"TO STUDY THE EFFECT OF POOLED PASTEURIZED DONOR HUMAN MILK VERSUS UNPOOLED PASTEURIZED PRETERM DONOR HUMAN MILK ON THE SHORT TERM GROWTH PARAMETERS OF PRETERM INFANTS - A ONE YEAR RANDOMIZED CONTROLLED TRIAL AT KLE, DR.PRABHAKAR KORE HOSPITAL AND MRC, BELAGAVI."

BY

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"TO STUDY THE EFFECT OF POOLED HUMAN DONOR MILK V/S UNPOOLED PRETERM HUMAN DONOR MILK ON THE SHORT TERM GROWTH OF PRETERM BABIES AT KLE HOSPITAL, BELAGAVI – A RANDOMIZED CONTROL TRIAL "**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

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LIST OF ABBREVIATIONS

PDHM	-	Pasteurized donor human milk
MOM	-	Mothers own milk
EBF	-	Exclusive breast feeding
HMB	-	Human milk bank
HM	-	Human milk
EBM	-	Expressed breast milk
KMC	-	Kangaroo mother care
LBW	-	Low birth weight
VLBW	-	Very low birth weight
ELBW	-	Extremely low birth weight
LSCS	-	Lower segment caesarean
LOS	-	Late onset sepsis
NEC	-	Necrotizing enterocolitis
ROP	-	Retinopathy of prematurity
BPD	-	Bronchopulmonary dysplasia
NMR	-	Neonatal Mortality Rate
IMR	-	Infant Mortality Rate
NG	-	Nasogastric tube
RT	-	Ryle's tube
NICU	-	Neonatal intensive care unit
NVD	-	Normal vaginal delivery
PTVD	-	Preterm vaginal delivery
OG	-	Orogastric
PIH	-	Pregnancy induced hypertension

PPROM	-	Preterm premature rupture ofmembranes
RCTs	-	Randomized controlled trial
WHO	-	World Health Organization
NFHS	-	National Family Health Survey
UNICEF	-	United Nations International Children's Education Fund
UN	-	United Nations
NICHD	-	National Institute of Child Health and Human Development
CLMC	-	Comprehensive Lactational Management Centre
LCPUFA	-	Long Chain Polyunsaturated Fatty Acids
EUGR	-	Extra Uterine Growth Restriction
SGA	-	Small for gestational age
CNS	-	Central nervous system
DNA	-	Deoxyribonucleic Acid
LDL	-	Low density lipoprotein
CGA	-	Corrected gestational age
PUFA	-	Polyunsaturated Fatty Acids
DHA	-	Docosahexaenoic Acid
EPA	-	Eicosapentaenoic Acid
TGF	-	Transforming growth factor
EGF	-	Epidermal growth factor
IGF	-	Insulin like growth factor
GCSF	-	Granulocyte- colony stimulating factor
VEGF	-	Vascular endothelial growth factor
MF GE8	-	Milk fat globulin EGF and Factor 8
HB-EGF	-	Heparin-Binding EGF

BDNF	-	Brain Derived Neutrophic Factor
GDNF	-	Glial cell line derived neutrophic factor
IQ	-	Intelligent Quotient
PIQ	-	Performance Intelligent Quotient
HMBANA	-	Human Milk Bank Association of North America
HoP	-	Holder’s Pasteurization
HTST	-	High temperature short time
SD	-	Standard deviation
TNF	-	Tumor Necrosis Factor
p	-	Probability
vs	-	Versus
wk	-	Week
d	-	Days
cm	-	Centimetre
cumm	-	Cubic millimetre
Kg	-	Kilograms
gm	-	Grams
GA	-	Gestational age
IgA	-	Immunoglobulin A
CFU	-	Colony forming unit
HC	-	Circumference
PF	-	Preterm formula
BW	-	Birth weight
MM	-	Mother’s milk
^{o}C	-	Degree Celsius

IL	-	Interleukin
IQR	-	Interquartile range
min	-	Minutes
mL	-	Milliliter
L	-	Liter
n	-	Total number
i.e	-	That is
%	-	Percentage
etc	-	et cetera
Ga	-	gestational age

ABSTRACT

Background and objectives

Adequate nutrition is of outmost importance for ensuring the optimal growth and development especially in preterm infants. Breast milk with it's ideal nutrient composition is known to achieve the optimal growth and development. Feeding difficulties and inadequate milk production are the major challenges in providing optimal nutrition for the preterm infants since most of the mothers of preterm infants experience delayed lactogenesis II and are unable to provide adequate milk to their infants during the initial days. Under these circumstances when mothers milk is not available, WHO and UNICEF recommends using Pasteurized Donor Human Milk (PDHM) as the next best infant feeding option. Pasteurized donor human milk (PDHM) is the pooled donor mothers milk which is distributed through human milk bank. Human milk bank systematically collects, pasteurizes, stores and distribute the donor human milk. PDHM in known to confer several advantages in preterm infants including feeding tolerance, reducing risk of Late Onset Sepsis (LOS), Necrotizing Enterocolitis (NEC), Bronchopulmonary Dysplasia (BPD) and Retinopathy of Prematurity (ROP). However, effect of PDHM in improving the growth parameters in preterm infants is controversial. Several studies have reported that babies fed with PDHM have no significant difference in gain in weight, length and head circumference at discharge when compared to preterm formula fed infants.The human milk composition of mothers who have given birth to preterm infants is different from that of mothers delivering term infants with protein content as high as 4.1 ± 2.1 g/100 ml in early preterm milk . Also the processes like freezing, thawing and pasteurization are known to modify the macronutrient content of donor human milk . PDHM

dispensed in human milk banks is a combination of pooled milk from both preterm and term donor mothers of different gestational age postpartum, which may affect the donor human milk composition and in turn may affect the growth outcomes of infants. This variability in human milk composition along with effect of pasteurization and routine practice of pooling both term and preterm milk together may be attributed to the effects on growth of preterm infants fed with PDHM .There is a lack of evidence to show the effect of pooled pasteurized preterm milk on the growth outcomes of infants. Therefore we conducted a RCT to study the effect of pooled pasteurized donor human milk versus unpooled pasteurized (pooling of only preterm donor milk) preterm donor human milk on the short term growth parameters (weight, length , head-circumference and mis- upper arm circumference) of preterm infants.

Materials and methods

This randomized controlled trial was conducted from December 2021 to August 2022 in the Neonatal Intensive Care Unit of Department of Paediatrics, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi. A total of 98 stable preterm infants (49 in each group) requiring PDHM anytime during their hospital stay were enrolled and analyzed during the study period. Baseline demographics, along with anthropometric parameters and feeding details were collected at the start of the study in a pre-designed and pre-tested proforma. Participants were then randomized into two groups, **Group A (intervention group) -** Preterm infants receiving unpooled preterm pasteurized donor human milk,and **Group B –** Preterm infants receiving pooled pasteurized donor human milk using computer generated random numbers. The pasteurized donor milk was provided from the human milk bank attached to the level III NICU of KLES Dr. Prabhakar Kore

Hospital and Medical Research Centre, Belagavi. The neonates were then followed up in the hospital for growth parameters namely weight, length, head circumference and mid upper arm circumference along with type of feeding, method of feeding, amount of feeding , duration of feeding and frequency of feeding during NICU stay ,at discharge, and during follow-up visits at 2 weeks and 4 weeks of life. The results were analyzed using statistical software R and Microsoft Excel and based on graphical representation and p values. A probability value (p-value) of less than or equal to 0.05 at 95 % confidence interval was considered statistically significant.

Results

During the study period a total of 98 preterm infants (49 in each group) were enrolled and analysed in the study. Of the 49 analysed in the pooled PDHM group , 46 preterm infants survived , and 3 deaths were noted. Of the 46 survivors, 2 preterm infants were lost to follow up at 2 weeks and 7 were lost to follow up at 4 weeks. Of the 49 analyzed in the unpooled preterm PDHM group , 48 preterm infants survived , and 1 death was noted. Of the 48 survivors, 1 preterm infant was lost to follow up at 2weeks and 1 was lost to follow up at 4 weeks. In the present study , the maternal characteristics namely maternal age (25.10 years v/s 23.84 years, p=0.09), maternal education (73.47% v/s 55.10%,p=0.15) maternal occupation (97.96% v/s 97.96%,p=0.00), maternal pregnancy profile (59.18% v/s 65.31 % ,p=0.24) , antenatal risk factors associated with preterm delivery , birth history namely , mean gestational age (34.42 weeks v/s 34.51weeks, p=0.80),mean weight at birth (1824.90 gm v/s 1769.59 gm, p=0.46), mode of delivery (63.27 % v/s 61.22 %,p=0.83) ,APGAR Score(7.96 v/s 7.88 ,p=0.43), day of enrollment (1.714days v/s 1.531)(p=0.71) except gender **(p=0.04)** , indications for NICU admission (100% v/s 97%), and indication for starting PDHM (93.88% v/s 87.76%) , all were comparable between both the groups. The mean maternal age observed in both the groups during the study was 24.47 years. Most of the mothers (64.29%) were educated upto secondary level and were homemakers (97.96%).Most of the mothers in the study (62.24%) were primigravida and the most common antenatal risk factor associated with preterm delivery was PPROM (40.5%) followed by severe intra-uterine growth restriction (IUGR) (32.65 %).The mean gestational age of the preterm infants in the study was observed to be 34.46 weeks with the mean weight at birth of 1797.24 gm. The most common mode of delivery observed was C-section (62.24%) with mean APGAR score at birth of 7.92 and mean day of enrollment of 1.622 days. Majority (51.02%) of preterm infants in the study were males. However a significant difference was observed in gender in between the two groups (**p=0.04**). Most of preterm infants in unpooled preterm PDHM group were females (59.18 %) and in pooled PDHM group were males (61.22%). The most common indication for admission to NICU was Low Birth Weight (98.98%) followed by Kangaroo Mother care (81.63%) and the most common indication for starting PDHM in preterm infants was decreased breast milk secretions in the mother's delivering preterm infants (90.82 %) followed by Poor Maternal health status (19.39 %). When analyzing and comparing primary outcomes namely weight, length , head circumference , and mid upper arm circumference at different time points and across the total length of hospital stay and follow ups , no much significant difference was observed in growth parameters between both the groups i.e from enrollment till the end of 4 weeks follow up ($p>0.05$). Although significant difference for specific growth parameters was noticed within the same group.The total % increase in mean weight (30.47% v/s 26.14%) (**p= 0.0001 v/s p=0.0001**) and mean mid-upper arm circumference(4.11 % vs 3.42 %) (**p=0.0001 v/s p=0.0001**) as observed from the beginning i.e baseline value at enrollment till end of 4 weeks within the same group i.e preterm unpooled PDHM group in this study was found to be significant. Similarly significant difference in total % increase in mean length (4.36 % v/s 3.45%)(**p=0.001 v/s p=0.001**)and mean head circumference (5.91 % v/s 5.76 %) (**p=0.0001 v/s p=0.0001**) was observed from the beginning i.e baseline value at enrollment till end of 4 weeks within the same group i.e pooled PDHM group in this study. Secondary outcomes namely ,feeding patterns, length of hospital stay and rate of blood infections were comparable between both the groups at all time points during the study period. The mean amount of PDHM across different time points i.e at enrollment (55.96 +/- 37.79 litres v/s 47.94 +/- 31.75 litres p=0.25), at discharge (61.43 +/- 48.09 litres v/s 60.00 +/- 61.29 litres p=0.93), at 2 weeks follow up (106.00 +/- 63.54 litres v/s 138.33 +/- 122.71 p=0.64), at 4weeks follow up (300 litre v/s 360 litres) and total amount of PDHM (421.45 +/- 360.79 litre v/s 373.59 +/- 292.25 litres) (p=0.47) consumed by preterm infants during total length of hospital stay between both groups were comparable. Other secondary outcomes like the mean duration of feedings namely exclusive PDHM feeding (2.73 +/- 2.61 days v/s 2.48 +/- 2.97 days, p=0.65), mixed feeding (MOM+PDHM) (3.78 +/-2.80 days v/s 3.19 +/- 2.00 days, p=0.23) ,duration of exclusive MOM feeding (2.31 +/-3.10 days v/s 2.44 +/- 3.84 days, p=0.85), days taken to switch to MOM (3.67 +/-2.81 days v/s 3.25 +/- 2.31 days, p=0.42), mean frequency of feeding across different time points i.e at enrollment (9.98 ±2.46 feeds/day in vs 9.84±2.65 feeds/day, p= 0.84), at discharge (10.69 ± 1.37 feeds/day to 10.67 ±1.42 feeds/ day, p=0.96), at 2 weeks follow up (12.26 ± 1.51 feeds/day to 12.14 ±1.56 feeds/ day, p=0.90), at 4 weeks follow up (13.45 ± 1.79 feeds/day to 13.67 ±1.56 feeds/ day, p=0.69) and method of feeding i.e at enrollment , majority(41.86%) of the preterm infants in the study were on SF (42.55% v/s 41.08%p=0.39), at discharge shift was noted to SF + DBF (79.79%) as method of feeding in both groups(81.25% v/s 78.26% p= 0.98), at 2 weeks follow up increasing trend was observed for DBF(29.67%) as method of feeding in both group (25.53 % v/s 34.09% p=0.29) and by 4 weeks significant increase in DBF rates was observed (43.02%) (40.43 % v/s 46.15% p=0.80) though overall rate of SF + DBF remained high at 55.81 % (59.57% v/s 51.28% p=0.80) all were comparable between both the groups. In the present study the mean duration of hospital stay in both groups (9.65+/-6.64 days and 9.10 +/- 6.49 days p=0.68) and % of blood infections at enrollment between both the groups at enrollment (10.42% v/s 6.25% p=1.00) were also found to be comparable.

Conclusion .

Although exclusive unpooled pasteurized preterm milk (pooled milk of 5 donor mothers delivering preterm) showed better overall outcomes within the same group for total % increase in weight and mid upper arm circumference of preterm infants by the end of 4 weeks, and pooled pasteurized donor human milk(pooled milk of 5 donor mothers including both preterm and term mothers) showed better overall outcome for total % increase in length and head circumference of preterm infants by the end of 4 weeks, however, when comparing growth outcomes of preterm infants between both the groups no much significant difference was noted for weight, length , head circumference and mid upper arm circumference. Therefore segregating donor human milk based on gestational age postpartum to provide exclusive unpooled pasteurized preterm milk especially for preterm infants admitted in NICU to meet their milk based needs and achieve better short term growth outcomes considering

compositional variation of human milk , and preterm milk to be naturally enriched with higher protein content as compared to term milk is not useful . Therefore wherever possible, pooled pasteurized donor human milk i.e pooled milk of both preterm and term delivering mothers should be given to preterm infants.

Keywords: Preterm, Pasteurized Donor Human Milk, Human Milk Bank, Banked Pooled Pasteurized Donor Human Milk.

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INTRODUCTION

Annually, approximately 15 million babies are born preterm , indicating a global preterm birth rate of about 10.6 % [1,2,3,6,7,9]. Across regions, Sub-Saharan Africa and South Asia report overwhelming majority accounting to about 60%-80% of preterm births reported worldwide [1,2,3,6,7,9]. India is a major contributor to the global preterm birth statistics and contributes 23 to 24 % to the global average [4,5,7,8,10,11]. The prevalence of preterm birth in India is between 13-17% and 28.25% in Karnataka and 8.6% in Belagavi [4,5,7,8,10,11].

Every year almost 1 million children die due to preterm birth and related complications, making it the leading cause of childhood mortality [2, 11]. Hypoglycemia, infection, respiratory distress syndrome, bronchopulmonary dysplasia, apnea of prematurity, jaundice, necrotizing enterocolitis, gastro-esophageal reflux, patent ductus arteriosus, retinopathy of prematurity, intra-ventricular hemorrhage, anemia of prematurity and feeding difficulties are the complications related to prematurity . Of all the complications, feeding difficulties account for a major proportion and have been estimated to range between 25% and 45% [12, 13, 14, 15, 25,26,27,28.] Shortened period of intra- uterine development, diminished suck and swallow co-ordination, immuno-compromised state, with immature physiological organ system functions, along with decreased breast milk production by mother's delivering preterm have been attributed to cause the feeding difficulties observed in preterm infants [14,15,16,17,19,22,26,27.]

Adequate nutrition is of outmost importance for ensuring the optimal growth and development especially in preterm infants [20,21,25,26,28]. Human milk with its ideal nutrient composition is known to achieve the optimal growth and development with improvement in both short term and long term outcomes in preterm infants [12,13,15,20,21,25,26,27]. Lactose present in human milk serves as the principle source of energy ensuring adequate weight gain in preterm infants. Oligosaccharides like Fucose along with immunoglobulin's IgA, IgM, IgG and growth factors like EGF,IGF help in development of defense mechanism and thereby decrease incidence of sepsis and NEC in preterm infants[12,13,15,20,21,22] . Whey proteins present in the human milk is easily digestible and is known to put less solute load on the developing immature gut of a preterm infant and hence leads to decreased feed intolerance and earlier achievement of full enteral feeding[12,13,14,15,17]. Polyunsaturated Fatty Acids (PUFA) like Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA) found abundantly in human milk also helps in achieving adequate neuroplasticity of brain of preterm infants in early years of life and play a significant role in strengthening neuro-cognitive outcomes in long term , along with retinal maturity [12,13,15,20,21,22]. World health organization (WHO), UNICEF and other related organisations emphasise on the importance of optimal nutrition for adequate growth and development in preterm infants and recommends exclusive breastfeeding for the first 6 months of life followed by continued breastfeeding for up to 2 years of age [23,24].

Feeding difficulties and inadequate milk production are the major challenges in providing optimal nutrition to the preterm infants. Most of the mothers of preterm infants are unable to provide adequate milk to meet the nutritional needs of their infants in the initial days[14,15,16,17,19]. Recent studies have shown that , delayed lactogenesis II is common in mothers of preterm babies [30,32,33].Delay in the onset of lactogenesis II will lead to decreased volume of milk expression and also babies are less likely to exclusively breast feed at 4-6 weeks postpartum [17,29, 30,31,32,33]. Under these circumstances when mothers milk is not available, WHO and UNICEF recommends using Pasteurized Donor Human Milk (PDHM) as the next best infant feeding option[23,34,35.]

Pasteurized donor human milk (PDHM) is the pooled donor mother's milk which is distributed through human milk bank [40, 85]. Human milk bank systematically collects, pasteurizes, stores and distribute the donor human milk. PDHM in known to confer several advantages in preterm infants[36,37,38,39,40,46,85] . Several meta-analysis and systematic reviews have demonstrated advantages of PDHM when compared to formula feeding[41,42,43,44,53,54,55,56,58] .PDHM is known to increase feeding tolerance, reduce the risk of developing Late onset sepsis (LOS), Necrotizing enterocolitis (NEC), Bronchopulmonary dysplasia (BPD) and Retinopathy of prematurity (ROP) in preterm infants [41,42,43,44,45,46,47,50,55,56,58]. However, the effect of PDHM in improving the growth parameters in preterm infants is controversial [45,49,51,52,55,56,58,62,68,69,70,71,72,73]

Several studies have reported that babies fed with PDHM have no significant difference in gain in weight, length and head circumference at discharge when compared to preterm formula fed infants. [41,50,55,56,57,58,60,74,76,80].

The human milk composition of mothers who give birth to preterm infants is different from that of mothers delivering term infants [81] .Studies have shown that early preterm human milk contains more protein and lower carbohydrate levels . Early pre-term milk is known to be naturally enriched with proteins [81]. Several studies have reported protein content as high as 4.1 ± 2.1 g/100 ml in early preterm milk [81, 82.] A study in Turkey comparing changes in breast milk macronutrient content during the first month in preterm and term infants reported , higher fat, energy and carbohydrate content in term milk when compared to preterm milk by day 14 and day 28 postpartum ,concluding that human milk composition is not only variable with gestation but also over time in the same mother [83] . Similar variations were also observed for lactose content and long chain polyunsaturated fatty acids (LCPUFA) which were found to be higher in term milk [84].The donor milk processing like freezing, thawing and pasteurization also is known to modify the macronutrient content of donor human milk, particularly reducing the content of lipids and proteins [86,87,88,89,90,91,92,93,94,95,96]. This variability in human milk composition along with effect of pasteurization on the donor milk may be attributed to the effects on growth of preterm infants fed with PDHM .

PDHM dispensed in human milk banks is a combination of pooled milk from both preterm and term donor mothers of different gestational age postpartum, which may affect the donor human milk composition and in turn may affect the growth outcomes of infants [97]. There is a lack of evidence to show the effect of pooled pasteurized preterm milk on the growth outcomes of infants. A recent Cochrane review of all the available RCTs related to growth effects in VLBW babies receiving banked donor preterm milk v/s banked donor term milk found no studies to demonstrate the effect of pooled preterm PDHM on growth outcomes in preterm infants[97]. Therefore we conducted a RCT to study the effect of pooled human donor milk v/s unpooled (pooling of only preterm donor milk) preterm human donor milk on the short term growth parameters of preterm infants.

OBJECTIVES

PRIMARY

To study the effect of Pooled Pasteurized Donor Human Milk v/s Unpooled Pasteurized Preterm Donor Human Milk on the short term growth parameters (weight, length, head circumference and mid upper arm circumference) of preterm infants following discharge from hospital up to 4 weeks of age.

SECONDARY

To study the

1. Duration of hospital stay.

2. Amount and duration of receiving PDHM, MOM and time taken to transit.

3. Method, type and frequency of feeding patterns.

REVIEW OF LITERATURE

HISTORICAL IMPORTANCE

Nurturing babies is an issue which is inextricably bound to all species in nature. From ancient times until today, the importance of breastfeeding has been well appreciated and understood and even reflected in history, art and religion all around the world so much so that, in prehistoric times, the goddesses of motherhood were presented with naked breasts[104]. The earliest Indian scripture, the Vedas, which represent the primary sacred texts of ancient times (1800 BC), mention milk and breast to be symbolic of longevity and nectarine sweetness. While the breasts have been conceived as a pitcher full of nectar (milk) in Atharva Veda, the other ancient Ayurveda texts like Charka Samhita (400-200 BC), the Sushruta Samhita (400BC), and Kashyap Samhita, illustrate the importance of breastfeeding, and consider it to be having vivifying power and property [104,105,106, 107].

INTRODUCTION

Preterm birth is defined by WHO as a live birth that occurs before 37 completed weeks of gestation, or fewer than 259 days from the first date of a woman's last menstrual period and low birth weight (LBW) babies as babies who weigh less than 2500gm at the time of birth[1].

- **CLASSIFICATION OF NEONATES (BASED ON GESTATIONAL AGE)[22]**

Sub – Groups	Weeks	Days
Extremely preterm	< 28 weeks	195
Early preterm	< 34weeks	237
Late preterm	Between 34 0/7 and 36 6/7	238 to 258
Term	Between 37 0/7 and 42 6/7	259 to 293

Figure 1. Classification of Neonates (Based On Gestational Age) [22]

- **CLASSIFICATION OF NEONATES (BASED ON BIRTH WEIGHT) [22]-**

Sub- Groups	Weight
Low birth weight (LBW)	< 2,500 grams
Very low birth weight (VLBW)	<1500g
Extremely low birth weight (ELBW)	<1000g

Figure 2 . Classification of Neonates (Based On Birth Weight) [22]

EPIDEMIOLOGY

According to global statistics reported by WHO including , "BORN TOO SOON" report, annually, approximately 15 million babies are born preterm which account for more than 1 in 10 of all the babies born globally, indicating a global preterm birth rate of about 10.6% [1,2,3,6,7,9.]The burden of prematurity is particularly high in low and middle income countries namely sub Saharan Africa and South-east Asia [1,2,3,4,7,10]. The Indian Foundation for Premature Babies together with WHO reported, overwhelming contribution of India (23-24%) in premature birth statistics across globe, with every 1 in 6th live born baby in India being born preterm accounting to an estimated prevalence rate of 13-17% in India [1,2.,3,4,5,6,7,8,9,10,11] .The prevalence of premature birth across India also shows varied trends with rates of 28.25% in Karnataka and 8.6% in Belagavi [5,8,10,11,108]. A recent review article in Indian context, studying prevalence and associated risk factors associated with preterm births in India, reported highest frequency of preterm birth from Tamil Nadu (28.25%) and Maharashtra (6.1%) [5,8,9,108,109,111.]

As per the current statistics , prematurity has now become the leading cause of under 5 mortality worldwide surpassing pneumonia both in number and magnitude [1,2,4,6,7, 9,10] . Every year almost 1 million children die due to preterm birth and related complications and India accounts to 20% of neonatal and 17% to the infant mortality rates globally [2, 4,10,11]. As per the NFHS -5 report Infant Mortality Rate (IMR) is observed to be 21% per 1000 live births in Karnataka and it is this overwhelming data and number that the issue of prematurity has been recognized as global health burden so much so that United Nation in its last meeting held on adoption of Sustainable Developmental Goals 3 addressed it as a major agenda and formulated target #3.2 aiming to end all preventable causes of deaths of newborn and childhood mortality under 5 by 2030 [2,112].

SHORT TERM COMPLICATIONS AND RISK FACTORS ASSOCIATED WITH FEEDING DIFFICULTIES IN PRETERM INFANTS

Prematurity is known to cause both short term and long term complications in preterm infants. The third trimester of pregnancy is known to be the period of rapid organ growth and maturation in a developing fetus. High energy and adequate nutritional supplementation is required during this period to keep the development process working harmoniously and is therefore also called period of high nutritional accretion by the developing fetus. It is also the period of development of oromotor skill co-ordination and adequate suck reflex to prepare the developing fetus for survival in the extra-uterine environment [14, 28].

Since preterm infants are born before this period of adequate maturation and development of their organ systems, along with less established feeding mechanisms , they are more prone for complications, like hypoglycemia, infection, respiratory distress syndrome, bronchopulmonary dysplasia, apnea of prematurity, jaundice, necrotizing enterocolitis, gastroesophageal reflux, patent ductus arteriosus, retinopathy of prematurity, intraventricular hemorrhage, and anemia of prematurity, all related to specific organ system development .In addition to the specific organ system vulnerability the early extra-uterine exposure and oxidative stress of the altered environment puts extra stress on preterm infants leading to extra uterine growth restriction (EUGR) and thereby sequelae to the associated long term complications like lung disorders, hypertension , metabolic disorders etc. later in adult life, [12,15,16,17,28].Of all the complication related to prematurity, feeding difficulties leading to sub-optimal nutrition account for a major proportion and have been estimated to range anywhere between 25% and 45% [14].

As per a review article analyzing and understanding the dietary transitional patterns in preterm infants published by Carla Lucchi Pagliaro et al in 2015, preterm infants were found to be more prone for feeding difficulties[14]. Immature oral reflexes, reduced sucking ability, early and easy fatigability, along with incoordination while sucking, swallowing and breathing were all attributed to be the cause of feeding difficulties. Shorter duration of intra-uterine development, immuno-compromised state, immature gastrointestinal and other organ system functioning, and associated co-morbidities like small for gestational age (SGA) were also reported [14].

Preterm infants usually have long hospital stays owing to their inadequate intra-uterine growth and therefore are more prone to frequent exposure to harmful sensory stimuli during hospital stay like prolonged intubation time, upper airway aspiration and repeated feeding tube insertions. All these stimuli make them more vulnerable and prone to feeding issues and hence decreased acceptability to full volume feed by oral route exclusively [14, 17, 18,113].

