Original Article

Fetal Outcome of Pathological Cardiotocography in Women Presenting at Term Pregnancy

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Abstract

Objectives: To determine the fetal outcome of pathological cardiotocography in terms of frequency of low apgar score in women presenting at term pregnancy

Study design: Descriptive, cross-sectional study.

Methodology: The study was conducted in the department of Obstetrics and Gynecology unit 2, Holy family Hospital Rawalpindi from11th August 2016 to 10th February 2017. Total of 117 pregnant women age 20 – 35 years, presenting with pathological CTG were selected. Patients with known fetal congenital malformations, cardiovascular disorders, DM, HTN and multiple pregnancies were excluded. In all the pregnant women intrapartum fetal monitoring was our main focus, which was implemented using cardiotocography. Based on the findings of physical examination and CTG, the appropriate method of delivery was decided by the consultant, and the patients were managed accordingly. The final outcome in terms of APGAR score was determined at 1 minute and 5-minutes (i.e. low APGAR score <7).

Results: Mean age was 28.71 ± 3.94 years. Mean parity was 3.15 ± 1.30. Mean gestational age was 39.17 ± 1.24 weeks. Pathological CTG type was seen as follows i.e. bradycardia in 31 (26.50%), tachycardia in 27 (23.08%), silent type in 11 (9.40%), late decelerations in 22 (18.80%) and variable decelerations in 26 (22.22%). Apgar score < 7 at 1 minute was found in 72 (61.54%) neonates and apgar score <7 at 5 minutes was found in 24 (20.51%), neonates.

Conclusion: This study concluded that the frequency of low APGAR score in pathological cardiotocography in women presenting at term pregnancy is quite high.

Keywords: Cardiotocography, bradycardia, APGAR score.

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Introduction

Fetal monitoring was invented by Doctors Alan Bradfield, Orvan Hess, and Edward Hon. CTG monitoring is widely used to assess fetal wellbeing. CTG may be normal (reactive), suspicious and pathological, false positive predictive value of abnormal CTG of around 70% reduced by fetal scalp blood sampling.[1]

A Cardiotocohograph is considered pathological if any one or more of the following were observed[2]:

- Baseline fetal heart rate above 170 beats per minute

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- Variability of the fetal heart rate less than five beats per minute
- Early deceleration that is a drop in baseline fetal heart rate of ≥ 15 beats per minute for >15 seconds, occurring with uterine contractions
- Prolonged decelerations that is a drop in the baseline fetal heart rate of 30 beats per minute lasting for at least two seconds
- Late decelerations that is a drop in the baseline fetal heart rate of ≥ 15 beats per minute for >15 seconds, occurring after uterine contractions

In the past intermittent auscultation of fetal heart sounds and nature of amniotic fluid were used as means of monitoring the fetus during labour. Now electronic fetal monitoring (CTG) record shows the changes in the fetal heart rate and their temporal relationship to uterine contractions[1]. CTG has been able to detect fetal distress with more reliability. Reactive CTG trace reassures both the mother and healthcare providers of good fetal health[3]. Widespread use of electronic fetal monitoring is associated with substantial falls in perinatal mortality being 0.7/1,000 compared with 0.8/1,000 in auscultation gorup[3]. There are several methods of antepartum and intrapartum fetal monitoring i.e. fetal movement, assessment, periodic fetal heart rate, auscultation, amniotic fluid analysis, fetal blood evaluation, and doppler velocimetry.[4]

Cardiotocography is the most widely used non-invasive method of monitoring fetal outcomes from the fact that for its implementation there are no contraindications. Abnormal CTG trace shows fetal distress, it means the absence of fetal well-being and it may be because of different pathologies affecting the fetus as a chronic hypoxia leading to metabolic acidosis, mechanical trauma, hyperthermia, meconium aspiration & sepsis.[5]

In a study conducted at Karachi, it was noted that 6.35% of babies born with pathological cardiotocography. Out of these 63.6% had APGAR <7 at one minute and 18.18% had APGAR <7 at five minutes.[6]

Great progress in antepartal and partal diagnosis of fetal condition was made by the introduction of cardiotocography. Prior to this, there was very little that could be determined about the state of the fetus. This new technology has introduced a new milestone for the determination of the health status of the fetus which would lead to better outcomes and reduce the incidence of unfavorable conditions. The use of CTG in Pakistan is very limited yet. So this study had been planned to identify the fetal outcome of pathological CTG in terms of APGAR score in pregnant women in our target population.

