ORIGINAL ARTICLE

Dexamethasone and Fetal Behaviour: A Cohort Study of the Effects of Maternal Dexamethasone Administration on Fetal Heart Rate and Movement

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ABSTRACT

Aim: To determine the association between maternal dexamethasone administration and changes in fetal heart rate and fetal movements.

Study Design: Cohort study

Setting: Obstetrics & Gynaecology Department, Punjab Rangers Teaching Hospital, Lahore

Duration of Study: Study was carried out over a period of 6 months, from 1st October 2019 to 31st March 2020.

Method: A total of 130 antenatal patients were taken, in the Obstetrics ward of Punjab Rangers teaching Hospital, over a period of 6 months, from 1st October 2019 to 31st March 2020, in whom there was a risk of preterm delivery and to whom dexamethasone was administered. Non stress test was evaluated and fetal movements were noted before and after dexamethasone administration.

Results: The number of patients complaining of reduced fetal movements was 18%, and the numbers of atypical CTGs observed were 8% following administration of Dexamethasone.

Conclusion: Statistically significant relationship between dexamethasone administration and CTG changes and Fetal Kick Count over 48 hours of administration of last dose.

Keywords: Preterm delivery, CTG, Fetal kick count

INTRODUCTION

Prematurity is the leading cause of neonatal death. With Preterm birth on the rise even in countries with sophisticated and reliable health care systems, World Health Organization has estimated a 5-18% prevalence covering 184 countries worldwide[1]. In half of the cases of spontaneous onset of preterm labour, the cause is unexplained, with inadequate understanding of the mechanism of preterm labour[2]. There is a 50% incidence of long term morbidity and 75% incidence of perinatal mortality associated with preterm births[3]. Among the identified maternal and fetal risk factors for preterm deliveries are infections, uterine contractions, shortened length of cervix, genetic factors, nutritional status, psychological characteristics and adverse behavior[4,5].

The fundamental cause of early neonatal mortality and morbidity is respiratory distress syndrome which occurs due to immature lung development in preterm deliveries, and leads to expensive treatments of intensive care[6]. Agent used for prevention of RDS is dexamethasone or betamethasone (synthetic corticosteroid), which is administered in antenatal period at least 24-48 hours prior to delivery. The mechanism of action of dexamethasone is surfactant production leading to maturity of fetal lungs[7]. It is also useful in prevention of occurrence of necrotizing enterocolitis, intraventricular hemorrhage and overall neonatal prognosis[8].

Changes were seen in fetal heart rate, fetal breathing and body movements, which were more pronounced with Betamethasone than with Dexamethasone administration, however the data is still vague.

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Therefore, more studies are needed to confirm this causal relationship. Aim of this study is the determination of effect of Dexamethasone on fetal cardiogram and perception of fetal movements by mother.

METHODOLOGY

The study was conducted at Punjab Rangers Teaching Ward, in the Obstetrics Ward of Unit 1. This Cross-Sectional study was carried out over a 6 month period, from 1st October 2019 to 31st March 2020. The age range of study group was from 18 to 36 years.

A total of 130 antenatal women were selected in order to have a confidence level of 90%, the real value being within ±5% of the measured/surveyed value. The margin of error was 5.02%. The selection was in accordance with the ethical standards of the institution.

The gestational age of participants was between 24 to 36 weeks and they were at risk of preterm delivery. The duration of Gestation was calculated from Last Menstrual Period, or from the First Trimester Ultrasound if she was unsure of dates. Patients who were at risk of preterm delivery were those who presented with uterine contractions, placenta previa, mild preeclampsia, previous history of preterm births, maternal diabetes mellitus and multiple gestation.

Those patients were excluded from the study who had a history of corticosteroid administration in current pregnancy, premature rupture of membranes, intrauterine fetal growth restriction, fetal abnormalities on ultrasound, abnormal nonstress test at time of admission, patients in active labour and who were admitted with complaint of reduced fetal movements.Also excluded from the study were women who had any contraindication to corticosteroid administration.

Non stress test and fetal kick count were done before intervention.Injection Dexamethasone 12 mg intramuscular was given, then repeated after 12 hours, as per unit's established protocol. Non stress test and fetal kick count were repeated after 12, 24 and 48 hours after first injection of dexamethasone.

Non stress test was taken as normal when a trace of 20 minutes showed fetal heart rate between 110-160bpm, variability between 6-25 bpm, at least 2 accelerations of >15bpm lasting 15 seconds, none or occasional decelerations (Category1).

An Atypical Non stress test was a trace of 20 minutes showing a baseline heart rate of 100-110bpm or >160 bpm, baseline variability of 5 or less, variable decelerations, < 2 accelerations (Category 2). Abnormal Non stress test was taken as baseline bradycardia<100bpm or tachycardia >160bpm, variability of <5 or sinusoidal 25bpm for >10min, variable decelerations, < 2 accelertions (Category 3).

