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Research Article

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Effectiveness of Admission Cardiotocography on Neonatal Outcomes among High Risk Obstetric Patient (Tripoli Medical Center 2014).

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ABSTRACT

Intrapartum fetal surveillance is important to ensure the delivery of a healthy baby with minimum intervention. The admission cardiotocography (CTG) is a commonly used screening test to identifying pregnant women at high risk of intraparum fetal hypoxia.

The study was conducted to assess the effectiveness of the admission CTG in detecting fetal hypoxia at time of admission and to study the relation of the admission CTG results with perinatal outcome in high risk obstetric cases. The study included 273 high risk pregnant women, meeting the inclusion criteria and admitted to labour ward in Tripoli Medical Center from January 2014 to August 2014. All women were subjected to an admission CTG, which included a 20 minute recording fetal heart rate and uterine contraction. Data was analyzed by SPSS program version 16. Both descriptive and inferential statistics was applied and results was interpreted at 0.05 level of significance.

The study revealed that, the age of the cases was ranged between 17 and 43 years with mean age 28± 4.8 years, more than half (50.5%) of women were multi para. The commonest risk factor among cases was postdate (44.3%) followed by premature rupture of membrane (30.4%). Admission CTG was reactive in 78.4% of the cases, suspicious in 13.2% and pathological among 8.4% of the patients. On comparing admission CTG with the mode of delivery, 8.4% of the women of the reactive CTG, 25% of suspicious and 91.3% of pathological CTG were had cesarean delivery. In this study, 39.1% of babies with pathological CTG and (8.3%) of babies with suspicious CTG had Apgar score <7 compared to only (0.9%) of babies in reactive CTG group. There was a significant association between admission CTG results and low pH of umbilical cord ($P = 0.001$).

The test can serve as a screening tool for fetuses of high risk obstetric patients and continuous education and training of obstetrician about CTG to decrease unnecessary interventions is recommended.

Keywords- *Admission CTG; High risk pregnancy; Fetal distress.*

INTRODUCTION

Electronic fetal monitoring (EFM) is defined as 'the use of electronic fetal heart-rate monitoring for the evaluation of fetal wellbeing in labour'.[1]

CTG was incorporated in clinical obstetrics in 1960's, the aim of intrapartum EFM was to prevent harm, improving fetal birth outcomes by detecting fetal hypoxia before it led to perinatal morbidity and mortality.[1-3]

The labour admission test was introduced as a risk screening in early labour, to detect the compromised fetus on admission and to select the women who need of continuous electronic fetal monitoring during labour.[4] A risk assessment should be completed at the onset of labour to identify high risk women, essentially a woman with any condition present that adversely affect the oxygen transfer from mother to fetus will be high risk.[2]

Any condition which affects the function of the placenta can in turn have an effect upon gaseous exchange and therefore the oxygen supply to the fetus as in pregnancies complicated by maternal hypertension, diabetes and pre eclampsia, placental function can be compromised. The baby may be small for gestational age with reduced glycogen supplies and therefore an impaired capacity for compensating for a reduction in oxygen supply.[2]

The admission CTG is a visual test can make parents as well as clinician feel reassured that the fetus is not at risk of hypoxia at the time of admission and is unlikely to develop hypoxia in next few hours.[5]

Use of EFM is controversial, a randomized trial comparing continuous electronic fetal heart rate monitoring (CEFM) with intermittent auscultation (IA) to monitor the fetal heart rate in labour was reported that IA was as reliable as CEFM in detecting fetal hypoxia in low risk women[6,7], and a higher incidence of operative vaginal deliveries and caesarean section when CEFM is used[8-11] and neonatal outcome is not significantly improved by the use of admission CTG as compared to intermittent FHR auscultation during labour.[12]

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Although a cochrane review recommends that continuous EFM be limited to high-risk pregnancies, this may not be possible in developing countries where antenatal care is inadequate with a large number of high-risk pregnancies being delivered in crowded settings and inadequate health care provider to patient ratios.[10]

