Association between Abnormal Cardiotocography and Fetal Outcome: A cross-sectional study At Benha University Hospitals

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Abstract

Contextual information Prenatal heart rate monitoring was first used to identify conditions like foetal hypoxia and foetal acidemia, both of which may result in serious problems for the baby. Pathological CTG has been shown to correlate with conditions of the infant as measured by Apgar score and hypoxic-ischaemic encephalopathy, according to data collected from the medical literature. In the current research, we wanted to analyse the influence of aberrant CTG pattern in late prenatal period and labour on the obstetrical and neonatal outcomes, in terms of mode of delivery and Apgar score of infant. Methods: The 260 pregnant women who presented with abnormal cardiotocography between weeks 37 and 42 of their pregnancies were the subjects of a cross-sectional research conducted at Benha University Hospital's Obstetrics and Gynecology Department. Group(A) : comprise ante-natal group 130 patients ≥37 weeks with apthological non-reactive CTG . Other 130 labouring patients (ages 37 to 42 weeks) were included in Group(B), and their Suspicious CTGs were redone after they were hydrated with 1000 ml iv fluid and oxygen at 10 L/minute for 20 to 30 minutes. Finally, we filtered out the 63 women who had normal CTG and included the 67 women whose CTG was permanently pathological. The results showed that early deceleration accounted for 39 (19.80%) of cases, late deceleration accounted for 61 (30.96%) of cases, variable deceleration accounted for 24 (12.18%) of cases, reduced variability accounted for 38 (19.29%) of cases, absent variability accounted for 19 (9.64%) of cases, and no accelerations accounted for only 16 (8.12%) of cases. We identified a statistically significant link between Apgar Score at 5 Minutes and gestational age, with a considerably greater proportion of newborns having a score of 7 or above if their gestational age was less than 39 weeks. (p=0.0430). Conclusion: CTG is a valid screening indication of foetal outcome and combination of preterm and abnormal CTG related with poor APGAR score.

Key words: Abnormal Cardiotocography, Fetal Outcome, Fetal heart rate, CTG.

1. Introduction

Contextual information Prenatal heart rate monitoring was first used to identify conditions like foetal hypoxia and foetal acidemia, both of which may result in serious problems for the baby. Pathological CTG has been shown to correlate with conditions of the infant as measured by Apgar score and hypoxic-ischaemic encephalopathy, according to data collected from the medical literature. In the current research, we wanted to analyse the influence of aberrant CTG pattern in late prenatal period and labour on the obstetrical and neonatal outcomes, in terms of mode of delivery and Apgar score of infant. Methods: The 260 pregnant women who presented with abnormal cardiotocography between weeks 37 and 42 of their pregnancies were the subjects of a cross-sectional research conducted at Benha University Hospital's Obstetrics and Gynecology Department. Group(A) : comprise ante-natal group 130 patients ≥37 weeks with apthological non-reactive CTG . Other 130 labouring patients (ages 37 to 42 weeks) were included in Group(B), and their Suspicious CTGs were redone after they were hydrated with 1000 ml iv fluid and oxygen at 10 L/minute for 20 to 30 minutes. Finally, we filtered out the 63 women who had normal CTG and included the 67 women whose CTG was permanently pathological. The results showed that early deceleration accounted for 39 (19.80%) of cases, late deceleration accounted for 61 (30.96%) of cases, variable deceleration accounted for 24 (12.18%) of cases, reduced variability accounted for 38 (19.29%) of cases, absent variability accounted for 19 (9.64%) of cases, and no accelerations accounted for only 16 (8.12%) of cases. We identified a statistically significant link between Apgar Score at 5 Minutes and gestational age, with a considerably greater proportion of newborns having a score of 7 or above if their gestational age was less than 39 weeks. (p=0.0430). Conclusion: CTG is a valid screening indication of foetal outcome and combination of preterm and abnormal CTG related with poor APGAR score.

2. Patients and Methods

Types of study : Cross-sectional study.

Site of study : Obstetric and Gynecology Department , Benha University Hospital **.**

Ethical approval was obtained from the hospital and informed consent was taken from the patient

Inclusion criteria:
- Pregnancy at 37-42 weeks of gestation (based on the dating ultrasound) in late antenatal period ,during labour with abnormal cardiotocography.
- women of age 20–35 years

Exclusion Criteria:
- known fetal congenital malformation.
- Malpresentations.
- Multiple gestation.
- Ruptured membrane more than 24 hours.
- Intrauterine growth restriction.
- Patients with medical disorders like hypertension and Diabetes Milletus .
- Decreased fetal movement.
- Bad Obstetric History.

