

# Pre-term labour: A study on evaluation of causes and outcome

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## ABSTRACT

**Background:** Despite recent advances in medicine, the incidence of pre-term birth is increasing globally. Approximately 70% of neonatal deaths, 36% of infant deaths, and 25–50% of cases of neurological impairment in children can be attributed to pre-term births. Identification of risk factors in women, supervised obstetric care during pregnancy, female empowerment, and patient education are strategies to minimize the burden of preterm deliveries. **Materials and Methods:** A prospective cross-sectional study was conducted over a 1-year period among 658 women in the Department of Obstetrics and Gynecology, Pramukhswami Medical College, Anand, Gujarat. Detailed history, general, and obstetrical examinations were carried out. Maternal and foetal outcomes were noted. Statistical software STATA 14.2 was used for data analysis. **Results:** The incidence of pre-term birth in our study was 34.95%. The incidence of late pre-term, very term, and extremely pre-term was 28.42%, 4.71%, and 1.82%, respectively. Pre-mature rupture of the membrane was observed among 20.34% of patients with late pre-term labour. IUGR was identified in 9.52% and 15.94% of the very and late pre-term births, respectively. A statistically significant difference was found in the 1 minute and 5 minute Apgar scores between pre-term babies and term babies. **Conclusion:** Pre-maturity is a huge health and financial burden in rural and semi-urban central Gujarat. Pre-mature rupture of membranes, previous MTP, extreme physical activity, and maternal anaemia were the major risk factors linked with pre-term labour. Poor neonatal outcomes like LBW, IUGR, and a low Apgar score were significantly associated with the babies delivered pre-mature in our study.

**Keywords:** Neonatal outcome, pregnancy, pre-term birth, risk factors

## Introduction

Newborns just entering the world are among the most susceptible members of any community on the planet. The World Health Organization (WHO) uses the term pre-mature birth to refer to the birth of a new-born baby that occurs before 37 weeks of pregnancy.<sup>[1]</sup>

It is estimated that pre-term births are responsible for approximately 70% of neonatal deaths and 36% of infant deaths

in addition to 25–50% of cases of neurological impairment in children. Pre-term births also increase the risk of cerebral palsy in children by approximately 50%.<sup>[2-3]</sup> Pre-term births that take place in India account for 23.6% of the total number of pre-mature births that take place across the world.<sup>[4]</sup>

The government has taken several mother and child healthcare programs. Inadequate access to or usage of health care services, delayed referral, and a lack of competent trained services for prenatal and antenatal obstetric care are the reasons that may be attributed to this issue.<sup>[5,6]</sup>

Under-utilization of the services of healthcare workers and ASHA workers, inadequate training, and poor knowledge lead to this vicious cycle.

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In spite of recent developments in medicine, the number of babies being born pre-maturely is on the rise all around the globe. It is a complex disorder, and the surprising heterogeneity of the risk factors for pre-term birth has not yet been proven. This is because pre-mature delivery is a condition that may be caused by a variety of reasons. By interpreting the associated etiological variables, it will be possible to identify pregnancies that are at a high risk and to lower the mortality and morbidity rates of both the mother and the infant that are caused by problematic early parturition.

Primary healthcare providers play an important role in identification of risk factors in women; greater medical treatment before, between, and during pregnancies; improved access to contraception; and enhanced female empowerment and education, which are all ways to further reduce the prevalence of pre-mature births.<sup>[7,8]</sup>

With the help of this research, we want to gather data related to the sequence of occurrences that result in pre-mature birth, conduct an analysis of the patterns of pre-term newborn morbidity and death, and evaluate the findings in light of term neonates.

## Subjects and Methods

### Study design

A prospective cross-sectional observational study was carried out between March 2021 and March 2022 with inclusion criteria of selecting all consecutive women with 24 to 40 weeks of pregnancy with clinical or ultrasonographic features of initiation of labor, indicated pre-term labor, and spontaneous pre-term labor including pre-mature rupture of the membrane. Those excluded were patients with threatened pre-term labor, post-term pregnancy, the fetus with congenital malformation, intrauterine fetal death, and no consent.

