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Original Research Article

Short term effects of antenatal maternal betamethasone administration on CTG

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ABSTRACT

Background: Antenatal administration of corticosteroids to pregnant women has proven to enhance lung maturation, prevent respiratory distress syndrome and provide neuroprotection to the foetus. When betamethasone is given antenatally, it has been observed to transiently reduce fetal movements and fetal heart rate variability; which are often used as indicators of fetal wellbeing. Aim and objectives of the present study was planned to assess the short-term effects of antenatal betamethasone administration on fetal heart rate and its variability by visual interpretation of CTG

Methods: A total of 30 women between gestational age of 28 weeks to 36 weeks 6 days with singleton pregnancy requiring maternal betamethasone administration were enrolled and the first CTG was taken. First dose of injection betamethasone 12 mg i.v. was administered and second CTG was taken 6 hours later and both the CTGs were compared.

Results: After 1st dose of antenatal betamethasone, 90% of the cases had changes in fetal heart rate on CTG. In 53.3% cases, the baseline fetal heart rate was reduced while in 46.7% there was no change. There was reduced fetal heart rate variability in 56.7% cases while 23.3% cases had increased variability and rest 20% had no observable change. 73.3% study patients delivered and 26.6% study patients continued pregnancy. Among those who delivered, 20% neonates required neonatal ventilator support and 10% required oxygen support. All neonates were eventually discharged.

Conclusions: Maternal betamethasone administration can cause changes in fetal heart rate and variability on CTG. Hence, other fetal parameters have to be considered before concluding fetal distress as these changes maybe transient. In our study, though CTG changes were seen in 90% cases, only 20% cases required neonatal ventilator support.

Keywords: Betamethasone, Antenatal, CTG, Fetal heart rate

INTRODUCTION

Antenatal administration of corticosteroids to pregnant women who present with threatened preterm has proven to reduce the risk of prematurity, enhance lung maturation in the foetus, prevent respiratory distress syndrome and provide neuroprotection. National Institute of Health recommends to routinely administer either betamethasone or dexamethasone to those pregnant women who are at high risk of preterm delivery before 34 weeks of gestation.[1]

Though, when betamethasone administration is given antenatally, there are reports of early effects like a rise in fetal heart rate variability, a rise or fall in basal fetal heart rate, or no change in either of the parameters, when data were obtained within 24 hours post-injection.[2,3] The reductions were most reflective

48-72 hours after the first of two injections of betamethasone (doses 24 hours apart) in studies that comprised hourly recordings made on each of five successive days. These parameters are often used as indicators of the wellbeing of the foetus. These observed effects were more likely the result of a glucocorticoid receptor mediated process in the fetal brain. Maternal betamethasone administration transiently abolishes the fetal diurnal rhythms of heart rates and its variation, breathing and body movements.

Betamethasone readily crosses the placenta and its fetal levels keep pace with the rapidly increasing maternal levels during the first few hours after administration of this drug. It may, therefore, be that betamethasone exerts an effect on the foetus shortly after injection to the mother.[4-6] Hence in this study, we want to determine the short-term effect of betamethasone on baseline fetal heart rate and its variability.

METHODS

Study design, location, duration and sample size

The study design was prospective observational study. The study was conducted on antenatal women between gestational age of 28weeks to 36weeks 6 days with singleton pregnancy visiting Department of obstetrics and gynecology, Kempegowda institute of medical sciences, Bangalore, Karnataka hospital requiring maternal betamethasone administration. Informed consent was taken. The study period was from February 2021 to October 2021. The sample size was 30.

Inclusion and exclusion criteria

All singleton pregnancies between gestational age of 28 weeks to 36 weeks 6 days were included in the study. Non-singleton pregnancy and patients already on steroid therapy were excluded from the study.

Procedure

All pregnant women between gestational age of 28 weeks to 36 weeks 6 days with singleton pregnancy requiring maternal betamethasone administration enrolled in the study after verbal consent. Relevant antenatal history elicited from the patient. 2 CTG traces taken: first, before administration of betamethasone 12 mg intra-muscular (1st dose). Second, 6 hours after administration of betamethasone 12 mg intra-muscular (1st dose). Comparison of both CTGs by visual interpretation for fetal heart rate and its variability.

