

A PROSPECTIVE STUDY OF MATERNAL RISK FACTORS IN RELATION TO PRETERM BABIES AND THEIR IMMEDIATE OUTCOME IN A TERTIARY CARE HOSPITAL, GUNTUR

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Abstract

Background: Preterm birth (neonate born <37 completed weeks) is a major cause of morbidity and mortality in newborns and survivors have significant risk of long-term neurodevelopmental sequelae and functional impairments. In recent years, the incidence of preterm birth has shown a steady rise globally, mainly due to indicated (or medically induced) preterm delivery, and multifetal pregnancy after artificial reproductive techniques and fertility-inducing drugs.^[1] Worldwide, approximately 15 million preterm births occur annually, indicating a global preterm birth rate of about 11%.^[2] Approximately 10% of all births in the United States of America are preterm.³ The incidence is higher in developing countries (13% in India).^[3] Low birth weight (LBW) has been defined by WHO as birth weight of less than 2.5 kg. In India, 8 million LBW infants are born every year or around 40% of the total of 20 million LBW babies born globally.¹The etiology of preterm birth is multifactorial and requires complex interactions between fetal, placental, uterine, and maternal factors. The major immediate complications encountered in preterm newborns are difficult delivery room resuscitation, respiratory distress syndrome, apnea, hypotension, hypothermia, hypoglycaemia, necrotising enterocolitis, intracranial haemorrhage, feeding difficulties, and vulnerability to infections and iatrogenic complications. With advanced medical care, low birth weight (LBW) survival has been steadily improving in the past years. The survival among infants born 22-24 week gestation increased from 30% in 2000–2003 to 36% in 2008–2011 and now to 50-60%.^[4] Hence, comes this prospective study to assess the maternal risk factors, clinical profile and immediate outcome of preterm babies, an important indicator of maternal and new born health in India. **Aims & Objectives:** 1. Study of maternal risk factors associated with preterm birth. 2. Study of the immediate outcome of preterm babies during their stay in hospital **Materials and Methods:** After approval from the Institutional Ethics Committee, a prospective, observational study was conducted by the Department of Pediatrics about maternal risk factors and associated neonatal morbidities among 250 preterm babies admitted in NICU at a tertiary care teaching hospital, Guntur, Andhra Pradesh. **Results:** In the present study, the major maternal risk factors that contribute to preterm births are oligohydramnios (26%) being the most common risk factor, followed by Bad obstetric history like previous abortions/deaths (20%), PROM (15.6%), gestational hypertension (15.2%). Hypothyroidism, GDM, eclampsia, APH, multiple pregnancy, infections were other risk factors. The most common neonatal morbidities in our study was RDS (58.8%) followed by sepsis (44.8%), NNJ (38%), Birth asphyxia (18%) and AOP (15.6%). Metabolic abnormalities like hypoglycaemia and hypocalcemia, congenital heart disease like congenital

heart disease like acyanotic/cyanotic CHD, MAS, NEC, seizures were other morbidities. **Conclusion:** It is important to detect risk factors early (maternal & fetal) through Pre-registration of all pregnant women for routine ANC and follow-up and educating mothers about early recognition of morbidities related to preterm babies and treating them.

INTRODUCTION

Preterm birth is a major cause of morbidity and mortality in newborns and survivors have significant risk of long-term neurodevelopmental sequelae and functional impairments. In recent years the incidence of preterm birth has shown a steady rise globally, mainly due to indicated (or medically induced) preterm delivery, and multifetal pregnancy after artificial reproductive techniques and fertility-inducing drugs.^[1]

A preterm neonate is one who is born at <37 completed weeks of gestation i.e., 259 days from 1st day of LMP.

Worldwide, approximately 15 million preterm births occur annually, indicating a global preterm birth rate of about 11%.^[2] Approximately 10% of all births in the United States of America are preterm.³ The incidence is higher in developing countries (13% in India).^[3]

Low birth weight is a heterogeneous group consisting of infants born preterm (<37 completed weeks of gestation) and infants born at term but of reduced weight.

Low birth weight (LBW) has been defined by WHO as birth weight of less than 2.5 kg.

In India, 8 million LBW infants are born every year or around 40% of the total of 20 million LBW babies born globally.^[1] The etiology of preterm birth is multifactorial and requires complex interactions between fetal, placental, uterine, and maternal factors.

