Clinical Profile Of All Pre-Term Neonates And Comparision Of Early Morbidities Among Small For Gestational Age And Appropriate For Gestational Age Preterm Neonates

by

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ABBREVATIONS

AGA	Appropriate for gestational age
APROP	Aggressive posterior retinopathy of prematurity
CPAP	continuous positive airway pressure
DIC	Disseminated intravenous coagulation
FFP	Fresh frozen plasma
LSCS	Lower segment caesarean section
LGA	Large for gestational age
NICU	Neonatal Intensive care unit
NEC	Necrotizing enterocolitis
NVD	Normal vaginal delivery
PROM	Premature rupture of membrane
PDA	Patent ductus arteriosus
PFO	Patent foramen ovalae
RDS	Respiratory distress syndrome
ROP	Retinopathy of prematurity
SGA	Small for gestational age
VAP	Ventilator associated pneumonia

ABSTRACT

Introduction: Pre-term birth defined "as child birth occurring at less than 37 completed weeks or 259 days of gestation is a main determinant of neonatal morbidity and mortality with long-term adverse health consequences". Infants born pre-term compared to term infants experience more difficulty with- temperature instability, feeding intolerance, blood glucose regulation, jaundice, , apnea, respiratory distress and sepsis either singly or in mixture.

Aim and Objective: study the early neonatal morbidities of all pre-term neonates admitted in NICU and to know the immediate outcome in these pre-term neonates during their stay in hospital. Comparison of rate of early morbidities among SGA and AGA pre-term neonates admitted in NICU during their stay at hospital

Material and method: It is a prospective observational study done for a period of 18 months. Neonates with TTN (Transient Tachypnea of the Newborn), Birth asphyxia, Neonatal sepsis, Hypoglycemia, Hypothermia, Neonatal hyperbilirubinemia, Respiratory insufficiency, Feed intolerance were included in present study.

Results: Total 50 SGA and 50 AGA babies are included with 45% female and 55% male neonates in the study. Hyperbilirubinemia constitute the major group with 61 neonates affected (61%), among which 47.5% are AGA neonates and 52.5% are SGA neonates. 24 newborns presented with infection, 15 newborns with feed intolerance, 80 newborns were with hypoxia, among them 45% was in AGA group and 55% in SGA pre-term neonates. Respiratory distress syndrome is most common morbidity in AGA neonates when compared to SGA neonates.

Majority of the neonates in both AGA and SGA group improved in health condition (51.8% and 48.2% respectively). 42.9% of AGA and 57.1% of SGA neonates not improved at the end of hospital stay.

Conclusion: SGA neonates had significant low birth weight compared to AGA neonates in present study. Most common morbidities among the SGA neonates were infection, hyperbilirubinemia, feed intolerance, hypoglycemia, Apnea, PDA, hypoxia compared to AGA neonates. Whereas AGA neonates had metabolic disorders and respiratory distress syndrome more in them. 51.8% neonates in AGA improved during hospital stay and SGA neonates 48.2%. A significant difference of mean hemoglobin among the mothers of SGA and AGA was found. Mothers with SGA newborn had significantly low hemoglobin than the mothers with AGA newborn.

Keywords: Hyperbilirubinemia, Small for gestational age (SGA), Appropriate for gestational age (AGA).

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INTRODUCTION

WHO defines "preterm birth as a birth occurring either before 37 completed week of gestation or on before 259 day counting from first day of last menstrual period"[1,2] . Preterm are major determinant of neonatal morbidity and mortality with significantly high risk for adverse medical ,psychosocial behavioral outcome in long term[1,2]. When compared to term infant ,preterm infant are at increased risk for various complication such as jaundice ,feed intolerance ,blood glucose control, apnea ,Respiratory distress syndrome, either singly or in combination because of their physiological immaturity[3,4,5]

- Preterm birth categorized based on gestational age[2]
- Very preterm are "those born before between 28-32 wk period of gestation"
- Moderate preterm "those born between 32-34wk period of gestation"
- Late preterm are" those born between 34-37wk period of gestation "

Base on birth weight using Fenton growth charts preterm are also classified into

- "SGA are those having birth weight less than 10^{th} centile for gestational age"
- "AGA are those having weight between 10^{th} and 90^{th} centile for gestational age"

Morbidity and mortality among SGA and AGA preterm are compared by number of studies which has shown high mortality in SGA preterm infant compared to AGA preterm infant but differences regarding respiratory and non respiratory morbidities are not clear. Lower incidence of RDS among SGA infant and longer hospital stay among AGA infant is shown by many

studies. In terms of admission to NICU, the SGA group is very important. Information regarding the mortality and morbidity patterns of pre-term babies from developing countries is sparse. Hence, studying these pre-term babies becomes mandatory for proper and timely decision-making in hospital.

As disease pattern vary among preterm infant in terms of place and time, present study is done at "SHRI.B.M.PATIL MEDICAL COLLAGE AND HOSPITAL, VIJAYAPURA, KARNATAKA" to know risk factor for preterm birth as well as morbidity and mortality pattern among all preterm and comparison of early morbidities among SGA and AGA preterm neonates for timely management and also for formulation of intervention plan to improve survival of preterm infant.

AIMS AND OBJECTIVES OF STUDY

1) To study the clinical profile of all preterm neonates admitted in NICU in Shri B M PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, KARNATAKA for the period of one and half year.

2) To know the immediate outcome such as sepsis, Respiratory distress syndrome, jaundice, hypoglycemia, feed intolerance, temperature instability, and Transient tachypnoea of newborn in these preterm neonates during their stay in hospital at time of discharge

3) Comparison of early morbidities among small for gestational age (SGA) and appropriate for gestational (AGA) preterm neonates admitted in NICU during their stay at hospital

REVIEW OF LITERATURE

WHAT IS PREMATURITY?

WHO defines prematurity or preterm birth as, a birth occurring either before 37 completed weeks of gestation or on before 259 day counting from first day of last menstrual period

EPIDEMIOLOGY

Despite major advance in perinatal medicine there is an increase in incidence of preterm birth over past two decades in United States, with an incidence of 12.5% which computes into staggering figure of one preterm infant born each time. Explanation for these increasing preterm birth are : increasing proportion of pregnant women older than 35years of age, change in practice parameter or guidelines for improved surveillance and increased medical intervention to prevent still birth, increase in infertility treatment and multiple gestation[2]

ETIOLOGY

What causes prematurity?

There is paucity of information about triggers that initiate labor before term leading to preterm birth ,preterm birth may be spontaneous or it may be induced by obstetrician to safeguard interest of baby or mother[6]

SPONTANEOUS

It accounts for 60% of all preterm birth[2]. In most of cases precise cause for this remains unknown ,some of factor that contribute include poor socioeconomic status acute and chronic

systemic maternal disease ,antepartum hemorrhage , maternal genital colonization and infection , emotional stress and past history of preterm birth.

INDUCED

Accounting for 40% of preterm birth[2], these are due to induced labor when there is impending danger to mother or fetal life in utero. E.g. Maternal HTN, Diabetes mellitus ,abnormal Doppler suggestive of fetal hypoxia , severe Rh isoimmunization[6]**.**

RISK FACTOR FOR PREMATURITY

Alison Stuebe et al, Boston, and Feb 2006: in his study found that 2/3rd of women who delivered their babies early, had no risk factors and the remaining 1/3rd of women had one of the following risk factors.

- **MULTIPLE GESTATIONS**
  - Multiple gestation increases risk of development of condition like pregnancy induced hypertension which may complicated by eclempsia, gestational diabetes mellitus
- **HISTORY OF PRETERM BIRTH**
  - Previous history of preterm birth has 15% to 40% chance of preterm delivery in subsequent pregnancies
- **HISTORY OF ABORTION**
  - Studies found that there is an association between history of abortion and subsequent preterm birth
- **INFECTION**
  - It may account for 30% of all preterm labor

- Infection may be localized (maternal genital colonization) or systemic

➢ **POLYHYDAMNIOS**

- Account for 40% of preterm birth it is contributed by congenital birth defects which constitute for 39% case , diabetes 22%

➢ **PROBLEMS WITH THE UTERUS**

- Septate uterus
- Unicornuate \ Bicornuate uterus
- If a women had a complete septum, baby's survival rate was 86%, if bicornuate, 50% chance for survival and if unicornuate, dropped to 40%.

➢ **GENETIC FACTOR**

- According to few experts, epigenetic mechanism is the final common pathway to explain diverse racial and ethnic factor and its effects on preterm birth rate . Increase risk for preterm birth in women is also being attributed to certain inherited trait.

➢ **SOCIAL FACTOR**

- Socio-demographic contributors includes
- Maternal age : There is an increased risk of preterm birth in females less than 17year and females more than 35 years of age.
- High rate of preterm birth associated with low socio economic status although etiologic pathways for such effects are unclear[2]

➢ **ENVIORNMENTAL FACTOR**

- High rate of preterm birth are associated with increased exposure to environmental toxin such as lead tobacco, air pollution etc

- **MATERNAL FACTORS[1,2]**
  - Medical illness like chronic hypertension and hypertensive disorder of pregnancy, pregestational and gestational diabetes, cardiac disease, renal disorder
  - Infection; may be localized or systemic infection
  - Drug abuse like cocaine, tobacco, and alcohol consumption
  - Poor nutrition and poor weight gain during pregnancy increase risk of preterm birth
  - Stress- mechanism involves various pathway affecting HPA axis, immune defense mechanism, autonomic nervous system leading to preterm birth
  - Pregnancy related complication includes abruption placenta, placenta previa
- **FOETAL FACTORS [1,2]**
  - Fetal factor such as multiple gestations, congenital anomalies increases risk of preterm birth.

WHAT ARE CHARACTERSTICS OF PREMATURITY?[1]

Following are the common characteristics of prematurity

- Small size with relatively large head
- Poor or sluggish reflex including sucking and swallowing reflex
- Poor tone due to which they assume extended posture
- Thin, shiny gelatinous skin with abundant lanugo, edema may be present with deficient subcutaneous fat
- Absence of sole crease

WHY PREMATURITY IS CONCERN?[1]

Preterms are exposed to various clinical problems because of functional immaturity of various systems therefore knowledge about these clinical problems is essential for satisfactory management.

- **RESPIRATORY SYSTEM**

- Functional immaturity of lung structure poses preterm at great risk for inefficient gas exchange due to delayed intrapulmonary fluid resorption, deficient surfactant causing RDS.
- Preterm's are also vulnerable to develop chronic pulmonary insufficiency due to development of BPD

❖ RESPIRATORY DYSTRESS SYNDROME

- It is also known as hyaline membrane disease ,inadequate pulmonary surfactant due to preterm birth results in RDS which leads to inefficient gas exchange across alveoli

RISK FACTOR FOR RDS INCLUDES

- Prematurity
- Genetic factor
- Maternal diabetes
- Lung hypoplasia caused by thoracic malformation such as diaphragmatic hernia which increases risk for RDS due to surfactant deficiency
- Factor affecting surfactant production, release, as well as function such as birth asphyxia

➢ CARDIOVASULAR SYSTEM[1]

- Recovery of preterm infant with RDS is usually delayed as result of delayed ductus arteriosus closure due to functional immaturity of cardiovascular system
- Cardiovascular reserve that is available during stress is restricted by structural and functional immaturity of cardiovascular system

➢ GASTROINTESTINAL TRACT[1]

- Poor or incordinared sucking and swallowing reflex and their small capacity of stomach , poor cough reflex results in regurgitation and aspiration
- Preterm are also at risk for functional intestinal obstruction or abdominal distention due to hypotonia
- Increased enterohaepatic circulation increases risk for hyperbilirubinemia
- Preterm are also at risk for development of NEC when predisposing factors are present
- Preterm are more prone for feed intolerance because of
    - ❖ Delayed gastric emptying
    - ❖ Sucking and swallowing incordination
    - ❖ Less organized motor pattern

➢ THERMOREGULATION[1]

- Response of infant to cold exposure is affected by factor like gestational age and physical size and also amount of white and brown adipose tissue as well as maturity of hypothalamus
- Preterm infant are at great risk for hypothermia because of following factors like

- ❖ Large surface area
- ❖ Increased permeability of skin leads to increased water loss
- ❖ Paucity of brown fat with poor stores of it due to preterm birth

➢ RENAL SYSTEM[1]

- Immaturity of renal system affects urine concentrating ability of kidney because of which preterm infant cannot conserve water and readily gets dehydrated
- Acidosis occurs early due to poorly developed renal tubular ammonia mechanism
- Edema of prematurity may results from retention of solute and low serum protein

➢ CENTRAL NERVOUS SYSTEM[1]

- Because of immaturity of central respiratory drive ,premature infant are at risk of apneic spells more frequently
- Apneic spells generally begins 2 or 3 days after birth
- Immaturity of blood brain barrier increases risk of hyperbillirubinemia and kernicterus even at lower serum billirubin level

➢ IMMUNE SYSTEM[1]

- Preterm infants are predisposed to infection due to immaturity of immune system characterized by low level of IgG antibody and inefficient cellular immunity
- Other factors like excessive handling, warm and humid atmosphere ,contaminated resuscitators, incubators contributes to higher incidence of infection by exposing them to infecting organism

- Maternal factors like
    - Prolonged labor
    - PROM more than 24 hour
    - Unclean vaginal examination
    - Chorioamnionitis – clinically characterized by high grade fever, foul smelling vaginal discharge, and maternal leucocytosis.

INCIDENCE OF PRE-TERM BIRTHS AND TRENDS.

