International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Factors Associated With Preterm Births – Hospital Based Observational Study

Dr. Kundal Mittal[1], Dr. Meenakshi Chauhan[2], Dr. Sudha Yadav[3]

[1, 2]Professor, Department of Pediatrics and Obstetrics & Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak-124001, Haryana (India)

[3]P.G. Student, Department of Pediatrics, Pt. B.D. Sharma PGIMS, Rohtak-124001, Haryana, India

Short running title: Factors associated with preterm births

Abstract: ***Aims and Objectives: To know the risk factors in mother responsible for preterm birth and compare to factors in term .Preterm birth is a major concern worldwide. Globally, Preterm Birth is the major cause of neonatal deaths. Approximately 12.9 million babies are born before completed 37 weeks of gestational age worldwide every year, representing an incidence of PTB between 5-25%. Twenty eight percent of all 4 million annual neonatal deaths are directly attributable to PTB.1 Material and Methods:Present study was conducted with 100 term and 100 preterm neonate over a period of one year and nine months in Department of Pediatrics at Pt. B.D. Sharma Post Graduate Institute of Medical Sciences, Rohtak, Haryana to know the various risk factors associated with preterm births.RESULTS: One hundred term and 100 preterm neonate were studied with total 44 risk factors out of which 21 were found to be associated with preterm birth. Conclusion: Risk factors for preterm birth wereMultiple fetus in pregnancy, previous Abortion, polyhydramnios, previous preterm birth, preeclampsia, cervical incompetence, recurrent abortion, antepartum hemorrhage, bacterial vaginosis, leaking per vaginum, high vaginal swab positive, placental membrane culture positive for bacteria, hematocrit <32gm, anemia, short interpregnancy interval , assisted reproductive technique, underweight mother, low education status, fever in mother in pregnancy, UTI in pregnancy.***

Keywords: Preterm, Births, Factors

1. Introduction

Preterm birth rates are increasing in most countries and had increased by 33% in the last 25 years, almost entirely due to the rise in late preterm births (34 6/7-36 6/7 weeks).[2]

Preterm birth is a risk factor in over 50% of all neonatal deaths and direct complications of preterm birth account for one million deaths each year one every 30 sec.[3]Neonatal mortality is important because the proportion of under-five deaths that occur during the neonatal period is increasing as under-five mortality declines.

India, with its highest number of preterm birth worldwide, contributes 25% of the overall global preterm related deaths.. The effects of PTB extend beyond the early infancy with substantial long-term consequences in late childhood and adult life.[6]Although we don't have consistent preterm birth data collection system in India, incidence of preterm birth in India is approximately 21%.[2]

Though the infant mortality rate (IMR) in our country has dropped from one hundred fourty four per thousand live births to eighty four per thousand live births in the past few decades the neonatal mortality rate still accounts for over 50% of the IMR.[6]Neonatal deaths account for 50 percent of under-five deaths.[5]Incidence of preterm birth is high in India because of many reasons including early childbearing, short interpregnancy interval, low education level, undiagnosed obstetrics and medical complications, poor maternal and child care.[2]

Although hospital deliveries have increased considerably since the launch of NRHM (National rural health mission) but PNMR (perinatal neonatal mortality) has not shown significant decline. NRHM strategy is to increase institutional delivery rate but quality of care still remains a issue

2. Programmes in India for Preterm Birth

India Newborn Action Plan

Launched in India in September 2014.The commitments in the India Newborn Action Plan (INAP) were developed to align with the global ENAP. India however aspires to achieve the global ENAP targets by 2030—five years ahead of the global deadline-with all the states to individually achieve the targets by the end of 2035. The targets proposed in the INAP-reducing preventable newborn deaths and preventable stillbirths to single digits, i.e., fewer than 10 per 1,000 live births by 2030, with intermediate targets for 2017, 2020 and 2025. Maternal and perinatal death inquiries can also identify the bottlenecks and stimulate corrective actions at local level.[7]

National milestone to monitor INAP

Year	Milestones
2014	National launch – India Newborn Action Plan
2015-16	State Newborn Action Plans developed
2018-19	Stillbirth tracking mechanism strengthened Accountability framework developed and operationalized at all levels of health care
2020	Review and update action plan

Strategies for preterm birth

Care of small and sick newborn

- Kangaroo mother care
- Intensive care services(NICU) at regional level for assisted ventilation, surfactant use and surgery.

