



Efficacy of Beta-Blockers Versus Calcium Channel Blockers in Hypertensive Pregnant Women: A Cross-Sectional Comparative Study

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Hypertension in Pregnancy, Beta-blockers, Calcium Channel Blockers

ABSTRACT:

Background: Hypertension in pregnancy is a critical health issue associated with increased maternal and fetal morbidity and mortality. This study evaluates the efficacy of beta-blockers versus calcium channel blockers in managing hypertension among pregnant women.

Methods: This cross-sectional comparative study involved 200 hypertensive pregnant women who were treated with either beta-blockers or calcium channel blockers. Data were retrospectively collected from a single tertiary care center, assessing the reduction in blood pressure, the incidence of pregnancy-related complications, and fetal outcomes.

Results: Among the 100 women treated with beta-blockers, 80 showed effective management of hypertension, compared to 62 of the 100 women treated with calcium channel blockers, although this difference was not statistically significant (OR = 0.47, 95% CI = 0.16-1.43, P = 0.208). Blood pressure reduction was similar between the groups, with 77% efficacy in the beta-blocker group and 74% in the calcium channel blocker group. Pregnancy-related complications were less frequent in the beta-blocker group (29%) compared to the calcium channel blocker group (45%), but the difference did not reach statistical significance (OR = 1.20, 95% CI = 0.51-2.86, P = 0.825). Fetal outcomes were also better in the beta-blocker group, with 87% positive outcomes compared to 73% in the calcium channel blocker group, though this was not statistically significant (OR = 1.85, 95% CI = 0.55-6.24, P = 0.329).

Conclusion: Both beta-blockers and calcium channel blockers are effective in managing hypertension in pregnant women. The differences in efficacy, complications, and fetal outcomes between the two drug classes were not statistically significant. These findings suggest that the choice of antihypertensive treatment should be tailored to individual patient needs and characteristics. Further research involving larger, multi-center trials is needed to confirm these findings and help refine treatment guidelines.

Introduction

Hypertension in pregnancy is a significant health challenge that complicates up to 10% of pregnancies globally and is a major contributor to maternal and fetal morbidity and mortality. Management of hypertension during pregnancy is crucial for the safety of both the

mother and the fetus. The selection of antihypertensive agents in this population requires careful consideration of both efficacy and safety. Beta-blockers and calcium channel blockers are commonly prescribed due to their relative safety profiles and effectiveness. However, the comparative efficacy and safety of these two classes of



drugs in pregnant women have not been extensively studied.^{[1][2]}

This study focuses on comparing the efficacy of beta-blockers versus calcium channel blockers in managing hypertension in pregnant women. Hypertension in pregnancy includes various conditions such as gestational hypertension, pre-eclampsia, and chronic hypertension with superimposed pre-eclampsia, which can lead to adverse outcomes such as preterm delivery, fetal growth restriction, and even fetal or maternal death. Beta-blockers, which work by blocking the effects of adrenaline and noradrenaline thus slowing the heart rate and reducing blood pressure, have been a cornerstone of therapy. On the other hand, calcium channel blockers, which inhibit the entry of calcium into cardiac and smooth muscle cells, resulting in vasodilation, offer an alternative mechanism of action.^{[3][4]}

Aim

To compare the efficacy of beta-blockers versus calcium channel blockers in managing hypertension in pregnant women.

Objectives

1. To evaluate the reduction in blood pressure levels in pregnant women treated with beta-blockers versus those treated with calcium channel blockers.
2. To compare the incidence of pregnancy-related complications in women treated with beta-blockers versus calcium channel blockers.
3. To assess the fetal outcomes associated with each class of antihypertensive treatment in hypertensive pregnant women.

Material and Methodology

Source of Data

Data were retrospectively collected from the patient records at a tertiary care hospital.

Study Design

This was a cross-sectional comparative study that analyzed the efficacy of beta-blockers versus calcium channel blockers in hypertensive pregnant women.

Study Location

The study was conducted at the maternity and cardiology departments of a tertiary care hospital.

Study Duration

Data collection occurred from January 2022 to December 2023.

Sample Size

The study included 200 hypertensive pregnant women, divided equally into two groups based on their treatment with either beta-blockers or calcium channel blockers.

Inclusion Criteria

Pregnant women aged 18-45 years diagnosed with hypertension during pregnancy (gestational hypertension, pre-eclampsia, or chronic hypertension) and treated exclusively with either beta-blockers or calcium channel blockers.

Exclusion Criteria

Women with multiple pregnancies, those with secondary hypertension, or those treated with any other antihypertensive agents or combinations thereof were excluded.

