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Research Article

Administration of Prophylactic Corticosteroids in Women Delivered by Elective Cesarean Section Before 39 Weeks of Gestation

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Abstract

Background: Newborns of normal weight born by means of a caesarean section are at greater risk of developing respiratory morbidity compared to those born normally, and the risk increases with the elective performance of a caesarean section before labor. Premature birth before 39 weeks is linked with elevated neonatal breathing difficulties necessitating neonatal intensive care hospitalization. Antenatal corticosteroids decrease neonatal mortality, respiratory distress syndrome, and intraventricular bleeding. They work best once 24-72 hours to 7 days before delivery. Generally, betamethasone 12mg (2 injections) or dexamethasone 6mg (4 injections) intramuscularly is used to increase fetal lung maturity. **Objectives:** The aim of the study is to evaluate procedures in the adherence to the use of prophylactic corticosteroids during elective caesarean sections before 39 weeks and see how it affects infant morbidity and newborn hospitalizations. **Study Design:** This was a retrospective audit of 60 patients undergoing an elective caesarean section from 37 and 38+6 weeks between June 1 and November 10, 2020. Indications, corticosteroid type, and dosing, and neonatal outcomes such as RDS, TTN, and NICU admission were gathered. **Results:** 54/60 (90) patients were given corticosteroids, and 6 (10) were not. Seven (11.6) neonates were admitted to the NICU. Respiratory morbidity was higher in untreated infants (5 [71%]) than in treated infants (2 [28%]). The effectiveness of dexamethasone and betamethasone was no different. **Conclusion:** Antenatal corticosteroids are effective in improving neonatal respiratory outcomes and reducing NICU hospitalization before 39 weeks, with no significant differences between the effectiveness of the different types of steroids.

Keywords: Elective Cesarean Section, antenatal corticosteroid, respiratory distress, transient tachypnea of newborn

Introduction

In recent years, the caesarean section rate in developed countries has been rising [1] . This may be because of improved techniques to control haemorrhage, infection, and thromboembolism that have increased the safety of the procedure. As a result, obstetricians and pregnant women have a reduced threshold for choosing it. However, although maternal risks have decreased, the effects on the baby of surgical delivery before the due date continue to be debated [2].

About 18.5 million CSs are conducted yearly worldwide, and 21–33% of all CSs are performed in middle and high-income countries [3]. The effectiveness of CS in preventing maternal and perinatal mortality and morbidity is justifiable and medically indicated, though there is no scientific confirmation that shows the benefit of cesarean delivery for the mother or for the newborn baby who does not require CS [4]. Like other surgical procedures, CS has short and long-term risks, which may affect the reproductive health and physiological health of the woman and her child [5]. These risks are higher in women with limited access to comprehensive obstetric care [6].

The United States vital statistics data have shown that the risk of neonatal mortality is increased by 1.5-fold after planned and unplanned CS compared to vaginal delivery, and the most common cause of neonatal mortality is respiratory morbidity [3]. However, the incidence of birth trauma, meconium aspiration syndrome, and

birth asphyxia is reduced by this mode of delivery as compared to vaginal delivery [7]. Mostly, respiratory morbidity occurs as a result of failure to clear fetal lung fluid. In recent times, 6 studies have revealed that the incidence of respiratory morbidity (transient tachypnoea of the newborn (TTN), respiratory distress syndrome [RDS], or persistent pulmonary hypertension [PPH]) was 10% in neonates born by elective CS (ECS) at 37 weeks as compared to 2.8% among neonates born vaginally [8].

Other risk factors for respiratory distress include gestational age, mode of delivery, male sex, fetal asphyxia, maternal asthma and diabetes, and the type of anesthesia given during delivery; the timing of the CS also affects the incidence of respiratory morbidity [1]. The newborn born by ECS at 37 and 38 weeks' gestation has a higher risk of respiratory complications compared with those delivered at later gestations [9].