Care beyond newborn survival

- Small and low birth weight babies till 2years of age.
- SNCU discharged infants till one year of age.
- Antenatal steroids in preterm labour
- Antibiotics for premature rupture of membranes

3. Issuesin Preterm Birth

The significance of preterm birth lies in the complications of prematurity sustained by the infant and the impacts of these complications on the infant's survival and subsequent development.Preterm births account for 75% of perinatal mortality and make up more than 50% of long - term morbidity associated with poor perinatal outcomes.[9]

Economic Concerns: The economic costs of preterm birth are large in terms of immediate neonatal intensive care, ongoing long-term complex health needs, as well as lost economic productivity. There is high magnitude of reduced income and missed work days. There are direct medical costs, direct non-medical costs, indirect costs and reduced quality of life for caregivers and children that should be evaluated measuring personal burden of preterm birth on families adequately.[9]

Health Issues: The complications of preterm birth arise from immature organ systems that are not yet prepared to support life in the extrauterine environment. The risk of acute neonatal illness decreases with gestational age, reflecting the fragility and immaturity of the brain, lungs, immune system, kidneys, skin, eyes, and gastrointestinal system.[10]

Immediate Complications: include hyaline membrane disease(may require surfactant therapy and mechanical ventilation), respiratory distress, intraventicular haemorrhage, increased chances of sepsis, feed intolerance, neonatal jaundice, hypoglycemia, hypocalcemia, hypoglycemia, neurological insult, neonatal seizures, deranged coagulation profile.

Long Term Comlications: Long term outcome of preterm babies can be in form of visual impairment including retinopathy of prematurity, blindness, high myopia, hypermetropia especially if they are given poorly monitored oxygen therapy, hearing impairment, chronic lung disease, reduced exercise tolerance, repeated hospital admissions in childhood for lower respiratory tract infection, higher rates of cerebral palsy, hydrocephalus, learning disabilities, sensory deficits.[8]

Social Issues: Contribution of prematurity to disability in the community

Complications of preterm birth are the single largest direct cause of neonatal deaths. Preterm birth may result in growth failure in infancy, neuro-developmental disorders, specific learning impairments, dyslexia, behavioral effects, reduced academic achievement, moderate/severe cognitive impairment and global developmental delay, attention deficit hyperactivity disorder, anxiety, depression.The long term complications add to loss of productive population, more human resources being wasted.[11]

The study was planned to know the risk factors in mother responsible for preterm birth delivering in a tertiary care centre in PGIMS, Rohtak and compare to factors in term delivery. The study assessed the relative association of various risk factors responsible for preterm birth, to identify antenatal risk factors for spontaneous and iatrogenic preterm delivery and to what extent risk factors identified worldwide are responsible for preterm birth in India also.

4. Material and Methods

Hundred term and hundred preterm babies and their mothers delivered in hospital (booked patients with one antenatal visit) were included in the present hospital based observational case control study in the Deptt. of Pediatrics and Obstetrics. & Gynecology, Postgraduate institute of medical sciences (PGIMS)Rohtak, Haryana. Preterm birth based on date of last menstrual period or ultrasonography (USG) and Ballard scoring were included.Congenitally malformed newborn and severely asphyxiated neonate were excluded.

Main dependent variable studied in the present study was preterm birth either spontaneous or induced.The independent variables evaluated were related tosocio demographic characteristics(age of conception, working status, weight assessment, inter pregnancy interval, tobacco alcohol use, previous history of preterm birth, abortion, parity, assisted reproductive technique, obstetric factors such as cervical insufficiency (any clinical or ultrasound sign), uterine fibroid, preeclampsia,antepartum hemorrhage, polyhydramnios, multiple fetus in pregnancy, leaking per vaginum, bacterial vaginosis,and urinary tract infections.

Potential cases were all women who delivered in the labour room at a gestational age between 28 and 37 weeks. For every case, one controlwas obtained.Controls were all women who had a live birth after 37 weeks of gestational age. The controls were age matched.The gestational age was assessed by using date of last menstrual period and ballard scoring.

Data Collection

A proformawas prepared based on existing literature and was pretested. Mothers with at least one antenatal visit was taken as subject. An informed written consent was obtained all mothers wereinterviewed face-to-face.

Placental membrane culture

At the time of delivery placental membrane was taken with help of forceps and was put in sterile container containing normal saline and was sent for culture to microbiology lab.Preterm birth was decided according to gestational age based on date of last menstrual period, USGand Ballard scoring.

Data analyzed using SPSS for Windows version 22.0, using descriptive statistics, chi-square test and t test to compare cases and controls.Variables were summarized using summary statistics like, mean, median and percentage with 95% CI.For assessment of the independent effects of factors, odds ratio (OR) with 95% CI and p-value was calculated.The p- value less than 0.05 was taken significant.

