"A PROSPECTIVE STUDY ON EARLY MORBIDITY PATTERNS OF LATE PRETERM NEONATES ADMITTED IN RURAL TERTIARY CARE CENTRE"

By

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ABBREVIATIONS

IVH	-	Intraventricular Hemorrhage
PDA	-	Patent ductus arteriosus
NEC	-	Necrotizing Enterocolitis
AGA	-	Appropriate for Gestational Age
ENaC's	-	Epithelial cell Sodium Channels
LMP	-	Last Menstrual Period
AAP	-	American Academy of Pediatrics
LPTI	-	Late Preterm Infants
LSCS	-	Lower Segment Caesarian Section
NCHS	-	National Center for Health Statistics
GA	-	Gestational Age
LGA	-	Large for Gestational Age
SGA	-	Small for Gestational Age
Vs	-	Versus
NICU	-	Neonatal Intensive Care Unit
NRP	-	Neonatal Resuscitation Programme
PROM	-	Premature Rupture of Membranes
PTI	-	Preterm Infants
PTL	-	Preterm Labour
RDS	-	Respiratory Distress Syndrome
HMD	-	Hyaline Membrane Disease

LSCS	-	Lower Segment Cesarean Section
PIH	-	Pregnancy Induced Hypertension
APH	-	Antepartum Haemorrhage..
AOP	-	Apnea of Prematurity
LPTI	-	Late Preterm Infant
FTI	-	Full Term Infant

ABSTRACT

BACKGROUND & OBJECTIVES: To study the early neonatal morbidities and immediate outcome at the time of hospital discharge, of late preterm neonates admitted to a tertiary hospital for the period of one year(January 2016 to December 2016).

STUDY DESIGN: Prospective observational study.

METHODS: All late preterm babies (340/7 weeks 366/7 weeks) admitted to RLJH hospital who met the inclusion criteria were studied for a period of one year (January 2016 to December 2016).

Short term outcome was assessed in the form of neonatal morbidities, mortality . Details regarding maternal risk factors were collected by detailed history taking and the medical records with them. The infants in the sample were followed throughout their stay in the neonatal intensive care unit (NICU) and postnatal wards, up until hospital discharge. Data were collected from infants and mothers medical records and supplemented with additional information collected at discharge using a structured form covering the variables of interest. Variables relating to the mothers and their infants were analyzed.

RESULT: A total of one hundred and thirty six late preterm neonates comprised the study group. Female preponderance was noticed with a ratio of 0.81:1. Majority of them were in the birth weight range of 2-2.5kg (37.5%). PIH PROM and Anemia forms the major maternal risk factor for preterm.

This study confirmed that late-preterm infants are a population at risk of increased neonatal morbidity. Respiratory distress and Neonatal hyperbilirubinemia requiring phototherapy forms the major morbidity, followed by feed intolerance probable sepsis, birth asphyxia, hypoglycaemia, hypocalcaemia, apnea of prematurity

Duration of hospital stay also prolonged in late preterm. Majority of late preterm neonates required more than 7 days hospital duration. Mortality was also present in latepreterm.

CONCLUSION: Analysis of the data shows that LPTI suffer a large number of intercurrent medical problems during the neonatal period, especially increased likelihood of resuscitation in the delivery room, hypoglycemia, jaundice requiring phototherapy, respiratory pathologies, sepsis, antibiotic use, feeding intolerance, mechanical ventilation, contributing to a high neonatal mordibity rate. Late-preterm infants are therefore a high-risk group of neonates and need special attention while in hospital, including delayed discharge and follow-up very soon after discharge. Prolonging pregnancy to the maximum safest gestation will result in decrease in such morbidities.

KEY WORDS: late preterm infants, Neonatal morbidity, Outcome.

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INTRODUCTION

INTRODUCTION

Preterm neonates are defined as those born before 37 weeks of gestation(259 days from the first day of the mother's last menstrual period).[1]

It is well know that prematurity places neonates at an increased risk for morbidities like HMD, IVH, PDA, feeding difficulties, N.E.C, Hypothermia, Hypoglycemia, Hyperbilirubinaemia, Sepsis and Death as compared with term infants [2-5]

Babies born at 35 and 36 weeks of gestation comprise 7% of all live births and 58.3% of all premature neonates in the United States.[2]

Much less is known about this subset of more "mature" premature neonates. Most of the data in the literature focus on premature babies that are less than 33 weeks of gestation.

Late preterm neonates refer to those born between 34 weeks ($34^{0/7}$) and less than 37 completed weeks of gestation. ($34^{6/7}$)[1]

Many neonates born in late preterm may be similar to term infants (37 to 41 completed weeks gestation) in appearance, weight and size. When compared with preterm neonates born at earlier gestations, they are generally healthier. However, late preterm neonates are developmentally and physically immature neonates compared with term. Consequently, they are at increased risk for medical complications and mortality especially during the first week after birth. [2,3.]

"Late Preterm" neonates, are often the same size and weight of some term neonates (born at $37^{0/7}$ - $41^{6/7}$ weeks gestation). Because of this fact, late preterm neonates may be treated by parents, caregivers and health care professionals as though they are developmentally mature and are at low risk of morbidity, thereby often managed in newborn level I (basic) nurseries or remain with their mother after birth.[4]

The rate of preterm birth is increasing worldwide primarily at the expense of late preterm newborns. Late preterm neonates are the fastest growing subgroup of neonates and constitute approximately 75% of all preterm births in 2009. The birth rate of late preterm newborns has increased by 25% from 1990 to 2005 in the United States.[5] The incidence of medical problems, either short-term or long-term, is higher among late preterm than term neonates. Because the late preterm neonates comprise the majority of preterm newborns, caring for such a large population who are prone to have unfavorable outcomes can exert a profound impact on the society.[5]

Concern about higher morbidity in late preterm neonates has led to numerous publications with largely the same conclusions: Late preterm neonates are more prone to problems related to delayed transition and overall immaturity, and they should be treated differently from their more mature term counterparts. These observations have led to greater attention being paid to tracking short-term morbidity, health care costs, hospital stays, and issues such as re-hospitalization. Nearly three out of four preterm births occur at late preterm gestational ages.[3]

There are few studies from India which have shown similar conclusion as of western studies. Understanding morbidity risk among late preterm neonates is not only

important for helping newborn care providers to anticipate and to manage potential morbidity during the birth hospitalization, but also may possibly assist in guiding non emergency obstetric intervention decisions.[6]

There is very limited data available from the Indian studies regarding the problems pertaining to late-preterm babies. So there is an immense need to conduct a

study which will provide an insight through the problems of the late preterm infant to make appropriate decisions in management.[6]

Therefore, it was thought prudent to undertake a prospective study to the early neonatal morbidity among late preterm neonates at our hospital.

OBJECTIVES

AIMS AND OBJECTIVES

1. To Study the early neonatal morbidities of late preterm neonates admitted in a tertiary care hospital for the period of one year (January 2016 to December 2016)

2. To know the immediate outcome in these late preterm neonates at the time of discharge.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The World Health Assembly in 1948 described preterm infants as infants weighing less than 2500 g or being less than 37 weeks' gestation. In 1950, the World Health Organization revised this definition, identifying all infants born before 37 completed weeks gestation (259th day), counting from the first day of the last menstrual period, as preterm infants.[7,8]

Although preterm, term, and post-term have been clearly defined according to the week and day of gestation by the World Health Organization, American Academy of Pediatrics, and American College of Obstetrics & Gynecology, not all subgroups within the preterm gestation are well defined. There is less ambiguity about infants less than 32 weeks‘ gestation in the literature, being defined as very preterm if less than 32 weeks‘ gestation, and extremely preterm if less than 28 weeks‘ gestation, but no clear definition existed for infants of 32 to 37 weeks‘ gestation. These infants were known by several different names, including moderately preterm, mildly preterm, minimally preterm, marginally preterm, and near-term. These near-term infants have been inconsistently defined in the literature as ‘34 to 36 weeks gestation, 35 to 37 weeks gestation’.[9]

To clarify and further emphasise on the fact that these near term infants have a greater risk of morbidity and mortality than term infants, an expert panel at a workshop convened by the National Institute of Child Health and Human Development(NICHD) of the National Institutes of Health(NIH) in July 2005 recommended that births between 34 completed weeks (340⁄7 weeks or day 239) and less than 37 completed weeks (366⁄7 weeks or day 259) of gestation be referred to as late preterm infants.[2]

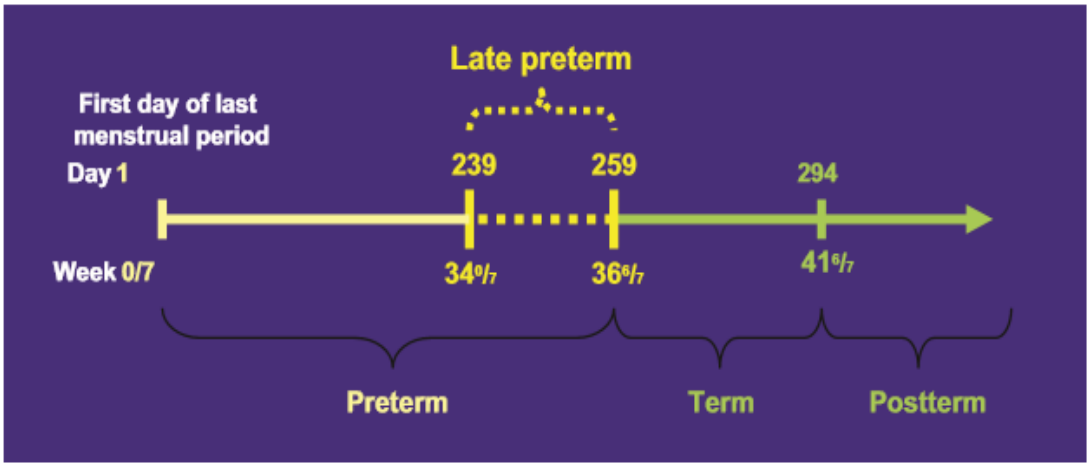


Figure 1: "Late Preterm" and "Early Term" Definitions

EPIDEMIOLOGY AND TRENDS IN LATE PRETERM BIRTHS

Preterm birth is a major determinant of neonatal mortality and morbidity and has long-term adverse consequences for health. In almost all countries with reliable data, preterm birth rates are increasing. Globally prematurity is the leading cause of newborn deaths (babies in the first four weeks of life) and now the second leading cause of death after pneumonia in children under the age of five.[10]

As per WHO data, every year about 15 million babies are born prematurely around the world and that is more than one in 10 of all babies born globally. Almost 1 million children die each year due to complications of preterm birth (2013 data). Many survivors face a lifetime of disability, including learning disabilities and visual and hearing problems.[11]

Across 184 countries, the rate of preterm birth ranges between 5% to 18% of babies born. In the lower-income countries, on average 12% of babies are born too early compared with 9% in higher-income countries. The burden of preterm birth is substantial and is increasing in these regions. Countries with the highest numbers include Brazil, India, Nigeria and the United States of America.[11]

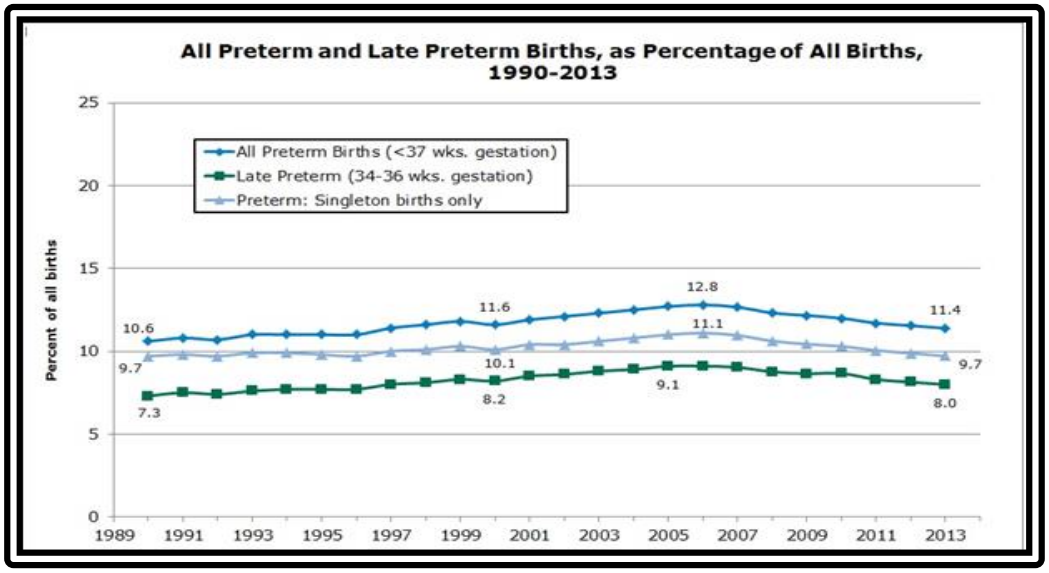


Figure 2: National statistics- Percentage of preterm births from 1990 - 2013

India accounts for 23.6 per cent of the global preterm births, out of which 13 per cent are live preterm births. Out of 27 million babies born in India every year (2010 data), 3.5 million babies born are premature and one million die, accounting for **25% of the mortality** around the world.[12]

According to the National Family Health Survey (NFHS-3) report, the current neonatal mortality rate (NMR) in India of 39 per 1, 000 live births, accounts for nearly 77% of all the infant deaths (57/1000) and nearly half of the under-five child deaths (74/1000). The rate of neonatal mortality varies widely among different states of India, ranging from 11 per 1000 live births in Kerala to 48 per 1000 live births in Uttar Pradesh. The neonatal mortality rate in Karnataka is 38 per 1000 live births.[13]

The American College of Obstetricians and Gynaecologists suggests that preterm birth rates have also increased because of a dramatic rise in late preterm births, defined as births between 34 weeks and 36-37 weeks of gestation. Late preterm

new born are the fastest growing subset of neonates, accounting for approximately 74% of all preterm births and about 8% of total births.[14]

CAUSES OF LATE PRETERM BIRTHS

Preterm birth rates continue to rise. A number of factors have been linked with the increase in premature births. Most babies born between 34 and 37 weeks gestation are delivered prematurely because of maternal or fetal medical indications.

New fertilization methods have increased the number of twin and multiple pregnancies. An increasing number of women are having children after the age of 35; and there is an increasing number of medical indications for interrupting pregnancy, which are the result of increased use of technology to monitor pregnancies.[15]

To date, limited studies have addressed the etiology of late preterm births. ***Reddy et al*** categorized the etiology of late preterm deliveries into five groups: Maternal medical conditions (14%), Obstetric complications (16%), Major congenital anomalies (1%), Isolated spontaneous deliveries (49%) and no recorded indications (23.2%).[16]

Laughon et al reported that spontaneous labor, preterm premature rupture of membranes and indicated deliveries each accounted for about 30% of late preterm births.[17]

These two studies revealed three aspects, Firstly, medically indicated elective Cesarean sections (CS) were responsible for the majority of all late preterm deliveries; secondly, varied neonatal morbidities and mortalities depended upon the indications for delivery and thirdly a certain proportion of deliveries with unknown

indications were likely patient scheduled caesarean section and thus potentially avoidable[16,17].

No consensus has yet been reached on the contributing factors of the increase in late preterm births.

Preterm births are categorized as either spontaneous or indicated. Spontaneous preterm births occur secondary to either preterm labour or preterm premature rupture of the amniotic membranes. PROM is rupture of the membranes prior to the onset of labor, while PPROM (Preterm Premature Rupture of Membranes) is rupture of membranes with gestation less than 37 weeks, prior to the onset of labor. Spontaneous preterm labor is defined as the onset of uterine contractions with cervical change before 37 weeks of gestation[18,19].

Indicated preterm births are those that occur because of medical or obstetric problem that places either the mother or the fetus at risk; delivery is undertaken to preserve or improve the maternal or fetal status. Spontaneous preterm births account for more than two thirds of all preterm births, and indicated preterm births account for remaining third.

Multiple gestation is one of the strongest risk factors for either a spontaneous or indicated preterm births[20].

CAUSES OF LATE PRETERM BIRTH[21] :

1. Idiopathic - Spontaneous Preterm labor, PROM, Preeclampsia, IUGR. Women with Chronic Medical conditions

2. Maternal factors:

- Advanced maternal age, assisted reproductive technologies and multiple births

- Increase in multifetal pregnancies
- Delayed childbearing and increased risk for prematurity
- Use of assisted reproductive technologies (multifetal pregnancies) and increased risk for complications associated with premature delivery (e.g., preeclampsia, diabetes, chorioamnionitis)

3) Medical Indications:

- Abnormal presentation, abnormal placentation, maternal or fetal conditions (e.g., PROM without labor, fetal hydrocephalus)
- Repeat cesarean section

4) Gestational Age Assessment And Obstetric Practice Guidelines

- Inaccurate gestational age assessment during elective deliveries
- Maternal obesity
- Presumption of fetal maturity at 34 weeks‘ gestation
- Cesarean or planned induction of labor

5) No medical indication:

- Induction of labour or cesarean section on maternal request
- Fear of fetal and neonatal risks with vaginal delivery (Increased rate of stillbirths beginning at 39 weeks‘ gestation, Hypoxic-ischemic encephalopathy, brachial plexus and other birth traumas)

- Fear of maternal risks with vaginal delivery (Risk for genital tract, anus and perineal injury and sexual dysfunction)
- Perception that cesarean delivery is easier and less stressful than vaginal delivery
- Maternal willingness to accept risk on behalf of the infant
- Convenience for mother and family

Available data have suggested medically indicated deliveries and patient driven factors were responsible for the increase of late preterm newborns. Because the actual indication for delivery is recognized as a determinant in neonatal outcome, more attention should be devoted to examine the etiology of late preterm births.

The gradual shift of deliveries towards lower gestational age along with the inaccuracies of gestational age measurement might have led to the increasing proportions of late preterm births. Prenatal ultrasound can lead to an overestimation of gestational age in conditions associated with fetal macrosomia, such as obesity and gestational diabetes, both of which have increased rapidly in the last decade. There is the possibility of earlier intervention (induction or elective cesarean section) when ultrasound estimates are used to guide the management plan. Although fetal surveillance is designed to reduce adverse neonatal outcome, when coupled with antenatal tests with poor positive predictive value (biophysical profile, nonstress test) it may inadvertently increase medical interventions, with a resultant increase in late preterm and early term birth rates [18].

PATHOPHYSIOLOGY AND CLINICAL COURSE OF THE LATE PRETERM INFANTS

Late preterm infants are physiologically and metabolically immature. A complete understanding of the extent of immaturity in such infants is largely unstudied and understanding of the developmental biology and mechanisms of disease experienced by these infants is largely incomplete. Management strategies, therefore, are based on general principles, clinical experience and extrapolation from knowledge of very preterm and term infants [22].

Most of the late preterm infants are born with a normal birth weight, are frequently accepted as term infants and are generally followed up beside of the mother postnatally. However, this group of newborns carries a higher risk in terms of morbidity and mortality compared to term infants [23,24].

According to an Indian study done by Wagh AS et al, 5114 where late preterm babies were compared against 1094 term born babies showed late preterm babies had more neonatal morbidities compared to term babies (85 % vs. 16.3 %) [25].

Because of their physiological immaturity, nearly every organ system is affected in late preterm infants. As their name implies, these infants are not term, however they are prone to a host of clinical problems, including RDS, Temperature instability, Feeding difficulties, Hypoglycaemia, Hyperbilirubinemia, Apnea, Late neonatal sepsis, prolonged hospital stay, and readmission [23,26,27].

RESPIRATORY MORBIDITY

Many studies have shown that all forms of pulmonary disorders occur at higher frequencies in late preterm infants when compared to term infants. Late preterm infants are born during the transition from the terminal saccular period to alveolar period of lung maturity. Functional deficiencies in surfactant and clearance of lung fluid, therefore occurs in many late preterm infants which predisposes to respiratory failure.

The underlying pathophysiology of RDS has been clarified as the combination of three factors:

1. Innability of lung to produce surfactant
2. Non-clearance of lung fluid attributable to LSCS
3. Birth prior to spontaneous labor [9].