Mothers delivering preterm infants have decreased milk production during early post natal period. The average breastfeeding rate of preterm infants during hospitalization in developed countries is estimated between 13–49% [18]. In Indian scenario, an observational study conducted in a tertiary care NICU reported, only 44 (45.4%) of the 97 enrolled preterm, VLBW babies, were exclusively breastfed at discharge [114]. A recent study published by Xiurong Yu in 2019 reported that only 50% of mothers who delivered prematurely were able to express sufficient milk to meet their infant's needs at 6 weeks postpartum and were 3 times more at risk of not producing adequate milk in comparison to mothers delivering at term gestation [29,32]. A study conducted by Dingding Dong et al in 2022, studying the lactational status and breastfeeding challenges in mother's delivering preterm, reported 51.4% of the mothers experienced delayed lactogenesis II (i.e. failure to initiate milk production within 72 hour postpartum) and hence significantly lower daily expressed milk volume until Day 7 postpartum and consequently lower exclusive breastfeeding rates by their preterm infants at 3 months of corrected age[33]. Early post natal separation due to NICU admission, lack of maternal and neonatal physical interaction , interrupted feeding sessions, type of delivery, family support along with maternal health factors were also reported to be the additional factors leading to decreased milk production in mothers delivering preterm [33].Similar findings were also observed in a recent study by Xin Jiang and Hui Jiang et al, which reported significant decline in exclusive breastfeeding rates at 6 months post discharge in mothers delivering preterm[18] .

LONG TERM COMPLICATIONS ASSOCIATED WITH PREMATURITY AND EFFECT OF SUB-OPTIMAL NUTRITION

As per a recent article aimed at understanding the relationship between preterm nutrition and neurodevelopment outcome by Alyson Margaret Skinner et al, cerebellar development, synaptic connectivity , myelination ,and neuroplasticity of premature infant's brain is very sensitive to nutrition in the first few weeks of life and the reason stated is that, the preterm neonate's brain is the most metabolically demanding organ and consumes the largest amount of energy and nutrients for its function and programmed growth and maturation. Starting in the prenatal period and continuing until the second year of life, the development of the cerebral white and gray matter structures of the central nervous system (CNS) involves many processes as stated above and sub optimal nutrition is known to hamper these processes[15].

Sub optimal nutrition causes decrease in cell replication cycles , total brain DNA, myelin sheath formation, restricted dendritic arborization and eventually reduced connectivity between neurons thereby impairing motor and cognitive development and social abilities in preterm infants[15]. Similar findings were reported by Katherine E Chetta et al, in her study on outcomes with human milk intake in preterm infants[101]. A follow-up study to determine the beneficial effects of breast milk ingestion by infants with extremely low birth weight in the NICU on developmental outcomes at 30 months of corrected age conducted by National Institute of Child Health and Human Development (NICHD) also reported that, the use of mother's milk is associated with clear gains in Bayley scores- an approximate increase of 0.59 Bayley Mental Developmental Index points, 0.56 Psychomotor Developmental Index points, and 0.99 Behavioral Index Points at 30 months of age for every +10 mL/ kg/day average increase in mother's milk given in the NICU [115].

Doctrine of Child Development also states that infants with preterm, LBW are at an increased risk of coronary heart disease, hypertension, and type 2 diabetes in adulthood [116]. Several studies have shown an association between preterm birth and risks of developing metabolic syndromes in early to mid-adulthood all related to suboptimal neonatal nutrition [15,16,25,26,27,28,]. A large cohort follow up study from Sweden which included 4 million subjects conducted between 1973 and 2015 and followed up for mortality rates till 2017, reported a strong inverse association between gestational age at birth and mortality. Those born preterm or early term had 5-fold and 1.3-fold increased risk of mortality, respectively, relative to those born at full-term, all related to mid adulthood endocrine and metabolic disorders [26,118]. Epidemiologic studies and meta-analysis review of previous cohorts have consistently linked preterm birth with higher blood pressure in adulthood, increased risk of type 1 and type 2 diabetes, almost 2 fold increased risk of lipid disorders and 3 fold increased risk of chronic kidney disease ,and chronic lung disorders owing to reduced pulmonary function capacity and immune system immaturity[15,16,25,26,27,28,117]. Attributable risks estimated using the data from this large cohort reported that the preterm and extremely preterm birth, accounted for an estimated 20.8 and 52.8 additional deaths per 100,000 person-years at ages18–45 years respectively , compared with full-term birth [26,118]. Indicating that preterm birth is independently associated with modestly increased all-cause mortality in early to mid-adulthood.

Adequate feeding and optimal nutrition is of outmost importance for ensuring better short term and long term outcomes in preterm infants. WHO committee for recommendations on optimal feeding options for low birth weight and preterm infants along with National Neonatology Forum of India recommends breastfeeding or mother's own expressed milk (MOM) as the first best and preferred infant feeding option for all newborns including those born small for gestational age (SGA), preterm, or VLBW (very low birth weight) admitted in NICU and emphasise exclusive breastfeeding for the first 6 months of life followed by continued breastfeeding for up to 2 years of age [23,24].

BENEFITS ASSOCIATED WITH HUMAN MILK CONSUMPTION IN PRETERM INFANTS

Human milk with its specific macro and micronutrient content along with innumerable bio-active factors, long chain polyunsaturated fatty acids (LCPUFA) , oligosaccharides, growth factors, chemokines and cytokines is known to provide several advantages in neonates especially preterm neonates and help in overcoming preterm birth related complication like [19,20,21,63,64].

1. Decreased incidence of late onset sepsis (LOS)
2. Reduced incidence of Necrotizing enterocolitis (NEC), secretory immunoglobulin's, lipases, lysozymes, growth factors, and oligosaccharides all play a role in protective mechanism.
3. Reduced incidence of retinopathy of prematurity (ROP).
4. Reduced incidence of hospital re-admission.
5. Decreased long-term risk of metabolic syndrome and lower low density lipoprotein (LDL) levels compared to those receiving formula feeding.
6. Better neurodevelopmental outcomes.
7. Decreased feed intolerance.
8. Earlier achievement to full enteral feeds.

Studies comparing growth outcomes in preterm infants supplemented with unpasteurized breast milk v/s pasteurized breast milk have shown better growth outcomes, including better weight gain velocities with unpasteurized breast milk. An observational study analyzing longitudinal growth outcomes and morbidities in 90 extremely preterm infants born between 2013 to 2015 in Gothenburg, Sweden comparing mother's milk v/s pasteurized donor human milk consumption reported that unpasteurized mother's milk correlated positively with almost all z-scores for weight, length, head circumference at postnatal age of 28days[119]. Another retrospective study conducted by Lloyd M et al in 2019 also reported similar observation when comparing mother's own milk with pasteurized donor human milk, and reported better weight growth velocity at 34+1weeks post menstrual age in group supplemented with mother's own milk as compared to group supplemented with pasteurized donor human milk [80]. As per a recent review by Jacopa Cerasani et al in 2020, studying human milk feeding and preterm infant's growth and body composition, analyzing 91 articles over a period of 11 years that is 2009 to 2020 reported a broader reduction in the weight z scores from birth to discharge in group receiving >75% human milk as compared to those receiving < than 75% [120].

When analyzing reasons for the above observation, a positive correlation was observed between consumption of human milk and adipose mass deposition in late preterm infants fed sole human milk diet, which strengthened on reaching term corrected gestational age (CGA) [121]. Study by Piemontese et al reported higher percentage of lean mass deposition at term corrected gestational age (CGA) in very low birth weight (VLBW) infants fed with human milk at more than equal to 50% of total milk volume as compared to VLBW infants fed with human milk at less than 50% of total milk volume [121]. Mol et al studied and compared preterm infants with term infants for body mass composition, for mother's own milk or preterm formula and showed at term CGA, the group with VLBW infants who were fed with mother's own milk had analogous body composition to full term infants as compared to group with VLBW infants fed with preterm formula(PF) [123].Therefore human milk feeding with its positive correlation with fat free mass deposition in preterm infants , contributes positively to recovery of body composition and hence better growth outcomes in preterm infants in the long run [120].

THE COMPOSITION OF HUMAN BREAST MILK [19,20,21,22]

Breast milk with its ideal nutrient composition is known to support the development and growth of preterm infant in the most precise and natural way. Human milk is known to contain the following:

- **MACRONUTRIENT COMPOSITION OF HUMAN MILK** [19,20,21,22]

Component	Contribution (in %)
Water	87
Protein	1
Lipids	4
Carbohydrates	7

Figure 3. Macronutrient Composition of Human Milk

- **CARBOHYDRATES** - Lactose, being the most common carbohydrate and the principal source of energy found in colostrum. Apart from lactose , human milk also contains oligosaccharides which are abundant and help in defense mechanism (Fucose), facilitating brain development (sialic acid) and acting as a probiotic agent (facilitating commensal organism growth) [22].

- **PROTEINS -** The protein component of human milk is in the form of WHEY and CASEIN. Breast milk is whey protein predominant which makes it easily digestible and puts less solute load on the gut of the neonate. The average whey**:** casein ratio in breast milk is 60:40 and major whey proteins are Lactalbumin (40%), Lactoferrin (30%) and IgA (15-20 %) [22].

- **LIPIDS -** Human milk contains lipids in the form of unsaturated fat, essential fatty acids, phospholipids. Human milk differs from milk of other mammals in that it has a higher proportion of PUFA (Poly Unsaturated Fatty Acids) such as Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA), which play a key role in brain and retinal development [22].

Human milk also confers impeccable immunity by providing for anti-inflammatory, anti-infective and anti- allergen properties via presence of following :

- **BIOACTIVE MOLECULES** - Bioactive dietary components are substances that "change biological processes or substrates, hence influencing body function or condition, and thereby health"[55]. The mammary epithelium synthesizes and secretes some bioactive components in human milk, while other bioactive components are collected from maternal serum and transferred via the mammary epithelium via receptor-mediated transport[56]. Important bioactive factors present in human milk are [21] :

  a. Immunoglobulins including, IgG, IgM, sIgA
  b. Cytokines such as TGF-β, IL-6, IL-7, IL-8, IL-10, IFN-γ, TNFα.
  c. Chemokines (e.g., G-CSF, Macrophage Migratory Inhibitory Factors)
  d. Growth factors (e.g., EGF, VEGF, IGF, Erythropoietin).
  e. Hormones (e.g., Somatostatin, Calcitonin)
  f. Anti-microbial (e.g., Lactoferrin, Lactadherin /MFG E8)
  g. Metabolic hormones (e.g., Adiponectin, leptin, Ghrelin)
  h. Cells such as macrophages, stem cells.

- **GROWTH FACTORS**

(i) **EGF** - The maturation and repair of the intestinal mucosa are both dependent on EGF.EGF is resistant to digestive enzymes and low pH, allowing it to cross through the stomach and into the intestines, where it promotes DNA synthesis, cell division, water and glucose absorption, and protein synthesis in enterocytes. In the newborn gut, EGF has a number of protective mechanisms in place, including:

a. Reversing TNF-induced changes in intestinal and hepatic tight junction proteins.

b. Suppression of programmed cell death[21].

(ii) **Heparin-binding growth factor (HB-EGF**)- is the primary growth factor responsible for the resolution of damage caused by hypoxia, reperfusion injury, hemorrhagic shock / injury during resuscitation, and necrotizing enterocolitis [21].

(iii) The enteral nervous system, which depends on **brain-derived neurotrophic factor (BDNF**) and **glial cell-line derived neurotrophic factor (GDNF)** for development, is also immature in the neonatal gut. BDNF can enhance peristalsis, a function which is frequently impaired in the pre-term gut. GDNF from breast milk improves neuron survival and growth[21].

(iv) Human milk contains **IGF-I and IGF-II,** as well as IGF binding proteins and IGF-specific proteases. Colostrum has the highest levels, which gradually decrease throughout lactation. IGF-1 may also have a function in enterocyte survival after oxidative stress induces intestinal damage [21].

- **LEPTINS** **-** play an important role in the postnatal growth of infants by regulating energy conversion and infant BMI, as well as hunger regulation[21,124].

PASTEURIZED DONOR HUMAN MILK

When mothers own milk (MOM) is not available, WHO recommends using pasteurized donor human (PDHM) as the next best alternative for infant feeding especially for low birth weight infants[23,34,35]. Pasteurized Donor Human Milk (PDHM) is defined as a pooled donor milk which is distributed through human milk banks to neonates who may or may not be the biological child of the donor mother[79].The concept of donor human milk dates back to ancient times, popularly known as "wet nursing" and described in ayurveda as the concept of "Dhaatri" in which lactating mothers act as donors for babies whose mothers are unable to produce enough milk due to variety of reasons [104,105,106, 107] .With advancement the concept of "Dhaatri" declined and was replaced by modern day HUMAN MILK BANKING. Pasteurized human milk is distributed by human milk banks which systematically collects, pasteurizes, stores and distribute the donor human milk [36,37,38,39,40,46,79, 85.]

The first human milk bank in the world was started in Vienna , Austria in 1909, under the noble guidance of Theodar Escherich , followed by Boston and many more continued to open throughout US and European regions. The first human milk bank was started by Armida Fernandez , in the year 1989 at Sion Hospital , Mumbai , India .In the last decade there is increase in the number of HMBs throughout India [34,35,36,40].

Government of India in 2017 released national guidelines on lactational management centers in public health facility and addressed human milk banks in India under the umbrella heading of Comprehensive Lactation Management Centers (CLMC) depending upon the level of health facilities where these units were established [98]. As of 2022 statistics, India reports nearly 90 milk banks across various states and regions both in private and public sector [34,35,36,40].

PDHM is known to offer several advantages to preterm infants. Several meta-analysis and systematic reviews have demonstrated advantages of PDHM when compared to formula feeding[41,42,43,44,53,54,55,56,58] . PDHM is known to increase feeding tolerance, reduce the risk of developing Late onset sepsis (LOS), Necrotizing enterocolitis (NEC), Bronchopulmonary dysplasia (BPD) and Retinopathy of prematurity (ROP) in preterm infants [41-50,55,56,58]. Cristefalo et al in his randomized controlled trial comparing the effect of formula feed v/s PDHM, reported shorter duration of parenteral nutrition in infants fed PDHM as compared to formula feeds [43].The study also reported that ,the incidence of surgical evidence of NEC was as high as 21% in formula fed group as against PDHM group which showed only 3 % incidence [43]. Another study by Yang et al reported, shorter duration of hospital stay in preterm infants fed PDHM v/s formula feed[47]. Lapidaire and Lucas et al conducted a randomized controlled trial to study cognitive outcomes and NEC in preterm infants with human milk and reported that increase in mother's breast milk or PDHM intake was associated with lower chances of NEC and thereby better neurological outcomes in terms of better full scale IQ and PIQ at age 7 and 30 years [125].

<u>THE HUMAN MILK BANK</u>

Human milk banks are repositories of donated human milk focused to provide donor milk to high risk newborn babies admitted in the NICU when MOM is not available. Milk banks receive milk from donors, process it, and store it, up until use[126]. Most commonly milk from multiple donors is pooled, although some banks pool milk only of individual donors (single-donor banks) [126]. Usually, milk provided by milk banks undergoes pasteurization. Once pasteurized, milk is placed in small (100-150 mL) containers and is stored frozen and then later distributed as per requirement and demand [126]. The national CLMC guidelines for the systematic functioning and management of human milk banks are as follows:

REQUIREMENTS TO SET UP HUMAN MILK BANK [127]

The certain set of requirements for establishment and operation of human milk banks includes-

1) **INFRASTRUCTURE [127]-**
    i) **LOCATION** - Human milk banks are primarily focused to provide donor milk to high risk newborns admitted in neonatal unit. Also presence of human milk banks in the NICUs is associated with elevated rates of exclusive breast feeding rates in VLBW and preterm babies. Therefore a location in close proximity or even inside the boundaries of neonatal unit is preferred.
    ii) **SPACE** - The minimum requirement as per guidelines is a partitioned room of 250 square feet, big enough to be able to comfortably accommodate at least the equipment required for milk banking, along with a work area for the technician to carry out all administrative formalities

such as enrollment, screening of donors and counseling etc. and some storage space for records. Ideally there should be

- **Administrative Area**- to carry out all administrative formalities such as enrollment and screening of donors. It would also serve as dispensing center for DHM from the milk banks.

- **Counseling Area**- to facilitate registration and counseling sessions with lactation management counsellors in milk banks, most milk banks have counseling area and reception area combined.

RECEPTION AND COUNSELLING AREA

MILK EXPRESSION AREA

- **Milk Expression Area**- This area should include milk expression stations for mothers with privacy for milk expression and should be equipped with electric breast pumps. Provision of music/television and a crèche is helpful in reducing stress of mothers. Teaching videos of KMC, expression of breast milk and advantages of breast milk feeding should be shown under supervision of milk bank staff. The other equipment in this area should include a deep-freezer (400L) and a refrigerator (190L) for storage of raw breast milk. The milk expression area should also include a nursing station with provision of wall cabinets for storage of autoclaved milk collection bottles and sterile tubing etc.

- **Cleaning/Autoclave Room**- It should be located adjacent to milk expression area. Cleaning and autoclaving arrangements should be available here to clean the used milk bottles and tubing and seal them for reuse.
- **Milk Processing/Storage Area**- Entry and exit to this area should have glass/swing door to reduce risk of infection. This area should accommodate equipment namely refrigerator(190L), laminar air flow, deep freezer(400L), water bath, electronic sealing machine etc. for carrying out key processes namely pooling of donor human milk, preparing aliquots, cooling of milk for pre pasteurized storage, thawing and pasteurization. This area should be under strict temperature control with negative airflow and should have access for CLMC technician to conduct milk processing activities.

MILK STORAGE AREA

- **Microbiological Laboratory**-The microbiological laboratory should be present to carry out the cultures and other procedures to test the milk for ensuring safety of processed milk. The central lab of the health facility where CLMC is established should carry out the laboratory tests to screen the donor mothers.
- **Milk Storage Area** - This area should be equipped with two deep freezers (a vertical of 400L and a Horizontal of 300L) for storage of post-pasteurized milk. Preterm and term milk should be stored in separate compartments. This area should also be under strict temperature control with negative airflow.

2) **EQUIPPMENTS REQUIRED** [127]

   a. **Pasteurizer/Shaker Water Bath** - It is a device that carries out heat treatment of donor milk. The donor human milk which is collected is pasteurized using the Holder Pasteurization Method, which involves heating the milk in a sealed container to 62.5°C and holding it there for 30 minutes, then rapidly chilling it in a specified device before dispensing it for use by the receiver. This process helps get rid of all the infective agents and making sure milk is free from any bacterial endotoxin and safe for consumption. Alternate to this is the use of a shaker water bath with a micro-processor controlled temperature regulator, an electronic time device, and a shaker speed controller for pasteurization of donor milk. The breast milk in the container is heated through the steam and hot water in water shaker bath. To avoid coagulation of the milk and to ensure even distribution of heat, the tray on which breast milk containers are placed is shaken. The size of the shaker water bath varies as per the need of the milk bank, with tray capacity varying between 9-24 flasks/stainless steel containers of 200-400ml capacity.

PASTEURIZATION MACHINE

b. **Deep Freezer**- A deep freezer to store the milk at -20C is essential in the milk bank. It is desirable to have deep freezer with digital display of the temperature inside the deep freezer with an alarm setting if the temperature rises above the set temperature. A separate freezer for preprocessed milk is needed to keep the donated raw milk which awaits pasteurization. It is desirable to have two deep freezers for processed milk. First for storage of the milk till the post-pasteurization milk culture reports are available. This freezer should be locked at all times with access only to the technician, so that no milk is accidentally used till the culture reports are available. The second deep freezer is used for storage of the pasteurized milk once the culture reports are negative and the milk is considered safe for distribution.

DEEP FREEZER

c) **Refrigerator**-Separate refrigerators are required to store the milk till the whole day's collection is over and the milk is ready to be mixed and pooled for further processing and also for thawing the milk before being dispatched.

REFRIGERATOR

d) **Hot Oven /Autoclave**- A hot air oven / autoclave in the milk bank or centralized sterile service department is essential for sterilizing the containers used for collection from donors, containers for pasteurization, storage and the test tubes needed for sending milk culture samples to the microbiology laboratory.

e) **Breast Milk Pump** -For milk banking, hospital grade electric pumps are preferred as they result in better volumes of expressed milks and are relatively painless and comfortable to use. Breast pumps can be a source of infection and hence they should be cleaned properly.

BREAST MILK PUMP

f) **Containers**- For collection and storing the milk, single use hard plastic containers of polycarbonates, pyrex or propylene are used across the world. However, in Indian experience, cylindrical, wide-mouthed stainless steel containers of about 200 ml capacity with tight fitting/ screwed caps are equally effective. They are easily available, and are durable, easy to clean and autoclave.

CONTAINER/STORAGE BOTTLES

3) GENERATOR/UN-INTERUPPTED POWER SUPPLY[127] – Every milk bank should have a dedicated source of uninterrupted power supply in the form of generator or inverter.

4) OTHER DESIRABLE EQUIPMENTS[127]- It includes infra-red spectroscopy based milk analyzer.

5) STAFF AND ADMINISTRATION[127]- Human milk banks should have a panel of consultants to guide overall development and functioning.

a) **Director-** Person who is overall in charge of milk bank activities and administration. Usually the head of neonatal services whose role is planning, developing, implementing and evaluating milk bank services.

b) **Milk Bank Officer/Chief Operating Officer**- Usually a doctor from public health and responsible for overall day to day functioning , administration, training and promotion and updating milk bank , taking consents from donors, and recipients and taking decisions on medical and technical aspects of the milk bank unit. He is supposed to report to the director.

c) **Lactation Management Nurses**- There should be at least one dedicated lactation nurse whose primary job is to help mothers with lactation problems, to motivate mothers to donate milk ,to organize the milk collection, to dispatch the donated milk to the milk bank and to ensure cleaning and disinfection and sterilization of pumps and other equipment's required.

d) **Milk Bank Technician**- He looks after all day to day activities in the milk bank, is responsible for pasteurization of milk , microbiological surveillance, collection of culture reports, maintenance of records and disbursement of milk.

e) **Milk Bank Attendant**- His job is to clean and sterilize the milk containers and breast milk pumps, to transport the milk to the milk bank from the collection sites, to take samples for culture to the microbiology department and to collect the reports, to maintain hygiene level in office and other rooms.

f) **Microbiologist**- His job is to carry out the cultures and send reports to the milk bank.

g) **Receptionist/Record Keeper**- There job is to counsel women who come to the milk bank and maintain counseling register containing data updated about women counseled, who agreed to donate, who will have to come back to milk bank. There work is to fill the Donor Record Files and Recipients Record Files. Also to maintain inventory of stationary items and maintain comfort and decorum of the milk bank.

As per CLMC guidelines, if it is not feasible to have the above mentioned staff, the basic minimum staff requirement includes- a Lactation Management Nurse, Milk Bank Technician (who can maintain records of collection and distribution), Sister in charge of NICU (who can take up the job of coordinating collection and transport of milk to milk bank), Regular Hospital Attendant (who can take up the job of cleaning),Unit Head(for overall functioning of the milk bank). Microbiology work can be shared by the regular hospital microbiology staff.

6. **FUNDS[127]-** The overall cost approximation of setting up and running a milk bank can be summed up to 18 lakh +/- 3 lakh per annum including salaries of the staff.
7. **HEALTHY DONORS [127]**- Healthy lactating mothers who would be willing to donate.

PROCESSING OF DONOR HUMAN MILK [127]– The process of processing of donor human milk involves, collection, pooling, pre-pasteurization testing, pasteurization, post-pasteurization testing and finally storage before dispensing. The fresh raw breast milk collected over the day is kept in pre-processed milk freezer/refrigerator. Caution should be taken not mix the newly collected fresh raw milk with the frozen milk already collected since it can result in defreezing with hydrolysis of triglycerides . If mixing fresh raw breast milk to frozen raw breast milk previously collected from same donor, care should be taken to chill the fresh raw milk before adding to frozen milk. For sick or preterm babies it is advisable to use a new container for each session of pumping. Whole day's collection is then processed by mid-day so that pre-processing cultures can be sent in time for microbiological testing.

Mixing & Pooling: Before the microbiological testing of milk collection is done, donated breast milk from multiple donors is pooled. Milk is transferred from donations collected in small containers to larger glass flasks/pasteurizer containers. Each pool (which usually includes milk from 3 to 5 donors) is thoroughly mixed to ensure an even distribution of milk components. Names & ID of donors in each pool is also recorded for future needs.

Microbiological Screening Of Donated Milk: Microbiological screening of donated and pooled milk is done as soon as possible both after and before pasteurization according to the protocol of the bank. The aim is to maintain contamination level at zero at all possible areas.

Pre-Pasteurization Culture: Wherever possible pre-pasteurization culture of the collected raw breast milk should be sent in order to know the extent of contamination and the efficacy of pasteurization process. Before treatment, there are no set levels for colony count levels, but a rough guide is as follows:

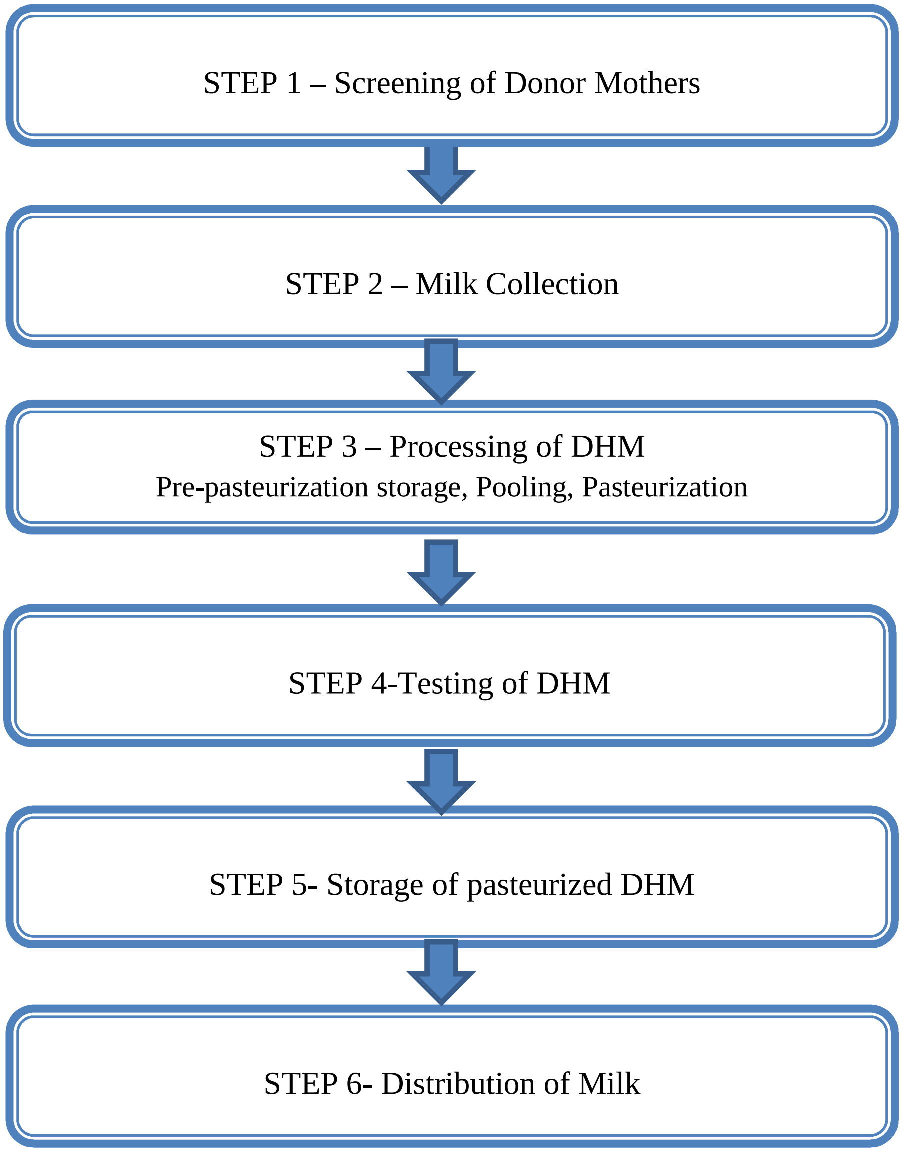
- <103CFU/mL: milk is used
- >105CFU/mL: milk is not used
- 103to 105CFU/mL: milk is only used if organisms are skin commensals.