Fetal kick count was recorded over a period of 1 hour, and was considered normal when fetal movements were ≥ 3/hour and abnormal when fetal movements were <3/hour of if 10 movements took more than 2 hours.

RESULTS

In this study, out of 130 patients, 18(13.8%) patients had abnormal fetal kick counts and 8(6.15%) had atypical or abnormal Non stress test.

Fig.1: Comparison of results of administration of Inj Dexamethasone on Non-stress test and Fetal kick count

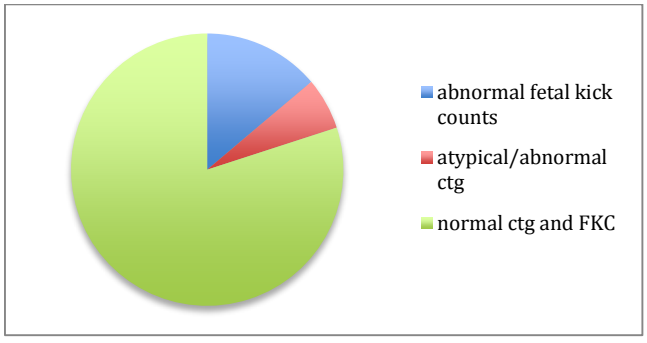
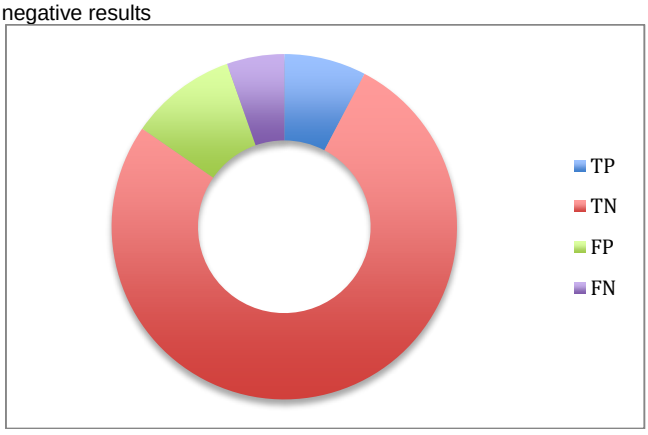


Fig. 2: Comparison of results indication the high value of true negative results



Ten patients were found to be true positive (at time of delivery: oligohydramnios, meconium stained liquor, cord entanglement, low birth weight <2.5 kg).100 patients were true negative (normal Non stress test and fetal kick count). 13 patients were false positive (atypical or abnormal non stress test or abnormal fetal kick count but no positive finding intra partum), 7 patients were false negative (normal non stress test and fetal kick count but positive findings intra partum).

When the results of non stress test and fetal kick count were compared withintra partum findings, sensitivity was found to be 58.8%, Specificity of 88.4%, Diagnostic accuracy of93.4% in detection of fetal distress, Positive predictive value of 43.4%, Negative predictive value of 93.4%.

DISCUSSION

Various studies have been conducted, comparing the transient effects of Betamethasone and Dexamethasone on clinical markers of fetal well being, like the Cardiogram and fetal kick count.The dosage is different in various studies, some completing the 24 mg dose in 24 hours, while others splitting it to cover 48 hours.

In comparison with Betamethasone, Dexamethasone might be a preferred drugdue to its association with significantly less alteration in fetal heart rate variability[9]. When the pregnancies were followed further, all changes in Cardiograms and Fetal kick counts returned to baseline values.

Dawes et al. concluded that dexamethasone administration normally causes a rise in foetal heart rate variation for upto a day[10].

In contrast,Senat et al and Mushkat et al, found no change in fetal heart rate variability[11,12].

Interestingly, Multon et al. who conducted their study on growth retarted fetuses only, also found no change with Dexamethasone[13].

In our study, the effect of dexamethasone was studied on Nonstress test and Fetal kick count, and the results were compared, for the presence or absence of markers of fetal distress at time of delivery. Interestingly, although there was a significant alteration in fetal behavior with the drug, no significant cause could be established at the time of delivery. This leads to a high specificity and negative predictive value.

Whether the maternal subjections towards foetal movements were factually true or erroneously reported, remains a matter of conjecture.Also In our study, we relied on visual interpretation that could only document strikingly significant CTG changes.

CONCLUSION

This study has concluded results from our general population that there is an 18% chance of abnormal Fetal kick count after administration of dexamethasone and an 8% chance of atypical or abnormal non stress test. As the sensitivity of these tests is below 60%, additional monitoring is required to decide the time and mode of delivery. This could be in the form of biophysical profile and fetal blood sampling for pH studies.

The effects of Dexamethasone on fetal behavior can be further studied by changing the amount of dosage and the interval between each dose so that slow incremental increase in maternal plasma levels is seen.

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