Clearance of lung fluid is controlled by the amiloride sensitive epithelial sodium channels(ENaC's). ENaC expression is developmentally regulated and peak expression in the alveolar epithelium is achieved only at term gestation, which leaves the late preterm infant with lower expression of these channels thus reducing their ability to clear fetal lung fluid after birth. Thus the cardiopulmonary transition that is necessary immediately after birth for postnatal adaptation may be delayed in late preterm infants, which is reflected in higher rates of retained fetal lung liquid syndrome(transient tachypnoea) and respiratory distress syndrome than in term counterparts.

Glucocorticoid surge that occurs during labour, up-regulates expression of ENaC's. Therefore respiratory morbidities are increased in case of preterm births after

elective induction and caesarean section. Whereas respiratory issues often tend to be transient in a vast majority of these neonates, some develop into primary pulmonary hypertension (PPHN) or severe hypoxic respiratory failure requiring additional therapies such as Nitrous Oxide(NO), High Frequency Ventilation(HFV), Extra-corporial membrane oxygenation(ECMO).

Late preterm infants are more prone for following respiratory morbidities:

1. Delayed respiratory transition
2. Respiratory distress syndrome (RDS)
3. Apneas
4. Pneumonia
5. Transient tachypnea of newborn(TTNB)
6. Primary pulmonary hypertension (PPHN)
7. Meconium aspiration syndrome
8. Sepsis/pneumonia

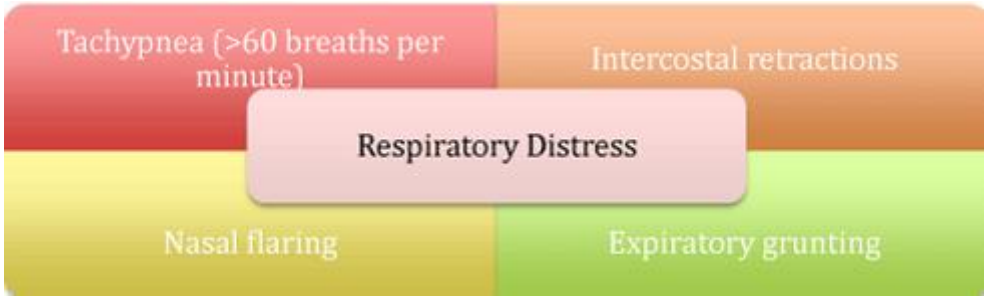


Figure 3: showing signs of respiratory distress

Across studies, incidence of respiratory morbidities in late preterm infants varies from 8% to 30% compared to term infants [25,28,29,30,31,32] . Several studies have shown that late preterm infants have a higher incidence of RDS than term infants [28,33,34]. Wang and colleagues[25] found that late preterm infants, despite their bigger size and Apgar scores similar to term infants, had increased RDS(28.9% versus 4.2%; odds ratio 9.14, P < .00001) and apnea (4.4% versus 0%; P = .05). Clark[35] found that RDS (43%) was the most common cause of pulmonary illness, followed by meconium aspiration syndrome (9.7%), pneumonia/sepsis (8.3%), TTN (3.9%), idiopathic PPHN (3.2%), aspiration of blood or amniotic fluid (2.3%), and lung hypoplasia (1.4%).

Madar and colleagues[36] found that the incidence of RDS was progressively higher with every week of gestation less than 39 weeks (30 of 1000 at 34 weeks, 14 of 1000 at 35 weeks, and 7.1 of 1000 at 36 weeks). In a large study cohort of almost 47,000 newborns in California, the incidence of RDS was 22.1% at 33 to 34 weeks, 8.3% at 35 to 36 weeks, and 2.9% at 37 to 42 weeks of gestation. Investigators in another large population-based cohort from California found that the incidence of RDS was 7.4%, 4.5%, and 2.3%, and the need for mechanical ventilation was 6.3%, 3.6%, and 2.3% in 34-week, 35-week, and 36-week infants [37]. In a more recent study, McIntire and colleagues[34] showed that the incidence of RDS requiring mechanical ventilation was 3.3% at 34 weeks, 1.7% at 35 weeks, and 0.8% at 36 weeks of gestation.

Prematurity, caesarean section, and absence of labour are independent risk factors for RDS, but together they pose a much greater risk to the infant. [24,38,39]According to a Swiss study, Roth-Kleiner et al[24] showed that term and near-term infants delivered by caesarean section before the onset of labor had much higher probability of having severe RDS. Morrison and colleagues[38] also showed that term

infants have nearly seven times the odds risk for RDS when delivered by caesarean section without labour, and they showed an increasing incidence of RDS with decreasing gestational age from 41 to 37 weeks.

There is slightly increased risk of RDS and TTN in latepreterm. Most of these late preterm infants do well and are weaned off respiratory support quickly. But as shown from the above-mentioned studies, a few of them are at increased risk of PPHN, severe Hypoxic respiratory failure and need for extracorporeal membrane oxygenation, henceforth putting them at risk of severe morbidity and mortality. Clark[35] showed that nearly 50% of late preterm infants received at least two adjunctive therapies (volume resuscitation, surfactant, vasopressors, neuromuscular blockade, high frequency ventilation, inhaled nitric oxide, extracorporeal membrane oxygenation) and nearly 11% developed chronic lung disease.

In a study done by Jaiswal et al [40] in India , the respiratory morbidity in late preterm group was seven times higher than in the term group. Treatment of respiratory disorders in late preterm infants include supportive care, mechanical ventilation, Surfactant replacement, management of pulmonary hypertension, ECMO.

Another Indian study done by Nazia Shaik et al [41]concluded that severity of RDS declined from 57 % for babies born at 34 weeks of gestation to 26.3 % for those born at 36 weeks (p 0.14). With each advancing week of gestation a significant reduction in the need for ventilator support (78 % at 34 weeks to 15 % at 36 weeks of gestation p\0.05) was observed

THERMOREGULATION

Thermoregulation in a newborn depends on the amount of brown adipose tissue, white adipose tissue, and body surface area. Non shivering thermogenesis is

controlled by the hypothalamic ventral medial nucleus through the sympathetic nervous system, which releases the neurotransmitter norepinephrine; this acts on the brown adipose tissue to liberate free fatty acids, which are eventually oxidized producing heat. Late preterm infants have decreased stores of brown adipose tissue and the hormones responsible for brown fat metabolism, such as prolactin, norepinephrine, triiodothyronine, and cortisol, which peak at term gestation. They are more likely to loose heat because of decreased amount of white adipose tissue and less insulation. Also, their smaller size leads to an increased ratio of surface area to body weight, losing heat readily to the environment.[23,42]

Cold stress manifests as tachypnea, pale colour secondary to peripheral vasoconstriction, altered pulmonary vascular tone, and metabolic acidosis. In a late preterm infant, this condition can worsen respiratory transition and exacerbate hypoglycemia, and these signs can be misinterpreted as something more ominous, such as sepsis, prompting unnecessary interventions and workups.[43]

Very few studies have looked at temperature instability in late preterm infants, but from experience we know that preterm infants are more likely to have hypothermia and cold stress. A survey of rectal temperatures among 196 term infants in a Dallas hospital found that nearly 28% were less than 36.5°C [44]. Similarly, admission temperatures at a Rhode Island hospital NICU in infants weighing more than 2 kg and of greater than 32 weeks gestation were reported to be between 34.5°C and 36.5°C[36.] Wang and colleagues[25] found that late preterm infants were more likely to present with temperature instability (10% versus 0%; P , .0012), and another study[45] found that among late preterm infants admitted to the NICU, hypothermia was listed as the primary reason for admission in almost 5.2% of this group

HYPOGLYCEMIA

The fetus gets a steady supply of glucose primarily by maternal transfer through the placenta. Immediately after birth, this constant supply of glucose is cut off, and the infant has to produce glucose primarily by hepatic glycogenolysis and gluconeogenesis[46,47]. The postnatal surge in catecholamines, glucagon, and corticosteroids plays an important role in maintaining euglycemia. This increase in plasma concentrations of catecholamines causes a decline in circulating insulin concentrations and a subsequent surge in glucagon concentrations. Glucose regulated insulin secretion by the pancreatic beta cells is also immature, resulting in unregulated insulin production during hypoglycemia [48]. Late preterm infants are challenged to maintain euglycemia secondary to developmentally immature hepatic enzyme systems for gluconeogenesis and glycogenolysis, hormonal dysregulation with inadequate adipose tissue lipolysis and decreased hepatic glycogen stores that are depleted quickly after birth[23,48].

Definition of hypoglycemia is blood glucose level less than 40 mg/dl. It can be symptomatic or asymptomatic Symptoms include Irritability, excessive crying, lethargy, or stupor, apnea cyanosis, feeding poorly, tachypnea ,tachycardia, grunting, hypothermia, hypotonia, seizures. The incidence of hypoglycemia in preterm infants is three times greater than in term newborns, and nearly two thirds of these infants require intravenous dextrose infusions[25].

Eighty percent of the fetal energy consumption is provided by glucose. In late preterm infants with limited ketogenic capacity, there is evidence that prolonged hypoglycemia is associated with neurological impairment. Hence the clinician should

be careful while discharging which may result in re-hospitalization and increased morbidities[48].

Late preterm infant should be treated for hypoglycemia if the blood glucose values are less than 45 mg/dl or in the presence of symptoms. Early feeding is the best intervention but when the secretion is not adequate oral dextrose can be given. Intravenous dextrose should be given if these interventions do not succeed and the glucose levels should be monitored frequently[48].

NEONATAL HYPERBILIRUBINEMIA

Poor caloric intake and dehydration result with exacerbation of physiologic jaundice leading to readmission to the hospital for dehydration and jaundice. These infants also have decreased activity of hepatic uridinediphosphate glucuronyl transferase enzyme and increased enterohepatic circulation because of immature gastrointestinal function and motility. This decreased ability for hepatic uptake and conjugation puts late preterm infants at increased risk of elevated serum bilirubin levels which results in more prolonged and severe jaundice[49] .

One study showed that infants born at 36 weeks of gestation have an eight times greater risk of developing a total serum bilirubin concentration greater than 20 mg/dL (.343 mmol/L) compared with infants born at 41 weeks or later[50]. Late preterm infants are 2.4 times more likely to develop significant hyperbilirubinemia than term infants.

According to a US study, Bhutani and associates [49], looking at the National Kernicterus Registry, showed that late preterm infants are at increased risk of kernicterus at bilirubin levels equal to or less than that of term infants. They are also more likely to present with high total serum bilirubin levels (25 mg/dL) and are less likely to recover without sequel than term infants. Nearly all late preterm infants in

this group were breast-feeding without adequate lactation support and poor milk intake and they were scheduled a follow-up appointment in 2 weeks. Jaundice was the most common cause of rehospitalization and late preterm infants were more likely to be rehospitalized for jaundice than term infants (4.5% versus 1.2% in term infants)[51].

Close follow-up and monitoring for feeding difficulties should be mandated to pre vent kernicterus in this vulnerable group. Screening for neonatal jaundice before discharge either by TSB or transcutaneous measurement and providing lactation management will prevent morbidities associated with hyperbilirubinemia [52]

Figure 4: Showing Neonatal Hyperbilirubenemia In A Late Preterm baby

FEEDING DIFFICULTIES

Late preterm infants have poor coordination of sucking and swallowing because of neuronal immaturity, and have decreased oromotor tone, generating lower intraoral pressures during sucking[42,43]. Poor caloric intake and dehydration result with exacerbation of physiologic jaundice, leading to readmission to the hospital for dehydration and jaundice [52]. Late preterm infants adapt well to enteral feeds, but have poor oromotor tone and difficulty with sucking and swallowing coordination. Their deglutition, sphincter control, and peristaltic functions are less likely to be as mature as in term infants.

One study found that approximately 27% of late preterm infants required intravenous fluids compared with only 5% of term infants (odds ratio 6.48, 95% CI 2.27 to 22.91, P = .0007) and among infants requiring prolonged hospital stay, poor feeding was cited as the primary reason in 76% of the late preterm infants[27].

Another study from St. Louis found that among late preterm infants admitted to the NICU, nearly 7.3% of infants of 35 weeks gestation were admitted for feeding difficulties[45].

In a study of rehospitalizations after birth hospitalization, Escobar and associates[52] found that 26% of the infants were readmitted for feeding difficulties, and late preterm infants were more likely to require rehospitalization (4.4% versus 2% in term infants).

Breast feeding the late preterm is a challenging task. Because of their immaturity they may be more sleepier and have less stamina. This is sometimes misinterpreted as sepsis which leads to unnecessary separation and treatment. Many of these infants require repeated assistance and support before achieving consistent

and nutritive breast feeding; initially, supplementation with expressed breast milk or formula is often required[54].

IMMUNITY AND INFECTION

Late preterm infants have unique susceptibilities to infection. The closed setting of NICU and immunological immaturity of premature infants set a stage for development of nosocomial infections. It has been shown that late preterm infants undergo workups for sepsis more often than term infants and receive antibiotics more often and for a longer duration (7-day course in 30% versus 17% of term infants)[27].

Neonatal sepsis can broadly classified into early-onset sepsis(<72 hours) and late onset sepsis(<72 hours). Early onset sepsis (EOS) often presents as a fulminant, multi-system illness within 72 hours of delivery and is mainly due to bacteria acquired before and during delivery whereas late onset sepsis(LOS) is due to bacteria acquired after delivery (nosocomial or community sources) and can present as either a fulminant or a smoldering infection. EOS presents with prominent respiratory signs while LOS has more varied presentations. In the Indian subcontinent, the distinction between EOS and LOS is somewhat blurred.[55]

Risk factors for sepsis:

Birth asphyxia, Unclean vaginal examination (more than 3 vaginal examination), foul smelling liquor, prolonged labor (>24 hrs), PROM > 24 hrs, birth weight <2Kg, Prematurity, Maternal fever, Gastic polymorphs >20/high power field and Meconium stained liquor constitute the majority of risk factors for sepsis

Another study found that the likelihood of having a workup for sepsis increased with decreasing gestational age; 33% had workups for sepsis at 34 weeks

compared with 12% at 39 weeks of gestational age (P < .01), of which only 0.4% of these infants had culture-proven sepsis [34]. Late preterm infants undergo workups more often for sepsis either as a part of a protocol after admission to the NICU or because of clinical manifestations of RDS, cold stress and hypoglycemia, which may appear to be signs of sepsis to the physician.

HYPOCALCEMIA

Hypocalcemia is a common neonatal abnormality particularly in high-risk neonates including infants of mothers with diabetes, infants with perinatal asphyxia, and premature and preterm infants. Calcium has crucial roles in many biochemical processes, such as blood coagulation, neuromuscular excitability, cell membrane integrity and cellular enzymatic activities. Its normal range at different ages has been reported to be between 8.8 and 10.6 mg/dl. Neonatal hypocalcemia is defined as serum or plasma tCa of < 2 mmol/L (8 mg/dL) in term and tCa of < 1.75 mmol/L (7 mg/dL) in preterm infants. Early onset Neonatal Hypocalcaemia (ENH) presents within the first three days of life, in contrast to late onset hypocalcemia, which usually presents after 72 hours[56].

NEUROLOGIC IMMATURITY

At 34 weeks gestation, brain weight is only 65% of a 40-week term infant and cerebral volume is 53% of a 40-week infant .The brain of a late preterm infant is still immature and continues to grow until 2 years of age when it reaches 80% of adult brain volume. The cerebral cortex is still smooth compared with that of a term infant because the gyri and sulci are not fully formed on the cerebral cortex, and myelination and interneuronal connectivity are still incomplete in these infants[53,57].

There is evidence that multiple insults during this critical phase of neuronal and glial maturation in these infants cause white and gray matter injury, particularly in the thalamic region and the periventricular white matter. All of this underscores the potential vulnerability of the late preterm infant to neuronal brain injury and poor developmental and long-term outcome [53].

HYPOXIC ISCHEMIC ENCEPHALOPHATY:

- Alteration in consciousness.
- Associated with systemic manifestations.
- Attributable to perinatal Hypoxia/ischemia.

PERINATAL ASPHYXIA:

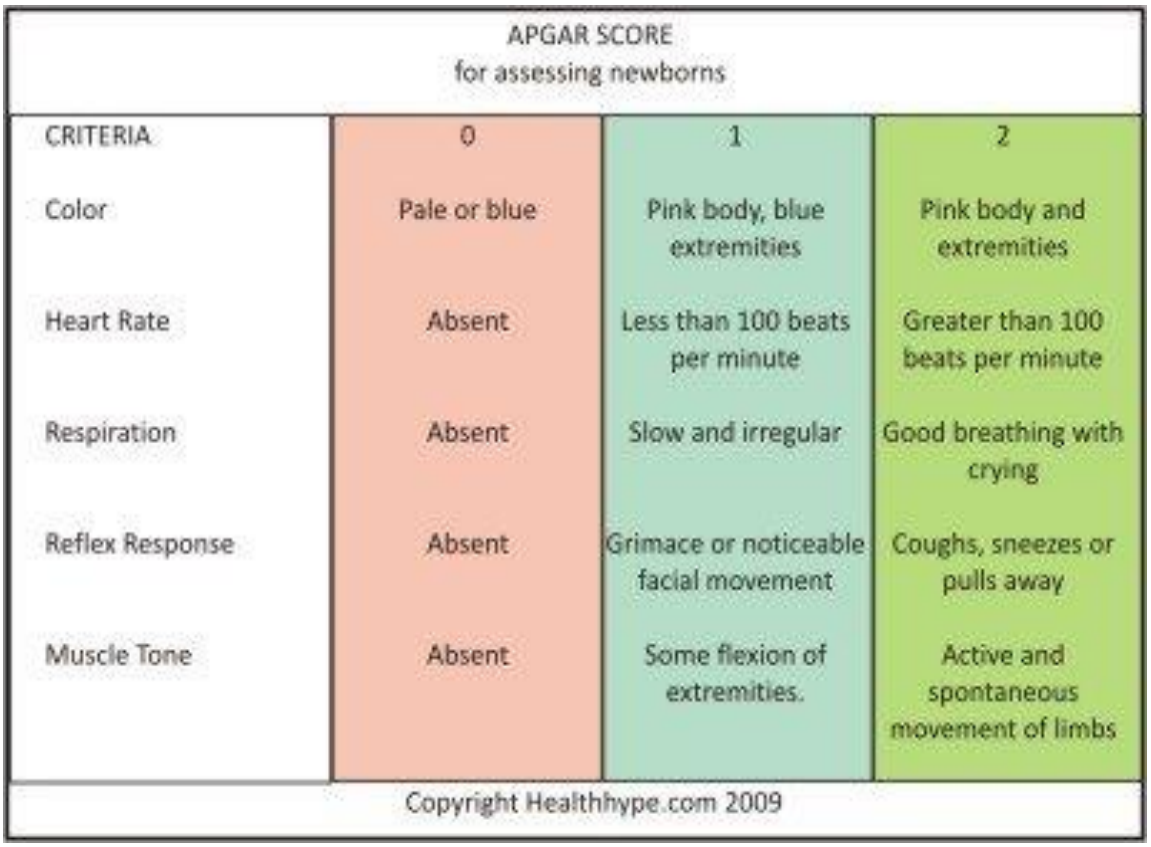
It is the insult to the fetus or newborn due to lack of oxygen (hypoxia)/or lack of perfusion to various organs of sufficient magnitude and duration to produce more than fleeting functional and biochemical changes.

WHO has defined perinatal asphyxia as a "failure to initiate and sustain breathing at birth." The National Neonatal Perinatal Database (NNPD) 2000 used a similar definition for perinatal asphyxia. It defined moderate asphyxia as slow gasping breathing or an Apgar score of 4-6 at 1 minute of age. Severe asphyxia was defined as no breathing or an Apgar score of 0-3 at 1 minute of age[59]

As per the AAP (American Academy of Pediatrics) and ACOG (American college of Obstetrics and Gynecology) all the following must be present for designation of asphyxia

1. Profound metabolic or mixed academia (pH< 7.00) in cord.
2. Persistence of APGAR scores 0-3 for longer than 5 minutes.
3. Nenonatal neurologic sequelae (eg, seizures, coma, hypotonia)

Definitions based on APGAR scores may be useful as it can be used for formulating guidelines for post-asphyxial treatment of neonates. APGAR scores are also useful for predicting long term outcome in infants with perinatal asphyxia [60,61].



