MATERNAL RISK FACTORS AND PERINATAL OUTCOME OF PRETERM LABOUR

Dr Nita Yadav[1*], Dr Ritesh Raj Karn[2], Dr Shyam Kumar Gupta[3] and Dr Binod Chaudhary[4]

[*1,4]*B P Koirala Institute of Health Sciences, Dhahran*

[2]*Udaypur District Hospital, Triyuga*

[3]*Sparsha Multispeciality Hospital, Birgunj*

ABSTRACT

OBJECTIVES: The aim of this study is to find out the maternal risk factors and prenatal outcome of preterm birth.

METHODOLOGY: This cross sectional descriptive study was conducted during a period of 3 months at Paropakar Maternity and Women's Hospital, Thapathali, Kathmandu, Nepal. A written informed consent was obtained from the patients meeting the inclusion criteria. All pregnancy admitted between 29 to 36 weeks of gestation in preterm labour and those pregnancies in which preterm termination of pregnancy was done due to maternal obstetric indications were enrolled in study and interviewed using a predesigned questionnaire for detailed history including name, age, parity, address, occupation, menstrual history, obstetric history, past history and personal history. General physical examination and systemic examination was done. Gestational age was confirmed by LMP, USG and clinical examination. All the cases included underwent the normal basic laboratory investigations, sonological assessment and treatment as per the standard treatment protocol. Outcome of pregnancy including mode of delivery, delivery findings, fetal outcome and fetal complications were recorded in details. All the information was collected through a Performa. Data were entered in SPSS 25 and analysis was done.

RESULTS: Incidence of preterm birth at Paropakar Maternity and Women's Hospital was 6.57%. 64% cases were less than 25 years old and 69.3% cases were primigravida suggesting that young maternal age and primiparity is a risk factor for preterm birth. 45.3% cases were overweight (BMI 25-29.9). Smoking, alcohol consumption and drug abuse was not associated with preterm labour.14.6% cases had either a history of preterm birth or abortion. Spontaneous preterm labour was most common (45.3%) followed by PPROM (24%), induced preterm birth for obstetrical indications (24%) and multifetal pregnancy (6.7%). The obstetrical indications were PIH (10.7%), abnormal AFI (8%) and APH (5.3%). Other common risk factors associated with preterm births were anemia (22.7%), genitourinary infection (10.7%), PIH (10.7%), reduced

AFI (8%) and hypothyroidism (6.7%). On the basis of gestational age, 24% cases were very preterm, 14.7% cases were moderate preterm and 61.3% cases were late preterm. Adverse prenatal outcome was worst among very preterm births. Overall prenatal mortality rate was 8%, mean birth weight was 1.99 kg, mean duration of hospital stay was 6.94 days, NICU admission was 42.66%. Most common neonatal morbidity was RDS (37.33%) followed by neonatal sepsis (29.33%) and hyperbilirubinemia (4%).

CONCLUSION: The main risk factors for preterm birth were primigravida, young maternal age, overweight, previous history of preterm labour and abortion, PPROM, multifetal pregnancy, PIH, abnormal AFI, antepartum haemorrhage, anemia, genitourinary infections and hypothyroidism. Perinatal mortality was 8% and most common among very preterm births. Most common neonatal morbidity was RDS followed by neonatal sepsis and hyperbilirubinemia. Most of the etiological factors of preterm labour are modifiable and hence giving community awareness and preconception counselling should be emphasized to diminish the health consequences and burden of preterm birth.

Keywords: preterm labour, anemia, pregnancy induced hypertension, gestational diabetes mellitus, multiple gestation, infections, antepartum haemorrhage, abnormal BMI,

INTRODUCTION

The World Health Organisation (WHO) defines preterm birth as any birth before 37 completed weeks of gestation, or fewer than 259 days since the first day of the woman's last menstrual period (LMP).[1] This is further subdivided on the basis of gestational age (GA): extremely preterm (<28 weeks); very preterm (28–<32 weeks); moderate preterm (32–<34 weeks) and late preterm (34-<37 weeks of gestation).[1] Preterm labour can be defined as onset of regular uterine contractions associated with cervical changes starting before 37 completed weeks of gestation with or without intact fetal membranes.[2] The American Academy of Pediatrics' and the American College of Obstetrics and Gynecology (1997) proposed the following criteria to diagnose preterm labour: Contractions of 4 in 20 minutes or 8 in 60 minutes plus progressive cervical changes; cervical dilatation greater than 1 cm and cervical effacement of 80% or greater.[2]

The worldwide incidence of preterm birth ranges between 6 and 11%.[3] 60% of preterm births occur in developing countries such as Africa and South Asia and rest of the world contributes to 40% of preterm births, hence having an impact globally.[1] Over the past two decades despite major preventive efforts, the incidence of preterm births has remained constant at about 5-10% of live births in developed countries and more in developing countries.[4] Two major factors have contributed to the rise in preterm delivery rate: 1) The dramatic increase in multiple births from assisted reproduction techniques; 2) obstetric interventions at early gestations for obstetric complications.[5]

The causes of preterm labour can be maternal, fetal, placental or idiopathic.[6] Four main direct reasons for preterm births include: Spontaneous unexplained preterm labour with intact membranes, idiopathic preterm premature rupture of membranes, preterm delivery for maternal and fetal indications and twins and higher order multifetal births.[5] Of all preterm births 30-35% have some obstetrical indications, 40-

45 percent are due to spontaneous preterm labour and 30-35% follow preterm membrane rupture.[5]

There are several risk factors known to be associated with preterm birth: these include multiple medical and genetic causes, environmental and socioeconomic factors, not always considered in combination. Previously observed risk factors include certain infections, maternal or fetal conditions (e.g. preeclampsia, fetal malformations), previous preterm delivery (a strong risk factor for recurrence), multifetal gestation, young or advanced maternal age, assisted reproductive technology (ART) (especially with multifetal gestation), cervical anomalies, certain ethnicities, smoking, extremes of body-mass index (BMI), low socio-economic status. Other less well-validated risk factors include stress, excessive physical work, alcohol and drugs consumption and periodontal disease. Despite much accumulated knowledge on individual etiological factors, the interactions among risk factors and the pathophysiology of preterm birth remain in part not explained.[7]