Patients satisfying the selection criteria were selected using purposive sampling.

After getting approval from the institutional ethics committee, the patients were enrolled as per the inclusion criteria.

The prevalence of pre-term reported in other studies varies from 10% to 30% in India. Considering the prevalence of pre-term at 23% in our institute, there is an allowable error of 3% on either side (i.e. an estimated prevalence of 20% to 26%). A sample size of 756 was calculated using the Winpepi software. The confidence level was kept at 95%. It is the minimum sample size.

After applying inclusion and exclusion criteria, a total of 658 patients were studied.

After obtaining verbal and written consent, participants were enrolled. Gestational age was calculated from the maternal last menstrual period. In cases where the last menstrual date was not

known, estimation of gestational age was done clinically, from review of records of previous antenatal visits and first or second trimester USG scan.

A detailed history was elicited from all patients along with review of data from past and present obstetric, neonatal, and surgical records. All patients were observed throughout the course of labor.

Parameters analyzed were demographic profile, psychosocial background, risk factors, probable causes of pre-term labor, and maternal and perinatal outcomes. The socio-economic background was classified using modified Kuppaswamy classification.

## Results

A total of 658 patients were studied. The mean age in both groups was 27 years.

The distribution of parity between both groups was similar. 28.7% in the pre-term group were primiparous and 29.9% in full term were primiparous, while 71.3% of pre-term and 70.09% of full term were multiparous.

Regarding the booking status, 43.91% were booked among pre-term and 71.03% among full term [Table 1].

Unbooked cases among pre-term (56.09%) were significantly higher than unbooked cases of the full-term group (28.97%).

The socio-economic status among both groups was comparable with 60% of pre-term and 62% of the full-term group belonging to the lower middle socio-economic class.

With regard to referral status, as per Table 2, those referred from private and government hospitals had a significant higher proportion of pre-term delivery as compared with those who came directly from home.

**Table 1: Booking status among study participants**

Booking status	Study group (pre term) (n=230)		Control group (Full term) (n=428)		P
	n	%	n	%	
Booked	101	43.91	304	71.03	0.001
Unbooked	129	56.09	124	28.97	
Total	230		428		

**Table 2: Referral status among study participants**

Referral status	Study group (pre-term) (n=230)		Control group (Full term) (n=428)		P
	n	%	n	%	
Private	44	19.13	33	7.71	<0.001
Government	85	36.96	90	21.03	
Home	101	43.91	305	71.26	

Table 3 displays the incidence of pre-term birth in our study with an overall incidence of 39.95% and late, very, and extreme pre-term being 28.42%, 4.71%, and 1.82%, respectively.

Table 4 displays comparison of risk factors between pre-term and full-term labor. Poor ANC care, extreme physical activity in the antenatal period, maternal anemia, previous history of MTP/abortion, and multi-fetal gestation were the factors which were significantly higher in the pre-term group as compared to the full-term group.

Table 5 shows distribution of various spontaneous and indicated causes among the pre-term group.

PROM, UTI, vaginal infection, and medical disorders were main causes of spontaneous pre-term.

Hypertensive disorders of pregnancy and APH were main causes for indicated pre-term.

As shown in Table 6, the rate of vaginal delivery and LSCS were comparable in pre-term and full-term groups.

Average hospital stay was significantly higher in mothers who had pre-term births.

ICU admissions and perinatal mortality and respiratory morbidity were higher in pre-term births.

The pre-term neonates with LBW were significantly higher than full-term neonates.

## Discussion

Pre-term birth is genuinely a worldwide issue; the numbers of pre-term births are growing as a result of assisted reproductive technologies and maternal physical and psychological stress.