However, most preterm births are spontaneous without an identifiable cause.

The major immediate complications encountered in preterm newborns are difficult delivery room resuscitation, respiratory distress syndrome, apnea,

hypotension, hypothermia, hypoglycaemia, necrotising enterocolitis, intracranial haemorrhage, feeding difficulties, and vulnerability to infections and iatrogenic complications.

With advanced medical care, low birth weight (LBW) survival has been steadily improving in the past years. The survival among infants born 22-24-week gestation increased from 30% in 2000–2003 to 36% in 2008–2011 and now to 50-60%.^[4]

Hence, comes this prospective study to assess the maternal risk factors, clinical profile and outcome of preterm babies, an important indicator of maternal and new born health in India.

Aims & Objectives

1. Study of maternal risk factors associated with preterm birth.
2. Study of the immediate outcome of preterm babies during their stay in hospital.

MATERIALS AND METHODS

After approval from the Institutional Ethics Committee, a prospective, observational study was conducted by the Department of Pediatrics about maternal risk factors and associated neonatal morbidities among 250 preterm babies admitted in NICU at a tertiary care teaching hospital, Guntur, Andhra Pradesh.

Inclusion Criteria

1. All preterm babies admitted in NICU during the study period.

Exclusion Criteria

1. Pre term babies on ventilator in NICU
2. Preterm babies admitted in SNCU
3. Stable preterm babies on mother side.

RESULTS

Table 1: Distribution of neonates based on gender

Sex	No. of Subjects	Percentage
Male	131	52.4%
Female	119	47.6%
Total	250	

Table 2: Distribution of neonates based on Gestational Age

Gestational Age	No. of Subjects	Percentage
Extreme Preterm	13	5.2%
Very Preterm	69	27.6%
Moderate Preterm	85	34.0%
Late Preterm	83	33.2%
Total	250	

Table 3: Distribution of neonates based on Mode of Delivery

Mode of Delivery	No. of Subjects	Percentage
Normal Vaginal Delivery	150	60.0%
Lower Segment Cesarean Section	100	40.0%
Total	250	

Table 4: Distribution of neonates based on Birth Weight

Birth Weight	No. of Subjects	Percentage
<1 Kg	17	6.8%
1 To 1.4 Kg	73	29.2%
1.5 To 1.9 Kg	85	34.0%
2 To 2.4 Kg	75	30.0%
Total	250	

Table 5: Distribution of maternal risk factors

Maternal Risk Factors	No. of Subjects	Percentage
Gestational HTN	38	15.2%
Eclampsia	5	2.0%
GDM	4	1.6%
Anemia Complicating Pregnancy	41	16.4%
Hypothyroidism Complicating Pregnancy	26	10.4 %
Preterm Premature Rupture Of Membranes	39	15.6%
Oligohydramnios	65	26.0%
Bad Obstetric History	50	20.0%
Antepartum Hemorrhage	32	12.8%
Multiple gestation	22	8.8%
Other Maternal Risk Factors	28	11.2%
No Risk Factors	8	3.2%

Table 6: Distribution of mothers based of SES

Socio Economic Status	No. of Subjects	Percentage
Upper Middle Class	5	2.0%
Lower Middle Class	124	49.6%
Upper Lower Class	89	35.6%
Lower Class	32	12.8%
Total	250	

Table 7: Distribution of neonates based on Respiratory System pathology

Respiratory System	No. of Subjects	Percentage
Normal	83	33.2%
Respiratory Distress Syndrome	147	58.8%
Transient Tachypnea of Newborn	13	5.2%
Congenital Pneumonia	3	1.2%
Pulmonary Hemorrhage	1	0.4%
RDS + Pulmonary Hemorrhage	2	0.8%
RDS+ Pneumothorax	1	0.4%
Total	250	

Table 8: Distribution of neonates based on Cardiovascular System pathology

Cardiovascular System	No. of Subjects	Percentage
Normal	228	91.2%
Acyanotic Congenital Heart Disease	20	8.0%
Cyanotic Congenital Heart Disease	2	0.8%
Total	250	

Table 9: Distribution of neonates based on sepsis

Sepsis	No. of Subjects	Percentage
No Sepsis	138	55.2%
Probable Sepsis	108	43.2%
Culture +Ve Sepsis	4	1.6%
Total	250	