APGAR SCORE
for assessing newborns

CRITERIA	0	1	2
Color	Pale or blue	Pink body, blue extremities	Pink body and extremities
Heart Rate	Absent	Less than 100 beats per minute	Greater than 100 beats per minute
Respiration	Absent	Slow and irregular	Good breathing with crying
Reflex Response	Absent	Grimace or noticeable facial movement	Coughs, sneezes or pulls away
Muscle Tone	Absent	Some flexion of extremities.	Active and spontaneous movement of limbs

Figure 5 :Showing Components of APGAR Score

Etiologies of perinantal hypoxia-ischemia include the following:

1. Maternal factors: Hypertension (acute or chronic), infection, diabetes, hypotension, vascular disease, drug use and hypoxia due to pulmonary, cardiac or neurologic disease.

2. Placental factors: infarction, fibrosis, abruption or hydrops.

3. Uterine rupture.

4. Umbilical cord accidents: prolapse, entanglement, true knot, compression.

5. Abnormalities of umbilical vessels.

6. Fetal factors: Anemia, infection, cardiomyopathy, hydrops, severe cardiac/circulatory insufficiency.

7. Neonatal factors: Severe neonatal hypoxia due to cyanotic congenital heart disease, persistent pulmonary hypertension of the newborn (PPHN), cardiomyopathy, other forms of neonatal cardiogenic and/or septic shock[62].

GRADING OF HIE (LEVENE STAGING)[63]

	GRADE I (Mild)	GRADE II (Moderate)	GRADE III (Severe)
Sensorium	Irritable	Lethargic	Comatose
Tone	Mild Hypotonia	Marked tone Abnormality	Severe Hypotonia
Feeding	Poor sucking	Required tube feeding	Failure to maintain spont. Respirations
Seizures	No seizures	Seizures	Prolonged seizures

Table 1 :Showing Components of Thompson levene scoring

MORTALITY

Kramer and colleagues[64], using a large population-based cohort of linked birth/death certificate data of infants born in the United States and Canada found relative risk for death from all causes in late preterm infants to be 2.9 (95% CI 2.8 to 3) and 4.5 (95% CI 4.0 to 5.0), with the corresponding etiologic fraction being 6.3% and 8% (etiologic fraction is the proportion of all cases of mortality that can be

attributed to being born at late preterm gestation). The relative risk and etiologic fraction remained high even when deaths from congenital malformations were factored out. Tomashek and coworkers[5], using U.S. period-linked birth/infant death files for 1995-2002 to compare overall and cause-specific mortality rates between singleton late preterm infants and term infants, found that despite significant declines in mortality rates for late preterm and term infants since 2005, infant mortality rates in 2002 were three times higher in late preterm infants than term infants (7.9 versus 2.4 deaths per 1000 live births); early (1-6 days), late (7-27 days), and postneonatal (28-365 days) mortality rates were 6, 3, and 2 times higher. During infancy, late preterm infants were approximately four times more likely than term infants to die of congenital malformations (leading cause); newborn bacterial sepsis; and complications of placenta, cord and membranes.[5]

Young and associates,[65] in a large cohort from Utah, showed increasing mortality and relative risk of death for every decreasing week in gestational age less than 40 weeks . In another study looking at a large cohort of 133,022 infants born at 34 to 40 weeks gestation, McIntire and colleagues[34] found that neonatal mortality rates were significantly higher for late preterm infants (1.1, 1.5, and 0.5 per 1000 live births at 34 weeks, 35 weeks, and 36 weeks) compared with 0.2 per 1000 live births at 39 weeks ($P < .001$).

ADMISSION AND READMISSION TO NICU

Late preterm infants are more likely to require intensive care and are admitted to the N1CU more often than term infants. Admission rates vary based on the policies of individual institutions and hospitals. Some routinely admit all infants less than 35 weeks of gestation to the NICU and others do so only if there is a need.

One large population-based study found that 88% of infants born at 34 weeks gestation, 12% born at 37 weeks gestation and 2.6% born at 38 to 40 weeks' gestation were admitted to an NICU[66].

The late-preterm infant may be discharged early from the hospital if the late preterm infant is often the same height and weight as a full term infant, maintain body temperature and and able to breast/bottle feed.

Early discharge is defined as less than 48 hours after a vaginal birth or 96 hours after a cesarean section[67]. The AAP recommends that early discharge should be limited to singleton births with gestational ages 38 to 42 weeks; however, early discharge of the late-preterm population still occurs. Early discharge is not recommended due to the multiple morbidity risks associated with late-preterm infants[67].

In a retrospective chart review of 235 late-preterm infants, 40% of the infants experienced a prolonged hospital stay; 75% of the 34 week gestation infants and 25% of the 36- week gestation infants experienced prolonged hospital stays due to oxygen need, phototherapy for hyperbilirubinemia, hypothermia, need for nasogastric feedings, or antibiotic administration greater than three days[68].

In a large multi-site study conducted by Shapiro-Mendoza et al.[15] in 2008 found that 22.2% of the 26,170 late-preterm births had experienced at least one complication that could lead to a prolonged hospital stay compared to 3% of the 377,638 term infants; the 34-week gestation age group had the highest morbidity (51%). The percentage gradually decreased with each advancing week down to 5.9% morbidity at 37 weeks gestation. So if infants are discharged early they are more prone to get readmitted with morbidities.

According to a Indian study done by Jaiswalet al,[40] the morbidity rate requiring inpatient observation, admission or readmission was 70.8% in late preterm group compared to 29.1% in term group. In another Indian study done by Wagh AS et al [25]late preterm babies had more neonatal morbidities compared to term babies (85 % Vs 16.3%) that required admission. The primary reasons for readmission of late preterm infants are hyperbilirubinemia (71%), suspected infection (20%), and feeding difficulty (16%), problems that reflect developing physiologic and metabolic organ functions[24,26].

MANAGEMENT OF LATE PRETERM INFANTS

It is of great importance that clinicians treat late preterm infants with monitoring and care which they deserve and not club them with term infants. It is recommended that even stable late preterm infants be admitted to an area where they can be closely monitored.

ADMISSION AND DISCHARGE CRITERIA[33]

ADMISSION CRITERIA

Admit all infants with 35 weeks gestational age or 2300g birth weight. Infants should not to be sent to their mother's rooms in the first 24 hours until stable, unless arrangements can be made to provide transitional care and close monitoring in the mother's room.

HOSPITAL MANAGEMENT

• Physical examination on admission and discharge

• Determination of accurate gestational age on admission examination

• Vital signs and pulse oximeter check on admission, followed by vital signs every 3-4 hours in the first 24 hours, and every shift thereafter

• Caution against use of oxyhoods with high FiO2; consider transfer to NICU/tertiary care center if FiO2 exceeds0.4

• Feeding plan should be developed; formal evaluation of breast feeding and documentation in the record by caregivers trained in breast feeding at least twice daily after birth.

• Serum glucose screening per existing protocols for infants at high risk of hypoglycaemia

DISCHARGE CRITERIA

• Discharge should not be considered before 48 hours after birth

• Vital signs should be normal for 12 hours before discharge

• Passage of one stool spontaneously

• Adequate urine output

• Successful feeding for 24 hours: ability to coordinate sucking, swallowing,

and breathing while feeding

• If weight loss >7% in 48 hours, consider further assessment before discharge

• Risk assessment plan for jaundice for infants discharged within 72 hours of birth

• No evidence of active bleeding at circumcision site for at least 2 hours

• Initial hepatitis B vaccine has been given or an appointment scheduled for its administration

• Metabolic and genetic screening tests performed in accordance with local or hospital requirements

• Hearing assessment has been performed and results documented in the medical record; follow-up if necessary has been arranged

• Family, environmental, and social risk factors have been assessed; when risk factors are present, discharge should be delayed until a plan for future care has been generated

• Identification of a physician with a follow-up visit arranged for 24-48 hours

• Give mother and caregivers training and competency in care of the infant.

The mother and caregivers should have received training and demonstrated competency in the following activities, knowledge of urine/stool frequency, umbilical cord and skin care, identification of common signs and symptoms of illness, specific instructions concerning jaundice, specific instructions regarding sleeping patterns and positions, instructions on thermometer use and instruction regarding responses to an emergency.

PREVENTION OF LATE PRETERM BIRTHS

As it is proven beyond doubt that late preterm births are associated with more neonatal morbidities than term births it is wise to prevent or reduce those births. Firstly awareness among the health personnel should be improved regarding the morbidities associated with the late preterm births. Reducing multiple births, halting the practice of performing elective caesarean sections without indication, educating

women of child bearing age, smoking cessation would be some of the practices which can bring down the late preterm birth rate. Iatrogenic late preterm and early term births can be reduced by adherence to guidelines for determining gestational age and elective deliveries (inductions and caesarean sections)[69].

Early prenatal care should be encouraged as it optimizes the opportunities to assess gestational age most accurately which helps to plan timing and route of delivery. Women requesting caesarean delivery are likely to benefit from a thorough discussion of the advantages and disadvantages of caesarean and vaginal births for the fetus, new born infant, and woman. If maternal fears of pain, fetal complications, or maternal morbidities with vaginal delivery are the primary reasons to request caesarean delivery, education and counselling about such fears are recommended[70].

STUDIES ON MORBIDITIES AMONG LATE PRETERM INFANTS:

Much has been spoken and written about problems of the preterm (less than 34 weeks) but little is available on babies above this gestation. The available literature is mainly from the western nations.

The obstetric and newborn care in these countries is different from a developing country like India. There is very limited data available on the problems regarding late preterm babies in India. Most of the studies on late preterm were retrospective.

Wagh AS et al [25] from Kerala, south India have done studies on comparison of neonatal morbidities of late preterm with term born babies in which 114 late preterm babies were compared against 1094 term born babies. Late preterm babies had more neonatal morbidities compared to term babies (85 % vs 16.3 %). Need for resuscitation (14 vs 1.7 %), need for respiratory support(29.8 vs 3.4%), hypoglycemia

(30 vs 2.2 %), hyperbilirubinemia (50 vs 10.4 %), sepsis (9.6 vs 0.9 %), need for intravenous fluids (58 vs 2 %) were more in late preterms as compared to term babies. They concluded that late preterm babies have higher risk of neonatal morbidities. They are likely to have growth and development concerns even at 3 months corrected age.

Jaiswal et al[40] did a prospective cohort study in Fernandez hospital, Hyderabad on early neonatal morbidities in late preterm infants with an objective to compare early neonatal morbidity (within first 7 days of life) in late preterm infants with term infants. 363 late preterm infants and 2707 term infants were included in study. Two hundred fifty seven (70.8 %) of late preterm and 788 (29.1%) of term infants had at least one of the neonatal morbidities like respiratory morbidity, hypoglycemia, sepsis and jaundice. Late preterm infants were at significantly higher risk for overall morbidity due to any cause. The incidence of morbidities increased from 23% at 40 weeks to 30%, 39.7%, 67.5%, 89% and 87.9% at 38, 37, 36, 35 and 34 weeks respectively. They concluded that compared with term infants, late preterm infants are at high risk for respiratory morbidity, need of ventilation (non invasive or invasive), jaundice, hypoglycemia, sepsis, and probable sepsis.

Femitha P et al [71]did study in, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), India on early neonatal outcome in late preterms showed that late preterm babies constituted 55% of all live preterm births. In the study group, 42.4% and 20.8% babies suffered major and minor morbidity compared to 8.4% and 6.8% of term controls respectively. Late preterm neonates had significantly higher odds of developing morbidity like respiratory distress (12.4% vs. 5.6%), need for non invasive(17.3% vs. 5.7%), and invasive ventilation (14.6% vs. 1.7%), sepsis (20.8% vs. 5.2%), seizures (22.8%vs. 4.8%), shock (17.6% vs. 4.4%) and jaundice

(26% vs. 6%). They concluded that late preterm neonates have significantly more mortality and morbidity compared to term controls.

In a retrospective study by Shapiro Mendoza et al[15], late preterm infants were compared with 377,638 term infants. Late-preterm infants were 7 times more likely to have newborn morbidity than term infants (22% vs 3%). The newborn morbidity rate doubled in infants for each gestational week earlier than 38 weeks.

Gouyon et al[72] did a study on singleton neonates with gestational age ranging from 34-41 weeks of gestation and found that the rate of severe respiratory disorders markedly declined with gestational age from 19.8% at 34 weeks to 0.28% at 39 to 41weeks.

A prospective study on mortality and morbidity in late-preterm newborns by Pinar B et al[73] showed that 412 of 2582 (15.2%) babies were late-preterms. The number and rate of neonatal ICU admissions of term and late preterm infants were 28 (14%) and 172 (54.5%) respectively. Respiratory problems in late-preterms were significantly more frequent (31.8% versus 2%). Mechanical ventilation was used in 20.9% of late-preterms while no term newborns needed it. Late-preterms were more likely to have feeding problems (19.1% vs 0.5%), hyperbilirubinemia (44.1% vs 7.5%), hypoglycemia (6.4% vs 1.0%), hypothermia(14.5% vs 0%), and infection (15.9% vs0%). The mortality rate in late-preterm infants were 11 times more than term infants (5.5% vs 0.5%).

Abu Salah et al[74] did a cross sectional study at Queen Alia Hospital in Amman, Jordan on unfavourable outcomes associated with late preterm birth. In their study there were 2904 (89.3%) term and 348 (10.7%) preterm live singletons. There were 253(7.8%) late preterm making the rate of late preterm at 253 (72.7%) of all

preterm singletons. Among them respiratory morbidities were diagnosed in 2.8% against 13.8% ($p<0.001$). Hypoglycemia was diagnosed in 1.1% against 10.3%.Feeding difficulties were 1.2% against 15.8 % ($p<0.001$). Evaluation for sepsis in 2.9% versus 30.8% ($p<0.001$). Phototherapy for jaundice was required in 1.2% against 10.7% infants ($p<0.001$). They concluded that late preterm infants are at higher risk of morbidity and hospitalization than term infants. Treating late preterm infant as almost term and almost normal infants should be avoided.

Breno F et al[75] did analysis of neonatal morbidity and mortality in late-preterm newborn infants. Study included 239 late preterms and 698 term neonates in the control group and concluded that late-preterm newborn infants had a mortality rate nine times that of full term infants and were exposed to a greater risk of intercurrent conditions during the neonatal period. These intercurrent conditions were inversely related to gestational age.

Bastek JA et al[76] studied on adverse neonatal outcomes: examining the risks between preterm, late preterm, and term infants. This study sought to assess differences in adverse outcomes between infants delivering 32 to 33 6/7, 34 to 36 6/7 weeks, and 37 weeks or later. Data were collected as part of a retrospective cohort study of preterm labor patients (2002-2005). Patients delivering 32 weeks or later were included ($n = 264$). The incidence of adverse outcomes was assessed. Significant associations between outcomes and gestational age at delivery were determined. It was found that late preterm infants had increased risk of adverse outcomes, compared with term infants. Controlling for confounders, there was a 23% decrease in adverse outcomes with each week of advancing gestational age between 32 and 39 completed weeks (relative risk 0.77, $p < .001$, 95% confidence interval, 0.71-0.84).

METHODOLOGY

MATERIALS AND METHODS

SOURCES OF DATA:

All late preterm babies (34 $^{0/7}$ weeks - 36 $^{6/7}$ Weeks) admitted to R L Jalappa hospital Kolar, who meet the inclusion criteria for a period of one year (January 2016-December 2016).

STUDY DESIGN:

A prospective observational hospital based study.

INCLUSION CRITERIA:

- All live inborn late preterm infants

EXCLUSION CRITERIA:

- Infants with major congenital anomalies
- Multi fetal births
- Infants with metabolic disorders
- Preterm infants less than 34 weeks of gestation
- Post term infants with gestation more than 42 weeks

Sample size: All late preterm babies (34 $^{0/7}$ weeks - 36 $^{6/7}$ Weeks) admitted to R L Jalappa hospital Kolar, who meet the inclusion criteria for a period of one year (January 2016-December 2016) and the Sample size was estimated based on the reference study[40]. Minimum sample

Size obtained was 136.

$$n = \frac{Z^2 pq}{d2}$$

n=sample size

Z=standard deviation(which is at 95% confidence interval)

p=prevalence (p1=17.2%,p2=29.7%)

q=(1-p)

d=margin of error of 10%

n=79+57=136

METHOD OF COLLECTION OF DATA

All late preterm babies delivered in RL JALAPPA Hospital were taken into the study

- Informed consent was taken from the parents.
- Gestational age was calculated from mothers LMP and New Ballard score
- Details regarding maternal risk factors were collected by detailed history taking and the obstretical records with them.
- Babies were weighed using electronic weighing machine present in our NICU with standard error of ±5grams.
- Babies were categorized into small for gestational age (SGA), appropriate for gestational age (AGA) by plotting on intrauterine weight chart for both the sexes.
- Babies with birth weight less than 10th percentile were categorized as SGA, between 10th & 90th percentile as AGA.
- A total of 136 late preterm babies were evaluated for morbidities and mortality for the first seven days of life.
- The infants were followed up regularly during their stay in the NICU and postnatal wards, up until hospital discharge.
- Data collected were filled in proforma (ANNEXURE-I)
- Infants were evaluated up to seven days of life through clinical examination or investigations for development of any of the following factors

a. Morbidities such as:

- Need for resuscitation at birth,
- Respiratory morbidities,
- Hypoglycemia,
- Sepsis,
- Feeding difficulties,
- Hyperbilirubinemia
- Hypocalcemia

b. **Need for resuscitation at birth** for any infant as per NRP 2010 guidelines was included in the study[40].

c. Hypoglycemia: Blood sugar less than 40 mg/dl was considered as Hypoglycemia[40.]

d. Hypocalcemia:. Neonatal hypocalcemia is defined as serum 7 mg/dL in preterm infants[77].

e. Jaundice: Clinically visible jaundice requiring phototherapy/exchange transfusion as per hour specific total serum bilirubin (TSB) nomogram (AAP chart). Criteria for 35 weeks were used for infants with 34 weeks gestation[40].

f. Respiratory morbidity: presence of at least two criteria[40]

1. Respiratory rate >60/min

2. Subcostal/ intercostal retractions

3. Expiratory grunt/groaning

4. Requirement of supportive respiratory therapy

g. Sepsis: Diagnosis of sepsis was considered based on the following data[25]

1. Suspect sepsis, on the basis of clinical suspicion

2. Probable sepsis on the basis of positive sepsis screen

3. Confirmed sepsis on the basis of culture positive sepsis

h. Feeding difficulties: Delay in initiating and maintaining adequate direct breast feeding was considered as feeding difficulties in the absence of sepsis and respiratory distress[74].

Statistical analysis:

- Data will be entered into Microsoft excel data sheet and analyzed using SPSS 18.0, and R environment ver.3.2.2 version software.
- Categorical data will be represented in the form of frequencies and proportions.
- Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. Non-parametric setting for Qualitative data analysis.
- Correlation will be done to find the relationship between two variables.
- Regression to find the value of dependent variable is known, p value < 0.05 will be considered as statistically significant

RESULTS

RESULTS

TABLE 2: GESTATIONAL AGE DISTRIBUTION OF NEONATES STUDIED

GESTATIONAL AGE	NO. OF NEONATES	%
$34^{0/7}$ to $34^{6/7}$	35	25.7
$35^{0/7}$ to $35^{6/7}$	55	40.4
$36^{0/7}$ to $36^{6/7}$	46	33.8
Total	136	100.0

Out of 136 neonates, 35 neonates were admitted between the gestational age of $34^{0/7}$ to $34^{6/7}$ weeks who constitute about 25.7%. 55 neonates were admitted between the gestational age of $35^{0/7}$ to $35^{6/7}$ weeks who constitute about 40.4% and 46 neonates were admitted between the gestational age of $36^{0/7}$ to $36^{6/7}$ weeks who constitute about 33.8% of the study group.

