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Frequency of Low Apgar Score of New Born in Patient Having Abnormal Cardiotocography

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ABSTRACT

Background: Cardiotocography (CTG) is used on a regular basis to check on fetal health, but it remains a topic of investigation for fetal-neonatal outcome correlation and low Apgar scores. Abnormal CTG patterns like fetal tachycardia, fetal bradycardia, and decelerations can signify fetal distress and are correlated with poor neonatal health. **Objective:** To determine the frequency of Low Apgar score in patient having abnormal cardiotocography. **Study Design:** Descriptive study. **Duration and Place of Study:** The study was conducted from March 2023 to September 2023 at the Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital Swat. **Methodology:** 107 pregnant women aged between 18 and 40 with singleton gestations and abnormal CTG were selected using a non-probability consecutive sampling. Demographic data such as maternal age, gestation age, parity and Apgar scores at 5 minutes of delivery were collected. Descriptive statistics and Chi-square tests were employed to associate low Apgar scores (≤5) with demographic parameters with a p-value of ≤0.05 considered to be statistically significant. **Results:** The mean age of the participants was 28.37 ± 3.08 years, the mean gestational age was 37.11 ± 1.95 weeks, and the mean parity was 1.71 ± 1.47. Of the 107 participants, 76 (71%) had a low Apgar score, while 31 (29%) had a normal score. No significant association was found between low Apgar scores and age, gestational age, or parity (p-values of 0.847, 0.688, and 0.993, respectively). **Conclusion:** Abnormal CTG is associated with a high frequency of low Apgar scores.

INTRODUCTION

Cardiotocography (CTG) is a common, critical monitoring method used during labor to assess the fetal heart rate (FHR) and the uterine contractions.[1] It gives clinicians real time data of the fetus's wellbeing, its oxygenation and its status in the labor.[2] FHR, and uterine contraction pattern are the main components of a CTG.[3] Clinicians can detect any signs of fetal distress — indicating reduced oxygen supply, for example from hypoxia or acidosis — as abnormal patterns may indicate problems.

Abnormal CTG refers to deviations of normal patterns of FHR such as decelerations (heart rate slowing), variability, or elevated or low baseline heart rate.[4] Abnormalities can be caused by a number of conditions such as umbilical cord compression, placental insufficiency, or infection in the fetus, among others. Abnormal CTG will necessitate close monitoring and may lead to further diagnostic testing or delivery depending on severity of abnormality and gestational age of the fetus.[5] A pathological CTG pattern is usually assumed to be indicative of possible fetal distress that will have to be addressed to prevent possible harm to the infant.[6]

Low Apgar score in a newborn, a rapid assessment of the physical condition of the baby at 1 and 5 minutes after delivery, can be correlated with abnormal CTG patterns.[7] Low Apgar score (generally below 7) indicates that the baby is experiencing difficulties with oxygenation, breathing, or circulation.[8] Abnormal CTG findings that indicate fetal hypoxia or distress can cause low Apgar score due to impaired health of the fetus during labor.[9] Severe or prolonged disruptions of fetal heart rate on CTG can indicate that the baby has been exposed to some level of hypoxic stress with a lower Apgar score that can necessitate resuscitation or other immediate neonatal interventions. Abnormal CTG patterns therefore forecast impending neonatal complications such as low Apgar score.[10]

Fetal decelerations or decreases in variability of the fetal heart rate suggest that the fetus is experiencing hypoxia or acidosis that can directly affect the newborn transition from the womb to life outside.[11] Therefore, abnormal CTG may induce distress signals that are

further a source of low Apgar score (an overall physical condition of the infant) leading to long term complication if intervention is not timely done.[12]

A study conducted by Nazir L, et al. demonstrated that the frequency of low Apgar score was 77% in patients with abnormal cardiotocography.[13]

It is important to perform this study to establish the correlation between abnormal cardiotocography and low Apgar scores in infants. As abnormal cardiotocography is a potential predictor of fetal distress, it is necessary to establish how it impacts Apgar scores to determine those pregnancies that are at risk early on. With this study of the correlation between abnormal cardiotocography and Apgar scores, clinical decision-making can be improved, neonatal outcomes can be enhanced, and monitoring practices during delivery can be improved. With these findings, more effective intervention can be made and risks for negative outcomes for mother and infant can be reduced.

