

Role of Corticosteroids in Reducing Respiratory Morbidity in Neonates Delivered by Elective Cesarean Section before 39 Weeks

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ABSTRACT

Objective: To determine the effect of dexamethasone administration to women between 37 to 39 weeks of gestation on neonatal outcome in terms of respiratory morbidity and the need for NICU admission.

Study Design: An experimental study.

Place and Duration of Study: Department of Obstetrics and Department of Neonatology, Military Hospital, Rawalpindi, Pakistan, from February to July 2017.

Methodology: Women with singleton pregnancies, undergoing elective cesarean section between 37-39 weeks. Neonates were evaluated for any respiratory morbidity and need for NICU admission as well as need of mechanical ventilation, length of hospital stay and final outcome.

Results: Out of 535 patients, 240 (44.8%) patients received steroid cover before their elective cesarean section (group 1). Two hundred and ninety-five (55.2%) patients who did not receive steroid cover, were allocated group 2. Mean age of mothers in group 1 was 29.20 \pm 4.50 years and in group 2, it was 29.34 \pm 4.50 years. The mean gestational ages were 37.56 \pm 0.66 weeks and 38.11 \pm 0.79 weeks in groups 1 and 2, respectively. In group 2, 14 (4.74%) newborns developed transient tachypnea of newborn (TTN), which was higher than the newborns in group 1 (04 (1.66%), $p = 0.049$). Also the number of neonates being admitted to NICU was greater in group 2 than in group 1 [23 (7.79%) vs. 06 (2.5%) respectively, $p = 0.007$]. However, there was no statistically significant difference between the two groups with regard to final outcome, requirement for mechanical ventilation, length of hospital stay and APGAR scores at one and five minutes.

Conclusion: Steroid cover significantly reduced the risk of respiratory morbidity in babies delivered by elective cesarean section between 37-39 weeks.

Key Words: Corticosteroids, Elective C-section, Neonates, NICU.

INTRODUCTION

Over the last decade, rate of cesarean section (C-section) has increased worldwide. Almost 15-25% of all deliveries are by cesarean section in developed countries.¹ A similar trend has been seen in the developing world with rates of 27.6% from Egypt and 21.7% from Pakistan.^{2,3} According to WHO, C-section is effective in saving lives of mothers as well as neonates only if done for medical conditions, but at rates more than 10-15% there is no additional health benefit in terms of reducing maternal and neonatal mortality.⁴ The main reasons for increasing rates of C-sections are different in different regions but mostly C-sections are performed due to decreasing trends for TOLAC (trial of labour after caesarean section), elective cesarean for breech presentation and maternal request.⁵

As with any other surgery, C-section is associated with both neonatal and maternal complications. There is increased incidence of respiratory problems in neonates born *via* C-section and the incidence increases in those who are born prematurely or *via* elective C-section before 39 weeks of gestation. The administration of corticosteroids to mother in pre-term labour has proven benefits to the neonate in terms of reduced respiratory morbidity mainly transient tachypnea of newborn (TTN) and respiratory distress syndrome (RDS).⁶ The Royal College of Obstetrics and Gynecology in 2010 started advocating the use of antenatal corticosteroids to mothers undergoing elective C-section prior to 39 weeks of gestation, in order to reduce the neonatal respiratory morbidity.⁷ However, the evidence for such recommendation is questionable. Studies have shown no additional benefits of administering corticosteroids to mothers after 34 weeks.⁸

Very few studies have been conducted so far in Pakistan to see the effects of corticosteroids given to mothers undergoing elective C-sections before 39 weeks, on neonatal respiratory morbidity.

The aim of the present study was to determine the effects of antenatal corticosteroids given to the mothers undergoing elective C-section on neonatal respiratory morbidity.

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Received: January 06, 2018; Accepted: July 12, 2018

METHODOLOGY

This was a non-randomised experimental study, conducted at Military Hospital, Rawalpindi, from February to July 2017 after obtaining approval from Hospital Ethical Committee. It included all women with singleton pregnancy, who underwent C-section between 37 to 39 weeks gestation. However, women who had history of rupture of membranes for more than 18 hours, who had history of fever, urinary tract infection, chorioamnionitis, history of drug intake or any chronic medical illness were excluded from the study. All newborns of either gender were included in this study. However, twin babies, babies who had congenital heart lesions or any dysmorphic features, those with intra-uterine growth restriction, and surgical conditions were excluded from the study.

The women who fulfilled the inclusion criteria were divided into two groups. Group 1 was the treatment group and received injection dexamethasone according to the recommended dose and duration *i.e.*, 12 mg intramuscularly 12 hours apart for a total of four doses; and group 2 was the control group which did not receive injection dexamethasone.