Statistical tool

The data was collected and compiled and entered into a Microsoft Excel worksheet. Descriptive statistics and suitable tests of significance like Chi-square test were used as required. The data was then analysed using SPSS (statistical package for social sciences) software v. 21.0.

RESULTS

In this present study, majority of the women (43.3%) were aged between 21 to 25 years (Table 1).

Table 1: Age distribution.

Age (years)	N (%)
≤20	2 (6.7)
21-25	13 (43.3)
26-30	10 (33.3)
>30	5 (16.7)
Total	30 (100)

A total of 63.3% of the patients were booked outside and 43.3% were primigravida. 53.3% women were administered antenatal corticosteroid administration for threatened preterm and preterm labour, while 46.7% were those women who might need preterm induction. After first dose of antenatal betamethasone, 90% of the cases had changes in fetal heart rate on CTG. In 53.3% cases, the baseline fetal heart rate was reduced, while in 46.7% there was no change (Table 2).

Table 2: Baseline fetal heart rate changes.

Baseline fetal heart rate	N (%)
Reduced	16 (53.3)
No change	14 (46.7)
Total	30 (100)

There was reduced fetal heart rate variability in 56.7% cases, while 23.3% cases had increased variability and rest 20% had no observable change (Table 3).

Table 3: Fetal heart rate variability.

Fetal heart rate variability	N (%)
Reduced	17 (56.7)
Increased	7 (23.3)
No change	6 (20.0)
Total	30 (100)

A total of 73.3% study patients delivered and 26.6% patients were discharged as symptoms subsided. 20% neonates required neonatal ventilator support and 10% required oxygen support. All neonates were eventually discharged.

DISCUSSION

This study was conducted in the Department of OBG, KIMS Hospital, Bengaluru among 30 pregnant women between gestational age of 28 weeks to 36 weeks 6 days with singleton pregnancy requiring maternal

betamethasone administration. Majority of the women (43.3%) were aged between 21 to 25 years. 63.3% were booked outside and 43.3% were primigravida. Antenatal administration of corticosteroids to pregnant women has proven to reduce the risk of prematurity, enhance lung maturation in the foetus, prevent respiratory distress syndrome and provide neuroprotection.[1] 53.3% women in our study were administered antenatal corticosteroid administration for threatened preterm and preterm labour, while 46.7% were those women who might need preterm induction. A meta-analysis by Crowley concluded that "antenatal glucocorticoids not only reduced the incidence of respiratory distress syndrome by 50% but also the incidences of neonatal mortality, periventricular haemorrhage, and necrotizing enterocolitis".[7] After 1st dose of antenatal betamethasone, 90% of the cases had changes in fetal heart rate on CTG. In 53.3% cases, the baseline fetal heart rate was reduced, while in 46.7% there was no change. In a similar study by E J H Mulder et al, foetuses exposed to betamethasone at 29-34 weeks gestational age showed decreased FHR on day 1 and reduced breathing activity and prolonged episodes of quiescence with a concomitant decrease in body movements on days 1 and 2.[8] There was reduced fetal heart rate variability in 56.7% cases, while 23.3% cases had increased variability and rest 20% had no observable change.

In a study by Simone et al, showed a significant decrease in basal FHR 6-12 hours after the first dose of betamethasone, whereas FHR variation increased gradually during the first 12 hours, reaching a maximal change from pre-treatment levels 6-12 hours after injection. 73.3% study patients delivered and 26.6% patients were discharged as symptoms subsided. 20% neonates required neonatal ventilator support and 10% required oxygen support. All neonates were eventually discharged.

Limitations

Limitations of current study were; the sample size was small. Interpretation of CTG is subjective. Further, multi-centric study with a greater number of subjects maybe justified.

CONCLUSION

Maternal betamethasone administration can cause changes in fetal heart rate evident on CTG. It can cause a reduction in baseline fetal heart rate or an increase or decrease of fetal heart rate variability or no changes in them. In our study, though CTG changes were seen in 90% cases, only 20% cases required neonatal ventilator support. Thus, apart from these CTG findings, in order to conclude about either fetal distress or normalcy, other fetal parameters have to be considered, as these changes maybe transient.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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