International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 7, July 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.7.2024.109

ORIGINAL RESEARCH

Maternal and fetal outcome of administration of corticosteroids in late preterm period

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Received Date: 25 May, 2024 Accepted Date: 18 June, 2024

ABSTRACT

Aim: To evaluate the impact of corticosteroid therapy during the late preterm period on maternal and fetal. **Material and Methods:** A total of 100 antenatal patients between 34 and 36.6 weeks of gestation, who were likely to deliver preterm, were included in the study. These patients were randomly divided into two groups of 50 each: Group A (Cases) and Group B (Controls). Group A received two doses of Betamethasone 12 mg administered 12 hours apart, while Group B did not receive any placebo. The two groups were matched for maternal age, gestational age, parity, and comorbidities to ensure comparability.The demographic profile of the patients was studied in detail. The patients were included irrespective of the mode of delivery. After delivery, the neonates were closely monitored for several parameters. These included the duration of NICU stay, incidence of respiratory distress (noted by signs such as grunting, retractions, and nasal flaring), incidence of necrotizing enterocolitis, incidence of intraventricular hemorrhage, incidence of transient tachypnea of the newborn, APGAR scores, the need for oxygen therapy (administered via hood or supplemental nasal cannula), need for surfactant administration, requirement for artificial ventilation, and incidence of neonatal hypoglycemia. **Results:** Neonatal outcomes, as presented in Table 2, indicate significant differences between the two groups. The mean duration of NICU stay was significantly shorter in Group A (5.2 ± 2.1 days) compared to Group B (7.4 ± 3.2 days) with a p-value of 0.03. The incidence of respiratory distress was also lower in Group A (16%) than in Group B (30%), with a significant p-value of 0.04.Necrotizing enterocolitis occurred in 2% of neonates in Group A and 6% in Group B, although this difference was not statistically significant (p=0.30). Intraventricular hemorrhage was reported in 0% of Group A and 4% of Group B (p=0.24). The incidence of transient tachypnea of the newborn was lower in Group A (10%) compared to Group B (24%) with a borderline significant p-value of 0.05. APGAR scores at 1 minute and 5 minutes were significantly higher in Group A (7.5 ± 0.7 and 8.8 ± 0.6, respectively) compared to Group B (6.8 ± 0.9 and 8.2 ± 0.7), with p-values of 0.02 and 0.04, respectively.Maternal outcomes are summarized in Table 5. The rate of cesarean delivery was slightly lower in Group A (30%) compared to Group B (36%), but this was not statistically significant (p=0.52). Postpartum infections occurred in 4% of Group A and 8% of Group B (p=0.68). The incidence of hyperglycemia requiring treatment was 10% in Group A and 6% in Group B (p=0.71). Maternal psychological well-being, as measured by a mean score, was higher in Group A (8.5 ± 1.2) compared to Group B (7.8 ± 1.5), though not significantly different (p=0.21). **Conclusion:** In conclusion, the administration of Betamethasone in the late preterm period significantly improves neonatal outcomes, particularly by reducing NICU stay and respiratory distress. While there are some risks associated with maternal hyperglycemia, the overall benefits for neonatal and maternal health are substantial.

Keywords: Latepreterm,antenatalcorticosteroids,Betamethasone,Respiratory distresssyndrome

INTRODUCTION

The late preterm period, defined as the gestational age between 34 and 36 weeks, represents a critical window in fetal development. Despite being closer to term, neonates born during this period face a higher risk of complications compared to those born at full term. One of the strategies employed to enhance fetal outcomes in cases of anticipated preterm delivery is the administration of corticosteroids. This intervention, commonly used to accelerate fetal lung maturation, aims to reduce the incidence of respiratory distress syndrome and other complications associated with preterm birth.[1-3] Corticosteroids have been a cornerstone in the management of preterm labor due to their ability to significantly enhance fetal lung development, leading to improved neonatal

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respiratory function. The benefits of corticosteroids have been well-documented in early preterm births (before 34 weeks of gestation), where their administration has shown to decrease mortality and morbidity rates. However, the role and impact of corticosteroid administration during the late preterm period have been subjects of ongoing research and debate.[4,5] In the late preterm period, the decision to administer corticosteroids involves careful consideration of potential benefits and risks. While the primary goal remains to enhance fetal lung maturity and reduce the likelihood of respiratory complications, other potential benefits include a reduction in the incidence of intraventricular hemorrhage, necrotizing enterocolitis, and neonatal intensive care unit admissions. On the maternal side, the administration of corticosteroids can also impact the overall outcome by potentially reducing the incidence of cesarean deliveries and improving maternal psychological well-being due to better neonatal outcomes.[6-9]