Country	Pre-term births (%)	Trend
Kochanek KD et al[7] USA	12.3	Increasing
Robert et al[8] Australia	5.5	Stationary
Bibby & Stewart[9] United kingdom	7	Increasing
Feresu SA et al[10] Zimbabwe	16.4	Increasing
Leung TN et al[11] China	7.4	Increasing
Morken et al[12] Sweden	5–6	Decreasing
Singh Uma et al[13] India	20.9%	--

CATEGORISATION OF PRETERM[1,2]

- **Preterm birth are categorized based on gestational age into following types**
    - Very preterm – are those born between 28-32 wk period of gestation
    - Moderate preterm- are those which are born between 32-34 wk period of gestation
    - Late preterm – are those born between 34-37 wk period of gestation
- **Using growth chart premature infant based on birth weight are categorized into**
    - Small for gestational age(SGA)
    - appropriate for gestational age (AGA)
    - Large for gestational age (LGA)

PRETERM GROWTH CHARTS

- Growth assessment is the single measurement that defines the health and nutritional status of children; it also provides an indirect measurement of quality of life of an entire population.
- Growth curves have been derived based on anthropometric data in populations of new-born at different gestational age. Such curves are used to demonstrate whether an infant's weight is within the normal-range for a given gestational-age, thus to estimate in utero growth of neonate was greater or lesser than normal. The normal range is defined as birth weights between the 10^{th} and 90^{th} percentile of the population-specific birth weight vs. gestational age relationship. AGA includes fetus and neonates who fall within the 10^{th} and 90^{th} percentiles for weight vs. gestational age. SGA includes neonates who are lesser than the 10^{th} percentile and LGA includes one greater than

the 90th percentile.[14]

- Each curve in graph are based on local populations with variable composition of maternal age, parity, socio-economic status, ethnic back ground, race, body size, degree of obesity or thinness, health, pregnancy-related issues, nutritional status and number of fetuses per mother, number of newborns included in the study and by type of methods and how accurately the measurements of body size and gestational age are taken. The designation of a child as having impaired growth implies some means of comparison with 'reference' child of the same age and sex[14].

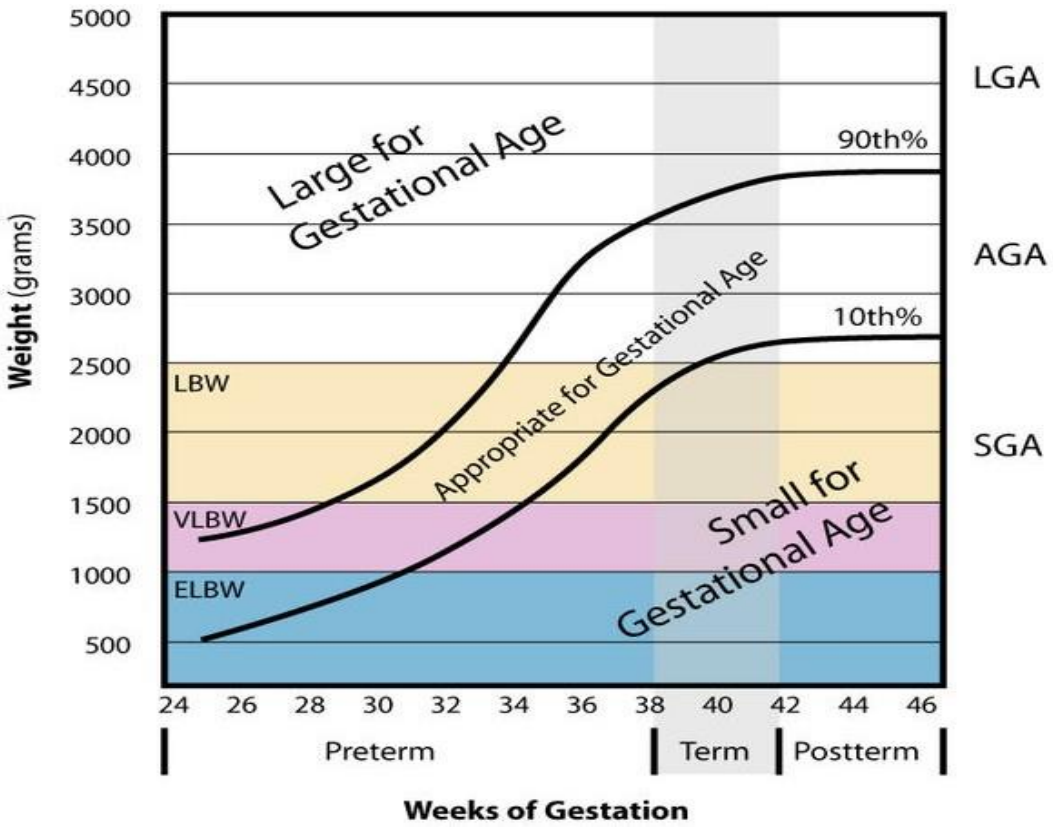
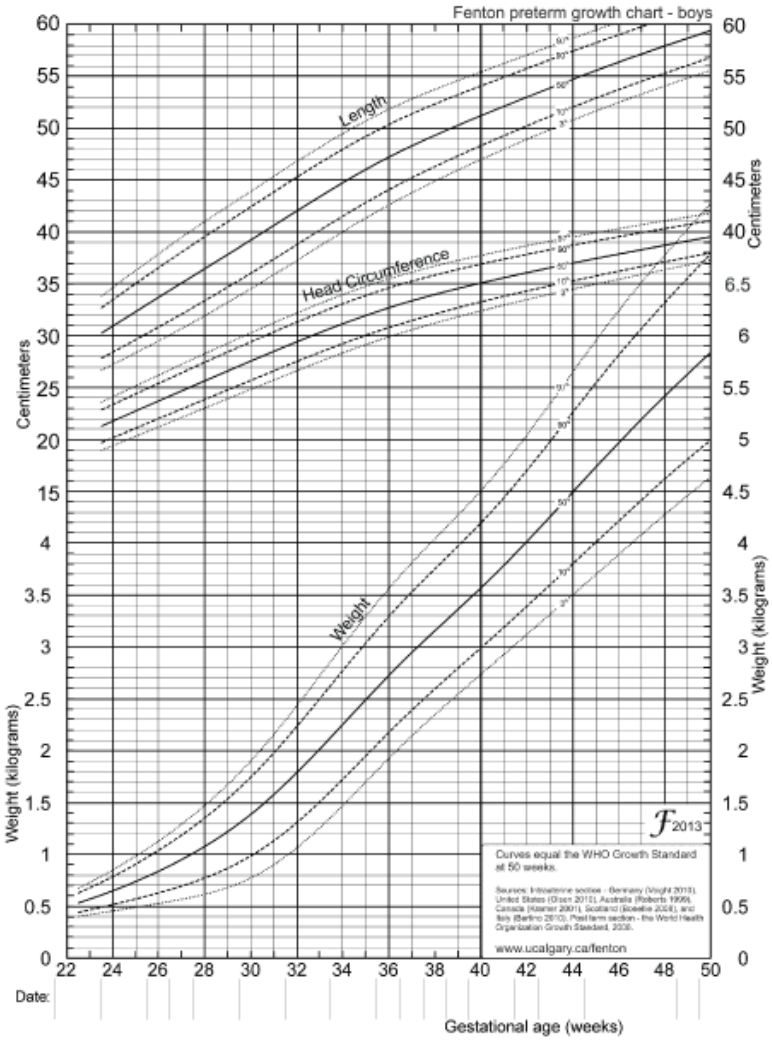


Figure 1: Gestational age and birth weight of infants born at 24 to 46 weeks' gestation.

Lubchenco et al.[15] was first to describe birth-weight as centiles for various gestations. “These birth weight centiles were based on data from live births from an ethnically mixed group in Denver had published in 1966. Colorado. In his data that these are not universally applicable since the growth potential of a fetus depends on various factors such as sex of the infant, birth order, maternal size and ethnic group. Each center should have its own birth-weight centiles for gestation age based upon locally collected data”



- **Figure 2. Modified Fenton's Growth Chart**

- Fenton growth charts are most widely used today which allows infant growth comparison from 22wk to 50wk postmenstrual age with separate charts for boys and girls.
- due to difference in racial and ethnic or maternal poor nutrition normal Indian infants are smaller (in all three parameter includes weight, length, head circumference) when compared to Fenton or Olsen intrauterine growth charts.

CLINICAL PROBLEMS OF PREMATRE INFANTS[3]

Pre-mature babies are born before their physical stature and organ systems have matured completely. They are often small, with birth-weight < 2,500 grams or 5½ pounds. They may need help while breathing and feeding. They are easily susceptible for infection and hypothermia. Very pre-mature babies are those born before 28 weeks and these are especially vulnerable to above problems. Many of their organ-system may not be ready for events post birth and compromised functional ability.

Pre-mature babies may experience the problems like :

- **Temperature instability**

- **Respiratory:**
    - Chronic lung disease/bronchopulmonary dysplasia
    - Hyaline membrane disease / respiratory distress syndrome
    - Air leak syndrome

- Lung immaturity
- Apnea - occurs in about half of babies born at or before 30 weeks

- **Cardiovascular:**
  - Hypotension / hypertension
  - Patent ductus arteriosus (PDA)
  - Bradycardia

- **Blood and metabolic:**
  - Anemia
  - Jaundice
  - Hypoglycemia
  - Hypocalcemia
  - Hyperglycemia

- **Gastrointestinal:**
  - Many are unable to coordinate sucking and swallowing before 35 weeks gestation leading to difficulty in feeding

- Poor digestion
- Necrotizing enterocolitis (NEC)

- **Neurologic:**
  - Intraventricular hemorrhage
  - Periventricular leukomalacia
  - Poor muscle tone
  - Seizures
  - Retinopathy of prematurity

- **Infections**

CARE OF PRETERM INFANT[1]

Care of preterm infant includes

- Monitoring of following clinical parameter
  - Vitals
  - Activity and behavior
  - Color of baby
  - Perfusion of tissue
  - Monitor for feed intolerance
  - Monitor for apneic spells ,abdominal distension
  - Weight of baby for weight gain velocity

- Temperature should be maintained in thermoneutral environment with servo sensor geared so that there is no or minimal thermogenesis
- Convective heat loss and evaporative water loss are prevented by application of oil or liquid paraffin
- Oxygen should be used only in given lowest ambient concentration when indicated to maintain spo_2 between 85% to 95% or po2 between 60and 80mmhg to prevent oxygen toxicity
- Phototherapy
    - Hepatic immaturity ,hypoxia, infection increase risk of preterm for development of hyperbillirubinemia
    - In preterm billirubin brain damage may occur occur at lower serum billirubin level when compared to term because of the immaturity of blood brain barrier ,hypoprotinemia therefore early phototherapy is necessary to keep serum billirubin within safer limit
- Feeding and nutrition
    - Once baby is stable establish early enteral feeding
    - Start trophic feed (1-2ml/kg 4 times a day) through NG in all preterm irrespective of their clinical condition
    - In stable preterm enteral feed can begin with 30ml/kg/day on day one of life and increment by 10-20ml/kg/day every day
    - Once baby is stable and tolerating feed expressed breast milk can be fortified with human milk fortifier
- Supplementation of minerals like iron and multivitamin including vitamin E

- Tactile stimulation of baby by gentle touch, massage and cuddling and soothing auditory stimuli by family voice or music ,studies have shown to reduce the stress of procedure and increase weight gain velocity by music
- Kangaroo mother care
    - Where babies are kept on bare chest of either parent preferably mother to establish skin to skin contact in order to prevent hypothermia and also increases bonding between child and mother
- TREATMENT OF PREMATURITY:

  It depends on

  Extent of the disease

  □ Tolerance for specific medications, procedures, or therapies

  □ Expectations for the course of the disease

  Treatment may include:

  Pre-natal corticosteroid therapy: Research has found that mother treated with corticosteroid at least 48 hours prior to delivery, greatly reduces the incidence and severity of HMD in the newborn. Incidence of intraventricular hemorrhage is decreased in newborns, if mother is treated with steroids prior to delivery. Many studies are not clear about pre-natal steroids may even help in reducing the incidence of PDA and NEC. When pre-term birth is likely between 24 and 34 weeks of pregnancy, mothers may be given steroids.

Morbidity and mortality among Late pre-term infants

They are at increased risk of the neonatal morbidity compared to term infants. They are 4 times more likely to have at least one medical condition diagnosis than the term infants.[16] The diagnosis during hospitalization at birth includes;

- Temperature instability[5]
- Hypoglycemia[5]
- Respiratory distress[5]
- Apnea[5]
- Jaundice[5]
- Feeding difficulties[5]

Risk factors for neonatal rehospitalization after birth is being evaluated by several case-control studies and they have identified late-pre-term birth as a significant risk factor[17]

John Toyson et al, Houston[18]

Newborns with extremely early birth, research shows that 4 factors aside from the baby's gestational age – may affect their odds of survival if given intensive care.

The 4 Factors are

- Birth weight (the higher the better)
- Sex (survival is better for girls)
- Mother's treatment with corticosteroids before giving birth
- Single birth or multiple birth

Michael G Ross et al, Los Angeles[19]

- Pre-term birth occurs in 12% of pregnancies
- Leading causes of neonatal mortality in US
- Neonatal morbidity (70%), mortality.
- 2% delivering very pre-mature infant <32 weeks.

Exact mechanism is unknown, possible mechanism is

(a) Decidual hemorrhage

(b) Cervical incompetence

(c) Uterine distortion Cervical inflammation (from bacterial vaginosis, trichomoniasis)

(d) Maternal inflammation, fever (e.g. UTI)

(e) Hormonal changes (maternal stress / fetal stress)

(f) Uteroplacental insufficiency (e.g. Hypertension, IDDM Drug abuse, alcohol consumption, smoking,)

Prediction remains inexact, a various of maternal characteristics are known to increase the risk, presumably by one of these mechanisms. Fetus plays a role in iniation of labour.

Also includes demographic factors, behavioral factors, and aspects of obstetric history such as previous pre-term birth.

- Demographic factors – non white race
- Extremes of maternal age (< 17 , or > 35 years)
- Low Socio economic status.
- Low Pregnancy weight

Distribution of Neonatal morbidity and mortality by gestational age:

Gestational age	Survival	Respiratory Distress Syndrome (RDS)	IVH	Sepsis
24 – 26 Weeks	40 – 75%	70 – 93%	25 – 30%	25 – 30%
27 – 29 Weeks	80 – 92%	53 – 84%	3 – 16%	25 – 36%
30 – 34 Weeks	93 – 95%	28 – 55%	1 – 2%	3 – 11%
32 – 34Weeks	93 – 97%	14 – 34%	0%	4 – 5%

Singh uma et al,[13] lucknow, prospective analysis of etiology and outcome of pre-term labour. 48.5% of women were in the gestational age group of 34 – 36 weeks. 48.1% received tocolysis and out of which 61.0% delivered pre-maturely. The most common (25.96%) risk factor was pre-mature rupture of membranes (PROM), followed by infection. UTI was found in 8.4%. Neonatal mortality was found to be high in babies less than 34 weeks gestation (30.4%). Betamathasone had not affected mortality incidence in babies born < 34weeks. Neonatal morbidity was found to be significantly reduced in cases with Betamethasone coverage and incidence of RDS was significantly less in this group. 14.4% had history of pre-term deliveries and 44(10%) had one pre-term delivery and 16% (4.8%) had two or more. 14.4% had prior abortions. In ELBW babies,

Neonatal hyperbilirubinemia (78%) and RDS (65%) were the most common causes of morbidity. Overall mortality was 12.7%.