Early preterm birth is particularly associated with high rates of neonatal mortality and morbidity, including intraventricular haemorrhages, necrotizing enterocolitis, respiratory distress syndrome and neurological deficit.[8] Preterm infants not only suffer the immediate complications but also have long term sequelae such as neurodevelopmental disability.[9] Long term complications include cerebral palsy, vision problems, hearing problems, dental problems, behavioral problems, impaired cognitive functions and chronic health problems.[9] Recently late preterm birth and its morbidity has gained importance.[9] Globally, more than 3.1 million neonatal deaths occur every year, and about 35% of deaths are due to prematurity of newborns.[10] Preterm birth is the second-leading cause of mortality in children aged < 5 years, after pneumonia and complications of preterm births are the largest cause of neonatal deaths.[10] Preterm neonates are more likely to have difficulty with feeding, blood glucose control, jaundice, temperature instability, apnea, respiratory distress, sepsis, wide spectrum of neuro – developmental disabilities, as well as growth and health problems either singly or in combination compared to neonates delivered at term.[11] Consequent upon these complications, the birth of a preterm neonate can bring with it considerable emotional and economic costs to families.[11] In the light of this, the plausible way of reducing the burden of preterm birth on our health sector is by reducing its incidence, starting with a proper understanding of the factors associated with these births.[12]

Preterm birth remains one of the most serious obstetric problem globally.[5] Each year, an estimated 15 million infants are born preterm, complications of which now constitute the leading cause of neonatal and under-five mortality.[1] Preterm birth is recognized as a worldwide problem responsible for most of the neonatal deaths and a vast majority of neonatal morbidity in surviving infants.[5] Preterm births and low birth weight remains the most important predictors of perinatal mortality and morbidity among otherwise healthy infants.[13] Despite the increasing survival of preterm infants due to the improvement in skills and technologies used in their management, the incidence of preterm birth continues to increase globally.[13] Providing optimal care for very preterm infants in dedicated neonatal intensive care units is vital to minimize any potential for life-long harm, but such care comes at considerable financial cost. The morbidity associated with preterm birth often extends to later life resulting in enormous physical, psychological and economic

costs.[14] Considerable benefit has arisen from the administration of corticosteroids to the mother at risk of early birth in decreasing the rate of death and respiratory distress syndrome in the preterm newborn, but the treatment does not in itself delay the age at birth.[15]

Developing countries like Nepal account for more global burden of perinatal morbidity and mortality where health facilities are limited.[16] Low birth weight babies among hospital deliveries in Nepal showed the prevalence of 23.1%.[17] The prevalence of preterm delivery in Nepal was found to be 8 to 13 percent.[18] In developing countries, the main cause of preterm births include infectious diseases and poor availability and accessibility of health care resources, although many preterm births remain unexplained.[16] In a study done by Ojha[18] in 2015 at Tribhuwan University Teaching Hospital, Kathmandu, Nepal, it was found that significant risk factors for low birth weight were primiparity, Indo-Aryan ethnicity, history of medical disorders and antepartum haemorrhage. The incidence of preterm births in Nepal remains high.[19] Further, poor access to antenatal care services during pregnancy leads to poor pregnancy outcomes like preterm births as demonstrated by a hospital-based study in Nepal.[19] Many risk factors like infectious diseases, pregnancy induced hypertension, preterm membrane rupture, multifetal gestation, antepartum haemorrhage have been proven to be causative while others remain under speculation needing ongoing research.[5]

The dream of every woman is to deliver a healthy and mature baby capable of adapting satisfactorily to extrauterine life. For prevention it is important to identify the high risk factors for preterm labour.[6] Significant progress has been made in the care of preterm infants, but not so in reducing the prevalence of preterm births. Though tremendous strides have been made in keeping preterm infants alive, there has been less success in reducing the long-term handicap rate among the survivors.[6]

During the past few decades, we have come closer to understanding the etiology of preterm births, but we still need better markers to identify women at risk for preterm delivery. There are limited studies in Nepal on risk factors and perinatal outcome of preterm labour. The present study therefore, is undertaken to identify the risk factors responsible for preterm labour and their perinatal outcome in our setting. It will help in pre-conception counselling emphasizing on prevention of modifiable risk factors and hence reduce the burden of preterm births.

OBJECTIVES

General Objective:

To find out only maternal risk factors and perinatal outcome of preterm birth.

Specific objective:

❖ To find out prevalence of preterm birth at Paropakar Maternity and Women's Hospital

❖ To identify the maternal factors associated with preterm labour such as anemia, pregnancy induced hypertension, gestational diabetes mellitus, multiple gestation, infections, antepartum haemorrhage, abnormal BMI, smoking, alcohol, past obsterical history.

❖ To evaluate the perinatal outcome of preterm birth such as APGAR score, birth weight, NICU admission,

morbidity and mortality

METHODOLOGY

Study design:

This is a cross-sectional descriptive study.

Place of study:

This study was conducted at Paropakar Maternity and Women's hospital, Kathmandu, Nepal.

Duration of the study:

Duration of the study was one year. Duration of data collection was 3 months.

Sample size:

Target sample was obtained with the formula:

$n = z^2pq/d^2$

(z =1.96 taken at 95% of confidence interval)

n =Required sample size

p = Prevalence (cases of pre-term labour according to inclusive criteria)

q=100-p

d=5% (Maximum tolerable error)

Z^2 =1.96×1.96=3.8

There were total 93 cases of preterm birth in 1 month out of total 1800 deliveries at Paropakar Maternity and Women's Hospital. Hence the prevalence is 0.05 percent.

Using the formula mentioned above:

p = 0.05

q= 99.95

d = 5%

z=1.96

n=72

Therefore, the target sample size was 72 for this study.

Inclusion criteria:

❖ All pregnancy admitted between 29-36 weeks of gestation in preterm labour

❖ Preterm termination of pregnancy due to maternal obstetric indications such as pregnancy induced hypertension, antepartum haemorrhage, uncontrolled gestational diabetes mellitus, multifetal gestation, preterm membrane rupture.

Exclusion criteria:

❖ Intrauterine fetal death

❖ Patients admitted as preterm labour or threatened preterm labour but discharged or delivered at term

❖ Known fetal congenital anomaly

Interventional details:

Following approval from Institutional Review Board (IRB) of NAMS and IRC of PMWH, this observational study was conducted at Paropakar Maternity and Women's Hospital, Thapathali, Kathmandu, Nepal. A written informed consent was obtained from the patients meeting the inclusion criteria for enrollment in the study. All the doctors, nursing staff and other concerned persons were oriented about the protocol of the study topic and the technique of study.

The women were interviewed using a pre designed questionnaires for detail history including age, parity, address, occupation, menstrual and contraceptive history, a full obstetric history including antenatal visit in pre designed Performa. General physical examination was done including degree of pallor, Jaundice, pulse, temp, respiratory rate, BP, chest, cardiovascular system and abdominal examination was done to confirm that the patient fulfills criteria of the study group. Gestational age was confirmed from date of last menstrual period, USG scan and clinical examination.