Prophylactic administration of corticosteroids in preterm as well as near-term pregnancies promotes accelerated lung maturity, thereby reducing the incidence of respiratory distress, admissions to neonatal intensive care units, and need for exogenous surfactant treatment [10 Various studies have found that the risk of respiratory morbidity decreases significantly at and after 39 weeks, so it has been recommended that the elective cesarean delivery, if possible, should be deferred till 39 weeks of gestation [11]. However, this may not be possible in all cases, and elective cesarean section may have to be undertaken due to maternal or fetal indications. In such situations, where the risk of continuing pregnancy outweighs the benefits, delivery becomes necessary to prevent adverse outcomes [12].

The antenatal steroids for term caesarean section (ASTECS) randomized trial, therefore, sought to evaluate whether giving the recommended two doses of betamethasone before delivery reduces the incidence of respiratory distress in babies delivered by elective caesarean section at term [13]. Five studies lasting between three and 20 years, with more than 1500 patients, have shown no adverse effects of a single course of antenatal corticosteroids, neither through infection of fetus or mother nor in long-term neurological or cognitive effects.

However, concerns remain regarding the potential long-term safety of antenatal corticosteroid exposure [14]. Animal studies show that maternal corticosteroid administration delays myelination in the fetal brain (which in humans normally continues up to the age of 2 years) and reduces the growth of all fetal brain areas, particularly the hippocampus [15]. There may be long-term effects on the setting of the hypothalamo-pituitary axis and glucose homeostasis [16]. In preterm infants, antenatal corticosteroids have been associated with higher systolic and diastolic blood pressures in adolescence, possibly leading to clinical hypertension. Other studies suggest that repeated courses of antenatal steroids reduce neonatal head circumference and birth weight [17].

Notwithstanding such issues, prenatal extension of non-urgent elective caesarean section to 39 weeks is not always possible in every clinical case [18]. Thus, the cost-benefit, as well as risk-benefit, of corticosteroid use in prenatal practice continues to give rise to clinical ambiguity. With this context, the necessity to assess the compliance of the use of the antenatal corticosteroid in practice and its efficacy in the reduction of the respiratory morbidity in the neonates at elective cesarean section conducted before 39 gestation weeks is evident [19]. The objective of this audit is to determine the administration of prophylactic corticosteroids and its influence on neonatal respiratory rates and NICU readmission in women who deliver through an elective cesarean section between 37 and 38+6 weeks of gestation. We hypothesized that the use of antenatal corticosteroids would lower neonatal morbidity in respiratory conditions and the neonatal admissions to the NICU.

Materials and Methods

Study Design and Setting

This retrospective audit was performed in the Department of Obstetrics and Gynecology at AL Sharq Hospital, Fujairah, UAE, using Electronic Medical Records of 60 pregnant patients who had undergone elective caesarean section between 37 to 38+6 weeks of gestation from 1st June 2020 to 10th November 2020.

Study Population

A total of 60 women with singleton pregnancies were included in this study on the basis of predefined inclusion and exclusion criteria.

Inclusion Criteria

Inclusion criteria involved all patients who delivered the baby through elective cesarean section at 37 to 38+6 gestation period with a singleton pregnancy.

Exclusion Criteria

The exclusion criteria were multiple pregnancies, gestational age of less than 37 weeks or greater than 39 weeks, and an anomalous fetus.

Exposure Groups

Those women who received two intramuscular injections of 12 mg betamethasone 24 hours apart or injection dexamethasone 6 mg every 12 hours apart in four doses were included in the audit and grouped as Group A (corticosteroid group), while those women who did not receive any dose of steroid were placed in Group B (no corticosteroid group).

Data Collection

A detailed history of the present pregnancy with respect to the date of the last menstrual period was noted from the case records of the patients. Additionally, past obstetric, menstrual, family, and personal history were recorded. Relevant data of systemic examination was documented in a structured proforma.

Findings of per abdominal examination were noted with respect to the height of the uterus, position, lie, presence of fetal heart sounds (FHS), and its rate. Indication for elective cesarean delivery was also recorded. Any maternal risk factors, such as maternal diabetes, history of infection during the antenatal period, eclampsia, or premature rupture of membranes, etc., were also noted.