Von-der Pool et.al.[20] in his study, reported approximately 30% of Pre-term births was due to pre-term labour. **Gonclases et al,** intra uterine infection was the major cause of pre-term births. **Wright et al**[21] identified UTI as significant risk factor.

Arvind Sehgal,et al[22] studied the maternal and neonatal profile with immediate outcome in ELBW babies. The overall survival rate was found to be 57%. Mean gestational age was 27.8 weeks and mean birth-weight was 831gm. Mortality was highest in babies born < 28 weeks gestation. Commonest morbidity was neonatal hyper-bilirubinemia (75%) and HMD/RDS (65%). SGA babies were more when compared to AGA babies. 44% did not receive antenatal care and babies born to them had unfavorable outcome, as compared to those with optimal antenatal care. Gender difference in this study followed male. Among the maternal risk factors, anemia ranked first and among the clinical profile of ELBW neonates, jaundice (78%), followed by HMD/RDS (65%), Hypoglycemia (38%). Respiratory failure was the immediate cause of death. IVH/ICH (27%), HMD (63%), Sepsis, pulmonary hemorrhage 18%, were main contributors to mortality.

Roy kk, et al study[23], analysis of immediate neonatal outcome in VLBW & ELBW babies, overall mortality was higher among boys (26.7%), than girls (16%). Common complications seen were neonatal jaundice, RDS, culture proven sepsis, birth asphyxia. There was higher association of SGA babies, there was higher number of deliveries in lower socio-economic class and among the maternal risk factors, PROM ranked first followed by Anemia, bacterial vaginosis, gestational hypertension and previous history of pre-term delivery. As for as delivery

outcome was analyzed, major delivered by caesarean sections followed by vaginal deliveries and breech deliveries, identified UTI as significant risk factors.

Wright et al[21] and Onyaye E et al[24] studied the Prevalence and Outcome of Pre-term Admissions at the Neonatal Unit of a Tertiary Health Centre. This was a retrospective descriptive study with Pre-term admissions of 24.0% of the total admissions with a male to female ratio of 1.1:1. The most common risk factor for pre-term birth was pre-term rupture of fetal membranes (46.4%) followed by lack of maternal care (35.5%) and multiple pregnancy (26.8%) respectively. The medical conditions were respiratory problems in 95 (68.8%) followed by jaundice in 94 (68.1%) and sepsis in 54 (39.1%) of the patients. The mortality rate was highest in patients with necrotizing enterocolitis and seizures (66.7%) followed by respiratory issues (63.2%) and bleeding diseases (60.0%). The overall survival rate was found to be 65.9%. The survival rate was significantly high in the mild pre-term category compared to very pre-term and extremely pre-term .

Ashish Jaiswal et al[25] in 2011 studied about "Early Neonatal Morbidities in Pre-term Infants". They did a prospective cohort study to compare the early neonatal morbidity (within first 7 days of life) in pre-term infants with term infants. Total of 363 pre-term infants and 2707 term infants were included in current study. Among them 257(70.8%) of pre-term and 788 (29.1%) of term infants had at least one of the predefined neonatal conditions. pre-term infants were at significantly high risk for overall morbidity due to various causes (P<0.001; adjusted Odds Ratio (OR): 5.5; 95% CI: 4.2- 7.1), respiratory morbidity (P<0.001; adjusted OR: 7.5; 95% CI: 4.2-12.3), any ventilation (non invasive or invasive) (P=0.001; adjusted OR: 4.2; 95% CI: 2-8.9), jaundice (P<0.001; adjusted OR: 3.4; 95% CI: 2.7-4.4), hypoglycemia (P<0.001; adjusted OR: 4.5; 95% CI: 2.6-7.7) and probable sepsis (P<0.001; adjusted OR: 3.2;

95% CI: 1.6-6.5). 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 (P<0.001). They concluded that, late pre-term infants were at high risk for respiratory morbidity in comparison with term infants, requiring possible ventilator support (noninvasive or invasive) and also are at increasing risk for hypoglycemia, jaundice, sepsis, and probable sepsis.

Anjali edbor et al[26] studied about mortality and morbidity in AGA and SGA pre-term babies. It was a hospital based study, examined 147 babies of which 84 were AGA and 63 were SGA. Mean gestation age was 33.47 weeks while Mean gestation was found to be 32.91 weeks in AGA babies and 33.89 weeks in SGA babies. Overall mortality rate was 11.56% in entire population. Mortality rate was higher in SGA babies which were irrespective of gestational-age. This contradiction to higher RDS % in SGA in their study was managed without surfactant therapy. They observed that incidence of Hypoglycaemia (19.04%), RDS (31.74%) and Jaundice (39.68%) was more in pre-term SGA babies while incidence of Sepsis (35.71%), Hypothermia (10.71%) and NEC (11.90%) was more in pre-term AGA babies.

Shrestha et al[27] studied a total of 266 pre-term deliveries in the year 2011. 45% were NICU admission. Pregnancy induced hypertension (26%) was most common cause of pre-mature delivery in mothers. Other causes were pre-term pre-mature rupture of membrane (24%) and in 25% of cases the cause was unknown. 10.2±8.8days was the mean duration of stay. The survival rate of severe pre-term newborns was 80%, moderate pre-term babies was 78% while that of late pre-term was 95%. And concluded that the main causes of morbidities in pre-term babies were respiratory distress, hyperbilirubinemia and sepsis. Predominant cause for the mortality in newborn was Respiratory distress syndrome and sepsis.

Gauchan E et al [28] studied the Clinical profile and outcome of 182 newborns admitted to NICU. 32.4% newborns were inborn. 41.2 % newborn were admitted directly from the emergency or OPD and 22.5 % were referred from district hospitals. Male: female ratio was 1.1:1. There were 67.5 % term newborn and 31.3% pre-term newborns. 44.5% were admitted in first 24 hours of life; commonest indications for admission were neonatal-jaundice (24.7%); sepsis (21.4%) and perinatal-asphyxia (19.2%). 76.9% babies improved and were discharged, 6.5% left against medical advice and 1.62% were referred for surgical interventions. Mortality was seen in 13.7%. Common reason for mortality was hyaline-membrane disease (28%) and hypoxic ischaemic-encephalopathy stage 3 (28%). He concluded with saying Neonatal period is a vulnerable period with a higher risk of morbidity and mortality. Most of these are preventable with good obstetric and subsequent neonatal-care. Prompt management and early anticipation is very essential to reduce in these neonatal mortality[13].

Satish D. Ashtekar et al[29] found that, out of 134 pre-mature babies 34 (25.3%) were SGA, 24 (17.9%) LGA and 78 (58.2%) were AGA. Commonest morbidities were Jaundice (44.7 %), RDS (37.3 %) and Sepsis (14.9 %). RDS (85.4%), Sepsis (10.4 %) and Aspiration Pneumonia (4.1 %) were the reasons for mortality. Mortality was high in pre-mature babies with birth weight < 1400grams. PROM (50.7 %), Anemia (35.8 %) and Twin (17.9 %). Overall mortality among pre-mature babies was found to be 35.8 %. PROM and Anemia are maternal risk factors for the pre-mature births.

Sumit Bansal et.al [30] analyzed a total of 80 pre-mature newborn infants for the complications they encountered after birth while admitted in NICU. Males accounted for 40%(32) and females 60%(48).

21(26.2%),16(20.0%), 43 (53.5%) were SGA, LGA and AGA respectively. 26 (32.5%) newborns had birth-weight <1500grams and 54(67.5%) newborns had birth-weight >1500grms. Neonatal hyper-bilirubinemia, HMD/RDS and Neonatal sepsis were the common cause of morbidity. Among 80 pre-mature newborns 15(18.7%) died with disease. The highest mortality was seen in newborn those weighing less-than 800 gms (100%). Mortality in male and female babies was 34.4% and 8.3% respectively.

According to Khan MR et.al[31] the number of pre-term births during study period was 13.3% (251/1885) and 58% (n=145) among them required admission in NICU. Mean gestational-age was 33 ± 2.4 weeks and mean birth-weight, was 1.88 ± 0.5 kg. 25% of patients were SGA while 75% AGA. Common morbidity was metabolic derangement, observed in 93% of newborns followed by sepsis (43.6%). Respiratory distress syndrome was seen in 35.5% of neonates while intraventricular hemorrhage in 3.5% patients. Mean length of stay for pre-term infants in NICU was 11.5 ± 9.6 days, 14% (n=20) pre-term neonates expired during NICU stay.

Mani Kant et.al.[32] studied 91 (38.6 %) pre-mature deliveries with a mean gestational-age of 34.4 ± 3.6 weeks and 94 (39.8 %) LBW neonates with a mean birth-weight of 2280 ± 754 gm. Major cause of Morbidity were Low birth weight (LBW) (39.8%), prematurity (38.6%), neonatal sepsis (23.3%), neonatal hyperbilirubinaemia (20.4%), birth asphyxia with hypoxic ischemic encephalopathy (HIE) (18.2 %), intra-uterine growth retardation (IUGR) (14 %) and hyaline membrane disease (9.7%).

Study Design: It is a prospective observational study done for a period of 18 months

Study site: SHRI.B.M.PATIL MEDICAL COLLAGE AND HOSPITAL, VIJAYAPURA, KARNATAKA

Source of data/Sampling method:

Gestational age will be assessed by Modified Ballard score. For hypothermia, hypoglycemia, hyperbilirubinemia, respiratory insufficiency, birth asphyxia, sepsis, feed intolerance well established definitions are used. Regarding rehospitalisation, duration considered is within one month of age. Exposed group consists of SGA babies and unexposed group consists of AGA. For each SGA baby admitted, the subsequent AGA baby of same gestational age will be identified as a comparison group.

Details regarding maternal risk factors will be collected by detailed history taking and the medical records with them. The infants in the sample are followed throughout their stay in the NICU and postnatal wards, up until hospital discharge. Data will be 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 will be analyzed.

The maternal and gestational variables studied will be: Age (years), number of pregnancies, prior history of miscarriages, still births and pre-mature deliveries; type of delivery (normal or caesarean); previous caesarean section, intercurrent clinical conditions observed during gestation

– diabetes, hypertension, anemia, urinary infections at any point during pregnancy, syphilis, human immunodeficiency virus (HIV), toxoplasmosis, heart disease, hepatitis B, pre-mature rupture of membranes (PROM) for longer than 18 hours, placental abruption.

The neonatal variables studied will be: Age at admission, days in hospital,sex, birth weight; gestational age (Calculated from modified Ballard's scoring); hypothermia/ hyperthermia (hypothermia : body temperature below 36ºC, hyperthermia: temperature above 37.5ºC); hypoglycemia (glucose below 40 mg/dL); hyperbilirubinemia requiring phototherapy/ exchange transfusion; feed intolerance; respiratory pathologies – transient tachypnea of the newborn (TTN), hyaline membrane disease (HMD), pneumonia, sepsis, interventions done, deaths, rehospitalization.

Neonatal morbidities that are included as follows:

- TTN (Transient Tachypnea of the Newborn)
- Birth asphyxia
- Neonatal sepsis
- Hypoglycemia
- Hypothermia
- Neonatal hyperbilirubinemia
- Respiratory insufficiency
- Feed intolerance

Sample Size: With Anticipated Mean Difference of prevalence of morbidity between the two study groups among pre-term babies as 10.1 and Anticipated SD as 13.9, the minimum sample size per group is 50 with 90% power and 5% level of significance.

Total 100; By using the formula:

$$n = \frac{(z_\alpha + z_\beta)^2 \, 2 \, SD^2}{MD^2}$$

Where Z= Z statistic at a level of significance

MD= Anticipated mean difference

SD= Anticipated Standard deviation

Sampling Technique: Consecutive sampling; **Randomization (if any)**

Type and Duration of study:

- It is a prospective analytical study done for a period of 18 months

Inclusion criteria

All preterm babies admitted in NICU at SHRI B,M PATIL MEDICAL COLLEGE AND HOSPITAL ,VIJAYAPURA

Exclusion criteria

1. Preterm babies of parents who have not given consent.
2. preterm babies who had surgical conditions, congenital malformations, genetic disorders, which are incompatible for life
3. All preterm babies admitted after 5 day of life referred from other hospital

Details of data tabulation & statistical analysis: All characteristics will be summarized descriptively. For continuous variables, the summary statistics of N, mean, standard deviation (SD) will be used. For categorical data, the number and percentage will be used in the data summaries and data will be analyzed by Chi square test for association, comparison of means using t test, ANOVA and diagrammatic presentation.

RESULTS:

Total of 100 pre-term neonates who are grouped into;

- Small for Gestational age: 50 pre-term neonates.
- Appropriate for Gestational age: 50 pre-term neonates.