Table 10: Distribution of neonates based on morbidity pattern

Neonatal Morbidity	No. of Subjects	Percentage
Respiratory Distress Syndrome	147	58.8%
Sepsis	112	44.8%
Neonatal Jaundice	95	38.0%
Birth Asphyxia	45	18.0%
Apnea of Prematurity	39	15.6%

Metabolic Abnormalities	23	9.2%
Cardiovascular System	22	8.8%
Meconium Aspiration Syndrome	20	8.0%
Necrotizing Enterocolitis	19	7.6%
Seizures	17	6.8%
Other Neonatal Morbidity	33	13.2%

Table 11: Distribution of neonates based on Outcome

Outcome	No. of Subjects	Percentage
Discharge	188	75.2%
Death	62	24.8%
Total	250	

Table 12: Distribution of neonates based on Mother's Age (Years)

Mother's Age (Years)	No. of Subjects	Percentage
Up to 18 yrs.	21	8.4%
19-20 yrs.	64	25.6%
21-25 yrs.	119	47.6%
26-30 yrs.	35	14.0%
Above 30 yrs.	11	4.4%
Total	250	

Table 13: Sex Vs Outcome

Sex	Outcome		Total
	Discharge	Death	
Male	97	34	131
Female	91	28	119
Total	188	62	250

Table 14: Gestational Age Vs Outcome

Gestational Age	Outcome		Total
	Discharge	Death	
Extreme Preterm	3	10	13
Very Preterm	41	28	69
Moderate Preterm	69	16	85
Late Preterm	75	8	83
Total	188	62	250

Table 15: Birth weight Vs Outcome

Birth Weight	Outcome		Total
	Discharge	Death	
<1 Kg	7	10	17
1 To 1.4 Kg	43	30	73
1.5 To 1.9 Kg	72	13	85
2 To 2.4 Kg	66	9	75
Total	188	62	250

Table 16: Mode of delivery Vs Outcome

Mode of Delivery	Outcome		Total
	Discharge	Death	
Normal Vaginal Delivery	104	46	150
Lower Segment Caesarean Section	84	16	100
Total	188	62	250

Table 17: Maternal Risk Factors Vs Outcome

Maternal Risk Factors	Outcome		P Value
	Discharge	Death	
HTN	32	6	0.356
GDM	2	2	0.205
Anemia Complicating Pregnancy	34	7	0.21
Hypothyroidism Complicating Pregnancy	17	9	0.221
Preterm Premature Rupture Of Membranes	27	12	0.347
Oligohydramnios	46	19	0.336
Bad Obstetric History	37	13	0.826
Antepartum Hemorrhage	21	11	0.179
Multiple pregnancy	17	5	0.814
Other Maternal Risk Factors	166	56	0.661

Table 18: Socio Economic Status Vs Outcome

Socio Economic Status	Outcome		Total
	Discharge	Death	
Upper Middle Class	4	1	5
Lower Middle Class	90	34	124
Upper Lower Class	72	17	89
Lower Class	22	10	32
Total	188	62	250

Table 19: Mother's Age (Years) Vs Outcome

Mother's Age (Years)	Outcome		Total
	Discharge	Death	
Up to 18 yrs	16	5	21
19-20 yrs	51	13	64
21-25 yrs	82	37	119
26-30 yrs	31	4	35
Above 30 yrs	8	3	11
Total	188	62	250

Table 20: Neonatal morbidity Vs Outcome

Neonatal Morbidity	Outcome		P Value
	Discharge	Death	
Respiratory Distress Syndrome	102	45	0.011
Apnea of Prematurity	18	21	<0.001
Congenital Heart Disease	17	5	0.814
Sepsis	81	31	0.342
Necrotising Enterocolitis	13	6	0.477
Birth Asphyxia	29	16	0.065
Neonatal Jaundice	86	9	<0.001
Meconium Aspiration Syndrome	16	4	0.604
Metabolic Abnormalities	15	8	0.245
Seizures	8	9	0.005
Other Neonatal Morbidity	26	7	0.608

DISCUSSION

The present study is done to identify maternal risk factors in relation to preterm babies and their immediate outcome admitted in NICU of Government General Hospital, Guntur during the period of 1st January 2020 to 31st December 2020.