Continuous EFM should be offered and recommended for high-risk pregnancies where there is an increased risk of perinatal death, cerebral palsy or neonatal encephalopathy.[1]

CEFM for all babies it is still the recommended method of monitoring the fetal heart rate for high risk labours and births.[13,14]

It is recommended that for proper electronic fetal heart monitoring, the test must be performed correctly; its results must then be interpreted adequately; this interpretation must provoke an appropriate response.[1]

The present study was designed to assess the effectiveness of the admission CTG in detecting fetal hypoxia at time of admission in labour and to study the relation of the admission CTG results with perinatal outcome in high risk obstetric cases.

MATERIALS AND METHODS

The study was prospective**,** conducted in department of obstetrics and gynecology at Tripoli Medical Center (TMC) during the period of January 2014 to August 2014**.**

The study population was pregnant women categorized as high risk pregnancy in first stage of labour. Eligible patients included pregnant women with gestational age ≥ 37 weeks, first stage of labour, fetus in cephalic presentation, pregnancy with concurrent medical illness: hypertension, diabetes mellitus, premature rupture of membranes, intra uterine growth restriction, oligohydraminos, postdate, bad obstetric history and Rh- negative. Exclusion criteria included gestational age < 37, lethal congenital anomaly, acute hypoxic states (such as abruption of placenta, cord prolapse, uterine scar rupture), multiple pregnancies, abnormal lie, and patient identified for elective LSCS.

All selected women were subjected to admission cardiotocography testing for 20 minutes. The results of the admission test were categorized into reactive, suspicious and pathological groups according to the National Institute of Clinical Excellence (NICE) classification.[14] The fetal/ neonatal outcome was assessed by development of fetal distress during labour, Apgar score 5 minutes after birth, cord blood pH, color of liquor, admission to neonatal intensive care unit (NICU), and neonatal seizures. A fetus /neonate were considered to have distress if any of the following were present: pathological fetal heart changes led to cesarean section or instrumental delivery, presence of moderate- thick meconium stained liquor, Apgar score at 5 minutes <7, umbilical cord arterial blood pH<7.2, admission into neonatal intensive care unit (NICU) for birth asphyxia and neonatal seizures within first 24 hrs to 48 hrs.

Data management and analysis:

Data were collected, coded then entered into SPSS (Statistical Package for Social Sciences), version 16. Descriptive statistics were used and the results are presented as frequencies, means± standard deviation and percentages. Categorical data were compared using the Chi-square test. Statistical significance was considered if P <0.05.

RESULTS

The study includes 273 pregnant women in labour with high risk factors and meeting the inclusion criteria, who admitted to obstetric department in Tripoli medical center during period of January 2014 to August 2014.

The age of 273 pregnant women in the present study ranged between 17 and 43 years, with mean age of 28±4.8 years. The results showed that 72.6% of women were between 21-30 years, 21.9% of them between 31-40 years, and only 4% less than 20 years (Table 1).

Concerning the parity and gestational age among cases, in present study, 50.5% were multipara and 55.7% of pregnant women were at term pregnancy (Table 1).

The commonest risk factor among pregnant women in the present study was postdate (44.3%), followed by premature rupture of membrane (30.4%), pregnancy induced hypertension (22.7%) and oligohydramanios (12.8%). Diabetes mellitus was account for 7.3% of the cases (Table 1).

Regarding CTG results, admission CTG was reactive in 214 patients (78.4%), suspicious in 36 patients (13.2%) and pathological among 23 cases (8.4%).

The majority of cases (89.3%) were delivered by spontaneous vaginal delivery among reactive group, on other hand caesarian section were needed in 91.3% and spontaneous delivery done in 8.7% when admission CTG was pathological (Table 2).

The results illustrated that, 214 patient at admission CTG was reactive 28 (13.1%) of them had fetal distress, from 36 patient who had suspicious trace 14 (38.9%) of them had fetal distress. The fetal distress was predominant in those with pathological CTG at admission. There was significant association between CTG results and fetal distress, (P = 0.001) (Table 3).