**Table 3: Incidence of pre-term and full-term birth**

Gestational age at birth	Number	Prevalence (%)
Extreme pre-term	12	1.82
Very pre-term	31	4.71
Late pre-term	187	28.42
Full term	428	65.05

Many variables impact pre-term deliveries, including maternal risk factors, pregnancy-related problems, and social and environmental factors. In the current research, the total prevalence of pre-term birth was 34.95%. The higher prevalence in our study can be attributed to the large volume of referred complicated cases like eclampsia, APH, and so on and referral due to NICU availability. Late pre-term, very pre-term, and extreme pre-term births occurred at a rate of 28.42%, 4.71%, and 1.82%, respectively. In the research conducted by Prakash SA *et al.*,<sup>[9]</sup> the incidence of pre-term labor was determined to be 6.72%, where the study was conducted over a period of 10 months at a tertiary center in southern India. In their research, Shetty MB *et al.*<sup>[10]</sup> had found 18.01% pre-mature labor.

In the current study, the proportion of unbooked cases in the study group was significantly higher than in the control group (56.09% vs 28.97%), which is consistent with the findings of Nalini A *et al.*,<sup>[11]</sup> who found that the incidence of pre-term birth was significantly lower in booked cases than in unbooked cases (who attended less than 3 antenatal care or none). Greenberg *et al.*<sup>[12]</sup> discovered that prenatal care had a stronger influence on pregnancy outcomes among women who were socially disadvantaged, a group of women who more than often received less prenatal care. The prevention of pre-mature labor may be based on an at-risk approach: (a) patients at high risk of pre-term labor should be closely watched and (b) patients with warning signals should get preventive therapy such as antibiotics, tocolytics, bed rest, and so on to avoid pre-mature delivery.

Primary healthcare workers and general practitioners play an important role in the preventive medicine programs due to their easy access to the general population at large.

ASHA workers as being the members of community itself can have a huge impact on the mindset of women and their families toward acceptance of healthcare facilities and bring awareness to many high-risk factors and behavior.

Poor prenatal care was shown to be strongly linked with the incidence of pre-term labor in the current research. Jiang M *et al.*<sup>[13]</sup> discovered that the risk of pre-term delivery was considerably increased in women who had no prenatal care or merely irregular prenatal treatment. This finding suggests

**Table 4: Comparison of risk factors with pre-term labor and full-term labor**

Modifiable/non-modifiable	Risk factor	Study group (pre-term) (n=230)			Control group (Full term) (n=428)	P
		Extreme	Very	Late	Full term	
Modifiable Risk Factors	Poor ANC	06 (50)	08 (25.81)	22 (11.76)	19 (4.44)	<0.001
	Extreme physical activities	0 (0.0)	02 (6.45)	05 (2.67)	03 (0.70)	0.041
	Anemia	08 (66.67)	12 (38.71)	89 (47.59)	146 (34.11)	0.003
Non-modifiable Risk Factors	Previous abortion/MTP	02 (16.67)	03 (9.60)	33 (17.65)	39 (9.11)	0.018
	Previous cervical surgery	0 (0.0)	01 (3.23)	0 (0.0)	0 (0.0)	0.065
	Multifetal gestation	0 (0.0)	03 (9.68)	07 (3.74)	01 (0.23)	<0.001
	Uterine anomalies	0 (0.0)	0 (0.0)	04 (2.14)	04 (0.93)	0.567

**Table 5: Spectrum of causes of pre-term labor**

Spontaneous	Extreme	Very	Late
PROM	02 (50)	0 (0.0)	24 (20.34)
UTI	0 (0.0)	01 (10)	21 (17.8)
Vaginal infection	0 (0.0)	0 (0.0)	24 (20.34)
Psychosocial factor	01 (25)	01 (10)	9 (7.63)
Polyhydramnios	0 (0.0)	01 (10)	01 (0.85)
Multifetal pregnancy	0 (0.0)	03 (30)	11 (9.32)
Acute/chronic medical disorder	01 (25)	04 (40)	28 (23.73)
Indicated	Extreme	Very	Late
Gestational HTN/ preeclampsia/eclampsia	06 (85.71)	12 (57.14)	39 (56.52)
APH	01 (14.29)	06 (28.57)	17 (24.64)
Prolonged prom	0 (0.0)	01 (4.76)	02 (2.90)
IUGR	0 (0.0)	02 (9.52)	11 (15.94)