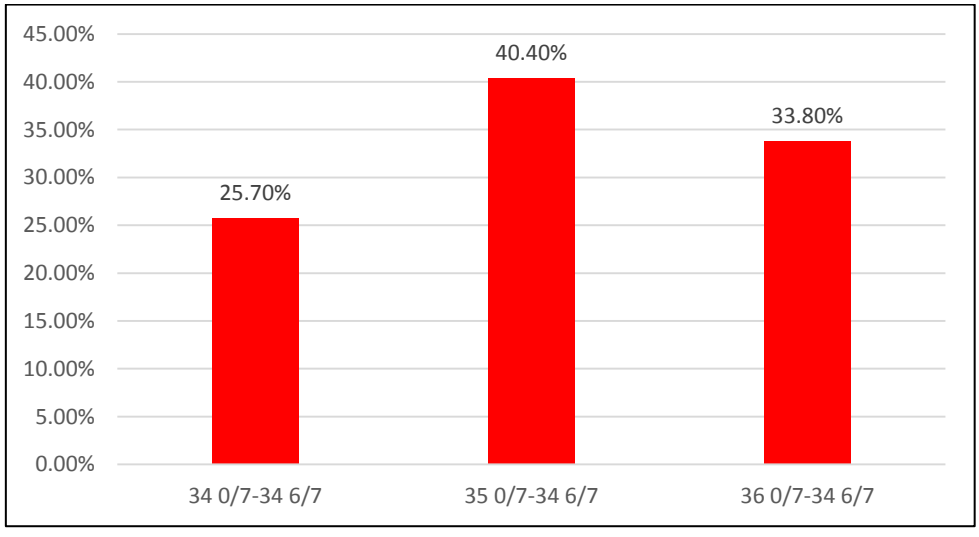


FIGURE 6-BAR DIAGRAM SHOWING GESTATIONAL AGE OF NEONATES STUDIED

TABLE 3: GENDER DISTRIBUTION OF NEONATES STUDIED

GENDER	NO. OF NEONATES	%
MALE	64	47.1
FEMALE	72	52.9
TOTAL	136	100.0

Out of the 136 neonates, 64 were male who constitute about 47.1% and 72 neonates were female who constitute 52.9%. Ratio of male to female is 0.81:1. Sex distribution showed female predominance.

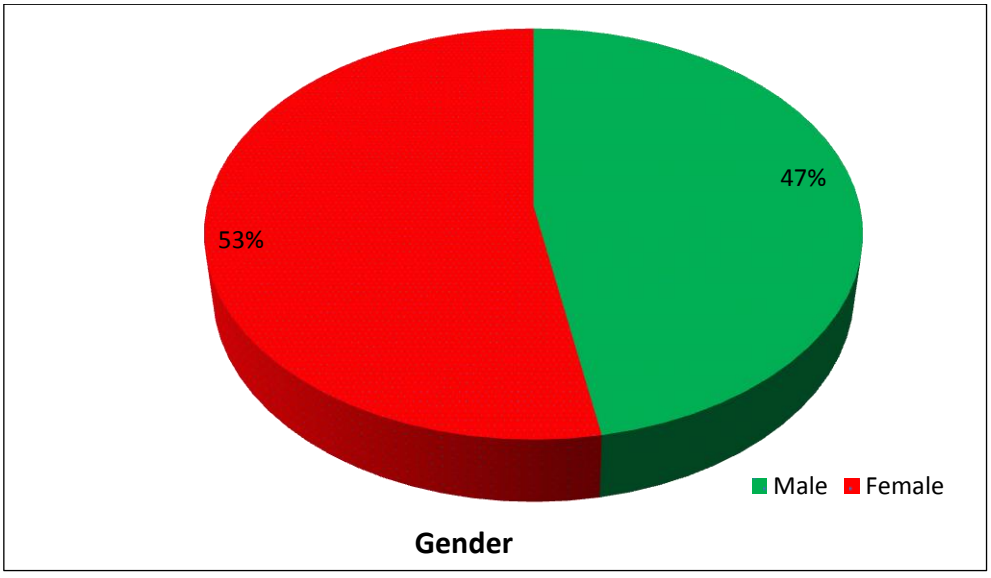


FIGURE 7-PIE DIAGRAM SHOWING GENDER DISTRIBUTION OF NEONATES STUDIED.

TABLE 4: CONSANGUINITY DISTRIBUTION OF NEONATES STUDIED

CONSANGUINITY	NO. OF NEONATES	%
NON-CONSANGUINEOUS	104	76.5
CONSANGUINEOUS	32	23.5
TOTAL	136	100.0

Of the 136 neonates studied, 32 (23.5%) were born of consanguineous marriage while 105 (76.5%) were born of non consanguineous marriage

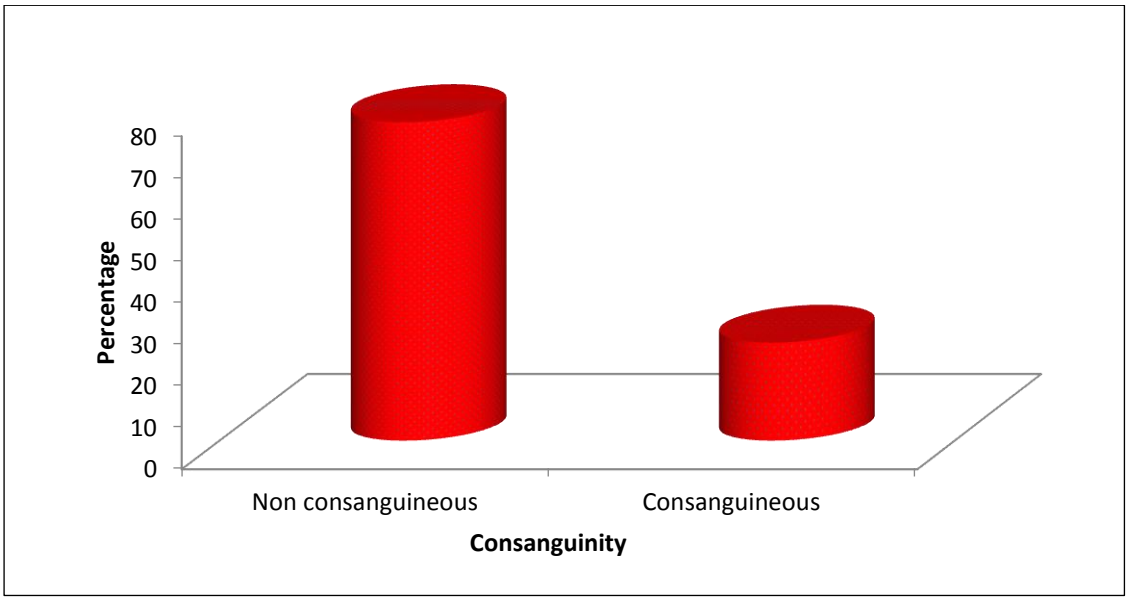


FIGURE 8 : BAR DIAGRAM SHOWING CONSANGUINITY DISTRIBUTION OF NEONATES STUDIED

TABLE 5: BIRTH WEIGHT (KG) DISTRIBUTION OF NEONATES STUDIED

BIRTH WEIGHT (KG)	NO. OF NEONATES	%
>2.5 KG	37	27.2
2-2.5	51	37.5
1.5-2	35	25.7
<1.5 KG	13	9.6
TOTAL	136	100.0

Regarding birth weight, 51 neonates were born with birth weight between 2 and 2.5 kg which constitute about 37.5%. 37 neonates were born with birth weight above 2.5 Kg which constitute about 27.2%. 35 neonates were born with birth weight between 1.5 and 2 kg which constitute about 25.7%. 13 neonates were born with birth weight of <1.5Kg which constitute 9.6%.

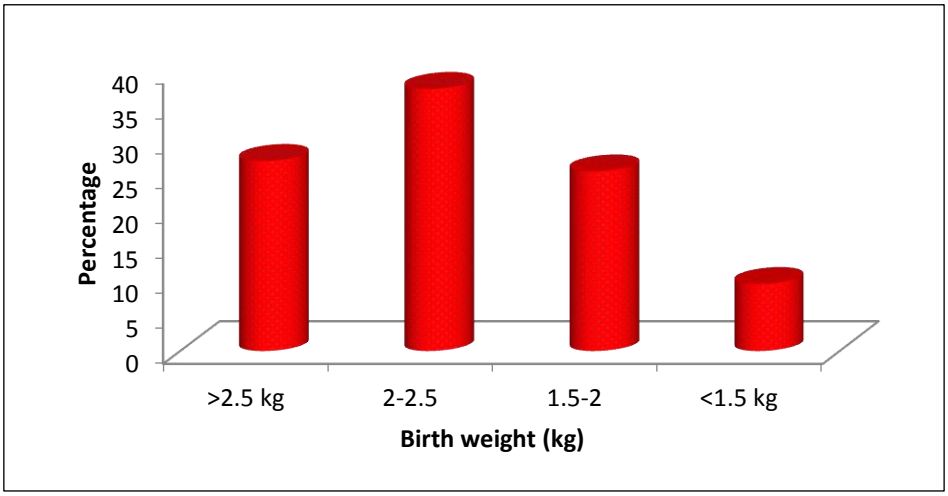


FIGURE 9 :BAR DIAGRAM SHOWING BIRTH WEIGHT (KG) DISTRIBUTION OF NEONATES STUDIED

TABLE 6: WEIGHT FOR AGE DISTRIBUTION OF NEONATES STUDIED

WEIGHT FOR AGE	NO. OF NEONATES	%
AGA	79	58.1
SGA	57	41.9
TOTAL	136	100.0

79 neonates (58.1%) have weight appropriate for gestation age. 57 neonates (41.9%) have weight small for gestational age.

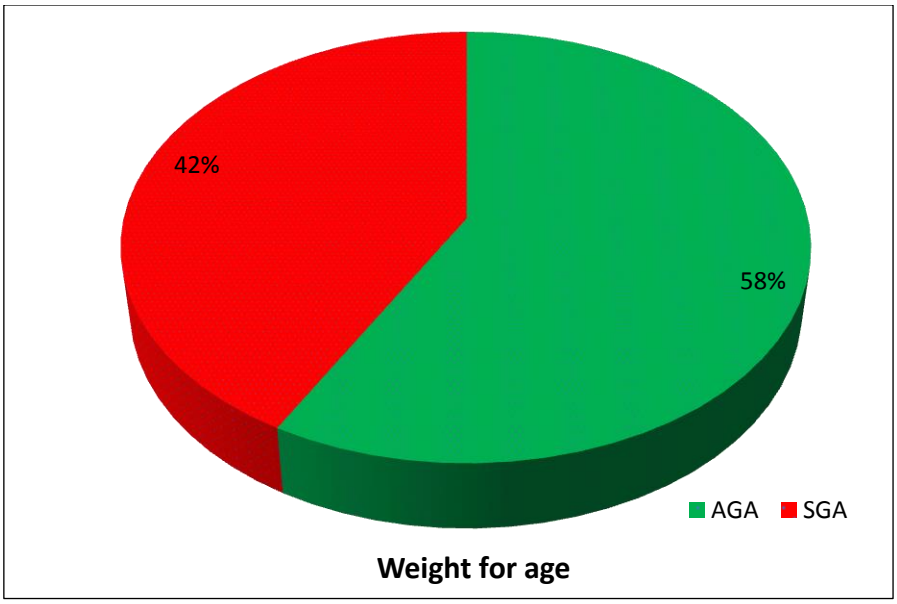


FIGURE 10: PIE CHART SHOWING WEIGHT FOR AGE DISTRIBUTION OF NEONATES STUDIED

TABLE 7: MODE OF DELIVERY

MODE OF DELIVERY	NO. OF NEONATES	%
NORMAL	55	40.4
INSTRUMENTAL DELIVERY	4	2.9
LSCS	77	56.6
TOTAL	136	100.0

Regarding mode of delivery, vaginal delivery was conducted in 55 mothers which accounts for 40.4%. 4 deliveries were assisted by ventouse extraction. 77 neonates were born through LSCS which accounts for 56.6%.

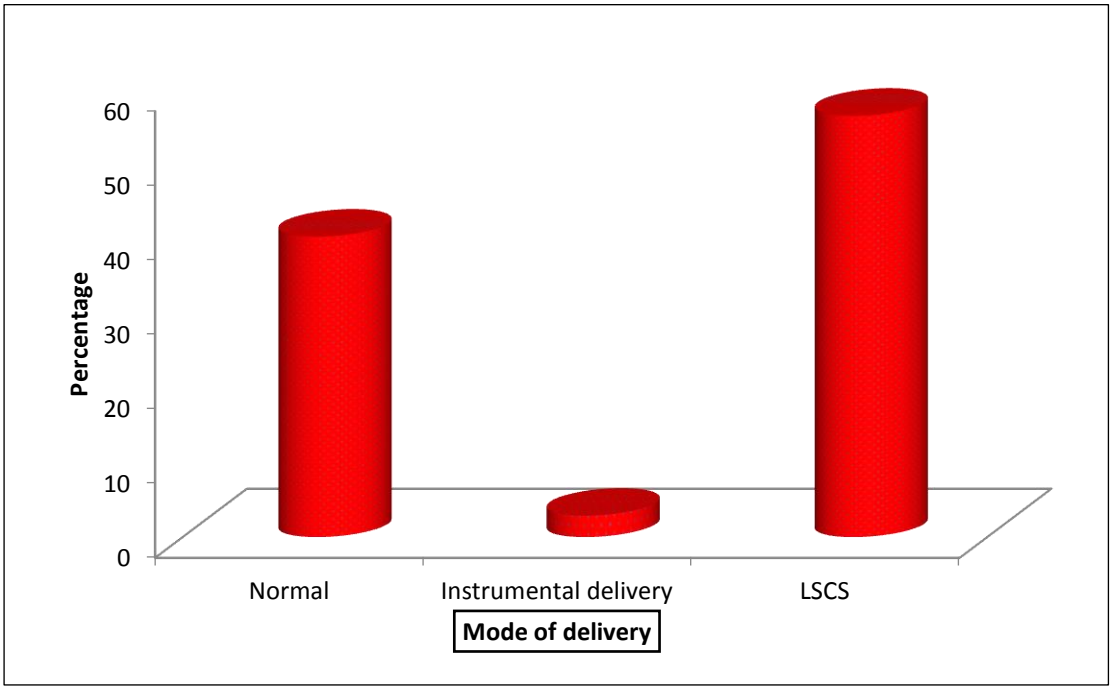


FIGURE 11:BAR DIAGRAM SHOWING MODE OF DELIVERY DISTRIBUTION OF NEONATES STUDIED

TABLE 8: MATERNAL RISK FACTORS DISTRIBUTION OF NEONATES STUDIED

MATERNAL RISK FACTORS	% OF NEONATES
ABSENT	24.26%
PRESENT	75.74%

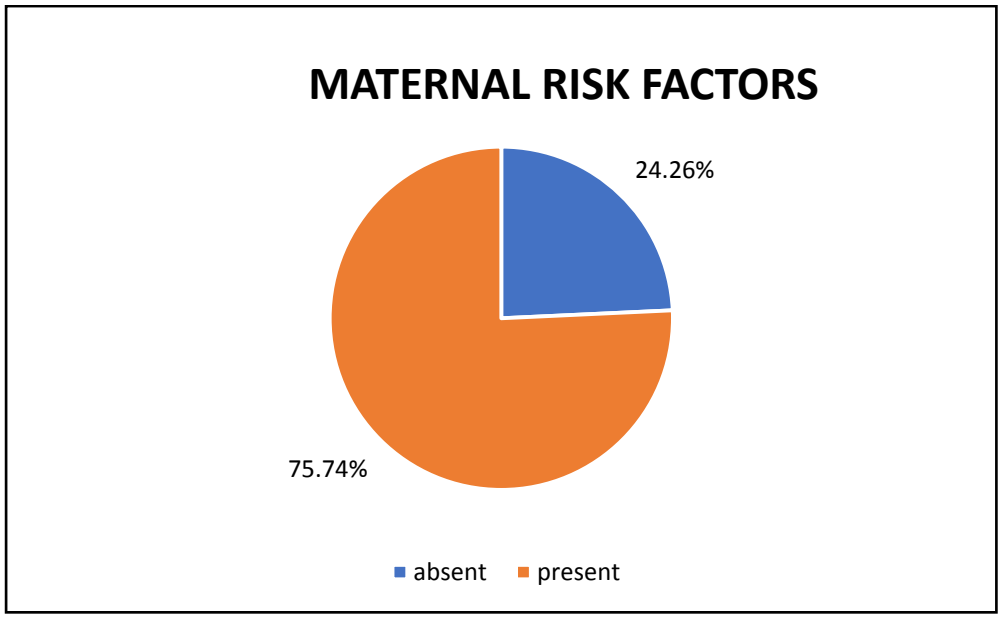


FIGURE 12: PIE CHART SHOWING MATERNAL RISK FACTORS DISTRIBUTION OF NEONATES STUDIED

TABLE NO 9-DISTRIBUTION OF NEONATES ACCORDING TO INDIVIDUAL MATERNAL RISK FACTORS

MATERNAL RISK FACTORS	NO OF NEONATES N=136	%
PIH	32	31.06
PROM	26	25.24
ANEMIA	18	17.47
PREVIOUS LSCS	9	8.73
APH	8	7.76
PREVIOUS H/O PRETERM	7	6.79
YOUNG AGE	6	5.82
ELDERLY PRIMI	5	4.85
PREVIOUS H/O ABORTIONS/STILL BIRTH	5	4.85
DIABETES	4	3.88
2 OR MORE RISK FACTORS	31	30.09

Maternal risk factors were present in 103 mothers which constitute about 75.7%. Among which PIH has high incidence followed by PROM. PIH and PROM constitute about 31.06% and 25.24% followed by Anemia and Previous LSCS which constitute about 17.47% and 8.73% each respectively. APH were found in 8 which

constitute about 7.76%. Previous history of preterm delivery were found in 7 neonates which accounts for about 6.79%. Younger age was found in 6 cases constituting 5.82%. Previous history of still birth/abortion was found in 5 neonates and elderly primi were found in 4.85%. Diabetes was found in 3.88%. Maternal risk factor could not be elicited in 33 cases which constitute about 24.3% and 31(30.09%) mothers had 2 or more identifiable risk factors.