METHODOLOGY

This descriptive study was conducted at the Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital Swat, from March 2023, to September 2023. A total of 107 patients were selected using a non-probability consecutive sampling technique, with sample size calculation based on a 95% confidence level, an 8% margin of error, and an anticipated frequency of 77% for low Apgar scores in patients with abnormal cardiotocography.[13]

Inclusion criteria consisted of women aged 18 to 40 years, with a singleton pregnancy confirmed by ultrasound, a gestational age of more than 32 weeks based on the last menstrual period, and any parity. Only patients exhibiting abnormal cardiotocography, defined by the presence of fetal tachycardia (baseline fetal heart rate >160 beats per minute), bradycardia (baseline fetal heart rate <110 beats per minute), minimal to absent baseline variability (fluctuations in fetal heart rate with irregular amplitude and frequency), recurrent variable decelerations (variable pattern in timing, size, and shape), or late decelerations (where there is at least a 15-second delay between the peak of the contraction and the nadir of the deceleration), were included. Exclusion criteria included fetal anomalies detected on ultrasound, a history of gestational diabetes, pre-eclampsia, and the presence of a cord around the neck. Data collection involved obtaining baseline demographic details, including age, gestational age, and parity, after securing informed consent from participants. Patients were followed through to delivery, and the Apgar score of each newborn was recorded at 5 minutes post-delivery. A score of 5 or less was considered low. All data was systematically documented on a specially designed Performa (Annexure-I).

Data analysis was carried out using IBM SPSS version 25. Descriptive statistics such as frequencies and percentages were calculated for categorical variables, while means and standard deviations were computed for continuous variables. Stratification of low Apgar scores was performed based on age, gestational age, and parity. The Chi-square test was applied post-stratification, with a p-value of ≤0.05 considered statistically significant.

RESULTS

The study included 107 patients, with the following demographic characteristics: the mean age of the participants was 28.37 ± 3.08 years, the mean gestational age was 37.11 ± 1.95 weeks, and the mean parity was 1.71 ± 1.47 (as shown in Table-I).

Table I

Mean±SD of patients according to age, gestational age and parity

Demographics	Mean±SD
1 Age (years)	28.37±3.08
2 Gestational age (weeks)	37.11±1.95
3 Parity	1.71±1.47

Regarding the frequency of low Apgar scores, 76 patients (71%) had a low Apgar score (≤5), while 31 patients (29%) had a normal Apgar score (as shown in Table-II).

Table II

Frequency and %age of patients according to Low Apgar Score (n=107)

Low Apgar Score	Frequency	%age
Yes	76	71%
No	31	29%
Total	107	100%

When analyzing the association between low Apgar scores and demographic factors, the results showed no significant differences based on age, gestational age, or parity. Specifically, among patients aged 18-30 years, 55 (70.5%) had a low Apgar score, and 23 (29.5%) had a normal score, with a p-value of 0.847. For those aged over 30, 21 (72.4%) had a low Apgar score, and 8 (27.6%) had a normal score. Regarding gestational age, 66 patients (71.7%) with a gestational age between 33 and 39 weeks had a low Apgar score, and 26 (28.3%) had a normal score (p = 0.688). Among patients with a gestational age over 39 weeks, 10 (66.7%) had a low Apgar score, and 5 (33.3%) had a normal score. Finally, when considering parity, 54 (71.1%) of patients with 0-2 previous births had a low Apgar score, and 22 (28.9%) had a normal score, with no significant difference in comparison to those with more than 2 previous births (p = 0.993) (as shown in Table-III).

Table III

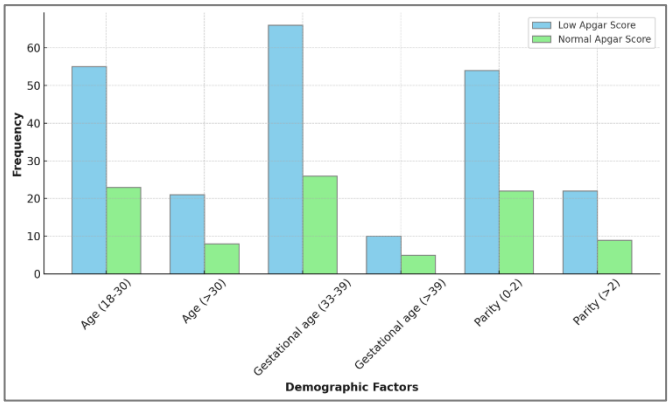
Association of Low Apgar Score with Demographic Factors

Demographic Factors		Low Apgar Score		p-value
		YES n(%)	NO n(%)	
Age (years)	18-30	55(70.5%)	23(29.5%)	0.847
	>30	21(72.4%)	8(27.6%)	

Gestational age (weeks)	33-39 >39	66(71.7%) 10(66.7%)	26(28.3%) 5(33.3%)	0.688
Parity	0-2 >2	54(71.1%) 22(71%)	22(28.9%) 9(29%)	0.993

Graph I

Stratification of Low Apgar Score with Demographic Factors



DISCUSSION

The results revealed that a significant proportion of patients (71%) exhibited low Apgar scores, indicating a potential risk of neonatal distress in cases with abnormal cardiotocography. However, when the association of low Apgar scores with demographic factors such as age, gestational age, and parity was analyzed, no significant correlation was found.