Methodology

This was a descriptive, cross-sectional study at the department of Obstetrics and Gynecology unit 2, Holy family Hospital Rawalpindi from 11th August 2016 to 10th February 2017. The sample size was calculated by using WHO sample size calculator taking confidence level 95 %, anticipated population proportion (frequency of pathological CTG) P 18.18%[6], absolute precision required 7% and sample size tuned out to be 117 pregnant women with Pathological CTG. Non-probability, consecutive sampling. The inclusion criteria were women of age 20–35 years, presenting with pathological CTG having any parity and pregnancy at 37-42 weeks gestation based on the dating ultrasound. The exclusion criteria were patients with known fetal congenital malformations, cardiovascular disorders, diabetes mellitus and hypertension, multiple gestations.

In this descriptive study, a total of 117 pregnant women with pathological CTG were included. The study was started after taking approval from the hospital ethical committee. These patients admitted to the gynecology department for delivery and fulfilling the inclusion criteria were enrolled for the study. All the patients were briefly explained the study purpose and informed written consent was taken.

In all the pregnant women intrapartum fetal monitoring was our main focus, which was implemented using cardiotocography. The clinical interpretation of cardiotocographic findings were based upon the FIGO guidelines (as given in operational definition).

We considered pathological CTG findings as 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.

Based on the findings of physical examination and CTG, the appropriate method of delivery was decided by the consultant, and the patients were managed accordingly. The APGAR score was calculated at 1 and 5 minutes for the newborns. The final outcome in terms of APGAR score was determined at 1 minute and 5-minutes (i.e. low APGAR score <7).

All this 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.

All the collected data was entered into SPSS version 16 and was analyzed. Mean and standard deviation were calculated for quantitative variables like, age, parity, gestational age and apgar score at 1 and 5 minutes. Qualitative variables like Pathological CTG type and APGAR (<7) score at 1 and 5 minutes were presented in the form of frequency and percentage.

Effect modifiers were controlled through stratification method on the basis of age, gestational age and parity. Post-stratification chi-square test was applied. P-value ≤ 0.05 was considered significant.

Results

The age range in this study was from 20 to 35 years with mean age of 28.71 ± 3.94years. Majority of the patients 71 (60.68%) were between 20 to 30 years of age as shown in **Table I**. Percentage of patients according to parity is shown in **Figure I**, mean parity was 3.15 ± 1.30. Mean gestational age was 39.17 ± 1.24 weeks as shown in **Figure II**. Pathological CTG type was seen as follows i.e. bradycardia in 31 (26.50%), tachycardia in 27 (23.08%), silent type in 11 (9.40%), late decelerations in 22 (18.80%) and variable decelerations in 26 (22.22%).

APGAR score < 7 at 1 minute was found in 72 (61.54%) neonates and APGAR score <7 at 5 minutes was found in 24 (20.51%), neonates. Stratification of APGAR score at 1 & 5 minutes with respect to age groups is shown in **Table II**. Stratification of APGAR score at 1 & 5 minutes with respect to gestational age is shown in **Table III**. **Table IV** shows the stratification of APGAR score at 1 & 5 minutes with respect to parity.