Table 1. Showing Gender distribution in present study.			
		Frequency	Percent
Gender	Female	45	45.0
	Male	55	55.0

55% neonates were male and 45% were female in present study

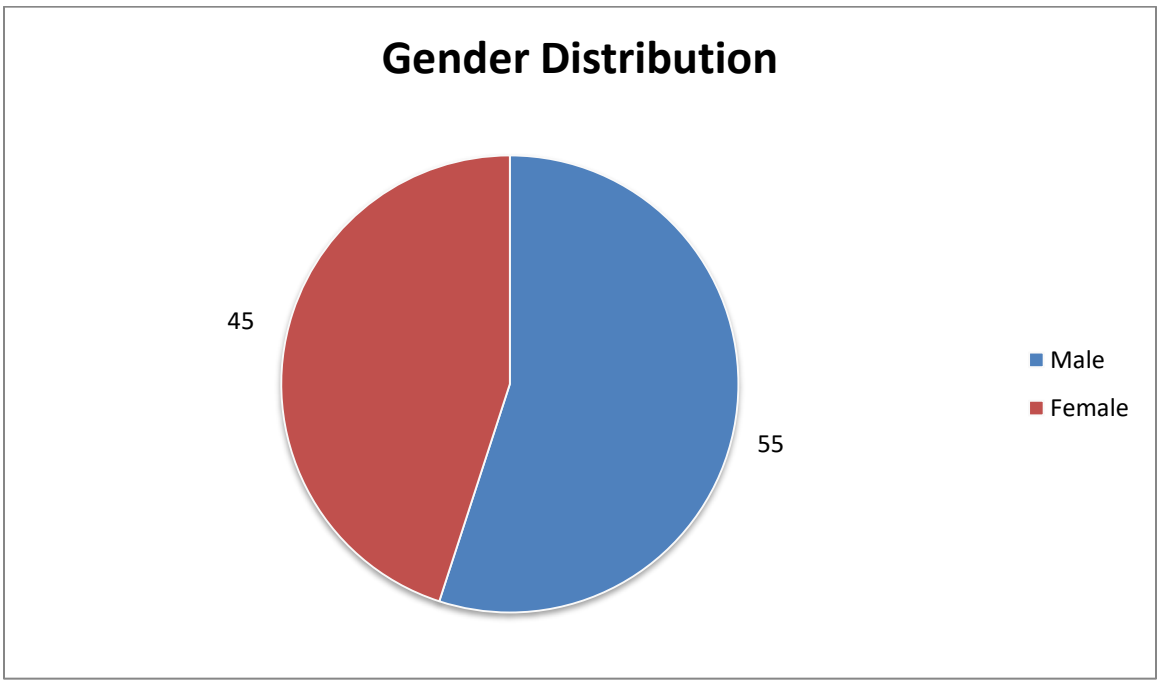


Figure 3: Gender distribution in present study.

Table 2: Showing Gender distribution in SGA and AGA groups.			
		Appropriate for Gestational Age (AGA)	Small For Gestational Age (SGA)
		N (%)	N (%)
Gender	Female	19 (42.2)	26 (57.8)
	Male	31 (56.4)	24 (43.6)

Gender distribution of neonates according to AGA and SGA is male- 56.4 % and 43.6% respectively; females- 42.2% and 57.8% respectively.

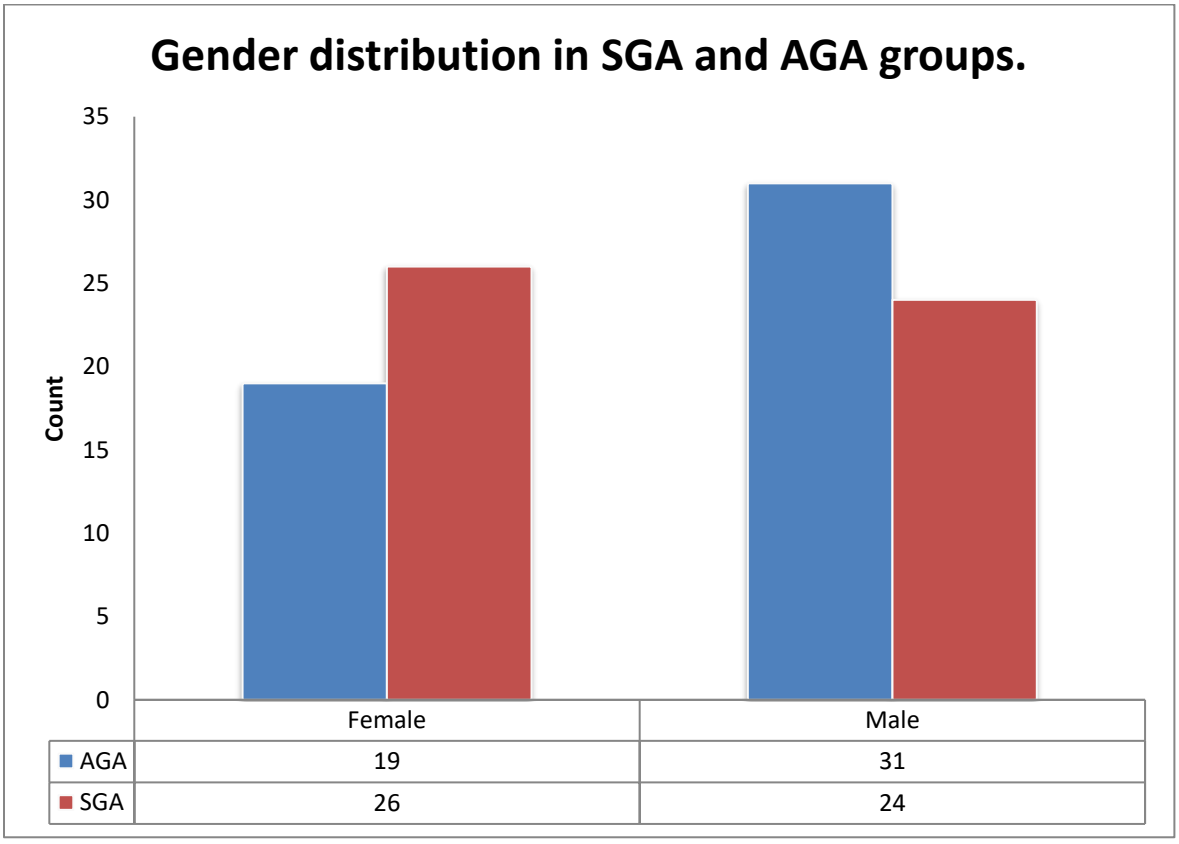


Figure 4: Gender distribution in SGA and AGA pre-term neonates.

Table 3: Showing the day at admission to hospital.			
		Frequency	Percent
Day at admission	Day 1	89	89.0
	Day 2	7	7.0
	Day 3	3	3.0
	Day 4	1	1.0

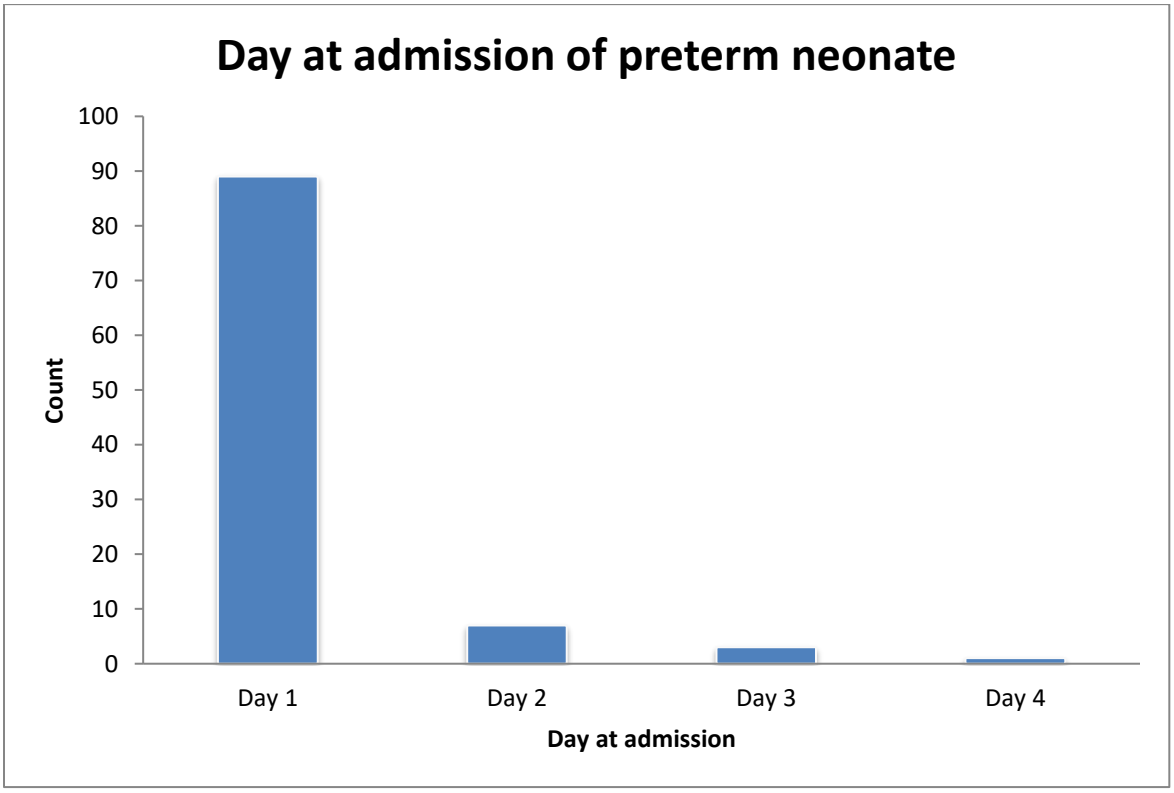


Figure 5: Day at admission of pre-term neonates.

Table 4: Distribution of age at admission according to the weight of birth, Small for Gestational age (SGA) and Appropriate to Gestational age (AGA).			
Day of Admission	Appropriate for Gestational Age (AGA)	Small For Gestational Age (SGA)	Chi-square
	N (%)	N (%)	p-value
Day 1	43 (48.3)	46 (51.7)	.236
Day 2	4 (57.1)	3 (42.9)	
Day 3	3 (100)	0	
Day 4	0	1 (100)	
p<.05 is statistically significant.			

Majority of the admission in both AGA and SGA pre-term neonates was on day 1 of birth and difference is not statistically significant.

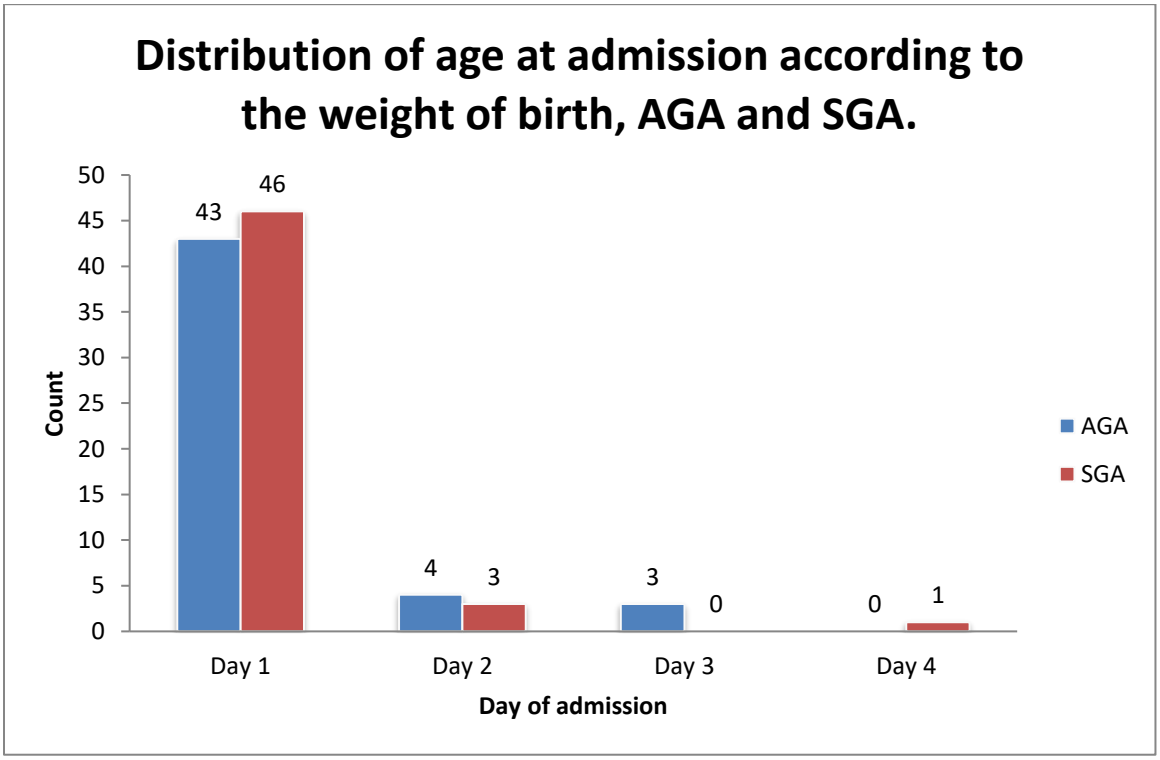


Figure 6: Age at admission according to weight of birth AGA and SGA.

Table 5. Comparison of Mean birth weight of babies according to the SGA and AGA.			
	Weight of Age	Mean ± SD	p-value
Birth weight in Kg	SGA	1.18 ± 0.21	<0.001**
	AGA	1.71 ± 0.27	
**P<.001 is statistically high significant.			

Statistically significant mean weight difference of pre-term neonates in AGA and SGA was found, with high mean weight in AGA neonates compared to SGA neonates.

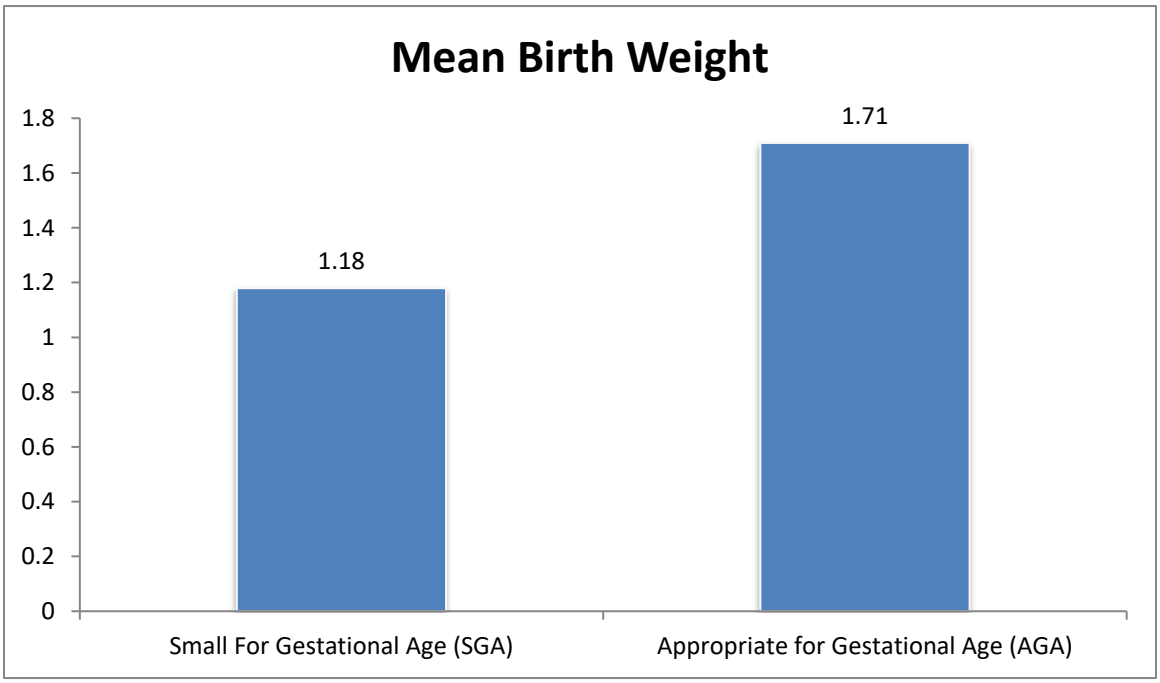


Figure 7: Mean birth weight in SGA and AGA pre-term neonates.