The lack of significant differences in the prevalence of low Apgar scores across age groups may suggest that the risk of neonatal distress, as indicated by abnormal cardiotocography, is not strongly influenced by maternal age. This could be due to the fact that abnormal cardiotocography reflects fetal well-being more directly than maternal age. Similarly, the absence of a significant association with gestational age suggests that the occurrence of low Apgar scores in this study cohort is not necessarily dependent on whether the pregnancy is preterm or full-term, which could be attributed to individual variability in fetal heart rate responses. Furthermore, the parity factor did not show a significant association with low Apgar scores, possibly because other underlying factors such as placental function or maternal health may have a more substantial impact on neonatal outcomes than the number of previous pregnancies.

The study conducted by Nazir et al.[13] found that a reactive CTG was observed in 39.36% of the participants, with a significant association between pathological CTG and decreased Apgar scores (OR: 0.30; 95% CI: 0.20-0.44; p<0.001). In contrast, our study results indicated that 76 patients (71%) presented with a low Apgar score (≤5), while only 31 patients (29%) achieved a normal Apgar score. This suggests a higher frequency of low Apgar scores in our cohort compared to the findings of Nazir et al.,[13] where 63.40% had an Apgar score below 8. This discrepancy could be attributed to differences in patient demographics, such as the mean gestational age of our participants being 37.11 ± 1.95 weeks, which is lower than the gestational periods of participants in other studies, potentially influencing the outcomes. Similarly, Mandvia et al.[14] reported that their study subjects had a mean age of 27.90 years and highlighted that women with abnormal CTG had poorer Apgar scores compared to those with normal CTG. In our study, the mean age of participants was 28.37 ± 3.08 years, showing comparable demographics. However, our results did not demonstrate a statistically significant association between Apgar scores and maternal age, gestational age, or parity (p>0.847 for age, p=0.688 for gestational age, and p=0.993 for parity). This lack of significance might suggest that the factors impacting Apgar scores in our population differ from those observed in Mandvia's cohort, potentially due to variations in clinical practices or patient selection criteria. Perveen et al.[15] noted that 38% of neonates experienced an Apgar score below 7, reflecting a concerning outcome similar to our findings of 71% with a low Apgar score. However, the absence of neonatal mortality and morbidity in both studies indicates a similar trend in immediate postnatal health. The higher frequency of low Apgar scores in our study suggests that there may be underlying factors, such as inadequate monitoring or variations in intervention protocols. Naeem et al.[16] identified that 37.3% of women with high-risk pregnancies had pathological CTG, correlating with higher adverse outcomes (p≤0.005). In our study, this relationship was echoed, as we found that low Apgar scores were significantly associated with factors such as gestational age and fetal presentation, highlighting a consistent theme across studies that abnormal CTG findings correlate with adverse perinatal outcomes. The findings by Lungameni et al.[17] also support the notion that neonatal factors significantly influence Apgar scores, with their study focusing on demographic variables similar to ours. They found a significant association between factors like gestational age and low Apgar scores, which aligns with our results indicating that gestational age was a crucial factor. This consistency across studies reinforces the importance of diligent monitoring and appropriate intervention during labor.

The consistent patterns observed across various studies highlight the need for ongoing research and improvements in clinical practices to enhance fetal monitoring and ultimately improve neonatal health outcomes. However, this study is not without limitations. It was conducted as a single-center study, which may affect the generalizability of the findings to broader populations. Additionally, the reliance on retrospective data could introduce biases and inaccuracies in reporting. Future research with larger, multi-center cohorts and long-term follow-ups will be essential to

validate these findings and explore the underlying factors contributing to low Apgar scores.

CONCLUSION

Our study demonstrated that low Apgar scores associated with abnormal CTG, and that there are no associations between low Apgar scores and demographic factors such as age, gestation age or parity. However, according to our results, CTG remains a useful diagnostic tool for fetal distress, but important clinical factors, such as immediate intervention and survival and management, are more significant than CTG in determining the neonatal outcome. Additional studies are required to elucidate other risk factors for more high risks of the Apgar scores in the abnormal CTG.

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Author Contributions

Each author played a key role in the creation of this manuscript, as outlined below.

Dr. Sawaira spearheaded the development of the study concept, the drafting of the article, and the collection of hospital data.

Dr. Sania Tanveer Khattak contributed to the advancement of the article, the conceptualization of the study, and the analysis and interpretation of the data.

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