Table I: Distribution of patients according to Age (n=117)

Age (in years)	No. of Patients	%age
20-30	71	60.68
31-35	46	39.32
Total	**117**	**100.0**

Mean ± SD = 28.71 ± 3.94 years

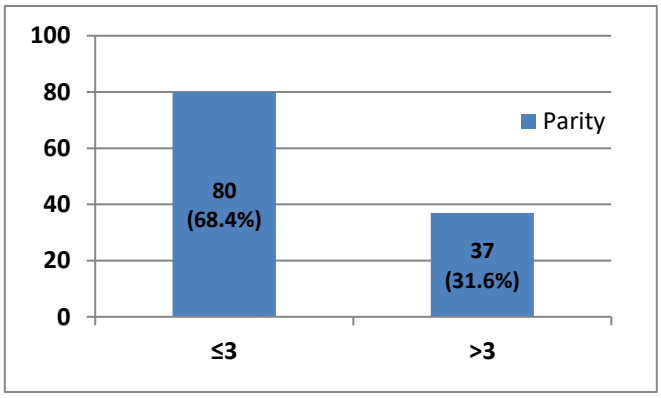

Figure-I: Distribution of patients according to parity (n=117)

Mean ± SD = 3.15 ± 1.30 weeks

Table II: Stratification of APGAR score at 1 minute and 5 minutes with respect to age.

Age (years)	Apgar score at 1 minute		p-value	Apgar score at 5 minutes		p-value
	<7	≥7		<7	≥7	
20-30	42 (59.15%)	29 (40.85%)		16 (22.54%)	55 (77.46%)	**0.501**
31-35	30 (65.22%)	16 (34.78%)	**0.510**	08 (17.39%)	38 (82.61%)	

Table III: Stratification of APGAR score at 1 minute and 5 minutes with respect to gestational age.

Gestational Age (weeks)	Apgar score at 1 minute		p-value	Apgar score at 5 minutes		p-value
	<7	≥7		<7	≥7	
37-39	44 (56.41%)	34 (43.59%)		13 (16.67%)	65 (83.33%)	**0.145**
40-42	28 (71.79%)	11 (28.21%)	**0.107**	11 (28.21%)	28 (71.79%)	

Table IV: Stratification of apgar score at 1 minute and 5 minutes with respect to parity.						
Parity	Apgar score at 1 minute		p-value	Apgar score at 5 minutes		p-value
	<7	≥7		<7	≥7	
≤3	46 (57.50%)	34 (42.50%)	0.187	16 (20.0%)	64 (80.0%)	0.840
>3	26 (70.27%)	11 (29.73%)		08 (21.62%)	29 (78.78%)	

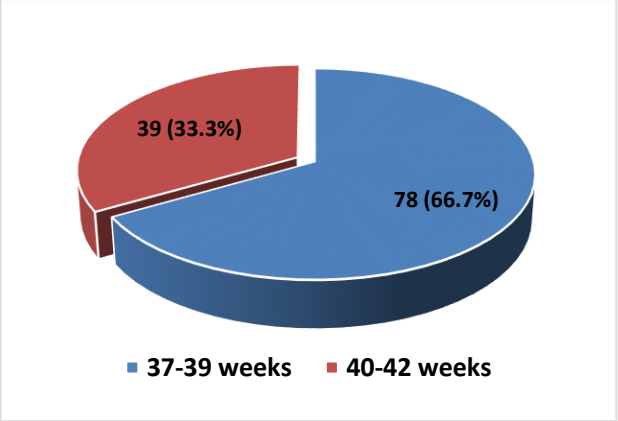

Figure-II: Distribution of patients according to gestational age (n=117)
Mean ± SD = 39.17 ± 1.24 weeks

Discussion

Great progress in antenatal and intrapartal diagnosis of fetal condition was made by the introduction of cardiotocography–simultaneous registration of fetal heartbeats and contractions.[7,8] FIGO guidelines for reading CTG records introduce in obstetrics unique terminology and interpretation ante and intrapartal cardiogram. These guidelines are descriptive in character, and allow assessment of CTG as normal, suspected and pathological.[9]

Advantage of cardiotocography as generally accepted, and certainly the most widely used non-invasive method of monitoring fetal outcomes, no contraindications and the CTG findings can be documented. There is a significant correlation between pathological CTG and the state of the newborn evaluated by Apgar score[10,11], the existence of acidosis, hypoxic-ischemic encephalopathy and subsequent neuromotor development.[12,13] I have conducted this study to determine fetal outcome of pathological cardiotocography in terms of frequency of low apgar score in women presenting at term pregnancy.