Heavily contaminated milk is discarded because pasteurization process is not effective on heavily contaminated sample. Heavily contaminated milk with specific bacteria (e.g. S. aureus, E.coli) may contain enterotoxins and thermostable enzymes even after pasteurization, expert panel has selected 105 CFU/mL for total bacterial count, 104 CFU/mL for Enterobacteriaceae and S. aureus as threshold values which are in accordance with milk banks operating worldwide.

Pasteurization of Donated Breastmilk[127]: The fresh raw donated milk is immediately pasteurized after collection. Holder method of pasteurization using 62.5°C for 30 minutes is widely used. Properties are better preserved at this temperature without compromising bacteriological safety. Recently, other safer methods of pasteurization with better preservation of nutrients and other properties, like flash heat treatment, HTST (High Temperature Short Time: 72°C for 16 seconds) and ultra violet irradiation are also coming up for use in human milk banks.

The stainless steel containers for the pasteurizer/shaker-water bath is cleaned & sterilized before use. The fresh raw donated breast milk of individual donor or multiple donors collected in small sterilized containers is poured in the larger sterilized stainless steel containers suitable to size of the pasteurizer. Containers should not be filled more than four-fifths the volume to allow for expansion of milk when heated. The containers are then placed in their specific slots inside the machine tray and clamped to avoid spillage. The bath canner is filled with water enough to submerge ¼ to ½ portions of the steel containers. The temperature is set at 62.5°C; time is set to 30 minutes and shaking speed set to Level 1.After 30 minutes, containers are taken out, sealed tight and allowed to cool rapidly. Samples for post pasteurization culture are then drawn from each container and containers are kept in the deep freezer at -20°C. Each containers of same batch of pasteurization are placed in one labeled batch tray and it is stored in the freezer designated for post-pasteurization milk awaiting cultures report which is not distributed till culture reports come negative. After each batch of pasteurization the containers are sent for autoclaving after cleaning.

Post Pasteurization Culture- It is done in every set-up before the milk is dispensed. No amount of growth is acceptable. 1 to 2 mL of milk from each batch should be sent to microbiology lab for culture from each container. If the test report is positive then the entire pasteurized batch/container's pool is discarded depending on culture reports of other containers of the same batch of pasteurization. The containers with negative culture reports are transferred to deep freezer designated for culture negative pasteurized milk ready for disposal. The six basic steps involved in HUMAN MILK BANKING are summarized in the algorithm given below [35,38,85,99]- .


STEP 1 – Screening of Donor Mothers
STEP 2 – Milk Collection
STEP 3 – Processing of DHM
Pre-pasteurization storage, Pooling, Pasteurization
STEP 4-Testing of DHM
STEP 5- Storage of pasteurized DHM
STEP 6- Distribution of Milk

POOLING OF DONOR HUMAN MILK [127,93]:

Human milk composition is dynamic, and changes over the course of a feed, over the course of a day, and over the course of lactation. For these reasons, DHM banks routinely pools milk from multiple donors in order to limit extreme variation. Criteria used to select individual donations for pooling are not standardized and vary among milk banks. Currently, milk postpartum age (age of the infant at the time milk was expressed) is not typically taken into account when pooling individual donations.

Normally before the microbiological testing of milk collection is done**,** donated breast milk from multiple donors is pooled. Milk is transferred from donations collected in small containers to larger glass flasks/pasteurizer containers. Each pool (which usually includes milk from 3 to 5 donors) is thoroughly mixed. Names & ID of donors in each pool is recorded for future use. This pooled milk is then subjected to pasteurization and further processing. Studies have shown pooling of milk from multiple donors help in evenly distributing milk components throughout the aliquot. A study by Young et al analyzing the impact of milk bank pooling practices on concentrations and variability of bioactive components of donor human milk reported less variability in IgA and insulin concentration in milk with more than 2 pooled donors. Pools with only one donor had lower total IgA and lower insulin concentrations than pools with at least 2 donors ($p < 0.05$) thereby optimizing bioactive components in donated milk and decreased compositional variability in produced DHM pools [93,128]. Another study by Young et al studying effect of pooling practices and time postpartum of milk donations on the energy, macronutrient, and zinc concentrations of resultant Donor Human Milk Pools concluded that Donor human milk pools were lower in calories than is normally assumed and these relatively low caloric density and protein concentrations need to be considered when providing DHM to low birth weight and premature infants [129].

PASTEURIZED DONOR HUMAN MILK AND GROWTH IN PRETERM INFANTS

Reports of the effect of PDHM on the growth parameters in preterm babies vary in different settings and have been controversial. Studies conducted have shown better growth in infants fed predominantly MOM as compared to PDHM.

A retrospective analysis study conducted by R Chowning et al in 2016 analyzing 550 VLBW infants for the effect of human donor milk on prevention of necrotizing enterocolitis and postnatal growth reported slower growth rates in weight and head-circumference at discharge following introduction of DHM when MOM was not available[49].Another retrospective case control study conducted in 2012 by Giulliani F et al, to study and evaluate short term advantages of MOM as a sole diet compared to donor milk as a sole diet, in terms of growth, anti-infectious properties, feeding tolerance, NEC, and ROP prevention in a population of VLBW infants born in a tertiary care center reported, no significant difference in clinical outcomes for infants belonging to MOM group compared with PDHM group. Only a slight but not statistical significant difference in growth was observed in favor of maternal milk [130].Lloyd M et al in 2019 also reported similar observation when comparing mother's own milk with pasteurized donor human milk , and reported better weight growth velocity at 34+1weeks post menstrual age in group supplemented with mother's own milk as compared to group supplemented with pasteurized donor human milk but showed evident catch-up growth by discharge. By 12 months of age no difference was observed in between the two groups. [80]. An observational study analyzing longitudinal growth outcomes and morbidities in 90 extremely preterm infants born between 2013-2015 in Gothenburg , Sweden comparing mother's milk v/s pasteurized donor human milk consumption reported that unpasteurized mother's milk correlated positively with almost all z-scores for weight, length, head circumference at postnatal age of 28days[119]. As per a recent review by Jacopa Cerasani et al in 2020, studying human milk feeding and preterm infant's growth and body composition, analyzing 91 articles over a period of 11 years that is 2009 to 2020 reported a broader reduction in the weight z scores from birth to discharge in group receiving >75% human milk as compared to those receiving < than 75% [120]. A positive correlation was observed between consumption of human milk and adipose mass deposition in late preterm infants fed sole human milk diet, which strengthened on reaching term corrected gestational age (CGA) [120]. Study by Piemontese et al reported higher percentage of lean mass deposition at term corrected gestational age (CGA) in very low birth weight (VLBW) infants fed with human milk at more than equal to 50% of total milk volume as compared to VLBW infants fed with human milk at less than 50% of total milk volume [122]. Mol et al studied and compared preterm infants with term infants for body mass composition, for mother's own milk or preterm formula and showed at term CGA, the group with VLBW infants who were fed with mother's own milk had analogous body composition as compared to group with full term infants [123].

When comparing PDHM feeding v/s formula feeding in preterm infants for growth outcomes, studies report mixed results. Schanler and Richard et al conducted a randomized control trial on 243 extremely premature infants (<30weeks), comparing donor milk v/s preterm formula as substitute for MOM and found the rates of weight gain differed between DHM and PF group and was higher in PF group , though there was no difference in head circumference gains between the two groups [51].Similar findings were reported by Lucas A et al in his study on early feeding of low birth weight infant and its effect on growth and Tyson et al in his study on growth , metabolic response , and development in VLBW infants fed banked human milk v/s enriched formula [55,59,132]. Brownell et al, also reported a rate of decline in weight gain by 0.17g/kg/day for every 10% increase in DHM intake [73].Weight gain increased significantly with increasing formula milk intake. On the other hand head circumference growth decreased as compared to infants fed MOM.

Another retrospective study, conducted by Kim L Chung in 2017 reviewing 132 infants of birthweights (BWs)<1500g and gestational ages (GAs) < than 32 weeks , studying the effects of exclusive donor human milk feeding in a short period after birth on morbidity and growth of preterm infants during hospitalization reported, lower values of weight, head circumference and height in PDHM group as compared to PF group on achieving full enteral feeding of 130ml/kg, but showed similar growth results at 36 weeks PMA[52] .Fang L et al conducted a prospective cohort ,analyzing the effects of preterm donor milk (DM) on growth, feeding tolerance, and severe morbidity in very-low-birth-weight infants (VLBW)infants whose mothers could not produce enough milk, , and reported no difference in daily weight gain and weekly head growth of VLBW in both PF and PDHM group concluding preterm DHM does not affect the growth of VLBW infants. Though the length of hospital stay and time to achieve full parenteral nutrition was lower in PDHM group[41]. Similar finding were reported in studies by Costa et al, Canizo Vazquez D et al [58,131]. Sisk et al also conducted similar study to evaluate necrotizing enterocolitis and growth in preterm infants fed predominantly maternal milk, pasteurized donor milk, or preterm formula and reported MM and PDHM feedings, given until 34 weeks postmenstrual age, were associated with lower rates of NEC in very low birth weight infants without interfering with growth. There were no differences in growth metrics from birth to hospital discharge [50]. Hoban et al in his retrospective cohort also reported slower rates of decline in short-term growth trajectories for weight and length in VLBW infants fed higher formula proportions[72].A randomized controlled trial (RCT) conducted in a tertiary care teaching hospital, in south India in 2018 by Adhisivam et al to study the effect of pasteurized donor human milk on 80 healthy preterm neonates randomized into groups with fortified PDHM and unfortified PDHM respectively and followed up for 28 days or discharge whichever was earlier for growth outcomes , reported no significant difference in growth parameters like weight gain and increase in head circumference among neonates in the fortified versus the unfortified group [77].

Quigley et al in 2019 conducted a meta-analysis review comparing formula v/s PDHM for feeding of preterm and LBW infants , showed formula fed infants were found to regain birth weight earlier and have higher in-hospital rates of weight gain, linear growth, and head growth than infants who received donor breast milk however at the cost of increased risk and incidence of NEC subsequently [71.]Meta-analysis by Fe Yu MD at al also reported similar results[133.]Several studies conducted by Connor et al and Morley et al have demonstrated better short-term weight gain and head circumference (HC) growth with MOM supplemented with fortified DM rather than formula[40,89] .

Dempsey et al in 2019 conducted a systemic review of randomized and quasi-randomized trails comparing banked donor preterm milk v/s banked donor term milk to study growth and development outcomes in VLBW infants and reported no literature evidence to demonstrate the effect of pooled preterm PDHM on growth outcomes in preterm infants [97]. Lack of preterm milk secretion and collection in milk banks along with routine practice of pooling term and preterm milk in milk banks along with processes like pasteurization altering the milk composition before distribution were major obstacles identified in conducting such.

DIFFERENCE IN COMPOSITION OF PRETERM AND TERM MILK

Human milk composition is known to differ with gestation, with days, hours, and also overtime in the same mother. The specific nutritional requirements of the preterm infants are met through special composition of preterm milk. Preterm infants because of their additional nutritional needs have higher in built nutritional accretion rates to accommodate the extra calories, protein, fats etc. for better growth and development.

One of the earliest studies conducted by Atkinson et al, in 1978 and 1981 at the Departments of Nutrition and Food Science and of Pediatrics, University of Toronto, Canada analyzed serial 24 hour milk collections from a group of preterm and term mothers, and found a significantly higher total nitrogen and protein nitrogen content in preterm milk which decreased during the first month of lactation. It also reported a 20-30% higher energy content in preterm milk during early lactation compared to term milk, due to a 20-30% higher concentration of fat and lipid in preterm milk[134]. The findings of Gross et al who conducted a similar study in Durham in 1980 were also similar and in addition concluded, the milk produced during the first month following parturition by mothers delivering between 28 and 36 weeks of gestation contained significantly higher concentrations of nitrogen, sodium, and chloride, and lower concentrations of lactose than milk produced by mothers delivering at term. [135]. Many other studies came up over the years with similar findings .In 2014 , Dominica A Gidrewicz and Tanis R Fenton , conducted a systematic review and meta-analysis of the 41 observational studies comparing preterm and term milk for breast milk nutrient content (energy, macronutrient (protein, lactose, fat) and mineral content) and highlighted higher preterm milk protein content of 2.2 g/dL and a fat content of 2.6 g/dL compared to term milk protein content of 1.8 g/dL and a fat content of 2.2 g/dL in the first week of life [136]. Similar findings were observed in a systemic review published in American Society for Parenteral and Enteral Nutrition by Gates et al in 2020 called “Review of preterm human milk nutrient composition”, where 27 articles published between January 1950 and December 2019 studying macronutrients and micronutrient content of preterm human milk were analyzed. The article stated, the energy density increased sharply over the first 7–14 days in preterm milk, after which energy density was largely consistent. The preterm milk was found to be more energy dense or that energy density was equivalent with the differences likely due to the influence of timing and technique of sample collection [82].Based on the aggregate data from 19 available reports of this review, fat content in preterm human milk appeared to increase nearly 2-fold over the first 2 weeks after birth and was relatively flat in mature preterm human milk. According to a latest review by Zhu Jing et al in May 2022,early pre-term milk is naturally enriched with bile salt-stimulated lipase, lipoprotein lipase and protein, with protein content as high as 4.1 ± 2.1 g/100 ml110 owing to the high protein accretion rates by preterm , LBW babies which reflected the nutrition needs of the preterm infant. [81] Another study in Turkey comparing changes in breast milk macronutrient content during the first month in preterm and term infants reported , higher fat, energy and carbohydrate content in term milk when compared to preterm milk by day 14 and day 28 postpartum ,concluding that human milk composition is not only variable with gestation but also over time in the same mother [83].

The transition of milk composition over weeks between term and preterm milk is shown in Figure 4.

Nutrient	TERM	PTM 1st week	PTM 2nd week	PTM 3rd week	PTM 4TH week	PTM 5th week	PTM 6th week
Protein (g)	1.1	2.3	1.9	1.6	1.5	1.4	1.3
Sodium (mmol)	0.6	1.7	1.3	1.2	0.9	0.8	0.8
Potassium(mmol)	1.5	1.7	1.5	1.3	1.3	1.2	1.2
Calcium(mmol)	0.8	0.7	0.7	0.7	0.7	0.7	0.7
Phosphorous(mmol)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Energy(kcal)	67	64	67	67	67	67	67

Figure 4. Human Milk Composition of Preterm and Term Milk

PASTEURIZATION AND HUMAN MILK COMPOSITION

Human milk processing involves processes like pasteurization, freezing, thawing, distributing milk into different bottles, all of which are known to modify the composition of donor human milk. These procedures reduce the macronutrient and biological composition of the donor milk, resulting in slow growth of infants fed with

PDHM. Inadequacy of standard PDHM fortification (particularly with regard to protein), loss of lipase activity during pasteurization and loss of fat during handling are the main reasons for this slower growth noted in preterm infants receiving PDHM [88,89,90]. A study conducted in “Hospital 12 de Octubre” (Madrid, Spain) by Gracia Lara et al in 2013 to study the effect of HoP and frozen storage on macronutrients and energy content of breast milk analysed 59 raw milk samples donated by 28 fresh donor mothers and stored for less than 24 hrs at 5’C in refrigerator. Milk was analysed prior to freezing, and after freezing for 90 days at --20°C, mimicking NICU standard handling of maternal milk and reported time-dependent decreases for fat and energy content after freezing, which was clinically significant when considering the nutritional needs of preterm infants [87].Secondary analysis of milk through the donor milk cycle: raw milk(thawed after storage at -20°C), post-pasteurized milk prior to freezing, and post-pasteurized milk frozen at -20°C for 180 days reported significant decreases in fat and total energy content after pasteurization and before freezing but stable lactose and nitrogen content. Frozen storage resulted in additional significant decreases over the180-day period for fat, energy and lactose content, but nitrogen remained stable. Total fat content was therefore decreased by 6.2% by the combination of pasteurization and frozen storage for 90 days. As fat is far more calorically dense at 9 kcal/g than carbohydrate or protein (4 kcal/g), the impact of fat loss on energy content was found to be significant[86,87].

Another study conducted by Ahrabi et al assessing lactoferrin and secretory IgA levels by enzyme-linked immunosorbent assay (ELISA) before and after freezing at -20°C in raw milk samples that were never pasteurized, reported that “freezer storage up to nine months does not affect lactoferrin or secretory IgA” [137].

Viera et al performed an in vitro study to demonstrate the effects of donor milk processing and NICU feeding practices on nutrient content in a step-wise fashion. Milk samples from 57 donors were analysed at each step: raw (frozen), post-HoP prior to freezing, post-HoP after thawing. It also included analysis of milk after mock tube-feeding, subjecting post HoP thawed milk to two conditions: gravity bolus and one-hour infusion and demonstrated fat and protein decreased at each step in the process, with the largest losses between raw and HoP (-6% fat and -4% protein). Further losses were seen with bolus feeding (-5% additional fat loss and -3% additional protein loss), compared to one-hour infusion (-40% additional fat loss and -10% additional protein loss)[91]. Castro et al performed a similar study of the effect of the infusion time of pasteurized DM feedings through 5-french feeding tubes, demonstrating that longer infusions led to greater nutrient loss. Milk fed by gravity bolus lost no nutrients, but milk fed over 30 minutes, 60 minutes, and 4 hours lost significant fat and thus energy. Energy decreased 8% at 30 minutes, 11% at 60 minutes, and a startling 29% after four hours[66].

Pasteurization also affects bioactive compounds in human milk, oligosaccharides and glycosaminoglycans are not depleted by HoP. Human milk immunoglobulin's are likely degraded by HoP, bile salt stimulated lipase, lipoprotein lipase, and amylase, and all are negatively affected by HoP to some degree[86,92,128] .Czank et al., investigated different pasteurisation temperatures with long exposures and found that temperature rather than holding time had a greater influence in retaining the bioactivity of the human milk proteins. For example, a slight increase in temperature from 57 ◦C to 58 ◦C decreased the retention of activity of the proteins more than when a similar proportional change in holding time was employed. While thermal inactivation of bacteria occurs during pasteurisation, the broad action of heat also disrupts proteins through thermally-induced denaturation. Also freezing itself can affect raw human milk due to rupture of the fat globule membrane, causing cream formation, as well as protein changes including alterations in casein micelle stability and altered quaternary structure of whey proteins.[92]

POOLING AND DONOR HUMAN MILK COMPOSITION

Human milk composition is dynamic, and changes over the course of a feed, over the course of a day, and over the course of lactation. For these reasons, DHM banks routinely pools milk from multiple donors in order to limit extreme variation. Studies have shown pooling of milk from multiple donors help in evenly distributing milk components throughout the aliquot. A study by Young et al analyzing the impact of milk bank pooling practices on concentrations and variability of bioactive components of donor human milk reported less variability in IgA and insulin concentration in milk with more than 2 pooled donors. Pools with only one donor had lower total IgA and lower insulin concentrations than pools with at least 2 donors ($p < 0.05$) thereby optimizing bioactive components in donated milk and decreased compositional variability in produced DHM pools [93,128]. Another study by Young et al studying effect of pooling practices and time postpartum of milk donations on the energy, macronutrient, and zinc concentrations of resultant donor human milk pools concluded that donor human milk pools were lower in calories than is normally assumed and these relatively low caloric density and protein concentrations need to be considered when providing DHM to low birth weight and premature infants [129].

NEED FOR STUDY

The variability in human milk composition along with effect of pasteurization and routine practice of pooling both term and preterm milk together may be attributed to the controversial effects on growth of preterm infants fed with PDHM. There is a lack of evidence to show the effect of pooled pasteurized preterm milk on the growth outcomes of infants. Therefore we conducted a RCT to study the effect of pooled pasteurized donor human milk versus unpooled pasteurized (pooling of only preterm donor milk) preterm donor human milk on the short term growth parameters (weight, length, head-circumference and mid- upper arm circumference) of preterm infants.

METHODOLOGY

The study was conducted from December 2021 to August 2022 in the Neonatal Intensive Care Unit of Department of Pediatrics, KLES Dr. Prabhakar Kore hospital and Medical Research Centre, attached to Jawaharlal Nehru Medical College, Belagavi.

Study Design:

Randomized controlled trial.

Study Duration:

December 2021 to August 2022

Study Place:

The study was conducted in Neonatal Intensive Care Unit of Department of Pediatrics, KLES Dr. Prabhakar Kore hospital and Medical Research Centre, attached to Jawaharlal Nehru Medical College, Belagavi.

Source Of Data :

Preterm infants admitted in the Neonatal Intensive Care Unit of Department of Pediatrics, KLES Dr. Prabhakar Kore hospital and Medical Research Centre, Belagavi.

Sample Size:

The sample size was calculated from the formula as mentioned below by taking power as 80% and an effect size as 0.6

$$x = \frac{2(Z^{\alpha}/_2 + Z_{\beta})^2}{(\frac{|\mu 1 - \mu 2|}{\sigma})^2}$$

$$d = \frac{|\mu 1 - \pi 2|}{\sigma}$$

Where

$\mu 1$ = mean of the first group,

$\mu 2$ = mean of the second group

$\sigma 2$ = common error variance,

$Z\alpha/2$ values = 1.96 and

$Z\beta$ values = 0.84.

Confidence interval level= 95%

Power =80%

Calculated sample size was 45 in each group assuming 10% lost to follow-up. The actual sample size per group was 49 in each group.

<u>Selection Criteria:</u> -

<u>Inclusion Criteria-</u>

1. Stable preterm infants admitted to NICU, receiving PDHM, any time during their stay .(Preterm birth as defined by WHO - a live birth that occurs before 37 completed weeks of gestation, or fewer than 259 days from the first date of a woman's last menstrual period)[1]

Exclusion Criteria-

Preterm neonates with

1. Major congenital anomalies.
2. Birth asphyxia
3. Surgical anomalies of gastrointestinal
4. Necrotizing enterocolitis
5. Patient not giving consent

Method Of Data Collection-

The study was conducted after obtaining institutional ethical clearance. Informed consent was obtained from the parents /caregivers of the eligible preterm infants. The preterm infants fulfilling the selection criteria were enrolled for the study. At enrollment, socio-demographic data viz name, age, gender, occupation, educational status of the parents and baseline maternal and infant parameters viz, maternal history, maternal age, gravida, antenatal care, antenatal risk factors ,birth history of the infant like birth weight, age at enrollment, weight, mode of delivery, gestational age, APGAR score, and indication for NICU admission and indication for starting PDHM were recorded on a pre-designed and pre-tested proforma.

Randomization: After enrollment, the participants were randomized to group A & group B using computer generated random numbers

Group A (intervention) - Preterm infants receiving unpooled preterm pasteurized donor human milk,

Group B – Preterm infants receiving pooled pasteurized donor human milk.

Intervention : Preterm infants in the interventional group (Group A) received unpooled PDHM that is pooled preterm pasteurized donor milk from five mothers who had delivered preterm infants, while preterm infants in (Group B) received pooled that is pooled mixed pasteurized donor milk from five mothers who had delivered predominantly term & preterm infants. The pasteurized donor milk was provided from the human milk bank “AMRUTHA” attached to the Level III NICU of KAHER Dr.Prabhakar Kore charitable hospital, Belagavi which was established in 2018. Breast milk was collected under sterile precautions using hospital grade breast pumps from healthy mothers who have delivered preterm and term infants, after screening and obtaining informed written consent. Processing ,storage and dispensing of the pooled sample of DHM was done as per the National CLMC guidelines[98].The infants received mothers own milk once it was available.

The neonates were followed up in the hospital for growth parameters namely weight, length, head circumference and mid upper arm circumference along with type of feeding, method of feeding, amount of feeding, duration of feeding and frequency of feeding during NICU stay, at discharge, and during follow-up visits at 2weeks and 4 weeks .

OUTCOMES ASSESSED:

PRIMARY OUTCOMES[103]:

Included the growth parameters namely, weight, length, head circumference and mid upper arm circumference at admission, at discharge and at follow up visits at 2 weeks and 4 weeks of life.

1. **Weight:** The neonate`s weight was measured on Essae-BS-250 electronic weighing scale with precision of 0.001 kg. Neonate was weighed naked with no clothing or diaper after making sure that scale was placed on flat, hard, even surface with proper calibration. Three readings were noted and mean of the three readings was taken as final value.
2. **Length**: The neonate`s length was measured on an infantometer board after placing it on a horizontal and level surface. Three measurements for each baby were taken and mean of the three values was taken as final value after measuring it to nearest 0.1cm.
3. **Head Circumference**: Neonate`s head circumference was measured with Schorr tape with precision of 1 mm by placing it over the occipital protuberance at the back and just over the supraorbital ridge and the glabella in front, once being positioned correctly it was pull tight to compress the hair and the skin, but not too tight causing injury to the baby. Three measurements were taken for each baby and mean of the three values was taken as final value.
4. **Mid Upper Arm Circumference**: Neonate`s mid upper arm circumference was measured with Schorr's tape at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromion). Three measurements were taken for each baby and mean of the three values was taken as final value

SECONDARY OUTCOMES:

1. **Feeding Details** :

   a) **Type Of Feeding –** Exclusive Breast feeding/mothers own milk (MOM)/Pasteurized donor human milk (PDHM), Formula Milk Feeding and Mixed Feeding.

   Exclusive Breastfeeding: “Exclusive breastfeeding" is defined by WHO as giving no other food or drink, not even water, except breast milk.

   Pasteurized Donor Human Milk: “breast milk expressed by a mother that is then processed by a donor milk bank for use by a recipient that is not the mothers own baby”[99].

   Formula Feeds: “An artificial substitute for breast milk intended for feeding infants, using cow’s milk as a base, supplemented with vitamins and minerals”[100].

   Mixed Feeding: Feeding of both PDHM and MOM.

   b) **Method of Feeding**

   Direct Breastfeeding: WHO defines ‘direct breastfeeding’ as the provision of human breast milk to the infant by direct feeding at the breast.

   Nasogastric feeding: “A feeding tube is a small, soft, plastic tube placed through the nose (NG) or mouth (OG) into stomach to provide feeds and medicines to the babies after measuring the distance from either the nostril or the mouth (depending on insertion site) to the tragus (lobe of the ear) to the half way point between the xiphi-sternum and the umbilicus”101.