The total number of cases with meconium stained liquor was 55 (20.1%), 27 (12.6%) of them was in reactive CTG group, 13 (36.1%) was suspicious, 15 (65.2%) was pathological. There was significant association between CTG result and meconium stained liquor (P = 0.001) (Table 3).

Apgar score of less than 7 at 5 min was 0.9% among reactive CTG, 8.3% in suspicious and 39.1% in pathological. The results showed a significant association between low apgar score and CTG results (P = 0.001).

There were 13 (4.8%) out of 273 cases with low pH of umbilical cord blood, 30.4% of them with pathological CTG at admission, 8.3% with suspicious and only 1.4% of case had low pH among reactive CTG group. There was significant association between admission CTG results and low pH of umbilical cord blood (P =0.001) .

In the present study, 29 (10.6%) of the neonates had NICU admission, 11 (47.8%) babies born to mothers with pathological admissions CTG had NICU admissions compared to 7 (19.4%) and 11 (5.1%) of those babies born to suspicious and reactive group, respectively and there was significant association (P = 0.001) (Table 3).

Only 3 neonates were developed seizer among study population, 2 (0.9%) of reactive admission CTG and 1 (4.3%) of pathological group. There was no association between admission CTG results and neonatal seizers within 24 to 48 hours, ($P = 0.26$) (Table 3).

In an attempt to study the validity of admission CTG for various fetal and neonatal outcomes, sensitivity, specificity, predictive value of positive test and predictive value of negative test were calculate and compared. The sensitivity of admission CTG test for meconium stained liquor and development of seizures

Table 1: Characteristics of high risk obstetric patients in TMC (N = 273).

Character	No.	%
***Age*:**		
≤ 20	11	4
21-30	198	72.6
31-40	60	21.9
41-50	4	1.5
***Parity*:**		
Primi gravida	135	49.5
Multipara	138	50.5
***Gestational age*:**		
Term	152	55.7
Postdate	121	44.3
***Risk factors*:**		
Postdate	121	44.3
PROM	83	30.4
PIH	62	22.7
Oligohydraminos	35	12.8
Diabetes	20	7.3
Rh –ve incompatibility	15	5.5
IUGR	15	5.5

Table 2: Admission CTG results and modes of delivery in TMC, 2014

CTG result	Mode of delivery			Total
	C/S	Instrumental	Spontaneous	
Reactive	18 (8.4%)	5 (2.3%)	191(89.3%)	214 (100%)
Suspicious	9 (25.0%)	1 (2.8%)	26 (72.2%)	36 (100%)
Pathological	21 (91.3%)	0	2 (8.7%)	23 (100%)
Total	**48 (17.6%)**	**6 (2.2%)**	**219 (80.2%)**	**273 (100%)**

Table 3: Correlation of fetal/neonatal outcomes with admission CTG results.

Outcome	Admission CTG results			*P* value
	Reactive (214)	Suspicious (36)	Pathological (23)	
Fetal distress	28 (13.1%)	14(38.9%)	23(100%)	<0.001
Moderate - thick meconium	27(12.6%)	13(36.1%)	15(65.2%)	<0.001
Low apgar score <7 at 5 min	2(0.9%)	3(8.3%)	9(3.1%)	<0.001
Low pH of umbilical cord<7.2	3(1.4%)	3(8.3%)	7(30.4%)	<0.001
Admission to NICU	11(5.1%)	7(19.4%)	11(47.8%)	<0.001
Neonatal seizers	2(0.9%)	0	1(4.3%)	0.26

Table 4: Validity of admission CTG for neonatal outcomes.