The age range in my study was from 20 to 35 years with a mean age of 28.71 ± 3.94 years. Majority of the patients 71 (60.68%) were between 20 to 30 years of age. Mean gestational age was 39.17 ± 1.24 weeks. Pathological CTG type was seen as follows i.e. bradycardia in 31 (26.50%), tachycardia in 27 (23.08%), silent type in 11 (9.40%), late decelerations in 22 (18.80%) and variable decelerations in 26 (22.22%).Apgar score < 7 at 1 minute was found in 72 (61.54%) neonates and apgar score <7 at 5 minutes was found in 24 (20.51%) neonates. In a study conducted at Karachi it was noted that 6.35% babies born with pathological cardiotocography. Out of these 63.6% had APGAR <7 at one minute and 18.18% had APGAR <7 at five minutes.[6]

In a retrospective research[5] carried out at the Clinic for Gynecology and Obstetrics UKC Tuzla, medical documentation from the history of mothers and newborns was used. The study group consisted of 68 pregnancies and newborns who developed HIE. The control group consisted of 40 pregnancies, which resulted in the birth of healthy newborns – without signs of asphyxia. CTG records were analyzed. Pathological CTG records (bradycardia 100, tachycardia 180, silent type of curve, late decelerations) were found in 45 (66.17%) cases of the study group in comparison to 11 (27.5%) in the control group. In the study group, Apgar score in 5th minute lower than 7 had 17.46% newborns and the highest incidence of the normally finished deliveries.[14]

However, the connection was found between low Apgar score and pathological CTG as a predictor of perinatal asphyxia, and also with later long-term prognosis.[2] Linkage of low Apgar score in the fifth minute, pathological CTG and the existence of HIE is also stated by other authors.[15]

In a local study[2], mean maternal age was 32 with SD ± 2.6. 66% women were primigravida, 18% were >P5 and 16% were between P2-5. Mean gestational age was 39 weeks SD ± 1 week. Eighteen (18%) had fetal bradycardia,16% had type 1 deceleration and decreased beat to beat variability, 24% had type II deceleration,42% had variable deceleration. When CTG abnormality was noticed, thirty eight (38%) of neonates had Apgar score between5-7, 46% had >7

and 16% had Apgar score of <5. This group of neonates required resuscitation and 5 min Apgar was >8.[16]

A study concluded that prolonged second stage of labor and repeated late decelerations on CTG trace in a low-risk population were predictors of AS5min < 7, a situation that was strongly associated with increased risk of neonatal respiratory distress, and need for mechanical ventilatory support and NICU. In addition, Apgar score 5min < 7 was strongly associated with hypoxic-ischemic-encephalopathy and, consequently, cerebral palsy.[17]

In another study[17], it was observed that the incidence of fetal distress was higher in the pathological group (75%) followed by suspicious group (48%) while it was low in the reactive group (8.4%).The incidence of low Apgar Score (Apgar <7 at 1 minute) was higher in patients with pathological admission test(75%) and suspicious AT group (55.55%) while in there active AT group it was lower (12.6%). There was a higher incidence of NICU admission for babies of patents with pathological AT (50%) and suspicious AT (44.44%) as compared to the reactive at (7.5%). On the whole, it is concluded that the frequency of low apgar score in pathological cardiotocography in women presenting at term pregnancy is quite high.

Conclusion

This study concluded that the frequency of low apgar score in pathological cardiotocography in women presenting at term pregnancy is quite high. CTG can be continued as a good screening test of fetal surveillance. Abnormal CTG influence the fetal outcomes i.e. poor Apgar score at 1 minute and 5 minutes, increased rate of caesarean section and neonatal resuscitation. Therefore, there is a need to develop a uniform and unequivocal definition of fetal heart rate tracing to reduce the incidence of false positive findings that may result in the increased incidence of unnecessary intervention.

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