**Table 6: Maternal and perinatal outcomes**

Outcome	Study group (Pre-term) (n=230)	Control group (Full term) (n=428)	P
Mode of delivery			
• Vaginal	84 (36.52)	154 (36.24)	0.995
• Instrumental	01 (0.43)	02 (0.47)	
• LSCS	145 (63.04)	269 (63.29)	
Average hospital stays	5.34±0.23	4.44±0.9	<0.001
Live births			
• 0	13 (5.65)	0 (0.0)	<0.001
• 1	203 (88.26)	427 (99.77)	
• 2	13 (5.65)	01 (0.23)	
• 3	01 (0.43)	0 (0.0)	
NICU admission	138 (60.0)	48 (11.21)	<0.001
Perinatal mortality	30 (13.04)	02 (0.47)	<0.001
Respiratory morbidity	107 (46.52)	31 (7.24)	<0.001
Apgar score			
• At 1 minute	5.31±0.11	6.7±0.04	<0.001
• At 5 minutes	6.76±0.14	8.6±0.05	<0.001
LBW	185 (80.43)	108 (25.23)	<0.001

that successful treatments will almost certainly involve women enrolling in prenatal programs.

Maternal anemia is substantially more common in pre-term birth than in full-term labor. Anemia was found in 47.39% of pre-term births in this research. Sureshbabu RP *et al.*<sup>[14]</sup> revealed that around 20% of women who had pre-term deliveries were anemic. They also discovered that anemic women were three times more likely to have a pre-mature birth. Hemoglobin levels below the normal range cause a variety of health problems, particularly during pregnancy, when it is critical to the mother's and developing fetus's health. Anemia may cause T- and B-cell suppression, and the accompanying immunological suppression may increase vulnerability to infection. Anemia may be avoided by providing appropriate maternal nutrition throughout pregnancy and preventive iron supplements for 100 days via the Government of India's iron deficient anemia prevention program.<sup>[15]</sup> The need of adhering to iron and folic acid consumption should also be emphasized to pregnant women.

Many high-risk factors such as anemia can be identified and corrected when adolescent and reproductive age women visit family physicians for other ailments. This can significantly reduce the burden of anemia in women before they embark upon pregnancy.

Gestational hypertension/preeclampsia and eclampsia were the cause of induced pre-term delivery in 85%, 57.14%, and 56.52% of extreme, very, and late pre-term deliveries, respectively. In the study done by Fernandez SF *et al.*,<sup>[16]</sup> hypertensive disorders of pregnancy were found in 21.07% of the participants. SJ E tuk *et al.*,<sup>[17]</sup> Shrestha S *et al.*,<sup>[18]</sup> and Taskeen Rehana *et al.*<sup>[19]</sup> reported hypertensive disorders of pregnancy in 23.8%, 13.3%, and 14% of the women, respectively. The prevalence of gestational diabetes was 3.41% in Fernandez SF *et al.*<sup>[16]</sup> and 4% in Taskeen Rehana *et al.*<sup>[19]</sup> studies.

Another aspect that can be strengthened in the training of primary healthcare workers is the technical knowhow and knowledge with regard to primary investigations and physical examination of antenatal woman.

In the current investigation, uterine abnormalities were found in 1.7% of pre-mature laboring mothers. Fernandes SF *et al.*<sup>[16]</sup> found uterine abnormalities in 0.07% of subjects. In the research by Pandey K *et al.*,<sup>[20]</sup> it was 4.82%. Some of the uterine malformations may have gone unnoticed.