Data was collected from Hospital record sheets regarding age of the mother, obstetric history, gestational age, current pregnancy complications, any maternal medical illness, history of any drug use by mother and the indication for C-section. Neonates were assessed after delivery for various parameters like APGAR scores at one and five minutes, birth weight, respiratory distress requiring oxygen administration, length of hospital stay, need for mechanical ventilation, neonatal intensive care unit (NICU) admission, and final outcome. Consultant neonatologist decided whether the baby needs admission to NICU or not for respiratory morbidity.

Informed written consent was taken from parents of all babies. Data was analysed using SPSS version 20. Numerical data like gestational and maternal ages were expressed as mean and standard deviation. Qualitative data were expressed as frequencies and percentages. Chi-square test was used to determine the relationship between qualitative variables while independent sample t-test was used to compare the means of gestational ages of both groups. The p-value <0.05 was considered significant.

RESULTS

During the study period, 585 elective C-sections were performed, but 535 women met the inclusion criteria; 182 (34.01%) C-sections were performed at 37 weeks, 269 (50.28.71%) at 38 weeks and 59 (11.02%) at 39 weeks; whereas, 25 (4.67%) C-sections were performed at 40 weeks gestation. Most common indication of C-section was abdominal scar due to previous C-section.

There were 240 (44.8%) women in group 1, and 295 (55.2%) women in group 2. Mean age of mothers in group 1 was 29.20 \pm 4.50 years and in group 2, it was 29.34 \pm 4.50 years. The mean gestational ages were 37.56 \pm 0.66 weeks and 38.11 \pm 0.79 weeks in groups 1 and 2, respectively (Table I).

In group 1, 128 (53.33%) C-sections were performed at 37 weeks, 91 (37.91%) were carried out at 38 weeks, 20 (8.75%) were performed at 39 weeks of gestation while 1 (0.42%) C-section was performed at 40 weeks gestation. In group 2, 54 (18.30%) C-sections were performed at 37 weeks, 178 (60.33%) at 38 weeks, 39 (13.22%) at 39 weeks of gestation and 24 (8.13%) C-section were performed at 40 weeks gestation.

In group 2 (control group), 14 (4.74%) newborns developed transient tachypnea of newborn which was higher than the newborns in group 1 (4, 1.66%), p-value = 0.049). The number of neonates being admitted to

Table I: Demographic characteristics of women and neonates in two groups.

Variables	Group 1	Group 2	p-value
Gestational age (weeks)	37.56 \pm 0.66	38.11 \pm 0.79	0.000
Parity			
Zero	33 (13.75%)	26 (8.81%)	0.07
>zero	207(86.25%)	269 (91.19%)	
Maternal age (years)			
15-30	163 (67.91%)	197(66.78%)	0.780
>30	77 (32.09%)	98 (33.22%)	
Birth weight (kg)			
<2.5	03 (1.25%)	03 (1.02%)	0.255
2.5-4.0	236 (98.33%)	286 (96.95%)	
>4.0	01 (0.42%)	06 (2.03%)	
Gender of neonates			
Female	136 (56.66%)	164 (55.59%)	0.80
Male	104 (43.34%)	131 (44.40%)	

Table II: Outcome of neonates in two groups.

Variables	Group 1	Group 2	p-value
Respiratory morbidity requiring oxygen supplementation			
Yes	04 (1.66%)	14 (4.74%)	0.049
No	236 (98.34%)	281(95.26%)	
NICU admission			
Yes	06 (2.5%)	23 (7.79%)	0.007
No	234 (97.5%)	272 (92.21%)	
Ventilatory support			
Yes	01 (0.41%)	05 (1.69%)	0.163
No	239 (99.59%)	290 (98.31%)	
Hospital stay (hours)			
<06	233 (97.08%)	275 (93.22%)	0.154
6-24	3 (1.25%)	4 (1.35%)	
24-48	1 (0.41%)	5 (1.69%)	
>48	3 (1.25%)	11 (3.72%)	
Final outcome			
Discharged	239 (99.59%)	294 (99.66%)	0.88
Expired	01 (0.41%)	01 (0.34%)	

NICU was greater in group 2 than in group 1 [23 (7.79%) vs. 6 (2.5%) respectively, $p = 0.007$] as shown in Table II. Of 29 neonates who were admitted to NICU, males were 16 and 13 were female babies and majority of the babies, were between 2.5 to 4.0 kg birth weight.

However, there was no statistically significant difference between the two groups with regard to final outcome, requirement for mechanical ventilation, length of hospital stay and APGAR scores at one and five minutes (Table II). One neonate in both groups died because of neonatal sepsis, rest all babies were discharged home. In both groups, maximum number of babies remained in NICU for less than six hours [233 (97.08%) in group 1 vs. 275 (93.22%) in group 2].