APGAR scores at 1 minute and 5 minutes were recorded from the pediatrician's notes. Need for immediate resuscitation measures and indication for admission to the neonatal intensive care unit were ascertained from the attending pediatrician's notes.

Outcomes

The primary outcome was assessed by the need for admission to the neonatal intensive care unit (NICU) for respiratory distress, including transient tachypnoea of the newborn (TTN), respiratory distress syndrome (RDS), or requirement for surfactant therapy and mechanical ventilation.

The secondary outcomes were the incidence of TTN, RDS, and a comparison of the results of various corticosteroid regimens (dexamethasone vs betamethasone).

Statistical Analysis

Microsoft Office was used for the preparation of charts and graphs, and statistical analysis was done using SPSS 22. SPSS version 22. The data were summarized using descriptive statistics, and appropriate comparisons between the two groups would be made.

Ethical Considerations

The research was done in the form of a retrospective audit utilizing anonymized patient information obtained through the electronic medical records. Patient confidentiality was ensured during the study, and no identifiable patient details were employed.

Results

Participant Distribution

This audit was performed in the Department of Obstetrics and Gynecology at Al-Sharq Hospital (private sector). Electronic medical records of 60 patients who underwent elective cesarean section from 37 to 38+6 weeks were included based on the predefined inclusion and exclusion criteria after detailed review of maternal and neonatal records.

Patients who received prophylactic corticosteroids before cesarean were included in Group A (corticosteroid group) and comprised 54 (90%) of the total patients, whereas 6 (10%) patients who did not receive corticosteroids were included in Group B (no corticosteroid group).

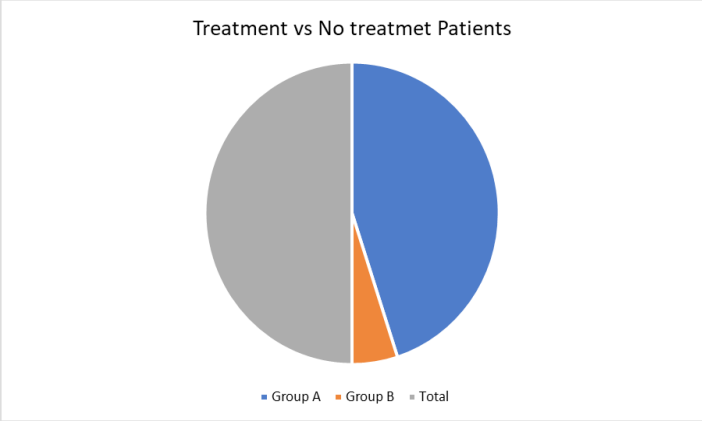

Figure 1: Treatment vs No Treatment Patients

Indications for Cesarean Section

The analysis of the indications for elective lower segment cesarean section (LSCS) showed that the majority of cases in Group A were performed for a previous scar 30 (50%). Other common indications included gestational diabetes 7 (11.6%), cephalopelvic disproportion 6 (10%), diabetes 4 (6.6%), preeclampsia 2 (3.3%), oligohydramnios 3 (5%), fetal growth restriction 2 (3.3%).

In Group B, indications included gestational diabetes mellitus 3 (5 %), pre-eclampsia 2 (3.3%), and previous scar 1 (1.6%). Figure 2.

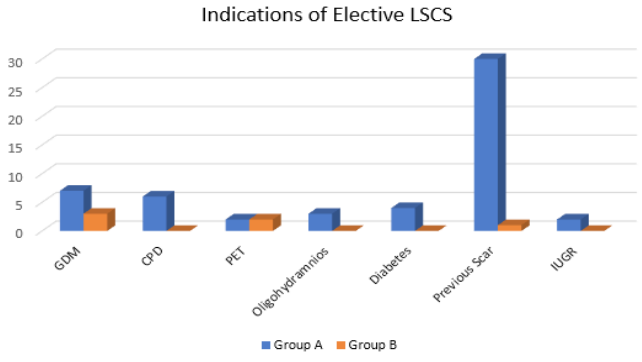

Figure 2: Indications of Elective LSCS

Gestational Age

The mean gestational age among patients in Group A was 37.5 weeks, whereas in Group B it was 37.1 weeks. (Figure 3)