A total of 250 preterm babies were included in this study.

SEX OF THE BABY: In this study 131 (52.4%) of the babies born were male and 119 (47.6%) were female indicating male preponderance. Male babies (13.6%) had a higher mortality rate than female babies (11.1%). In a study by Roy K.K et al,^[17] the overall mortality rate was found to be significantly greater in males (26.7%) than in females (16%), while a study by Singh Uma et al,^[37] indicated a gender difference favouring males.

GESTATIONAL AGE AND BIRTH WEIGHT:

In our study, majority of babies are moderate preterm (34%) i.e., delivered at 32-34 weeks, and late preterm babies (33.2%) i.e., delivered at 34-37 weeks which was in contrast to K.K.Roy et al,^[17] study where majority (n=37) had delivered at 30-32wks of gestation.64% babies come under LBW, 29.2% under VLBW, 6.8% under ELBW category.

MODE OF DELIVERY: In this study 60% of the mothers were delivered by NVD and 40% by LSCS, in contrast to Roy K.K et al,^[17] where LSCS was high (67.3%).

MATERNAL AGE: In this study mother's age range between 16 to 43 years. Majority i.e.119 (47.6%) of the mothers were in the 21 to 25 years age group. In our study there were 21 (8.4%) mothers aged 18 years & 11 (4.4%) of mothers aged above 30 years.

In a study done by Singh Uma et al.³⁷ 32(7.7%) women were 18 years & 24(5.8%) > 35 years old, which was similar to our study.

In a study by K.K. Roy et al,^[17] the age of the mothers ranged from 17-37 years with an average of 26.2 years.

SOCIOECONOMIC CLASS: In this study, majority of the mothers (49.6%) were from class III Socio Economic class, followed by class IV (35.6%), class V (12.8%) and class II (2%), in contrast to a study by Singh Uma et al,^[37] in which class IV & class V (22. 1%) predominated.

HYPERTENSION: In our study 15.2% of the mothers with preterm babies had gestational hypertension. In a study done by Mishra et al,^[38] the incidence of preeclampsia among the mothers of LBW babies was higher (30%) than the mothers of NBW babies (5%).

As per the study done by Getaneh T et al,^[39] the pooled prevalence of LBW among women with pregnancy induced hypertension was more than twice as high as the pooled estimate of LBW among all reproductive aged women.

ANEMIA: In our study 16.4% of the mothers with preterm babies had anemia.

In a study done by Figueiredo AC et al,^[40] maternal anemia was considered a risk factor for low birth weight, after adjusting the confounding factors. Pregnant women with anemia had a 38% higher risk of having children with low weight at birth than the women without anemia.

In a study done by S Rahmati et al,^[41] maternal anemia, especially during the 1st trimester of pregnancy, can be considered as a risk factor for pregnancy outcomes. Therefore, one needs to take the necessary steps to cure this disease in order to decrease the incidence of infant low birth weight.

HYPOTHYROIDISM: In our study 10.4% of the mothers had hypothyroidism.

In a study done by Sheehan PM et al,^[42] both overt hypothyroidism and hyperthyroidism are associated with a small but statistically significant increase in Odds ratio for preterm birth not seen in subclinical hypothyroidism or isolated hypothyroxinaemia.

PPROM: In our study 15.6% of the mothers had PPRM. These results were almost identical to a study done by Chithra R. Rao et al,^[13] where PROM was seen in 17.5% of the cases.

In a study done by Mercer B.M et al,^[43] Premature rupture of membranes at <37 weeks' gestation complicated 4.5% of pregnancies, accounting for 32.6% of preterm births. The combination of short cervical length, previous preterm birth caused by PPRM, and positive fetal fibronectin screening results was highly associated with preterm delivery caused by PPRM in the current gestation.

In a study done by SA Feresuet al,^[44] history of PROM was associated with a 2.43 times risk of all LBW, 1.77 times increased risk of term LBW and 3.96 times increased risk of preterm LBW.

OLIGOHYDRAMNIOS: In our study 26% of the mothers had oligohydramnios which is the major risk factor contributing to preterm births.

In a study done by Petrozella LN et al,^[45] it was found that Pregnancies with decreased AFI between 24 and 34 weeks, including borderline AFI as well as oligohydramnios, were significantly more likely to be associated with major fetal malformations, and in the absence of malformations, to be complicated by fetal growth restriction and preterm birth.