Pregnancies between 29-36 weeks of gestation admitted as preterm labour or threatened preterm labour were included according to inclusion and exclusion criteria. If any patient in the study group was discharged without being delivered, lost to follow up, doubtful gestational age, delivered at term, were excluded from the study. All the cases included underwent the normal basic laboratory investigations and sonological assessment required as per the standard treatment protocol without giving extra economic burden to the patient.

Outcome of pregnancy including mode of delivery, delivery findings, fetal outcome and fetal complications were recorded in details.

Data Collection:

Data collection was done by filling the designed proforma. Detail history including age, parity, address, occupation, menstrual and contraceptive history, a full obstetric history including antenatal visit, previous pregnancy events and outcome were recorded. General physical examination was done including degree of pallor, Jaundice, pulse, temp, respiratory rate, BP, chest, cardiovascular system, abdominal and obstetrical examination. Routine blood investigations, urine routine examinations, urine culture and sensitivity, high vaginal swab culture and sensitivity, USG examination and other investigations required as per symptoms of patient were done.

Data Analysis And Statistical Analysis:

The obtained data were entered in a master chart daily. SPSS was used for statistical analysis. Collected data was analyzed and is presented in the form of mean ± standard deviation for continuous variables and as numbers and percentages for categorical variables.

Operational definitions:

Threatened preterm labour:

Frequent painful uterine contractions prior to 37 weeks of gestation without cervical changes.

Cervical incompetence:

Inability of the uterine cervix to retain a pregnancy in the absence of signs and symptoms of clinical contractions or labour or both in the second trimester.

Preterm Premature Rupture of Membrane (PPROM):

A pregnancy complication in which amniotic membrane surrounding the baby ruptures before 37 weeks of gestation.

Threatened abortion:

Vaginal bleeding that occurs in first 20 weeks of pregnancy with closed cervical os.

Grand multipara:

Women who has given birth 4 or more times.

Short spacing:

Inter-pregnancy interval of 18 months or less.

Long spacing:

An inter-pregnancy interval of greater than 5 years.

Bacterial vaginosis:

It is a type of vaginal inflammation caused by the overgrowth of bacteria naturally found in the vagina which upsets the natural balance.

Intrauterine Fetal Death:

Death of fetus in-utero after 20 weeks period of gestation.

RESULTS

There were total 5504 deliveries in 3 months from Asadh to Bhadra, 2077, and there were 362 cases of preterm birth from which the prevalence is 6.57%. 75 cases of preterm birth were taken in this study. Out of these 75 cases, 16 cases (21.3%) were less than 20 years old, 32 cases (42.7%) were between 20-24 years old, 16 cases (21.3%) were between 25-29 years old, 4 cases (5.3%) were between 30-34 years old, 6 cases (8%) were between 35-39 years old and 1 case (1.3%) was more than 40 years.
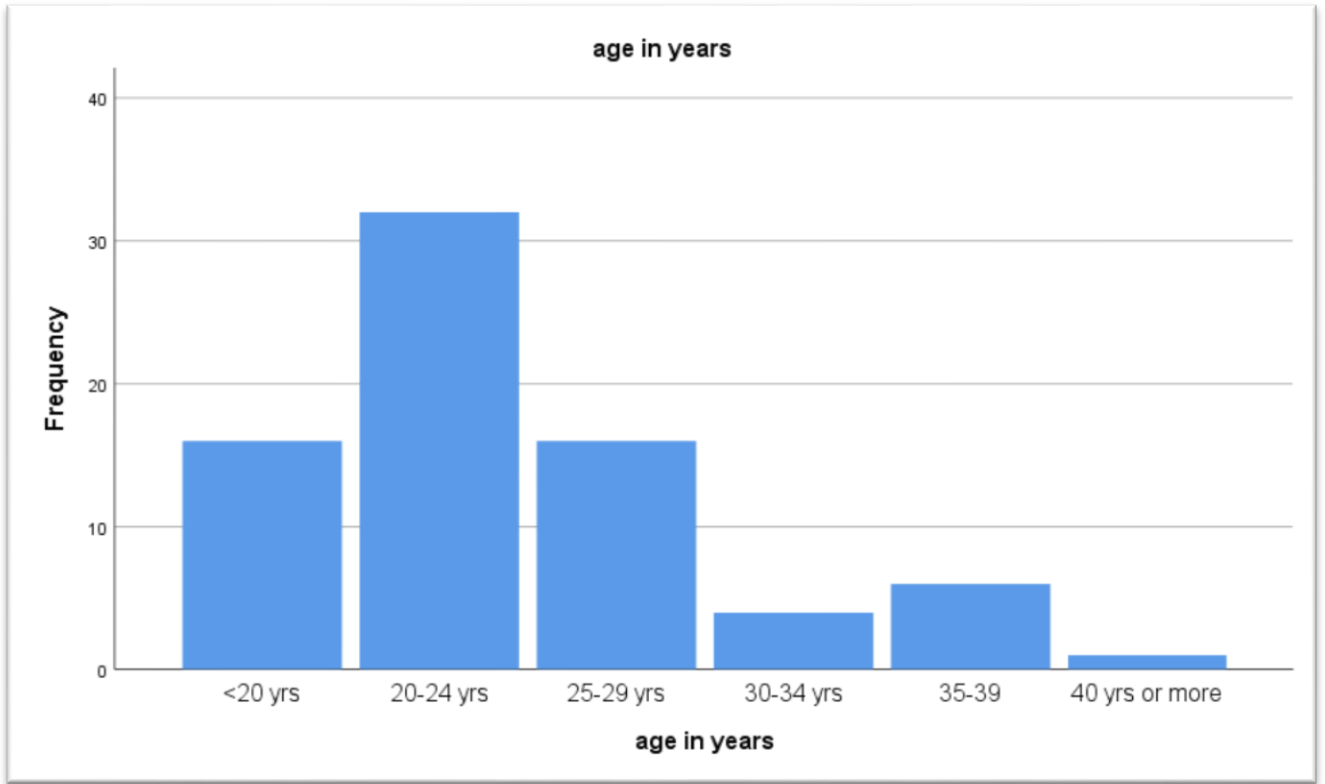
Figure 1: Distribution of cases according to age group

Out of 75 cases, most of them were primigravida (69.3%), 15 cases (20%) were in second parity, 7 cases (9.3%) were in third parity and only 1 case (1.3%) was grand multipara. So, our result does not show

Parity	No. of cases	Percentage
Primigravida	52	69.3%
2nd parity	15	20%
3rd parity	7	9.3%
Grand multipara	1	1.3%

increased incidence of preterm labour with multiparity as most cases were primigravida.

