

PROFILE OF ABNORMAL CARDIOTOCOGRAPHY AND PERINATAL OUTCOME AT TERM PREGNANCY – A DESCRIPTIVE STUDY IN A TERTIARY CENTRE OF NEPAL

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ABSTRACT

INTRODUCTION

Identification of fetal distress and intervention in time accordingly can have good perinatal health. Different modalities can be used for identifying fetal distress depending upon the resources and settings. This study aims to find the abnormalities of cardiotocography (CTG) in identifying fetal distress and its utility in perinatal outcome.

MATERIAL AND METHODS

This was hospital based cross-sectional descriptive study for 6 months in patients with term pregnancy in cephalic presentation having abnormal CTG findings.

RESULTS

Out of 198 patients, 53% were multigravidae. Variable deceleration was seen in 74 (37.3%), late deceleration was notified in 30 (15.1%), and persistent tachycardia was seen in 22 (11.1%). Meconium stained liquor was observed in 114 (57.6%). Cord around neck was present in 40 (20.2%). APGAR score less than 7 at 5 minutes was notified in 120 (60.6%), reception of resuscitation was in 100 (50.5%), NICU admission was done in 50 (25.2%), neonatal deaths within 72 hours were 4 (2%) which were observed in CTG with variable and late deceleration however, no still birth was recorded.

CONCLUSION

Cardiotocography interpretations help in identifying fetal distress which in turn determines the perinatal outcome.

KEYWORDS

Cardiotocography, Fetal distress, Perinatal outcome

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INTRODUCTION

Identifying fetal distress in time during maternal labor has been identified as an important factor for newborn health.¹ Perinatal mortality in Nepal is 21/1000 live births and perinatal asphyxia is one of the common causes of stillbirth.² Perinatal hypoxia can also result in hypoxic insult in brain and kidney.

Caesarean section is the common modality in the management in patients with fetal distress to reduce perinatal complications. The prevalence of fetal distress as an indication of caesarean section has been around 14.5 to 40 %.^{3,4} Different causes of which important were placental diseases like placental insufficiency, umbilical cord compression, low amniotic volume, abnormal uterine contractions, abnormal fetal position, fetal anemia and different maternal medical diseases.

Fetal distress can be identified by assessing fetal heart rate intermittently using fetoscope or fetal doppler, looking at the colour of meconium, intermitted cardiotocography (CTG) or by fetal blood sampling.^{5,6} The choice of investigations depends upon the resources and expertise available.

This study aimed to determine the various abnormal findings of CTG in identifying fetal distress and its utility in perinatal outcome.

MATERIAL AND METHODS

This was a hospital-based cross-sectional descriptive study conducted in Universal College of Medical Science Teaching Hospital for 6 months (August 2021 to January 2022). The study was approved by the institution review board (IRB No UCMS/IRC/050/21). Inclusion criteria were nulliparous/multiparous women, singleton pregnancy with cephalic presentation, term pregnancy (≥ 37 weeks) as determined from the date of the last menstrual period and/or confirmed by first trimester ultrasound measurements, women with prelabour rupture of membrane, those patients who were admitted for induction of labour or who came in latent phase or active phase of labor with documented suspicious or pathological CTG who had undergone caesarean section. Exclusion criteria were multiple pregnancies, malpresentations, intrauterine growth restriction, gestational diabetes, obstetric cholestasis, previous lower segment caesarean section and other uterine surgery, severe oligohydramnios (AFI less than 5), fetus with congenital anomalies, preterm premature rupture of membrane and known gross congenital malformation in the fetus.

Sample size was calculated to be 198 by using the formula $n = Z^2 \times p \times (1-p) / e^2$ where n is sample size, Z is confidence interval (1.96), e is the margin of error (5%) and p is the event in population.⁴

Cardiotocography was done for 20 minutes by using machine (Bistos BT-350 Fetal Monitor machine) with record paper speed 3 cm/min. Results were classified according to RCOG (2001) into normal, suspicious and pathological.⁵

Normal cardiotocography was defined as baseline heart rate (110-160 bpm), baseline variability (5-25 bpm), absence of decelerations and at least 2 accelerations (>15 bpm for >15 secs).