Sample size

According to **Banu et al, [7],** 15.6% of cases with abnormal CTG required resuscitation. By using Epiinfo

program; the least sample size at 0.05 level of significance and power 0.8 , is 260 patients; 130 in each group.

Group(A) : include ante-natal group 130 patients ≥37 weeks with apthological non-reactive CTG .

Group(B) : include other 130 patients in labour (37-42 weeks) with Suspicious CTG which was repeated after hydration with 1000 ml iv fluid and oxygen at 10 L/minute over 20-30 minutes. Then, women with normal CTG were excluded (n= 63) and others with permanent pathological CTG were included (n=67)

So, we studied a total of 197 pregnancy with pathological CTG.

All information along with demographic information like name, age, parity and gestational age (based on the date of the last menstruation and ultrasound) were recorded on a predesigned proforma.

Admission CTG was done for 30 minutes in left lateral position. In case of suspicious pattern, CTG was repeated after hydration with 1000 ml iv fluid and oxygen at 10 L/minute over 20-30 minutes. If it remained suspicious, then action for delivery was taken. Mode of delivery was dependent on stage of labour. Lower segment caesarean section was perfomed unless the vaginal delivery is imminent. In case of pathological pattern, lower segment caesarean section was performed even ,when vaginal delivery is imminent.

Interpretation of Fetal Heart Rate Patterns on CTG

Baseline fetal heart rate: Derived from a line passing through the saw-toothed fluctuations of the trace and determined over a time period of 5–10 min, expressed as beats per minute. Normally, it is 110–160 bpm.

Tachycardia—sustained rise in FHR > 160 bpm for >10 min

Bradycardia—sustained fall in FHR < 110 bpm for >10 min

Baseline variability: Measured by the differences between two lines drawn through the highest and lowest point of the trace in any 1-min segment. Normally, it is >5 bpm between contractions. Non-reactive trace (flat trace)—loss of normal long-term baseline variability for >35 min.

Accelerations: Transient increase in FHR > 15 bpm above baseline for >15 s.

Decelerations: Transient episodes of slowing of FHR > 15 bpm below the baseline, lasting >15 s.

Early decelerations—deceleration where the FHR dropping to no more than 15 beats below the baseline and lowest point of fetal heart rate occurs within 20 s of contraction.

Late deceleration—Deceleration where the lowest part of fetal heart rate occurs more than 20 s

after the peak of contraction and there must be 3 or more such decelerations following consecutive contractions.

Variable deceleration—All deceleration not fitting in the definition of early/late deceleration.

Prolonged deceleration—An abrupt decrease in FHR to levels below the baseline that lasts at least 2 min, but not >10 min.

Sinusoidal patterns: Regular oscillation of the baseline, long-term variability is absent.

Fetal heart rate traces are categorized according to NICE guidelines 2001. (NICE, 2001)

Various patterns and their correlation were documented with the presence or the absence of meconium at delivery, perinatal deaths, mode of delivery, indications for intervention, Apgar score at 5 min and NICU admission

Technique

By this instrument, fetal heart rate was heard for 20 min particularly before and after the contraction. It is heard 1/2 hourly when the fetal heart rate is within the normal range. In those cases where fetal heart rate showed bradycardia or tachycardia, we heard it in every 15 min.

We considered pathological findings the occurrence of late decelerations in 30% contraction, silent type CTG curve for 30 minutes, the occurrence of variable decelerations 80/min for at least 60 seconds, bradycardia 100/min for at least three minutes and tachycardia at 180/min for at least 30 minutes, as well as combinations of these records.

Postnatal assessment of the state of the newborn was done by neonatologist. The newborns were evaluated in terms of Apgar Score at 1 minute and at 5 minute i.e, good Apgar score >7, poor Apgar score 5-7 and bad Apgar score <5. Note is also kept whether or not the neonate needs resuscitation.

Ethical consideration:

An informed written consent was obtained from patients before participation, it included data about aim of the work, study design, site, time, subject, tool and confidentiality.