In the current research, antepartum bleeding was associated with 10.43% of pre-mature births. According to Uma S *et al.*,<sup>[21]</sup> antepartum bleeding is connected with roughly 10.8% of pre-mature deliveries. This is consistent with the current findings, although in contrast to the current analysis, antepartum hemorrhage was related with just 4.6% in the Singla S *et al.*<sup>[22]</sup>

In the current study, UTI was found in 9.56% of pre-mature laboring women. Mohamed discovered a prevalence of 22.2% urinary tract infections (UTI) in women with pre-term labor in his research. Pandey K *et al.*<sup>[20]</sup> discovered that 20.34% of women who experienced pre-term labor had a UTI.

Polyhydramnios was found in 0.86% of pre-term laboring mothers in the current research. Fernandez SF *et al.*<sup>[16]</sup> found 1.46% of pregnant women to have hydramnios. Shrestha S *et al.*<sup>[18]</sup> found 0.7% of pre-term births were associated with hydramnios. Pandey K *et al.*<sup>[20]</sup> identified a 0.79% incidence of hydramnios in their research.

In the current study, 11.30% of women who experienced pre-term labor developed PROM. Pre-term pre-mature membrane rupture accounted for 18.1% in Shetty MB *et al.*,<sup>[10]</sup> which was greater than the current study.

The manner of delivery had no significant relationship with pre-term birth in the current research. Taha *et al.*<sup>[23]</sup> and Ghelichkhani *et al.*<sup>[24]</sup> discovered a link between repeated cesarean

section and the incidence of pre-mature birth before 37 weeks. Temu *et al.*<sup>[25]</sup> investigated numerous variables related to pre-term birth, including cesarean delivery. They discovered that scheduled cesarean sections increase the chance of pre-mature birth.

Neonates have several survival issues at birth as a result of their pre-term delivery and are commonly admitted to neonatal intensive care units (NICUs) for critical care. In this research, the NICU admission rate was much greater among pre-term newborns than among full-term babies (60% vs 11.21%). Sureshbabu RP *et al.*<sup>[14]</sup> found that 51.8% of babies needed to be admitted to the NICU. NICU admissions were 66.5% in the research conducted by Shetty MB *et al.*<sup>[10]</sup> The NICU hospitalizations were either for observation or for treatment of pre-maturity and associated problems such as perinatal hypoxia, respiratory distress syndrome, and infection. Thus, recognizing women at risk of pre-term labor and providing them with appropriate therapy and care may help to improve outcomes.

The perinatal death rate for pre-maturely delivered children was 13.04%, compared to 0.47% for term births. The newborn death rate in the research conducted by Shetty MB *et al.*<sup>[10]</sup> was 6.9%. In the research conducted by Sureshbabu RP *et al.*,<sup>[14]</sup> 4 (2.1%) of the 191 pre-term newborns died. In the research conducted by Singla S *et al.*,<sup>[22]</sup> neonates delivered before 34 weeks of gestation had the highest neonatal mortality (55%). Uma S *et al.*<sup>[21]</sup> found that newborn mortality was 30.4% in neonates born before 34 weeks gestational age and only 3.4% in those born after 34 weeks gestational age.

Pre-term newborns had much greater respiratory morbidity (46.52% vs 7.24%) than full mature neonates. Pulmonary complications are one of several complications. Pre-mature delivery alters normal lung development, resulting in significant alterations in lung function and physiology. Furthermore, they discovered that babies' respiratory system immaturity at 34 to 36 weeks gestational age produces increased morbidity in children, resulting in pulmonary function impairments that may endure throughout adulthood.<sup>[26]</sup>

In the current research, pre-term babies had substantially lower Apgar scores at 1 minute and 5 minutes after delivery than full-term neonates. In the research conducted by Nungsangtemjen *et al.*,<sup>[27]</sup> 14.5% of the newborns had an Apgar score less than 7 at 1 minute, but Karegoudar *et al.*<sup>[28]</sup> found that 55.28% of the infants had an Apgar score less than 7. Low Apgar scores were related with higher mortality in pre-term newborns, particularly those at 24 to 28 weeks gestational age, according to Lee *et al.*,<sup>[29]</sup> and may be a valuable tool for doctors in determining prognosis as well as for researchers as a risk prediction variable. The proportion of pre-term neonates with a low birth weight was much greater as compared to full-term newborns (80.43% vs 25.23%). According to a study by Sureshbabu RP *et al.*,<sup>[14]</sup> the average birth weight of pre-term newborns was 2.1 kg, whereas that of term babies was 3 kg.