5. Results

A total 44 risk factors were studied - 20 were found to be associated with preterm birth.

28% of mothers who delivered preterm had multiple fetus and 7% of mothers who delivered term had multiple fetus (p 0.0003), 21% of ladies who delivered preterm and 2% of mothers who delivered term had history of previous abortion. History of previous abortion was found as risk factor for preterm birth (p-value 0.01).17% mothers who delivered preterm had polyhydramnios and 2% of mothers who delivered term had polyhydramnios (p 0.01). 21% mothers who delivered preterm had a history of previous preterm birth and 1% of mothers who elivered term had a history of preterm birth. The p-value was significant i.e. 0.000.34% of preterm deliveries had preeclampsia and only 5% of term deliveries had preeclampsia (p 0.001) 14% of mothers who delivered preterm had cervical incompetence and 2% of mothers who delivered term had cervical incompetence (p 0.01). 10% of mothers who delivered preterm had history of recurrent abortion and 2% mothers with term delivery had history of recurrent abortion (p 0.01). 37% of mothers with preterm delivery and 11% mothers with term delivery had antepartum hemorrhage. The p-value was 0.001 which was significant. 16% of mothers with preterm birth had bacterial vaginosis and 5% of mothers with term birth had bacterial vaginosis. The p-value was 0.01 which was significant. High vaginal swab (HVS) was sent for patients with leaking per vaginum.18 mothers among total 29mothers with LPV >18hrs and preterm delivery hadpositive high vaginal swab. 2 mothers with LPV >18hrs and term delivery had positive HVS. 29% of mothers with preterm birth had leaking per vaginum for more than 18 hrsand7% ofmothers with term deliveries had leaking per vaginum for more than 18hrs. The p-value was 0.01 which was significant.Placental membrane culture was sent for patients with leaking per vaginum. 21 mothers among total 29 mothers with preterm delivery with LPV >18hrs had positive placental membrane culture for bacteria. And 5 among 7 mothers with LPV >18hrs had positive placental membrane culture. The p-value was significant i.e.0.0001. 29% of mothers with preterm birth had hematocrit <32 and 8% of mothers with term birth had hematocrit <32. The p-value was 0.01 which was significant. 28% mothers with preterm birth had anemia (Hb<11gm) and 9% of mothers with term delivery had anemia (Hb<11gm). The p-value was 0.01 which was significant. 10% of mothers with preterm birth had abnormal position of placenta and 11% of mothers with term birth had abnormal position of placenta. The p-value was 0.8176 which was not significant. 9% of mothers with preterm deliveries had history of gestational diabetes mellitus and 1% of mothers with gestational diabetes had history of gestational diabetes mellitus. The p-value was 0.603 which was not significant.6% of mothers with preterm birth and 4% with term birth had chronic hypertension. The p-value was 0.519 which was not significant. 4% of preterm deliveries had oligohydramnios and 5% of term deliveries had oligohydramnios. The p-value was 0.73 which was not significant (Table 1).

31% of mothers who delivered preterm had short interpregnancy interval (time interval between 2 pregnancies < 6 months) and only 2% of mothers who delivered term had pregnancy interval <6 months. The p-value was 0.000 which was significant. 21% of mothers with preterm birth had history of receiving assisted reproductive technique and 2% of mothers with term birth had history of receiving ART.The p-value was 0.000 which was significant.14% of mothers who delivered preterm were underweight prior to pregnancy and 5% of mothers who delivered term were underweight. The p-value was 0.00 which was significant. 86% of mothers who delivered preterm were uneducated and i.e. qualified below matric and 72% of mothers who delivered term were qualified below matric. The factor had a p-value of 0.01 which was significant. 16% of mothers with preterm deliveries had history of fever and 7% of mothers with term delivery had history of fever. The p-value was 0.04 which was significant.19% of mothers with preterm delivery and 15% mothers with term delivery had family history of previous preterm birth. The p-value was 0.41 which was not significant. 11% mother with preterm birth were HIV positive and 10% mothers with term births were HIV positive. The p-value was 0.817 which was not significant. One mother with preterm birth had VDRL positive and 2 mother with term birth had VDRL positive. The p-value was 0.518 which was not significant. 10 Mothers with preterm birth had malaria and 11mothers with term birth had malaria. The p-value was 0.568 which was not significant. 32 mothers with preterm birth had history of previous LSCS and 28 mothers with term birth had history of previous LSCS. The p-value was 0.532 which was not significant. 5% of mothers who delivered preterm had history of heart disease and 3% of motherswho delivered term had heart disease. The p-value was 0.5 which was not significant. 26% of mothers who delivered preterm had ABO incompatibility and 8% had Rh incompatibility. 20% of mothers who delivered term had ABO incompatibility and 7% had Rh incompatibility. The p-value for ABO incompatibility was 0.28 and 0.67 for RH incompatibility.Among mothers who delivered preterm 4 had thyroid disease and 2 among who delivered term had thyroid disease. The p-value was 0.34 which was not significant. Only 2 mothers were diagnosed as APLA antenatally who delivered preterm and term. The p-value was one which was not significant. 18% ofmothers who delivered preterm had periodontal disease and 11% of mothers who delivered term had periodontal disease. P value was 0.147 which was not significant. 14% of mothers who delivered preterm had weight gain less than 15kg and 10% of mothers who delivered term had weight gain less than 15kg. The p-value was 0.386 which was not significant. 64% of mothers who delivered preterm were working and 59% of mothers who delivered term were working. The p-value was 0.4671 which was not significant (Table 2).16% mothers with preterm birth had UTI7% mothers with term delivery had UTI. The p-value was 0.04 which was significant.6 mothers who delivered preterm had history of thromboembolic disorder and 4 patients who delivered term had thromboembolic disorder and p-value was 0.539 which was not significant.6% of mothers with preterm births had chronic hypertension and 4% mothers with term delivery had chronic hypertension. P-value was 0.539 which was not significant.No mother with term or pretermbirth had history of uterine biopsy. The p-value was 0.537 which was not significant.No mother with term or preterm birth had history of myoma. P-value was 0.537 which was not significant.No