Suspicious cardiotocography was defined as lacking at least one characteristic of normality, but with no pathological features

Pathological cardiotocography in the present study was defined as:

- Baseline fetal heart rate > 180 bpm or < 100 bpm
- Variability (< 5 bpm) pattern for > 90 minutes
- Sinusoidal pattern for ≥ 10 minutes
- Late decelerations.
- Atypical variable decelerations
- Single prolonged deceleration for > 3 minutes

Perinatal outcome was assessed by using following variables: APGAR Score at 5 minutes, need of resuscitation in any of the forms like (suction and stimulation, bag and mask ventilation, chest compression and intubation), NICU admission (> 12 hours), still birth and perinatal death.

In our study, perinatal death was defined as the neonatal death within 72 hours of life after birth.

After verbal and written consent, all patients meeting inclusion criteria had undergone CTG studies and mother and fetus with abnormal CTG study were further followed up. Results were written in preformed performa. All data were tabulated in Microsoft Excel and analyzed in SPSS software version 20.

RESULTS

One hundred ninety eight patients were studied which were categorized according to age group in figure 1 and according to gravida as in figure 2.

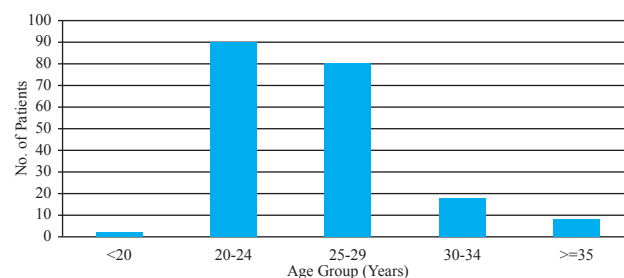


Figure 1. Study population according to age group (N=198)

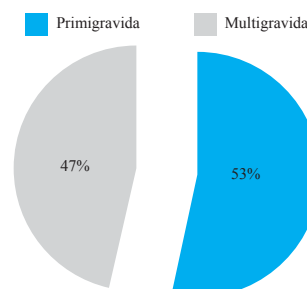


Figure 2. Distribution of study population according to gravida (N=198)

The cardiotocography parameters on the basis of which caesarean section was planned were enlisted in Table 1.

Majority of the CTG were pathological (73.74%). The common abnormality detected was variable deceleration (37.3%) followed by absent acceleration (25.2%) and late deceleration (15.1%) respectively, as depicted in table 1.

Table 1. Cardiotocography parameters (N=198)

| CTG category | N (%) |
|-----------------------------|-------------|
| Suspicious | 52 (26.26) |
| Pathological | 146 (73.74) |
| CTG study parameters | |
| Persistent bradycardia | 2 (1) |
| Early deceleration | 2 (1) |
| Sinusoidal pattern | 6 (3) |
| Reduced variability | 12 (6) |
| Persistent tachycardia | 22 (11.1) |
| Late decelerations | 30 (15.1) |
| Absent Acceleration | 50 (25.2) |
| Variable Deceleration | 74 (37.3) |

Among the abnormal CTG findings, around 2/3rd of the female had adequate liquor as shown in table 2. Meconium stained liquor was detected in around 57.6% of the babies.

Table 2. Intraoperative Findings of patient with abnormal CTG (N=198)

| | No of patients (%) |
|-------------------------------------|--------------------|
| Amniotic fluid volume | |
| Adequate | 144 (72.7) |
| Scanty | 54 (27.3) |
| Excessive | 0 (0) |
| Meconium stained liquor | |
| Yes | 114 (57.6) |
| No | 84 (42.4) |
| Cord present around the neck | |
| Yes | 40 (20.2) |
| No | 158 (79.8) |

The perinatal outcomes of newborn with abnormal CTG are shown in table 3 where 39.4% had normal APGAR score. Around 60.6% had low APGAR score, around 50.5% required resuscitation after birth and 25.2% received NICU admission. There were death of babies in the study with abnormal CTG findings.