Table 6: Showing distribution of newborns according to birth weight.		
Birth weight	No of patients	%
<1.5 kg weight	61	61.0
1.5-2.0 Kg weight	32	32.0
2.0-2.5 Kg weight	7	7.0
Total	100	100.0

61% of the pre-term neonates are below the weight of 1.5kg, 32% in 1.5-2.0kg of weight and 7% in 2.0-2.5kg of weight.

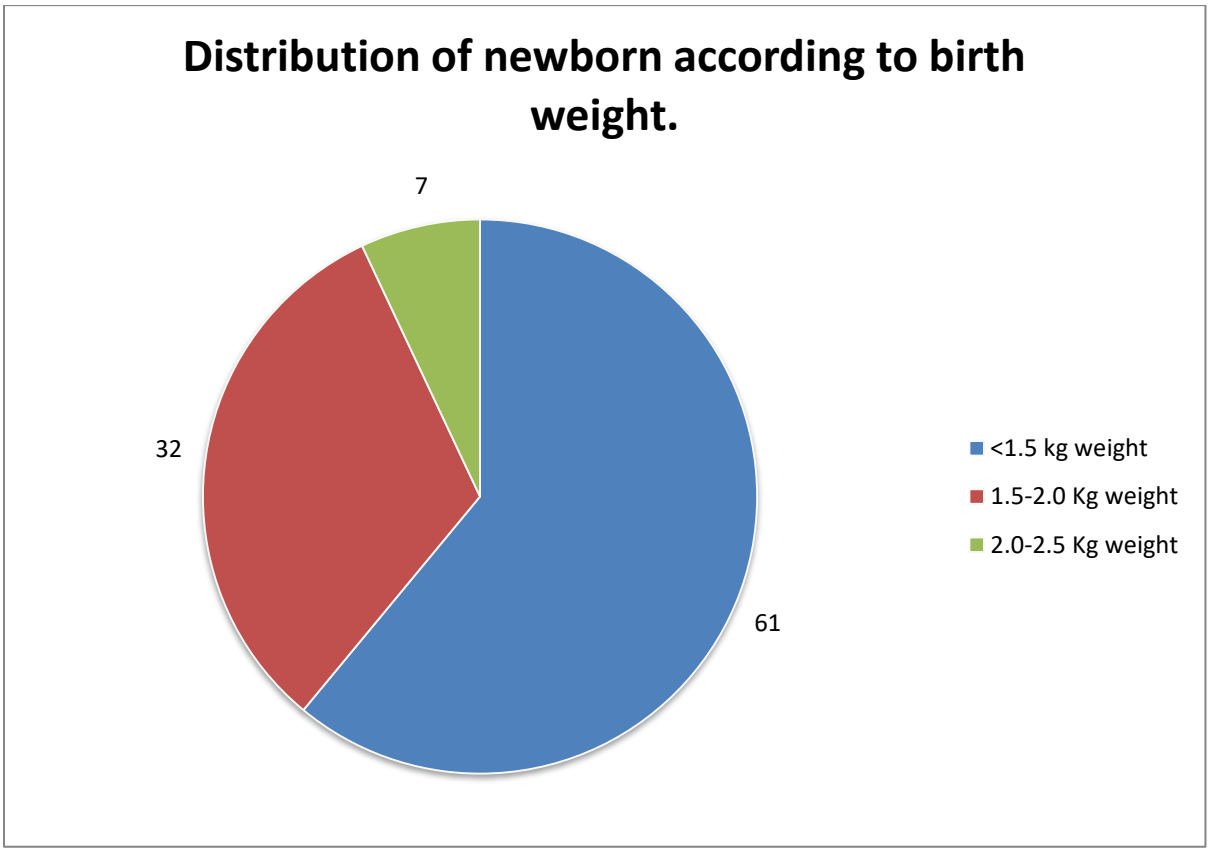


Figure 8: Distribution of Newborn according to various weight range.

Table 7: Frequency distribution of SGA and AGA newborns according to week of gestation at delivery.			
Gestational Age in Weeks	Appropriate for Gestational Age (AGA)	Small For Gestational Age (SGA)	Chi-square
	N (%)	N (%)	p-value
28-30 weeks	7 (25)	21 (75)	<.001**
31-32 weeks	9 (37.5)	15 (62.5)	
33-34 weeks	22 (71)	9 (29)	
34-36 weeks	12 (70.6)	5 (29.4)	

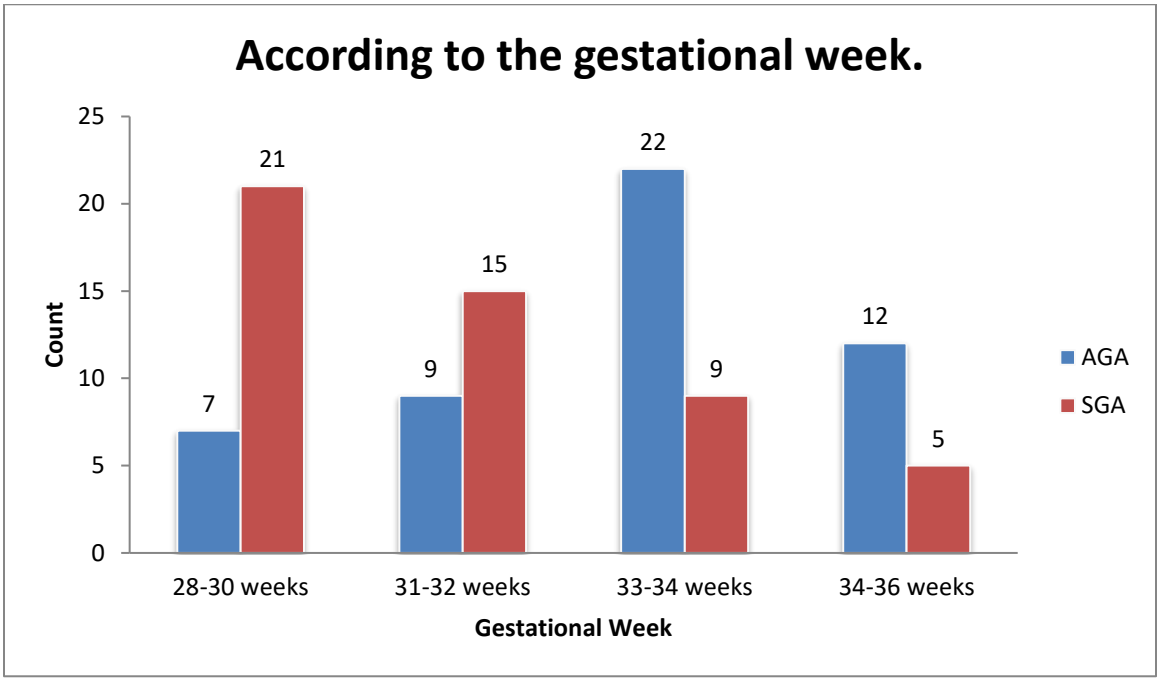


Figure 9: Distribution according to gestational week in SGA and AGA group

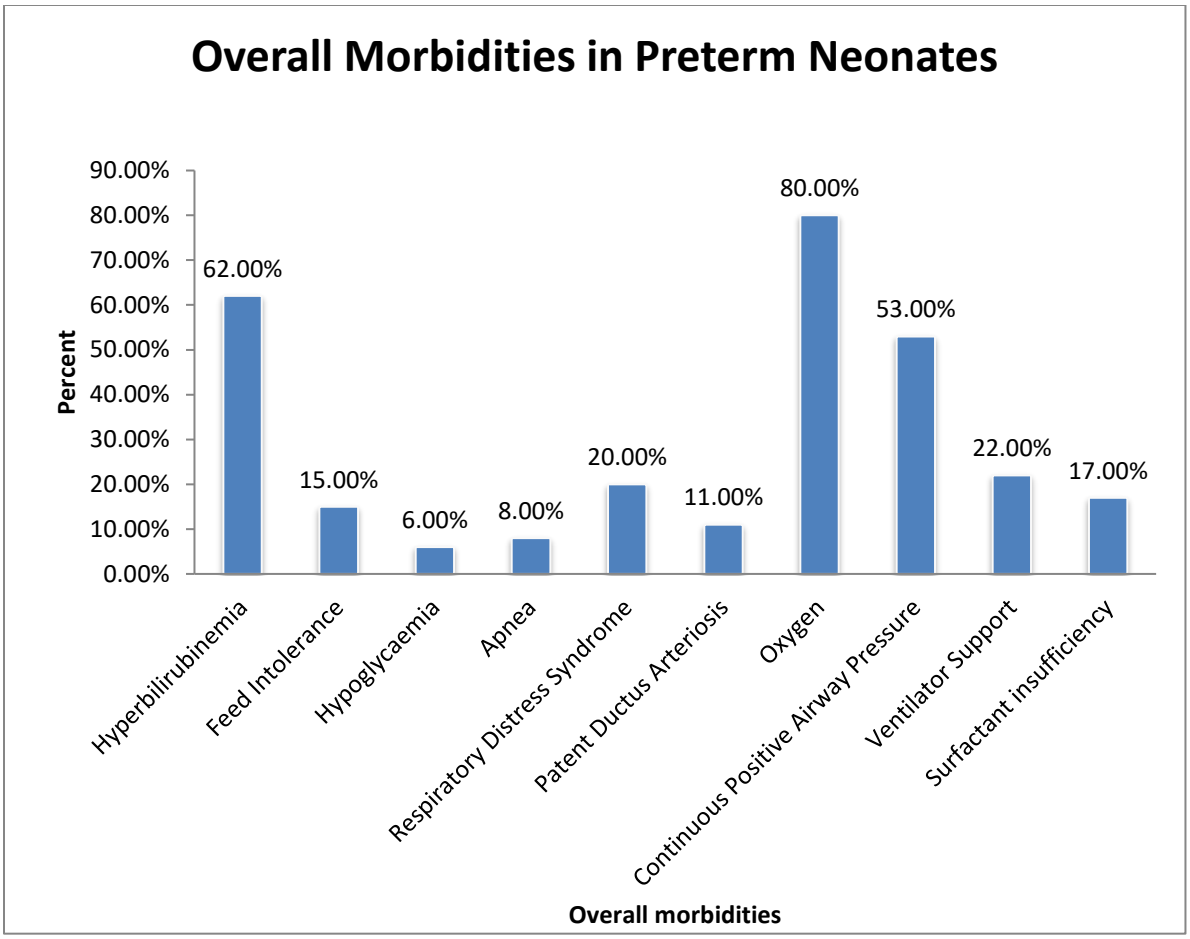
**P<.001 is statistically highly significant.

Significant difference in frequency distribution of birth week in SGA and AGA groups, with 21 pre-terms born in 28-30 weeks in SGA, 15 on 31-32 weeks in SGA. Whereas, in AGA group, majority pre-term were born in gestational age of 33-34week.

Table 8: Showing overall morbidities in pre-term neonates in present study.

Morbidities		Pre-term neonates	
		Frequency	Percent
Infection		24	24.0%
Hyperbilirubinemia		62	62.0%
Feed Intolerance		15	15.0%
Hypothermia		0	0.0%
Metabolic Issues	Metabolic Acidosis	11	11.0%
	No Metabolic imbalance	87	87.0%
	Respiratory Acidosis	1	1.0%
	Respiratory Alkalosis	1	1.0%
Hypoglycemia		6	6.0%
Apnea		8	8.0%
Respiratory Distress		20	20.0%
Patent Ductus Arteriosis		11	11.0%
Oxygen		80	80.0%
Continuous Positive Airway Pressure		53	53.0%
Ventilator Support		22	22.0%
Hyaline membrane disease		17	17.0%
Outcome	Discharge Against Medical Advice	1	1.0%
	Improved	85	85.0%
	Not Improved	14	14.0%

Table showing the frequency and percent of overall morbidities in pre-term neonates included in the present study.



Over all morbidities in pre-term newborns was presented with 62% hyperbilirubinemia, 24 % with infections, 20% with respiratory distress syndrome, and 6% with hypoglycemia and 8% with apnea. 80% of the pre-term neonates were required oxygen support at the hospital stay, and 22% required ventilator support. 17% presented with surfactant insufficiency. 11 newborns were diagnosed with presence of Patent Ductus Arteriosis and 53% required continuous positive airway pressure. At time of discharge from the hospital 85% of pre-term newborns improved in the health condition and 1 discharged against the medical advice.

Table 9: Distribution of overall morbidities in SGA and AGA newborns and compared using Chi-square test.

Presence of morbidities		Appropriate for Gestational Age (AGA)	Small For Gestational Age (SGA)	Chi-square
		N (%)	N (%)	p-value
Infection		9 (37.5)	15 (62.5)	.160
Hyperbilirubinemia		29 (47.5)	32 (52.5)	.535
Feed Intolerance		6 (40)	9 (60)	.401
Hypothermia		0 (0)	0 (0)	-
Metabolic Disorders	Metabolic acidosis	7 (63.6)	4 (36.4)	.376
	Respiratory acidosis	1 (100)	0 (0)	
	Respiratory alkalosis	1 (100)	0 (0)	
Hypoglycemia		4 (66.7)	2 (33.3)	.400
Apnea		0 (0)	8 (100)	.003**
Respiratory Distress Syndrome		14 (70)	6 (30)	.046*
Patent Ductus Arteriosis		4 (36.4)	7 (63.6)	.338
Hypoxia		36 (45)	44 (55)	.046*

*p<.05 is statistically significant; **p<.001 is statistically high significant.