An approval from Research Ethics Committee in Benha faculty of medicine was obtained

Statistical analysis

All data were collected, tabulated and statistically analyzed using (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.2015).. Quantitative data were expressed as the mean ± SD & median (range), and qualitative data were expressed as & (percentage). t test was used to compare between two groups, normally distributed variables . .Percent of categorical variables were compared using Chi square test. p-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant.

3. Results
Table (1) gestational age in all studied group

N = 197 gestational age		
	Mean	39.21
	SD	1.31
	<39 week	63 (32%)
	≥39 week	134 (68%)

Mode of Delivery was elective caesarean section in 80.7% (159) pregnancies while 19.3% (38) was vaginal delivery.

Table (2) Mode of Delivery in all studied group.

N = 197		N	Percentage
Mode of Delivery	Normal vaginal delivery	38	19.3%
	Caesarean section	159	80.7%

According to Type of pathological CTG pattern, it was Early deceleration in 39 (19.80%) of cases, Late deceleration in 61 (30.96%) of cases, Variable deceleration in 24 (12.18%) of cases, Reduced variability in 38 (19.29%) of cases, Absent variability in 19 (9.64%) of cases and No accelerations in only 16 (8.12%) of cases.

Table (3) Type of pathological CTG pattern in all studied group.

N = 197		N	Percentage
Type of pathological CTG pattern	Early deceleration	39	19.80%
	Late deceleration	61	30.96%
	Variable deceleration	24	12.18%
	Reduced variability	38	19.29%
	Absent variability	19	9.64%
	No accelerations	16	8.12%

According to Apgar Score at 1 Minute in all studied babies, 39 (19.80%) babies showed Apgar Score <5 while 88 (44.67%) of them showed Apgar Score (5-7) and 70 (35.53%) of them showed Apgar Score >7

Table (4) Apgar Score at 1 Minute in all studied babies.

N = 197		N	Percentage
Apgar Score at 1 Minute	<5	39	19.80%
	5-7	88	44.67%
	>7	70	35.53%

According to Apgar Score at 5 Minute in all studied babies, 28 (14.21%) babies showed Apgar Score <5 while 67 (34.01%) of them showed Apgar Score (5-7) and 102 (51.78%) of them showed Apgar Score >7

Table (5) Apgar Score at 5 Minute in all studied babies.

N = 197		N	Percentage
Apgar Score at 5 Minute	<5	28	14.21%
	5-7	67	34.01%
	>7	102	51.78%

Resuscitation was needed for 29 (14.72%) of patients. Out of studied 197 babies, neonatal death occured in 11 (5.58%) of babies within first 24 h. of Resuscitation.

Table (6) Resuscitation Required in all studied babies

N = 197		N	Percentage
Resuscitation Required:	Yes	29	14.72%
	No	168	85.28%

There was no statistically significant correlation between Apgar Score at 5 Minute and age or parity while we found a statistically significant correlation between Apgar Score at 5 Minute and gestational age as rate of babies with gestational age <39 and Apgar Score ≤ 7 week was significantly higher. (p=0.0430).

Table (7) Correlation between Apgar Score at 5 Minute and other factors.

Apgar Score at 5 Minute		Apgar Score ≤ 7 (n=95)	Apgar Score > 7 (n-=102)	X2	P
Age	20-30	71	65	2.79	0.0949
	21-30	24	37		
parity	Primigravida	25	36	1.85	0.173
	Multigravida	70	66		
gestational age	<39 week	37	26	4.095	0.0430
	≥39 week	58	76		

4. Discussion

The average gestational age at birth in this research was 39.21 1.31 weeks, and 32.2% of pregnancies (63 total) were delivered before the 39th week.

The median gestational age upon presentation in Daly et al. (8)'s research was 37+1 weeks (range, 28-42+2).

Among the pregnancies that were analysed, a total of 80.7% (159) were delivered through elective caesarean section, while 19.3% (38) were delivered vaginally.

Of the instances analysed, 39 (19.80%) showed early deceleration, 61 (30.96%) showed late deceleration, 24 (12.18%) showed variable deceleration, 38 (19.29%) showed reduced variability, 19 (9.64%) showed absent variability, and 16 (8.12%) showed no accelerations.