Spoon/Paladai Feeding: "The paladai is a cup-like utensil with a narrow tip has been used traditionally to feed preterm neonates who has not developed coordinated Suck-Swallow Reflex".102

c) **Frequency of Feeding:** Number of feeds per day.

d) **Duration of Feeding:** Total number of days receiving MOM, PDHM or Mixed feeding.

e) **Amount of Feeding:** Amount in (ml) Of PDHM, MOM or Mixed feeding.

2. **Duration Of Hospital Stay**: Total number of days of NICU stay.

Statistical Analysis:

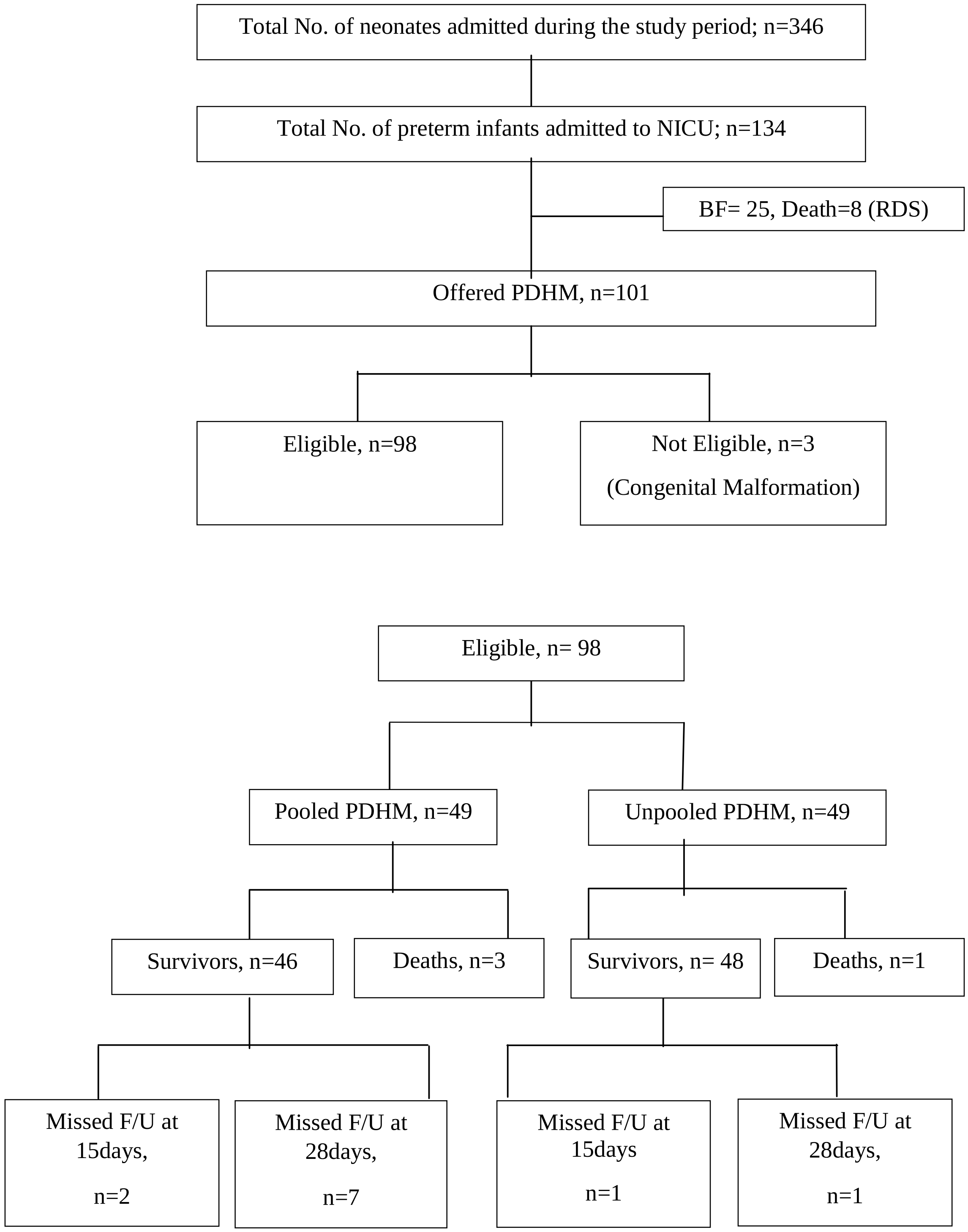
Data obtained was coded and collected and stored in Microsoft Excel spreadsheet. Data was analyzed using statistical software R and Microsoft Excel. The continuous variables were given in mean± SD/median (range). Categorical variables were represented by frequency. To check the dependency between attributes Chi-square test was used. To compare mean/distribution over groups t-test/ANOVA/Mann-Whitney test/Kruskal-Wallis test was used. To compare the mean/distribution within the group at 2 or more time points paired t-test/Repeated measures of ANOVA/Wilcoxon's test/Friedman's test was used. To compare the paired nominal data at two time points within the group, McNemar's test was used. To check the normality of variables Quantile-Quantile (QQ) plot/Shapiro-Wilk's test was used. A probability value (P-value) of less than or equal to 0.05 at 95 % confidence interval was considered statistically significant.

RESULTS

The study was conducted from December 2021 to August 2022 in the Neonatal Intensive Care Unit of Department of Pediatrics, KLES Dr. Prabhakar Kore hospital and Medical Research Centre, attached to Jawaharlal Nehru Medical College, Belagavi.

A total of 346 neonates were admitted in NICU during the study period of which 134 were preterm infants. Of the 101 preterm infants who received PDHM, 3 preterm infants were excluded from the study in view of congenital malformations (CHD+ GIT). A total of 98 preterm infants were enrolled (49 in each group) and were analyzed in the study. Of the 49 analyzed in the pooled PDHM group, 46 preterm infants survived, and 3 deaths were noted. Of the 46 survivors, 2 preterm infants were lost to follow up at 2 weeks and 7 were lost to follow up at 4 weeks. Of the 49 analyzed in the unpooled PDHM group, 48 preterm infants survived, and 1 death was noted. Of the 48 survivors, 1 preterm infant was lost to follow up at 2weeks and 1 was lost to follow up at 4 weeks (Fig 5)

Figure 5. CONSORT diagram for screening and enrolment of preterm newborn



I. MATERNAL PARAMETERS

In the present study, maternal parameters were comparable between unpooled and pooled groups (Table 1) .The mean age of the mother was 24.47 years (25.10 years v/s 23.84 years=0.09). Majority of the mothers (64.29%) had received education up to secondary educational level (73.47% v/s 55.10%,p=0.15).Majority of the mothers (97.96%) were observed to be homemakers (97.96% v/s 97.96%,p=0.00).

Table 1: Comparison of Maternal Parameters Between Unpooled and Pooled Group

Profile	Unpooled	%	Pooled	%	Total	%	χ^2	p-value
Maternal age								
Mean+/-SD	25.10	4.46	23.84	2.77	24.47	3.75	1.6870	0.0949
Maternal education								
Illiterate	1	2.04	2	4.08	3	3.06	5.2520	0.1540
Primary	5	10.20	4	8.16	9	9.18		
Secondary	36	73.47	27	55.10	63	64.29		
Graduate & above	7	14.29	16	32.65	23	23.47		
Mother occupations								
Homemaker	48	97.96	48	97.96	96	97.96	0.0000	1.0000
Employed	1	2.04	1	2.04	2	2.04		

II. MATERNAL PREGNANCY PROFILE

In the present study, maternal history and antenatal risk factors associated with preterm delivery were comparable between unpooled and pooled groups (Table 2) .Majority of the mothers (62.24%) were primigravida (59.18% v/s 65.31 % ,p=0.24). The most common antenatal risk factor associated with preterm delivery was PPROM 40.5 % (45.5% v/s 36.20%) followed by severe intra-uterine growth restriction (IUGR), (32.65 % v/s 32.65 % ,p=0.38).

Table 2: Comparison of Maternal Pregnancy Profile Between Unpooled And Pooled Group

Maternal History	Unpooled	%	Pooled	%	Total	%	Statistic	p-value
Gravida								
Primi	29	59.18	32	65.31	61	62.24	χ^2 =4.1480	0.2460
Multi-G	15	30.61	10	20.41	25	25.51		
Multi-P	2	4.08	6	12.24	8	8.16		
Multi-L	3	6.12	1	2.04	4	4.08		
Total	49	100.00	49	100.00	98	100.00		

Antenatal History	Unpooled	%	Pooled	%	Total	%	Statistics	p-value
Risk Factors								
Elderly primigravida	3	6.12	1	2.04	4	4.08	Z score =0.28	0.3868
Short Stature	0	0.00	1	2.04	1	1.02		
Pre-ecplampsia and eclampsia	10	20.41	10	20.41	20	20.41		
Anaemia	2	4.08	10	20.41	12	12.24		
GDM	2	4.08	5	10.20	7	7.14		
Previous still birth or IUD	0	0.00	0	0.00	0	0.00		
Previous LSCS	2	4.08	2	4.08	4	4.08		
Grand multipara	0	0.00	0	0.00	0	0.00		
PPROM	36	45.5	33	36.2	69	40.5		
IUGR	16	32.65	16	32.65	32	32.65		
Twins	6	12.24	10	20.41	16	16.33		
Rh Isoimmunization	0	0.00	0	0.00	0	0.00		
Placenta previa /abruptio	2	4.08	1	2.04	3	3.06		
Congenital Malformations	0	0.00	2	4.08	2	2.04		

III. BASELINE BIRTH HISTORY

In the study, mean gestational age, mean weight at birth, mode of delivery, APGAR score and day of enrollment were comparable except gender, between unpooled and pooled groups.

Majority (51.02%) of preterm infants in the study were males. However a significant difference was observed in gender in between the two groups (p=0.04). Majority of preterm infants in unpooled group were females (59.18 %) and in pooled group were males (61.22%).

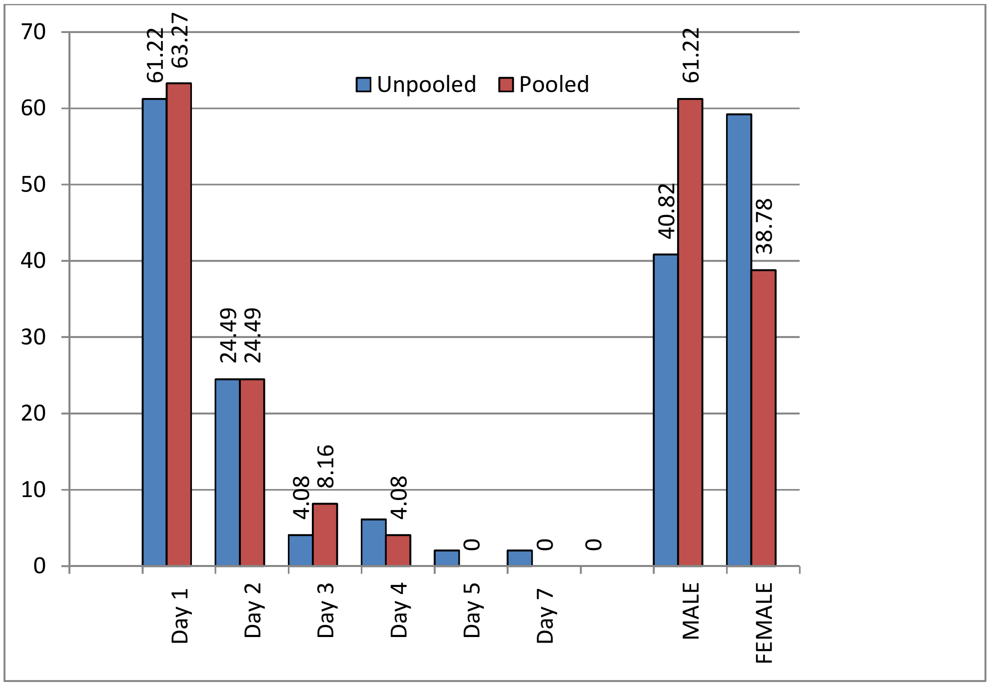
The mean gestational age of the preterm infants in the study was 34.46 weeks (34.42 weeks in unpooled group v/s 34.51weeks in pooled group, p=0.80).The mean weight at birth was 1797.24 gm (1824.90 gm in unpooled group v/s 1769.59 gm in pooled group, p=0.46).The most common mode of delivery observed was C-section (62.24%) and was similar between unpooled and pooled groups (63.27 % v/s 61.22 %, p=0.83). The mean APGAR score at birth of the preterm infants was 7.92 and was similar between both the groups (7.96 v/s 7.88, p=0.43) (Table 3)

Table 3: Comparison of Baseline Birth History Between Unpooled And Pooled Group

Profile	Unpooled	%	Pooled	%	Total	%	χ^2	p-value
Gender								
Male	20	40.82	30	61.22	50	51.02	4.0830	**0.0430***
Female	29	59.18	19	38.78	48	48.98		
Gestational age								
Mean+/-SD	34.42	2.04	34.51	1.66	34.46	1.85	T=-0.2447	0.8072
Mode of delivery								
LSCS	31	63.27	30	61.22	61	62.24	χ2 =0.0430	0.8350
NVD	18	36.73	19	38.78	37	37.76		
Birth wt (in grams)								
Mean+/-SD	1824.90	397.31	1769.59	352.33	1797.24	374.59	T=-0.7290	0.4678
5 min APGAR								
Mean+/-SD	7.96	0.54	7.88	0.48	7.92	0.51	T=0.7889	0.4321
Total	49	100.00	49	100	98	100		

Majority (62.24%) of the preterm infants were enrolled at day one of life (61.22% in unpooled group v/s 63.27% in pooled group, p=0.71). The mean day of enrollment was 1.622 (1.714days in unpooled group v/s 1.531 in pooled group) (p=0.71), (Graph 1).

Graph 1: Comparison of Baseline Birth History Between Unpooled And Pooled Group

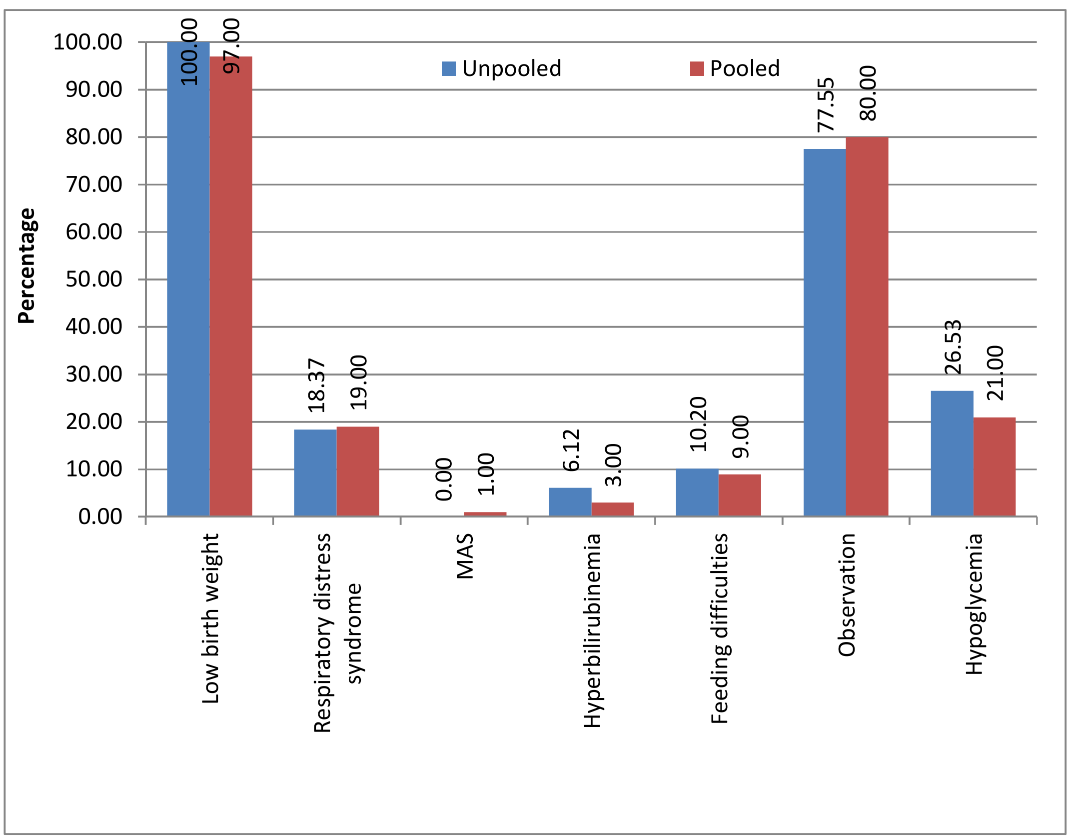


IV. INDICATION FOR NICU ADMISSION

In the present study, indications for NICU admission were comparable between both the groups.

The most common indication for admission of preterm infants to Neonatal Intensive Care Unit was Low Birth Weight (98.98%) (100% in unpooled group v/s 97% in pooled group) followed by Kangaroo Mother care (81.63%) and were similar in unpooled and pooled groups (77.55% in unpooled group v/s 80 % in pooled group).(Graph 2)

Graph 2: Comparison of Indication For NICU Admission Between Unpooled And Pooled Group



V. PRIMARY OUTCOMES

A. GROWTH PARAMETER- WEIGHT

At enrolment, baseline mean weight (1793 ± 344 gm in Unpooled group v/s 1738 ± 315gm in Pooled group, p=0.41) was similar between the two groups. At Discharge, transient decline in the mean weight was observed in Unpooled group (1773 ± 302 gm v/s 2106gm +/- 619 gm, p=0.38) compared to weight gain in infants of the Pooled group .Increase in the mean weight of preterm infants from the baseline value was observed within both the groups at 2 weeks (1958 ± 410.5gm v/s 1898 ±389 gm, p=0.47) and at 4 weeks follow up (2357 ± 433gm v/s 2212 ± 556 gm ,p=0.17), but no significant difference in weight gain was observed between the two groups (Table 4),

Table 4: Comparison of Mean Weight At Different Time Points Between Unpooled And Pooled Group.

Time points	**Unpooled**		**Pooled**		**t-value**	p-value
	Mean	Std.Dev.	Mean	Std.Dev.		
At enrolment	1793.67	344.04	1738.57	315.83	0.8259	0.4109
At discharge	1773.54	302.17	2106.74	2619.09	-0.8755	0.3836
F/U at 15 days	1958.72	410.56	1898.41	389.60	0.7178	0.4748
F/U at 4 weeks	2357.87	433.11	2212.69	556.36	1.3604	0.1774
At enrolment -At discharge	-30.83	101.47	333.04	2554.92	-0.9862	0.3266
At enrolment -15days	147.45	125.79	135.00	148.50	0.4324	0.6665
At enrolment -4 weeks	546.60	144.09	454.49	399.80	1.4700	0.1453

The total percentage increase in mean weight from the weight at enrolment value to 4 weeks observed was significant within the groups .The difference noted was higher in Unpooled group (30.47% v/s 26.14%) (**p= 0.0001 vs p=0.0001**) (Table 5)

Table 5: Comparison of % Gain in Mean Weight at Different Time Points Between Unpooled And Pooled Group

Groups	Changes from At enrolment to	% of change	t-value	P-value	F-value	**P-value**	Effect size
Unpooled	At discharge	-1.72	2.1051	0.0407*	287.574	**0.0001***	0.8620
	F/U at 15 days	8.22	-8.0358	0.0001*			
	F/U at 4 weeks	30.47	-26.0064	0.0001*			
Pooled	At discharge	19.16	-0.8841	0.3813	45.1120	**0.0001***	0.5430
	F/U at 15 days	7.76	-6.0301	0.0001*			
	F/U at 4 weeks	26.14	-7.0992	0.0001*			

B. GROWTH PARAMETER - LENGTH

At enrolment, baseline mean length (44.59 ±.2.5 cm in Unpooled group v/s 44.78 +/- 2.40cm in Pooled group p=0.70) was similar between the two groups. Increase in mean length of preterm infants, from the baseline value was observed in both groups , at discharge (45.07 ±.2.15 cm v/s 45.27 +/- 1.98 cm p=0.65) , at 2 weeks (45.65 ±.2.48 cm v/s 45.81.78 +/- 2.30cm p=0.75) and by 4 weeks follow up (46.23 ±.3.07 cm v/s 46.76 +/- 2.35 p=0.377) respectively but no significant difference in increase in mean length was observed between the two groups . (Table 6)

Table 6: Comparison of Mean Length (In Cm) at Different Time Points Between Unpooled And Pooled Group

Time points	Unpooled		Pooled		t-value	p-value
	Mean	Std.Dev.	Mean	Std.Dev.		
At enrolment	44.59	2.52	44.78	2.40	-0.3776	0.7066
At discharge	45.07	2.15	45.27	1.98	-0.4506	0.6534
F/U at 15 days	45.65	2.48	45.81	2.30	-0.3189	0.7506
F/U at 4 weeks	46.23	3.07	46.76	2.35	-0.8868	0.3777
At enrolment -At discharge	0.37	0.56	0.33	0.53	0.3771	0.7070
At enrolment -15days	0.95	0.31	0.97	0.32	-0.1918	0.8484
At enrolment -4 weeks	1.54	2.13	1.95	0.44	-1.2035	0.2321

The total percentage increase in mean length from enrollment value to 4 weeks observed was significant within the groups. The difference noted was higher in Pooled group (4.36 % v/s 3.45%**) (p=0.001 v/s p=0.001**) (Table 7)

Table 7: Comparison Of % Gain in Mean Length (In Cm) at Different Time Points Between Unpooled And Pooled Group

Groups	Changes from At enrolment to	% of change	t-value	P-value	F-value	**P-value**	Effect size
Unpooled	At discharge	0.84	-4.5833	0.0001*	16.8980	**0.0001***	0.2690
	F/U at 15 days	2.14	-20.9466	0.0001*			
	F/U at 4 weeks	3.45	-4.9513	0.0001*			
Pooled	At discharge	0.74	-4.2527	0.0001*	217.852	**0.0001***	0.8510
	F/U at 15 days	2.16	-19.9867	0.0001*			
	F/U at 4 weeks	4.36	-27.4343	0.0001*			

C. GROWTH PARAMETER – HEAD-CERCUMFERENCE

At enrolment, baseline mean head circumference (31.10 ±.1.80 cm in Unpooled v/s 31.26 +/- 1.58 cm p=0.64) was similar between the two groups. Increase in mean head circumference of preterm infants from the baseline value was observed in both groups at discharge (31.45 ±.1.57 cm v/s 31.71 +/- 1.21 cm, p=0.36) , at 2 weeks(32.04 ±.1.88 v/s 32.30 +/- 1.45 cm, p=0.47) and by the end of 4 weeks (32.95 ±.1.85 cm v/s 33.17+/-1.35 cm p=0.52) respectively, but no significant difference in increase in head circumference was observed between the two groups. (Table 8)

Table 8: Comparison of Mean Head Circumference (In Cm) at Different Time Between Unpooled And Pooled Groups.

Time points	**Unpooled**		**Pooled**		**t-value**	**p-value**
	Mean	Std.Dev.	Mean	Std.Dev.		
At enrolment	31.10	1.80	31.26	1.58	-0.4657	0.6425
At discharge	31.45	1.57	31.71	1.21	-0.9158	0.3622
F/U at 15 days	32.04	1.88	32.30	1.45	-0.7201	0.4733
F/U at 4 weeks	32.95	1.85	33.17	1.35	-0.6335	0.5281
At enrolment -At discharge	0.28	0.43	0.35	0.57	-0.6468	0.5193
At enrolment -15days	0.88	0.36	0.99	0.38	-1.3609	0.1770
At enrolment -4 weeks	1.79	0.44	1.85	0.42	-0.5869	0.5589

The total percentage increase in mean head circumference from mean head circumference at enrolment value to 4 weeks observed was significant within the group .The difference noted was higher in Pooled group (5.91 % v/s 5.76 %)(**p=0.0001 v/s p=0.0001**) (Table 9)

Table 9 : Comparison of % Gain In Mean Head Circumference (In Cm) at Different Time Between Unpooled And Pooled Groups

Groups	Changes from At enrolment to	% of change	t-value	P-value	F-value	**P-value**	Effect size
Unpooled	At discharge	0.90	-4.5413	0.0001*	255.732	**0.0001***	0.8480
	F/U at 15 days	2.84	-16.8083	0.0001*			
	F/U at 4 weeks	5.76	-27.8337	0.0001*			
Pooled	At discharge	1.11	-4.1744	0.0001*	216.814	**0.0001***	0.8510
	F/U at 15 days	3.16	-17.2366	0.0001*			
	F/U at 4 weeks	5.91	-27.7128	0.0001*			

D. GROWTH PARAMETER - MID UPPER ARM -CIRCUMFERENCE

At enrollment, baseline mean mid upper arm circumference (7.50+/- 0.44 cm in Unpooled group and 7.50 +/- 0.46 cm in Pooled group p=1.00) was similar between the two groups. Increase in mean mid upper arm circumference from the baseline value of preterm infants was observed in both groups, at discharge (7.54 ±.0.44 cm v/s 7.54 +/- 0.45 cm p=0.99) , at 2 weeks(7.66 ±.0.42 cm v/s 7.64 +/- 0.42 cm p=0.86) and by the end of 4 weeks (7.82 +/- 0.38cm v/s 7.74 +/- 0.42 cm p=0.34) follow up respectively, but no significant difference in increase in mid upper-arm circumference was observed between the two groups.(Table 10)

Table 10 : Comparison Of Mean Upper Arm Circumference (In Cm) at Different Time Points Between Unpooled And Pooled Group.