DISCUSSION

In the current study, the effects of administering corticosteroids to mothers who were planned to have elective C-section after 37 weeks gestation, were evaluated in terms of neonatal respiratory morbidity requiring oxygen supplementation and the requirement for admission to NICU. The study found that administering dexamethasone reduced the occurrence of respiratory morbidity and admission to NICU. However, there was no statistically significant difference on the APGAR scores at one and five minutes, length of hospital stay, requirement of mechanical ventilation and final outcome.

Using antenatal steroids after 37 weeks of gestation helps to reduce respiratory morbidity by different mechanisms. One is increasing the number and function of the sodium channels in the apical membrane of respiratory epithelium thereby increasing the re-absorption of the fluid from lungs.⁹ The other is increasing the responsiveness to catecholamines and thyroid hormones.¹⁰

Elective C-section is associated with increased incidence of respiratory morbidity and subsequent hospital admission and hospital stay as compared to vaginal delivery and emergency C-section. This leads to financial burden on the state as well as the individual in the form of expensive neonatal care, parental anxiety, separation of newborn from the mother and increased risk of neonatal morbidity secondary to NICU admission. All these problems warrant adoption of the strategies which can minimise the respiratory morbidity in those born *via* elective C-section. One of the strategies that seems promising, is the administration of steroids to mothers undergoing elective C-section before 39 weeks of gestation as recommended by the American College of Obs and Gynae and Royal College of Obs and Gynae.^{7,11}

Neonatal respiratory morbidity is increased by various risk factors including gender of the newborn, birth weight, type of anesthesia given to mother at the time of C-section, maternal medical conditions like premature

rupture of membranes (PROM), maternal fever, and history of maternal medication use.^{12,13} But in this study, all those babies who were born to mothers with history of PROM and other medical disorders were excluded. All the C-sections were performed under spinal anesthesia. There was no statistically significant difference between the two treatment groups in our study as far as birth weight and gender of the neonates were concerned. Same results were shown by study conducted in Egypt.¹⁴

This study revealed that there was statistically significant difference between the two groups with regard to respiratory morbidity and admission to NICU. The same results were shown by a study conducted by Nada *et al.* in 2015, which showed a reduction in the incidence of respiratory morbidity as well as NICU admission.¹⁵ Their results showed that the rate of respiratory morbidity in corticosteroid treated group was 1.3%, while in control group it was 3.4% ($p = 0.014$). In this study, it was 1.66% *versus* 4.74% ($p = 0.049$) for the treatment and control groups, respectively. Similarly, their study showed rates of NICU admission in two groups at 2.8% and 12.7%, respectively ($p = 0.003$). In this study, these were 2.5% and 7.79% for the treatment and control groups, respectively ($p = 0.007$). Same results were shown by study conducted by Stutchfield *et al.* which showed a reduction in NICU admission in the group who received antenatal corticosteroids.¹⁶ The study carried out by Hansen *et al.* has the same results in terms of reduced neonatal respiratory morbidity in the corticosteroid treated group.¹⁷ A study conducted by Dileep *et al.* in Karachi also found that administration of corticosteroids to mothers undergoing elective C-section at term was associated with reduced NICU admission and respiratory morbidity.¹⁸

These results are also in agreement with a Cochrane systematic review, which stated that there was a reduction in NICU admission for babies whose mothers received antenatal corticosteroids.¹⁹ However, the same review did not find any statistically significant difference as far as the respiratory morbidity was concerned. The results of this study are in contrast to a study carried out by Hutchison, who showed that antenatal corticosteroids have no role in reducing the neonatal respiratory morbidity as well as NICU admission.²⁰ However, according to Hutchison, if a large sample size is taken and the study is adequately powered then there might be a reduction in terms of respiratory morbidity and NICU admission.

This study revealed that there was no significant difference between the two groups in terms of need for mechanical ventilation, length of hospital stay, and the final outcome. These results were in agreement with studies performed by Nada *et al.*, Dileep *et al.*, and Sotiriadis *et al.*^{15,18,19}

The present study has certain limitations. The sample size is small, though it was the largest sample size for any such study conducted so far in Pakistan. Lack of long term follow-up of babies whose mothers received dexamethasone. It was a non-randomised trial. Hence, a randomised controlled trial with large sample size need to be carried out with long term follow-up in order to know the effects of corticosteroids on neonates.

CONCLUSION

Corticosteroids should be administered to women who are planned for elective C-section between 37 to 39 weeks of gestation in accordance with ACOG and RCOG guidelines. Hence, we recommend that delaying the elective C-section beyond 39 weeks of gestation or administering corticosteroids to those who are going to be planned for elective C-section between 37 to 39 weeks gestation in order to reduce the burden of neonatal intensive care units as well as reduce the parental anxiety and financial burden.

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