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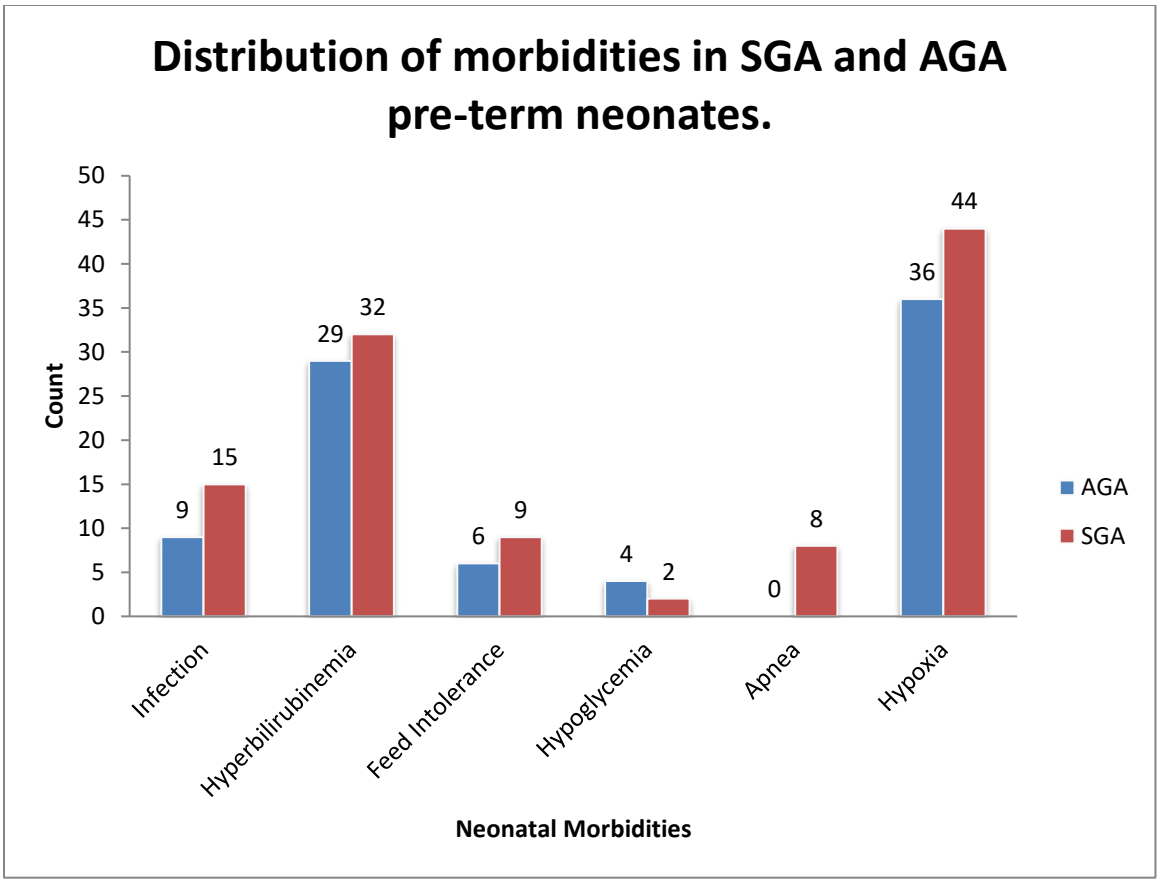

Figure 10: Neonatal Morbidities in SGA and AGA pre-term neonates.

Neonates with SGA had more morbidities compared to the AGA neonates. Incidence of Apnea, Respiratory Distress Syndrome and Hypoxia was significantly more in the SGA pre-term neonates compared to AGA. Others which include, infections, hyperbilirubinemia, hypoglycemia, Patent Ductus Arteriosis (PDA) was more in SGA pre-term neonates than the AGA neonates. Whereas, metabolic disorders which include metabolic acidosis, respiratory acidosis and respiratory alkalosis was more in AGA than SGA pre-term neonates.

Table 10: Distribution of frequency of other variables in the newborns in SGA and AGA group.

Treatment support in newborns		Appropriate for Gestational Age (AGA)		Small For Gestational Age (SGA)	
		Count	Column N %	Count	Column N %
Continuous Positive Airway Pressure	Absent	30	60.0%	17	34.0%
	Present	20	40.0%	33	66.0%
Ventilator Support	Absent	35	70.0%	43	86.0%
	Present	15	30.0%	7	14.0%
Surfactant insufficiency	Absent	37	74.0%	46	92.0%
	Present	13	26.0%	4	8.0%
Ionotropes	Absent	45	90.0%	44	88.0%
	Present	5	10.0%	6	12.0%
Platelet Transfusion	Absent	49	98.0%	49	98.0%
	Present	1	2.0%	1	2.0%
Exchange Transfusion	Absent	50	100.0%	50	100.0%
	Present	0	0.0%	0	0.0%
	Absent	50	98.0%	45	90.0%
	Present	1	2.0%	5	10.0%
Fresh Frozen Plasma Transfusion	Absent	48	96.0%	44	88.0%
	Present	2	4.0%	6	12.0%

Table 11: Showing the investigation results in AGA and SGA group.

Investigation result in the Newborns (n=100)		Appropriate for Gestational Age (AGA)		Small For Gestational Age (SGA)	
		Count (n=50)	Column N %	Count (n=50)	Column N %
Sepsis Screening	Negative	42	84.0%	37	74.0%
	Positive	8	16.0%	13	26.0%
Blood Culture	Actinobactor	0	0.0%	1	2.0%
	Kleibsella	2	4.0%	0	0.0%
	Staphylococcus Aureus	1	2.0%	0	0.0%
	Sterile	47	94.0%	49	98.0%
Neurosonogram	IVH	0	0.0%	1	2.0%
	Normal	50	100.0%	49	98.0%
Echocardiography	Atrial Septal Defect	1	2.0%	1	2.0%
	Normal	44	88.0%	41	82.0%
	Pulmonary Arterial Hypertension	1	2.0%	0	0.0%
	Patent Ductus Arteriosis	0	0.0%	7	14.0%
	Patent Dutus Arteriosis + Pulmonary Arterial Hypertension	1	2.0%	0	0.0%
	Patent Dutus Arteriosis + Pulmonary Arterial Hypertension + Atrial Septal Defect	1	2.0%	0	0.0%
	Patent Foramen Ovale	1	2.0%	1	2.0%
	Ventricular Septal Defect + Atrial Septal Defect	1	2.0%	0	0.0%
X-Ray	Air Bronchogram	4	8.0%	2	4.0%
	Distended Bowel	1	2.0%	0	0.0%
	Normal	37	74.0%	44	88.0%
	Pneumonia	1	2.0%	0	0.0%
	Respiratory Distress Syndrome	6	2.0%	4	8.0%
	Respiratory Distress Syndrome + Cardiomegaly	1	2.0%	0	0.0%

Table 12: Comparison of the final outcome in AGA and SGA newborns using Chi-square test.			
Outcome	Appropriate for Gestational Age (AGA)	Small For Gestational Age (SGA)	Chi-square
	N (%)	N (%)	p-value
Improved	44 (51.8)	41 (48.2)	.499
Not Improved	6 (42.9)	8 (57.1)	
P<.05 is statistically significant.			

There is no significant outcome difference in SGA and AGA pre-term neonates in present study.

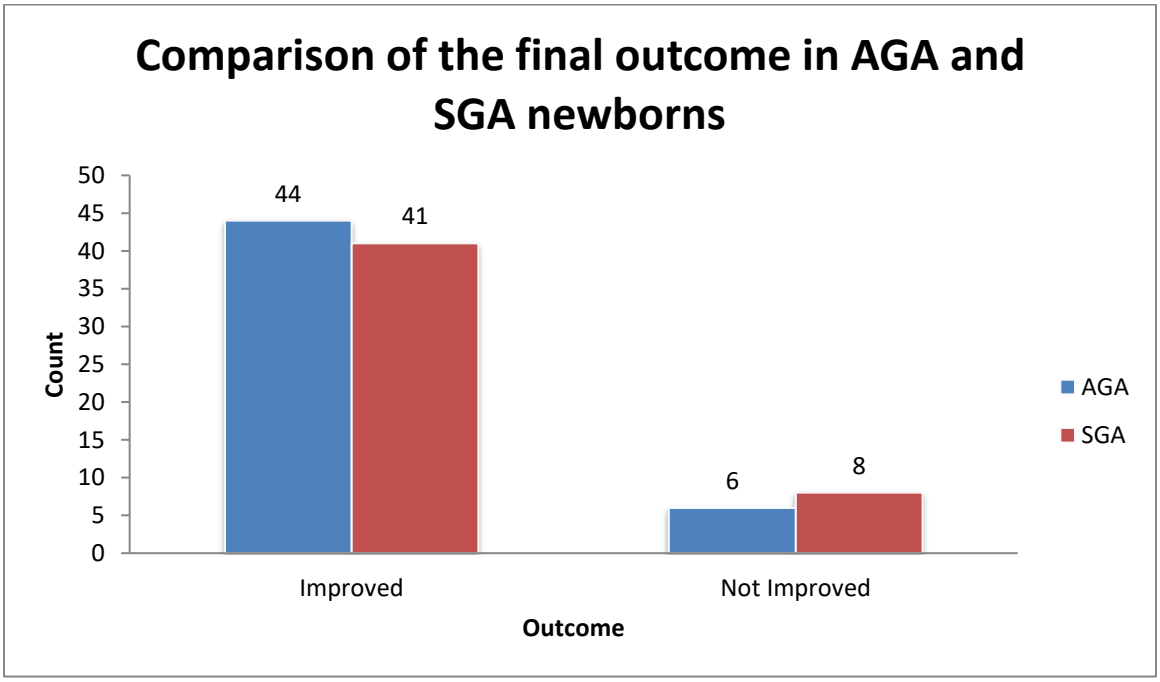

Figure 11: Comparison of the final outcome in AGA and SGA newborns

There is no significant outcome difference in SGA and AGA pre-term neonates in present study.

Table 13: Showing the mean difference in mother Hemoglobin in AGA and SGA group.		
	Mothers Hemoglobin in Gm% Mean ± SD	p-value
Appropriate for Gestational Age (AGA)	10.47 ± 0.95	.022*
Small For Gestational Age (SGA)	9.89 ± 1.47	
*p-value <.05 is statistically significant.		

There is significant mean hemoglobin level in the mothers with newborns AGA and SGA. Mothers with SGA newborns had a significant low Hemoglobin levels compared to mothers with AGA newborns.

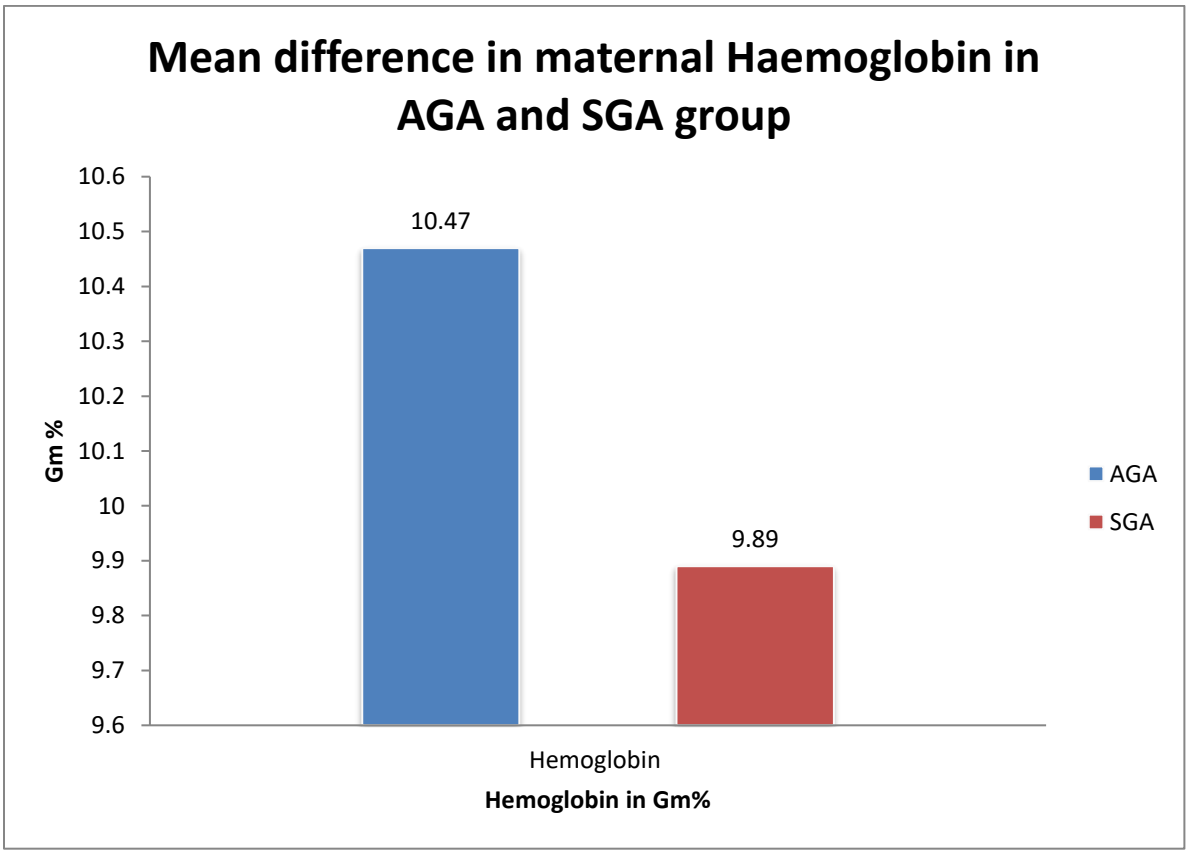

Figure 12: Maternal Haemoglobin in AGA and SGA group.