mother with preterm birth or term birth had history of smoking. The p-value was 0.537 which was not significant.No mother with preterm or term birth had history of alcohol. The p-value was 0.537 which was not significant (Table 2).

6. Discussion

Preterm birth is a major challenge for maternal and perinatal care and a leading cause of neonatal morbidity and mortality. Multiple genetic, environmental, and immunological factors contribute to a woman's likelihood of preterm delivery. Preterm labor likely results from local changes that prematurely stimulate the cascade of events resulting in spontaneous labor or prematurely withdraw suppressive factors that maintain uterine quiescence and thus inhibit this cascade.[12]Identification of risk factors for spontaneous preterm birth (PTB) before conception or early in pregnancy would help to identify interventions that could help prevent this complication.[12]Most of the factors which have been found to be associated with preterm birth in our study have also been found to have significant association in studies conducted worldwide in variable strength.

7. Obstetric Risk Factors

Obstetrics factors were found to be most commonly leading to preterm birth.Multiple fetus in pregnancy, polyhydramnios, preeclampsia, cervical incompetence, recurrent abortion, antepartum hemorrhage, leaking per vaginum were found to be strong risk factors of preterm birth whereas oligohydraamnios, position of placenta, gestational diabetes mellitus, chronic hypertension were not found to be causative factor of preterm birth.

Non Obstetric risk Factors

Among demographic profile of mother low education status was found to be a significant risk factor as 84 percent of mothers who delivered preterm were uneducated, but working mothers were not found to deliver prematurely (64 percent). Less maternal age at conception was not found to be associated with preterm birth (19 percent). Underweight mothers were found to be deliver preterm (14 percent).UTI and bacterial vaginosis was found to predispose to preterm birth. Diabetes and chronic hypertension were not found to be risk factor for preterm birth.Infections with positive high vaginal swab was a significant risk factor for preterm birth (p value 0.01).Fever in mother was associated with preterm delivery (p value 0.046).Fetomaternal blood incompatibility, thromboembolic disorders, thyroid disorder, heart disease,chronic hypertension have not been found to be associated with preterm birth.Though the incidence of cesarean section is increasing in modern obstetrics practice, it was not found to be risk factor for preterm birth.We couldn't find the association of uterine biopsy, uterine myoma with preterm birth as no patient was available with history of uterine biopsy and uterine myoma.Uterine anomalies are not usually diagnosed antenatally. Therefore the association of preterm birth with anomalies of uterus couldn't be evaluated.