Table 3. Perinatal outcomes of newborn with abnormal CTG

| | No. of patients (%) |
|----------------------------------|---------------------|
| Normal APGAR | 78 (39.4) |
| Low APGAR (<7) at 5 mins | 120 (60.6) |
| Resuscitation | 100 (50.5) |
| NICU Admission (>12 hours) | 50 (25.2) |
| Still Birth | 0 |
| Neonatal death (Within 72 hours) | 4 (2) |

DISCUSSION

Out of different modalities to identify fetal distress, our study had used abnormal cardiotocography as standard tool for diagnosing fetal distress. Cardiotocography is the standard noninvasive investigation for finding fetal distress in different studies.⁷⁻¹⁰ Apart from cardiotocography other adjunct methods described for identifying distress were intermittent auscultation of Fetal heart sound by Morrison et al,¹¹ perception of fetal movement by Koirala et al¹² meconium stained liquor by Wong et al,¹³ and fetal blood or cord blood sampling by Aafreen et al.¹⁴

Among the cardiotocography variables, our study population who had caesarean section had pathological (73.74%) and suspicious (26.26%). In our study, we have included suspicious CTG as an indication of caesarean section (CS) to all persistent suspicious CTG even after stoppage of oxytocin and performing resuscitation in pregnant women by maintaining left lateral position, oxygenation and fluid administration. Variable deceleration, late deceleration and persistent tachycardia were most common parameters for abnormal CTG in our study. Late deceleration (22.05%), tachycardia (16.1%), bradycardia (13.2%) and variable deceleration (10.29%) were common in study conducted by Bogdanovic et al¹⁵ while as persistent bradycardia, late deceleration, variable deceleration and tachycardia were in 62.5%, 19.5%, 15.5% and 2.5% respectively in a study done by Rana et al.⁴

This study included all patients who underwent caesarean section for pathological or suspicious CTG. Other studies which include the prevalence of fetal distress as causes of CS were 14.5% by Rana et al⁴ and 19.8% by Samdal et al.⁷ Rate of caesarean section in hospitals were 12.3% by Khanum et al,⁸ 23.6% by Hussain et al⁹ and 44.2% by Tamrakar et al¹⁶ This has been high in comparison to WHO recommendation of 10-15%.¹ Sensitivity and specificity of CTG on fetal distress were 29.6% and 83.05% by Shrestha,¹⁷ 66.7% and 93.3% by Sandhu et al¹⁸ and 6% and 27% by Bogdanovic et al¹⁵ respectively. As sensitivity and specificity were varying with different studies other adjunct parameters like meconium stained amniotic fluid and presence of cord around neck can be used to expect fetal distress.

Meconium stained liquor was in 57.6% of patients. Meconium stained was in 75% of abnormal CTG in Faruqui M et al,³ 17.5% in Rana et al,⁴ 35.4% in Khanum et al,⁸ 25.5% in Shrestha¹⁷ and 51.7% in Hussain et al.⁹ Cord around neck was in 20.2%. This was as 13.5% in Khanum et al,⁸ 22.1% in Shrestha¹⁷ and 25.9% in Shrestha NS.¹⁹

For assessing neonatal health, APGAR score at 5 minutes, neonatal resuscitation, NICU admission, still birth, perinatal death percentage were studied. In the present study with women having abnormal CTG, the APGAR score less than 7 at 5 minutes was seen in 60.6%, whereas studies conducted by Faruqui M et al,³ Chetandas et al,¹⁰ Khanum et al⁸ and Hussain et al⁹ noticed APGAR score < 7 at 5 minutes to be between 3.5% and 60.4%.

Neonatal resuscitation was done in 50.5 % of patients which was higher than of Faruqui M et al³ (12%). Neonatal admission in NICU was 25% in comparison to 55.3% by Khanum et al,⁸ 12% in Faruqui M et al³ and 14.5% in Rana et al.⁴ Meconium aspiration was suspected in 34% of admitted newborn and respiratory distress syndrome, neonatal sepsis and neonatal jaundice were common causes of NICU admission.⁸ None of our patient had still birth. Perinatal hypoxia causing neonatal death within 72 hours of life was seen in 2% in the present study which was observed in variable and late deceleration. Perinatal death was notified 1% in the study done by Faruqui M et al,³ 1.5% in Rana et al⁴ and 2.4% in Hussain et al.⁹

The result of this observational study will have been more conclusive if comparison with normal or instrumental delivery were also included. Fetal or cord blood laboratory examination, if done, could have objectively defined fetal

distress. The perinatal health observation for 7 days could have clearly given different pathology in neonates and death if recorded.