Table 14: Showing effect of Mode of delivery on SGA and AGA by chi-square test.			
	Lower Segment Caesarean Section N (%)	Normal Vaginal Delivery N (%)	Chi-square p-value
Appropriate for Gestational Age	27 (54)	23 (46)	.161
Small For Gestational Age	20 (40)	30 (60)	
*p-value <.05 is statistically significant.			

There is no significant effect of the type of delivery on the AGA and SGA pre-term neonates in present study. 30 SGA newborn were born with Normal vaginal delivery and 27 AGA newborns by LSCS.

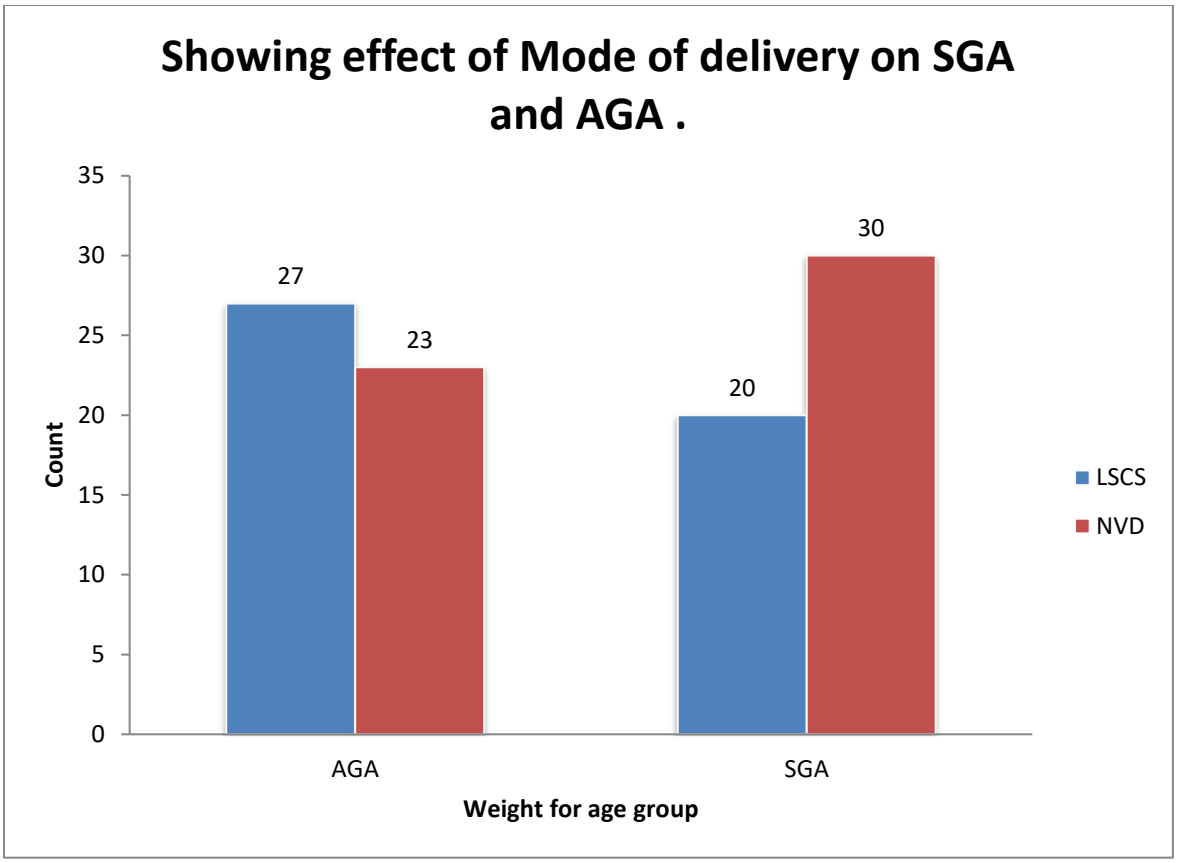

Figure 13: Mode of delivery Vs. SGA and AGA

Table 15: Type of delivery and outcome compared using chi-square test.			
Mode of Delivery	Outcome		Chi-square
	Improved	Not Improved	
	N (%)	Count	X^2 (p-value)
Lower Segment Caesarean Section (LSCS)	37 (78.7)	9 (19.1)	3.21 (.200)
Normal Vaginal Delivery (NVD)	48 (90.6)	5 (9.4)	
*p-value <.05 is statistically significant.			

There is no significant effect of type of delivery on the outcome in SGA and AGA pre-term neonates.

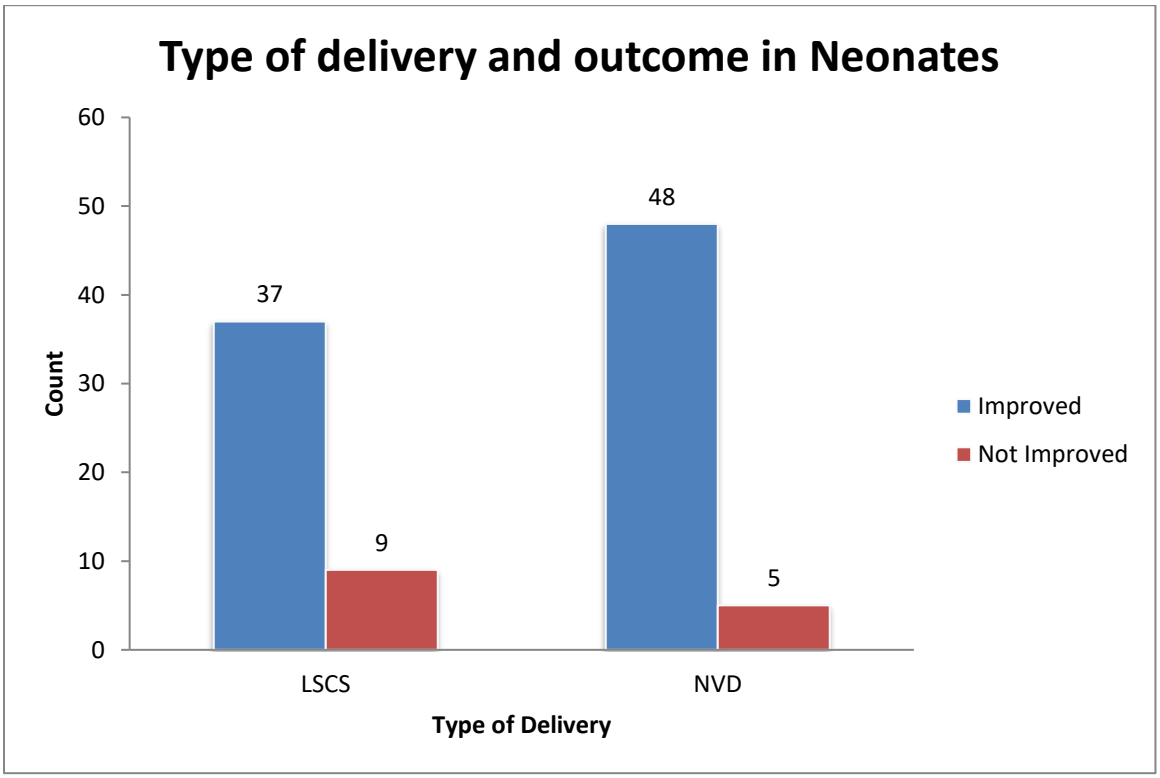

Figure 14: Type of delivery and outcome in SGA and AGA neonates.

Table 16: Maternal hypertension, Diabetes mellitus, Pre-mature rupture of membrane and steroid treatment among the groups of AGA and SGA, compared using Chi-square test.

		Appropriate for Gestational Age (AGA)	Small For Gestational Age (SGA)	Chi-square
		N (%)	N (%)	X^2 (p-value)
Gestational Hypertension	Absent	40 (55.6)	32 (44.4)	3.2 (.075)
	Present	10 (35.7)	18 (64.3)	
Gestational Diabetes Mellitus	Absent	50 (50.5)	49 (49.5)	1.01 (.315)
	Present	0	1 (100)	
Pre-mature Rupture Of Membrane	Absent	47 (53.4)	41 (46.6)	3.41 (.065)
	Present	3 (25)	9 (75)	
Steroid Received	No	7 (35)	13 (65)	3.11 (.211)
	Yes	43 (53.2)	37 (46.8)	
*p-value <.05 is statistically significant.				

There is no significant impact of the maternal risk factors on the AGA and SGA neonates, only one Gestational Diabetes mellitus (GDM) patient was present in present study with SGA pre-term neonate.

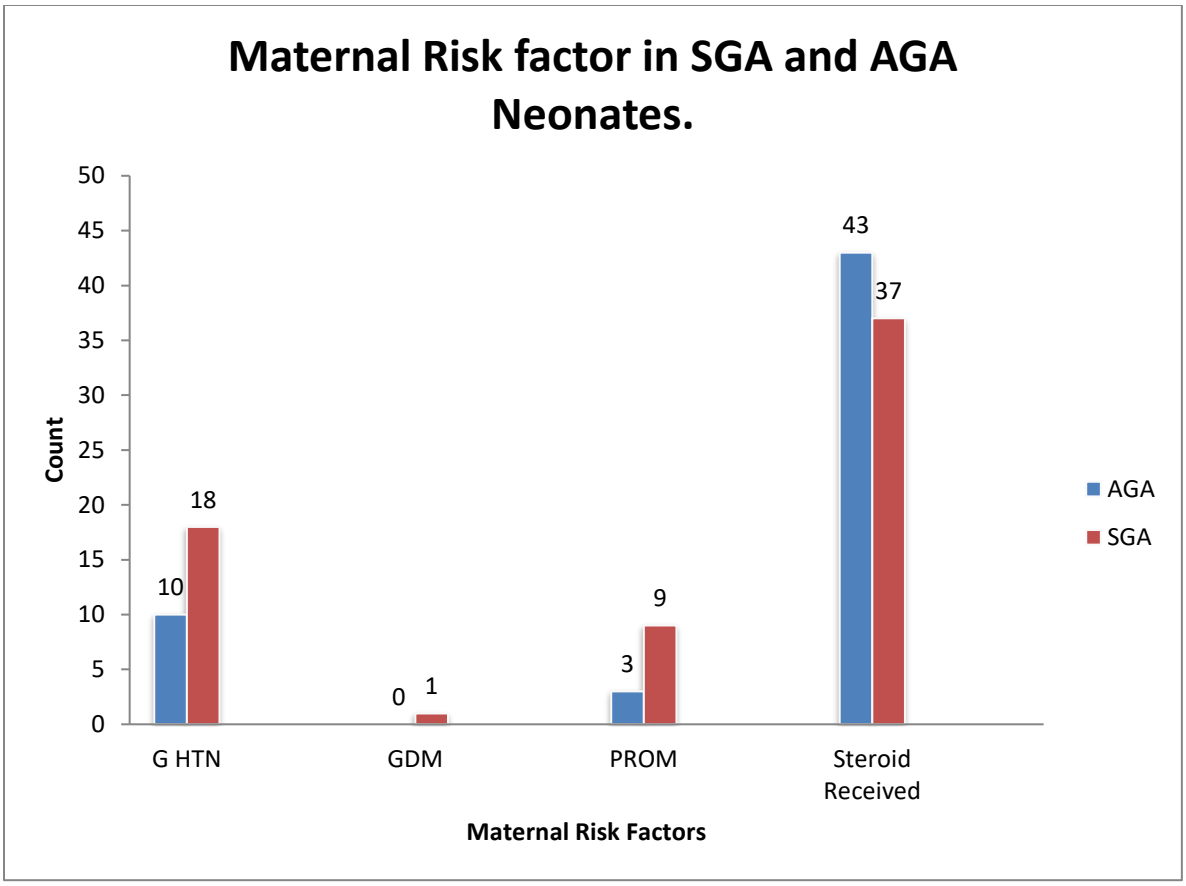

Figure 15: Maternal risk factors in SGA and AGA neonates.

There is no significant impact of the maternal risk factors on the AGA and SGA neonates, only one Gestational Diabetes mellitus (GDM) patient was present in present study with SGA pre-term neonate.

DISCUSSION

The study comprised of 100 pre-term neonates. Frequency of pre-term births is increasing in many countries. The published data from India are limited with respect to morbidities in pre-term babies based on Appropriate to gestational age (AGA) and Small for gestational age (SGA). Many reasons and trends of maternal health and outcome in newborn have been documented. It is suggested to be a result of increased surveillance, fetus considered to be a risk of stillbirth, including those with intrauterine growth retardation, fetal anomalies, intra-uterine birth asphyxia identified earlier.

Sex distribution:

In this study male predominance was observed with 55% comprising male newborn and female newborn contributed for 45%, which was comparable with study conducted by Hasthi U et.al.[33]

Age distribution:

Majority of neonates were admitted by 1st day of life. About 89 neonates admitted on 1st day of life which accounts for about 89%.

Birth weight:

Mean birth weight of SGA neonates is 1.18 ± 0.21 and AGA was 1.71 ± 0.27, which was significantly lower in SGA than AGA pre-term neonates. Birth weight of more than 2 kg was found 7%, 61% were weighted 61% in our study. The above results are comparable with study conducted by Hasthi U et.al.[34] Majority of the neonates in SGA born at gestational age of 28-30weeks.

Overall morbidities in pre-term neonates:

In present study the overall morbidities in newborns includes the infection (n=24), feed intolerance (n=15), hyperbilirubinemia (n=62), metabolic disorders (n=13), hypoglycemia (n=06), Apnea (n=08), Respiratory Distress Syndrome (n=20), Patent Ductus Arteriosis (n=11), surfactant insufficiency (n=17), these findings are similar to study conducted by the other researchers in the past[33]. The improved outcome in these neonates was found in 85 newborns, with 1 newborn was discharged against medical advice.

Morbidities in SGA and AGA pre-term newborn:

In the present study, hyperbilirubinemia constitute the major group with 61 neonates affected (61%), among which 47.5% are AGA neonates and 52.5% are SGA neonates. 24 newborns presented with infection, 15 newborns with feed intolerance, 80 newborns were with hypoxia, among them 45% was in AGA group and 55% in SGA pre-term neonates. Similar kind of morbidities were found in study conducted by the Hasthi U et.al.[33] Respiratory distress syndrome is most common morbidity in AGA neonates when compared to SGA neonates.

