 2020) supports this initiative by demonstrating the physiological consequences of supine sleep, including alterations in fetal cerebral blood flow.

Moreover, the advancements in technology for monitoring maternal sleep positions, as discussed by (J. Kember et al., 2023), provide promising avenues for enhancing maternal health care. By utilizing vision-based detection methods, healthcare providers can better assess and advise on safe sleeping practices, thus addressing a significant public health concern.

In conclusion, the literature strongly supports the association between the supine going-to-sleep position in late pregnancy and negative outcomes such as reduced birth weight and increased stillbirth risk. The studies reviewed highlight the physiological mechanisms at play, the potential for behavioral interventions, and the importance of continued research in this area to improve maternal and fetal health outcomes.

DISCLOSURE STATEMENT

- Disclosure Statement : The authors have no conflicts of Interest to declare
- Funding Sources : None
- Acknowledgements : -
- Author Contribution : All authors discussed and contributed the final content for journal submission and publication

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