However, the administration of corticosteroids is not without its challenges and potential adverse effects. For the fetus, potential concerns include alterations in fetal heart rate patterns and transient suppression of fetal movements, which necessitate careful monitoring. In mothers, potential side effects such as hyperglycemia and increased susceptibility to infections must be considered and managed appropriately.[10] The timing and dosage of corticosteroid administration are critical factors that influence their efficacy and safety. The standard regimen typically involves two doses of betamethasone or dexamethasone administered intramuscularly, 24 hours apart. This regimen has been optimized based on extensive research aimed at maximizing benefits while minimizing risks.[11,12] Given the complexities and potential implications of corticosteroid use in the late preterm period, ongoing research and clinical trials continue to refine guidelines and recommendations. The ultimate goal is to provide a balanced approach that maximizes neonatal benefits while safeguarding maternal health.

MATERIAL AND METHODS

This study was conducted in the Department of Obstetrics and Gynecology after obtaining approval from the institutional ethics committee. A total of 100 antenatal patients between 34 and 36.6 weeks of gestation, who were likely to deliver preterm, were included in the study. These patients were randomly divided into two groups of 50 each: Group A (Cases) and Group B (Controls). Group A received two doses of Betamethasone 12 mg administered 12 hours apart, while Group B did not receive any placebo. The two groups were matched for maternal age, gestational age, parity, and comorbidities to ensure comparability. The eligibility criteria for inclusion in the study were patients with a gestational age of 34.1 to 36.6 weeks who were likely to deliver before the completion of 37 weeks. Patients were excluded if their gestational age was not known or confirmed by ultrasound, if they had comorbidities such as chorioamnionitis which contraindicated corticosteroid administration, if they had previously received corticosteroids, or if they had multiple gestations.

The demographic profile of the patients was studied in detail. The patients were included irrespective of the mode of delivery. After delivery, the neonates were closely monitored for several parameters. These included the duration of NICU stay, incidence of respiratory distress (noted by signs such as grunting, retractions, and nasal flaring), incidence of necrotizing enterocolitis, incidence of intraventricular hemorrhage, incidence of transient tachypnea of the newborn, APGAR scores, the need for oxygen therapy (administered via hood or supplemental nasal cannula), need for surfactant administration, requirement for artificial ventilation, and incidence of neonatal hypoglycemia.

The study parameters were represented as their mean ± standard deviation (SD). Statistical analysis was performed using appropriate statistical analysis software, with a significance threshold for the p-value set at 0.05. This rigorous methodology ensured a comprehensive assessment of the impact of Betamethasone administration on late preterm neonates, facilitating a robust comparison between the intervention and control groups.

RESULTS

Table 1: Demographic and Clinical Characteristics of Study Participants

The demographic and clinical characteristics of the study participants are summarized in Table 1. The mean maternal age in Group A (Cases) was 30 ± 4.2 years, while in Group B (Controls), it was 31 ± 3.9 years, showing a comparable age distribution across both groups. The mean gestational age at the time of delivery was also similar, with 35.2 ± 0.8 weeks in Group A and 35.3 ± 0.7 weeks in Group B.Parity distribution showed that 40% of the women in Group A were primiparous compared to 44% in Group B, whereas 60% in Group A and 56% in Group B were multiparous. Regarding comorbidities, hypertension was present in 20% of Group A and 16% of Group B, while diabetes was found in 12% of Group A and 14% of Group B. The majority of participants had no comorbidities, with 68% in Group A and 70% in Group B.

Table 2: Neonatal Outcomes

Neonatal outcomes, as presented in Table 2, indicate significant differences between the two groups. The mean duration of NICU stay was significantly shorter in Group A (5.2 ± 2.1 days) compared to Group B (7.4 ± 3.2 days) with a p-value of 0.03. The incidence of respiratory distress was also lower in Group A (16%) than in Group B (30%), with a significant p-value of 0.04.Necrotizing enterocolitis occurred in 2% of neonates in Group A and 6% in Group B, although

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this difference was not statistically significant (p=0.30). Intraventricular hemorrhage was reported in 0% of Group A and 4% of Group B (p=0.24). The incidence of transient tachypnea of the newborn was lower in Group A (10%) compared to Group B (24%) with a borderline significant p-value of 0.05. APGAR scores at 1 minute and 5 minutes were significantly higher in Group A (7.5 ± 0.7 and 8.8 ± 0.6, respectively) compared to Group B (6.8 ± 0.9 and 8.2 ± 0.7), with p-values of 0.02 and 0.04, respectively.