Fresh frozen plasma transfusion is performed in 6 SGA neonates, airway pressure and ventilator support was given to the AGA and SGA neonate. 33 SGA babies required ventilator support in our study.

Sepsis screening was found positive in 13 neonates in SGA group and 8 in AGA group. 1 SGA newborn was positive for Actinobactor, 2 AGA newborn were positive for Klebsella and 1 for Staphylococcus Aureus.

Echocardiography in neonates was found normal in 85 newborns. 7 newborn in SGA were diagnosed with being positive for Patent Ductus Arteriosis (PDA). One newborn in AGA was

positive for Atrial Septal defect, one newborn with pulmonary arterial hypertension. Similar findings were present in other study conducted by Teune MJ et.al.[34] In present study, morbidities related to sepsis, hypoglycemia, feed intolerance and hyperbilirubinemia was comparable to above study.

Table 17: Table showing the comparison of study output with Hasthi U et.al.

Morbidities	**Hasthi U et.al.[33]**	**Present study**
Hyperbilirubinemia	56.1	52.2
Feed intolerance	36	60
Infection	65.2	62.5
PDA	21	63.6
Mechanical ventilator	22.9%	20.2%
Respiratory distress / Surfactant insufficiency	31.4%	34%

Table 18 : **Comparison of morbidities associated with AGA and SGA in various studies.**

		HYPOGLYCEMIA	SEPSIS	JAUNDICE	HYPOTHERMIA	NEC	RDS	IVH	PDA
ANJALI et. Al[26]	AGA	6(7.14%)	30(35.71%)	31(36.90%)	9(10.71%)	10(11.90%)	14(16.66%)	3(3.57%)	7(8.33%)
	SGA	12(19.04%)	21(33.33%)	25(39.68%)	6(9.52%)	4(6.34%)	20(31.74%)	1(1.56%)	2(3.17%)
	P-VALUE	0.0412	0.80	0.78	0.823	0.28	0.059	0.47	0.21
TAJ MUHAMMAD et.al[35]									
	AGA	27(27%)	9(9%)	51(51%)			47(47%)		4(4%)
	SGA	15(15%)	11(11%)	67(67%)			37(37%)		4(4%)
	P-VALUE	0.03	0.6	0.02			0.15		1.0
HASTI et.al[33]									
	AGA	4(8.2%)	17(34.7%)	44(89.8%)		1(2.04%)	43(87.8%)	9(18.4%)	8(16.3%)
	SGA	12(26.1%)	27(58.7%)	40(87%)		3(6.5%)	30(65.2%)	8(17.4%)	4(8.7%)
	P-VALUE	0.019	0.016	0.455		0.007	0.009	0.558	0.210
OUR STUDY									
	AGA	4 (66.7)	8(16%)	29(47.5%)	0(0%)	1(2%)	14(70%)	0(0%)	4(36.4%)
	SGA	2 (33.3)	13(26%)	32(52.5%)	0(0%)	0(0%)	6(30%)	1(2%)	7(63.6%)
	P-VALUE	0.400	0.160	0.535			0.046		0.21

OUTCOME

Majority of the neonates in both AGA and SGA group improved in health condition (51.8% and 48.2% respectively). 42.9% of AGA and 57.1% of SGA neonates not improved at the end of hospital stay, these findings were in hand with study conducted by Hasthi U et.al.[33] . Mothers with SGA neonates had anemia with mean Hb 9.89gm%, which was statistically lower than the mothers with AGA neonates, mean Hb 10.47gm%. Anemia in mothers is always correlated with growth retardation in the fetus.

CONCLUSION

SGA neonates had significant low birth weight compared to AGA neonates in present study. 61% of neonates where below the weight of 1.5kg. Majority of SGA neonates were born at the gestational age of 31-32weeks in present study. Most common morbidities among the SGA neonates were infection, hyperbilirubinemia, feed intolerance, hypoglycemia, Apnea, PDA, hypoxia compared to AGA neonates. Whereas AGA neonates had metabolic disorders and respiratory distress syndrome more in them. 51.8% neonates in AGA improved during hospital stay and SGA neonates 48.2%. A significant difference of mean hemoglobin among the mothers of SGA and AGA was found. Mothers with SGA newborn had significantly low hemoglobin than the mothers with AGA newborn.

SUMMARY

- Present study was done in Shri.B.M.PATIL MEDICAL COLLAGE AND HOSPITAL, VIJAYAPURA, and KARNATAKA.
- Study was done for total duration of one and half years.
- Total of 100 pre-term neonates were included in present study, further grouped as AGA n-50(Appropriate to gestational age) and SGA n-50 (Small for gestational age).
- Male preponderance was noticed in present study.
- Majority of neonates were born with birth weight of less than 2kg of weight.
- A similar pattern of varied morbidities with no statistical significance difference was seen in neonates born as AGA and SGA.
- Immediate Outcome during the stay of hospital of AGA and SGA neonates showed no significant difference.
- Mean blood hemoglobin was significantly lower in mothers of SGA (9.89 ± 1.47) neonates compared to the Mothers with AGA neonates (10.47 ± 0.95).
- In present study, there was no statistically significant difference of mode of delivery on SGA and AGA neonates.
- Mode of delivery did not had significant effect on the immediate outcome in neonates during hospital stay, with more number of bad outcome in neonates was noted in LSCS mode of delivery compared with Normal vaginal delivery.

LIMITATIONS:

- Small sample size
- A multicentric study can be considered

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INFORMED CONSENT FORM

BLDEA'S SHRI B.M.PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE,

VIJAYAPUR, KARNATAKA -586103.

TITLE OF THE PROJECT : "CLINICAL PROFILE OF ALL PRETERM NEONATES AND COMPARISON OF EARLY MORBIDITIES AMONG SGA AND AGA PRETERM NEONATES**".**

GUIDE

PROFESSOR,

DEPARTMENT OF PEDIATRICS

PG STUDENT :

PURPOSE OF RESEARCH:

I have been informed that the present study will help to assess clinical profile of all preterm neonates and comparision of early morbiditie among SGA and AGA preterm neonates

PROCEDURE:

I understand that after having obtained a detailed clinical history, thorough clinical examination and relevant investigations, a final work up of the procedure and its outcome is planned.

RISK AND DISCOMFORTS:

I understand that I may experience some pain and discomforts during the examination or during my treatment. This is mainly the result of my condition and the procedures of this study are not expected to exaggerate these feelings which are associated with the usual course of treatment.

BENEFITS:

I understand that my participation in the study will have no direct benefit to me other than the potential benefit of the treatment.

CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of hospital records and will be subject to the confidentiality. Information of sensitive personal nature will not be part of the medical record, but will be stored in the investigations research file. If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs will be used only with special written permission. I understand that I may see the photograph before giving the permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time; Dr. Madhu S. Nadagouda, at the department of pediatrics is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might

influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL FOR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that Dr. Madhu S. Nadagouda may terminate my participation in the study after he/she has explained the reasons for doing so.

INJURY STATEMENT:

I understand that in the unlikely event of injury to my child resulting directly from child's participation in this study, if such injury were reported promptly, the appropriate treatment would be available to the child. But, no further compensation would be provided by the hospital. I understand that by my agreements to participate in this study and not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks to the best of my ability.

Date

(Investigator)

PARENTS / GUARDIAN CONSENT STATEMENT:

We confirm that doctor is doing a study on clinical profile of all preterm neonates and comparision of early morbidities among SGA and AGA preterm neonates Admitted In Nicu In Shri B. M. Patil Medical College Hospital, Vijayapur, Karnataka. Dr. Doctor has explained to us the purpose of research and the study procedure. We are willing to allow our child to get treated in Shri B.M. Patil Medical College Hospital, Vijayapur. We have been explained about the study, benefits and possible discomforts in detail in our native language and we understand the same. We are aware that child will get best treatment ,and no compensation like financial benefits will be given if our child's condition deteriorates and any untoward happens, and we will not sue anyone regarding this. Therefore we agree to give our full consent for child's participation as a subject in this research project.

_____ _____

(**Parents / Guardian**) **Date**

_____ _____

(**Witness to signature**) **Date**

PROFORMA

NAME : **IN PATIENT NUMBER:**

MALE/FEMALE: **DATE OF ADMISSION:**

DATE AND TIME OF BIRTH: **AGE AT ADMISSION:**

ADDRESS:

MODE OF TRANSPORT:

PHONE NUMBER:

MOBILE:

LAND LINE:

GESTATIONAL AGE:

AS PER LMP –

AS PER ULTRASONOGRAM - MODIFIED BALLARD SCORE- TEMPERATURE AT ADMISSION: GRBS AT ADMISSSION:

SPO2 AT ADMISSION:

<u>MATERNAL HISTORY</u>:

AGE **GRAVIDA:** **PARA:**

CONSANGUINITY: **PEDIGREE:**

LMP: **EDD:**

MOTHER'S BLOOD GROUP:

ANAEMIA:

HYPERTENSION:

DIABETES:

DRUGS:

ULTRASOUND FINDINGS:

ANTENATAL STEROIDS ADMINISTERED:

CAUSE OF PRETERM:

NATAL HISTORY

MODE OF DELIVERY:

NORMAL VAGINAL/ INSTRUMENTAL/ INDUCED/ LSCS:

INDICATION FOR LSCS: **BIRTH WEIGHT:**

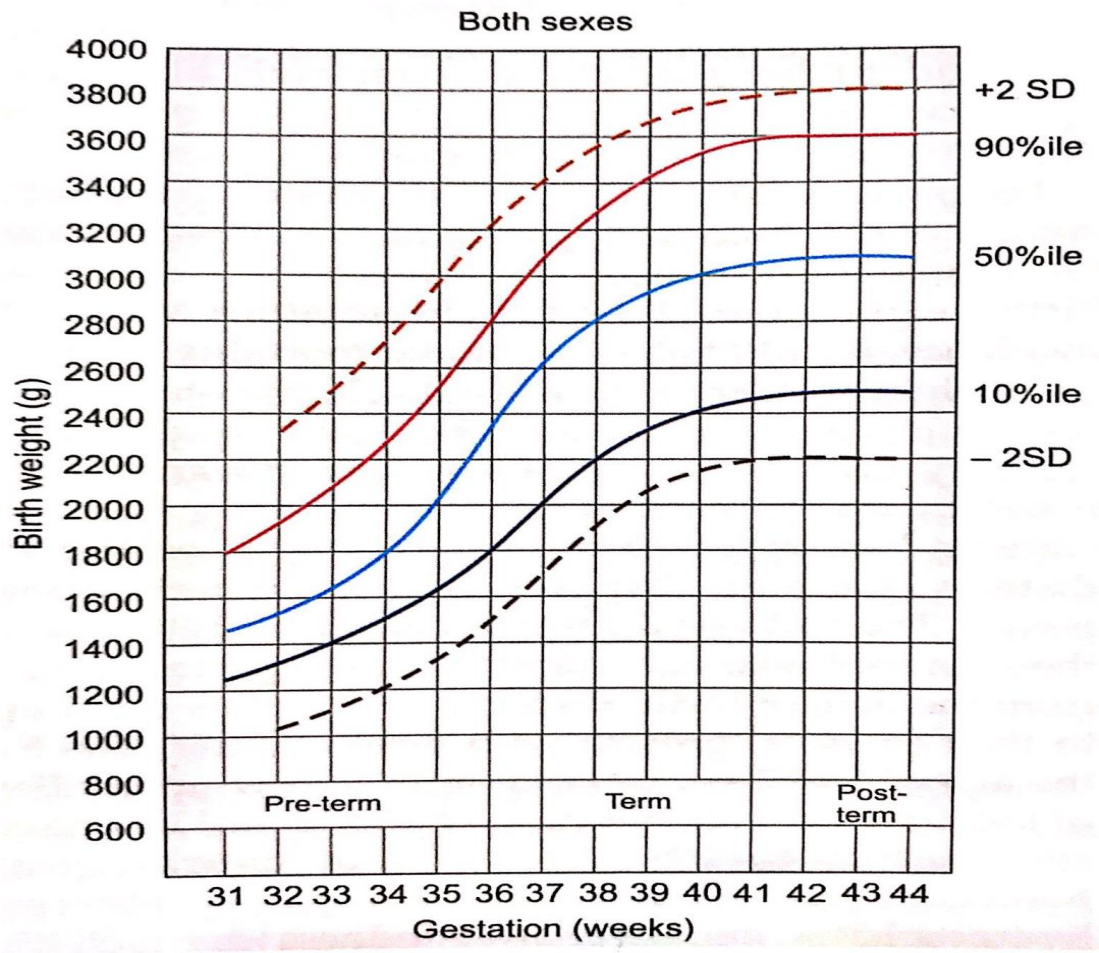
APGAR AT 1 MIN:

5MIN:

MODIFIED BALLARD SCORE:

ANTHROPOMETRY:

WEIGHT: AGA: SGA: LGA:



HEIGHT:

HEAD CIRCUMFERANCE:

RESPIRATORY RATE: **HEART RATE:**

SPO2:

RESPIRATORY SYSTEM:

CARDIOVASCULAR SYSTEM:

PER ABDOMEN:

CENTRAL NERVOUS SYSTEM:

ADMISSION DIAGNOSIS:

PROBLEMS IDENTIFIED:

INFECTION: **HYPERBILIRUBINEMIA:**

FEED INTOLERANCE:

METABOLIC:

TEMPERATURE INSTABILITY: **OTHERS:**

FINAL DIAGNOSIS:

INTERVENTION DONE: **NUMBER OF DAYS:**

IONOTROPES /OXYGEN/ CPAP VENTILATION/ SURFACTANT/

ANTIBIOTICS

TPN/PPN

PHOTOTHERAPY/ EXCHANGE TRANSFUSION/ BLOOD TRANSFUSION.

Packed cell:

FFP:

Feeds started on which day of life :

Full feeds on which day of life :

Duration of hospital stay :

<u>INVESTIGATIONS</u>:

CBC: **CRP:**

BILIRUBIN: **ABG:**

BABY'S BLOOD GROUP: **BLOOD CULTURE:**

USG CRANIUM:

2 D ECHO:

OUTCOME:

Signature of the candidate **Signature of the guide**