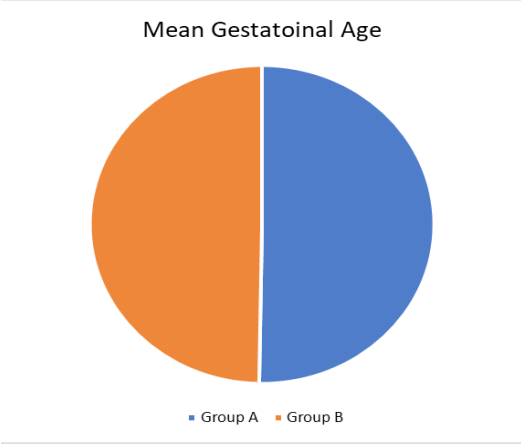

Figure 3: Mean Gestational Age

NICU Admissions

A total of 7(11.6%) neonates required admission to the neonatal intensive care unit (NICU) among the 60 patients included in the audit. Of these, 2 (28%) neonates belonged to Group A, while 5 (71.4%) neonates belonged to Group B, indicating a higher rate of NICU admissions in the group that did not receive corticosteroids. (Figure 4)

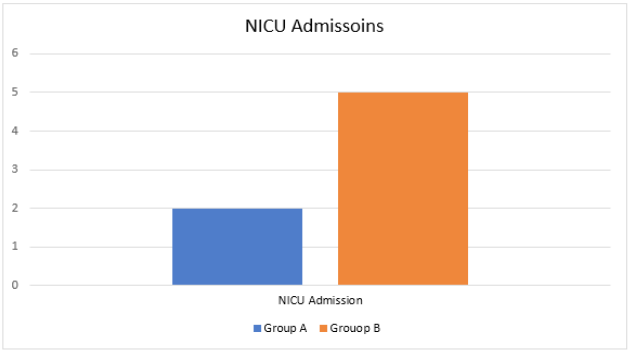

Figure 4: NICU Admissions

Neonatal Respiratory Outcomes (TTN and RDS)

Analysis of neonates' outcomes demonstrated that among 7 neonates admitted to NICU, 1 (14%) neonate from Group A and 2(28%) neonates from Group B showed a transient tachypnoea of the newborn (TTN), which represented an increased prevalence of the non-corticosteroid group.

Similarly, 1 (14%) neonate in Group A had respiratory distress syndrome (RDS), 3 (42.8) neonates in Group B had respiratory distress syndrome (RDS); therefore, having a higher incidence rate of respiratory distress in the non-antenatal corticosteroids group Figure 5.

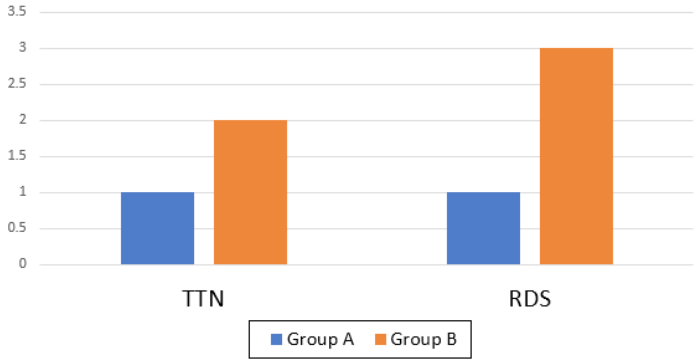

Figure 5: Incidence of TTN and RDS in Newborns

Comparison of Corticosteroid Types

Among patients who received corticosteroids, 48(80%) received dexamethasone, while 6(10%) received betamethasone.