## Conclusion

In the current research, the total prevalence of pre-term birth was 34.95%. The higher prevalence in our study can be attributed to the large volume of referred complicated cases like eclampsia, APH, and so on and referral due to NICU availability. Late pre-term, very pre-term, and extreme pre-term births occurred at a rate of 28.42%, 4.71%, and 1.82%, respectively. It can be concluded that pre-maturity is significantly associated with poor maternal care and neonatal outcomes. Pre-mature rupture of membranes, previous MTP, vigorous physical exercise, and maternal anemia are the major risk factors linked with pre-term labor. Poor neonatal outcomes like LBW, IUGR, RDS, and low APGAR scores are significantly associated with the babies delivered pre-mature.

## Key take home message

The burden of emotional, financial, drainage on healthcare facilities incurred due to pre-maturity is substantial, many of which can be avoided by instating appropriate strategies at the grass root level and a robust communication system between general practitioners and specialists at tertiary care centers.

## Summary of key points

The incidence of pre-term is on the rise despite advances in the medical field.

The incidence of pre-maturity in our institute is higher (34.95%) than the national incidence (10 to 20%) due to a large volume of referral from periphery involving complicated cases and availability of NICU facility.

The prevalence of pre-maturity is significantly higher in unbooked cases, which strengthen the idea that robust prenatal care goes a long way in prevention of perinatal mortality and morbidity.

Prenatal and antenatal screening for high-risk factors such as anemia, hypertension, and UTI is of paramount importance for identification of patients at risk.

General practitioners and family physicians play an important role in preventive medicine programs due to their easy access to the general population at large.

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## Conflicts of interest

There are no conflicts of interest.