Time points	Unpooled		Pooled		t-value	p-value
	Mean	Std.Dev.	Mean	Std.Dev.		
At enrolment	7.50	0.44	7.50	0.46	0.0000	1.0000
At discharge	7.54	0.44	7.54	0.45	-0.0097	0.9923
F/U at 15 days	7.66	0.42	7.64	0.42	0.1728	0.8632
F/U at 4 weeks	7.82	0.38	7.74	0.42	0.9452	0.3472
At enrolment -At discharge	0.03	0.12	0.02	0.10	0.4068	0.6851
At enrolment -15days	0.15	0.23	0.15	0.23	0.0250	0.9801
At enrolment -4 weeks	0.31	0.27	0.26	0.25	0.9224	0.3590

The total percentage increase in mean mid upper arm circumference from mean mid upper arm circumference at enrolment value to 4 weeks observed was significant within the group .The difference noted was higher in Unpooled group (4.11 % vs 3.42 %) (**p=0.0001 v/s p=0.0001**) (Table 11)

Table 11 : Comparison of % Gain In Mean Upper Arm Circumference (In Cm) At Different Time Points Between Unpooled And Pooled Group

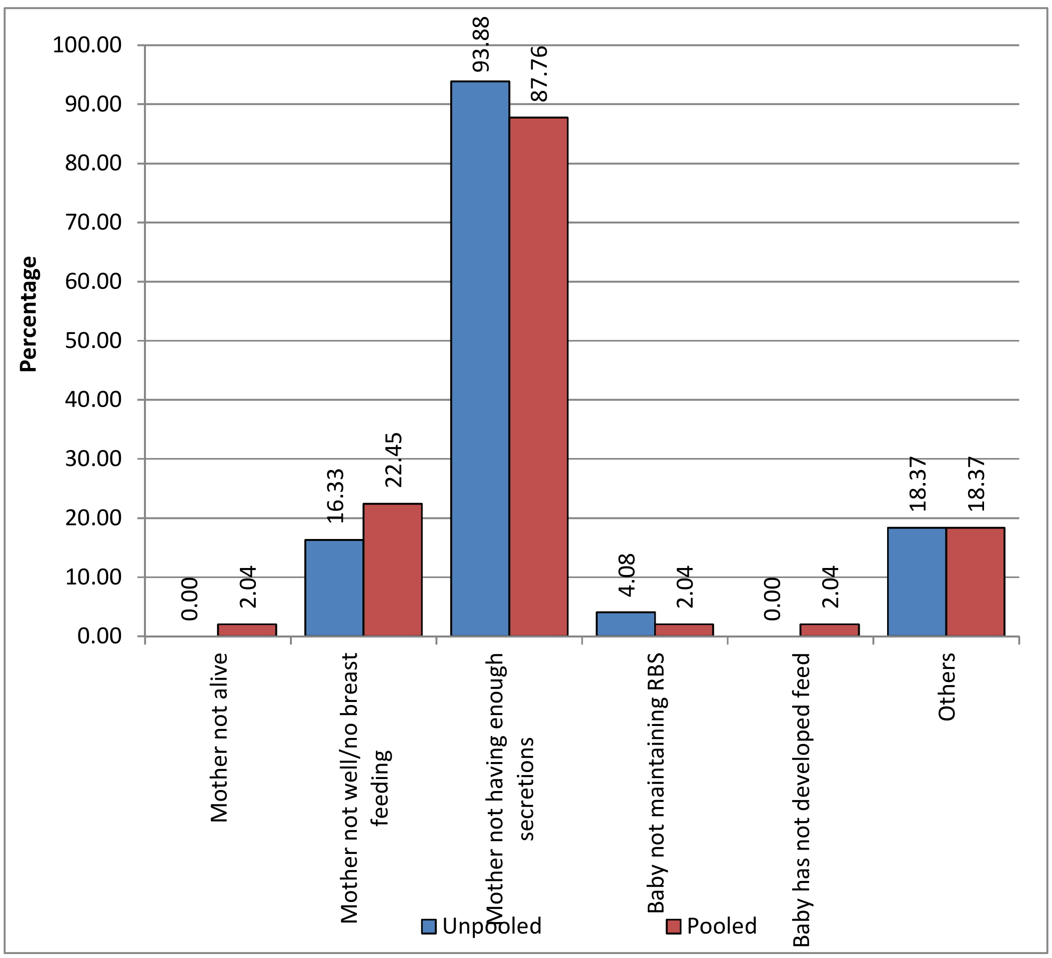
Groups	Changes from At enrolment to	% of change	t-value	P-value	F-value	**P-value**	Effect size
Unpooled	At discharge	0.42	-1.7701	0.0832	34.897	**0.0001***	0.4310
	F/U at 15 days	1.99	-4.4176	0.0001*			
	F/U at 4 weeks	4.11	-7.9248	0.0001*			
Pooled	At discharge	0.29	-1.4298	0.1595	21.911	**0.0001***	0.3600
	F/U at 15 days	1.97	-4.2279	0.0001*			
	F/U at 4 weeks	3.42	-6.2450	0.0001*			

VI. FEEDING DETAILS

A. INDICATION FOR STARTING PDHM

The major indication for starting PDHM in preterm infants was decreased breast milk secretions in the mother's delivering preterm infants 90.82 % (93.88% in unpooled group v/s 87.76% in pooled group),followed by poor maternal health status 19.39 %(16.33 % unpooled group v/s 22.45% pooled group). In the present study indication for starting PDHM were comparable between both the groups (Graph 3)

Graph 3 : Comparison Of Indication For Starting PDHM Between Unpooled And Pooled



B. TOTAL AMOUNT OF PDHM

The total amount of PDHM consumed in both group was comparable (421.45 +/- 360.79 litre in unpooled group v/s 373.59 +/- 292.25 litres in pooled group) (p=0.47) (Table 12)

Table 12: Comparison of Total Amount Of PDHM Between Unpooled And Pooled Group

Parameters	Unpooled		Pooled		t-value	p-value
	Mean	SD	Mean	SD		
Total Amount of PDHM (ml)	421.45	360.79	373.59	292.25	0.7215	0.4724

C .MEAN AMOUNT OF PDHM

The mean amount of PDHM consumed by preterm infants across different time points between unpooled and pooled group was comparable (Table 5). At enrollment (55.96 +/- 37.79 litre v/s 47.94 +/- 31.75 litres p=0.25), at discharge (61.43 +/- 48.09 litre v/s 60.00 +/- 61.29 litres p=0.93), at 2 weeks (106.00 +/- 63.54 litre v/s 138.33 +/- 122.71 p=0.64) and at 4weeks (300 litre v/s 360 litres).The total amount of PDHM consumed from enrolment till end of 4 weeks was higher in pooled group (360 litres v/s 300 litres) (Table 13)

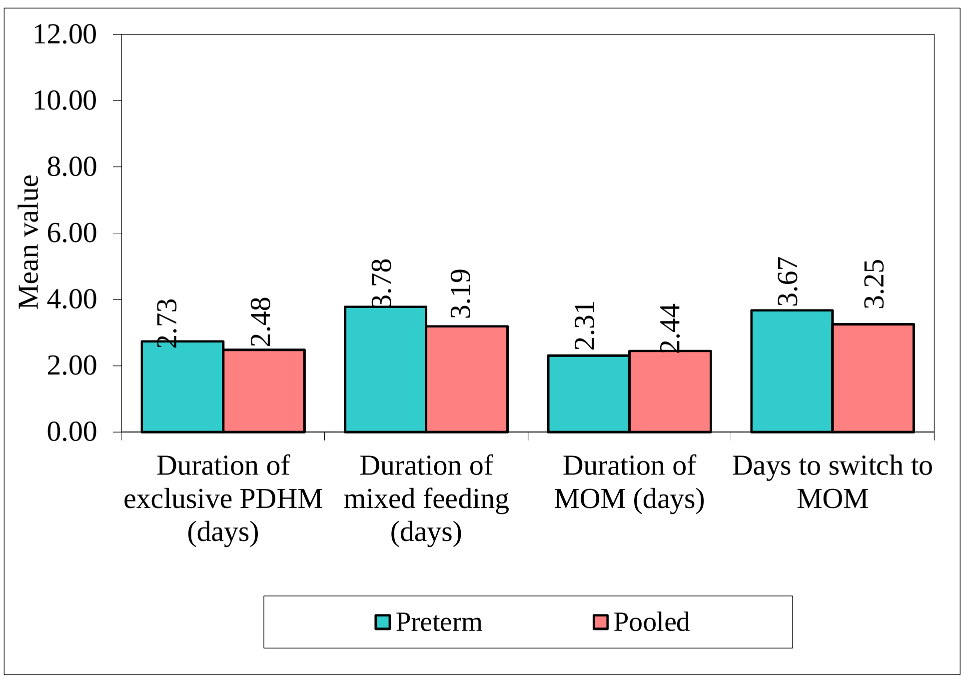
Table 13: Comparison of Mean Amount of PDHM between Unpooled and Pooled group At Different Time Points

Time points	Unpooled		Pooled		t-value	p-value
	Mean	Std.Dev.	Mean	Std.Dev.		
At enrolment	55.96	37.79	47.94	31.75	1.1375	0.2581
At discharge	61.43	48.09	60.00	61.29	0.0861	0.9318
F/U at 15 days	106.00	63.54	138.33	122.71	-0.4792	0.6446
F/U at 4 weeks	300.00	-	360.00	-	-	-
At enrolment -At discharge	13.24	59.69	17.17	61.32	-0.2171	0.8292
At enrolment -15days	92.50	56.91	101.00	112.98	-0.1373	0.8942
At enrolment -4 weeks	288.00	-	300.00	-	-	-

D .DURATION OF PDHM

The mean duration of exclusive PDHM feeding (2.73 +/- 2.61 days v/s 2.48 +/- 2.97 days, p=0.65), mixed feeding (MOM+PDHM) (3.78 +/-2.80 days v/s 3.19 +/- 2.00 days, p=0.23) ,duration of exclusive MOM feeding (2.31 +/-3.10 days v/s 2.44 +/- 3.84 days,p=0.85) and days taken to switch to MOM (3.67 +/-2.81 days v/s 3.25 +/- 2.31 days, p=0.42) between both the groups was comparable (Graph 4).

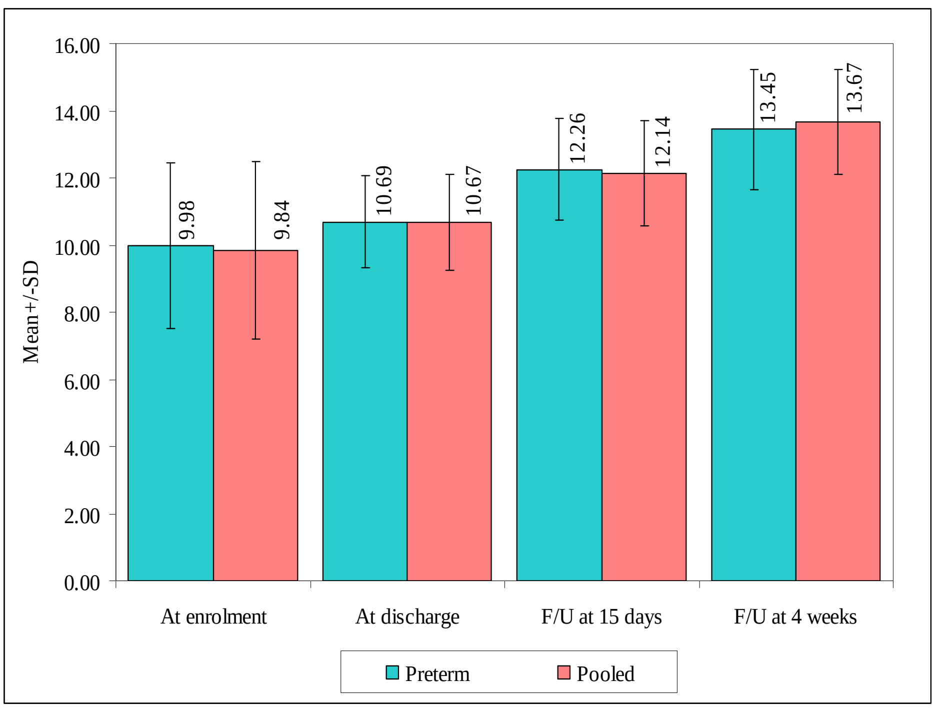
Graph 4: Comparison of Duration of PDHM between Unpooled and Pooled group



E .FREQUENCY OF FEEDING

The mean frequency of feeding in preterm infants in unpooled and pooled group across different time points was comparable. The mean frequency at enrolment was (9.98 ±2.46 feeds/day v/s 9.84±2.65 feeds/day, p= 0.84), at discharge was (10.69 ± 1.37 feeds/day to 10.67 ±1.42 feeds/ day, p=0.96), at 2 weeks was (12.26 ± 1.51 feeds/day to 12.14 ±1.56 feeds/ day, p=0.90) and at 4 weeks was (13.45 ± 1.79 feeds/day to 13.67 ±1.56 feeds/ day, p=0.69) respectively. (Graph 5).

Graph 5 : Comparison of Mean Frequency of Feeding Between Unpooled And Pooled Group



The total percentage increase in frequency of feeding from enrolment value to 4 weeks observed was significant within the groups .The difference noted was higher in pooled group (33.47% v/s 40.14%) (**p= 0.0001 vs p=0.0001**).(Table 14)

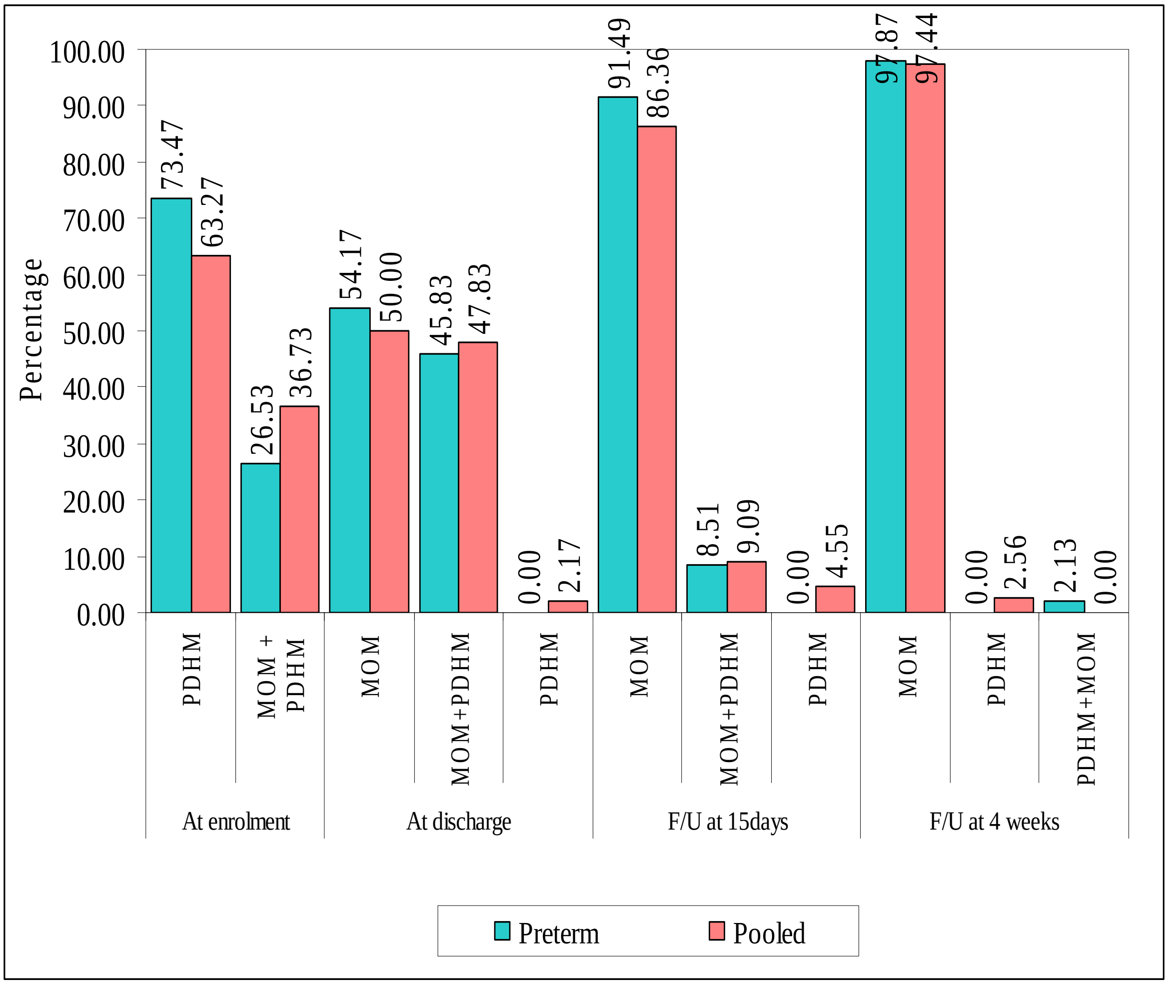
Table 14 : Comparison Of Change of Mean Frequency Of Feeding Between Unpooled And Pooled Group

Groups	Changes from At enrolment to	% of change	T-value	Z-value	P-value	Friedman's ANOVA	**P-value**
Preterm	At discharge	6.26	294.00	1.1094	0.2672	56.5747	**0.0001***
	F/U at 15 days	21.53	31.00	4.4580	0.0001*		
	F/U at 4 weeks	33.47	24.00	5.0250	0.0001*		
Pooled	At discharge	7.07	206.00	1.0845	0.2781	56.9814	**0.0001***
	F/U at 15 days	22.64	46.00	4.4060	0.0001*		
	F/U at 4 weeks	40.14	0.00	4.8599	0.0001*		

F .TYPE OF FEEDING

1) At enrolment, majority (68.37 %) of the preterm infants in the unpooled and pooled group were exclusively on PDHM (73.47 % v/s 63.27% p=0.27).
2) At discharge, majority (52.13%) were on MOM (54.17% v/s 50.00% p=0.95). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 2.17% p= 0.95).
3) At 2 weeks period , similar trends of increased MOM rates and decreasing PDHM rates were observed in both group with majority (89.01%)of preterm infants on MOM in both the groups (91.49% v/s 86.36% p=0.98). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 2% p= 0.98).
4) At 4 weeks almost all (97.67%) of preterm infants were on MOM in both the groups (97.87% v/s 97.44 % p=0.89). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 1% p= 0.89). (Graph 6). Both the groups were comparable for type of feeding at different time points.

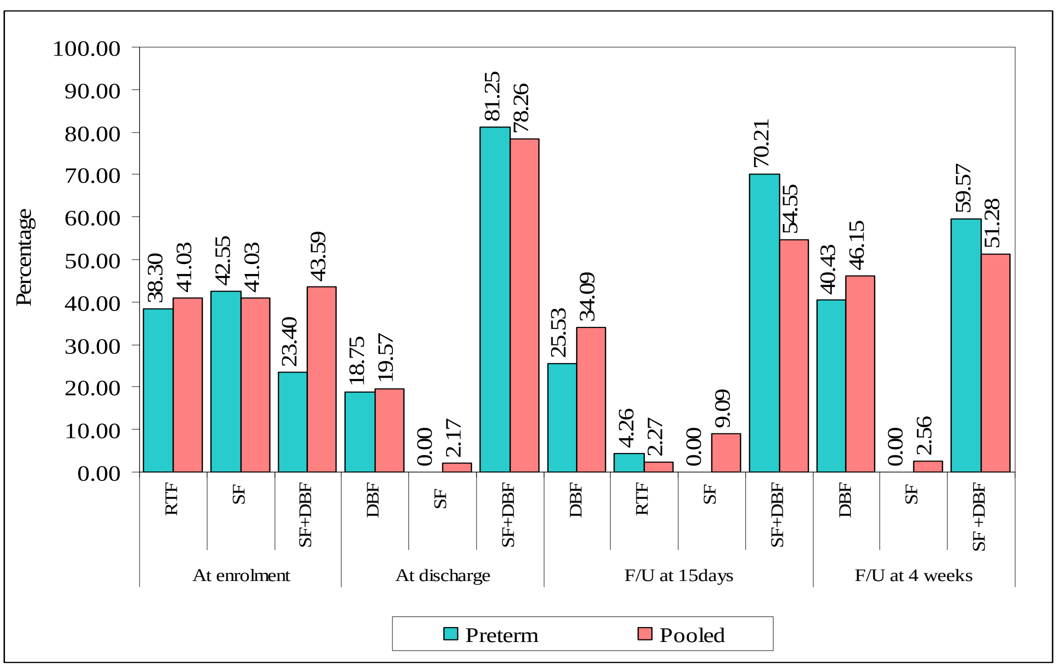
Graph 6 : Comparison of Type Of Feeding Between Unpooled And Pooled Group



G. METHOD OF FEEDING

1. At enrolment, majority (41.86%) of the preterm infants in the study were spoon feeding (42.55% v/s 41.08%p=0.39).
2. At discharge shift was noted to SF + DBF (79.79%) as method of feeding in both groups (81.25% v/s 78.26% p= 0.98). Increase in rate of exclusive DBF (19.15%) as method of feeding was noted in both groups (18.75% v/s 19.57% p=0.98)
3. Increasing trend was observed for DBF(29.67%) as method of feeding at 2 weeks follow up in both group (25.53 % v/s 34.09% p=0.29)
4. **4.** And by 4 weeks significant increase in DBF rates were observed (43.02%) (40.43 % v/s 46.15% p=0.80) overall rate of SF + DBF remained high at 55.81 % (59.57% v/s 51.28% p=0.80)(Graph 7)

Graph 7 : Comparison Of Method Of Feeding Between Unpooled And Pooled Group



VII SECONDARY OUTCOMES

A . LENGTH OF HOSPITAL STAY

In the present study the mean duration of hospital stay in both unpooled and pooled group was comparable (9.65+/-6.64 days and 9.10 +/- 6.49 days p=0.68) (Table 15)

Table 15 :Comparison of Length Of Hospital Stay Between Unpooled And Pooled Group

Parameters	Preterm		Pooled		t-value	p-value
	Mean	SD	Mean	SD		
Duration of hospital stay	9.65	6.84	9.10	6.49	0.4092	0.6833

DISCUSSION

Prematurity has been recognized as global health burden with the leading cause of under 5 mortality worldwide[1,2,4,6,7, 9,10]. Adequate nutrition is of outmost importance for ensuring the optimal growth and development especially in preterm infants[20,21,25,26,28]. Human milk with its ideal nutrient composition is known to achieve the optimal growth and development with improvement in both short term and long term outcomes in preterm infants[12,13,15,20,21,25,26,27]. Feeding difficulties and inadequate milk production by mothers delivering preterm are the two main reasons stated for sub-optimal nutrition in preterm infants and have long term growth, neurodevelopment and metabolic implications. Under these circumstances of inadequate milk production and non-availability of mothers own milk ,Pasteurized Donor Human Milk (PDHM) is recommended as the second best infant feeding option [23,34,35]. PDHM is known to confer several advantages in preterm infants[41,42,43,44,53,54,55,56,58] . However , the effect of PDHM in improving the growth outcomes in preterm infants is controversial[45,49,51,52,55,56,58,62,68,69,70,71,72,73]. Most milk banks provide pooled donor human milk (term plus preterm milk) and human milk composition is different for different gestation, which may affect the donor human milk composition and in turn may affect the growth outcomes of infants[97]. Processes like pasteurization , freezing and thawing are also known to alter the composition of human milk by acting on the lipases and other bio-active components along with macronutrients[86,87,88,89,90,91,92,93,94,95,96]. There is a lack of clear evidence with no studies to demonstrate the effect of pooled pasteurized preterm milk on the growth outcomes of infants[97]. Therefore present study was conducted to study the effect of pooled donor human milk v/s unpooled (pooling of only preterm donor milk) preterm donor human milk on the short term growth parameters of preterm infants.

General Maternal Characteristics- In the present study, maternal characteristics namely, maternal age, occupation and maternal educational status were comparable between unpooled and pooled groups.

A. **MATERNAL AGE** -The mean maternal age of the preterm infants enrolled in the our study was observed to be 24.47 years (25.10 years v/s 23.84 years, p=0.09).Several studies exploring the risk factors associated with preterm delivery from low and middle income countries have reported similar observations . In a retrospective case-control study from Yemen ,by Dahman et al, analyzing records of 591 live-born deliveries to explore risk factors associated with preterm delivery reported that the preterm delivery was common in the maternal age group of 14-25 years [138] .In an observational study from Nepal ,to evaluate the incidence, risk factors and consequences of preterm birth in Nepal, reported, 83.5% of the mother in the study were between age group of 20-35 yrs[139]. A community-based prospective cohort study of 1977 antenatal mothers from India conducted to explore different risk factors for PTB reported mean maternal age of 24.6 ± 2.5 years (48.2%),similar to our observations [140]. In a community based longitudinal study carried out in rural Mysore, Karnataka, India conducted for a period of one year March 2015- February 2016 by Rashmi et al on 257 antenatal mothers, studying risk factors associated with preterm birth reported women aged 25-29 years to have higher OR (Odd's Ratio=0.74) for preterm delivery[141]. Similar observation was reported by a single-center, observational cohort study conducted by Madore L.S et al comparing in-hospital weight gain, and neurodevelopment outcomes in preterm infants supplemented with predominantly (>50%) DBM (donor breast milk) to those fed only MOM (mother's own milk) or supplemented with predominantly (>50%) preterm formula (PF) reported the mean maternal age in the study to be around 29 years [78]. On the contrary, a recent Indian review by Devi T et al published in 2021 analyzing 9 Indian studies, studying prevalence and associated risk factors of preterm birth in India reported maternal age of <20 years and > 40years with increased risk for preterm delivery [5,11, 111,142,143].

B. **MATERNAL EDUCATION STATUS**: In our study, most of the mothers (64.29%) were educated up to secondary educational level (73.47% v/s 55.10%,p=0.15). Similar observations were reported by other Indian studies conducted to evaluate the risk factors for preterm delivery. Abhishek Gurung et al in his study of preterm birth in Nepal reported 68.1% mothers to have received secondary education[139]. A hospital based cross sectional questionnaire study assessing the knowledge and attitude of post natal lactating mothers regarding human milk banking at Yenepoya Medical College and Hospital, Karnataka, reported 52% of the mothers had received high school education[144]. However, a recent review of 9 Indian studies evaluating the prevalence and associated risk factors of preterm birth reported, mothers with low educational status mostly illiterate and primary educated to have increased risk of preterm deliveries than mothers with higher educational status[145,149,150].

C. **MATERNAL OCCUPATION** :In our study most of the mothers (97.96%) were observed to be homemakers (97.96% v/s 97.96%,p=0.00). Similar observations were reported by Dahman et al from Yemen, analyzing records of 591 live-born deliveries and studying the risk factors associated with preterm delivery, reported 95.8 % of the mothers to be homemakers [138].

Maternal Pregnancy Profile - In the present study, maternal pregnancy profile namely, gravida status and antenatal risk factor associated with preterm delivery were comparable between unpooled and pooled groups.

A. **GRAVIDA STATUS -** Most of the mothers delivering preterm infants in our study (62.24%) were primigravida (59.18% v/s 65.31 %, p=0.24). Similar observations were reported by several Indian studies. A descriptive longitudinal follow-up study of infant feeding practices in a tertiary care hospital in Karnataka, reported that most of the mothers delivering preterm infants in the study (62.24%) were primigravida[151]. A retrospective hospital based study by Ahankari et al observed that the odds of preterm delivery and LBW(low birth weight) were increased in primigravida compared to multigravida women[111].Contrary to our observations several studies have reported increased prevalence of preterm delivery in multigravida pregnant women. Bouchra Koullali et al in his retrospective study to investigate associations between parity and the risk of spontaneous preterm birth of large number of pregnant women, noted increased risk for spontaneous preterm birth in women with increase in parity [152]. Similar observation of increased risk of preterm delivery with increase in parity was reported by S J Etuk et al from Nigeria[153] .Several Indian studies have also reported similar observations [109,141].

B. **ANTENATAL RISK FACTORS -** The most common antenatal risk factor associated with preterm delivery in our study was PPROM (preterm premature rupture of membrane) with oligohydraminos (45.5% v/s 36.2% ,p=0.38) followed by severe intra-uterine growth restriction (IUGR), (32.65 % v/s 32.65 % ,p=0.38) .Similar observations of PPROM causing oligohydraminos has been reported to be significantly associated with preterm delivery by several Indian studies [108,146,147,154,155]. It is known that patients with PPROM and oligohydramnios are at increased risk of microbial invasion of the amniotic cavity causing intra-amniotic inflammation. Also rupture of membranes causes release of local inflammatory mediators and imbalance between matrix metalloproteins and chemical messengers with, increased collagenase and protease activity, ultimately causing increased intrauterine pressure and therefore preterm delivery[157,158]. Contrary to these observations few of the south Indian studies have reported PIH (pregnancy induced hypertension) as the most common antenatal risk factor causing preterm birth in India. Devi et al in a recent review of 9 Indian studies has reported PIH (21.45%) as the most common risk factor for preterm birth [5,11]. A similar observation has been reported by CR Rao et al from Karnataka in his case control study [148]. A systemic review and meta-analysis of 9 studies and total 27,119 participants, by Getaneh Mulualem et al, concluded that among the risk factors associated with preterm birth, PIH was in increasing trend and mothers with PIH were nearly 4.7 times more likely to give preterm birth than those with no PIH [156].