Table 1: Distribution of cases according to parity

38 cases (50.7%) were having normal body mass index (BMI 18-24.9), 34 cases (45.3%) were overweight (BMI 25-29.9), and 3 cases (4%), were having grade 1 obesity (BMI 30-34.9).
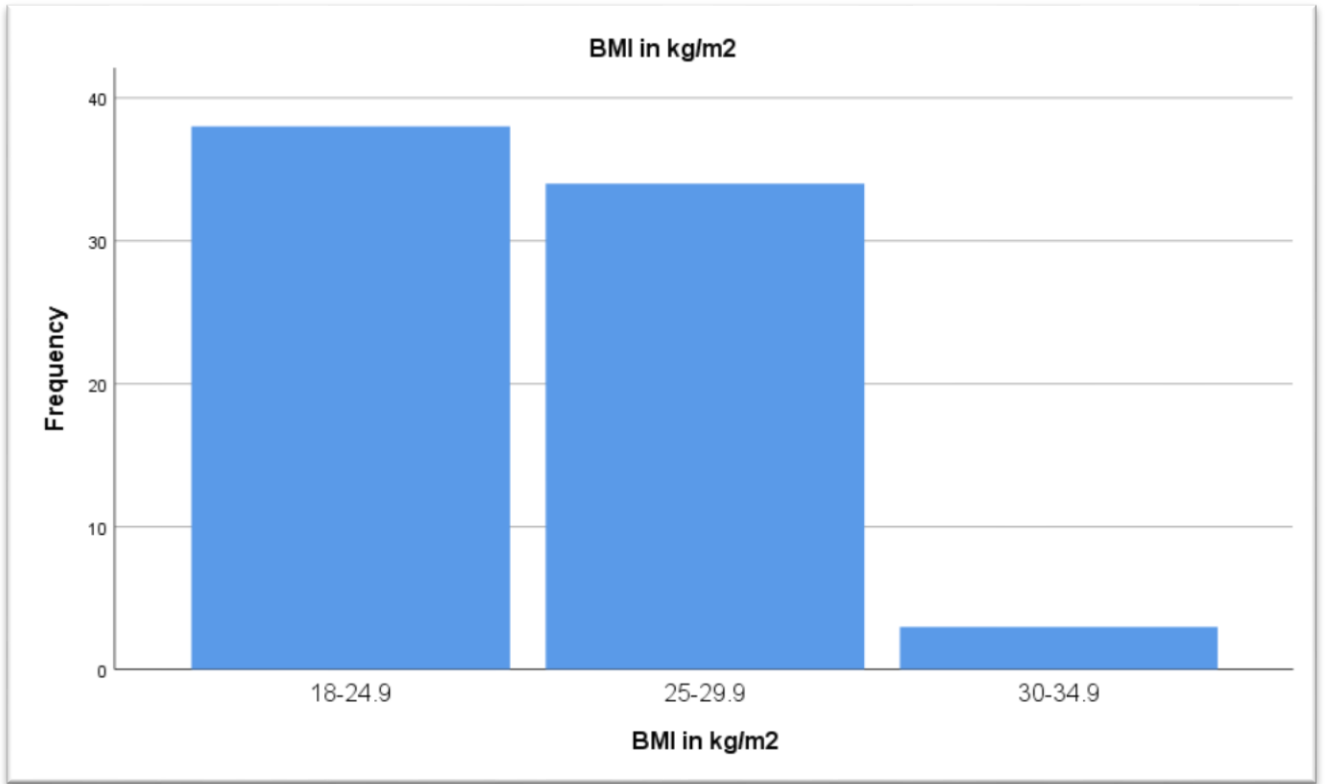
**Figure 2:** Distribution of cases according to BMI

Out of total 75 cases, 2 cases were smokers (2.6%), none of them were alcohol consumers and none of them gave history of any other drug abuse.

Regarding past obstetric history risk factors, 4 cases (5.3%) had previous h/o preterm birth, 3 cases (4%) had history of spontaneous or induced abortion and 4 cases (5.3%) had history of both preterm birth and abortions and 64 cases (85.3%) had no risk factors in obstetric history.

Obstetric history	No. of cases	Percentage
No history of PTB or abortions	64	85.3%
History of PTB	4	5.3%
History of abortion	3	4%
History of both PTB and abortion	4	5.3%

Table 2: Distribution of cases according to obstetric history risk factors

Out of 75 cases, 34 cases (45.3%) of preterm birth were due to spontaneous preterm labour in which no cause was identifiable, 18 cases (24%) was due to preterm premature rupture of membrane, 18 cases (24%) had some obstetrical indications for termination of pregnancy and 5 cases (6.7%) were due to multifetal pregnancy. The obstetrical indications for induced preterm labor were- PIH (8 cases, 10.7%), reduced AFI (6 cases, 8%), and APH (4 cases, 5.3%).
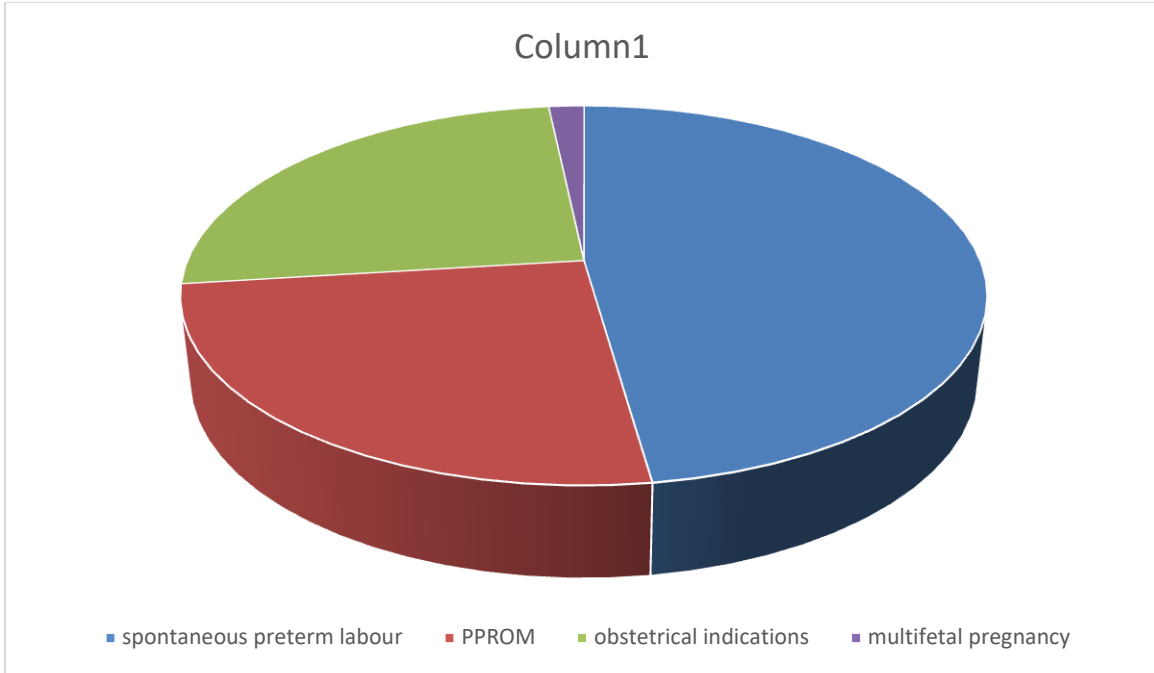
Figure 3: Direct cause leading to preterm birth

|	No. of cases	Percentage
Spontaneous preterm labor	34	45.3%
PPROM	18	24%
Obstetrical indications	18	24%
Multifetal pregnancy	5	6.7%