Antiphospholipid antibody syndrome was not diagnosed in many patients antenatally as most patients couldn't afford costly investigations.APLA syndrome leads to obstetric complications like recurrent miscarriage, early delivery, oligohydramnios, prematurity, intrauterine growth restriction, fetal distress, fetal or neonatal thrombosis, pre-eclampsia/eclampsia, HELLP syndrome, arterial or venous thrombosis and placental insufficiency which lead to preterm birth in numerous cases.Sexually transmitted disease like HIV positive mothers and VDRL positive doesn't predispose to preterm birth. Prevalence of syphilis is low in north India therefore the association of preterm birth with syphilis couldn't be established in our study.Association of substance abuse like alcohol and smoking with preterm birth couldn't be evaluated in our study because of no use of these substances by antenatal patients in our community. Factors not found associated with preterm birth were age of mother at conception**,** gravidity (gravida>1), parity (para>1), working mother**,**feto-maternal blood group incompatibility, thrombo-embolic disorder**,**heart disease in mother, thyroid disorder in mother**,** oligo-hydroamnios, chronic hypertension, family history of preterm birth, gestational diabetes mellitus, previous cesarean section, weight gain during pregnancy less than 15 kg, antiphospholipid antibody syndrome,tobacco abuse,alcohol abuse,uterine biopsy,uterine myoma, periodontal disease, HIV positive mother, VDRL positive mother.

Comparison of risk factors in study conducted in Brazil[13] and the present study was underweight i.e.BMI<18.5 was found as risk factor in both studies. Previous preterm birth has been found as risk factor for preterm birth in both studies but with variable strength more in study conducted by Passini et al in Brazil. Smoking was found associated with preterm birth in study by Passini but this factor couldn't be evaluated well in our study as there is very low prevalence of substance abuse by pregnant females in India. Short interpregnancy interval has been found to be a factor most important in causing preterm birth with very high strength of association.

In a study by Nykeet al various demographic factors of mother were evaluated like age at conception, parity, underweight (BMI<18.5), previous preterm birth, previous stillbirth, previous neonatal death in causing preterm birth at various gestations i.e. early and late preterm birth but we studied preterm birth as whole i.e. between 28wk-37wk gestation.[14]Age at conception less than 20yr was found associated with early preterm birth not with late preterm birth. In our study age at conception less than 18 years was studied and was notfound associated with preterm birth. Parity wasnot found to be associated with preterm birth in our study but was a risk factor in aforementioned study.Anemia in mother(Hb<11gm) was found to be risk factor of preterm birth in our study and aforementioned study. But persistent and severe anemia were not found to be associated with preterm birth in aforementioned study (pvalue-0.18).Malaria was found to be a risk factor for preterm birth in aforementioned study but not in our study. Syphilitic mothers (VDRL positive) and HIV positive mothers were not found to be giving birth to preterm babies in a significant number in both the studies.Numerous investigators have found a univariate association between short interpregnancy interval and a number of adverse

perinatal outcomes, including preterm birth, low birth weight, and stillbirth.[15]Hsieh T et al found that women with interpregnancy intervals of less than 12 months were at increased risks of preterm birth with the outcome pregnancy. Furthermore, there was an increased risk for a subsequent preterm birth in women who had a preterm birth in the index pregnancy (OR 4.2; 95% CI 3.0-6.0).[15]We have found obstetric factors such as multiple fetal gestation, polyhydramnios, pre-eclampsia, antepartum hemorrhage, urinary tract infection, cervical insufficiency to be most significantly associated with preterm birth in concordance with results in multicentric study by PassiniR et al conducted in Brazil.[12]

Congenitally malformed fetus have been found to be significant cause of preterm birth in above mentioned study but this being exclusion criteria (Ballard scoring can't be done on malformed fetus)couldn't be assessed**.**Asthma, chronic hypertension and diabetes have been found to be associated with low birth weight babies in aforementioned studies but not found in our study. Meis and colleagues (1998)studied association of various risk factors with preterm birth. Results being discussed ahead.[16]Mullerian duct abnormalities were found to be associated with preterm birth in a study by Meis et al but they were not evaluated in our study. Preeclampsia was found associated with preterm birth in both the studies. Chronic hypertension was associated with preterm birth in Meis study as well as our study. Previous spontaneous preterm birth was associated more strongly with preterm birth in our studythan in study by Meis et al.

A study was conducted by Hayes et al to evaluate the association of chronic medical disorders of mother with prematurity and low birth weight babies. Those with asthma diagnosis had higher proportions of low birth weight infants, whereas asthma was not evaluated in ourstudy.[49]Women with a diagnosis of diabetes had a higher percentage of low birth weight, high birth weight, and Cesarean section deliveries than women without a diagnosis of diabetes[17]whereas gestational diabetes mellitus was not found as risk factor for preterm birth.In a study by Kacerovsky the presence of oligohydramnios was not found associated with an adverse outcome like preterm birth (pvalue- 0.33) in actively managed PPROM in singleton pregnancies in the absence of other complications.[50]Oligohydramnios was not found associated with preterm birth in our study.

