Admission Cardiotocography in Predicting Perinatal Outcome

Shrestha S, Shrestha I

Department of Nursing

Dhulikhel Hospital, Kathmandu University Hospital,

Kathmandu University School of Medical Sciences,

Dhulikhel, Kavre, Nepal.

Corresponding Author

Subasna Shrestha

Department of Nursing

Dhulikhel Hospital, Kathmandu University Hospital,

Kathmandu University School of Medical Sciences,

Dhulikhel, Kavre, Nepal.

E-mail: subasnashrestha@gmail.com

ABSTRACT

Background

Antepartum assessment of the fetus is very important to prevent intra-uterine demise, birth asphyxia, neurological defect of newborns and neonatal mortality. Cardiotocography is the best indicator for fetal surveillance during labour in low resource country.

Objective

To assess on admission cardiotocography and predict perinatal outcome of antenatal mothers admitted to labour room for delivery at Dhulikhel Hospital, Kathmandu University Hospital.

Method

A prospective, observational study was conducted from 1st January 2016 to 31st December 2017. Antenatal mothers were evaluated in admission cardiotocography for 20 minutes. Cardiotocography studies were interpreted and categorized according to the classification proposed by National Institute of Clinical Excellence (NICE)- clinical guidelines 2007.

Result

Total 204 mothers were enrolled, the mean age is 24.06±4.331. Cardiotocography interpretation shows, 81.4% of Normal, 13.7% suspected and only 4.9% accounts pathological. Mother having CTG of pathological had more operative delivery 80% compare to normal and suspicious (0.0001). Similarly, more meconium stained liquor fall in pathological group with p value of 0.002. Fetal distress in labour is seen in all groups, showing 13.3% in normal, 32.1% in suspicious and 80% in pathological with p value 0.000. The duration of on admission cardiotocography to occurrence of fetal distress found to be mean hour of 9.57.

Conclusion

The admission cardiotocography test is useful to detect fetal distress which is already present at the time of test and can predict fetal wellbeing during the next few hours of labour. This test might lead to higher incidence of operative delivery at low resource countries because of lack of fetal blood sampling test to confirm fetal hypoxia during labour.

KEY WORDS

Admission cardiotocography, Perinatal outcome, Obstetrical outcome

INTRODUCTION

Child birth is a crucial period for mother, her unborn baby and health care providers. The main aim of fetal monitoring during intrapatum is to prevent intra-uterine demise, birth asphyxia, neurological defect of newborns and neonatal mortality. Various methods have been practiced, mostly in developed countries as continuous fetal monitoring. Intermittent fetal heart rate monitoring through pinard fetoscope or fetal Doppler is used to assess fetal condition during labour where continuous fetal monitoring or cardiotocography is not affordable. On admission, intermittent cardiotography is used to monitor fetal condition in low resource countries as a best method to detect early fetal distress.

The cardiotocograph (CTG) is a continuous electronic record of the fetal heart rate obtained via an ultrasound transducer placed on the mother's abdomen (external or indirect CTG). A second transducer is placed on the mother's abdomen over the uterine fundus to record simultaneously the presence of any uterine activity.[1]

Complications during birth, such as obstructed labour and fetal malpresentation, are common causes of perinatal death in the absence of obstetric care. Birth asphyxia and trauma often occur together. Modern obstetric practices have almost eliminated birth trauma. Conversely, where modern obstetric care is not available, intrapartum or early postnatal deaths are very frequent. It is estimated that in developing countries asphyxia causes around seven deaths per 1000 births, whereas in developed countries this proportion is less than one death per 1000 births. The majority of deaths occur soon after birth, some just before birth.[2]

To assess on admission CTG and predict perinatal outcome of antenatal mothers admitted to labour room for delivery at Dhulikhel Hospital, Kathmandu University Hospital.

METHODS

A prospective, observational study was conducted among mothers admitted to labour room with gestational weeks from 37 weeks and above for delivery. Study was conducted for 24 months period from 1st January 2016 to 31st December 2017. Study was conducted after ethical approval taken from institutional review committee of Kathmandu University School of Medical sciences. Antenatal mothers came for safe confinement were evaluated in admission CTG for 20 minutes after taking written consent for the procedure and study. Demographic data were taken from her medical (admission) file.

Recorded CTG study was categorized according to baseline fetal heart rate, variability, presence of accelerations, fetal movements and presence of decelerations in relation to contractions. Based on mentioned criteria CTG findings were interpreted and categorized as reactive

trace (normal), suspicious trace and non reactive trace (pathological) as according to the classification proposed by national Institute of Clinical Excellence (NICE)- clinical guidelines 2007.[3] Mothers were followed up till discharged from the hospital to know pattern of delivery and outcome of neonates.