CONCLUSION

Cardiotocography has been found as an important tool for identifying fetal distress which in turn determines the perinatal outcome. Variable deceleration was the most common profile of abnormal CTG. Similarly meconium stained liquor was the most common intraoperative findings and newborn babies identified as fetal distress by CTG had APGAR score less than 7 at 5 minutes and required resuscitation. Thus, CTG records should be carefully interpreted and timely interventions like caesarean section and new born resuscitation can be planned to improve perinatal health.

CONFLICT OF INTEREST

None

REFERENCES

1. Appropriate technology for birth. *Lancet*. 1985;2(8452):436-7.
2. Ministry of Health and Population; New Era; ICF International. Nepal Demographic and health Survey 2016.Nepal; Kathmandu Nepal: Nepal Ministry of Health;2017
3. Faruqui M, Shrestha S, Bhatta R. Pregnancy outcomes of normal versus abnormal cardiotocography in a tertiary center in Nepal. *Int J Reprod Contracept Obstet Gynecol*.2019;8:4406-13
4. Rana P, Sharma P, Sharma S, Sharma M, Chouhan P. Caesarean section for foetal distress and correlation with perinatal outcome. *MedPulse – International Medical Journal*. October 2018; 5(10): 97-99.
5. Thomas J, Kavanagh J, Kelly T. The use of electronic fetal monitoring. Evidence-based clinical guideline, number 8. London: RCOG Press; 2001
6. Gurung G,Rana A,Giri K.Detection of intrapartum fetal hypoxia using admission test. *N J Obstet Gynecol*.2006;1:10-13
7. Samdal LJ, Steinsvik KR, Pun P, et al. Indications for Caesarean Sections in Rural Nepal. *J Obstet Gynaecol India*. 2016; 66(Suppl 1):284-88.
8. Khanum S, Chowdhary L.Justification of caesarean section in fetal distress experience in a tertiary care military hospital in Bangladesh. *BIRDEM Med J*2020;10:60-63.
9. Hussain S, Fatima S, ShafqatR, Rasool F. Fetal outcome after caesarean section performed for fetal distress based on abnormal cardiotocography. *J Med Sci* 2021;29:13-16
10. Chetandas P, Zahiruddin S, Jabeen N, Baloch R. and Shaikh F. Increasing rate of Caesarean Section Due to Non-Reassuring Cardiotocography. *Open Journal of Obstetrics and Gynecology*.2017; 7:351-57.
11. Morrison J, Chez B, Davis I et al. Intrapartum fetal heart rate assessment: monitoring by auscultation or electronic means. *Am J Obstet Gynecol*. 1993;168.
12. Koirala P, Ghimire A. Pregnancy outcome in women with decreased fetal movement beyond 34 weeks of gestation.*JIOM*.2022;44(3):41-46
13. Wong SF, Chow KM, Ho LC. The relative risk of 'fetal distress' in pregnancy associated with meconium-stained liquor at different gestation. *J Obstet Gynaecol*. 2002;22(6):594-99.
14. Aafreen R, Dabral A, Panwar M, Tripathi A. Cord blood parameters and fetal outcome in neonates with fetal distress due to meconium staining liquor- an observational study. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*.2022;11(11):3074-79.
15. Bogdanovic G, Babovic A, Rizvanovic M et al. Cardiotocography in the prognosis of perinatal outcome. *Med Arch*. 2014; 68(2):102-5.
16. Tamrakar R, Sapkota S, Sitaula D, Thapa R, Pokharel B, Acharya S, et al. Cesarean Section Among all Deliveries in a Tertiary Care Centre of Nepal: A Descriptive Cross-sectional Study. *JNMA; journal of the Nepal Medical Association*. 2021;59(241):839-43.
17. Shrestha S, Shrestha I. Admission Cardiotocography in Predicting Perinatal Outcome. *Kathmandu Univ Med J (KUMJ)*. 2019;17(67):201-5.
18. Sandhu GS, Raju R, Bhattacharyya TK, Shaktivardhan. Admission Cardiotocography Screening of High Risk Obstetric Patients. *Med J Armed Forces India*. 2008;64(1):43-45.
19. Shrestha NS, Singh N. Nuchal cord and perinatal outcome. *Kathmandu University medical journal (KUMJ)*. 2007;5(3):360-3.