Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

COMPARISON OF NORMAL AND ABNORMAL CTG TRACINGS IN LABOUR IN TERMS OF PREGNANCY AND EARLY NEONATAL OUTCOME

1. **Dr. Farheen Khan Consultant (Obstetrics/Gynaecology)City speciality ClinicNew Delhi, India**
2. **2. Dr Nikhil Sinha Professor, Department of General Medicine, Heritage Institute of Medical Sciences, Varanasi, U.P. India**
3. **Dr.Rajeev Kumar Assistant professor, Department of Community Medicine, The White Medical College and Hospital, Pathankot, Punjab , India**
4. **Corresponding Author Dr Dhananjay Kumar Singh Associate Professor, Department of Community Medicine, Autonomous State Medical College, Ayodhya, Uttar Pradesh, India**

Abstract

Introduction:

Cardiotocography (CTG) is a crucial tool in monitoring fetal well-being during labor, helping detect fetal distress and guiding timely interventions. Abnormal CTG tracings often indicate potential complications and necessitate clinical interventions such as cesarean sections. This study aims to compare the pregnancy and early neonatal outcomes between patients with normal and abnormal CTG tracings during labor.

Methodology:

This comparative, observational study was conducted in the Department of Obstetrics and Gynaecology at Batra Hospital, New Delhi. A total of 100 patients in active labor were enrolled, with 50 having normal CTG tracings (Group A) and 50 having abnormal CTG tracings (Group B). Data collected included mode of delivery, Apgar scores at 1 and 5 minutes, birth weight, NICU admissions, and perinatal mortality. Statistical analysis was conducted using chi-square and t-tests, with a p-value <0.05 considered significant.

Results:

Patients in the abnormal CTG group had a significantly higher rate of cesarean sections (68% vs. 44%, $p = 0.004$), particularly due to fetal distress (79% vs. 18%, $p = 0.00$). Neonates in the abnormal CTG group were more likely to have Apgar scores below 7 at 1 minute (50% vs. 6%, $p = 0.00$) and 5 minutes (28% vs. 4%, $p = 0.001$). NICU admissions were also significantly higher in the abnormal CTG group (28% vs. 6%, $p = 0.003$). Low birth weight (<2.5 kg) was more common in the abnormal CTG group (28% vs. 8%, $p = 0.009$), while perinatal mortality, though higher in the abnormal CTG group, was not statistically significant (4% vs. 0%, $p = 0.15$).

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

Conclusion:

Abnormal CTG tracings are strongly associated with adverse pregnancy and neonatal outcomes, including higher rates of cesarean section, low Apgar scores, NICU admissions, and low birth weight. This study highlights the importance of vigilant monitoring and timely interventions in managing labor for patients with abnormal CTG tracings to improve neonatal outcomes.

Keywords:

Cardiotocography, fetal heart rate monitoring, cesarean section, neonatal outcomes, Apgar score, NICU admission, fetal distress.

Introduction

Cardiotocography (CTG) is a widely used method for fetal monitoring during labor, providing real-time information about fetal heart rate (FHR) and uterine contractions. Its primary purpose is to identify fetal hypoxia and distress, enabling timely clinical interventions to prevent adverse outcomes such as perinatal morbidity and mortality.[1] CTG has become a standard practice in obstetric care globally, particularly for pregnancies that are considered high-risk. Abnormal CTG tracings, including changes in baseline FHR, variability, and decelerations, are often considered indicators of fetal compromise, which may lead to interventions such as cesarean sections to safeguard fetal health.[2]

The use of CTG as a diagnostic tool has significantly reduced perinatal mortality by allowing early detection of fetal distress. However, its efficacy has been debated, especially regarding its predictive value for neonatal outcomes. While abnormal CTG readings can predict fetal distress, they are also associated with an increase in operative interventions, such as cesarean sections, which may not always be necessary.[3] Consequently, the balance between the benefits of CTG in preventing neonatal complications and the potential for unnecessary interventions remains a key focus of research in obstetrics.[4]

Previous studies have demonstrated that abnormal CTG patterns are associated with poorer neonatal outcomes, including low Apgar scores, increased rates of neonatal intensive care unit (NICU) admissions, and higher incidences of low birth weight.[2] Despite this, the specificity of CTG in predicting long-term outcomes remains under debate, as some neonates with abnormal CTG tracings may not experience significant complications. The current study explores the association between normal and abnormal CTG tracings during labor and their respective pregnancy and early neonatal outcomes, including mode of delivery, Apgar scores, NICU admissions, birth weight, and perinatal mortality.