Table 3: Direct cause leading to preterm birth

Most common risk factor was anemia (17 cases, 22.7%), among them 15 cases (20%) had mild anemia and 2 cases (2.7%) had moderate anemia. Other risk factors were genitourinary infection (8 cases, 10.7%), hypertensive disorder of pregnancy (8 cases, 10.7%), reduced AFI (6 cases, 8%), hypothyroidism (5 cases, 6.7%) and no risk factors in 31 cases (41.3%).

Risk factors	No. of cases	Percentage
Anemia	17	22.7%
Genitourinary infections	8	10.7%
Hypertensive disorder of pregnancy	8	10.7%
Reduced AFI	6	8%
Hypothyroidism	5	6.7%
Diabetes mellitus	0	0%
No risk factors	31	41.3%

Table 4: Risk factors associated with preterm birth in index pregnancy

18 cases (24%) were between 29-32 weeks of gestation, 11 cases (14.7%) were between 32-34 weeks of gestation and 46 cases (61.3%) were between 34-37 weeks of gestation.
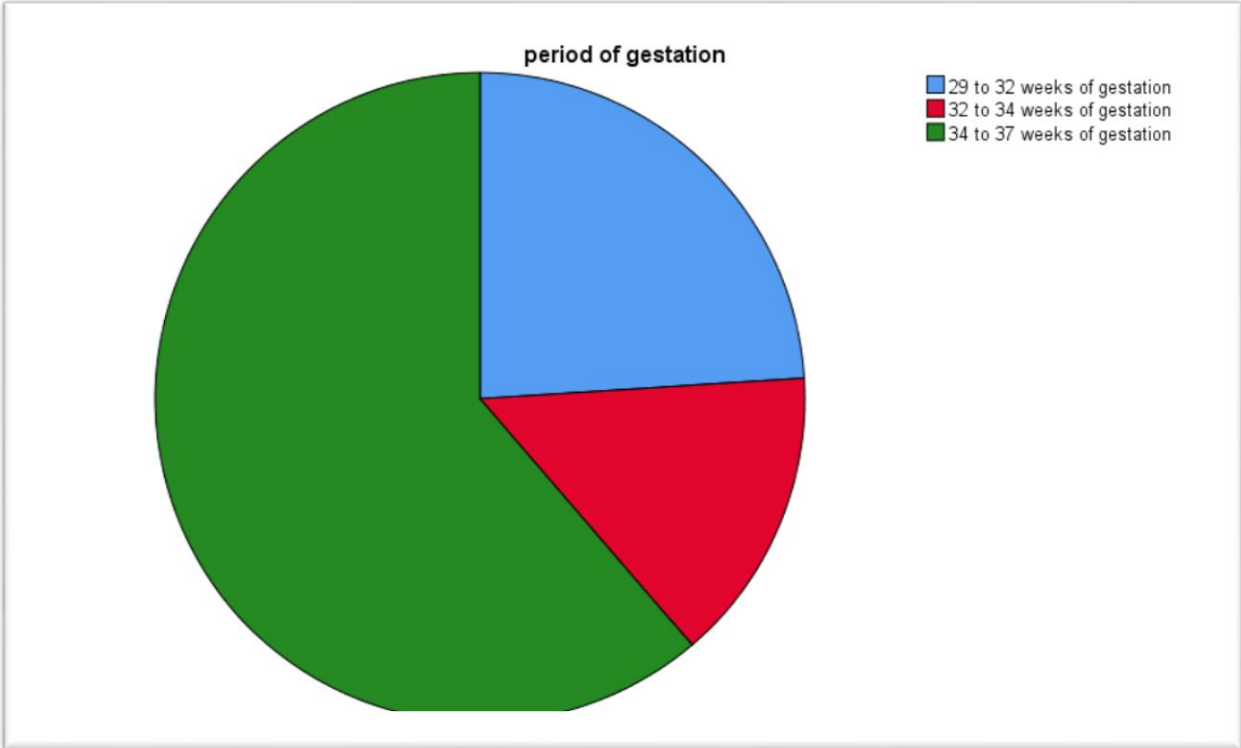
Figure 4: Distribution of cases as per period of gestation

Due to differences in the perinatal outcome of preterm babies at different period of gestation and for ease of study, preterm birth has been categorized in 3 groups as shown in table 5.

Regarding adverse perinatal outcome, it was more common among preterm newborns of 29-32 weeks of gestation compared to those between 32-34 weeks and 34-37 weeks of gestation as shown in table no.5. Mean birth weight was 1.29 kg for very preterm births, 1.97 kg for moderate preterm birth and 2.27 kg for late preterm birth. Overall mean birth weight was 1.99 kg. Mean duration of hospital stay was 16.2 days for very preterm birth, 7.6 days for moderate preterm birth and 3.17 days for late preterm birth. Overall mean duration of hospital stay was 6.94 days.

Low APGAR score was found in 16 cases (88.88%) of very preterm birth, 5 cases (45.45%) of moderate preterm birth and 6 cases (13%) of preterm births. NICU admission was 18 cases (100%) of very preterm birth, 7 cases (63.63%) of moderate preterm birth and 7 cases (15.21%) of late preterm birth. Overall NICU admission was 32 cases (42.66%). Perinatal mortality was seen among 5 cases (27.8%) of very preterm birth, 1 case (9.09%) of moderate preterm birth and no mortality among late preterm birth. Overall perinatal mortality was 6 cases (8%).