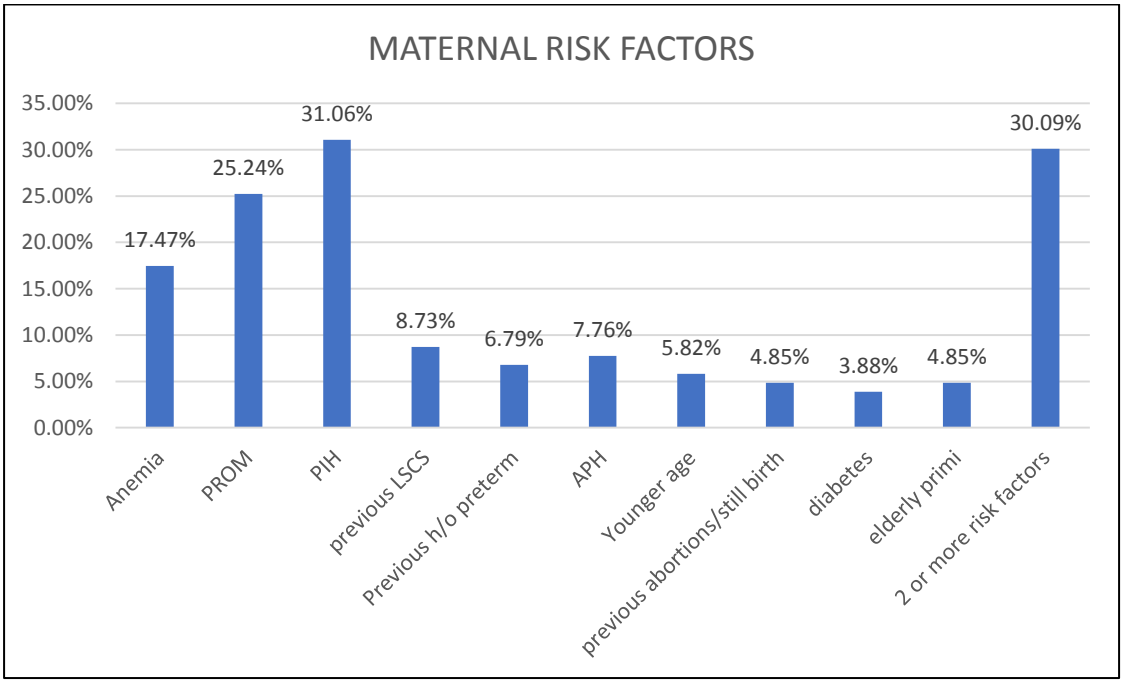


FIGURE 13: BAR DIAGRAM SHOWING DISTRIBUTION OF NEONATES ACCORDING TO INDIVIDUAL MATERNAL RISK FACTORS

TABLE 10: TYPE OF MORBIDITY DISTRIBUTION OF NEONATES STUDIED

TYPE OF MORBIDITY	NO. OF NEONATES	%
BIRTH ASPHYXIA	16	11.8
FEED INTOLERANCE	31	22.8
RESPIRATORY MORBIDITY	66	48.5
HYPERBILIRUBINEMIA	58	42.6
PROBABLE SEPSIS	21	15.8
APNEA OF PREMATURITY	5	1.5
HYPOGLYCEMIA	15	11.0
HYPOCALCEMIA	6	1.5
TOTAL	136	100.0

Of the 136 neonates studied, majority of them presented with multiple morbid conditions of which Respiratory morbidity and Hyperbilirubinemia had highest incidence of 48.5% and 42.6% each followed by Feed Intolerance and Probable Sepsis constituting about 22.8% and 15.8% respectively. Birth Asphyxia was found in 11.8%, Hypoglycemia in 11%, Hypocalcaemia and Apnea of Prematurity was seen in 1.5% of neonates each.

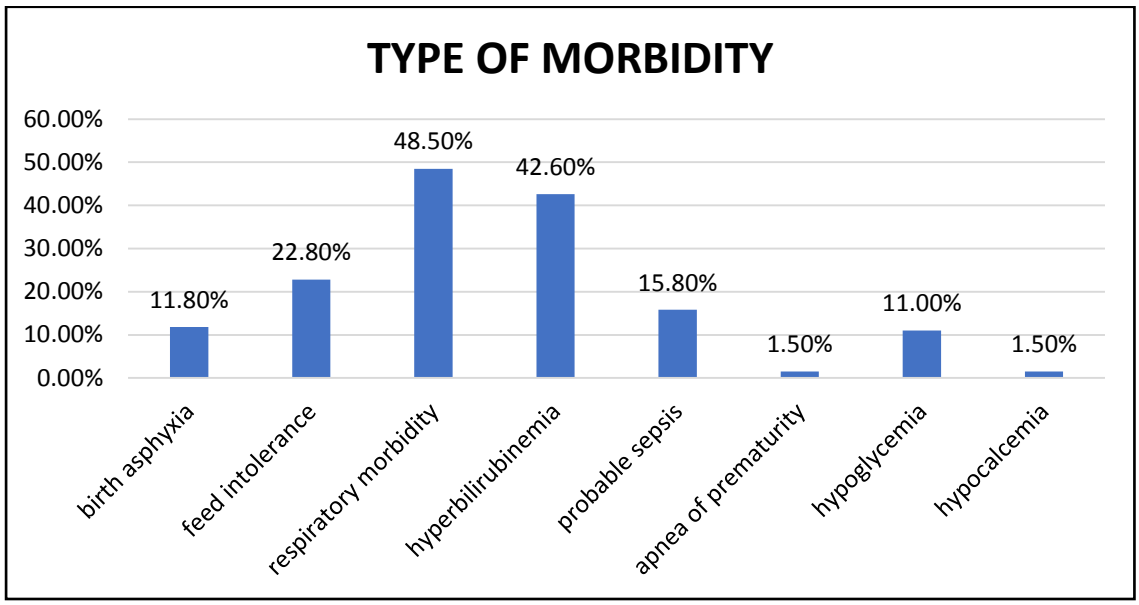


FIGURE 14 : BAR DIAGRAM SHOWINGTYPE OF MORBIDITY

DISTRIBUTION OF NEONATES STUDIED

Table 11: DISTRIBUTION OF RESPIRATORY MORBIDITY IN NEONATES STUDIED

RESPIRATORY MORBIDITY	NUMBER OF PATIENTS	PERCENTAGE (%)
ABSENT	70	49%
PRESENT	66	51%
TOTAL	**203**	**100.0**

Regarding respiratory morbidity ,66 neonates had respiratory morbidity which accounts for about 51%

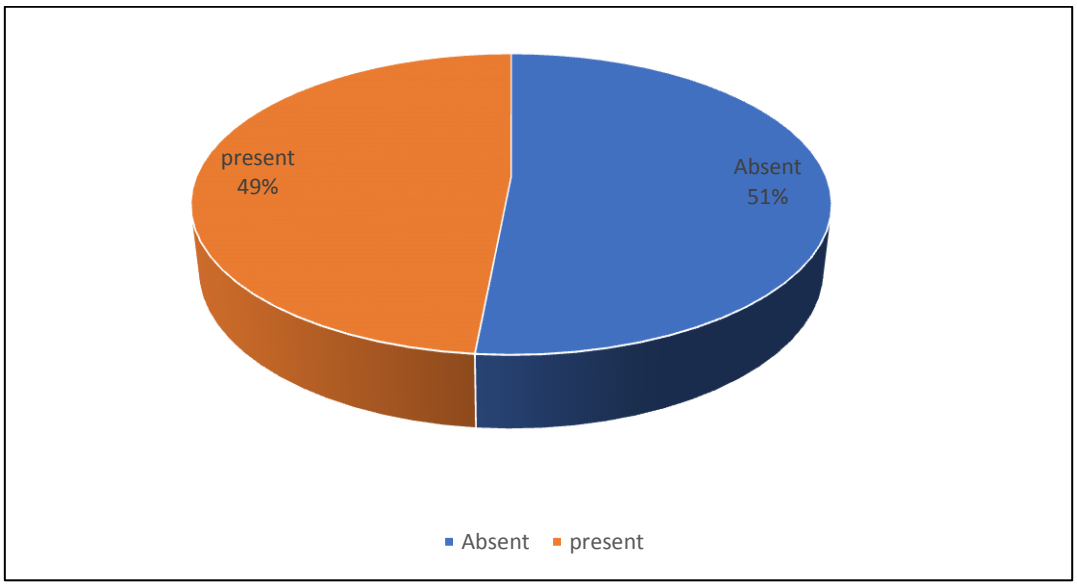


FIGURE15 : PIE CHART SHOWING DISTRIBUTION OF RESPIRATORY MORBIDITY IN NEONATES STUDIED

TABLE 12: TYPE OF RESPIRATORY MORBIDITY DISTRIBUTION OF NEONATES STUDIED

TYPE OF RESPIRATORY MORBIDITY	NO. OF NEONATES	%
NORMAL	70	51.5
PNEUMONIA	8	5.9
RDS	15	11.0
TTNB	43	31.6
TOTAL	136	100.0

Out of 48.5% of neonates who presented with Respiratory morbidity, 31.6% had Transient Tacyhpnea of Newborn, followed by Respiratory Distress Syndrome in 11% and Pneumonia in 5.9%.

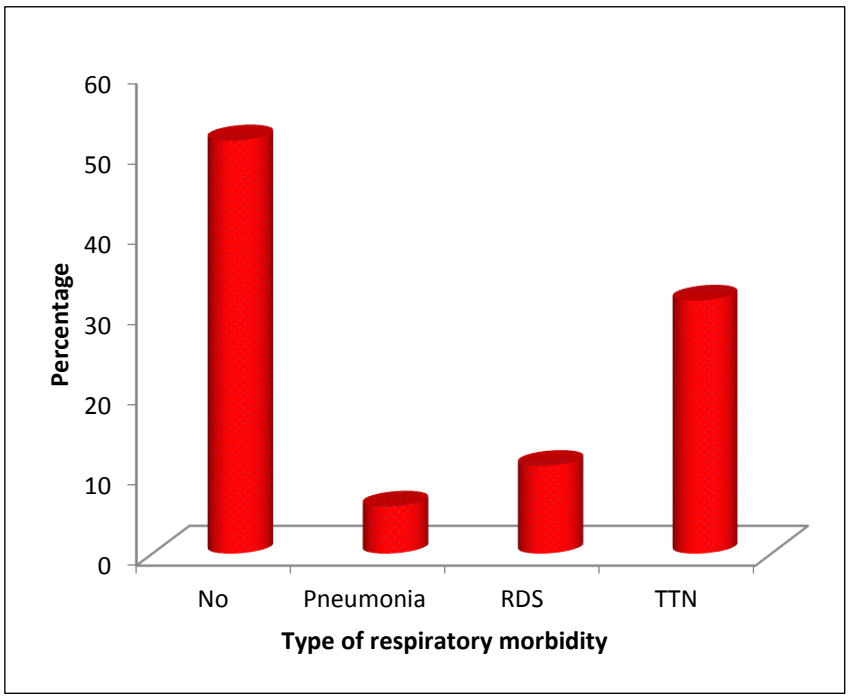


FIGURE 16: BAR DIAGRAM SHOWING TYPE OF RESPIRATORY MORBIDITY DISTRIBUTION OF NEONATES STUDIED

TABLE 13: DISTRIBUTION OF HYPERBILIRUBINEMIA IN NEONATES STUDIED

HYPERBILIRUBINEMIA	NUMBER OF PATIENTS	PERCENTAGE (%)
ABSENT	78	57.3
PRESENT	58	42.6
TOTAL	**136**	**100.0**

Regarding hyperbilirubinemia, 58 neonates had hyperbilirubinemia which accounts for about 42.6%

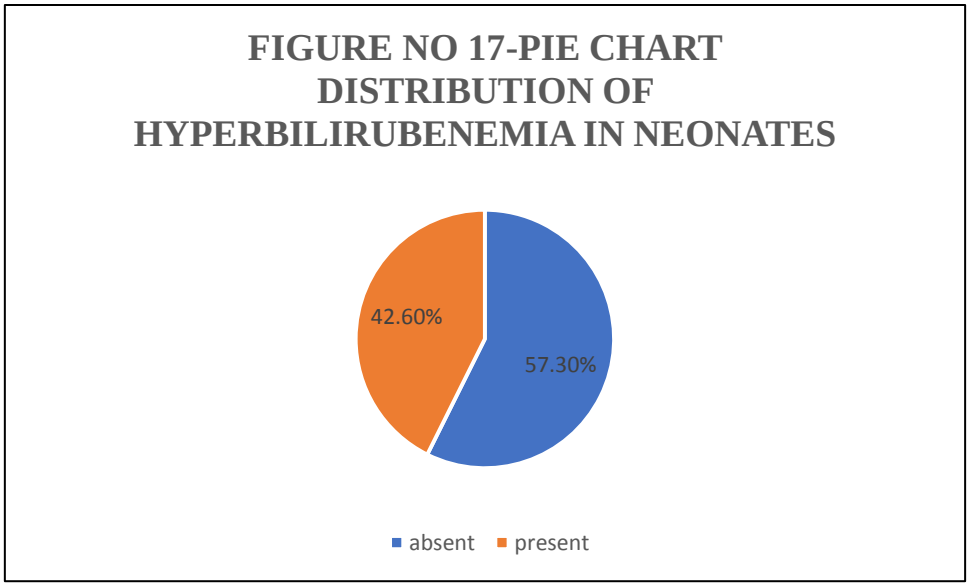


TABLE 14: RISK FACTORS FOR HYPERBILIRUBINEMIA DISTRIBUTION OF NEONATES STUDIED

RISK FACTORS FOR HYPERBILIRUBINEMIA	NO. OF NEONATES(N=58)	%
NO IDENTIFIABLE RISK FACTORS	21	36.20
SEPSIS	16	27.58
PERINATAL ASPHYXIA	14	24.13
RH INCOMPATIBILITY	5	8.62
ABO INCOMPATIBILITY	4	6.89
GDM	3	5.17
2 OR MORE RISK FACTORS	5	8.62

Out of 58 neonates who presented with Hyperbilirubinemia, 36.2% had no identifiable risk factor for hyperbilirubinemia,while sepsis was seen in 27.58%, Perinatal Asphyxia in 24%, RH incompatibility was seen in 8.6%, ABO Incompatibility was seen in 6.89% and GDM was seen in 5.17% as a risk factor for hyperbilirubinemia. 3.68% had more than one risk factors for the same.

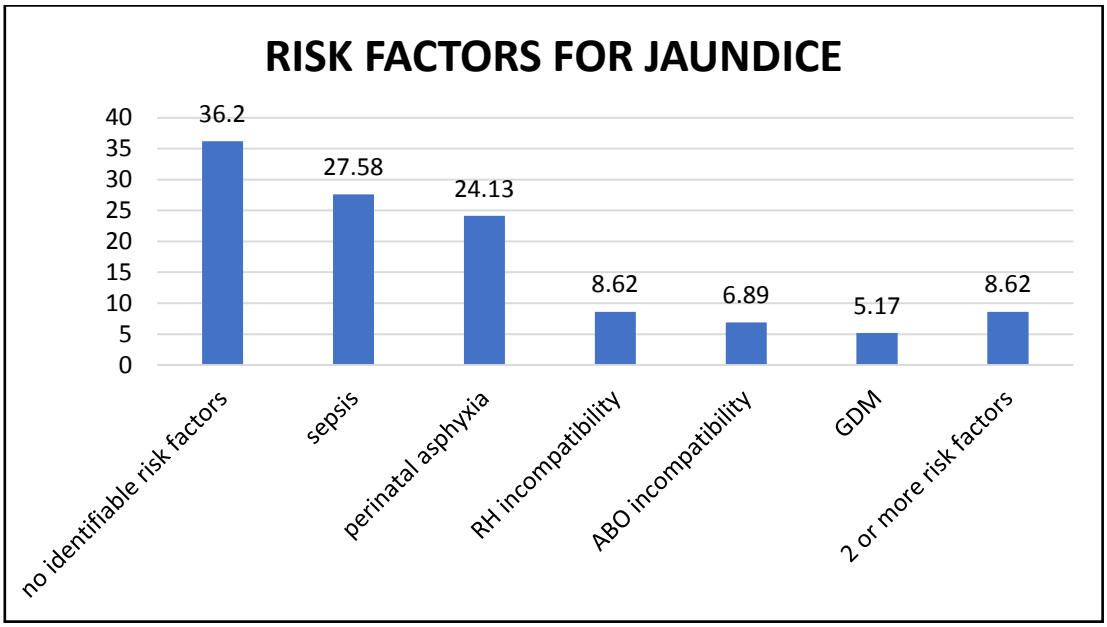


FIGURE 18: BAR DIAGRAM SHOWING RISK FACTORS FOR HYPERBILIRUBINEMIA DISTRIBUTION OF BABIES STUDIED

TABLE 15: DISTRIBUTION OF BIRTH ASPHYXIA IN NEONATES STUDIED

BIRTH ASPHYXIA	NUMBER OF PATIENTS	PERCENTAGE (%)
ABSENT	120	88.20
PRESENT	16	11.70
TOTAL	**136**	**100.0**

Regarding Birth asphyxia, 16 neonates had birth asphyxia which accounts for about 11.70%.

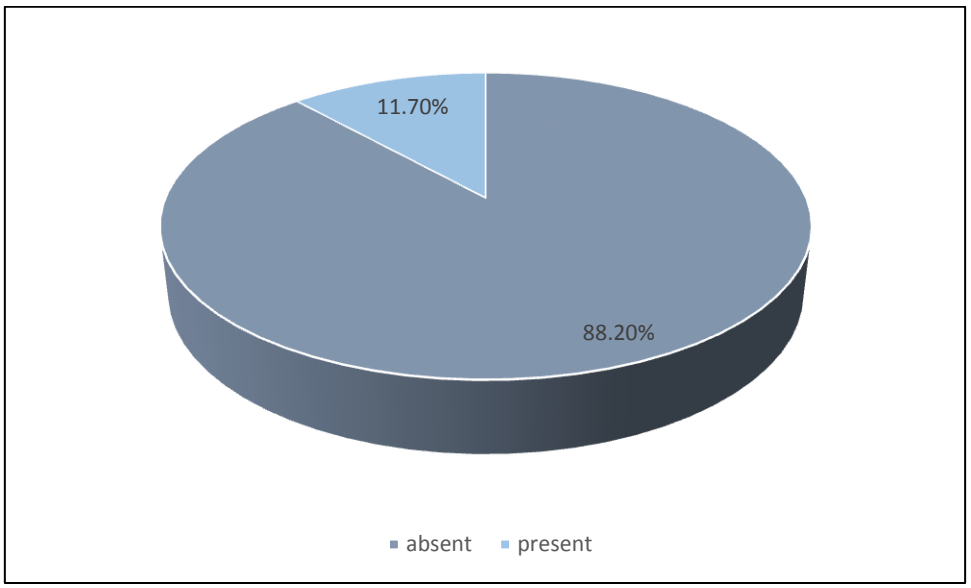


FIGURE 19:PIE CHART SHOWING DISTRIBUTION OF BIRTH ASPHYXIA IN NEONATES STUDIED

TABLE 16: STAGING OF BIRTH ASPHYXIA IN NEONATES STUDIED

BIRTH ASPHYXIA	NO. OF NEONATES	%
ABSENT	120	88.2
HIE 1	5	3.7
HIE 2	9	6.6
HIE 3	2	1.5
TOTAL	136	100.0

16 patients (11.76%) of 136 had Birth asphyxia at birth of which 3.7% belonged to HIE 1 category, 6.6% to HIE 2 category and 1.5% belonged to HIE 3 category.

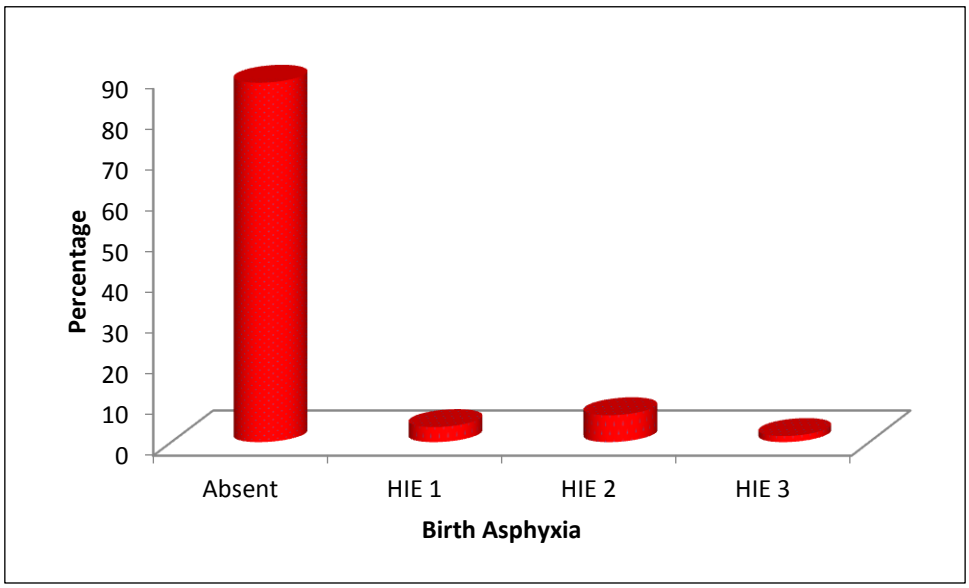


FIGURE 20:BAR DIAGRAM SHOWING STAGING OF BIRTH ASPHYXIA IN NEONATES STUDIED

TABLE 17: SEPSIS DISTRIBUTION OF NEONATES STUDIED

SEPSIS	NO. OF NEONATES	%
ABSENT	115	84.6
PROBABLE SEPSIS	21	15.4
TOTAL	136	100.0

Of the 136 patients studied, Probable sepsis was seen as one of the morbidity causes in 21 (15.4%) neonates.

