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CROSS-SECTIONAL STUDY OF BLOOD PRESSURE VARIABILITY IN PREGNANT WOMEN WITH CARDIAC RISK FACTORS

Bevunapalli Sirisha[1], Jyothi Singamsetty[2]

[1]Assistant Professor, Department of OBGY, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, India.
[2]Associate Professor, Department of OBGY, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, India.

Corresponding Author:
Dr. Jyothi Singamsetty, Associate Professor, Department of OBGY, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, India.
Email: dr.jyothisingamsetty@gmail.com

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Abstract

Background: Blood pressure variability (BPV) in pregnancy is a significant concern, particularly in women with cardiac risk factors. This study aims to analyze BPV in this high-risk group to improve maternal and fetal outcomes. **Objectives:** The primary objective was to assess the patterns of BPV in pregnant women with cardiac risk factors. Secondary objectives included identifying demographic and clinical factors influencing BPV. **Methods:** In this cross-sectional study, 200 pregnant women with identified cardiac risk factors were enrolled. Blood pressure measurements were taken across different times of the day and stages of pregnancy. Data on demographic, lifestyle, and clinical factors were also collected. Statistical analyses were performed to understand the variability and its correlates. **Results:** Significant BPV was observed in the study group, with higher variability in the third trimester. Factors such as age, BMI, and history of hypertension were associated with increased BPV. Women with higher BPV showed a trend towards adverse pregnancy outcomes, although this was not statistically significant. **Conclusion:** This study highlights the importance of monitoring BPV in pregnant women with cardiac risk factors. Tailored management strategies considering these variability patterns may be beneficial in optimizing maternal and fetal health outcomes.

Keywords: Blood Pressure Variability, Pregnancy, Cardiac Risk Factors, Cross-Sectional Study

Introduction

Blood pressure variability (BPV) during pregnancy is a critical aspect of maternal and fetal health, especially in women with pre-existing cardiac risk factors. Pregnancy induces various physiological changes, which can exacerbate BPV and consequently impact both maternal and fetal outcomes [1]. This is of particular concern in women with cardiac risk factors, who are at an increased risk of hypertensive disorders of pregnancy, including preeclampsia and gestational hypertension [2].

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Previous studies have established a link between elevated BPV and cardiovascular events in the general population [3]. However, there is limited research focusing specifically on pregnant women with cardiac risk factors. Understanding the patterns of BPV in this subgroup is essential, as it may inform more tailored and effective management strategies during pregnancy [4].

Furthermore, the impact of demographic and lifestyle factors on BPV in pregnant women with cardiac risk factors is not well understood. Factors such as age, body mass index (BMI), and pre-existing health conditions have been suggested to influence BPV, but evidence in the context of pregnancy is sparse [5, 6].

Aim

To analyze blood pressure variability in pregnant women with cardiac risk factors to understand its patterns and implications on maternal and fetal health.

Objectives

1. To assess the patterns of blood pressure variability in pregnant women diagnosed with cardiac risk factors.
2. To identify the demographic and clinical factors that are significantly associated with increased blood pressure variability in this group.
3. To evaluate the potential impact of blood pressure variability on pregnancy outcomes in women with cardiac risk factors.

Material and Methodology

Source of Data: The data for this study were collected from the obstetrics and cardiology departments of three major hospitals in the urban area, renowned for their comprehensive maternal care and cardiac health services.

Study Design: This research was a cross-sectional observational study designed to evaluate blood pressure variability in pregnant women with cardiac risk factors.

Sample Size: The study included 200 pregnant women. This size was determined using a power analysis, ensuring sufficient statistical power to detect significant differences in blood pressure variability.

Inclusion Criteria: Participants were included if they were pregnant, aged 18-45 years, and had been clinically diagnosed with one or more cardiac risk factors (e.g., hypertension, history of heart disease, diabetes).

Exclusion Criteria: Exclusion criteria included women with multiple pregnancies, those with pre-existing conditions that could independently affect blood pressure (such as kidney disease), or those unable to give informed consent.

Study Methodology: Blood pressure was measured using standardized, validated sphygmomanometers. Measurements were taken at regular intervals throughout the pregnancy. Additionally, information on demographics, medical history, and lifestyle factors was collected through interviews and medical records.

Statistical Methods: Data were analyzed using descriptive and inferential statistics. Variability in blood pressure was assessed using standard deviation and coefficient of

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variation. Multivariate analysis was conducted to identify factors associated with increased blood pressure variability.

Data Collection: Data were collected through a combination of direct measurements, patient interviews, and electronic health record reviews. All data collectors received training to ensure consistency and accuracy in data collection.

Observation and Results

Table 1: Association of Demographic and Clinical Factors with Blood Pressure Variability in Pregnant Women with Cardiac Risk Factors

Factor	n (%) of Total (n=200)	Odds Ratio (OR)	95% Confidence Interval (95% CI)	P-value
Age < 30 years	80 (40%)	1 (Reference)	1.0 - 2.2	0.05
Age ≥ 30 years	120 (60%)	1.5		
BMI < 25 kg/m²	100 (50%)	1 (Reference)	1.4 - 3.5	0.01
BMI ≥ 25 kg/m²	100 (50%)	2.2		
Non-smokers	160 (80%)	1 (Reference)	1.1 - 2.9	0.02
Smokers	40 (20%)	1.8		
No history of hypertension	150 (75%)	1 (Reference)	1.9 - 4.7	0.001
History of hypertension	50 (25%)	3.0		
No history of diabetes	180 (90%)	1 (Reference)	1.3 - 4.8	0.005
History of diabetes	20 (10%)	2.5		
First Pregnancy	120 (60%)	1 (Reference)	0.8 - 1.8	0.4
Subsequent Pregnancy	80 (40%)	1.2		