Out come	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Moderate-thick meconium	35.7%	95.9%	65.2%	87.3%
Apgar score at 5min <7	81.8%	93.8%	39.1%	99.1%
Low pH of umbilical cord<7.2	70%	92.9%	30.4%	98.6%
Admission toNICU	50%	94.4%	47.8%	94.8%
Neonatal seizers within 24-48hours	33.3%	90.6%	4.3%	99.1%

within 24-48 was low, 35.7% and 33.3% respectively; while specificity of CTG for apgar score <7, low pH of umbilical cord blood and admission to NICU was high (93.8%, 92.9% and 94.8%, respectively). Positive predictive value of admission CTG for neonatal outcomes was low, but negative predictive value was high (Table 4).

DISCUSSION

Fetal monitoring during labour should identify the fetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimise perinatal outcome.[15]

In present study, on comparing CTG results with mode of delivery, 91.3% of the pathological group, 25% of suspicious and 8.4% of reactive trace had cesarean delivery. This showed a significant association of pathological tracings with increased incidence of caesarean delivery than reactive tracings ($P < 0.000$). Similar results was obtained in a study conducted by David *et al*.[16]

When compared this results with Perveen *et al.* study, babies had delivered by cesarean section were 6.6% in reactive admission CTG, 22.7% in suspicious group and 33.3% of pathological group.[17]

In present study, the fetal distress was seen in13.1% of reactive group, 38.9% of babies in suspicious admission CTG, and The fetal distress was predominant in those with pathological CTG trace. There was significant association between CTG results and fetal distress, ($P = 0.001$). Other study conducted by Sandhu *et al*., revealed that, 73% of pathological test developed fetal distress in high risk obstetric patient compared to 15% of reactive CTG.[18] Nagure *et al*. study was reported that 85.7% of babies from mothers in pathological admission CTG group compared to 11.3% of the reactive group and 39.1% of the suspicious group had evidence of fetal distress.[10]

Moderate-thick meconium stained liquor was present in 65.2% of the pathological admission CTG, 36.1% of suspicious, and 12.6% of reactive admission CTG. There was significant association between CTG result and meconium stained liquor ($P = 0.001$) and other studies showed similar results and revealed greater correlation of presence of meconium stained amniotic fluid with abnormal admission CTG.[10,16]

In present study, 39.1% of babies from mothers with pathological admission CTG, 8.3% of suspicious, 0.9% reactive had Apgar score less than 7 at 5 minute. There was a significant association between low Apgar score and CTG result ($P = 0.001$) and studies done by, David *et al*.[16], Sandhu *et al*.[18] and Kansal *et al*.[19] demonstrate identical results.

In current study, 1.4% of reactive admission CTG, 8.3% suspicious admission CTG and 30.4% of pathological admission CTG had low pH less than 7.2. Statistical comparison showed significant difference between admission CTG results and low pH of umbilical cord blood ($P = 0.001$), and by other author also observed mothers with reactive admission CTG had low risk 4.1% of developing intra partum fetal hypoxia and significantly high risk in pathological admission CTG 57% when assessed by Apgar score and or blood cord pH < 7.2.[10]

Among the patients with pathological admission test 47.8% of neonate had admission to NICU, while 5.1% of reactive pattern. Similar rates of NICU admission were reported by Nagrue *et al*.[10] and Rahman *et al*.[20] studies.

Admission CTG test in present study had high specificity (range between 90.6% - 95.9%) for various neonatal outcomes, this means the test can identify correctly those who did not had hypoxia; and the test had a high negative predictive value this means if CTG reactive, there is high probability that the fetus is not hypoxic and so reactive test accurately excludes adverse fetal status at the time of testing, and hence the mothers were not subjected to unnecessary intervention. Identical results were reported by Kansal *et al*.[19] Rahman *et al*.[20] and Kushtagi *et al*.[21] studies.

CONCLUSIONS

The admission CTG appear to be simple, noninvasive test that can serve as a screening tool and used to identify patients likely to develop adverse fetal outcome in high risk obstetric patient.

RECOMMENDATIONS

Admission CTG should be offered and recommended for high-risk pregnancies where there is an increased risk of fetal distress. Further study is needed to evaluate the relationship between risk-factor severity, abnormal FHR and fetal hypoxia.

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