This study seeks to contribute to the ongoing discussion about the utility of CTG in labor management, particularly in the context of clinical decision-making regarding operative interventions and neonatal

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

care. By comparing the outcomes of normal and abnormal CTG tracings, this research aims to provide further insights into the relationship between fetal heart rate monitoring and maternal and neonatal outcomes, to refine CTG as a tool for improving perinatal care.

Methodology

This study was conducted as a comparative, observational study in the Department of Obstetrics and Gynaecology at Batra Hospital. The primary aim was to compare the pregnancy and early neonatal outcomes in patients with normal and abnormal cardiotocography (CTG) tracings during labor. 100 patients in active labor who met the inclusion criteria were enrolled in the study. Fifty consecutive patients with normal CTG readings were assigned to Group A (Normal CTG), and fifty patients with abnormal CTG readings were assigned to Group B (Abnormal CTG).

The inclusion criteria for this study were singleton pregnancies, gestational age of more than 34 weeks, vertex presentation, and patients in active labor with a cervical dilatation of 4–6 cm and effacement greater than 80%. Patients with multifetal pregnancies, gestational age less than 34 weeks, abnormal presentations (such as breech), elective cesarean sections, intrauterine fetal death, and conditions like gross congenital abnormalities or high-risk pregnancies (such as those involving diabetes, hypertension, or preterm premature rupture of membranes) were excluded from the study.

CTG tracings were obtained from each patient upon admission to the labor ward using standard external fetal monitoring methods. For both groups, CTG recordings were taken for 20 minutes while the patient was in the left lateral position. The tapes were classified according to the International Federation of Gynecology and Obstetrics (FIGO) guidelines. Patients were monitored closely during labor, and interventions were carried out as necessary based on CTG findings.

Data regarding pregnancy outcomes were collected, including the interval between CTG monitoring and delivery, mode of delivery (expected vaginal delivery, instrumental delivery, or lower segment cesarean section [LSCS]), and the percentage of cesarean sections performed for fetal distress. Neonatal outcomes were assessed using Apgar scores at 1 and 5 minutes, birth weight, the need for NICU admission, duration of NICU stay, and perinatal mortality.

The collected data were analyzed using statistical software. Descriptive statistics were used to summarize the baseline characteristics of the study groups, including age, gravidity, parity, and gestational age. The chi-square test and Fisher's exact test were used to compare categorical variables, such as mode of delivery and NICU admission, between the two groups. Continuous variables, such as maternal age and the time interval between CTG monitoring and delivery, were analyzed using the independent sample t-test. A p-value of less than 0.05 was considered statistically significant.

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

This study adhered to ethical guidelines, with informed consent obtained from all participants prior to inclusion in the study. Approval for the study was granted by the institutional ethics committee of Batra Hospital, New Delhi.

Results

Table 1: Demographic Characteristics of Study Groups

Characteristics	Group A (Normal CTG)	Group B (Abnormal CTG)	p-value
Mean Age (years)	25.42	26.18	0.60
Primigravida (%)	34	36	0.80
Multigravida (%)	66	64	0.80
Nulliparous (%)	36	34	0.85
Parous (%)	64	62	0.85

The demographic characteristics of the study groups showed no statistically significant differences between the normal and abnormal CTG groups. The mean age of participants in the regular CTG group was 25.42 years. In contrast, the abnormal CTG group was slightly higher at 26.18 years, with a p-value of 0.60, indicating no significant age difference between the two groups. The distribution of primigravida and multigravida patients was also similar, with 34% of participants in the normal CTG group being primigravida compared to 36% in the abnormal CTG group. The proportion of multigravida patients was 66% in the regular CTG group and 64% in the abnormal CTG group, with a p-value of 0.80, again indicating no significant difference. Additionally, the percentages of nulliparous and parous women were comparable between the two groups. In the regular CTG group, 36% of women were nulliparous, compared to 34% in the abnormal CTG group, with a p-value of 0.85. Similarly, the percentage of parous women was 64% in the regular CTG group and 62% in the abnormal CTG group, with a p-value of 0.85. These results suggest that the demographic characteristics of the two groups were well-matched and did not differ significantly.