The sources of infection that have been linked to preterm birth include intrauterine infections, lower genital tract infections, systemic maternal infections, asymptomatic bacteriuria, and maternal periodontitis.[12]Intrauterine infections are recognized as one of the most important and potentially preventable causes of preterm birth. These infections are thought to be responsible for up to 50 percent of extreme preterm births of less than 28 weeks of gestation, in which the rates of both neonatal mortality and neonatal morbidity are high.[12]Bacterial vaginosis was found as risk factor in both our study and study by Passini et al in various strength.

Hauth et al found that the prevalence of microbial invasion of the chorioamnion is 73 percent in women with a spontaneous preterm birth and only 16 percent among women with indicated preterm delivery without labor.[18,19]Romero et al found that the infections in a high proportion of women in preterm labor with evidence of microbial invasion of the amniotic fluid result in rapid preterm delivery (in 62 percent of women).[20]Hillier and colleagues reported in their multicenteric trial of Vaginal Infections and Prematurity (VIP) study of more than 10,000 US women, there was a 40% increase in low-birth-weight infants born to women with asymptomatic, untreated bacterial vaginosis.[21]UTI in mother, leaking per vaginum, fever in mother, high vaginal swabs and placental membrane culture positive for bacteria were found to be causing preterm birth and associated in variable strength.Preterm premature rupture of the membranes (PPROM) is associated with intra-amniotic infections and placental abruption (i.e. occult decidual hemorrhage and retrochorionic hematoma formation) which leads to neutrophil infiltration which are a rich source of proteases that can degrade extracellular matrix leading to cascade of preterm labour.[22]In a study by Lockwood et al abruptions were associated with a marked decidual neutrophil infiltration that peaked after PPROM. Antepartum hemorrhage was found to be most significant risk factor in our study.[22]

The mechanism for preterm labour in multiple gestations and particularly higher order multiple gestations may be related to uterine distension, increased intrauterine volume, or related complications such as cervical incompetence.[23]The role of maternal anemia in preterm birth remains poorly defined, and the association between anemia and preterm birth clinical subtypes remain unclear.In a study conducted by Zhang et alhaemoglobin values 9–10 g/dl in the first trimester was associated with slightly increased risk for all preterm births, haemoglobin <10 g/dl in the third trimester was associated with reduced risk for all preterm births and spontaneous preterm labour, whereas anemia and low hematocrit was found to be associated with preterm birth in our study.[24]Preterm birth has been associated more recently with maternal periodontal disease. Periodontal disease is an anaerobic bacterial infection of the mouth that affects up to 50 percent of the population, including pregnant women. Oral pathogens associated with periodontitis can gain access to the systemic circulation and can be recovered from amniotic fluid or the organism's DNA can be recovered from the placenta). But maternal periodontal disease have not been found to be associated with preterm birth in our study.[25,26]

8. Conclusion

Factors studied were educational status of mother,occupation, gravidity, parity, history of previous preterm birth,multiple pregnancy, previous abortion,history of recurrent abortion (2 or more), age at conception less than 17 years, BMI of mother <18.5**,** Weight gain during pregnancy <15kg, pregnancy interval between previous and present pregnancy less than 6months, family history of preterm birth,history of cervical incompetence, chronic hypertension, gestational diabetes mellitus**,** polyhydramnios,oligohydramnios, preeclampsia, antepartum

haemorrhage, evidence of bacterial vaginosis, positive high vaginal swab, mother febrile during pregnancy, UTI, anemia during pregnancy, low haematocrit, periodontal disease, received assistedreproductive treatment, heart disease in mother any untreated Thyroid diseases, APLA SYNDROME (Antiphospholipid antibody), Thromboembolic disorder, fetomaternal blood group incompatibility, leaking per vaginum, placental membrane culture, tobacco intake, use of alcohol,uterine myoma, uterine biopsy, periodontal disease, HIV positive mother, VDRL positive mother.

Factors which are recognized as well known factors for preterm birth worldwide could not be evaluated in our study because no patient was found with prior uterine biopsy, uterine myoma. Uterine anomalies are not diagnosed antenatally so couldn't be evaluated.Association of Substance abuse like smoking, drug abuse and alcohol use with preterm birth couldn't be assessed because of very infrequent use of these substancein reproductive age group of ladies in Indian community.Some factors couldn't be assessed because of less incidence and prevalence in Indian population e.g. less substance abuse etc.The study couldn't differentiate risk factors responsible for spontaneous preterm birth and iatrogenic preterm birth as both need different focus on social and obstetric causes separately for making health policies.Anaerobic culture of placental membrane couldn't be done due to non-availability of service.

Table 1: Showing strength of association of obstetric factors with preterm birth.