Collected data was checked for its accuracy, completeness and stored safely. Data was entered in SPSS version 16. Analysis was done in descriptive analysis such as mean, percentage and numbers and chi-square test and odd ratio was used in inferential statistics in 0.5 level of significance.

RESULTS

Total 204 mothers who meet inclusion criteria were enrolled for this study. The Mean/SD (24.06±4.331) age ranging from 16 years to 40 years of age. Mothers who were home makers accounts 71.1% followed by self employed (shopkeeper) 9.3%, service holder 7.8%, farmers 7.4%, labour 2.5% and (others) 2.0%. Education level revealed

Table 1. Demographic characteristics

Demographic characteristics	Frequency	%
Age in years (Mean 24.06±4.331)		
Academic background		
Illiterate	15	7.4
Primary	65	31.9
Secondary	82	40.2
College	42	20.6
Occupation		
Housewife	145	71.1
labour	5	2.5
Agriculture	15	7.4
Service	16	7.8
Business	19	9.3
Others	4	2.0
Antenatal checkup		
Yes	202	99
No	2	1
Place of ANC (n=202		
Dhulikhel Hospital	113	55.9
Outside	71	35.1
Both	18	8.9
ANC attended times (n=202)		
< 4times	11	5.4
4 times	56	27.7
> 4 times and < 10 times	106	52.5
> 10 times	29	14.4
CTG Interpretation		
Normal	166	81.4
Suspicious	28	13.7
Pathological	10	4.9

that, 7.4% of mothers were illiterate and only 20.6% of them had higher education such as studying intermediate to masters level. (Table. 1)

Table 2. Newborn outcome

Newborn outcome	Frequency	%
Weight of newborn		
< 2.5 kg	32	15.7
> 2.5 kg	172	84.3
Liquor		
Clear	152	74.5
Meconium stained	52	25.5
Nuchal cord		
Present	45	22.1
Not present	159	77.9
Admission at neonatal Intensive care Unit (NICU)		
Yes	15	7.4
No	189	92.6
Diagnosis for admission at NICU		
Meconium aspiration syndrome grade 2	3	20.0
Respiratory distress with transit tachypnea	7	46.7
Asphyxia HIE grade 1	4	26.7
Neonatal sepsis	1	6.7

Antenatal visit were done by 99% of women, only 1% of them never attended antenatal clinic. Among antenatal visited mothers, 55.9% of them had attended ANC clinic at Dhulikhel Hospital, 35.1% attended outside and 8.9% of them attended both at Dhulikhel Hospital and outside. The frequency of ANC attended time of mothers showed that 5.4% of them visited clinic less than 4 times in whole pregnancy, 27.7% had visited 4 times, 52.5% of them had more than four and 14.4% visited more than 10 times in recent pregnancy.

Of the total pregnant women, 81.4% of them had normal, 13.7 had suspicious and only 4.9% had pathological CTG result at the time of admission. (Table 1)

All newborn born ware alive in this study. Among them, 84.3% had weight more than 2.5 kg and 15.7% had weight < 2.5 kg. The minimum weigh baby born was 1.9 kg and maximum of 4.1 kg. Mean APGAR in 1 minute and 5 minute were 7.35±0.932 and 8.66±0.699 respectively. Among all, 74.5% had clear liquor and 25.5% had meconium stained liquor. Nuchal cord during birth were existed in 22.1% of births, only 7.4% of newborns were admitted at neonatal intensive care unit (NICU) with various diagnosis such as muconium aspiration syndrome (MAS) grade 2 in 20% of babies, Respiratory distress with transit tachypnea in 46.7%, birth asphyxia hypoxic ischemic encephalopathy (HIE) grade 1 in 26.7% and neonatal sepsis is found in one neonate. However, all babies survived and discharged. (Table 2)

Table 3. Obstetrical outcome

Obstetrical outcome	Frequency	%
Types of Delivery		
Normal vaginal	146	71.6
Operative delivery	58	28.4
Cause of Operative Delivery (n=58)		
Non reassurance CTG	11	19.0
Fetal Distress	27	46.6
Prolonged 2nd stage	7	12.1
Abruption Placenta	1	1.7
Non progress of labour	12	20.7

Obstetrical outcome revealed that, 71.6% had normal delivery and operative delivery were 28.4%. The cause of operative deliveries disclosed with 46.6% with fetal distress, 20.7% with non progress of labour, 19.0% with non reassurance CTG, 12.1% with prolonged second stage of labour and only one lady had abruption of placenta. The mean duration of delivery since admission CTG was 11.18±9.63. Augmentation was performed at 92.2% of women and only 7.8 % delivered without chemical augmentations. (Table. 3)