Baseline Birth History -In the present study, baseline birth history namely, mean gestational age, mean weight at birth, mode of delivery, Apgar score and day of enrollment were comparable, between unpooled and pooled groups except for gender.

A. **MEAN GESTATIONAL AGE**- The mean gestational age of the preterm infants in our study was 34.46 weeks (34.42 weeks in unpooled group v/s 34.51weeks in pooled group, p=0.80) and similar in both the groups. This is in contrast to majority of the studies from both Indian and International literature which have reported mean gestational age of ≤ to 32 weeks. A non inferiority randomized controlled trial conducted by Costa et al analyzing 70 preterm infants for tolerance of preterm formula versus pasteurized donor human milk in very preterm infants reported majority of infants with gestational age (GA) of ≤32 weeks [58]. A retrospective clinical audit conducted by Lloyd M et al to study growth of preterm infants fed predominantly pasteurised donor human milk v/s those fed mother's own milk also collected data from the medical records of a cohort of preterm infants with gestational age ≤ to 30 weeks [80]. Debora et al in her study, analyzing availability of donor milk for very preterm infants and risk of necrotizing enterocolitis along with growth outcomes and rates of breastfeeding also reported mean gestational age of 29.5 ± 2.3 weeks[76]. Similar observation is reported by several Indian studies. Adhisivam et al in his randomized controlled trial (RCT) study in a tertiary care teaching hospital, in south India studying the effect of fortified v/s unfortified pasteurized donor human milk on 80 healthy preterm neonates reported a mean gestational age (GA) of 31.82 weeks[77]. Rohan Sapra et al in his longitudinal observational study conducted in level III NICU (neonatal intensive care unit), of a tertiary care hospital from North Karnataka, studying feeding patterns and growth parameters in newborns receiving PDHM following discharge from hospital up to 6 months of age also reported mean GA of 35.72weeks[159]. Saurabh et al in his hospital based cross sectional study in a similar setting, studying the incidence of NEC among preterm infants receiving PDHM, reported mean gestational age between 28 week to 34 week by Modified Ballard score[160].

B. **BIRTH WEIGHT -** The mean weight at birth of the preterm infants in our study was 1797.24 gm (1824.90 gm in unpooled group v/s 1769.59 gm in pooled group, p=0.46).This is in contrast to majority of the studies as most studies analyzing the effect of feeding patterns on growth parameters, have preterm infants with mean GA < 32 weeks, and therefore mean weight of < 1500gm. A hospital based retrospective study, conducted by Kim , Eun Jeong MD et al in in Korea, between January 2011 and December 2016 studying the effects of exclusive donor human milk feeding on morbidity and growth of preterm infants during hospitalization reviewed 132 infants with birth weights (BWs) <1500 g and gestational ages (GAs) of less than 32 weeks [52]. Another retrospective cohort study conducted by Ahreen Allana et al in Kings County Hospital Center (KCHC) in Brooklyn, New York, over four years, two years before and two years after the introduction of donor human milk analyzing use of donor human milk in preterm, very-low-birth-weight (VLBW) infants for the rates of necrotizing enterocolitis, duration of parenteral nutrition (PN), growth, culture-positive sepsis,length of hospital stay, and mortality, analyzed 190 infants with a birth weight of less than 1500 g [161]. Similar observations were also reported by several Indian studies[77,159,160] .

C. **MODE OF DELIVERY**- In the study the most common mode of delivery observed was LSCS (lower segment caesarian section) (62.24%) (63.27 % v/s 61.22 %,p=0.83) which is similar to observations noted by others. A retrospective analysis from a large tertiary referral center from Australia, to evaluate the effect of mode of delivery on neonatal outcome among preterm infants in different birth weight categories reported higher incidence of LSCS and better outcomes with LSCS in AGA (appropriate for gestational age) preterm infants[162]. A case control study from Iran reported the odds ratio of preterm delivery in women with a history previous C-section delivery increased by 2.09 folds[163]. Similar observations of majority of preterm deliveries by LSCS (67%) is also reported by an Indian study[164].

It is known that the rate of cesarean section is significantly higher in the preterm period, as several criteria must be ensured to enable vaginal delivery for preterm infants namely regular labor contractions, intrapartum fetal cardiotocography without pathological features, absence of congenital fetal anomalies , appropriate neonatal birth weight, etc. to name a few along with nil maternal comorbidities[162]. The higher rate of LSCS in our study can be attributed to the referral of high-risk antenatal cases with complications to our hospital since it is a tertiary care facility and increased occurrence of complications in preterm delivery in our study.

D. **GENDER OF THE PRETERM INFANT-** Majority (51.02%) of preterm infants in the study were males. However a significant difference was observed in gender in between the two groups (p=0.04). Majority of preterm infants in unpooled group were females (59.18 %) and in pooled group were males (61.22%). This is similar to the study by Hassan N. et al in 2019, conducted to outline the morbidity and mortality pattern of preterm infants admitted to NICU of a tertiary care center in Western Uttar Pradesh (UP) and reported that, 74.5% of neonates were boys [164].Similar observation was reported by Saurabh et al in his study in the Indian setting (56.11%) analyzing effect of PDHM on incidence of NEC [160]. Costa et al, Sisk et al, also reported similar observation of male gender preponderance in their respective studies [50,58].

E. **APGAR SCORE -** In our study the mean APGAR score at birth of the preterm infants was 7.92 and was similar between both the groups (7.96 v/s 7.88,p=0.43) This was in accordance with, a population based cohort study from Norway by D Mosteret al which aimed at analyzing the combination of a low five minute Apgar score and symptoms of neonatal encephalopathy with minor impairments at school age reported 75% of the neonates with Apgar scores of 7-10[165]. Similar observation was reported by a hospital based retrospective study, conducted by Kim, Eun Jeong MD et al in in Korea, studying the effects of exclusive donor human milk feeding on morbidity and growth of preterm infants during hospitalization and reported mean Apgar score of 7.1 +/- 1.4 [52]. The higher Apgar scoring in our study could be because, majority of the preterm infants in our study were stable preterm infants belonging to mean gestational age of 34.4.weeks and mean birth weight of 1797.24gm with no associated co-morbidities.

F. **DAY AT ENROLLMENT**

In the present study, we observed that majority (62.24%) of the preterm infants were enrolled at day one of life (61.22% in unpooled group v/s 63.27% in pooled group, p=0.71). This observation is similar to another Indian study conducted by Rohan Sapra et al in North Karnataka.

G. **INDICATION FOR NICU ADMISSION**

In the study, the most common indication for admission to NICU was low birth weight (98.98%) (100% v/s 97%) followed by kangaroo mother care (81.63%) (77.55% v/s 80 %). This is similar to observation reported by a hospital based, cross- sectional descriptive study by Khasawneh et al conducted in Jordan between September 2016 and September 2018 analyzing a total of 1444 infants which reported 39 % of the preterm infants admitted to NICU was because of LBW [166]. Similar observation was reported in an Indian study by Dayanithi et al determining prevalence of LBW and premature births and their associated maternal factors [167].Other south Indian studies by Rohan et al and Saurabh et al also reported similar observation.

Feeding Profile

A. **AMOUNT OF FEEDING** – In the study the total amount of PDHM consumed in both groups was high. The total amount of PDHM (421.45 +/- 360.79 litre v/s 373.59 +/- 292.25 litres) (p=0.47) and the mean amount of PDHM consumed by preterm infants across different time points between both groups were comparable. At enrollment (55.96 +/- 37.79 litre v/s 47.94 +/- 31.75 litres p=0.25), at discharge (61.43 +/- 48.09 litre v/s 60.00 +/- 61.29 litres p=0.93), at 2 weeks (106.00 +/- 63.54 litre v/s 138.33 +/- 122.71 p=0.64) and at 4weeks (300 litre v/s 360 litres). However majority of the studies report lesser volumes of PDHM utilization by preterm infants. A mono-centric randomized non-inferiorty controlled trial conducted by Costa et al between January 2015 to August 2015 assessing tolerance of preterm formula versus PDHM in very preterm infants reported the amount of PDHM consumed to be (52.8+/- 37.5

ml/kg /day) in PDHM group[58].Lloyd M et al , also conducted a retrospective clinical audit in , Australia between 1 January 2012 and13 April 2013, to study growth of preterm infants fed predominantly pasteurised donor human milk v/s. those fed mother's own milk in the neonatal intensive care unit, and reported total milk intake for the PDHM group to be (196·4 ml +/- 9·95 ml) compared with that of the MOM group (183·1ml +/- 12·01ml, P=0·391) which is in contrast to our study[80].

Majority of our babies enrolled in our study were stable preterm infants with mean gestational age of 34.4 weeks and mean weight of 1797.24gm and therefore the consumption of PDHM is more compared to other studies which have preterm infants belonging to GA ≤ to 32 weeks and birth weight of less than 1500gm.

B. **DURATION OF FEEDING-** In our study the mean duration of feedings namely exclusive PDHM feeding (2.73 +/- 2.61 days v/s 2.48 +/- 2.97 days, p=0.65), mixed feeding (MOM+PDHM) (3.78 +/-2.80 days v/s 3.19 +/- 2.00 days, p=0.23), duration of exclusive MOM feeding (2.31 +/-3.10 days v/s 2.44 +/- 3.84 days, p=0.85) and days taken to switch to MOM (3.67 +/-2.81 days v/s 3.25 +/- 2.31 days, p=0.42) were comparable between both the groups. This is in contrast to several studies reporting mean duration of PDHM feeding ≥ to 5 days. A hospital based retrospective cohort study conducted by Melesa et al in in Euthopia from August 2018 to 2019, to determine time taken to reach full enteral feeding among low-birth-weight neonates reported the median time to achieve full enteral feeding as 8 days [170]. Similar observation has been reported in many European studies with mean duration of PDHM feeding ranging between 8.5 -10.5 days [168,169]. A randomized controlled trial (RCT) conducted in a tertiary care teaching hospital, in south India in 2018 by Adhisivam et al to study the effect of fortified v/s unfortified pasteurized donor human milk on 80 healthy preterm neonates for incidence of NEC ,sepsis, mortality,duration of hospital stay, and time taken to reach full enteral feeds and growth outcomes, reported mean duration of PDHM feeding of 8.5 ±5.1 days[77]. Several other Indian studies have also reported similar observation [159,160].

The shorter duration of PDHM feeding of preterm infants in our study is due to inclusion of stable, preterm, SGA babies with adequate gestation and baseline weight measurements. Suck and swallow reflexes are well established by 34 weeks therefore leading to early switching over to mother`s milk (3.67 +/-2.81 days in unpooled group and 3.25 +/- 2.31 days in pooled group respectively) which could also explain the reason for shorter duration of PDHM feeding.

C. **TYPE OF FEEDING -** In our study the type of feeding in preterm infants in both the group across different time points was comparable. At enrollment, majority (68.37 %) of the preterm infants in both the groups were exclusively on PDHM (73.47 % v/s 63.27% p=0.27). At discharge, the rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 2.17% p= 0.95) and majority (52.13%) were on MOM (mother's own milk) (54.17% v/s 50.00% p=0.95) .And by the end of 4 weeks almost all (97.67%) of preterm infants were on MOM in both the groups (97.87% v/s 97.44 % p=0.89). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 1% p= 0.89). Similar observation has been reported by a population based cohort by Agata Kantorowska et al studying the impact of donor human milk availability on breast milk use and NEC (nectrotisig enterocolitis) rates from 2007 to 2013 in California and has reported 10% increase in breast milk feeding at NICU discharge [171]. This is in contrast to Williams et al who conducted a systematic literature review of studies in October 2014 that assessed maternal breastfeeding rates before and after the introduction of DHM and found that presence of a human milk bank (HMB) and the usage of PDHM in NICU and reported a significant decrease in the percentage of feeds that were MOM after the introduction of DHM.

Most of the mothers of preterm infants are unable to provide adequate milk to meet the nutritional needs of their infants in the initial days[14,15,16,17,19]. Recent studies have shown that, delayed lactogenesis II is common in mothers of preterm babies [30,32,33]. Delay in the onset of lactogenesis II will lead to decreased volume of milk expression by preterm mothers and therefore more chances of PDHM feeding during the initial days.[17,29, 30,31,32,33]This delay in lactogenesis gets corrected by 1-2 weeks and therefore increased rates of DBF by discharge and follow up. Another reason for the above observation is LCSC(Lower segment cesarian section) is associated with decrease in let down reflex and therefore delay in breast milk expression. The initial separation of preterm infants from their mothers during NICU stay causes no proper activation of let down reflex and is also one reason, for PDHM feeding rates high on admission which is eventually taken over by MOM by discharge and follow up as these factors are mitigated.

D. **METHOD OF FEEDING -** In our study the method of feeding in preterm infants in both the group across different time points was comparable.At enrollment , majority (41.86%) of the preterm infants in the study were on SF (spoon feeds) (42.55% v/s 41.08%p=0.39%) .At discharge shift was noted to SF + DBF(direct breast feeding) (79.79%) as method of feeding in both groups(81.25% v/s 78.26% p= 0.98). Increase in rate of exclusive DBF (19.15%) as method of feeding was noted in both groups (18.75% v/s 19.57% p=0.98).At 2 weeks follow up increasing trend was observed for DBF(29.67%) as method of feeding in both group (25.53 % v/s 34.09% p=0.29).And by 4 weeks significant increase in DBF rates was observed (43.02%) (40.43 % v/s 46.15% p=0.80) though overall rate of SF + DBF remained high at 55.81 % (59.57% v/s 51.28% p=0.80). Similar trend of increase in BF rates by discharge was observed in studies by Bramer et al and Underwood et al [20,172]. Torres et al in his study on preterm infants with weight of < or = 1500 g or GA< 32 weeks gestation, analyzing BF rates before and after the opening of the human milk bank, reported ,that opening a milk bank did not reduce EBF rates at discharge[175].An Indian study by Adhisivam et al also reported an improvement in breastfeeding rates after opening of milk bank at 6months from 34% to 74% [77].

Most of the infants in our study were on SF at enrolment, which later changed to DBF. This is due to inclusion of stable, preterm infants in our study with mean gestational age of 34.4 weeks. Although sucking and swallowing activities are present by 28 weeks intra-partum , the coordination does not develop fully until about 32 to 34 weeks and therefore preterm infants born at less than 32 weeks gestation, cannot sustain full oral feeds. Since majority of the preterm infants in our study belonged to gestational age of 34 weeks, SF was started. WHO also recommends starting SF as it helps in reaching full enteral feeds faster and early hospital discharge when compared to RT feeding[1].

It was also observed that type of feeding at following visits had significant correlation with method of feeding at each visit as, DBF rates increased as MOM was available.

Also PDHM availability promotes a breastfeeding - friendly environment which boost breastfeeding rates and therefore higher rates of DBF at discharge and follow up visits.

FREQUENCY OF FEEDING- In our study the mean frequency of feeding in preterm infants in both the group across different time points were comparable. At enrolment (9.98 ±2.46 feeds/day in v/s 9.84±2.65 feeds/day ,p= 0.84).At discharge (10.69 ± 1.37 feeds/day to 10.67 ±1.42 feeds/ day, p=0.96). At 2 weeks (12.26 ± 1.51 feeds/day to 12.14 ±1.56 feeds/ day, p=0.90) .At 4 weeks (13.45 ± 1.79 feeds/day to 13.67 ±1.56 feeds/ day, p=0.69). Increase in frequency of feeding was observed during follow up visits.This is in contrast to a randomized clinical trial conducted by Hussain et al in VLBW (very low birth weight) neonates in evaluating and comparing volume advancement v/s frequency advancement as feeding methods in VLBW infants and reported decrease in frequency of feeds after discharge from hospital [174]. Kumar et al in a recent systemic review and meta-analysis of 6 RCTs in PGI,Chandigarh studying effect of three-hourly versus two-hourly feeding interval in stable preterm infants also reported three hourly interval to be a safer option [173]. The possible explanation of increased feeding frequency at discharge and subsequent follow ups in our study is because, our NICU is associated with Human Milk Bank with proper lactation management counsellors which has affected the feeding frequency in our study both at discharge and at follow up. Also majority of the infants in our study at discharge and follow up visits at 2 weeks and 4 weeks were on DBF +SF causing combined frequency rates to be high in our study. Also since this study is largely based on preterm infants, and a short interval (1–2 hour) feeding schedule delivers smaller volume per feed and is therefore easy tolerated by preterm infants.

LENGTH OF HOSPITAL STAY - In our study the mean duration of hospital stay in both groups was comparable (9.65+/-6.64 days and 9.10 +/- 6.49 days p=0.68).The average length of hospital stay ranged between 3 days to 15 days. This is similar to observation seen in a systematic review and meta-analysis conducted by Rui Yang et al studying the effect of donor human milk on the length of hospital stay in very low birth weight infants in 2020 analyzing 136 articles which reported, that meta-analysis of eight observational studies showed significant reduction in length of hospital stay for infants receiving DHM (donor human milk) (− 11.72 days; 95% CI -22.07,-1.37 days; $p = 0.03$).This is in contrast to mono-centric randomized non-inferiority controlled trial conducted by Costa et al assessing tolerance of preterm formula versus PDHM in very preterm infants with gestational age (GA) of ≤32 weeks which reported an average length of hospital stay for infants to be 37.5+/-17.5 days[58] . The possible explanation for this observation in our study is because of enrollment of stable, preterm babies with mean gestational age of 34 weeks requiring shorter duration of PDHM feeding. Also early switching over to mother`s milk (3.67 +/-2.81 days in unpooled group and 3.25 +/- 2.31 days in pooled group respectively) and increased rate of EBF at discharge is also one reason for early discharge from NICU .Also PDHM is known to confer several advantages in preterm infants with decreased risk of comorbidities like LOS , NEC, BPD , IVH etc. leading to decreased rate of hospital acquired infections and therefore shorter in-hospital stay[41- 47,50,55,56,58].

Primary Outcomes

The growth parameters of preterm infants in our study , namely mean weight, length , head-circumference, mid upper arm circumference did not show significant difference between the unpooled (exclusive pooled preterm milk) and pooled group (pooled milk of both preterm and term) following discharge from hospital up to 4 weeks of age. However the total percentage increase in growth parameters namely mean weight, length, head circumference and mid upper arm circumference from the baseline value at enrolment to 4 weeks observed was significant within the groups. Our observations infer that PDHM had a positive effect on the growth parameters irrespective whether exclusive preterm pooled milk was given or pooled milk(both term and preterm milk combined) was given .

A recent Cochrane review by Dempsey et al in 2019 analyzing all the available RCTs related to growth effects in VLBW babies receiving banked donor preterm milk v/s banked donor term milk found no studies to demonstrate the effect of exclusive pooled preterm PDHM on growth outcomes in preterm infants[97]. The limitation stated in the Cochrane review for conduct of such studies was decreased breast milk production in mothers delivering preterm. We did not encounter this limitation in our study, and therefore this study is first and one of its kind and therefore we found no studies to compare with our results.

However majority of the studies reported in the literature studying the effect of PDHM on the growth outcomes of preterm infants have shown controversial results.

Very few studies have reported similar observation of improved growth outcomes in neonates receiving PDHM when compared to either MOM or PF (preterm formula) at discharge and at follow up visit . A recent longitudinal observational study conducted by Rohan Sapra et al in level III NICU of a tertiary care hospital situated in North Karnataka, between January 2020 to December 2021 studying feeding patterns and growth parameters in 70 newborns receiving PDHM feeding following discharge from hospital up to 6 months of age, reported improvement in all growth parameters including weight, length , head circumference and mid upper arm circumference in neonates receiving PDHM by the time of discharge up to 6 months of age, implying PDHM has a positive impact on early and late postnatal growth[159].

Another Indian cross sectional study by Saurabh et al based in similar setting , studying the incidence of NEC along with secondary outcomes as growth parameters among 221 preterm infants receiving PDHM , reported significant increase in weight(4.61%), height(3.15%), and head circumference (4.07%) at discharge ($p<0.001$)[160].

However majority of the studies conducted to show the effect of PDHM on growth outcomes in preterm infants when compared to MOM or PF have noted no difference in improvement of growth outcomes either short term or long term.

Several studies have compared PDHM with MOM to analyze the advantages of PDHM on various parameters in preterm infants. A retrospective analysis of 550 VLBW infants by R Chowning et al for the effect of human donor milk on prevention of necrotizing enterocolitis and postnatal growth outcomes reported slower growth rates in weight and head-circumference at discharge following introduction of DHM [49].A retrospective study, conducted by Kim, Eun Jeong MD et al in neonatal intensive care unit (NICU) of a hospital in Korea, studying the effects of exclusive donor human milk feeding on morbidity and growth outcomes of preterm infants during hospitalization reviewed 132 VLBW infants and reported ,that DHM group demonstrated a comparatively lower rate of weight gain, head circumference increment, and height increment from birth to the age at which an enteral feeding volume of 130 mL/kg/d was achieved. However there were no significant difference noted in these values at 36 weeks postmenstrual age between both groups[177]. A retrospective clinical audit conducted by Lloyd M et al, to study growth of preterm infants fed predominantly pasteurised donor human milk v/s. those fed mother's own milk in preterm infants (≤30 weeks gestational age) receiving either ≥28 d of PDHM (n 53) or ≥28 d of their mother's own milk (MOM, n 43) with standard fortification observed transient slow growth in PDHM group but evident catch-up growth by discharge. By 3 months of age no difference was observed in between the two groups[80].

A retrospective case control study conducted in 2012 by Giulliani F et al, to study and evaluate short term advantages of MOM as a sole diet compared to donor milk as a sole diet , in terms of growth, anti-infectious properties, feeding tolerance, NEC, and ROP prevention in a population of VLBW infants born in a tertiary care center reported , no significant difference in clinical outcomes for infants belonging to MOM group compared with PDHM group. Only a slight but not statistical significant difference in growth was observed in favor of maternal milk[130].

An observational study analyzing longitudinal growth outcomes and morbidities in 90 extremely preterm infants born between 2013-2015 in , Sweden by Lund et al comparing mother's milk v/s pasteurized donor human milk consumption reported that unpasteurized mother's milk correlated positively with almost all z-scores for weight, length, head circumference at postnatal age of 28days and at PMA at 32 and 36 weeks .Infants consuming > 80% of MOM had more favorable z scores at PMA at 32 and 36 weeks [119].

Studies comparing PDHM with PF (preterm formula) have reported better growth parameters with PF in preterm babies than PDHM. A randomized control trial from a NICU from Texas comparing donor milk v/s preterm formula as substitute for MOM found the rates of weight gain to be higher in PF group infants as against DHM group at discharge [51]. A randomized multicenter study by Lucas et al , conducted on 502 preterm infants admitted in NICU in Cambridge, to study effect of human milk v/s formula milk for development outcomes in preterm infants reported, babies fed on preterm formula gained weight and head circumference significantly faster than those fed on banked breast milk [59].A single-center retrospective study conducted by Brownell et al in 4 urban level NICUs, aimed at analyzing dose-response relationship between donor human milk, mother's own milk, preterm formula, and neonatal growth outcomes analyzed 314 infants records and reported that adjusted mean growth velocity for weight significantly decreased by 0.17g/ kg−1 / day for every 10% increase in DHM intake, but did not vary with PF intake in neonates[73].

A prospective cohort conducted from August 2017 to October 2019 in a large neonatal intensive care unit in China by Fang L et al ,analyzing the effects of preterm donor milk (DM) on growth, feeding tolerance, and severe morbidity in very-low-birth-weight infants, analyzed 304 preterm infants weighing <1,500 g or of gestational age <32 weeks and reported no difference in daily weight gain and weekly head growth of VLBW in both PF and PDHM group concluding preterm DHM does not affect the growth of VLBW infants[41]. A systemic review conducted by Quigley M et al in 2018, analyzed 11 completed trials uptil June 2017 studying the effect of formula feeding v/s donor breast milk on growth and development in preterm or low birth weight (LBW) infants and reported formula-fed infants to have higher in-hospital rates of weight gain ,linear growth and head growth as compared to PDHM [71].

A retrospective cohort study by Sisk et al in North Carolina also reported no differences in growth metrics from birth to hospital discharge in preterm infants fed predominantly maternal milk, pasteurized donor milk, or preterm formula[50].A mono-centric randomized controlled non-inferiority trial conducted by Costa et al assessing tolerance of preterm formula versus PDHM in very preterm infants analysed 75 eligible preterm infants , and reported infants in PF group regained birth weight faster by 2 days than PDHM group[58].

A retrospective cohort conducted by Hoban et al in urban level III NICU in Chicago in two time periods: A “pre-DM” group using preterm infant formula as a supplement to MOM, and a “DM” group that supplemented MOM with pasteurized DM instead of formula between January 2011 and December 2012 analyzing 321 VLBW for anthropometric data at six time points from birth to 20–24 months corrected age in VLBW infants showed higher formula proportion was associated with slower rates of decline in short-term growth trajectories for weight and length. Though z-scores for weight and length decreased during hospitalization for DM group but it increased for all parameters including head circumference post-discharge and therefore DM can be used in early post-birth period to mitigate potential risk from formula without compromising long-term growth[72].

A retrospective study, conducted by Kim L Chung et al in China reviewing 132 infants of birth weights (BWs)<1500g and gestational ages (GAs) of less than 32 weeks studying the effects of exclusive donor human milk feeding in a short period after birth on morbidity and growth of preterm infants during hospitalization reported lower values of weight, head circumference and height in PDHM group as compared to PF group on achieving full enteral feeding of 130ml/kg but showed similar growth results at 36 weeks PMA [52].

A randomized controlled trial (RCT) conducted in a tertiary care teaching hospital, in south India in 2018 by Adhisivam et al to study the effect of fortified v/s unfortified pasteurized donor human milk on 80 healthy preterm neonates followed up for 28 days or discharge primary outcome measurement as incidence of NEC and the secondary outcomes measurements as severity of NEC, incidence of sepsis, mortality, duration of hospital stay, number of days to reach full enteral feeds and weight gain and increase in head circumference, reported no significant difference in growth parameters like weight gain and increase in head circumference among neonates in the fortified versus the unfortified group[77].

However the results in our study demonstrate better growth outcomes within the groups with PDHM feeding irrespective of exclusive preterm PDHM feeding or Pooled (term and preterm) PDHM feeding. This could be because majority of the studies showing no effect on growth outcomes with PDHM milk did not analyze growth outcomes as primary outcomes for their study. Also many factors like gestational age and amount of PDHM influence growth outcomes with PDHM feeding.

<u>GESTATIONAL AGE</u> - Better growth outcomes observed for preterm infants in our study with PDHM feeding is likely because the mean gestational age of the preterm infants in our study was 34.46 weeks that is late preterm as against majority of the studies with GA (gestational age) ≤ 30 weeks . GA is independently associated with some growth outcomes. Infants with higher GA experienced more normal short-term growth, likely due to a less challenging clinical course and lower nutritional requirements than infants with lower GAs and birth weights.