As per study done by Rabie N et al,^[46] Oligohydramnios in complicated pregnancy is associated with an increased risk of delivery of an infant with low birth weight, but this may be confounded by the comorbid condition.

BAD OBSTETRIC HISTORY: In our study 20% of the mothers had BOH like previous abortions/still births/deaths, most of them due to previous abortions.

In a study done by J S Brown et al,^[47] Compared with women with no history of abortion, women who had one, two and three or more previous abortions were 2.8, 4.6 and 9.5 times more likely to have LBW, respectively. The risk for PB was also 1.7, 2.0 and 3.0 times higher for women with a

history of one, two and three or more previous abortions, respectively.

Similar results were found in a study done by HM Swingleet al.^[48]

ANTEPARTUM HEMORRHAGE: In our study 12.8% of the mothers had APH.

In a study done by Beneret al,^[49] they concluded that LBW was higher in maternal anemia and antepartum hemorrhage. In their study, a statistically significant number of mothers (21.4%) had associated antepartum haemorrhage.

SINGLE/MULTIPLE PREGNANCY: In our study 8.8% of the mothers had twin pregnancy.

ECLAMPSIA: In our study 2% of the mothers had eclampsia during/before pregnancy.

GESTATIONAL DIABETES MELLITUS: In our study 1.6% had GDM.

In a study done by Hunt KJ et al,^[50] infant birth weight was significantly higher in women with GDM than in women without diabetes.

Seghieri G et al,^[51] found that prevalence of Gestational Diabetes Mellitus (GDM) was higher in the group with low birth weight babies than in the group with normal/high birth weight babies and the relative risk for GDM was about twofold in the group with low birth babies.

CONCLUSION

- In the present study, maternal risk factors of preterm babies and their immediate outcome were studied among 250 preterm neonates admitted in NICU of Government General Hospital, Guntur during the period of 1st January 2020 to 31st December 2020.
- The most common maternal age during pregnancy was 21- 25 years (n=119) in this study followed by <20 years (n=85) indicating pregnancy at a young age has a risk of giving birth to premature babies.
- The majority of the mothers were from socioeconomic classes III and IV, indicating that mothers from lower socioeconomic groups had a higher risk of preterm delivery due to factors such as poor antenatal care, limited access to medical facilities, poor nutrition, and a lack of knowledge about preterm delivery and its consequences.
- The relationship between gestational age and outcome was statistically significant, showing that survival improved as gestational age increased.
- The relationship between Birth weight & outcome was statistically significant, showing that survival improved as birth weight increased.
- Incidence of LBW is relatively higher in male babies when compared to female babies. Even mortality was higher in male babies.
- Many maternal risk factors contribute to preterm births of which oligohydramnios (26%)

is the most common risk factor in this study followed by Bad obstetric history like previous abortions/deaths (20%), PROM (15.6%), gestational hypertension (15.2%). Hypothyroidism, GDM, eclampsia, APH, multiple pregnancy, infections were other risk factors.

- The most common neonatal morbidities in our study was RDS (58.8%) followed by sepsis (44.8%), NNJ (38%), Birth asphyxia (18%) and AOP (15.6%). Metabolic abnormalities like hypoglycaemia and hypocalcemia, congenital heart disease like congenital heart disease like acyanotic/cyanotic CHD, MAS, NEC, seizures were other morbidities.
- There is no significant statistical relationship between any of the maternal risk factors and outcome of babies.
- There exists a statistically significant relationship between AOP, NNJ and outcome of babies.
- Overall mortality in this study was 24.8%.
- All these neonatal morbidities also add to mortality of preterm babies of which HMD/RDS was the most common cause followed by sepsis, apnea of prematurity and birth asphyxia.

Therefore, it is important to recognise the maternal risk factors as early as possible & necessary interventions have to be taken to reduce preterm births and their associated morbidity & mortality. This can be accomplished by using the following methods:

1. Pre-registration of all pregnant women for routine ANC and follow-up to detect risk factors early (maternal & fetal).
2. Educating mothers about proper diet, proper cleanliness, and the signs and symptoms of maternal illnesses and preterm birth.
3. Recognition of morbidities related to preterm babies and treating them as soon as possible.

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