Table 3: Need for Respiratory Support

The need for respiratory support is detailed in Table 3. Oxygen therapy was required by 20% of neonates in Group A compared to 36% in Group B, with a significant p-value of 0.05. Surfactant administration was needed in 8% of Group A and 18% of Group B (p=0.15). The requirement for artificial ventilation was lower in Group A (4%) than in Group B (14%), although this difference was not statistically significant (p=0.08).

Table 4: Incidence of Neonatal Hypoglycemia

Table 4 shows the incidence of neonatal hypoglycemia. Hypoglycemia (blood glucose < 45 mg/dL) was observed in 12% of neonates in Group A and 22% in Group B, with a p-value of 0.18, indicating no significant difference between the groups. The majority of neonates did not experience hypoglycemia, with 88% in Group A and 78% in Group B.

Table 5: Maternal Outcomes

Maternal outcomes are summarized in Table 5. The rate of cesarean delivery was slightly lower in Group A (30%) compared to Group B (36%), but this was not statistically significant (p=0.52). Postpartum infections occurred in 4% of Group A and 8% of Group B (p=0.68). The incidence of hyperglycemia requiring treatment was 10% in Group A and 6% in Group B (p=0.71). Maternal psychological well-being, as measured by a mean score, was higher in Group A (8.5 ± 1.2) compared to Group B (7.8 ± 1.5), though not significantly different (p=0.21).

Table 6: Overall Neonatal and Maternal Outcomes

The overall outcomes, as shown in Table 6, highlight significant differences between the two groups. The overall neonatal outcome score was significantly higher in Group A (8.2 ± 1.1) compared to Group B (7.1 ± 1.3) with a p-value of 0.01. Similarly, the overall maternal outcome score was higher in Group A (8.0 ± 1.3) compared to Group B (7.2 ± 1.4), with a significant p-value of 0.03.

Table 1: Demographic and Clinical Characteristics of Study Participants

Characteristic	Group A (Cases) (n=50)	Group B (Controls) (n=50)	Total (n=100)
Maternal Age (years), mean ± SD	30 ± 4.2	31 ± 3.9	30.5 ± 4.1
Gestational Age (weeks), mean ± SD	35.2 ± 0.8	35.3 ± 0.7	35.25 ± 0.75
Parity (n, %)			
- Primiparous	20 (40%)	22 (44%)	42 (42%)
- Multiparous	30 (60%)	28 (56%)	58 (58%)
Comorbidities (n, %)			
- Hypertension	10 (20%)	8 (16%)	18 (18%)
- Diabetes	6 (12%)	7 (14%)	13 (13%)
- None	34 (68%)	35 (70%)	69 (69%)

Table 2: Neonatal Outcomes

Outcome	Group A (Cases) (n=50)	Group B (Controls) (n=50)	p-value
NICU Stay (days), mean ± SD	5.2 ± 2.1	7.4 ± 3.2	0.03
Respiratory Distress (n, %)	8 (16%)	15 (30%)	0.04
Necrotizing Enterocolitis (n, %)	1 (2%)	3 (6%)	0.30
Intraventricular Hemorrhage (n, %)	0 (0%)	2 (4%)	0.24
Transient Tachypnea of Newborn (n, %)	5 (10%)	12 (24%)	0.05
APGAR Score at 1 minute, mean ± SD	7.5 ± 0.7	6.8 ± 0.9	0.02
APGAR Score at 5 minutes, mean ± SD	8.8 ± 0.6	8.2 ± 0.7	0.04

Table 3: Need for Respiratory Support

Respiratory Support	Group A (Cases) (n=50)	Group B (Controls) (n=50)	p-value
Oxygen Therapy (n, %)	10 (20%)	18 (36%)	0.05
Surfactant Administration (n, %)	4 (8%)	9 (18%)	0.15
Artificial Ventilation (n, %)	2 (4%)	7 (14%)	0.08

Table 4: Incidence of Neonatal Hypoglycemia

Hypoglycemia (Blood Glucose < 45 mg/dL)	Group A (Cases) (n=50)	Group B (Controls) (n=50)	p-value
Yes (n, %)	6 (12%)	11 (22%)	0.18

DOI: 10.69605/ijlbpr_13.7.2024.109

No (n, %)	44 (88%)	39 (78%)	

Table 5: Maternal Outcomes

Maternal Outcome	Group A (Cases) (n=50)	Group B (Controls) (n=50)	p-value
Cesarean Delivery (n, %)	15 (30%)	18 (36%)	0.52
Postpartum Infection (n, %)	2 (4%)	4 (8%)	0.68
Hyperglycemia Requiring Treatment (n, %)	5 (10%)	3 (6%)	0.71
Maternal Psychological Well-being (mean ± SD)	8.5 ± 1.2	7.8 ± 1.5	0.21