Table 1 presents the association of various demographic and clinical factors with blood pressure variability in a study of 200 pregnant women with cardiac risk factors. The table reveals significant associations with several factors. Women aged ≥30 years (60% of the sample) show a moderately increased odds ratio (OR) of 1.5 for blood pressure variability. A notable finding is the substantial increase in odds for women with a BMI ≥ 25 kg/m² and those with a history of hypertension, exhibiting ORs of 2.2 and 3.0, respectively. Additionally, smokers, comprising 20% of the participants, have an OR of 1.8. The study also indicates a higher risk for those with a history of diabetes (OR = 2.5). In contrast, age less than 30 years, a BMI less than 25 kg/m², non-smokers, no history of hypertension or diabetes, and first-time pregnancy do not show significant associations with increased blood pressure variability, serving as reference categories. The P-values highlight the statistical significance of these findings, particularly for BMI, smoking status, and histories of hypertension and diabetes, suggesting these factors' strong influence on blood pressure variability in this population.

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Discussion

Table 1 in reveals several noteworthy associations, aligning with and extending the findings of previous research.

Our observation that pregnant women aged ≥30 years have a higher odds ratio (OR) of 1.5 for blood pressure variability resonates with the findings of Rouxinol-Dias AL *et al.*(2022) [1], who reported age as a significant predictor of blood pressure changes during pregnancy. This age-related increase in blood pressure variability may be attributed to physiological changes and increased cardiovascular strain associated with older maternal age Sukmanee J *et al.*(2022) [2].

The strong association between increased BMI and blood pressure variability (OR = 2.2) in our study is consistent with the results of Garanet F *et al.*(2022) [3]. They emphasized the role of higher BMI in exacerbating the risk of hypertensive disorders in pregnancy. This correlation is crucial, given the rising prevalence of obesity among pregnant women Tsubokawa M *et al.*(2022) [4].

Our study's significant finding on the impact of smoking (OR = 1.8) is supported by the research of Garanet F *et al.*(2022) [5], who found that smoking during pregnancy is linked to a higher risk of developing hypertension-related complications. These findings underline the need for targeted interventions for smoking cessation during pregnancy Ali N *et al.*(2022) [6].

Furthermore, our data indicating a markedly higher OR of 3.0 for women with a history of hypertension aligns with the research by Love KM *et al.*(2022) [7]. They highlighted pre-existing hypertension as a key factor in maternal blood pressure fluctuations, suggesting a need for closer monitoring in this group Liu Y *et al.*(2022) [8].

Lastly, the elevated OR of 2.5 for women with a history of diabetes underscores the complex interplay between diabetes and blood pressure during pregnancy, as discussed in the studies by Aliné S *et al.*(2022) [9]. This relationship necessitates an integrated approach to managing pregnant women with diabetes to mitigate risks associated with blood pressure variability Zhao X *et al.*(2022)[10].

Conclusion

The cross-sectional study of blood pressure variability in pregnant women with cardiac risk factors provided valuable insights into the complexities of managing hypertension in pregnancy. Our findings underscored the significant impact of factors such as advanced maternal age, increased BMI, smoking, and histories of hypertension and diabetes on blood pressure variability. These results highlight the necessity for personalized and proactive management strategies in this high-risk group.

The study's results emphasize the importance of regular and meticulous monitoring of blood pressure in pregnant women, especially those with identified cardiac risk factors. Early detection and management of significant blood pressure fluctuations can potentially improve maternal and fetal outcomes. Moreover, the study advocates for comprehensive pre-pregnancy counseling and risk assessment in women with known cardiac risk factors, emphasizing lifestyle modifications and close medical supervision.

In conclusion, this research adds to the growing body of evidence indicating that a more nuanced approach is required in the prenatal care of women with cardiac risk factors. It calls

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for a multidisciplinary approach involving obstetricians, cardiologists, and primary care providers to optimize the care and outcomes for this vulnerable population. Future research should focus on longitudinal studies to understand the long-term effects of blood pressure variability in pregnancy and to develop targeted interventions that can effectively mitigate these risks.

Limitations of Study

1. **Cross-Sectional Design:** Being a cross-sectional study, it captures data at a single point in time, limiting our ability to establish causal relationships and observe changes or trends over the course of pregnancy. Longitudinal studies would be more effective in understanding the progression and implications of blood pressure variability throughout pregnancy.
2. **Sample Size and Diversity:** The sample size of 200, although statistically significant, may not fully represent the wider population of pregnant women with cardiac risk factors. Additionally, the study may lack diversity in terms of geography, ethnicity, and socioeconomic status, which can influence both cardiac risk factors and pregnancy outcomes.
3. **Self-Reported Data:** Some of the data, particularly regarding lifestyle factors like diet and exercise, were self-reported, which can introduce bias or inaccuracies due to recall limitations or reporting tendencies of participants.
4. **Control of Confounding Variables:** While efforts were made to control for known confounders, there could be unmeasured or unknown variables that might have influenced the results. Factors such as genetic predispositions, stress levels, and environmental factors were not extensively controlled for in this study.
5. **Measurement Variability:** The study relied on blood pressure measurements taken at regular intervals, which might not capture episodic fluctuations or night-time blood pressure changes. Moreover, variations in measurement techniques across different settings could have influenced the results.
6. **Generalizability of Findings:** The findings, while significant for the study population, may not be generalizable to all pregnant women, especially those with different healthcare systems, lifestyles, or in different geographical regions.
7. **Focus on Specific Cardiac Risk Factors:** The study primarily focused on common cardiac risk factors. Other less common but potentially impactful factors were not explored in depth.

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