Perinatal outcome	29-32 weeks	32-34 weeks	34-37 weeks
Mean birth weight (in kg)	1.29	1.97	2.27
Mean duration of hospital stay	16.2 days	7.6 days	3.17 days
Low APGAR scores	16 (88.88%)	5 (45.45%)	6 (13%)
NICU admission	18 (100%)	7 (63.63%)	7 (15.21%)
Perinatal mortality	5 (27.8%)	1 (9.09%)	0

Table 5: Perinatal outcome

The perinatal morbidity is also categorized into three groups as per period of gestation as shown in table 6. Perinatal morbidity is measured in terms of hyaline membrane disease or respiratory distress syndrome, neonatal sepsis, neonatal hyperbilirubinemia and a combination of all of these. Perinatal morbidity was also greater among preterm newborns born at 29-32 weeks of gestation compared to late preterm births. Among very preterm births, 5 cases (27.8%) had respiratory distress syndrome (RDS), 3 cases (16.7%) had only neonatal sepsis, 8 cases (44.4%) had both RDS and neonatal sepsis and 2 cases (11.1%) had RDS, neonatal sepsis and hyperbilirubinemia. Among moderate preterm births, 6 cases (54.5%) had RDS, 1 case (9.1%) had only neonatal sepsis, 1 case (9.1%) had both RDS and neonatal sepsis and 1 case (9.1%) had RDS, neonatal sepsis and hyperbilirubinemia. 2 cases (18.2%) had no neonatal morbidity. Among late preterm births, 4 cases (8.7%) had RDS, 5 cases (10.9%) had neonatal sepsis, 1 case (2.2%) had both neonatal sepsis and RDS and 36 cases (78.3%) had no neonatal morbidities.

Perinatal morbidity	29-32 weeks	32-34 weeks	34-37 weeks
HMD or RDS	5 (27.8%)	6 (54.5%)	4 (8.7%)
Neonatal sepsis	3 (16.7%)	1 (9.1%)	5 (10.9%)
Both RDS and neonatal sepsis	8 (44.4%)	1 (9.1%)	1 (2.2%)
RDS, neonatal sepsis and hyperbilirubinemia	2 (11.1%)	1 (9.1%)	0
No neonatal morbidity	0	2 (18.2%)	36 (78.3%)
Total	18 cases	11 cases	46 cases

Table 6: Perinatal morbidity

DISCUSSION

The prevalence of preterm birth was 6.57% at Paropakar Maternity and Women's Hospital and this was similar to the worldwide prevalence of 6 to 11%[3.] Similar prevalence of 6.9% was found in the study done by Ojha N in 2015 at Tribhhuvan University Teaching Hospital, Kathmandu.[18]

Out of these 75 cases, 16 cases (21.3%) were less than 20 years old, 32 cases (42.7%) were between 20-24 years old, 16 cases (21.3%) were between 25-29 years old, 4 cases (5.3%) were between 30-34 years old, 6 cases (8%) were between 35-39 years old and 1 case (1.3%) was more than 40 years. The mean age was 23.8 years, minimum age was 17 years and maximum age was 42 years. So, majority of cases were less than 25 years of age (64%) in our study. A similar result was found in a study done by AAM Da Silva et al

which showed increased incidence of preterm birth in teen age pregnancy.[69] However our result doesn't comply with the study done by Waldenstrom U et al in 2017 which shows that advanced maternal age is associated with an increased risk of preterm birth, irrespective of parity, especially very preterm birth.[70] Similarly a study done by Cobo T et al in 2020 showed that the risk of preterm delivery increases with maternal age and women older than 35 years have an odds ratio (OR) of 1.4 with a 95% confidence interval (CI) of 1.3–1.5 for spontaneous preterm delivery.[71]

Out of 75 cases, most of them were primigravida (69.3%), 15 cases (20%) were in second parity, 7 cases (9.3%) were in third parity and only 1 case (1.3%) was grand multipara. So, our result does not show increased incidence of preterm labour with multiparity as most cases were primigravida. A meta-analysis of cohort studies done by Kozuki N et al showed similar result that nulliparous women below 18 years of age had the highest risk of preterm birth across all age/parity categories (OR: 1.52, 95% CI: 1.40e1.66).[22] However another systematic review done by Kazemier BM et al in 2014 showed multiparity and low inter-pregnancy interval less than 6 months to be a strong risk factor for preterm birth.[24]

A prior preterm delivery is one of the most consistently reported risk factors for preterm delivery.[5,71] However in our study most of the women were primigravida and so the recurrence risk was not significant. Among 22 multiparous women, 8 women (36.3%) had history of previous preterm birth. This was similar to study done by Goldenburg et al which showed the recurrence risk in women with a previous preterm delivery ranging from 15% to more than 50%.[5]

Out of 75 cases, 7 cases (9.3%) had history of prior spontaneous or induced abortion. A systematic review and meta-analysis done by Saccone G et al in 2016 concluded that prior surgical uterine evacuation is an independent risk factor for preterm labour.[72] Similarly, another systematic review of 16 studies done by Swingle HM et al in 2009 showed that the OR for preterm birth increased with multiple induced abortions and ranged from 1.25 (95% CI 1.03 to 1.48) following one abortion to 1.51 (95% CI 1.21 to 1.75) following two or more abortions, and OR increased following one spontaneous abortion (adjusted OR 1.43, 95% CI 1.05 to 1.66; six studies) to following more than one spontaneous abortion (adjusted OR 2.27, 95% CI 1.98 to 2.81; seven studies).[73]

38 cases (50.7%) were having normal body mass index (BMI 18-24.9), 34 cases (45.3%) were overweight (BMI 25-29.9), and 3 cases (4%), were having grade 1 obesity (BMI 30-34.9). In our hospital, many cases are unbooked cases and even for booked cases, pre-pregnancy body weight is not known. So, pre-pregnancy BMI could not be measured in our study. Hence, we have calculated the BMI of patients at the time of admission. Our study shows that overweight and obesity is a risk factor for preterm birth, but there were no underweight cases as BMI was taken in 3rd trimester and it is not reliable.

Different studies have shown obesity and underweight both to be a risk factor for preterm birth. In a systematic review and meta-analysis done by McDonald SD et al in 2010, although the overall risk of preterm birth was similar in overweight and obese women and women of normal weight, the risk of induced preterm birth was increased in overweight and obese women (relative risk 1.30, 95% confidence interval 1.23 to

1.37).[74]

Similarly, another study done by AM Lynch et al in 2014 showed a significant increase in the overall incidence of PTB at the extremes of BMI, a higher risk for PTB from spontaneous preterm labor at the lower extremes of BMI, a higher risk for preterm premature rupture of the membranes at the upper extremes of BMI and a higher risk for a medically indicated PTB at the lower and upper extreme of BMI.[75]

In a retrospective cohort study done by Vinturache A et al in 2017, risk of spontaneous PTB was increased in obese nulliparas (adjusted OR (aOR) 2.8, 95% CI 1.7 to 4.4) and underweight multiparas (aOR 2.2, 95% CI 1.3 to 3.8). The risk of elective PTB was increased in underweight nulliparas (aOR 1.8; 95% CI 1.04 to 3.4) and severely obese multiparas (aOR 1.4, 95% CI 1.02 to 3.8).[76]