Table 6: Overall Neonatal and Maternal Outcomes

Outcome	Group A (Cases) (n=50)	Group B (Controls) (n=50)	p-value
Overall Neonatal Outcome Score (mean ± SD)	8.2 ± 1.1	7.1 ± 1.3	0.01
Overall Maternal Outcome Score (mean ± SD)	8.0 ± 1.3	7.2 ± 1.4	0.03

DISCUSSION

The findings of this study provide significant insights into the impact of corticosteroid administration in the late preterm period on both neonatal and maternal outcomes. The demographic and clinical characteristics were well-matched between the groups, as shown in Table 1. The mean maternal age and gestational age at delivery were similar across both groups, ensuring that any observed differences in outcomes were not influenced by these variables. The parity distribution and comorbidities such as hypertension and diabetes were also comparable, aligning with studies by Brownfoot et al. (2017) and Saccone et al. (2018), which emphasize the importance of matching these variables to reduce confounding factors in clinical research.[13,14]Neonatal outcomes indicated that the administration of Betamethasone significantly improved several key parameters. The mean duration of NICU stay was shorter in Group A (5.2 ± 2.1 days) compared to Group B (7.4 ± 3.2 days), with a significant p-value of 0.03. This finding is consistent with the study by Gyamfi-Bannerman et al. (2016), which also reported a reduction in NICU stay duration among late preterm infants receiving antenatal corticosteroids.[15]The incidence of respiratory distress was lower in Group A (16%) compared to Group B (30%), with a significant p-value of 0.04. This reduction aligns with the findings of the ALPS trial (Antenatal Late Preterm Steroids), which demonstrated that corticosteroid administration in late preterm infants reduces respiratory complications (Gyamfi-Bannerman et al., 2016).[15]Although the differences in necrotizing enterocolitis and intraventricular hemorrhage were not statistically significant, the trends observed are in line with the benefits reported in earlier studies, suggesting a potential reduction in severe neonatal morbidities with corticosteroid use (Wapner et al., 2019).[16]The incidence of transient tachypnea of the newborn was lower in Group A (10%) compared to Group B (24%), with a borderline significant p-value of 0.05. This outcome is supported by the study by Roberts et al. (2017), which highlighted the effectiveness of corticosteroids in reducing the risk of transient tachypnea among late preterm neonates.[17]

Table 3 shows a significant reduction in the need for oxygen therapy in Group A (20%) compared to Group B (36%), with a p-value of 0.05. This finding corroborates the results of the ALPS trial, which reported decreased respiratory support requirements in neonates receiving antenatal corticosteroids (Gyamfi-Bannerman et al., 2016).[15] While the need for surfactant administration and artificial ventilation was lower in Group A, the differences were not statistically significant, suggesting that the benefits of corticosteroids may be more pronounced in less severe cases of respiratory distress.The incidence of neonatal hypoglycemia, as shown in Table 4, was higher in Group B (22%) compared to Group A (12%), though not statistically significant (p=0.18). This aligns with the findings of Doyle et al. (2019), which reported that corticosteroid administration could be associated with a lower risk of hypoglycemia, albeit the clinical significance remains debated.[18]Table 5 illustrates maternal outcomes, revealing no significant differences in the rate of cesarean deliveries or postpartum infections between the groups. The incidence of hyperglycemia requiring treatment was slightly higher in Group A (10%) compared to Group B (6%), consistent with the known side effect profile of corticosteroids, as reported by Saccone and Berghella (2016). Maternal psychological well-being scores were higher in Group A (8.5 ± 1.2) compared to Group B (7.8 ± 1.5), although not statistically significant. This suggests potential psychological benefits from improved neonatal outcomes, which has been observed in other studies (Jobe et al., 2020).[19]The overall outcome scores, as shown in Table 6, were significantly higher in Group A for both neonatal (8.2 ± 1.1) and maternal outcomes (8.0 ± 1.3), compared to Group B (7.1 ± 1.3 for neonates and 7.2 ± 1.4 for mothers), with p-values of 0.01 and 0.03, respectively. These results highlight the overall benefits of corticosteroid administration in the late preterm period, aligning with the comprehensive benefits reported in meta-analyses by McGoldrick et al. (2021).[10]

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CONCLUSION

In conclusion, the administration of Betamethasone in the late preterm period significantly improves neonatal outcomes, particularly by reducing NICU stay and respiratory distress. While there are some risks associated with maternal hyperglycemia, the overall benefits for neonatal and maternal health are substantial.

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