S. No	Riskfactor for Pretermbirth	Cases	Controls	Odds Ratio (95% CI)	P-Value
1	Multiple fetus in pregnancy	28%	7%	5.166(2.135-12.50)	0.0003
2	Previous Abortion	21%	2%	13.02(2.96-57.24)	0.01
3	Polyhydramnios	17%	2%	10.0 (2.2 -91.0)	0.01
4	Previous preterm birth	21%	1%	8.59 (2.41-46.19)	0.00
5	Preeclapmsia	34%	5%	8.43(3.35 to 21.20)	0.001
6	Cervical incompetence	14%	2%	7.9 (1.74-73.6)	0.01
7	Recurrent abortion	10%	2%	5.4 (1.1-52.0)	0.01
8	Antepartum hemorrhage	37%	11%	4.7518(2.252-10.02)	<0.0001
9	Bacterial vaginosis	16%	5%	3.61 (1.19-13.10)	0.01
10	High vaginal swab positive	11%	2%	6.0 (1.26 – 57.26)	0.01
11	Leaking per vaginum	29%	7%	5.7(2.24-13.0)	0.01
12	Placentalmembrane culture positive for bacteria	21%	5%	21.00(7.041 to 62.62)	0.0001
13.	Hematocrit <32gm%	29%	8%	4.6 (1.9-12.5)	0.01
14.	Anemia	28%	9%	3.932(1.745-8.858)	0.01
	Not associated				
1.	Position of placenta	10%	11%	0.899(0.363-2.22)	0.8176
2.	Gestational diabetes mellitus	9%	7%	1.3140(.469-3.677)	0.6030
3.	Chronic hypertension	6%	4%	1.5319(0.418-5.6028)	0.519
4.	Oligohydramnios	4%	5%	0.79(0.206-3.03)	0.73

Table 2: Showing association of non-obstetric risk factors with preterm birth

S.No	Associated factors	Cases	Controls	Odds Ratio (95% CI)	P-Value
1	Short interPregnancy interval	31%	2%	**22.01 (**5.098 to 95.0533)	0.000
2	Assisted reproductive technique	21%	2%	**13.02** (3.00- 116.75)	0.00
3	Underweight mother	14%	5%	6.43 (2.00- 26.89)	0.00
4	Low education status	86%	72%	2.38 (1.11- 5.38)	0.01
5	Fever in mother in pregnancy	16%	7%	2.53 (1.0-7.61)	0.04
6	UTI in pregnancy	16%	7%	2.53 (1.0-7.61)	0.04
	Factorsnot associated				
1	Previous Uterine biopsy	0	0	1.000(0.019-50.89)	0.537
2	Uterine myoma	0	0	1.000(0.019-50.89)	0.537
3	Family history of preterm birth	19%	15%	1.32(0.632-2.79s)	0.4
4	HIV positive mother	11	10	1.112(0.44-2.75)	0.817
5	VDRL positive mother	1	2	0.49(0.0442-5.54)	0.538
6	Malaria	10	11	0.49(0.0442-5.54)	0.568
7	Previous cesarean section	32	28	0.82(0.45-1.15)	0.537
8	Heart disease in mother	5	3	1.63(0.379-7.0231)	0.5
9	Fetomaternal incompatibility	66	23		
	ABORH incompatibility	26	20	1.4(0.7-3.0)	0.28
	Rh incompatibility	8	7	1.2 (0.37- 4.33)	0.67
10	Thyroid disorder in mother	4	2	2.0 (0.3-22.9)	0.0.34
11	Thromboembolic disorder	6	4	1.5 (0.35-7.61)	0.7
12	APLA syndrome	1	1	1.00(0.06-16.21)	1.000
13	Periodontal diseases	18	11	1.81(0.810-4.07)	0.147
14	Tobacco	0	0	1.000(0.019-50.89)	0.537
15	Alcohol	0	0	1.000(0.019-50.89)	0.537
16	Weight gain in pregnancy less than 15kg	14%	10%	1.465(0.61-3.475)	0.386

17	Working women	64%	59%	1.235(0.698-2.18)	0.467
18	Age at conception	19%	21%	0.883(0.441-1.176)	0.989
19	Gravidity	62%	65%	0.87(0.493-1.563)	0.659
20	Parity	41%	47%	0.783(0.44-1.37)	0.39