In our study, only 2 cases were smoker and none of them were alcohol consumer or other drug abuser, so it is difficult to make an inference regarding smoking and alcohol as a risk factor for preterm labour from our study. In a population based case- Smith LK et al in 2015, they found that Women who smoked during pregnancy were at 38% increased risk of preterm birth compared with non-smokers (RR 1.38, 95% CI 1.04 to 1.84) while there was no significant effect of alcohol or recreational drug use on preterm birth.[77]

Out of 75 cases, 34 cases (45.3%) of preterm birth were due to spontaneous preterm labour in which no cause was identifiable, 18 cases (24%) were due to preterm premature rupture of membrane, 18 cases (24%) had some obstetrical indications for termination of pregnancy and 5 cases (6.7%) were due to multifetal pregnancy. This result is somewhat similar to a study done by Goldenberg RJ et al in 2008 which showed that 30-35% of preterm births have some obstetrical indications, 40-45 percent are due to spontaneous preterm labour and 30-35% follow preterm membrane rupture.[5]

Similarly, in a study done by Moutquin JM in 2003, it was found that four main conditions explain preterm birth: medically indicated (iatrogenic) preterm birth (25%; 18.7–35.2%), preterm premature rupture of membranes (PPROM) (25%; 7.1–51.2%) spontaneous (idiopathic) preterm birth (40%; 23.2–64.1%), multiple pregnancies (10% of all preterm births).[78] This result is also similar to result in our study with approximately similar percentages.

The obstetrical indications for induced preterm labour were- PIH (8 cases, 10.7%), reduced AFI (6 cases, 8%), and APH (4 cases, 5.3%). In a study done by Ananth CV et al in 2006, the underlying clinical conditions necessitating medically indicated preterm births were preeclampsia (23%), IUGR or SGA (19%), fetal distress (23%), placental abruption (12%) and others (47%). The others category included DM in pregnancy, abnormalities of liquor volume, chronic kidney diseases and other medical or surgical illness complicating pregnancy. This result is nearly similar to result of our study.[79] Similarly in another study done by Meis PJ et al, the underlying conditions necessitating preterm births were preeclampsia (43%), fetal distress (37%), placental abruption (7%), and others (13%) which is also somewhat similar to our study.[80]

Similarly, Goldenberg RJ et al in 2008 also concluded that preeclampsia, vaginal bleeding caused by placental abruption or placenta previa, extremes in the volume of amniotic fluid—polyhydramnios or

oligohydramnios, maternal medical disorders, such as thyroid disease, asthma, diabetes, and hypertension, are associated with increased rates of preterm delivery, many of which are indicated because of maternal complications.[5]

Most common risk factor associated with preterm birth was anemia (17 cases, 22.7%), among them 15 cases (20%) had mild anemia and 2 cases (2.7%) had moderate anemia. Other risk factors associated were genitourinary infection (8 cases, 10.7%), hypertensive disorder of pregnancy (8 cases, 10.7%), reduced AFI (6 cases, 8%), hypothyroidism (5 cases, 6.7%) and no risk factors in 31 cases (41.3%). Regarding this association, there are different results in different study and apart from risk factors in our study; there are other risk factors as well which are associated with preterm labour.

In a case control study done by Jiang M et al in 2018, it was found that maternal age, prior history of pregnancy and abortion, prenatal care, complications of pregnancy (includes hypertension, intrahepatic cholestasis of pregnancy (ICP), fetal growth restriction (FGR), premature rupture of the membranes (PROM), placenta previa, abnormal presentation, abnormal S/D ratio were significantly associated with preterm birth.[81]

In a cross sectional study done by Khanum MA in 2017, Premature rupture of membranes was found to be the most common risk factor related with preterm labour in the present pregnancy. Genitourinary tract infection was the next important risk factor of preterm labour (24.8%), patients had either vaginal infection (19.5%) or urinary infection (21.4%) or both. Another important risk factor identified in this study was antepartum haemorrhage which was cause in 11.4 % cases.[82]

In a systematic review and meta-analysis done by Devi T et al in 2020 in India, it was found that the overall pooled risk of PTB varies with different risk factors such as gestational hypertension shows 19.16% (95% CI 8.54 to 29.78, I2 = 84.09 %); 9.49% for gravida (95% CI 2.99 to 16.00, I2 = 86.07%), 8.34 % for anaemia (95% CI 4.45 to 12.24, I2 = 79.88%)]; 8.34% for prior preterm birth (95% CI 4.45 to 12.24, I2 = 94.89%)] and4.61% for gestational diabetes (95% CI 1.48 to 7.73, I2 = 53.27%). Moreover, low socioeconomic status, inadequate antenatal care, infections during pregnancy, and advance maternal age, were also found to be potential risk factors of PTB among the Indian population.[83]

In an observational study done by Gurung A et al in 2020 in 14 public hospitals of Nepal, it was found that nulliparity (aOR 1.33; 1.20–1.48), multiple delivery (aOR 6.63; 5.16–8.52), severe anemia during pregnancy (aOR 3.27; 2.21–4.84), less than 4 antenatal visits during pregnancy (aOR 1.49; 1.38–1.61) and maternal age less than 20 years (aOR 1.26;1.15–1.39) were significant risk factors of preterm birth.[84]

Regarding perinatal outcome, it depends on weeks of gestation and birth weight. So, we classified preterm births as extremely preterm (<28 weeks); very preterm (28–<32 weeks); moderate preterm (32–<34 weeks); and late preterm (34-<37 weeks of gestation).[1] In our country, preterm babies less than 28 weeks are not viable and so they were excluded from study. Among 75 cases, 18 cases (24%) were between 29-32 weeks of gestation, 11 cases (14.7%) were between 32-34 weeks of gestation and 46 cases (61.3%) were between 34-37 weeks of gestation.

The overall perinatal mortality for preterm baby was 8% (6 cases) in our study, it was 27.80 % for very preterm babies between 28-<32 weeks, and 9.09% for moderate preterm babies between 32-<34 weeks and no mortality among late preterm babies. Perinatal mortality was highest among very preterm babies. Overall NICU admission was 32 cases (42.66%) and low APGAR score was 27 cases (36%). NICU admission rate was also highest among very preterm babies (100%) compared to moderate preterm babies (63.63%) and late preterm birth (15.21%).