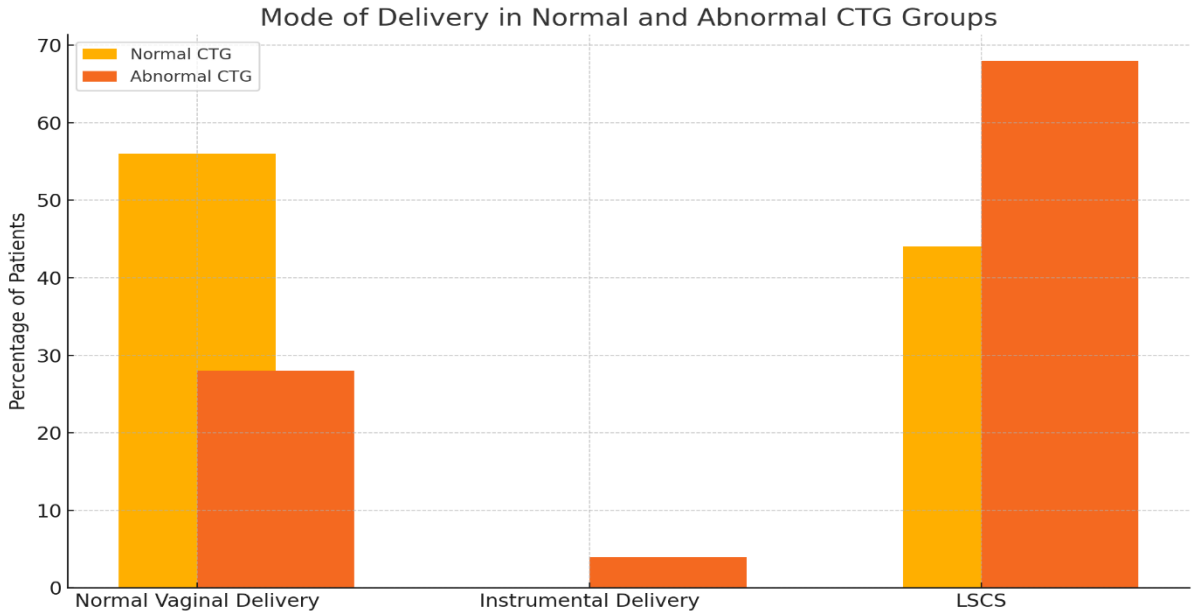
Table 2: Mode of Delivery and Indications for Caesarean Section

Mode of Delivery	Group A (Normal CTG)	Group B (Abnormal CTG)	p-value
Normal Vaginal Delivery (%)	56	28	0.004**
Instrumental Delivery (%)	0	4	0.15
LSCS (%)	44	68	0.004**
LSCS for Fetal Distress (%)	18	79	0.00**
LSCS for Other Reasons (%)	82	21	0.00**

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

The mode of delivery showed significant differences between the normal and abnormal CTG groups. In the normal CTG group, 56% of deliveries were normal vaginal deliveries. In contrast, only 28% of deliveries in the abnormal CTG group were vaginal, with a p-value of 0.004, indicating a statistically significant difference. Instrumental deliveries were absent in the normal CTG group but accounted for 4% of deliveries in the abnormal CTG group, although this difference was not statistically significant (p-value = 0.15).

Fig 1 : Mode Of Delivery



Regarding cesarean sections (LSCS), 44% of the deliveries in the normal CTG group were via LSCS, compared to 68% in the abnormal CTG group, with a p-value of 0.004, showing a significant difference between the groups. The rate of cesarean sections performed specifically for fetal distress was markedly higher in the abnormal CTG group (79%) compared to the normal CTG group (18%), with a p-value of 0.00, indicating a strong association between abnormal CTG and cesarean sections for fetal distress. Conversely, cesarean sections for reasons other than fetal distress were much more common in the normal CTG group (82%) compared to the abnormal CTG group (21%), with this difference also being statistically significant (p-value = 0.00).