<u>DOSE OF PASTEURIZED DONOR HUMAN MILK</u> - Better growth outcomes observed for preterm infants in our study with PDHM feeding is likely because the total amount of PDHM consumed in both group was high as against majority of the studies reported. Majority of our babies enrolled in our study were stable preterm infants with mean gestational age of 34.46 weeks and mean weight of 1797.24gm and therefore the consumption of PDHM is more compared to other studies which have preterm infants belonging to GA ≤ to 32 weeks and birth weight of less than 1500gm.This is because consumption of human milk is correlated positively with fat free mass deposition in late preterm infants which ultimately leads to improved metabolic and neurodevelopment outcomes[120].A recent review by Jacopa Cerasani et al in 2020, studying human milk feeding and preterm infant's growth and body composition, reported a broader reduction in the weight z scores from birth to discharge in group receiving >75% human milk as compared to those receiving < than 75% [120]. Similar observation was reported by Piemontese et al in his study in Milan, who observed higher percentage of lean mass deposition at term corrected gestational age (CGA) in very low birth weight (VLBW)infants fed with human milk at more than equal to 50% of total milk volume as compared to VLBW infants fed with human milk at less than 50% of total milk volume[122].

STRENGTHS OF THE STUDY

The strength of the study is its study design and adequate sample size .This is the first study to assess the effect of exclusive preterm PDHM v/s Pooled PDHM on short term growth parameters in preterm infants in Indian settings.

LIMITATIONS OF THE STUDY

The limitations of this study is that it is a single center study and with no long term follow up of the preterm infants, which was beyond the scope of the study.

RECOMMENDATIONS

Multicentric studies with larger sample size and long term follow up to study the effect of exclusive preterm pasteurized donor human milk on growth and developmental outcomes of preterm infants is recommended.

CONCLUSION OF THE STUDY

This randomized controlled trial (RCT) was conducted among preterm infants receiving pasteurized donor human milk (PDHM) from December 2021 to August 2022. The present study showed no difference when comparing short term growth parameters (weight, length, head-circumference, mid-upper arm circumference) of preterm infants receiving pooled pasteurized donor human milk versus unpooled pasteurized preterm donor human milk. However, significant difference was noted for various growth parameters (weight, length, head-circumference, mid-upper arm circumference) within the group suggesting that pasteurized donor human milk (PDHM) promotes short term growth parameters in preterm infants but not with exclusive preterm PDHM. Multicenteric, large sample size RCT studies for longer duration are recommended to the confirm the findings of our study.

SUMMARY

The Randomized Control Trial was conducted from December 2021 to August 2022 in the Neonatal Intensive Care Unit of Department of Pediatrics, KLES Dr.Prabhakar Kore hospital and Medical Research Centre, attached to Jawaharlal Nehru Medical College, Belagavi. During the study period a total of 346 neonates admitted in NICU were screened. Out of these 134 were preterm infants, of which 101 received PDHM. Of the 101 preterm infants who received PDHM, 3 preterm infants were excluded from the study and a total of 98 preterm infants were enrolled (49 in each group) and were analyzed in the study. Of the 49 analysed in the pooled PDHM group, 46 preterm infants survived, and 3 deaths were noted. Of the 46 survivors, 2 preterm infants were lost to follow up at 2 weeks and 7 were lost to follow up at 4 weeks. Of the 49 analyzed in the unpooled PHDM group, 48 preterm infants survived, and 1 death was noted. Of the 48 survivors, 1 preterm infant was lost to follow up at 2weeks and 1 was lost to follow up at 4 weeks. The data was analyzed and the important findings of the study are summarized as below.

1. In the present study, maternal characteristics namely maternal age, maternal education and maternal occupation were comparable between both the groups.

   Mean maternal age observed was 24.47 years (25.10 years v/s 23.84 years, p=0.09). Most of the mothers (64.29%) were educated up to secondary level (73.47%v/s55.10%, p=0.15) and were homemakers (97.96% v/s 97.96%,p=0.00).
2. Maternal pregnancy profile and antenatal risk factors associated with preterm delivery were comparable between both the groups.

   Most of the mothers in the study (62.24%) were primigravida (59.18% v/s 65.31 %, p=0.24) and the most common antenatal risk factor associated with preterm delivery was PPROM (40.50 %) (45.5% v/s 36.2%) followed by severe intra-uterine growth restriction (IUGR), (32.65 % v/s 32.65 % ,p=0.38).

3. Birth history namely, mean gestational age, mean weight at birth, mode of delivery, Apgar score and day of enrollment were comparable between both the groups except for gender which showed significant variation. Mean gestational age of the preterm infants in the study was 34.46 weeks (34.42 weeks v/s 34.51weeks, p=0.80). The mean weight at birth was 1797.24 gm (1824.90 gm v/s 1769.59 gm, p=0.46). The most common mode of delivery observed was C-section (62.24%) (63.27 % v/s 61.22 %, p=0.83). The mean APGAR score at birth of the preterm infants was 7.92 (7.96 v/s 7.88, p=0.43). The mean day of enrollment was 1.622 (1.714days v/s 1.531) (p=0.71).
4. Majority (51.02%) of preterm infants in the study were males. However a significant difference was observed in gender between the two groups (p=0.04). Most of preterm infants in unpooled group were females (59.18 %) and in pooled group were males (61.22%).
5. Indications for NICU admission were comparable between both the groups. The most common indication for admission of preterm infants to Neonatal Intensive Care Unit was Low Birth Weight (98.98%) (100% v/s 97%) followed by Kangaroo Mother Care (81.63%)(77.55% v/s 80 %).
6. In the study, the total percentage increase in mean weight from the weight at enrolment till end of 4 weeks was observed to be significant within the two groups. The difference noted was higher in Unpooled group (30.47% v/s 26.14%) (**p= 0.0001 v/s p=0.0001**), however increase in mean weight at different time points and across total length of hospital stay and 4 weeks follow up between the two groups was not significant.

a) From enrolment to Discharge (-30.83gm v/s 333.04gm, p= 0.32)

b) From enrolment to 2 weeks follow up (147.45gm v/s 135.00gm , p=0.66)

c) From enrollment to 4 weeks follow up (546.60gm v/s 454.49gm , p=0.14)

7. In the study the total percentage increase in mean length from length at enrollment till end of 4 weeks was observed to be significant within the groups. The difference noted was higher in Pooled group (4.36 % v/s 3.45%)(**p=0.001 vs p=0.001**), however increase in mean length at different time points and across total length of hospital stay and 4 weeks follow up between the two groups was not significant.

a) From enrolment to Discharge (0.37 cm v/s 0.33cm , p=0.70)

b) From enrolment to 2 weeks follow up (0.95cm v/s 0.97cm , p=0.84)

c) From enrollment to 4 weeks follow up (1.54cm v/s 1.95cm , p=0.23)

8. In the study , the total percentage increase in mean head circumference from mean head circumference at enrolment till end of 4 weeks was observed to be significant within the group .The difference noted was higher in Pooled group (5.91 % vs 5.76 %)(**p=0.0001 vs p=0.0001**), however increase in mean head circumference at different time points and across total length of hospital stay and 4 weeks follow up between the two groups was not significant.

a) From enrolment to Discharge (0.28cm v/s 0.35cm , p=0.51)

b) From enrolment to 2 weeks follow up (0.88 cm v/s 0.99cm ,p=0.17)

c) From enrollment to 4 weeks follow up (1.79cm v/s 1.85cm , p=0.55)

9. In the study, the total percentage increase in mean mid upper arm circumference from mean mid upper arm circumference at enrolment till the end of 4 weeks was observed to be significant within the groups .The difference noted was higher in Unpooled group (4.11 % vs 3.42 %) (**p=0.0001**

vs p=0.0001) , however increase in mid upper arm circumference at different time points and across total length of hospital stay and 4 weeks follow up between the two groups was not significant.

a) From enrolment to Discharge (0.03cm v/s 0.02cm , p=0.68)

b) From enrolment to 2 weeks follow up (0.15cm v/s 0.15cm , p=0.98)

c) From enrollment to 4 weeks follow up (0.31cm v/s 0.26cm , p=0.35)

10. Indication for starting PDHM was comparable between both the groups. The major indication for starting PDHM in preterm infants was decreased breast milk secretions in the mother's delivering preterm infants 90.82 % (93.88% v/s 87.76%),followed by poor maternal health status 19.39 %(16.33 % v/s 22.45%).

11. The total amount of PDHM consumed in both group was comparable (421.45 +/- 360.79 litre v/s 373.59 +/- 292.25 litres) (p=0.47).The mean amount of PDHM consumed by preterm infants across different time points between both groups was comparable. The total amount of PDHM consumed from enrolment till end of 4 weeks was higher in Pooled group (360 litres v/s 300 litres).

a) At enrollment (55.96 +/- 37.79 litre v/s 47.94 +/- 31.75 litres p=0.25),

b) At discharge (61.43 +/- 48.09 litre v/s 60.00 +/- 61.29 litres p=0.93),

c) At 2 weeks (106.00 +/- 63.54 litre v/s 138.33 +/- 122.71 p=0.64) and

d) At 4weeks (300 litre v/s 360 litres).

12. In the study the mean duration of feedings namely exclusive PDHM feeding (2.73 +/- 2.61 days v/s 2.48 +/- 2.97 days, p=0.65), mixed feeding (MOM+PDHM) (3.78 +/-2.80 days v/s 3.19 +/- 2.00 days, p=0.23) ,duration of exclusive MOM feeding (2.31 +/-3.10 days v/s 2.44 +/- 3.84 days , p=0.85) and days taken to switch to MOM (3.67 +/-2.81 days v/s 3.25 +/- 2.31 days, p=0.42) were comparable between both the groups.

13. In the study the mean frequency of feeding in preterm infants in both the group across different time points was comparable.

a) At enrollment (9.98 ±2.46 feeds/day in vs 9.84±2.65 feeds/day ,p= 0.84),

b) At discharge (10.69 ± 1.37 feeds/day to 10.67 ±1.42 feeds/ day, p=0.96),

c) At 2 weeks(12.26 ± 1.51 feeds/day to 12.14 ±1.56 feeds/ day, p=0.90)

d) At 4 weeks(13.45 ± 1.79 feeds/day to 13.67 ±1.56 feeds/ day, p=0.69)

14. In the study the type of feeding in preterm infants in both the group across different time points was comparable.

a) At enrolment, majority (68.37 %) of the preterm infants in both the groups were exclusively on PDHM (73.47 % v/s 63.27% p=0.27).

b) At discharge, majority (52.13%) were on MOM (54.17% v/s 50.00% p=0.95). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 2.17% p= 0.95).

c) At 2 weeks, increased MOM rates and decreasing PDHM rates were observed in both groups. Majority (89.01%) of preterm infants were on MOM in both the groups (91.49% v/s 86.36% p=0.98). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 2% p= 0.98).

d) At 4 weeks almost all (97.67%) of preterm infants were on MOM in both the groups (97.87% v/s 97.44 % p=0.89). The rate of exclusive PDHM feeding had decreased in both the groups (0% v/s and 1% p= 0.89).

15. In the study the method of feeding in preterm infants in both the group across different time points was comparable.

a) At enrolment, majority (41.86%) of the preterm infants in the study were on spoon feeding (SF) (42.55% v/s 41.08%p=0.39).

b) At discharge shift was noted to SF + DBF (79.79%) as method of feeding in both groups (81.25% v/s 78.26% p= 0.98). Increase in rate of exclusive DBF (19.15%) as method of feeding was noted in both groups (18.75% v/s 19.57% p=0.98)

c) At 2 weeks follow up increasing trend was observed for DBF(29.67%) as method of feeding in both group (25.53 % v/s 34.09% p=0.29)

d) And by 4 weeks significant increase in DBF rates was observed (43.02%) (40.43 % v/s 46.15% p=0.80) though overall rate of SF + DBF remained high at 55.81 % (59.57% v/s 51.28% p=0.80).

16. In the present study the mean duration of total length of hospital stay in both groups was comparable (9.65+/-6.64 days and 9.10 +/- 6.49 days p=0.68).

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ANNEXURE I – CONSENT FORM

CONSENT FOR PARTICIPATION IN RESEARCH

To study the effect of Pooled Pasteurized Donor Human Milk v/s Unpooled Pasteurized Preterm Donor Human Milk on the short term growth of preterm infants in NICU at KLE HOSPITAL, BELAGAVI –A randomized controlled trial

Principal Investigator :Dr.

Guide- Dr

You have been asked to involve your child in the above said research to be conducted at NICU of KLE university's JN medical college hospital, Belagavi by Dr.AABHA DHAND , PG student in the Department of Pediatrics at Jawaharlal Nehru Medical College, Belagavi.

Introduction

PURPOSE OF THE STUDY:

Participation of your child will help us to evaluate growth patterns of preterm infants who have received Unpooled Pasteurised Preterm Donor Human Milk with growth patterns of preterm infants who have received Pooled Pasteurized Donor Human Milk and other observational outcome following discharge. You are free to discontinue the participation in the study at any time for any reasons and you will not be paid any reimbursement for participation in the research. Hence involving your child in the study is your voluntary decision.

Voluntary participation

Your child's participation in this study is your voluntary decision, whether or not to participate will not affect your current or future relationship with KLEs Dr. Prabhakar Kore Charitable Hospital & MRC, Belagavi.

Risk and benefits

There are no risks involved.

Reduction in morbidity and mortality.

Privacy and Confidentiality -The only people who will know that you are a research participant are member of the research team. No information about you or provided by you, during research will be disclosed to others without your written consent. When the results of the research are published or discussed in the conferences, no information will be disclosed that would reveal your identity. Any information obtained in connections with this study and that can be identified with you remain confidential and will be disclosed only with your permission.

Queries

If you have any queries you may contact Dr.___________ Post Graduate Student Department Of Pediatrics Jnmc ,Belagavi-590010 Phone No. 79829-27527

Dr. ___________ MD DCH Professor Department Of Paediatrics, JNMC,Belagavi-590010

If you have any questions about your rights or research participation you may contact Chairman ethical committee -Dr. Harsha hegde, Chairperson, JNMC,IEC And Scientist D, Icmr, National Institute Of Traditional Medicine Belagavi-590010

You will be given a copy of this form for your information and to keep for your record.

TATEMENT OF CONSENT

I hereby voluntarily agree for my participation in this study. I understand that even if I have the liberty to withdraw at any time. My signature below indicates that I have read or have been told in the language I understand , about this entire consent form including the risks and benefits and have had all my questions answered. I will be given a copy of this consent form.

Signature of the authorized representative/ parent: _______________

Date: _____________

Name: ____

Relation to the Subject: ___________________________________

Signature of the witness: ____________________________

Date: _____________

Name: ____

Signature of investigator: ____________________________

Date: _____________

Name: ____

ANNEXURE II – PROFORMA

SCREENING PORFORMA

HOSPITAL PATIENT NUMBER

SCREENING NUMBER

DATE

NAME OF THE PARTICIPANT :

B/O FIRST NAME

MIDDLE NAME

LAST NAME

AGE-

GENDER-

ADDRESS-H.NO.

STREET

TALUKA

DISTRICT

CONTACT NUMBER OF PARENTS

GENERAL QUESTIONNAIRE

- AGE OF THE MOTHER AT DELIVERY -
- DATE OF DELIVERY-
- GESTATIONAL AGE AT DELIVERY - WKS DAY
- MODE OF DELIVERY –
- BIRTH WEIGHT AT DELIVERY- KG
- WEIGHT AT TIME OF SCREENING- KG

INCLUSION CRITERIA

1. Baby less than 36 completed week. Yes ☐ No ☐

2. Requiring NICU or KMC admission Yes ☐ No ☐

If yes,indication

I.	LOW BIRTH WEIGHT	YES	NO
II.	RESPIRATORY DISTRESS SYNDROME	YES	NO
III.	MAS	YES	NO
IV.	HYPERBILIRUBINEMIA	YES	NO
V.	FEEDING DIFFICULTIES	YES	NO
VI.	OBSERVATION	YES	NO
VII.	HYPOGLYCEMIA	YES	NO
VIII.	ANY OTHER	YES	NO

3. STABLE Yes ☐ No ☐

- on ventilator support, Yes ☐ No ☐
- on parentral nutrition Yes ☐ No ☐

4.Living within 50-100 km of KLE ,Hospital Yes ☐ No ☐

5.Requiring DONOR MILK- Yes ☐ No ☐

If yes , indication

I. Mother not alive	YES	NO
II. Mother is not well/ not physically healthy for breast feeding	YES	NO
III. . Mother not having enough secretions	YES	NO
IV. Baby not maintaining RBS despite mother's feed	YES	NO
V. Baby is has not developed suck reflex	YES	NO
VI. Others	YES	NO

EXCLUSION CRITERIA

1. Congenital malformation especially cardiac anomalies Yes ☐ No ☐

2. Birth asphyxia Yes ☐ No ☐
3. Anomalies of GI tract. Yes ☐ No ☐
4. Any surgical intervention in last 1 month Yes ☐ No ☐
5. Necrotising enterocolitis Yes ☐ No ☐
6. Pateint not giving consent Yes ☐ No ☐

Eligible as per above mentioned criteria - Yes ☐ No ☐

If eligible, CONSENT

- Does the mother/father assent to participate Yes ☐ No ☐
- Has the study consent form been signed Yes ☐ No ☐

If Consent given , Enrollment done Yes ☐ No ☐

Mother ID ☐☐☐

Baby ID ☐☐☐

If Enrolled ,randomization done Yes ☐ No ☐

Date of randomization

☐☐☐☐☐☐☐

Participant number- ☐☐☐

NAME OF THE INVESTIGATOR-

☐☐☐☐☐☐☐
☐☐☐☐☐☐☐

SIGNATURE-

PROFORMA

To study the effect of Pooled Pasteurized Donor Human Milk v/s UnPooled Pasteurized Preterm Donor Human Milk on the short term growth of Preterm infants in NICU at KLE HOSPITAL,BELAGAVI –A randomized controlled trial.

Participant Id - ☐☐☐ Screening Id- ☐☐☐☐

I. SOCIO-DEMOGRAPHIC DATA

- (I –Receiving preterm milk) ☐
- (II- Receiving pooled milk) ☐

Date of admission - ☐☐ ☐☐ ☐☐☐☐

1. Mother`s Name: ☐☐☐☐☐☐☐
☐☐☐☐☐☐☐

2. Mother`s education: Illiterate ☐ Primary ☐ Secondary ☐ Graduate ☐ Post Graduate ☐

3. Mother`s Occupation: Home maker ☐ Employed ☐ Self employed ☐

4. Father`s Name: ☐☐☐☐☐☐
☐☐☐☐☐☐

5. Father`s education: Illiterate ☐ Primary ☐ Secondary ☐ Graduate ☐ Post Graduate ☐

6. Marrital History:
Years of marital life - ☐☐
Consanguinous ☐
Non- Consanguinous ☐

9. General information given by: Mother ☐ Father ☐

10. Written informed consent Yes ☐ No☐

II. Maternal history

11.Age of mother at the time of delivery - ☐☐

a. Gravida:☐ Primi ☐
Multi - G ☐ P☐ L ☐ A☐

b. Antenatal Visits: Done ☐ Not done ☐

c. Antenatal USG scan: Done ☐ Not done ☐

12. Antenatal risk factors for preterm birth

	Yes	No
a. Elderly primi >30 years	☐	☐
b. Short statured <140 cm	☐	☐
c. Preeclampsia and eclampsia	☐	☐
d. Anemia	☐	☐
e. Gestational diabetes mellitus	☐	☐
f. Previous stillbirth, IUD	☐	☐
g. Previous cesarean section	☐	☐
h. Grand multipara	☐	☐
i. PPROM	☐	☐
j. . IUGR	☐	☐
k. Twins	☐	☐
l. placenta previa/placenta abruption	☐	☐
m. Rh isoimmunization	☐	☐
n. congenital malformations	☐	☐

III. Birth history

1. Mode of Delivery: PTNVD ☐ FTNVD ☐ LSCS ☐

- ♦ Previous LSCS ☐
- ♦ Malposition ☐
- ♦ Multiple pregnancy ☐
- ♦ Pre-eclampsia ☐
- ♦ PPROM OR PROM ☐
- ♦ Cephalo –pelvic disproportion ☐
- ♦ Failed Induction of Labor ☐

2. Date of delivery - ☐☐ ☐☐ ☐☐☐☐
3. Time of delivery- ☐☐**:**☐☐ ☐**AM** ☐**PM** ☐
4. Gestational age in weeks: <28 ☐ 28-34 ☐ 34-36 ☐ 36+7 days
5. APGAR score at five minutes

<7 ☐ >= 7 ☐

6.Weight at the time of delivery - ☐ ☐ ☐ ☐ gm

IV. NICU Admission

1. Examination

a.General physical examination

i. Temperature -

ii. Respiratory rate:

iii. Heart rate

iv. CFT

2. Anthropometry

	Measured	Expected
Weight (kg) Reading 1 Reading 2 Reading 3 Mean		
Length (cm) Reading 1 Reading 2 Reading 3 Mean		
Head circumference (cm) Reading 1 Reading 2 Reading 3 Mean		
Mid arm circumference (cm) Reading 1 Reading 2 Reading 3 Mean		

3. Systemic examination
   a. Cardiovascular system-
   b. Respiratory system-
   c. Per abdomen-
   d. Central nervous system-

4. Feeding history

Type	Days of life																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
MOM																												
DHM Preterm Preterm plus Term																												
Formula feeds																												
Amount (ml/day)																												
Method RTF																												
SF/Paladay																												
Direct																												

5. Date of starting DHM: ☐☐ ☐☐ ☐☐☐☐

6. Total duration of DHM given: ☐☐ days

7. Total amount of DHM given : ☐☐☐ ml

8. Type of DHM given – Pooled preterm donor milk ☐ Unpooled preterm donor milk ☐

9. Hospital stay
   a. NICU: ☐☐ days

10. Anthropometry at discharge

	Measured	Expected
Weight (kg) **Reading 1** **Reading 2** **Reading 3** **Mean**		

11.

Length (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Head circumference (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Mid arm circumference (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		

Types of feeds at discharge

a. Breast feed Yes ☐ No ☐

b. If yes,

i. Direct breast feed Yes ☐ No ☐

ii. Expressed breast milk Yes ☐ No ☐

iii. Both Yes ☐ No ☐

12. PDHM Yes ☐ No ☐

a. If yes, amount: ☐ ☐ ☐ ml/day

Baby`s follow up at 2 weeks

Feeding patterns:

		Yes	No	If yes: estimate no of time baby is fed	c. If yes: who decided that your baby should be fed this? Myself	Doctor	Family member	d. If yes, how was this fed to your baby? Cup/ Spoon/ Palladi	Bottle with nipple	N G tube
1	**Breastmilk** (if yes, ask 2-5)	☐	☐		☐	☐	☐	☐	☐	☐
2	Breastmilk directly from your breast	☐	☐		☐	☐	☐	☐	☐	☐
3	Breastmilk expressed from your breast	☐	☐		☐	☐	☐	☐	☐	☐
4	Breastmilk from another mother (Donor Human Milk)	☐	☐		☐	☐	☐	☐	☐	☐
5	Infant Formula	☐	☐		☐	☐	☐	☐	☐	☐
6	Tinned, powdered or fresh animal milk (cow, goat, etc.)	☐	☐		☐	☐	☐	☐	☐	☐

ANTHROPOMETRY

	Measured	Expected
Weight (kg) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Length (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Head circumference (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Mid arm circumference (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		

Follow up at 4 weeks

Feeding patterns:

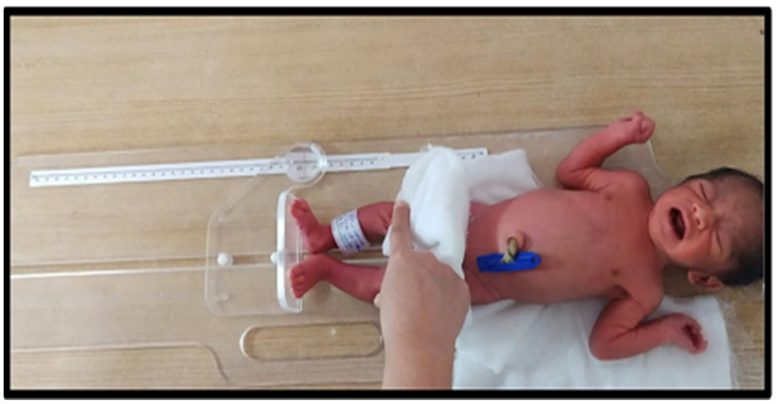
		Yes	No	If yes: estimate no of times baby is fed	c. If yes: who decided that your baby should be fed this? Myself	Doctor	Family member	d. If yes, how was this fed to your baby? Cup/ Spoon/ Palladi	Bottle with nipple	NG tube
1	**Breastmilk** (if yes, ask 2-5)	☐	☐		☐	☐	☐	☐	☐	☐
2	Breastmilk directly from your breast	☐	☐		☐	☐	☐	☐	☐	☐
3	Breastmilk expressed from your breast	☐	☐		☐	☐	☐	☐	☐	☐
4	Breastmilk from another mother (Donor Human Milk)	☐	☐		☐	☐	☐	☐	☐	☐
5	Infant Formula	☐	☐		☐	☐	☐	☐	☐	☐
6	Tinned, powdered or fresh animal milk (cow, goat, etc.)	☐	☐		☐	☐	☐	☐	☐	☐

ANTHROPOMETRY:

	Measured	Expected
Weight (kg) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Length (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Head circumference (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		
Mid arm circumference (cm) **Reading 1** **Reading 2** **Reading 3** **Mean**		

ANNEXURE III – PHOTOGRAPHS FOR THESIS

Photograph 1. Essae-BS-250 electronic weighing scale used for measuring weight.



Photograph 2. Infantometer was used to measure the length.