Table 4. Distribution of CTG type with perinatal and obstetrics outcome

Variables	Category of cardiotocography			p-value
	Normal	Suspicious	Pathological	
Type of Delivery				
Normal vaginal delivery	127(76.5%)	17(60.7%)	2(20.0%)	0.000
Operative delivery	39(23.5%)	11(39.3%)	8(80.0%)	
APGAR in 1 minute				
< 7	78(47.0%)	14(50.0%)	6(60.0%)	0.7
> 7	88(53.0%)	14(50.0%)	4(40.0%)	
APGAR in 5 minute				
< 7	6(3.6%)	1(3.6%)	2(20.0%)	0.04
> 7	160(96.4%)	27(96.4%)	8(80.0%)	
Liquor				
Clear	130(78.3%)	19(67.9%)	3(30.0%)	0.002
Stained	36(21.7%)	9(32.1%)	7(70.0%)	
NICU admission				
Yes	11(6.6%)	2(7.1%)	2(20.0%)	0.2
No	155(93.4%)	26(92.9%)	8(80.0%)	
Fetal distress				
Yes	22(13.3%)	9(32.1%)	8(80.0%)	0.000
No	144(86.7%)	19(67.9%)	2(20.0%)	

Mother having pathological CTG on admission had more operative delivery 80% compare to normal 23.5% and suspicious 39.3% which showed statistically significant with p- value of 0.0001. APGAR score in 1 min was not statistical

significant but the score less than 7 was high in pathological group compare to other two groups (60%, 50% and 47%). However, In 5 min APGAR scoring there was statistically significant among three groups with p value of 0.04.

Similarly, more meconium stained liquor fall in pathological group and showing significant relation with p value of 0.002. There was 6.6 % of babies from normal and 7.2% of suspicious and 20% of pathological group babies admitted to NICU, which was statistical insignificant.

Fetal distress is seen in all types of CTG, showing 13.3% in Normal, 32.1% in suspicious and 80% in pathological which is statistically significant with p value 0.000. (Table 4)

Table 5. Comparative results of admission CTG as a screening test for the fetal distress

Study	Sensitivity	Specificity
Rajalakshmi[4]	92.85	94.16
Bhartiya[5]	25	75.38
Sandhu[6]	66.7	93.3
Chaudhari[7]	31.3	95.3
Present study	29.62	83.05

The predictive ability of the admission test was evaluated to see the fetus developing intra partum distress. The sensitivity of admission CTG test found to be low, 29.6% with high specificity 83.05% in this study.

DISCUSSION

Cardiotocography provides information of fetal condition. It is the widely used method to detect fetal condition during labour. Of the total pregnant women 204, 81.4% of them had normal NST, 13.7 % had suspicious and only 4.9% had pathological NST. Similar findings were observed in study conducted by Gurung et al. 73% had reactive, 23 had equivocal and 4% had ominous result and study done by Shrestha et al. found 81% category I, 9% category II and 10% category III NST.[8,9] Similarly, Bhartiya et al. reported 60% of non-reassurance, 37% re assurance, and 3% abnormal, Chaudhari et al. mentioned 74% reactive, 10% Omnious and 16% equivocal.[5,7]

Mother with pathological NST had more operative delivery 80% compare to normal 23.5% and suspicious 39.3% of operative delivery which showed statistically significant with p-value of 0.0001. Similar findings were reported many Authors.[5-12] Recent guideline, Category III is considered as suspected fetal acidosis, in this case fetal blood sampling should be undertaken and the baby should be delivered urgently.[1] The accepted standard has been that ideally this should be accomplished within 30 minutes for better fetal outcome.[3] In the context of low developing countries due to lack of fetal blood sampling for confirm diagnosis of fetal hypoxia, more interventions are being practiced.

APGAR score in 1 minute was statistical insignificant but APGAR score less than 7 was high in pathological group compare to suspicious and normal group (60%,50% and 47%). However, in 5 min APGAR scoring, 96.4% of normal and suspicious had APGAR score > 7 and 20% of pathological group had APGAR < 7, which was statistically significant among three groups with p value of 0.04. Similar findings were noticed in study done by Gurung et al., Shrestha et al. and Rasheed et al.[5,8-10]

Meconium stained liquor is considered as sign of fetal distress. In present study, 74.5% had clear liquor and 25.5% had meconium stained liquor at delivery. Meconium stained liquor was 70% in pathological NST, followed by 32.1% in suspicious and 21.7% in normal which is showing significant relation with p value of 0.002. Similar findings have been reported by study done by Shrestha P, Bhartiya B and Rahman et al.[9,5,11] However, Gurung et al. reported that colour of liquor was not noted difference among three categories.