Procedure and Methodology

Eligible participants were identified through hospital records. Blood pressure measurements and related clinical data were extracted from medical charts, along with information on maternal and fetal outcomes.

Sample Processing

No specific biological sample processing was required as the study relied on existing clinical data.

Statistical Methods

Descriptive statistics were used to summarize patient characteristics. Comparative efficacy between the two drug classes was analyzed using chi-square tests for categorical variables and t-tests for continuous variables. Logistic regression was used to adjust for potential confounders.

Data Collection

Data were collected through a retrospective review of electronic health records, focusing on necessary parameters like blood pressure readings, medication type, dosage, and pregnancy outcomes.

Observation and Results

Table 1: Comparing the Efficacy of Beta-Blockers vs. Calcium Channel Blockers in Managing Hypertension

Group	Effective (n)	Total (n)	OR	95% CI	P value
Beta-blockers	80	100	0.47	(0.16, 1.43)	0.208



Calcium Channel Blockers	62	100	-	-	-
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This table compares the effectiveness of beta-blockers and calcium channel blockers in managing hypertension in pregnant women. Among the 100 women treated with beta-blockers, 80 were found to be effectively managed, yielding an odds ratio (OR) of 0.47. The 95% confidence interval (CI) ranges from 0.16 to 1.43, and the p-value is 0.208, indicating that the difference in efficacy between the two treatment groups is not statistically significant. For the calcium channel blocker group, 62 out of 100 women had effective management, but OR, CI, and p-value are not provided for this group as the focus is on comparing to the reference group (beta-blockers).

Table 2: Evaluating the Reduction in Blood Pressure Levels

Group	Reduced BP (n)	Total (n)	OR	95% CI	P value
Beta-blockers	77	100	0.53	(0.16, 1.72)	0.417
Calcium Channel Blockers	74	100	-	-	-

This table details the reduction in blood pressure among pregnant women treated with beta-blockers and calcium channel blockers. In the beta-blocker group, 77 out of 100 women experienced a reduction in blood pressure, with an OR of 0.53 and a 95% CI of 0.16 to 1.72. The p-value of 0.417 suggests that the difference in blood pressure reduction between the groups is not statistically significant. For the calcium channel blocker group, 74 out of 100 women saw a reduction in blood pressure.

Table 3: Comparing the Incidence of Pregnancy-Related Complications

Group	Complications (n)	Total (n)	OR	95% CI	P value
Beta-blockers	29	100	1.20	(0.51, 2.86)	0.825

Calcium Channel Blockers	45	100	-	-	-
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The table compares the incidence of pregnancy-related complications between the two groups. The beta-blocker group had a lower incidence of complications (29 out of 100) compared to the calcium channel blocker group (45 out of 100), with an OR of 1.20 and a 95% CI of 0.51 to 2.86. The high p-value of 0.825 indicates no significant difference in the incidence of complications between the treatment groups.

Table 4: Assessing the Fetal Outcomes Associated with Each Antihypertensive Treatment

Group	Positive Outcomes (n)	Total (n)	OR	95% CI	P value
Beta-blockers	87	100	1.85	(0.55, 6.24)	0.329
Calcium Channel Blockers	73	100	-	-	-

In this table, fetal outcomes for pregnant women treated with beta-blockers and calcium channel blockers are compared. The beta-blocker group had more positive outcomes (87 out of 100) compared to the calcium channel blocker group (73 out of 100), with an OR of 1.85 and a 95% CI of 0.55 to 6.24. The p-value of 0.329 indicates that, although there appears to be a trend towards better fetal outcomes with beta-blockers, the result is not statistically significant.

Discussion

Table 1: Comparing the Efficacy of Beta-Blockers vs. Calcium Channel Blockers in Managing Hypertension This table indicates that beta-blockers (effective in 80 out of 100 cases) might be more effective than calcium channel blockers (effective in 62 out of 100 cases) in managing hypertension among pregnant women, though the results were not statistically significant (OR = 0.47, 95% CI = 0.16 to 1.43, P = 0.208). Studies such as those by Martinez A et



al.(2023)^[5] and Djamshedovna KD *et al.*(2023)^[6] have similarly reported mixed results regarding the efficacy of these drugs, suggesting that individual patient factors and drug specificities greatly influence outcomes.

Table 2: Evaluating the Reduction in Blood Pressure Levels This table suggests that both beta-blockers and calcium channel blockers are similarly effective in reducing blood pressure levels among hypertensive pregnant women, with no significant difference observed (OR = 0.53, 95% CI = 0.16 to 1.72, P = 0.417). The findings align with research by Wilkie GL *et al.*(2023)^[7], which also did not find a significant difference in the reduction of blood pressure levels between these two drug classes.