Of the total NICU admissions, 1 (14%) neonate belonged to mothers who received dexamethasone, and 1(14%) belonged to mothers who received betamethasone, suggesting no significant difference in effectiveness between the two different corticosteroids in preventing neonatal respiratory morbidity. (Figure 6)

Figure 6: NICU Admissions with Corticosteroids

Discussion

Principal Findings

In this audit, the use of antenatal corticosteroids before elective delivery by cesarean section before 39 weeks of gestational age was linked with a lower occurrence of post-delivery respiratory morbidity of the neonates and neonatal intensive care. Respiratory distress syndrome can be considered one of the most significant

causes of early neonatal morbidity and mortality.

An increased incidence rate of respiratory morbidity and NICU hospitalizations was found in babies who were not exposed to corticosteroids, and no significant difference was found between dexamethasone and betamethasone to prevent respiratory complications in neonates.

Results in the Context of What is Known

Cesarean section is a risk factor for the occurrence of neonatal respiratory complications, primarily RDS and transient tachypnea of the newborn, in infants at term and in preterm infants. It is a risk that reduces following increasing gestational age. Cesarean section before 39 weeks will result in respiratory morbidity necessitating neonatal intensive care unit admission.

The findings have also been reported in the literature published before, such as the ASTECS randomized trial, which showed that neonatal respiratory complications were reduced in cases when antenatal betamethasone was administered before the elective cesarean delivery. Similarly, Cochrane reviews have also suggested that although the use of antenatal corticosteroids is useful in alleviating neonatal respiratory morbidity, no evidence has been found to prove that a particular corticosteroid regimen is better when compared to another, which also conforms to our findings [20].

Clinical Implications

In all women planning an elective cesarean section and 38+6 weeks of gestation, we find support for corticosteroids to lower the number of neonatal respiratory complications, where delivery below 39 weeks is inevitable.

Nevertheless, the use of corticosteroids in high-risk pregnancies, especially among diabetic and systemically infected women, needs a great deal of attention since it might have metabolic consequences and must be observed closely.

The timing of administration is also of critical importance because it has been shown that corticosteroids clearly work best within 24 hours to 7 days before delivery.

Research Implications

Although the advantages were witnessed, doubts still exist about the safety of antenatal corticosteroid exposure in the long run, especially in term and near-term pregnancies.

Studies on animals indicate that the administration of maternal corticosteroids slows myelination of the fetal brain and decreases all fetal brain sizes, especially the hippocampus. There are implications of long-term effects on the hypothalamo-pituitary axis and glucose homeostasis. Other studies have indicated that repeated courses of antenatal steroids diminish fetal head circumference and birth weight.

Thus, additional randomized controlled trials on a large scale are needed to assess long-term neurodevelopmental effects, the most effective dosing schedule, and the age of administration among this group of individuals.

Strengths and Limitations

The strength of the present study is that it is a clinical audit design, which is based on the real world and reflects what happens in the actual practice and adherence to the corticosteroid administration practice.

Nonetheless, a number of limitations should be admitted. The research was a retrospective study that was done in one facility and had a relatively small sample size, which can restrict the applicability of the results. Further, the possible confounding variables could not be adequately manipulated.

Conclusions

The use of antenatal corticosteroids before elective delivery via cesarean section before 39 weeks of gestational age is linked to a decrease in respiratory morbidity in newborns and NICUs. A significant difference was not found between dexamethasone and betamethasone in the prevention of neonatal respiratory complications.

Nevertheless, one should exercise caution with high-risk pregnancies, and additional studies are necessary to make the long-term safety clear and maximize the clinical guidelines.

Abbreviations

CS: cesarean section

TTN: Transient tachypnoea of the newborn

RDS: Respiratory distress syndrome

GDM: Gestational Diabetes Mellitus

DM: Diabetes Mellitus

IUGR: Intrauterine Growth Restriction

ECS: Elective repeat cesarean

NICU: Neonatal intensive care unit

PPH: post-partum hemorrhage

APGAR: Appearance, Pulse, Grimace, Activity, and Respiration Score

CPD: Cephalopelvic disproportion

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