Table 3: Neonatal Outcomes Based on Apgar Scores at 1 and 5 Minutes

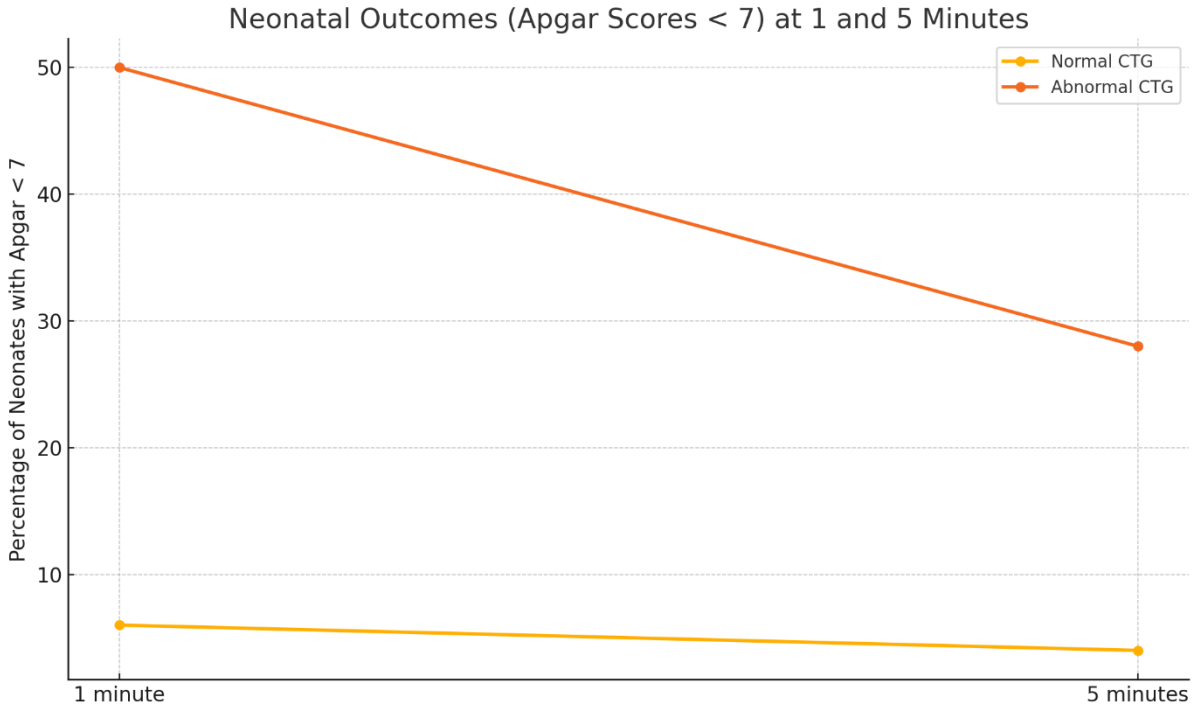
Apgar Score	Group A (Normal CTG)	Group B (Abnormal CTG)	p-value
< 7 at 1 minute (%)	6	50	0.00**
≥ 7 at 1 minute (%)	94	50	0.00**
< 7 at 5 minutes (%)	4	28	0.001**

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

Apgar Score	Group A (Normal CTG)	Group B (Abnormal CTG)	p-value
≥ 7 at 5 minutes (%)	96	72	0.001**

The neonatal outcomes, measured by Apgar scores at 1 and 5 minutes, show significant differences between the normal and abnormal CTG groups. At 1 minute after birth, only 6% of neonates in the normal CTG group had Apgar scores below 7, while 50% of neonates in the abnormal CTG group had scores below 7. This difference is statistically significant, with a p-value of 0.00. Conversely, 94% of neonates in the normal CTG group had Apgar scores of 7 or above at 1 minute, compared to only 50% in the abnormal CTG group, again reflecting a significant difference (p-value = 0.00).

Fig 2: Neonatal Outcomes.



At 5 minutes after birth, the outcomes continued to diverge. In the normal CTG group, only 4% of neonates had Apgar scores below 7, whereas 28% of neonates in the abnormal CTG group had scores below 7, a statistically significant difference (p-value = 0.001). Furthermore, 96% of neonates in the normal CTG group had Apgar scores of 7 or higher at 5 minutes, compared to 72% in the abnormal CTG group, with a p-value of 0.001, indicating a significant difference in neonatal well-being.