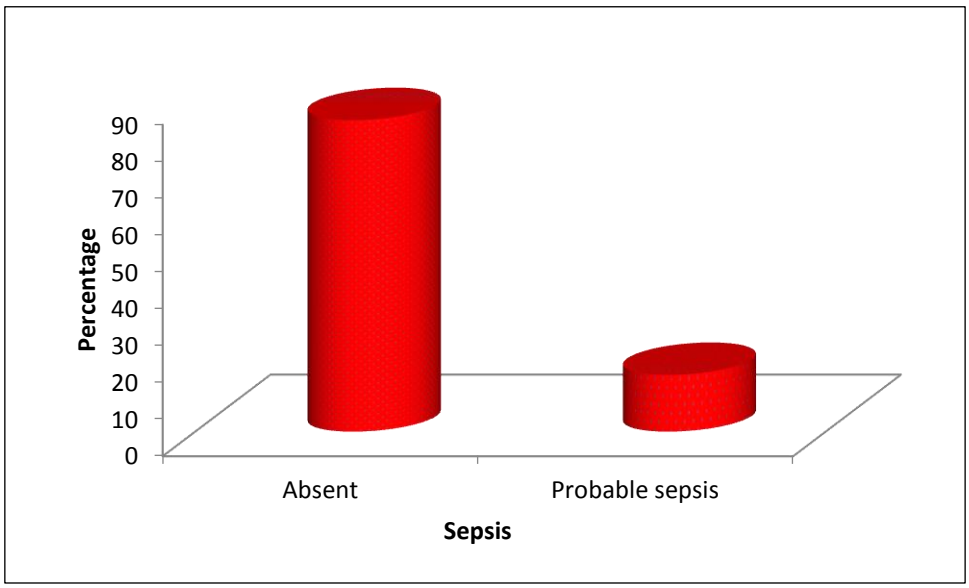


FIGURE 21: BAR DIAGRAM SHOWING SEPSIS DISTRIBUTION OF NEONATES STUDIED

TABLE 18: OUTCOME DISTRIBUTION OF NEONATES STUDIED

OUTCOME	NO. OF NEONATES	%
RECOVERED	131	96.3
DEATH	5	3.7
TOTAL	136	100.0

Among 136 neonates studied, 131 (96.3%) had complete recovery from the illness while mortality was seen in 5 (3.7%) neonates due to various causes

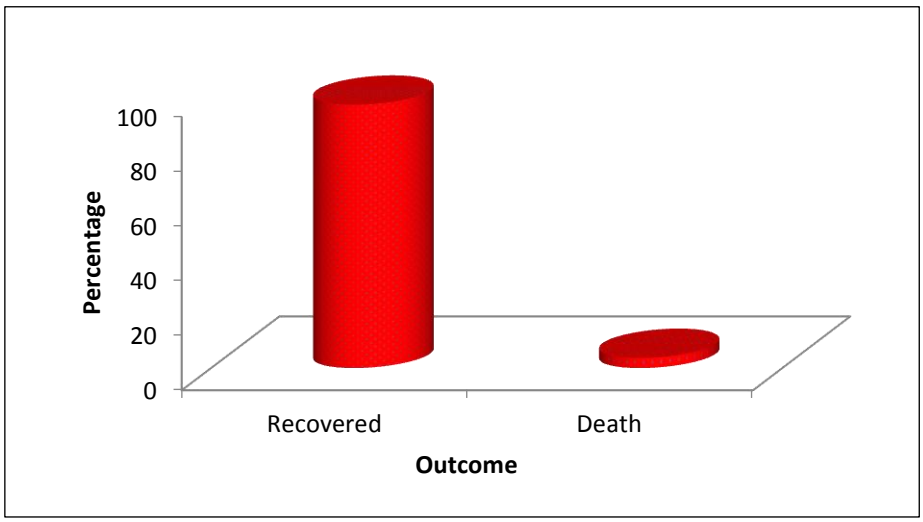


FIGURE 22 :BAR DIAGRAM SHOWING OUTCOME DISTRIBUTION OF NEONATES STUDIED

TABLE 19: INTERVENTION DONE

INTERVENTION DONE	NO. OF NEONATES	%
PHOTOTHERAPY	58	42.64
EXCHANGE TRANSFUSION	2	1.41
OXYGEN SUPPLEMENTATION	66	48.52
VENTILATION	11	8.08
SURFACTANT	15	11.02
CPAP	15	11.02
INOTROPES	6	4.41

Among 136 neonates studied, 66 of the them required oxygen supplementation which accounts for about 48.52%. 58 of the neonates required phototherapy which accounts for about 42.64%, 15 (11.02%) required CPAP ventilation while 11 (8.08%) required invasive ventilation, 6(4.41%) of them required inotrope support,15 (11.02%) required surfactant administration while 2 neonates required exchange transfusion which accounts for about 1.41%.

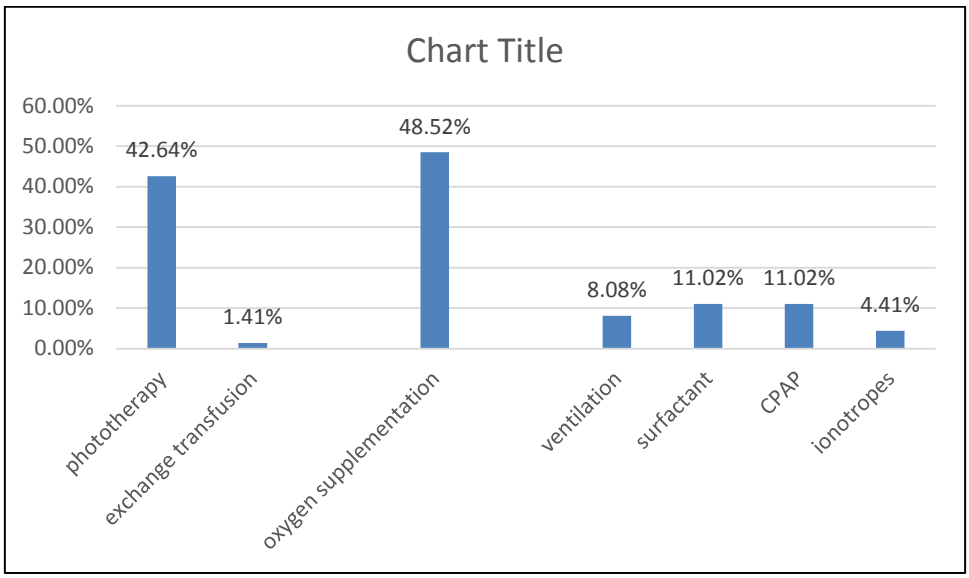


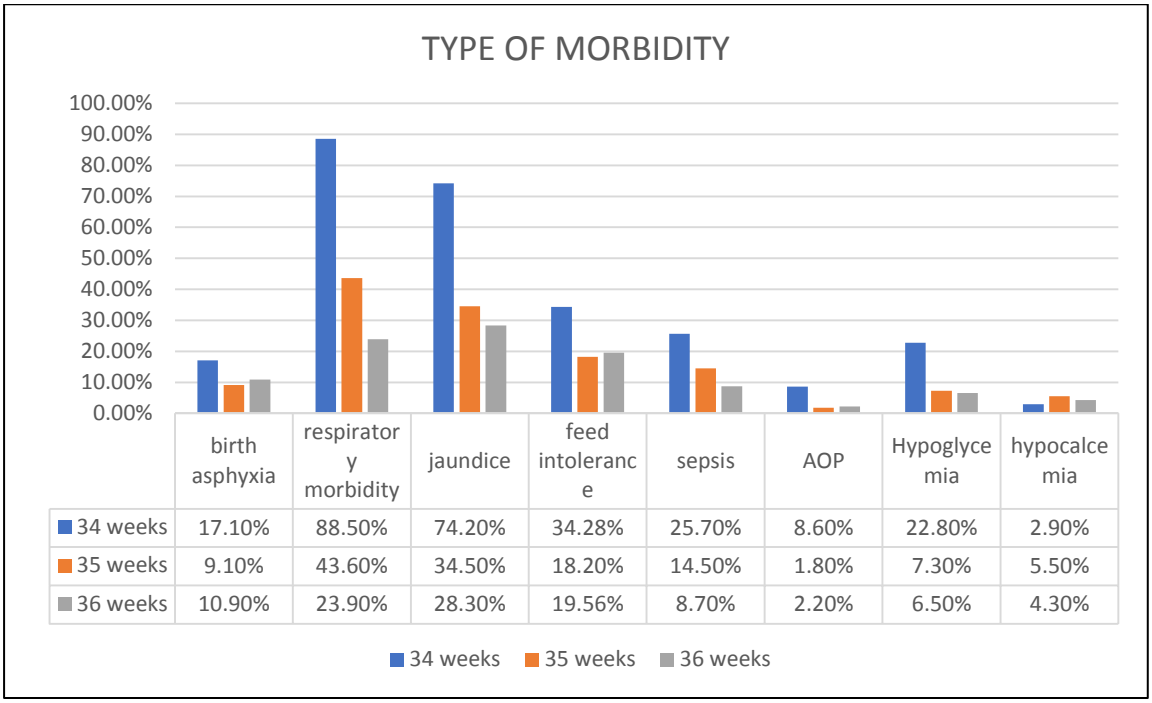
FIGURE 23:BAR DIAGRAM SHOWING INTERVENTION DONE

TABLE 20: TYPE OF MORBIDITY IN RELATION TO GESTATIONAL AGE IN WEEKS OF PATIENTS STUDIED

TYPE OF MORBIDITY	GESTATION AGE			TOTAL (N=136)	P VALUE
	34 WEEKS (N=35)	35 WEEKS (N=55)	36 WEEKS (N=46)		
BIRTH ASPHYXIA	6(17.1%)	5(9.1%)	5(10.9%)	16(11.8%)	0.499
FEED INTOLERANCE	12(34.28%)	10(18.2%)	9(19.56%)	31(22.8%)	0.572
RESPIRATORY MORBIDITY	31 (88.5%)	24(43.6%)	11(23.9%)	66(48.5%)	<0.002
HYPERBILIRUBINEMIA	26(74.2%)	19(34.5%)	13(28.3%)	58(42.6%)	<0.001

PROBABLE SEPSIS	9 (25.7%)	8(14.5%)	4 (8.7%)	21(15.4%)	0.763
APNEA OF PREMATURITY	3(8.6%)	1(1.8%)	1(2.2%)	5(3.7%)	0.307
HYPOGLYCEMIA	8(22.8%)	4(7.3%)	3(6.5%)	15(11%)	0.745
HYPOCALCEMIA	1(2.9%)	3(5.5%)	2(4.3%)	6(4.4%)	0.889

In neonates born in 34 weeks of gestation, respiratory causes was predominantly seen followed by hyperbilirubenemia, feed intolerance, sepsis and hypoglycemia as a leading causes of morbidity in neonates. Similar results were seen in infants born in 35 weeks of gestation. In neonates born in 36 weeks of gestation, hyperbilirubinemia followed by respiratory causes, feed intolerance, sepsis and hypoglycemia were the factors responsible for the morbidity in the neonates.



	birth asphyxia	respiratory morbidity	jaundice	feed intolerance	sepsis	AOP	Hypoglycemia	hypocalcemia
34 weeks	17.10%	88.50%	74.20%	34.28%	25.70%	8.60%	22.80%	2.90%
35 weeks	9.10%	43.60%	34.50%	18.20%	14.50%	1.80%	7.30%	5.50%
36 weeks	10.90%	23.90%	28.30%	19.56%	8.70%	2.20%	6.50%	4.30%

FIGURE 24 : BAR DIAGRAM SHOWING TYPE OF MORBIDITY IN RELATION TO GESTATIONAL AGE IN WEEKS OF NEONATES STUDIED

TABLE 21: TYPE OF RESPIRATORY MORBIDITY IN RELATION TO GESTATIONAL AGE IN WEEKS OF NEONATES STUDIED

TYPE OF RESPIRATORY MORBIDITY	GESTATION AGE			TOTAL
	34 0/7-6/7	35 0/7-6/7	36 0/7-6/7	
NO	5(14.3%)	31(56.4%)	34(73.9%)	70(51.5%)
PNEUMONIA	4(11.4%)	2(3.6%)	2(4.3%)	8(5.9%)
RDS	8(22.8%)	4(7.2%)	3(6.5%)	15(11%)
TTNB	18(52.9%)	18(32.7%)	7(15.2%)	43(31.6%)
TOTAL	35(100%)	55(100%)	46(100%)	136(100%)

In neonates born in 34 weeks of gestation, respiratory morbidities were predominantly TTNB (52.9%) ,RDS(22.8%) seen followed by Pneumonia (11.4%) .Neonates born in 35 weeks of gestation had TTNB (32.7%) ,RDS(7.2%), Pneumonia (3.6%).In babies born at 36 weeks of gestation TTNB,RDS and pneumonia were respectively 31.6%,11% and5.9%.

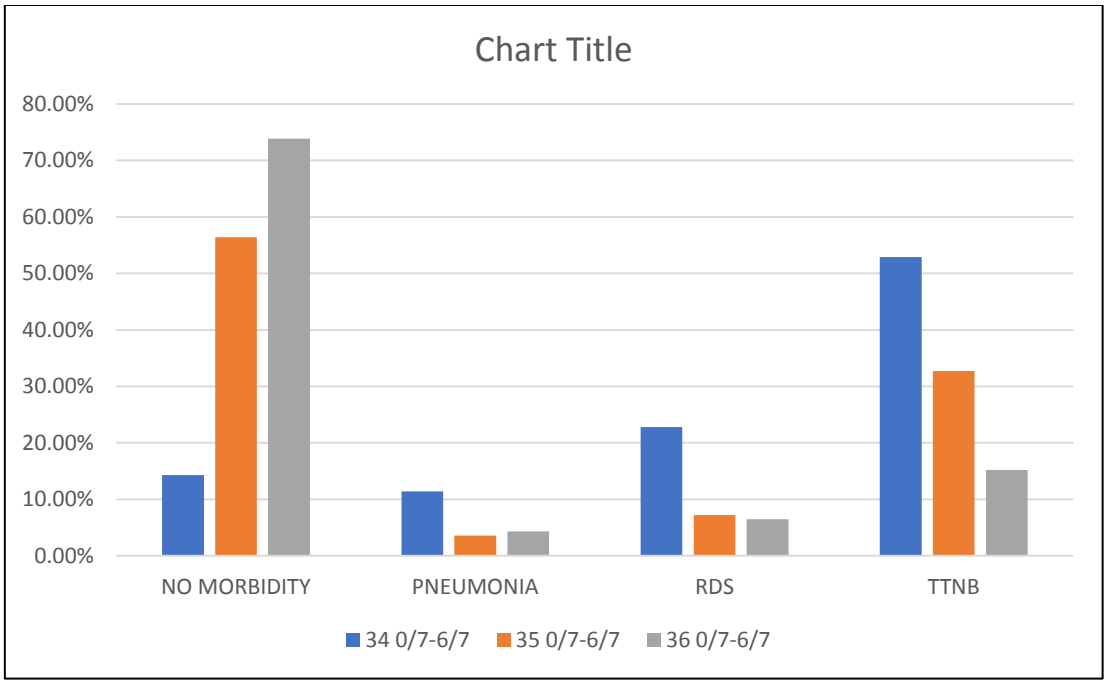


FIGURE 25: BAR DIAGRAM TYPE OF RESPIRATORY MORBIDITY IN RELATION TO GESTATIONAL AGE IN WEEKS OF NEONATES STUDIED

TABLE 22: DURATION OF HOSPITAL STAY IN DAYS

DURATION FOR HOSPITAL STAY	NUMBER OF PATIENTS	%
< 3	14	10.3
4-7	34	25.0
7-14	62	45.6
>14	26	19.1

Regarding duration of hospital stay, 14 neonates required less than 3 days hospital stay which accounts for about 10.3%, 34 neonates required duration of 4 to 7 days which accounts for about 25%. 62 neonates required 7 to 14 days of hospital stay which accounts for about 45.6%. 26 neonates required >14 days of hospital stay which accounts for about 19.1%.

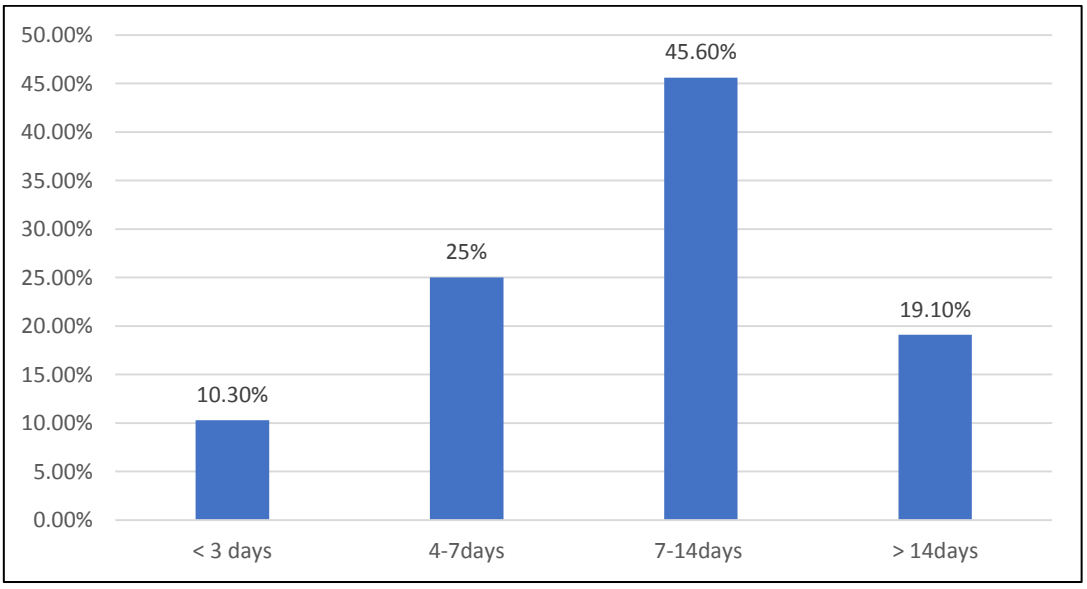


FIGURE 26: BAR DIAGRAM SHOWING DURATION OF HOSPITAL STAY IN DAYS

TABLE 23: OUTCOME IN RELATION TO GESTATIONAL AGE IN WEEKS OF NEONATES STUDIED

OUTCOME	GESTATION AGE			TOTAL
	34 0/7-6/7	35 0/7-6/7	36 0/7-6/7	
RECOVERED	32(91.4%)	53(96.4%)	46(100%)	131(96.3%)
DEATH	3(8.6%)	2(3.6%)	0(0%)	5(3.7%)
TOTAL	35(100%)	55(100%)	46(100%)	136(100%)

P=0.141, Not Significant, Fisher Exact test

With respect to outcome in relation to gestational age of birth, outcome was very good with no mortality in neonates born in 36 weeks of gestation while neonates born in 34 weeks of gestation had highest mortality of 8.6% and neonates born in 35 weeks had mortality of 3.6%.