## References

1. National Health Portal, India. <https://www.nhp.gov.in/disease/reproductive-system/female-gynaecological->

- diseases-/preterm-birth. [Last accessed on 2022 Jun 22].
2. Walani SR. Global burden of preterm birth. *Int J Gynaecol Obstet* 2020;150:31-3.
  3. Harrison MS, Goldenberg RL. Global burden of prematurity. *Semin Fetal Neonatal Med* 2016;21:74-9.
  4. Salunkhe AH, Salunkhe JA, Mohite VR, More U, Pratinidhi AK, Kakade SV. Development of risk scoring scale tool for prediction of preterm birth. *Indian J Community Med* 2019;44:102-6. doi: 10.4103/ijcm.IJCM\_262\_18.
  5. Tayebi T, Zahrani ST, Mohammadpour R. Relationship between adequacy of prenatal care utilization index and pregnancy outcomes. *Iran J Nurs Midwifery Res* 2013;18:360-6.
  6. Hajian S PhD, Imani F Ms, Riazi H PhD, Salmani F PhD. Prediction of adequate prenatal care utilization based on the extended parallel process model. *Int J Community Based Nurs Midwifery* 2017;5:342-54.
  7. Keelan JA, Newnham JP. Recent advances in the prevention of preterm birth. *F1000Res* 2017;6:F1000.
  8. Dean SV, Mason E, Howson CP, Lassi ZS, Imam AM, Bhutta ZA. Born too soon: Care before and between pregnancy to prevent preterm births: From evidence to action. *Reprod Health* 2013;10 Suppl 1(Suppl 1):S3.
  9. Prakash SA, Rasquinha S, Rajaratnam A, Lavanya S. Analysis of risk factors and outcome of preterm labor. *Int J Eng Sci.* 2016;8:2602-4.
  10. Shetty MB, Krupa BM, Malyala M, Swarup A, Pathadan DS, Pocha S. Preterm birth: Associated risk factors and outcome in tertiary care center. *Int J Reprod Contracept Obstet Gynecol* 2017;6:3271-5.
  11. Nalini IA, Nikunj KM, Hariom MS. Evaluation of risk factors for preterm delivery and creasy's risk scoring. *Int J Med Res Health Sci* 2015;4:269-73.
  12. Greenberg RS. The impact of prenatal care in different social groups. *Am J Obstet Gynecol* 1983;145:797-801.
  13. Jiang M, Mishu MM, Lu D, Yin X. A case control study of risk factors and neonatal outcomes of preterm birth. *Taiwan J Obstet Gynecol* 2018;57:814-8.
  14. Sureshbabu RP, Aramthottil P, Anil N, Sumathy S, Varughese SA, Sreedevi A, *et al.* Risk factors associated with preterm delivery in singleton pregnancy in a tertiary care hospital in South India: A case control study. *Int J Womens Health* 2021;13:369-77.
  15. Kapil U, Kapil R, Gupta A. National iron plus initiative: Current status and future strategy. *Indian J Med Res* 2019;150:239-47.
  16. Fernandes SF, Chandra S. A study of risk factors for preterm labour. *Int J Reprod Contracept Obstet Gynecol* 2015;4:1306-12.
  17. Etuk SJ, Etuk JS, Oyo-Ita AE. Factors influencing the incidence of pre-term birth in Calabar, Nigeria. *Niger J Physiol Sci* 2005;20:63-8.
  18. Shrestha S, Dangol SS, Shrestha M, Shrestha RP. Outcome of preterm babies and associated risk factors in a hospital. *JNMA J Nepal Med Assoc* 2010;50:286-90.
  19. Rehana T. Preterm delivery. A major predictor of perinatal morbidity and mortality. *J Postgrad Med Inst* 2006;20:279-83.
  20. Pandey K, Bhagoliwal A, Gupta N, Geetanjaly K; Predictive value of various risk factors for preterm labor. *J Obstet Gynaecol India* 2010;60:141-5.
  21. Uma S, Nisha S, Shikha S. A prospective analysis of etiology and outcome of preterm labor. *J Obstet Gynaecol India* 2007;57:48-52.
  22. Singla S, Das B. Risk factor and perinatal outcome of preterm delivery in a tertiary care centre in rural Haryana. *Int J Reprod Contracept Obstet Gynecol* 2020;9:4187-92.
  23. Taha Z, Ali Hassan A, Wikkeling-Scott L, Papandreou D. Factors associated with preterm birth and low birth weight in Abu Dhabi, the United Arab Emirates. *Int J Environ Res Public Health* 2020;17:1382.
  24. Ghelichkhani S, Masoumi SZ, Shirzadeh AA, Khazaei S, Shahbazi F. Evaluation of maternal risk factors for preterm delivery in Fatemieh Hospital of Hamadan, Iran, 2019: A case-control study. *J Family Med Prim Care* 2021;10:3832-7.
  25. Temu TB, Masenga G, Obure J, Mosha D, Mahande MJ. Maternal and obstetric risk factors associated with preterm delivery at a referral hospital in northern-eastern Tanzania. *Asian Pac J Reprod* 2016;5:365-70.
  26. Colin AA, McEvoy C, Castile RG. Respiratory morbidity and lung function in preterm infants of 32 to 36 weeks' gestational age. *Pediatrics* 2010;126:115-28.
  27. Nungsangtemjen, Mahajan K, Singh MR, Mahongnao Y, Momin DG, Subba T. Fetomaternal outcome in preterm labour. *Int J Reprod Contracept Obstet Gynecol* 2021;10:2362-7.
  28. Karegoudar D, Prabhu A, Amgain K, Dhital M. Perinatal outcome and associated maternal co-morbid conditions in late preterm births-a prospective study at Kles Dr. PrabhakarKore Hospital, Belgaum, India. *Int J Curr Microbiol App Sci* 2014;3:865-75.
  29. Lee HC, Subeh M, Gould JB. Low Apgar score and mortality in extremely preterm neonates born in the United States. *Acta Paediatr* 2010;99:1785-9.