A similar result was found in a descriptive study done by Chaudhary K et al in 2020 in India, in which 46% babies were admitted in NICU for various reasons and 12% babies had perinatal death.[85]

Another similar result was found in a cohort study done by Mathew SM et al in 2018 in which perinatal mortality was 9.33% and NICU admission was 20%.[5]

However, another study showed poor neonatal outcome in preterm birth. This study done by Al-Assadi AF et al in 2018 showed that Perinatal death among preterm birth was 34.7%, antepartum haemorrhage and congenital abnormalities were the common causes of stillbirth, whereas respiratory distress syndrome was the common cause of early neonatal deaths. Neonatal death rate was 84.3% in babies with birth weight less than 1000 grams.[86]

In a descriptive retrospective study done in our country by Shrestha S et al in 2010, the neonatal mortality among preterm babies was 20.6%, the mortality rate in extremely low birth weight and very low birth weight was 80% and 39.5% respectively. The common causes of death were hyaline membrane disease (64.5%), sepsis (58.06%) and necrotizing enterocolitis (25.8%).[19]

In our study mean birth weight was 1.29 kg for very preterm births, 1.97 kg for moderate preterm birth and 2.27 kg for late preterm birth. Overall mean birth weight was 1.99 kg.

A similar result was found in a descriptive study done by Chaudhary K et al in 2020 in India in which Mean birth weight of preterm baby was 1.7 ± 0.4 Kg.[85]

In our study, mean duration of hospital stay was 16.2 days for very preterm babies, 7.6 days for moderate preterm babies and 3.17 days for late preterm babies. Overall mean duration of hospital stay was 6.94 days.

The perinatal morbidity is also categorized into three groups as per period of gestation. Perinatal morbidity is measured in terms of hyaline membrane disease or respiratory distress syndrome, neonatal sepsis, neonatal hyperbilirubinemia and a combination of all of these. Perinatal morbidity was also greater among preterm newborns born at 29-32 weeks of gestation compared to late preterm births. Among very preterm births, 5 cases (27.8%) had respiratory distress syndrome (RDS), 3 cases (16.7%) had only neonatal sepsis, 8 cases (44.4%) had both RDS and neonatal sepsis and 2 cases (11.1%) had RDS, neonatal sepsis and hyperbilirubinemia. Among moderate preterm births, 6 cases (54.5%) had RDS, 1 case (9.1%) had only neonatal sepsis, 1 case (9.1%) had both RDS and neonatal sepsis and 1 case (9.1%) had RDS, neonatal sepsis and hyperbilirubinemia. 2 cases (18.2%) had no neonatal morbidity. Among late preterm births, 4 cases (8.7%) had RDS, 5 cases (10.9%) had neonatal sepsis, 1 case (2.2%) had both neonatal sepsis and RDS and 36

cases (78.3%) had no neonatal morbidities.

Our result shows that there is greatest risk of hyaline membrane disease and neonatal sepsis in very preterm birth compared to moderate and late preterm births. There was 100% neonatal morbidity among very preterm babies while 2 babies (18.2%) of moderate preterm babies had no neonatal morbidity and 36 babies (78.3%) of late preterm babies had no neonatal morbidity.

Comparing neonatal morbidity among preterm babies, a similar result was found in a descriptive retrospective study done in our country by Shrestha S et al in 2010, in which Common morbidities were clinical sepsis (66.7%), hyperbilirubinemia (58.8%), birth asphyxia (26.8%) and hyaline membrane disease (23.5%).[19]

In another descriptive study done by Chaudhary K et al in 2020 in India, the common neonatal morbidities werebirth asphyxia (42%) followed by extreme prematurity (16%), septicemia (12%) jaundice (11%), RDS (10%) and hypoglycaemia (7%).[85] This result is slightly different from our study because RDS was most common neonatal morbidity in our study, but the leading morbidity birth asphyxia may be due to RDS.

Similarly, in a retrospective study done by Paudel L et al in 2018 in western Nepal, common morbidities were Sepsis (40.9%), Jaundice (28%), Respiratory Distress Syndrome (RDS) (14%) and necrotizing enterocolitis (2.2%). Case fatality rate was significantly high in RDS (45.1%) and perinatal asphyxia (11.1%). Overall survival rate was 75.26%.[87]

A different result was seen in a prospective study done by Mathew SM et al in 2018 which showed that most common neonatal morbidity was hyperbilirubinemia (54.7%) followed by RDS (23%), neonatal sepsis (5%) and perinatal mortality of 9.86%.[6] Neonatal hyperbilirubinemia was the leading complication in the late preterm babies while RDS was leading complication in moderate preterm babies while neonatal sepsis was equally common in both moderate and late preterm babies.[6] Hence, we can say that RDS and neonatal sepsis is the most common neonatal morbidity among preterm babies followed by hyperbilirubinemia and morbidities decrease with increasing period of gestation.

CONCLUSION

In our study total 75 cases of preterm labour were enrolled meeting the inclusion criteria after taking informed consent. Incidence of preterm birth at Paropakar Maternity and Women's Hospital was 6.57%. 64% cases were less than 25 years old and 69.3% cases were primigravida suggesting that young maternal age and primiparity is a risk factor for preterm birth. 45.3% cases were overweight (BMI 25-29.9). Smoking, alcohol consumption and drug abuse was not associated with preterm labour.14.6% cases had either a history of preterm birth or abortion.

Spontaneous preterm labour was most common (45.3%) followed by PPROM (24%), induced preterm birth for obstetrical indications (24%) and multifetal pregnancy (6.7%). The obstetrical indications were PIH (10.7%), abnormal AFI (8%) and APH (5.3%). Other common risk factors associated with preterm

births were anemia (22.7%), genitourinary infection (10.7%), PIH (10.7%), reduced AFI (8%) and hypothyroidism (6.7%).

On the basis of gestational age, 24% cases were very preterm, 14.7% cases were moderate preterm and 61.3% cases were late preterm. Adverse perinatal outcome was worst among very preterm births. Overall perinatal mortality rate was 8%, mean birth weight was 1.99 kg, mean duration of hospital stay was 6.94 days, NICU admission was 42.66%. Most common neonatal morbidity was RDS (37.33%) followed by neonatal sepsis (29.33%) and hyperbilirubinemia (4%) while 50.67% cases had no neonatal morbidity and most of them were late preterm births.

Hence, the main risk factors for preterm birth were primigravida, young maternal age, overweight, previous history of preterm labour and abortion, PPROM, multifetal pregnancy, PIH, abnormal AFI, APH, anemia, genitourinary infections and hypothyroidism. Late preterm birth was more common while perinatal morbidity and mortality was more common among very preterm birth. Most common neonatal morbidity was RDS followed by neonatal sepsis and hyperbilirubinemia.

Limitations:

The study population in this study was small and it's difficult to implicate the data obtained from such small sample to entire population. This study was done at a single center. Time frame was relatively shorter. Extremely preterm birth was excluded from the study so overall burden of preterm labour, perinatal morbidity and mortality was not accurate.

Recommendations:

Most of the etiological factors of PTB are modifiable and hence giving community awareness and preconception counseling should be emphasized to diminish the health consequences and burden of preterm birth.

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