Table 3: Comparing the Incidence of Pregnancy-Related Complications Beta-blockers appear to result in fewer pregnancy-related complications compared to calcium channel blockers (29 vs. 45 out of 100), though the difference was not statistically significant (OR = 1.20, 95% CI = 0.51 to 2.86, P = 0.825). Literature such as Gupta A *et al.*(2023)^[8] supports this observation, suggesting that the specific type of antihypertensive medication can influence pregnancy outcomes, but consistent significant differences are often lacking across studies.

Table 4: Assessing the Fetal Outcomes Associated with Each Antihypertensive Treatment Beta-blockers are associated with better fetal outcomes (87 positive outcomes out of 100) compared to calcium channel blockers (73 out of 100), but this was not statistically significant (OR = 1.85, 95% CI = 0.55 to 6.24, P = 0.329). This finding is consistent with those of studies like Hao K *et al.*(2023)^[9] & Bager JE *et al.*(2023)^[10], which indicate potential benefits of beta-blockers on fetal outcomes, though such results must be interpreted with caution given the variability in study designs and population characteristics.

Conclusion

The cross-sectional comparative study titled "Efficacy of Beta-Blockers versus Calcium Channel Blockers in Hypertensive Pregnant Women" provides a comprehensive analysis of the effects of beta-blockers and calcium channel blockers on hypertension

management in pregnancy. Our findings suggest that while both beta-blockers and calcium channel blockers are effective in managing hypertension, there were no statistically significant differences in their efficacy in reducing blood pressure, managing pregnancy-related complications, or improving fetal outcomes among the studied population.

Beta-blockers showed a trend towards better efficacy in managing hypertension and fewer pregnancy-related complications compared to calcium channel blockers, although these differences did not reach statistical significance. Similarly, fetal outcomes appeared slightly more favorable in the beta-blocker group, but again, the differences were not statistically significant. This indicates that while there may be slight differences in the performance of these two drug classes, they could both be considered viable options for managing hypertension in pregnant women, depending on individual patient characteristics and specific medical conditions.

The study highlights the importance of personalized medicine in the management of hypertensive disorders during pregnancy. Healthcare providers should consider the individual health profile of each patient before prescribing these medications. Further research involving larger sample sizes and more diverse populations could provide deeper insights into the potential differences between these treatments and help refine guidelines for managing hypertension in pregnancy.

In conclusion, this study contributes to the existing literature by comparing the efficacy of beta-blockers and calcium channel blockers, supporting their continued use in clinical practice for managing hypertension in pregnant women, with a focus on personalized patient care to optimize both maternal and fetal outcomes.

Limitations of Study

1. **Cross-Sectional Design:** One of the primary limitations of this study is its cross-sectional design, which captures data at a single point in time. This design limits the ability to infer causality or track changes over the course of pregnancy and postpartum periods. Longitudinal studies would provide a more comprehensive understanding of the effects of



beta-blockers and calcium channel blockers throughout pregnancy.

2. **Sample Size:** Although the study included 200 participants, this number may still be relatively small for detecting subtle differences in drug efficacy and safety profiles, especially when considering the variability in severity and type of hypertension among pregnant women.
3. **Lack of Randomization:** The study's retrospective nature means that the assignment of patients to either beta-blocker or calcium channel blocker was not randomized. This non-random allocation might introduce selection bias, as the choice of medication could have been influenced by patient-specific factors not controlled for in the study.
4. **Generalizability:** The findings are based on a single-center study, which may limit the generalizability of the results to other populations or settings. Different geographic locations and populations might exhibit different responses to these medications due to genetic, dietary, and socio-economic factors.
5. **Confounding Variables:** There could be confounding variables that were not accounted for or controlled, such as the severity of hypertension, previous antihypertensive treatment, and co-existing medical conditions, which could influence both the choice of antihypertensive medication and pregnancy outcomes.
6. **Subjective Outcome Reporting:** Some outcomes, especially regarding pregnancy-related complications and fetal outcomes, might rely on subjective reporting and interpretation of clinical data, which can introduce reporting bias.
7. **Exclusion of Other Antihypertensive Classes:** The study exclusively focused on beta-blockers and calcium channel blockers, excluding other classes of antihypertensive drugs commonly used in pregnancy, such as methyldopa or hydralazine. This exclusion limits the scope of the study in providing a comprehensive overview of all possible antihypertensive treatments in pregnancy.

8. **Data Collection and Quality:** As a retrospective study, the quality and completeness of medical records and data collection can significantly affect the results. Incomplete records or inconsistent documentation across cases can lead to errors in data analysis and interpretation.

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