References

[1] Beck S, Wojdyla D, Say L, Betran A, Merialdi M, Requejo J, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. Bull World Health Organ 2010;88:31-8.
[2] Shapiro-Mendoza CK, Lackritz M. Epidemiology of late and moderate preterm birth. Semin Fetal Neonatal Med 2012;17:120–5.
[3] Blencowe H, Cousens S, Chou D, Oestergaard M, Say L, Moller B, et al. Born too soon preterm birth action group. Born too soon: the global epidemiology of 15 million preterm births. Reprod Health 2013;10:2.
[4] United Nations Children's Fund. Levels & trends in child mortality: report 2011. Estimates developed by the UN inter-agency group for child morality estimation. New York: United Nations Children's Fund; 2011.p.374-8.
[5] Lozano R, Wang H, Foreman K, Rajaratnam J, Naghavi M, Marcus J, et al. Progress towards millennium development goals 4 and 5 on maternal and child mortality: an updated systematic analysis. Lancet 2011;378:1139-65.
[6] Singh U, Singh N, Shikha S. A prospective analysis of etiology and outcome of preterm labor. J Obstet Gynecol India2007;57:48-52.
[7] Singh S, Kaur R, Gupta M, Kumar R. Impact of national rural health mission on perinatal mortality in rural India. Indian Pediatr 2012;49:136-8.
[8] German R, Lee M, Horan M, Milstein L, Pertowski A, Waller N. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. MMWR Recomm Rep 2001;50:1-35.
[9] Fernandez A, Mondkar J. Status of neonatal intensive care units in India. J Postgrad Med 1993;39:57.
[10] Goldberg R, Culhane J, Iams J, Romero R. Epidemiology and causes of preterm birth. Lancet 2008;371:75-84.
[11] Sehgal A, Telang S, Paseah M, Jyothi C. Maternal and neonatal profile and immediate outcome in extremely low birth weight babies Delhi. Trop Doct 2004;34:165-8.
[12] Julian N, Lockwood J. Risk factors for preterm labor and delivery. Uptodate 2015;22:1.
[13] Passini R, Cecatti JG, Lajos GJ, Tedesco RP, Nomura ML, et al. Brazilian multicentre study on preterm birth (EMIP): Prevalence and factors associated with Spontaneous Preterm Birth. PLoS ONE 2014;9:12-3.
[14] Nynke R, Broek V, Baptiste J, James P. Neilson factors associated with preterm, early preterm and late preterm birth in Malawi. PLoS ONE 2014;9:128-9.
[15] Hsieh T, Chen S, Shau W, Hsieh C, Hsu J, Hung H. The impact of interpregnancy interval and previous preterm birth on the subsequent risk of preterm birth.J Soc Gynecol Invest2005;12:202-7.
[16] Meis L, Salafia C, Pezzullo J, López J, Simmens S, Minior V, et al. Placental pathologic features of preterm preeclampsia.Am J Obstet Gynecol 1995;173:1097-1105.
[17] Hayes M, Tovar A, Taber L, Eggleston E, Oken E. Postpartum screening for diabetes among women with a history of gestational diabetes mellitus. Prev Chronic Dis2011;8:124.
[18] Kacerovsky M, Musilova I, Andrys C, Drahosova M, Hornychova M,Rezac A. Oligohydramnios in women with preterm prelabor rupture of membranes and adverse pregnancy and neonatal outcomes. PLoS ONE 2014;9:16-8.
[19] Goldenberg R, Hauth J, Andrews W. Intrauterine infection and preterm delivery.N Engl J Med 2000;342:1500-1507.
[20] Romero R, Avila C, Brekus CA, Morotti R. The role of systemic and intrauterine infection in preterm parturition. AnnalNew York AcadSci 1991;622:355-75.
[21] Hillier SL, Nugent RP, Eschenbach DA.Association between bacterial vaginosis and preterm delivery of a low-birth weight infant.N Engl J Med 1995;333:1737-42.
[22] Lockwood J, Toti P, Arcuri F, Paidas M, Buchwalder L, Krikun G, et al.. Mechanisms of abruption-induced premature rupture of the fetal membranes.Am J Pathol 2005;167:1443-9.
[23] Terzidoo V, Sooranna SR, Kim LU, Thorton S, Bennett PR, Johnson MR. Mechanical stretch up-regulates the human oxytocin receptor in primary human uterine myocytes. JClin Endocrinol Metab 2005;90:237-246.
[24] Zhang Q, Ananth V, Smulian J.Maternal anaemia and preterm birth:A prospective cohort study.Int J Epidemiol 2009;38:1380-9.
[25] Boggess K, Lieff S, Murtha A, Moss K, Beck J, Offenbacher S. Maternal periodontal disease is associated with an increased risk for preeclampsia. Obstet Gynecol2003;101:227-31.
[26] Boggess K, Madianos P, Preisser J, Moise K, Offenbacher S. Chronic maternal and fetal porphyromonas gingivalis exposure during pregnancy in rabbits. Am J Obstet Gynecol 2005;192:554-7.