These results demonstrate that neonates in the abnormal CTG group were more likely to have lower Apgar scores, both at 1 and 5 minutes. This reflects poorer neonatal outcomes and indicates the strong association between abnormal CTG tracings and neonatal distress.

Table 4: NICU Admissions and Duration of Stay

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

NICU Outcome	Group A (Normal CTG)	Group B (Abnormal CTG)	p-value
NICU Admissions (%)	6	28	0.003**
NICU Stay <7 Days (%)	100	78.57	0.10
NICU Stay ≥7 Days (%)	0	21.43	0.10

The data on NICU admissions and duration of stay highlight notable differences between the normal and abnormal CTG groups. In the normal CTG group, only 6% of neonates required NICU admission, while in the abnormal CTG group, 28% of neonates were admitted to the NICU. This difference is statistically significant, with a p-value of 0.003, suggesting a strong association between abnormal CTG readings and the need for NICU care.

When considering the duration of NICU stay, all neonates from the normal CTG group who were admitted to the NICU stayed for less than 7 days. In the abnormal CTG group, however, 78.57% of NICU admissions involved stays of less than 7 days, while 21.43% of neonates required a stay of 7 days or longer. Although the duration of NICU stays was longer in the abnormal CTG group, this difference did not reach statistical significance, with a p-value of 0.10.

Table 5: Birth Weight and Perinatal Mortality

Outcome	Group A (Normal CTG)	Group B (Abnormal CTG)	p-value
Birth Weight < 2.5kg (%)	8	28	0.009**
Birth Weight ≥ 2.5kg (%)	92	72	0.009**
Perinatal Mortality (%)	0	4	0.15

The comparison of birth weight and perinatal mortality between the normal and abnormal CTG groups reveals significant differences in neonatal outcomes. In the normal CTG group, only 8% of neonates had a birth weight of less than 2.5 kg, compared to 28% of neonates in the abnormal CTG group. This difference is statistically significant, with a p-value of 0.009, indicating that low birth weight was more common in neonates from the abnormal CTG group. Conversely, 92% of neonates in the normal CTG group had a birth weight of 2.5 kg or more, while in the abnormal CTG group, this proportion was lower at 72%, with the same p-value of 0.009, reflecting a statistically significant difference.

Regarding perinatal mortality, there were no neonatal deaths in the normal CTG group, whereas 4% of neonates in the abnormal CTG group experienced perinatal mortality. However, this difference was insignificant, with a p-value of 0.15.

These findings suggest that abnormal CTG readings are associated with a higher incidence of low birth weight. Still, the difference in perinatal mortality between the two groups is insignificant. The increased

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

rate of low birth weight in the abnormal CTG group may indicate poorer fetal health outcomes in cases with abnormal CTG tracings.

Discussion

The findings of this study underscore the significant relationship between abnormal CTG tracings and adverse pregnancy and neonatal outcomes. Cardiotocography (CTG) remains an essential tool in fetal monitoring during labor, with abnormal readings often prompting clinical interventions to prevent fetal distress and adverse outcomes. In line with previous studies, the results of this research show that abnormal CTG tracings are associated with increased rates of cesarean sections, NICU admissions, and neonatal complications, particularly concerning Apgar scores and birth weights.

A significantly higher rate of cesarean sections was observed in the abnormal CTG group compared to the normal CTG group (68% vs. 44%, p = 0.004). This finding aligns with earlier studies that have shown that abnormal CTG tracings are strongly correlated with increased operative interventions due to fetal distress.[5] The rate of cesarean sections for fetal distress was particularly notable, with 79% of cesarean deliveries in the abnormal CTG group being conducted for this reason, compared to only 18% in the normal CTG group (p = 0.00). These findings highlight the role of CTG in identifying fetal hypoxia, prompting timely interventions to prevent further complications.[6,7]

The Apgar scores of neonates born to mothers with abnormal CTG tracings were significantly lower at both 1 and 5 minutes compared to those born to mothers with normal CTG readings. At 1 minute, 50% of neonates in the abnormal CTG group had an Apgar score of less than 7, compared to only 6% in the normal CTG group (p = 0.00). Similarly, at 5 minutes, 28% of neonates in the abnormal CTG group had scores below 7, compared to 4% in the normal CTG group (p = 0.001). These results are consistent with existing literature, which suggests that abnormal CTG readings are indicative of fetal distress and are associated with poor neonatal outcomes such as low Apgar scores.[8,9]