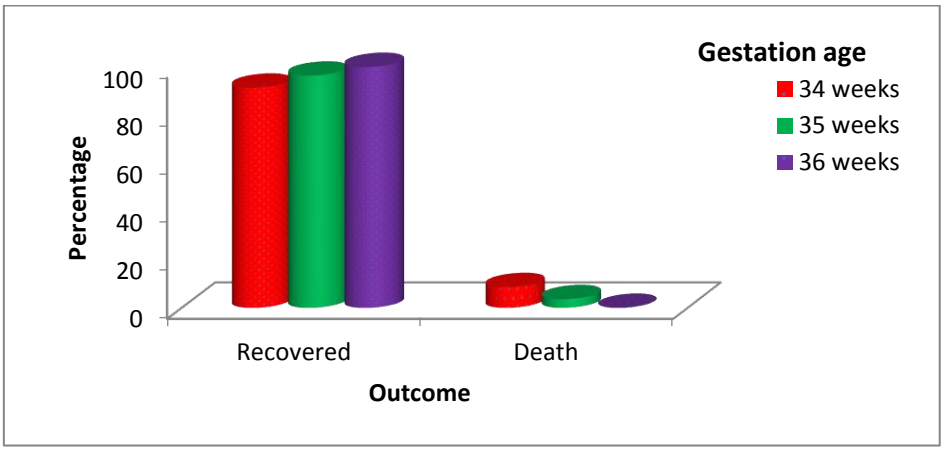


FIGURE 27: BAR DIAGRAM SHOWINGOUTCOME IN RELATION TO GESTATIONAL AGE IN WEEKS OF NEONATES STUDIED

DISCUSSION

DISCUSSION

The study comprised of 136 late preterm neonates. The frequency of preterm births is increasing in many countries and this is mainly due to rise in late preterm births. There is only limited published data from India related to morbidities of late preterm neonates. Many reasons were proposed to explain this increasing trend including increased surveillance of the mother and fetus, increasing maternal age and reproductive technologies which are associated with multiple pregnancies. It is suggested that as a result of increased surveillance, fetuses considered to be at risk of stillbirth, including those with intrauterine growth restriction, fetal anomalies, and intra partum asphyxia may be identified earlier which results in more deliveries at 34 to 36 weeks' gestation[22].

This study demonstrates the importance and magnitude of the risk of intercurrent conditions to which infants born at 34 $^{0/7}$ to 36 $^{6/7}$ weeks gestation were subjected .

SEX DISTRIBUTION

GENDER	**Jaiswal A et al[40]**	**Jean-Bernard Gouyon et al[72]**	**Tamilselvan et al[78]**	**Present study**
Female	48.5%	44.6%	49.4%	52.9%
Male	51.5%	55.4%	57.5%	47.1%

In this study female predominance was observed with 52.9% which is comparable with the study conducted by **Jaiswal et al[40]** . Other studies conducted by **Jean-Bernard Gouyon et al[72],** and **Tamil selvan et al [78]**showed male predominance which were differing from our study.

BIRTH WEIGHT:

STUDY	MEAN BIRTH WEIGHT(KG)
Jaiswal et al[40]	2.350
Femitha P et al[71]	1.973
Pinar B et al[73]	2.068
Present study	**2.18**

Birth weight of more than 2 KG was found in 64.7%, among which 27.2% of the neonates were born with birth weight more than 2.5kg. In our study the mean birth weight was 2.18kgs. This was comparable to studies done by Jaiswal et al[40], Femitha P et al[71] and Pinar B et al[73].

WEIGHT FOR GESTATIONAL AGE

STUDY	AGA	SGA
Jaiswal et al[40]	83%	10.2%
Araujo BF et al[75]	66.6%	26.1%
Anuradha Bansal et al[79]	71.6%	28.4%
Present study	58.1%	41.9%

In our study weight was appropriate for gestational age in 79 neonates which constitutes about 58.1%. Small for gestation was seen in 41.9% of the study group. Among mothers remaining 57 small-for-gestation, the common maternal risk factor associated was pregnancy induced hypertension. Similar results were noted in an Indian study done by **Anuradha Bansal et al[79]**. In the present study, 104 neonates (76.5%) were born out of non-consanguineous marriage and 23.5% constitute neonates born out of consanguineous marriage. This was similar to the study done by Fahimeh S S et al[80] from Iran in 2009-2010.

MATERNAL RISK FACTORS:

STUDY	ABSENT (%)	PRESENT (%)
Reddy et al[16]	23.2	**76.8%**
Laughon et al[17]	29.8	**70.2%**
Present study	**24.2**	**75.74**

Maternal risk factors for preterm was elicited in 75.74% of mothers. Among them 31(30.09%) mothers had more than 2 identifiable risk factors. There were no recorded indication in 33 mothers which constitute about 24.26%.

A study by **Reddy et al[16]** recorded maternal risk factors in 76.8% of all late preterm deliveries and risk factors were not recorded in 24.2% of mothers which is similar to this study. Prolonging pregnancy to the maximum safest gestation will result in decreased morbidities. A study by **Laughon et al[17]** showed that maternal risk factors were absent in 29.8% of mothers which is comparable to the present study.

In this study PIH and PROM had high incidence among all maternal risk factors. PIH constitutes 31.06% and PROM about 25.24% followed by Anemia and previous LSCS which constituted about 17.47% and 8.73% each respectively.

A study done by **Tucker JM et al** [81] and **Laughon et al**[17] reported PROM as the most common maternal risk factor i.e 23.3% and 31.8% respectively whereas in this study PROM (25.24%) is second major risk factor after PIH(31.06%).

A study done by **Shrestha L et al[82]** and **Tamil selvan et al[78]** reported that most common maternal risk factor was pregnancy induced hypertension (26%) followed by premature rupture of membrane (24%) which is similar to our study.

MODE OF DELIVERY:

MODE OF DELIVERY	LSCS	NORMALVAGINAL DELIVERY
Jean-Bernard Gouyon et al[72]	33.2	66.8
Sreelaxmi L et al[83]	30.5	69.5
Ming-Luen Tsai et al[84]	76.1	23.9
Rohit Modi et al[85]	67.82	32.18
Pinar B et al[73]	56.8	43.2
Femitha P et al[71]	32.4	67.6
Jaiswal et al[40]	67.8	32.2
Present study	**56.6**	**40.4**

55 neonates were born out of vaginal deliveries which constitute about 40.4% and 4 were born out of instrumental deliveries. LSCS was done on mothers of 77 neonates which constitute 56.6%. This difference can be explained by the fact that study was conducted at a tertiary care centre where most of high risk pregnancies are referred.

Jean-Bernard Gouyon et al[72] and **Sreelaxmi L et al[83]** in their study on late preterms found vaginal delivery was more compared to Caesarean section which is differing with the present study.

RESPIRATORY MORBIDITY

Name of study	% OF NEONATES
Leone et al[86]	34.7%
Ashish Jaiswal et al[40]	10.5%
Tsai M L et al[84]	**18.9%**
Garcez C et al[87]	40.1%
Marocchella S et al[88]	11.26%
TamilSelvan et al[78]	17.5%
Rather G.N. et al[89]	11.2%
Arunagirinathan A et al[90]	**51.7%**
Tiwari S.K et al[91]	13.06%

Shrestha L et al[82]	14%
Gupta A et al[94]	27%
Rohit M et al[85]	**44.83%**
Sreelaxmi L et al[83]	57.1%
Present study	48.5%

In the present study, respiratory morbidity constitutes the most common morbidity with 66 neonates being affected, which constitutes 48.5%. A large number of infants in this study had respiratory distress, secondary to TTNB & RDS which demonstrates the immaturity of these newborn's respiratory systems. Pneumonia was found as the cause of respiratory distress in 8 babies constituting 5.9% and RDS in 15 neonates which constitute about 11%. Surfactant was given to all RDS Neonates.

These findings reported in our study were similar to an Indian population based studies done by **Arunagirinathan A et al[90], Rohit M et al[85],** Sreelaxmi L et al[83]. Other studies done by **Garcez C et al[87], Leone et al [86]** also showed similar results.

In the present study TTNB and respiratory distress syndrome are more frequent respiratory morbidities. Higher incidence of TTN at 34 weeks of gestation was observed when comparing to a large retrospective multicenter study in the US done by **Hibbard J et al** (36.4% vs 6.4%)[31]. The study also reported a high incidence of respiratory distress syndrome at the same gestational age (10.5%) which is almost simliar to our study results.

HYPERBILIRUBINEMIA

NAME OF THE STUDY	% OF NEONATES
Leone et al[86]	**47.7%**
Ashish Jaiswal et al[40]	**55.1%**
Margreet J. Teune et al[92]	23.5%
Tsai M L et al[84]	14.6%
Garcez C et al[87]	**63.3%**
TamilSelvan et al[78]	**67.5%**
Savitha M.R et al[93]	19.1%
Rather G.N. et al[89]	**41.6%**
Arunagirinathan A et al[90]	40%
Sreelaxmi L et al[83]	**76.70%**
Present study	42.6%

Hyperbilirubinemia constituted the second major group with 58 neonates being affected (42.6%). This finding is similar to studies done by **Margreet J. Teune et al[92], Tsai M L et al[84] and Indian study by Arunagirinathan A et al[90].**

However hyperbilirubinemia was most common morbidity in late preterm babies in Studies like done by **Leone et al[86] (47.7%), Ashish Jaiswal et al [40](55.1),** Garcez C et al(**63.3%)[87] and** an Indian population based studies by **Rather G.N. et al[89](41.6%).**

Among the 58 neonates with hyperbilirubinemia, 16 babies (27.58%) had sepsis, 14 babies (24.13%) had perinatal asphyxia, 4 babies (6.89%) had ABO incompatibility, 5(8.62%) babies had Rh incompatibility, 3 babies (5.17%) were born to GDM and 21 babies (36.2%) had no identifiable risk factors for hyperbilirubinaemia.

FEED INTOLERANCE

NAME OF STUDY	% OF NEONATES
Leone et al[86]	8.3%
Margreet J. Teune et al[92]	**34%**
Tsai M L et al[84]	2.2%
Garcez C et al[87]	62.7%
TamilSelvan et al[78]	18.7%
Savitha M.R et al[93]	**34.5%**
Tiwari S.K et al[91]	18.06%
Sreelaxmi L et al[83]	16.70%
Present study	22.8%

Third common morbidity was feed intolerance which was found in 31 neonates which constitute 22.8%. This finding is similar to Indian population based studies done by **Tamil selvan et al[78], Savitha M.R.et al[93] ,Rather G.N. et al[89]**. A study by **Savitha M.R et al[93]** showed feed intolerance as most common morbidity.

SEPSIS

NAME OF STUDY	% OF NEONATES
Ashish Jaiswal et al[40]	50.2%
Tsai M L et al[84]	1.3%
TamilSelvan et al[78]	23.7%
Savitha M.R et al[93]	18.1%
Arunagirinathan A et al[90]	50%
Tiwari S.K et al[91]	9.79%
Shrestha L et al[82]	**29%**
Rohit M et al[85]	16.67
Present study	15.8%

In our study, 21 neonates had sepsis which constitute 15.8%. In contrast to the other studies done by Arunagirinathan A et al[90] , Shrestha L et al [82]and **Ashish Jaiswal et al[40]** where sepsis was the most common morbidity.

BIRTH ASPHYXIA

NAME OF STUDY	% OF NEONATES
TamilSelvan et al[78]	16.2%
Savitha M.R et al[93]	9.1%
Arunagirinathan A et al[90]	8.9%
Shrestha L et al[82]	7%
Sreelaxmi L et al[83]	5.30%
Present study	11.8%

Birth asphyxia was reported in 16 (11.8%) neonates which is similar to studies conducted by **Savitha M.R et al[93]** and **Tamil selvan et al[78]**. However a study by **Shrestha L et al[82]** showed lesser incidence. Among the neonates with birth asphyxia, 3.7% of them had HIE 1, 6.6 % had HIE 2 and 1.5% had HIE 3 which correlates with most of the Indian studies.

HYPOGLYCEMIA

NAME OF STUDY	% OF NEONATES
Leone et al[86]	14.3%
Marocchella S et al[88]	**25.35%**
TamilSelvan et al[78]	27.5%
Savitha M.R et al[93]	0.9%
Arunagirinathan A et al[90]	17.8%
Tiwari S.K et al[91]	10.99%
Shrestha L et al[82]	3%
Gupta A et al[94]	2.5
Sreelaxmi L et al[83]	22%
Present study	11%

In our study hypoglycemia was reported in 15 neonates (11%). It was significantly more in the studies done by Tamil selvan et al[78], Sreelaxmi L et al[83], and Marocchella S et al[88]. Other studies mentioned above (Gupta A et al[94], Shrestha L et al[82], Savitha M.R et al[93]**)**showed lesser incidence of hypoglycemia compared to our study. Hypoglycemia may affect fasting newborn infants of all gestational ages because of insufficient metabolic responses to the abrupt loss of the maternal glucose supply after birth.

APNEA OF PREMATURITY

NAME OF STUDY	% OF NEONATES
Leone et al[86]	7.2%
Margreet J. Teune et al[92]	0.87%
Tsai M L et al[84]	2.1%
TamilSelvan et al[78]	11.2%
Present study	1.5%

A significant number of infants had apnea of prematurity (1.5%). Studies by **Leone et al[86] and Tamil selvan et al[78]** showed higher incidence of AOP compared to our study.

HYPOCALCEMIA

Name of study	% OF NEONATES
Tsai M L et al[84]	2.4%
TamilSelvan et al[78]	10%
Arunagirinathan A et al[90]	1.5%
Present study	1.6%

Hypocalcemia was observed in about 1.6% of late preterm neonates in our study. Results of the studies done by **Tamil selvan et al[78]** and **Arunagirinathan A et al[90]** & **Tsai M L et al[84]** differed from ours.

INTERVENTION

INTERVENTION	Leone et al[86]	Margreet J.Teune et al[92]	Ashish Jaiswal et al [40].	Present study
Oxygen supplementation	16.6%	6.0%	20.6%	48.52%
Mechanical ventilation	3%	2.5%	3%	8.08%
CPAP	-	5.5%	-	11.02%
Surfactant	-	3.8%	-	11.02%
Phototherapy	-	4.7%	-	42.64%
Exchange transfusion	-	0.8%	-	1.41%
Inotropes	-	-	-	4.41%

The need for mechanical ventilation was in 11 neonates which constitutes 8.08%. surfactant was given to 15 (11.02%) neonates. Noninvasive ventilation was provided to 15 neonates which constitutes 11.02%. Oxygen supplementation was observed in 48.52% of neonates. These results were similar to the study done by **Arunagirinathan et al[91]**. Other studies reported less percentage of interventions needed compared to our study.

LATE PRETERM MORTALITY:

STUDY	MORTALITY %
Tsai M L et al[84]	0.3
Modi R et al[85]	13.79
Shrestha L et al[82]	12
Tiwari S K et al[91]	7.29
Arunagirinathan A et al[90]	2.67
Savitha M. R et al[93]	10.9
Rather G N et al[89]	2.5
Tamil Selvan et al[78]	0.9
Present study	3.7

Our study shows mortality rate of 3.7% which is comparable to other studies done by Rather G N et al[89] and Arunagirinathan A et al[90]. Studies done by Savitha M. R et al[93], Modi R et al[85], Shrestha L et al[82] and Tiwari S K[91] et al showed higher rates of mortality.

It was observed there was decreasing trend in the frequency of morbidities with the increase in gestational age. Hyperbilirubinemia, feeding difficulties, respiratory disease, hypoglycemia and intrauterine growth restriction were the main complications and they were more frequent at 34 weeks of gestation. These are the most frequent causes of morbidity associated with late-preterm birth in other studies as well **(Gupta et al[94], Tsai M L et al[84], Garcez C et al[87]).**

CONCLUSION

CONCLUSION

- Late preterm infants constitute the most rapidly growing group among newborns. They are increasingly being regarded as “at-risk” rather than “low-risk” neonates..
- In this study, maternal risk factors were present in 75.7% of the mothers of late preterm neonates. Anemia, PIH and PROM were the most common maternal risk factors identified. Thus, implying the need for strengthening the antenatal services to identify maternal risk factors at earlier gestation for appropriate intervention which would help in prolonging the pregnancy to term gestation.
- Respiratory distress, Neonatal hyperbilirubinemia and feed intolerance were the significant morbidity noted in our study which required intervention. These indicate,need for close monitoring and preparedness of the neonatal care unit for timely intervention of the morbidities of the latepreterm.
- It is important to explain to parents the vulnerabilities to which their neonates are prone to and to stress to them the importance of monitoring feeding, weight gain and follow up.
- In present study, it was observed that there was decreasing trend in the frequency of morbidities with the increase in gestational age.Thus,prolonging the pregnancy to the maximum possible gestation would result in decreasing the morbidities of the neonate.
- In our study, 96.3% of late preterm neonates recovered from the morbidities whereas mortality is seen in 3.7%. Thus, indicating late preterm infants have high survival rates and good outcomes with timely intervention.

- Results from this study conclude that late-preterm neonates have significantly high risk of morbidity and mortality. Hence, greater concern and attention is required for the management of latepreterm neonates.

LIMITATIONS OF THE STUDY

1. The study population is derived from tertiary care referral center where significant proportions of mothers are referred for antenatal problems. Therefore a higher incidence of morbidities may be observable in the late preterm population.
2. As the present study was designed to assess early neonatal morbidities and mortality, it did not address morbidities and mortality after 7 days of life, and also whether outcomes studied had long-term implications.
3. Clinical profile of late preterm is not compared with the term neonates.

SUMMARY

SUMMARY

- The study was a hospital-based prospective observational study conducted at R L Jalappa hospital.
- All inborn late preterm infants with gestational age between 34 0/6-36 6/7 weeks were included in our study.
- After obtaining written informed consent from the parents of the patient detailed history was taken, clinical examination was done and entered in a semi-structured proforma.
- Data was entered into Microsoft excel data sheet and was analyzed using SPSS 18.0 R environment ver.3.2.2 version software.
- A total of 136 late preterm neonates comprised the study group.
- In the study, majority (40.4%) of patients belonged to gestational age of 35 weeks with a female predominance (52.9%).
- Majority of them were in the birth weight range of 2-2.5kg (37.5%).
- In the study, majority of the babies were appropriate for gestational age (58.1%).
- Most of babies were born out of non-consanguineous marriage (76.5%).
- In our study, maternal risk factors were present in 75.7%.
- Among all maternal risk factors PIH (31.06%)and PROM (25.24%) has high incidence followed by Anemia(17.47%). 2 or more identifiable risk factors were found in 30.09%.
- Most common mode of delivery observed in our study group was LSCS (56.6%).
- In this study, most common morbidity observed was respiratory morbidity (48.5%) which is followed by hyperbilirubinemia (42.6%).

- Other common morbidities observed in these neonates were feed intolerance, probable sepsis, birth asphyxia, hypoglycaemia, hypocalcaemia, apnea of prematurity.
- TTNB (31.6%) is the most common respiratory morbidity noticed in our study group.
- In our study, oxygen supplementation was provided to 48.52% of neonates whereas ventilatory support was given to 8.08%. Surfactant was administered to 11.02% of neonates.
- In the study, sepsis (27.58%) was the most common risk factor among neonates with hyperbilirubinemia.
- Phototherapy was given to all neonates with neonatal hyperbilirubenemia whereas exchange transfusion was done only to 2 neonates.
- In present study, HIE stage 2 (6.6%) was most common in neonates with birth asphyxia.
- In our study, 96.3% of neonates recovered from the morbidities whereas mortality rate was 3.7%.
- Our study showed decrease in severity of respiratory morbidity with each advancing week of gestation in the late preterms from 34 to 36 weeks.
- As the gestational age increases there is decrease in incidence of neonatal morbidities.
- In this study, it was noted that there is significant decrease in the risk of respiratory morbidity($p<0.002$) and hyperbilirubinemia ($p<0.001$) with advancing gestational age.
- Hence, from this study we conclude that late preterms are more prone for morbidity and mortality and so clinicians should closely monitor late preterms immediately after birth.

- Because of significant neonatal complications among these infants, a re-assessment of optimal obstetric and neonatal care is needed so that clinical management can be better directed toward optimal outcomes.

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ANNEXURE

ANNEXURES

PROFORMA

Name :

Sex :

IP No :

Address :

Contact no :

HISTORY :

Gestation (wks)

By LMP :

By USG :

By new Ballard Score :

Date of Birth :

Birth weight :

Weight for Gestation : AGA/SGA/LGA

Mode of Delivery : Vaginal / LSCS

Amniotic fluid : Clear/Meconium stained

APGAR at 1min :

APGAR at 5 min :

MATERNAL HISTORY

IP NO :

Age :

Married life :

Consanguinity :

Obstetric Score :

Blood group :

BABY DETAILS AT BIRTH

Weight :

Vitals :

Heart rate :

Respiratory rate :

Capillary Refilling Time :

Blood group of baby :

Systemic examination :

EVALUATION FOR ANY MORBIDITES :

Resuscitation at birth : Required/ Not required

Whether the child required NICU admission : Yes / No

Feeding difficulty : Yes / No

Hypoglycemia : Yes/No

Respiratory morbidity : Yes/No

Jaundice requiring intervention : Yes/No

Hypocalcemia : Yes/No

Sepsis : Yes/No

Clinical :

Probable :

Confirmed :

CONSENT FORM

Study title: A PROSPECTIVE STUDY ON EARLY MORBIDITY PATTERNS OF LATE PRETERM NEONATES ADMITTED IN A RURAL TERTIARY CARE CENTER.