There was 6.6% of babies from normal and 7.2% of suspicious and 20% of babies from pathological groups were admitted to NICU which was statistically insignificant. Moreover, none of them had developed seizures and succumbed to death. Similar findings were reported in study by Gurung et al., Shrestha et al. and Kulkarni et al.[8,9,12]

The predictive ability of the admission test was evaluated to see the fetus developing intra partum distress. The sensitivity of admission CTG test found to be low, 29.6% with high specificity 83.05%. This findings were supported by study done by Bhartiya, 25% and Chaudhari, 31.5%.[5,7] In contrast, high sensitivity 92.85 was found in study done by Rajyalakshmi et al.[4]

Operative delivery for fetal distress was seen in all categories, varying from 13.3% in normal to 80% in pathological group, which was statistically significant. Among the 22 cases of normal CTG group at admission underwent operative delivery for fetal distress. The mean duration of admission CTG to fetal distress found to be mean hour of 9.57. This findings was supported by other studies.[5,8,12] A study conducted by Praveen et al. revealed that interval between admission test (AT) and development of fetal distress was 6 hours in the reactive group. Similar, findings were revealed by Kulkarni et al. the interval was 5 hours respectively after the reactive AT.[12] Which revealed that fetal distress was developed after few hours of admission CTG test, which means admission CTG test only determined fetal condition at the time of monitoring or can be predicted fetal wellbeing for few hours of CTG monitoring. However, this research could not forecast the specific time interval to do next CTG or how long would be reliable for admission CTG. However, it is worthy to do repeat CTG after few hours of admission CTG to detect fetal distress.

We recommend to do further research, to define specific time interval to repeat CTG.

CONCLUSION

The admission CTG test is simple, noninvasive and useful test to detect fetal distress which is already present at the time of test and can predict fetal well being during the next few hours of labour. This test might lead to higher incidence of operative delivery at low resource country because of lack of fetal blood sampling test to confirm fetal hypoxia. With this conclusion we recommend that, repeat CTG test to be done after few hours of reactive admission test.

REFERENCES

1. Grivell RM, Alfirevic Z, Gyte GM, Devane D. Antenatal cardiotocography for fetal assessment. *Cochrane Database Syst Rev.* 2010 Jan 20;(1):CD007863. doi: 10.1002/14651858.CD007863.

2. World Health Organization, Neonatal and perinatal mortality: country, regional and global estimates. 2006; Zeneva.

3. National Institute for Clinical Excellence, the use of electronic fetal monitoring. Web: www.nice.org.uk

4. Rajalekshmi M, Chithra J, Nithya R, Vijay NS. Admission Cardiotocography as a screening test to predict foetal outcome and mode of delivery. *Indian Journal of Obstetrics and Gynaecology Research.* 2016;3(1):43-50.

5. Bhartiya V, Sharma R, Kumar A, Srivastava H. Admission Cardiotocography: A Predictor of Neonatal Outcome. *J Obstet Gynaecol India.* 2016 Oct;66(Suppl 1):321-9. doi: 10.1007/s13224-016-0912-0. Epub 2016 Jun 14.

6. Sandhu GS, Bhattacharya RR, Shaktivardhan TK. Admission cardiotocography Screening of High Risk Obstetric Patient. *Medical Journal Armed forces India.* 2008 Jan;64(1):43-45. Published online 2011 Jul 21. doi: [10.1016/S0377-1237(08)80145-1]

7. Chaudhari KR, Pai SS. Admission test for screening Labour. Hyderabad, India: a comparative study by Dr. reddy 's laboratories; 2009.

8. Gurung G, Rana A, Giri K. Detection of intrapartum fetal hypoxia using admission test (AT). *NJ Obstet Gynaecol.* 2006;1(2):10-3.

9. Shrestha P, Mishra M, Shrestha S. A prospective study on impact of non stress test in predicting of pregnancy outcome. *American Journal of Public health Research.* 2015;3(4):45-8.

10. Rasheed M, Srivastava AK. Labour admission test: a screening test for foetal distress in labour. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology.* 2017 Feb;6(2):452-6. www.ijrcog.org.

11. Rahman H, Renjhen P, Dutta S. Reliability of admission cardiotocography for monitoring in low resource setting. *Nigerian Medical Journal.* 2012;53(3):145-9.

12. Kulkarni AA, Shrotri A N. Admission test: a predictive test for fetal distress in high risk labour. *J Obstet Gynaecol Res.* 1998;24(4):255-9.

13. Perveen S, Hashmi H. Effectiveness of admission test. *JDUHS.* 2007; 1 (1):20-5.