Neonates in the abnormal CTG group were more likely to be admitted to the NICU than those in the normal CTG group (28% vs. 6%, p = 0.003). This finding aligns with previous studies that have demonstrated the association between abnormal CTG tracings and an increased need for intensive neonatal care due to fetal distress and other complications.[10,11] Although there was a trend toward longer NICU stays in the abnormal CTG group, the difference in the duration of stay was not statistically significant (p = 0.10). This suggests that while abnormal CTG readings predict NICU admission, the length of stay may depend on other factors such as the severity of neonatal complications and the efficacy of postnatal care.[4]

The study also found a statistically significant difference in birth weights between the two groups, with 28% of neonates in the abnormal CTG group weighing less than 2.5 kg compared to 8% in the normal CTG group (p = 0.009). Low birth weight is a known intrauterine growth restriction (IUGR) marker

ISSN:0975 -3583,0976-2833 VOL 13, ISSUE 10, 2022

and is often linked to poor fetal conditions, which can be detected through abnormal CTG readings.[5,2] Although perinatal mortality was higher in the abnormal CTG group (4% vs. 0%), this difference was not statistically significant ($p = 0.15$). Previous research has also found mixed results regarding the link between abnormal CTG and perinatal mortality, suggesting that while CTG can help predict fetal distress, it is not always a perfect predictor of neonatal death. [4,5]

Conclusion

In conclusion, this study reinforces the importance of CTG in monitoring fetal well-being during labor, particularly in identifying cases of fetal distress that require timely clinical intervention. The significant differences in neonatal outcomes between the normal and abnormal CTG groups underscore the need for continued use of this tool, especially in settings where more advanced fetal monitoring techniques may not be available. While abnormal CTG is a strong predictor of adverse outcomes such as cesarean section and NICU admission, the results also indicate that further studies are needed to refine the criteria for intervention, ensuring that interventions are both necessary and timely.

References

1. Hon EH. The electronic evaluation of the fetal heart rate: preliminary report. Am J Obstet Gynecol. 1963;87:814-26.
2. Spencer JA, Ramsey PS. Fetal heart rate monitoring and its relationship with adverse neonatal outcomes. J Perinatol. 1997;17(3):183-8.
3. Vintzileos AM, Nochimson DJ, Guzman ER, Knuppel RA, Lake M, Schifrin BS. The impact of electronic fetal heart rate monitoring on neonatal outcome. Am J Obstet Gynecol. 1995;173(4):1024-8.
4. Ian M, Kelso E, Westgate J, Harris E. A randomized controlled trial of continuous electronic fetal heart rate monitoring during labor. Am J Obstet Gynecol. 1978;132(4):413-8.
5. Sultana J, Ahmed S, Ali L. Correlation of cardiotocographic findings with pregnancy outcomes. J Obstet Gynaecol Res. 2009;35(5):847-52.
6. Thacker SB. The efficacy of intrapartum fetal heart rate monitoring. Am J Obstet Gynecol. 1987;156(1):24-30.
7. Singh DK, Sinha N, Kumar R, Bhattacharya S, Maurya A. Identifying the risk factors for the prevention of hypertensive disorders in pregnancy in a tertiary care hospital: A cross-sectional study. J Family Med Prim Care 2020;9:6121-4.
8. Shenker L. Fetal heart rate monitoring in labor: a retrospective review of 1000 laboring patients. Am J Obstet Gynecol. 1973;115(2):219-25.
9. Hon EH. The Electronic Evaluation of the Fetal Heart Rate. Am J Obstet Gynecol. 1963;87:814-26.
10. Vintzileos AM, Nochimson DJ, Guzman ER, Knuppel RA, Lake M, Schifrin BS. The impact of electronic fetal heart rate monitoring on neonatal outcome. Am J Obstet Gynecol. 1995;173(4):1024-8.
11. Singh DK, Sinha N, Bera OP, Saleem SM, Tripathi S, Shikha D, et al. Effects of diet on hypertensive disorders during pregnancy: A cross-sectional study from a teaching hospital. J Family Med Prim Care 2021;10:3268-72