Chief researcher/ PG guide's name: Dr. Beeregowda Y C

Principal investigator: Dr.Kusuma N

Name of the subject:

Age :

Address :

a. I have been informed in my own vernacular language the purpose of the study, the necessity of relevant steps to be carried out and photographs to be taken.
b. I understand that the medical information produced by this study will become part of institutional record and will be kept confidential by the said institute.
c. I understand that my participation is voluntary and may refuse to participate or may withdraw my consent and discontinue participation at any time without prejudice to my present or future care at this institution.
d. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).
e. I confirm that _____ (chief researcher/ name of PG guide) has explained to me the purpose of research and the study procedure that I will undergo and the possible risks and discomforts that I may experience, in my own language. I hereby agree to give valid consent to participate as a subject in this research project.

Participant's parent signature :

Date:

I have explained to _____ (subject) the purpose of the research, the possible risk and benefits to the best of my ability.

ANNEXURE 2

PATIENT INFORMATION SHEET

Study title: A PROSPECTIVE STUDY ON EARLY MORBIDITY PATTERNS OF LATE PRETERM NEONATES ADMITTED IN RURAL TERTIARY CARE CENTRE

Study site: R.L Jalappa hospital, Tamaka, Kolar.

Aim: To study the early neonatal morbidities and immediate outcome at the time of hospital discharge, of late preterm neonates admitted to a tertiary hospital for the period of one year(January 2016 to January 2017).

Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in this study we will collect information (as per proforma) from you. Routine (CBC) and Relevant investigations (bilirubin,Blood c/s, CRP,electrolytes,CXRAY) will be carried out if required during hospital stay. This information collected will be used for dissertation and publication only.

All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the member of the Institutional Ethics Committee. There is no compulsion to agree to this study. The care you will get will not change if you don't wish to participate. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study.

For any further clarification you can contact the study investigator:

Dr. Kusuma.N

Mobile no: 8197418292

E-mail id: kusdravid@gmail.com

KEY MASTER CHART

GENDER

- Males-1
- Females-2

GESTATIONAL AGE

- 34 weeks-1
- 35 weeks-2
- 36 weeks-3

BIRTH WEIGHT

- >2.5 kg-1
- 2-2.5 kg-2
- 1.5-2kg-3
- <1.5 kg-4

MATERNAL RISK FACTORS

- No -1
- PROM-2
- Previous LSCS-3
- Anemia -4
- PIH-5
- Previous h/o preterm-6
- APH-7
- Younger age-8
- Previous abortions/still birth-9
- Diabetes – 10
- Elderly primi- 11

TYPE OF MORBIDITY IN LATE PRETERM

- Birth asphyxia-1
- Feed intolerance-2
- Respiratory morbidity-3
- Hyperbilirubinemia-4
- Probable sepsis-5
- Low apgar- 6
- Apnea of prematurity-7
- Hypoglycemia-8
- Hypocalcemia-9

TYPE OF RESPIRATORY MORBIDITY

- No-1
- Pneumonia -2
- RDS-3
- TTN-4

BIRTH ASPHYXIA

- Absent-1
- HIE 1-2
- HIE 2-3
- HIE 3-4

SEPSIS

- Absent- 1
- Probable sepsis-2

WEIGHT FOR AGE

- AGA-1
- SGA-2

RISK FACTORS FOR JAUNDICE

- No identifiable risk factors-1
- Sepsis-2
- Perinatal asphyxia-3
- Rh incompatibility-4
- ABO incompatibility-5
- GDM-6
- No jaundice-7

MODE OF DELIVERY

- Normal-1
- Instrumental delivery-2
- LSCS-3

INTERVENTION DONE

- Phototherapy-1
- Exchange transfusion-2
- Oxygen supplementation-3
- Ventilation -4
- Surfactant-5
- CPAP-6
- NIL-7

- Inotropes-8

OUTCOME

- Recovered -1
- Death -2

TYPE OF MARRIAGE

- Non consanguineous-1
- Consanguineous-2

MASTER CHART

S.NO	NAME	IPNO	GESTATION	GENDER	BIRTH WEI	WEIGHT FC	MATERNAL	TYPE OF M	TYPE OF RE	RISK FACTO	BIRTH ASPI	SEPSIS	MODE OF I	CONSANGU	INTERVEEN	OUTCOME
1	B/O NAZEEMA	240517	1	1	1	2	7,3	2,3,6	4	7	1	1	3	1	4	1
2	B/O ARSHEYA	241450	2	2	1	1	5	3	4	7	1	1	1	1	3	1
3	B/O AMBIKA	245342	2	1	1	1	1	4,5,9	1	2	1	2	1	1	1	2
4	B/O ROJA	246259	2	2	2	1	3	4	1	1	1	1	3	1	1	1
5	B/O SOUNDHRAYA	246793	1	1	1	2	7,5	2,3,8	3	7	1	1	1	1	4,8	1
6	B/O VENA	248812	2	2	2	1	1	4	1	1	1	1	3	1	1	1
7	B/O SUMA	251414	3	1	1	1	1	4	1	1	1	1	3	1	1	1
8	B/O DIL NAWAZ	253099	2	2	2	2	9,6	3,6	4	7	1	1	1	1	3	1
9	B/O NAGA LAKSHMI	253125	2	1	1	1	1	3	2	7	1	1	1	1	3	1
10	B/O NAYEEMAs	253946	3	2	1	1	2,3	4,5	1	2	1	2	3	1	1	1
11	B/O SAMEERA ANJUM	254040	2	2	1	2	1	2,8	1	7	1	1	3	1	7	1
12	B/O USHA	255094	1	1	4	2	5,8	3,6	4	7	1	1	1	2	3	1
13	B/O SHARADHA	256881	3	2	4	1	3,6	4	1	1	1	1	3	1	1	1
14	B/O MANJULA	257319	2	1	1	2	7	3,5	3	7	1	2	3	1	3	1
15	B/O NAZEEMA	258667	3	1	4	1	3,8	4	1	1	1	1	3	1	1	1
16	B/O SHABANA	259079	1	2	4	2	5	5	1	7	1	1	3	1	7	1
17	B/O ROOPA	260778	2	1	2	1	1	4,5,8	1	2	1	2	3	2	2	1
18	B/O PAVITHRA	262826	3	2	4	1	2,8	3	2	7	1	1	3	1	3	1
19	B/O ROOPA	263629	2	2	1	2	7	2,6,8	1	7	1	1	1	1	7	2
20	B/OLAKSHMI DEVI	263630	2	1	1	1	6	3	4	7	1	1	3	1	3	1
21	B/O ASHA	263635	3	2	3	1	2,3	5	1	7	1	2	3	2	7	1
22	B/O NAGAMANI	262071	2	2	2	1	7,9	3	3	7	1	1	3	1	3,5	1
23	B/O ASHWINI	265554	1	1	1	2	1	2,8	1	7	1	1	1	1	7	1
24	B/O BHAVYA	266029	2	2	2	2	7	4,5	1	2	1	2	3	1	1	1
25	B/O PAVITHRA	267771	2	2	1	1	5	3	3	7	1	1	1	1	3	1
26	B/O JOYTHI	268606	3	1	3	1	1	4	1	1	1	1	3	1	1	1
27	B/O VEENA	269435	1	2	4	1	7,8	3	4	7	1	1	1	2	3	1
28	B/O SHEELA	263966	2	1	2	2	3	3	3	7	1	1	3	1	3	1
29	B/O SAMEERABANU	274179	3	2	3	1	5	2,6,8	1	7	1	1	1	1	7	1
30	B/O ASHA	274899	2	2	1	2	3	4	1	1	1	1	3	1	1	1
31	B/O SUVARNA	278733	1	1	4	2	7	3	4	7	1	1	1	2	3	1
32	B/O VANI	278749	2	2	2	1	1	5,6	1	7	1	2	1	1	7	1
33	B/O PRATHIMA	279661	2	1	3	2	6,10	4,5	1	2	1	2	1	2	1	1
34	B/O SWAPNA	280880	3	2	3	1	1	3	3	7	1	1	1	1	3	1
35	B/O NALINI	280881	2	2	1	2	8,9	2	1	7	1	1	3	1	7	1
36	B/O MAMATHA BHAI	281466	1	2	3	2	4,8	3	4	7	1	1	1	1	3	1
37	B/O AYESHA PHIRDOSE	281920	3	1	3	1	1	2,8	1	7	1	1	3	1	7	1
38	B/O LAKSHMI DEVI	283625	2	2	2	1	4	4,6	1	1	1	1	1	1	1	1
39	B/O GAYATHRI	283280	3	1	3	2	4,9	4	1	1	1	1	1	2	1	1
40	B/O JAYASHREE	284116	2	2	1	1	3	2,8	1	7	1	1	3	1	7	1
41	B/O VALLI YAMUNA	286539	1	1	3	1	4,7	1,3	2	7	2	1	1	2	3	1
42	B/O PRIYA	287426	2	2	2	1	2,3	1,6	1	7	2	1	3	1	7	1
43	B/O VANI	289066	2	1	4	1	8	3	3	7	1	1	1	1	3	1
44	B/O NETHRAVATHI	291908	3	2	3	1	1	1	1	7	3	1	1	1	4,8	1
45	B/O PRABAVATHI	293799	1	2	3	2	4	1,3,8	4	7	2	1	1	2	6	2
46	B/O MOUNICA	293356	3	1	3	1	2	4	1	1	1	1	3	1	1	1
47	B/O SHAMALA	292838	2	2	1	1	4	2	1	7	1	1	1	2	7	1
48	B/O RAMYA	296192	3	2	3	1	1	3	3	7	1	1	3	1	3	1

49	B/O SABITHA	296495	3	1	2	1	4	4,5	1	2	1	2	1	1	2	1
50	B/O SAROJA	298454	1	1	3	2	5,9	1,3,8	3	7	2	1	1	1	6	2
51	B/O NAGARATHNAMMA	298455	2	2	2	1	1	1,6	1	7	2	1	3	2	7	1
52	B/O ANITHA	300455	3	2	2	1	2,3	2	1	7	1	1	3	1	7	1
53	B/O DEVISHREE	305218	1	1	3	2	4	1,3	4	7	3	1	3	2	6	1
54	B/O RANI	304125	2	2	1	1	3	8	1	7	1	1	3	1	3	1
55	B/O NADHERA	304128	3	2	2	2	4	1,3,9	3	7	3	1	3	2	4,5,8	1
56	B/O ANJALI	305769	3	1	2	1	1	4	1	4	1	1	1	1	1	1
57	B/O SHOBANA	306256	2	1	2	2	2	3	3	7	1	1	1	1	3	1
58	B/O MANJULA	304545	3	1	2	1	3	4	1	4	1	1	3	1	1	1
59	B/O SUNITHA	307073	1	2	1	1	4	1,3	4	7	3	1	3	2	4,5	1
60	B/O CHITHRA	308781	3	2	2	1	5,8	4	1	4	1	1	1	1	1	1
61	B/O PUSPHA VATHI	310636	1	1	3	1	4	1,5	1	7	3	2	1	2	3	1
62	B/O JYOTHI	311076	1	2	1	2	5,9,11	3	2	7	1	1	3	1	3,5	2
63	B/O ARUNA	311682	2	1	1	2	4	4,5	1	2	1	2	3	1	1	1
64	B/O SWATHI	312954	1	2	2	1	1	3	3	7	1	1	3	1	3,5	1
65	B/O INDU	312946	2	2	2	2	4,8	3	4	7	1	1	1	1	3,5	1
66	B/O IMRAN TAJ	312946	3	1	2	1	1	4	1	4	1	1	3	2	1	1
67	B/O AYESHA	317692	1	1	2	2	3	2,4	1	5	1	1	3	1	1	1
68	B/O AMBIKA	317130	1	2	3	1	2,3	3,4	2	3	1	1	3	1	1,5	1
69	B/O ASHA	319194	2	1	2	1	1	3	3	7	1	1	3	1	3	1
70	B/O LEKHA	320341	2	2	2	1	1	4,5,9	1	2	1	2	3	2	1	1
71	B/O RAJESHWARI	323885	3	2	2	2	1	1	1	7	3	1	3	1	7	1
72	B/O PARVEEN TAJ	324429	1	1	2	1	4,9	3	4	7	1	1	3	1	3	1
73	B/O KAVITHA V S	323689	2	2	1	2	1	4	1	4	1	1	1	1	1	1
74	B/O VARALAKSHMI	327838	3	1	2	2	3,5	2,4	1	5	1	1	3	1	1	1
75	B/O ROJA	329351	2	1	1	2	4	3	3	7	1	1	3	1	3	1
76	B/O PREMAVATHI	329918	2	2	2	2	1	3,4	2	3	1	1	1	1	1,5	1
77	B/O TEJASWINI	329923	1	2	2	2	3	3	3	7	1	1	3	2	3,8	1
78	B/O MAMATHA BHAI	330486	3	1	2	1	2	5,8,9	1	7	1	2	1	1	7	1
79	B/O BHARATHI	331241	1	2	3	1	3,9	3	4	7	1	1	3	1	3	1
80	B/O DURGA	331468	3	2	2	2	2,5,11	4	1	6	1	1	1	1	1	1
81	B/O GAYATHRI	332807	2	1	2	1	4,11	4,6,9	1	6	1	1	1	2	1	1
82	B/O SHILPA	331559	2	2	4	1	1	3	4	7	1	1	3	1	3	1
83	B/O MANJULA	341263	1	1	2	1	3	3,4,8	2	3	1	1	3	1	1,4	1
84	B/O RUKSARA	342654	2	2	4	2	5	3	4	7	1	1	3	1	3	1
85	B/O SHRUTHI	343665	3	1	2	2	1	1,5,8	1	7	3	2	1	1	4,8	1
86	B/O SEEMA	343666	3	2	2	1	1	3	4	7	1	1	1	1	3	1
87	B/O ANURADHA	345697	2	1	2	1	2,11	2,4	1	6	1	1	3	2	1	1
88	B/O UMEERA SULTHANA	346622	1	2	2	2	1	2,3	4	7	1	1	3	1	3	1
89	B/O RAMYA	348709	2	1	4	2	1	1	1	7	3	1	3	1	7	1
90	B/O SABINA TAJ	349756	2	1	3	2	1	2,4	1	5	1	1	1	1	1,4,8	1
91	B/O SUBALAKSHMI	350558	3	2	2	2	1	3	4	7	1	1	1	1	3	1
92	B/O SUKANYA	351901	3	1	2	1	2	4	1	5	1	1	3	1	1	1
93	B/O LATHA	351912	2	1	3	1	3,5	1,3	4	7	3	1	3	1	4	1
94	B/O PADMA	351937	1	2	3	1	3,5	3,5	4	7	1	2	3	2	7	1
95	B/O SUPRIYA	359873	3	1	2	2	4	8	1	7	1	1	3	1	7	1
96	B/O LAKSHMI DEVI	363113	2	1	3	1	6	3,4	4	3,5	1	1	1	1	1,6	1
97	B/O SUJATHAMMA	363909	2	1	2	1	3	3	4	7	1	1	3	2	3	1

98	B/O ANJANA	366120	3	2	1	1	2,9	4	1	1	1	1	3	1	1	1
99	B/O HEMAVATHI	348729	1	1	3	2	4	3,5	4	7	1	2	2	1	7	1
100	B/O NETHRAVATHI	367454	2	2	3	2	3	2	1	7	1	1	3	1	7	1
101	B/O VEENA	371003	2	2	2	2	4	3,5	4	7	1	2	3	1	6	1
102	B/O MOUNYA	373913	3	1	1	1	3,9	2	1	7	1	1	3	1	7	1
103	B/O MUNIRATHNA	374261	3	2	1	1	1	4	1	1	1	1	1	2	1	1
104	B/O NIRMALA	374358	1	1	2	1	4	3	4	7	1	1	3	1	3	1
105	B/O NAFREEN TAJ	374375	2	1	3	2	4,10	3	4	7	1	1	1	1	6	1
106	B/O ANJUN KOUSER	375646	3	2	1	1	6	2	1	7	1	1	3	1	7	1
107	B/O LALITHAMMA	376569	2	2	2	1	3	2,4	1	1,5	1	1	3	1	1	1
108	B/O SHOBANA	375628	1	1	2	2	4	3,5	4	7	1	2	1	2	7	1
109	B/O CHITRA	378530	2	2	3	2	2,10	1,4,6	1	3	4	1	3	1	1	1
110	B/O LAKSHMI DEVI	379631	3	1	1	1	1	3	4	7	1	1	1	1	4	1
111	B/O POORVIKA	379633	3	2	1	1	1	2	1	7	1	1	2	2	7	1
112	B/O RAJESHWARI	379738	3	2	1	1	3	2,3	2	7	1	1	3	1	6	1
113	B/O KOUSER	380956	2	1	2	2	6,9	5	1	7	1	2	1	1	7	1
114	B/O SHIVAMMA	382724	3	2	2	2	1	2,3	4	7	1	1	2	1	6	1
115	B/O ARSHIYA BEGUM	383732	1	1	3	1	6,8	3,7,9	4	7	1	1	1	1	6	1
116	B/O ANITHA	384707	2	1	3	1	3	3,4,7	4	3	1	1	3	2	1,6	1
117	B/O RABIYA	387907	3	1	1	1	4	2,6,9	1	7	1	1	1	1	7	1
118	B/O BARGAVI	387046	1	2	2	2	2	3	4	7	1	1	3	1	3	1
119	B/O SOWMYA	388993	3	2	1	1	6,8	2	1	7	1	1	1	2	7	1
120	B/O SALINI	396021	2	1	2	2	4	3,5	4	7	1	2	2	1	6	1
121	B/O ANANTAMMA	396094	1	2	3	2	3	2,4,7	1	1	1	1	3	1	1	1
122	B/O SOWMYA	397516	2	2	3	2	4,10	3	4	7	1	1	1	1	3	1
123	B/O NAVANEETHA	398307	3	1	1	1	4	3	4	7	1	1	1	2	3	1
124	B/O RANJITHA	398712	2	2	3	2	3,8	4,6	1	1	1	1	3	1	1	1
125	B/O SINDHUPRIYA	398713	1	2	3	2	4	2,3	4	7	1	1	3	1	6	1
126	B/O MAHADEVI	397515	3	1	1	1	4	3	4	7	1	1	1	2	3	1
127	B/O VEENA	400760	2	2	2	2	3	4	1	1	1	1	3	1	1	1
128	B/O LAKSHMAMMMA	400761	3	1	1	1	4	4	1	1	1	1	1	1	1	1
129	B/O ASMA TAJ	401566	1	2	3	2	2,10	2,3	4	7	1	1	3	2	3	1
130	B/O AMARAVATHI	402575	1	2	4	1	2	2,3,7	4	7	1	1	1	1	7	1
131	B/O SHOBANA	402523	3	1	1	1	4,8	5,6	1	7	1	2	3	1	7	1
132	B/O JYOTHI	406775	1	2	4	1	4,11	3,4,7	4	3,6	1	1	3	1	1,6	1
133	B/O MUNIRATHNA	412326	2	1	3	1	3	2,4	1	5	1	1	3	1	1	1
134	B/O RADDHAMMA	412593	3	2	2	1	4	2,4	1	1	1	1	1	2	1	1
135	B/O SAMEENA BHANU	412597	3	1	1	2	3	1,3	4	7	4	1	3	1	3	1
136	B/O HEMALATHA	412772	1	1	3	1	2,8	3,4,6	4	3	1	1	1	2	1,6	1