18% had foetal bradycardia, 16% had type 1 deceleration and reduced beat-to-beat variability, 24% had type II deceleration, and 42% had variable deceleration, according to the research by Reif et al. [9]. Nifty-eight percent of newborns with a CTG anomaly had an Apgar score of 7 or higher, whereas 46 percent had an Apgar score of 7 or higher, and 16 percent had an Apgar score of 5 or below. These infants had a 5 minute Apgar score of >8 and needed resuscitation.

Apgar scores at 1 minute were taken from all newborns in the research; 39 (19.80%) had scores below 5, 88 (44.67%) had scores between 5 and 7, and 70 (35.53%) had scores above 7.

A total of 28 newborns (14.21%) had an Apgar Score of 5, while 67 (34.01%) had an Apgar Score of (5-7), and 102 (51.78%) had an Apgar Score of >7 after the first five minutes.

Results were comparable to a research by Waheed et al. [10], in which 71 infants (61.54%) had an APGAR score of 7 or above at 1 minute.

In addition to being a predictor of prenatal asphyxia, a disordered CTG was also shown to be associated with a poor prognosis for the child years later. Apgar score had the weakest connection with CTG changes, with only 12 (17.64%) babies having an Apgar score of less than 7. (who developed HIE). Other writers also make the connection between a low Apgar score at the five-minute mark, abnormal CTG, and the presence of HIE. [11]

Thirty-nine individuals (14.72%) in our analysis required some kind of cardiopulmonary resuscitation. Only 11 (5.58%) of the 197 newborns evaluated died during the first 24 hours after receiving resuscitation.

We identified a statistically significant link between Apgar Score at 5 Minutes and gestational age, with a considerably greater proportion of newborns having a score of 7 or above if their gestational age was less than 39 weeks. (p=0.0430)

Contrary to the findings of Waheed et al. [10], who found that low APGAR scores were common in abnormal cardiotocography in women who presented at term, we found no such association.

From the prenatal obstetric population, 7%, 284 (or 54%) of the 524 women who presented with RFM and a viable foetus were nulliparous in the research by Daly et al., [8]. There were 482 (92% of total) women whose first CTG was reassuring, and 15 (3% of total) whose repeat tracing within 1 hour was encouraging, making up the reassuring CTG group. The group with a non-reassuring or abnormal CTG (n = 27, 5%) had a greater risk of emergency caesarean section, newborn resuscitation, and NICU hospitalisation, but a similar proportion of small-for-gestational-age babies. After CTG, there were no perinatal deaths in either group.

Of the 100 participants with abnormal CTG in Khalid et al. [4], 72 (72%) were intrapartum and classified as pathological CTG; 28 patients had their CTG during antenatal periods (Non-stress test); all of these 28 patients, were delivered by C/S (100%); 25 (89.2%) babies cried immediately, and 3 (10.17%) babies cried after resuscitation; their Apgar scores at 1minute were >8 in 25(89.2%) Among the 72 cases of intrapartum pathological CTG, 59 (81.9%) were delivered via C/S, 8 (11.1%) were delivered via Instrumental delivery, and 5 (6.7%) were delivered via NVD; 21 (28.1%) of the babies cried immediately, 46 (63.8%) cried after resuscitation, and 5 (6.7%) died in the early neonatal period.

When it comes to monitoring the health of the foetus throughout labour and delivery, cardiotocography is a tried and true technique. Evidence of prenatal asphyxia on a pathological CTG suggests the potential of its presence. Regrettably, cardiotocography also produces a high rate of false positive results. When a pregnant woman is admitted to the labour room, this screening test is used to assess the foetal oxygenation level dynamically. The foetal reserve is evaluated by monitoring the fetus's heart rate during the period of temporary blockage of the utero-placental blood supply, which occurs during the physiological stress of repetitive uterine contractions. For this reason, [1] the entrance CTG may serve dual

purposes. To identify women who will benefit from continuous foetal electronic monitoring and to identify impaired foetuses upon admission, this test may be utilised as a screening tool in the first stages of labour.

hyperstimulation, placental abruption, and meconium aspiration. [1]

5. Conclusion

The combination of preterm and abnormal CTG is linked with a poor APGAR score, making CTG a good screening indication of foetal prognosis.

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In term pregnancies, the admission test is an accurate predictor of foetal status at the time of admission and throughout the subsequent hours of labour, barring acute occurrences such as cord prolapsed, uterine

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