Photograph 3. Head circumference was measured using Schorrs tape

ANNEXURE-IV KEY TO MASTER CHART

Sex

F	-	Females
M	-	Males

Mother`s & Fathers' education

1	-	Illiterate
2	-	Primary
3	-	Secondary
4	-	Graduate
5	-	Post graduate

Occupation

1	-	Homemaker
2	-	Employed
3	-	Self employed

Antenatal risk factors

1	-	Elderly primi > 35 years
2	-	Short statured < 145 cm
3	-	Preeclampsia and eclampsia
4	-	Anemia
5	-	Gestational diabetes mellitus
6	-	Previous still birth, intra uterine death
7	-	Previous caesarean section
8	-	Grand multipara
9	-	Preterm premature rupture of membranes

10 - IUGR

11 - Twins/ Triplets

12 - Placenta previa/placenta abruption

13 - Rh isoimmunization

14 - Congenital malformations

Mode of delivery

LSCS - Lower segment caesarean section

NVD - Preterm vaginal delivery

Gravida status

1 - Primigravida

2 and above - Multigravida

Indication of NICU admission

1 - Low birth weight

2 - Respiratory Distress syndrome

3 - Meconium Aspiration Syndrome

4 - NNH

5 - Feeding difficulty

6 - Observation

7 - Hypoglycemia

8 - Any other / Kangaroo mother care

Indication of starting PDHM

1 - Mother not alive

2 - Mother not physically fit

3 - Mother not having enough seretions

4	-	Baby not maintaining RBS despite mother's feed
5	-	Baby has not developed suck reflex
6	-	Others

Feeding history

MOM	-	Mother's own milk
PDHM	-	Pasteurized donor human milk
RTF	-	Ryles tube feeding
SF/Paladai	-	Spoon feed

Anthropometric Parameters

Wt.	-	Weight
Lt.	-	Length
H.C	-	Head circumference
MUAC	-	Mid Upper Arm Circumference

Serial No.	Hospital ID No	Name (B/O)	DEMOGRAPHICS: Screening ID No (Mother/Baby)	Eligible	Consented	Enrolled	Randomized	Date of Randomization	Participant ID No.	Type of Milk	DOB	DOE	Age at enrollment (Day of Life)	Sex	Maternal History: Maternal Age (y)	Gravida	Educational status: Mother	Educational status: Father	Occupation: Mother	Occupation: Father	Antenatal visits and scans	Antenatal risk factors	Birth History: Gest. Age	Mode of delivery	Birth wt.	5 min APGAR	Indication for starting DHM	Indication for NICU admission	Feeding Patterns: Type of feeding: At enrollment	Type of feeding: At discharge	Type of feeding: F/U at 15days	Type of feeding: F/U at 4weeks	Frequency of feeds (/day): At enrollment	Frequency: At discharge	Frequency: F/U at 15 days	Frequency: F/U at 4 weeks	Amount of PDHM: At enrollment	Amount of PDHM: At discharge	Amount of PDHM: F/U at 15 days	Amount of PDHM: F/U at 4 weeks	Method of feeding: At enrollment	Method of feeding: At discharge	Method of feeding: F/U at 15 days	Method of feeding: F/U at 4 weeks	Anthropometric Parameters: Weight (g): At enrollment	Weight: At discharge	Weight: At 15 days	Weight: At 4 weeks	Length (cm): At enrollment	Length: At discharge	Length: At 15 days	Length: At 4 weeks	Head Circumference (cm): At enrollment	Head Circumference: At discharge	Head Circumference: At 15 days	Head Circumference: At 4 weeks	Mid Upper Arm Circumference (cm): At enrollment	MUAC: At discharge	MUAC: At 15 days	MUAC: At 4 weeks	Infections: At enrollment	Infections: At discharge	Infections: At 15 days	Infections: At 4 weeks	Duration of hospital stay	Date of Starting DHM	Type of DHM	Total Amount of PDHM (ml)	Duration of exclusive PDHM (days)	Duration of mixed feeding (PDHM +MOM) (days)	Duration of MOM (days)	Days to switch to MOM
1	1084644	SAMPRITA SHRIDHAR	1104/304	YES	YES	YES	YES	12-08-2021	127	POOLED	12-08-2021	12-08-2021	D1 , 7hr	M	25	1	3	3	1	2	YES	3,10	36+2	LSCS	1400	`8	3	1,6	MOM + PDHM	MOM	MOM	MOM	8	10	12	14	120	None	None	None	RT Feeds	DBF + SF	DBF + SF	DBF+ SF	1420	1380	1560	1820	43.1	43.1	43.9	46	30	30.2	31.4	33	7	7	7.5	7.5	None	None	None	None	6	12-08-2021	POOLED	240	2	0	4	0
2	1084993	SHRUTI SUNIL BELAGANKAR	1105/ 305	YES	YES	YES	YES	12-09-2021	139	POOLED	12-09-2021	12-09-2021	D1, 12hr	M	24	1	4	4	1	3	YES	10,15	34	LSCS	1300	8	3	1,6	PDHM	MOM	MOM	MOM	8	12	12	20	60	None	None	None	RT Feeds	DBF +SF	RT Feeds	DBF+SF	1430	1460	1400	1980	42	44.3	43.5	45.2	29.5	30.8	30.8	31.8	7	7.5	7	7.5	None	None	None	None	23	12-09-2021	POOLED	160	2	0	18	0
3	1085111	MEGHA MAHESH BIRJE	1106/306	YES	YES	YES	YES	12-10-2021	113	POOLED	12-10-2021	12-10-2021	D1,4hr	F	26	1	4	5	1	1	YES		34+6	NVD	2000	8	3	1,6	PDHM	MOM	MOM	MOM	12	8	14	15	80	None	None	None	SFs	DBF+SF	DBF	DBF	1920	1790	1900	2270	47	47.1	48.5	49.4	31	31	31.5	32.8	7.5	7.5	7.5	8	None	None	None	None	5	12-10-2021	POOLED	290	2	1	2	1
4	1085215	POOJA KALLAPPA HONGEKAR	1107/307	YES	YES	YES	YES	12-12-2021	128	UNPOOLED	12-11-2021	12-12-2021	D2,32hr	F	22	2	3	3	1	2	YES	15	34+5	NVD	1700	`9	3	1,2	PDHM	MOM	MOM	MOM	8	10	12	10	30	None	None	None	RT Feeds	DBF	DBF	DBF	1780	1900	1860	2300	46	47.5	47.5	48.8	31	31.4	31.4	33.5	7	7	7	7.5	Staph epidermidis	None	None	None	18	12-12-2021	UNPOOLED	250	3	0	15	0
5	1085260	SUNITA MARUTI JOGI	1108/308	YES	YES	YES	YES	12-12-2021	106	POOLED	12-11-2021	12-12-2021	D2,27hr	M	30	1	3	3	1	2	YES	2	36+3	LSCS	2200	8	3	1	PDHM	MOM	M	M	11	9	M	M	150	None	M	M	SFs	DBF	M	M	1880	1860	M	M	48	48	M	M	32	32.11	M	M	7.5	7.5	M	M	None	None	M	M	5	12-12-2021	POOLED	440	3	1	1	1
6	1085870	SUNITA RAHUL PATIL	1109/309	YES	YES	YES	YES	16/12/21	168	POOLED	14/12/21	16/12/21	D2,36 hr	M	27	2	3	3	1	2	YES	5,9,10,13,15	34+2	LSCS	1100	`7	3	1	PDHM	D	D	D	12	D	D	D	60	D	D	D	RT Feeds	D	D	D	1100	D	D	D	38	D	D	D	30	D	D	D	7	D	D	D	None	D	D	D	5	16/12/21	POOLED	60	D	D	D	D
7	1085787	ROOPA CHANDRASHEKHAR	1110/310	YES	YES	YES	YES	15/12/21	192	POOLED	14/12/21	14/12/21	D2,25hr	M	19	1	3	2	1	1	YES	4	36	NVD	2000	`7	3	1	MOM + PDHM	MOM	MOM	MOM	12	9	15	15	60	None	None	None	SFs +DBF	DBF	DBF	DBF	2000	1940	2200	2450	45.1	45.1	46.2	47.2	32.1	32.1	33	33.3	7.5	7.5	7.5	8	None	None	None	None	5	15/12/21	POOLED	120	0	2	3	2
8	1086085	DEEPA NITIN TWIN 1	1111/311	YES	YES	YES	YES	16/12/21	136	POOLED	16/12/21	16/12/21	D1,3hr	M	25	1	4	4	1	1	YES	11	35+3	NVD	1900	`8	3	1	MOM + PDHM	MOM	MOM	MOM	12	11	12	15	60	None	None	None	SFs+DBF	DBF+SF	DBF	DBF	1900	1860	1920	2360	44.2	44.2	45.4	46.7	32.5	32.5	33.2	34	7	7	7	7.5	None	None	None	None	4	16/12/21	POOLED	210	0	3	1	3
9	1086086	DEEPA NITIN TWIN 2	1112/312	YES	YES	YES	YES	16/12/21	133	POOLED	16/12/21	16/12/21	D1,3hr	M	25	1	4	4	1	1	YES	11	35+3	NVD	2300	`8	3	1	MOM + PDHM	MOM	MOM	MOM	12	11	12	15	60	None	None	None	SF + DBF	DBF +SF	DBF	DBF	2260	2140	2240	2760	49	49	50.2	51.4	33	33	33.5	34.2	7.5	7.5	7.5	8	None	None	None	None	4	16/12/21	POOLED	210	0	3	1	3
10	1086568	NEELAMAVA SANTOSH	1115/315	YES	YES	YES	YES	18/12/21	154	UNPOOLED	18/12/21	18/12/21	D1,4hr	F	27	2	3	4	1	1	YES	9	34+3	NVD	1900	`8	3	1	PDHM	MOM	MOM	MOM	8	10	15	15	100	None	None	None	SF	DBF	DBF	DBF	1920	1840	2010	2500	44.1	44.1	45.5	46.3	33.1	33.1	34.3	35	7.5	7.5	7.5	8	None	None	None	None	7	18/12/21	UNPOOLED	300	2	1	4	1
11	1086845	SANGEETA RUDRAPPA	1116/316	YES	YES	YES	YES	21/12/21	177	UNPOOLED	20/12/21	21/12/21	D2,25hr	F	36	2	2	3	1	1	YES	7,10,15	36+5	LSCS	2100	`8	3	1	MOM + PDHM	MOM	MOM	MOM	12	9	12	15	90	None	None	None	DBF+ SFs	DBF	DBF	DBF	2000	1920	2200	2600	49	49	50.3	51.5	32	32.2	33.3	34.2	7.5	7.5	7.5	8	None	None	None	None	6	21/12/21	UNPOOLED	210	0	2	4	2
12	1087060	SAVITA SANTOSH	1117/317	YES	YES	YES	YES	22/12/21	107	UNPOOLED	22/12/21	22/12/21	D1OL,1hr	M	24	1	2	3	1	1	YES	3,15	34+6	LSCS	1700	`8	3	1	PDHM	MOM	MOM	MOM	12	9	12	15	120	None	None	None	SF	SF + DBF	DBF+SF	DBF	1740	1620	1620	2230	42.2	43	43	44.2	31.1	31.7	31.7	32.8	7	7	7	7.5	None	None	None	None	13	22/12/21	UNPOOLED	1680	3	8	2	8
13	1087064	PRATIBHA RAMESH	1118/318	YES	YES	YES	YES	23/12/21	185	UNPOOLED	22/12/21	23/12/21	D2,25 hr	M	26	1	4	4	1	1	YES	15	35	LSCS	2000	`8	3	1	PDHM	MOM+PDHM	MOM	MOM	11	12	15	15	120	None	None	None	SF	SF + DBF	DBF + SF	DBF	1920	1860	2080	2420	43.3	43.5	44.3	45.2	31.2	31.5	32	33	7	7	7.5	7.5	None	None	None	None	7	23/12/21	UNPOOLED	420	2	5	0	5
14	1087418	SWATI YALLAPA NAIK	1119/319	YES	YES	YES	YES	25/12/21	142	UNPOOLED	23/12/21	25/12/21	D2, 46hr	F	22	1	3	3	1	1	YES	9,15	29+4	NVD	1100	7	2,3	1	PDHM	D	D	D	6	D	D	D	12	D	D	D	RT Feeds	D	D	D	1280	D	D	D	39.2	D	D	D	28.1	D	D	D	7	D	D	D	None	D	D	D	6	25/12/21	UNPOOLED	12	1	0	0	1
15	1087611	DRAKSHAYANI ANAND	1120/320	YES	YES	YES	YES	27/12/21	108	POOLED	25/12/21	27/12/21	D2, 26hr	F	21	1	2	3	1	1	YES	3,4,15	34+4	LSCS	1400	`8	1,2,6	2,3	PDHM	D	D	D	8	D	D	D	36	D	D	D	RT Feeds	D	D	D	1400	D	D	D	46	D	D	D	31	D	D	D	7	D	D	D	None	D	D	D	5	27/12/21	POOLED	36	1	0	0	0
16	1087765	UZMA MUZZAMIL KILLEDAR	1122/322	YES	YES	YES	YES	27/12/21	183	POOLED	27/12/21	27/12/21	D1OL,1hr	M	23	1	4	3	1	1	YES	3,10	32+4	LSCS	1400	`8	3	1,6	PDHM	MOM	MOM+PDHM	MOM	6	12	12	12	12	None	180	None	RT Feeds	DBF + SF	RT Feeds +SF	DBF +SF	1400	1400	1320	1680	42	43.2	42.5	44.3	29	30.3	29.5	31	7	7	7.5	7.5	Candida .G	None	None	None	26	27/12/21	POOLED	762	6	8	6	8
17	1088624	GIRIJA OMKAR PARITEKAR	1125/325	YES	YES	YES	YES	31/12/21	102	POOLED	31/12/21	31/12/21	D1OL,1hr	M	29	1	1	3	1	1	YES	4,10,15	35+5	NVD	1690	9	3	1,6	MOM+PDHM	PDHM +MOM	MOM	MOM	12	12	15	15	100	140	None	None	SF + DBF	SF + DBF	SF +DBF	DBF	1700	1620	1760	2200	42	42.4	43.2	44.3	30.1	30.5	31.5	32.2	7	7	7.5	7.5	None	None	None	None	5	31/12/21	POOLED	700	0	5	0	5
18	1089033	ROOPA MALLIKARJUN SIDDANAVAR	1127/327	YES	YES	YES	YES	01-02-2022	110	UNPOOLED	01-02-2022	01-02-2022	D1OL,1hr	F	33	1	2	2	1	1	YES	1,9	33+5	NVD	1720	`9	6	1,6	PDHM	MOM	MOM	MOM	12	9	10	15	60	None	None	None	RT Feeds	DBF	DBF+SF	DBF	1720	1800	1740	2240	44	45.5	45.3	46.5	30	31	31	32	7	7.5	7.5	7.5	None	None	None	None	19	01-02-2022	UNPOOLED	300	3	4	8	4
19	1089036	MAYURI SANTOSH SUNGAR	1128/328	YES	YES	YES	YES	01-03-2022	126	UNPOOLED	01-02-2022	01-03-2022	D2OL,24 hr	F	22	2	4	3	1	1	YES	15	30+3	NVD	1260	8	3	1,6	PDHM	MOM	MOM	MOM	6	12	12	15	12	None	None	None	RT Feeds	SF + DBF	SF +DBF	SF +DBF	1260	1300	1300	1620	40	41.3	41.3	42	27	28	28	29	7	7	7	7	None	None	None	None	17	01-03-2022	UNPOOLED	360	5	4	7	4
20	1089067	DEEPA CHANNAPA GUDAS	1129/329	YES	YES	YES	YES	01-03-2022	155	POOLED	01-02-2022	01-03-2022	D1OL,1hr	F	27	2	4	3	1	1	YES	15	33+3	NVD	1800	`9	3	1,6	PDHM	MOM	MOM	MOM	6	12	12	15	12	None	None	None	RT Feeds	DBF+ SF	SF+DBF	DBF	1880	1920	1860	2300	44.5	45.5	45.3	46	31.1	32.2	32.3	33	7.5	7.5	7.5	7.5	None	None	None	None	19	01-03-2022	POOLED	90	4	1	13	1
21	1089600	MANJULA BALESH HOSUR	1131/331	YES	YES	YES	YES	01-04-2022	194	UNPOOLED	01-04-2022	01-04-2022	D1OL,1hr	M	30	1	2	2	1	1	YES	1,3,10,13,15	35+5	LSCS	1500	`8	3,4	1,5,6,7	PDHM	MOM	MOM	MOM	12	10	15	12	24	None	None	None	RT Feeds	DBF +SF	SF+DBF	DBF+SF	1500	1420	1620	2000	44	44.2	44.9	45.8	28	28.1	29.2	30	7	7	7.5	7.5	None	None	None	None	10	01-04-2022	UNPOOLED	490	4	4	2	4
22	1089492	SAYISTA MALLIKASAB	1132/332	YES	YES	YES	YES	01-04-2022	109	POOLED	01-04-2022	01-04-2022	D1OL,1hr	M	18	1	4	3	1	1	YES	15	35	NVD	2000	`9	3	1,6	PDHM +MOM	PDHM +MOM	MOM	MOM	10	12	15	15	30	10	None	None	SF + DBF	SF + DBF	DBF	DBF	1900	1840	2080	2340	45	45	46.1	46.9	32	32	32.8	33.7	7.5	7.5	7.5	7.5	None	None	None	None	5	01-04-2022	POOLED	190	0	5	0	5
23	1090004	SAMPADA KALAMESH PATIL	1133/333	YES	YES	YES	YES	01-07-2022	147	POOLED	01-06-2022	01-07-2022	D2OL,26 hr	M	19	2	2	4	1	1	YES	4,15	33+2	NVD	1700	8	2,3,5	1,6,7	PDHM	MOM	MOM	M	12	9	12	M	36	None	None	M	RTF	DBF	DBF	M	1840	1800	1760	M	43	43.8	43.8	M	30.1	31	31.1	M	7	7	7	M	Enterobacter fecium	None	None	M	17	01-07-2022	POOLED	103	5	1	8	10
24	1090022	RADHIKA AMOL MALAVADE	1135/335	YES	YES	YES	YES	01-06-2022	164	UNPOOLED	01-06-2022	01-06-2022	D1OL,1hr	F	33	2	1	4	1	1	YES	1,3	33+1	NVD	1800	8	2,3,6	1,6	PDHM	MOM+PDHM	MOM	MOM	12	10	15	12	60	80	None	None	SF	DBF +SF	DBF +SFs	SF +DBF	1840	1760	2100	2520	44	44	45.5	46.7	30	30	31.5	32	7	7	7.5	7.5	None	None	None	None	6	01-06-2022	UNPOOLED	650	3	3	0	3
25	11012022	ANJANA LAKAPA TUKANATI	1136/336	YES	YES	YES	YES	01-11-2022	125	POOLED	01-07-2022	01-11-2022	D4OL	F	23	3	3	3	1	1	YES	3,15	31+2	LSCS	1100	7	3	1,2,6	PDHM	D	D	D	3	D	D	D	3	D	D	D	RTF	D	D	D	1100	D	D	D	38	D	D	D	28.1	D	D	D	7	7	7	7	None	D	D	D	7	01-11-2022	POOLED	3	1	0	0	0
26	1090262	MANISHA BHARAT	1137/337	YES	YES	YES	YES	01-09-2022	179	POOLED	01-08-2022	01-09-2022	D2OL,24 hr	F	25	3	4	4	1	2	YES	10,15	36+2	LSCS	2200	`8	3	1	MOM+PDHM	MOM+PDHM	MOM	MOM	12	8	15	12	20	20	None	None	SF+DBF	SF + DBF	DBF	DBF	2020	1960	2300	2600	45.2	45.2	46.2	47.5	32.1	32.1	33.1	34.1	7.5	8	8	8	None	None	None	None	4	01-09-2022	POOLED	50	0	3	1	3
27	1090937	VIJAYLAXMI BASAVRAJ SOMANAKAR	1138/338	YES	YES	YES	YES	01-12-2022	152	POOLED	01-12-2022	01-12-2022	D1OL,1hr	M	22	1	1	2	1	1	YES	3,10,15	34+2	NVD	1800	8	2,6	1,5,6	PDHM	PDHM	PDHM	PDHM	12	10	12	12	60	300	360	360	SF	SF	SF	SF	1800	1720	1900	2320	44.8	44.8	45.5	46.5	30.9	31	31.9	32.8	7.5	7.5	7.5	7.5	None	None	None	None	6	01-12-2022	POOLED	1200	6	0	0	0
28	1091229	RENUKA NAGARAJ PUJERI	1139/339	YES	YES	YES	YES	17/1/22	131	UNPOOLED	13/1/22	17/1/22	D5OL	M	22	1	2	3	1	1	YES	4,15	35+2	NVD	2500	`9	3	1,2,6	PDHM	MOM	MOM	MOM	12	9	12	15	60	None	None	None	RTF	SF + DBF	SF+DBF	SF+DBF	2480	2400	2550	2940	47	47.8	47.8	48.7	32	32.8	32.8	34	8	8	8	8	None	None	None	None	11	17/1/22	UNPOOLED	240	2	4	1	4
29	1091246	DINAR SHABAB SHAIKH	1140/340	YES	YES	YES	YES	17/1/22	190	UNPOOLED	14/1/22	17/1/22	D4OL	F	26	1	5	5	2	2	YES		30	NVD	1350	7	3	1,2,6	PDHM	PDHM+MOM	MOM+PDHM	PDHM+MOM	12	12	15	12	12	250	84	300	RTF	DBF+ SF	RTF	DBF+SF	1350	1620	1260	1620	42	44.2	43.1	44.2	27.5	28.9	28	29	7	7	7	7.5	Candida .G	None	None	None	30	17/1/22	UNPOOLED	5000	5	14	3	14
30	1091902	SAMEENA IMAM HUSSAIN	1142/342	YES	YES	YES	YES	19/1/22	103	POOLED	19/1/22	19/1/22	D1OL,2hrs	M	21	1	4	4	2	2	YES	4,10,14	35+3	LSCS	1600	`8	3	1,6	PDHM	MOM+PDHM	MOM	M	10	9	12	M	60	20	None	M	SF	DBF +SF	DBF +SFs	M	1600	1520	1680	M	44	44	45.4	M	28.9	29	30.3	M	7.5	7.5	7.5	M	None	None		M	6	19/1/22	POOLED	460	3	3	0	3
31	1091974	KOMAL MANOJ	1143/343	YES	YES	YES	YES	19/1/22	188	POOLED	19/1/22	19/1/22	D1OL,2hrs	M	23	1	3	3	1	1	YES	14	34+2	LSCS	1600	`8	2,3	1,6	PDHM	MOM+PDHM	MOM	MOM	12	12	15	15	60	60	None	None	SF	SF+DBF	DBF+SF	DBF+SF	1620	1480	1620	1900	43	43.2	44.2	45	30	30.2	31	31.8	7.5	7.5	8	8	None	None	None	None	8	19/1/22	POOLED	840	4	4	0	4
32	1091942	GAYATRI DARSHAN PATIL	1144/344	YES	YES	YES	YES	20/1/22	160	UNPOOLED	19/1/22	20/1/22	D2OL,25hr	M	26	1	3	3	1	1	YES	10,15	35+5	LSCS	1740	`8	3	1,5,6,7,	PDHM	MOM	MOM	MOM	9	9	12	15	80	None	None	None	SF	DBF + SFs	DBF	DBF	1740	1680	1900	2340	43	43	44.1	45.4	30.5	30.5	31.8	32.6	7.5	7.5	8	8	None	None	None	None	6	20/1/22	UNPOOLED	160	2	0	3	0
33	1092047	STELLA JASHIVA ABIMUDUPU	1145/345	YES	YES	YES	YES	20/1/22	186	UNPOOLED	20/1/22	20/1/22	D1OL,1hr	M	26	1	3	3	1	2	YES	10	35+2	LSCS	1700	`9	3	1	PDHM	MOM	MOM	MOM	12	9	12	15	120	None	None	None	SF	DBF	DBF	DBF	1780	1720	1900	2400	43.5	43.5	44.5	45.5	30.2	30.2	31.3	32	7.5	7.5	7.5	8	None	None	None	None	5	20/1/22	UNPOOLED	220	2	0	3	0
34	1092316	SUNITA GURUNATH	1147/347	YES	YES	YES	YES	21/1/22	191	UNPOOLED	21/1/22	21/1/22	D1OL,1hr	M	22	1	3	3	1	1	YES	10,15	35+1	LSCS	1400	8	3	1,6	PDHM	MOM	MOM	MOM	12	8	12	15	60	None	None	None	SF	DBF+SF	DBF+SF	DBF+SF	1380	1300	1400	1620	45	45.1	45.8	46.5	31.2	31.2	31.7	31.7	7.5	7.5	7.5	8	None	None	None	None	6	21/1/22	UNPOOLED	430	3	2	1	2
35	1093307	BHARATI TWIN 1	1149/349	YES	YES	YES	YES	28/1/11	163	UNPOOLED	28/1/22	28/1/22	D1OL,1hr	M	34	4	3	3	1	1	YES	11	36+6	NVD	1700	`9	2,3,6	1,5,6	PDHM	MOM	MOM	MOM	12	9	12	15	60	None	None	None	SF	DBF + SFs	DBF +SFs	DBF+SF	1680	1640	2000	2400	45.1	45.2	46.5	47	31	31	32	33	8	8	8	8.5	None	None	None	None	6	28/1/22	UNPOOLED	400	3	1	2	1
36	1093308	BHARATI TWIN 2	1150/350	YES	YES	YES	YES	28/1/22	162	UNPOOLED	28/1/22	28/1/22	D1OL,1hr	M	34	4	3	3	1	1	YES	11	36+6	NVD	1900	`8	2,3,6	1,5,6	PDHM	MOM	MOM	MOM	12	10	12	15	60	None	None	None	SFs	DBF+SF	DBF+SF	DBF+SF	1900	1840	2230	2800	47	47	48.2	48.8	32	32	33	33.5	8	8	8	8.5	None	None	None	None	6	28/1/22	UNPOOLED	480	3	1	2	1
37	1093108	LAXMI BASAVRAJ	1151/351	YES	YES	YES	YES	28/1/22	189	POOLED	27/1/22	28/1/22	D2OL,26 hr	M	26	1	3	3	1	2	YES	10,11,15	33+5	LSCS	1440	`8	3	1,6,	PDHM	MOM	MOM	MOM	12	9	12	15	60	None	None	None	RTF	SF+DBF	DBF+SF	SF+DBF	1400	1360	1440	1940	43.5	44	44	45.3	31	31.8	32	33	7.5	7.5	7.5	7.5	None	None	None	None	11	28/1/22	POOLED	170	2	1	7	1
38	1093663	NANDINI NANDKUMAR	1152/352	YES	YES	YES	YES	02-04-2022	101	UNPOOLED	31/1/22	02-04-2022	D4OL	F	23	2	3	3	1	2	YES	3,10,15	33+1	LSCS	1330	8	3	1,6	PDHM	MOM	MOM+PDHM	MOM	12	9	12	12	12	None	60	None	RTF	SF+DBF	SF+DBF	SF+DBF	1360	1480	1300	1620	41	41.9	41.3	42.5	28	29	28.5	29.6	7	7	7	7.5	None	None	None	None	22	02-04-2022	UNPOOLED	1000	9	6	3	6
39	1094326	SANGEETA APPAYYA	1153/353	YES	YES	YES	YES	02-07-2022	104	POOLED	02-04-2022	02-07-2022	D4OL	F	24	2	3	3	1	2	YES	3,7,10,15	31+4	LSCS	1300	`8	3	1,2,6	PDHM	MOM	MOM+PDHM	MOM	12	8	9	12	12	None	10	None	RTF	SF+DBF	SF	SF+DBF	1260	1350	1180	1520	41	42	41.5	42.8	29.2	30.3	29.7	30.9	7	7	7	7	Candida .G	None	None	None	25	02-07-2022	POOLED	1134	7	6	9	6
40	1094507	RENUKA DEEPAK PATIL	1158/358	YES	YES	YES	YES	02-07-2022	112	POOLED	02-06-2022	02-07-2022	D2OL,25hr	F	22	1	3	3	1	1	YES	15	34+6	NVD	2000	8	3	1,6	PDHM	MOM	MOM	MOM	8	9	9	12	60	None	None	None	SFs	DBF	DBF	DBF	1900	1840	2100	265	46.5	46.6	47.2	48.3	32	32.2	33	33.8	7.5	7.5	8	8	None	None	None	None	9	02-07-2022	POOLED	410	3	3	2	3
41	1094509	SUGANDHA MAHESH BACHOLKAR	1159/359	YES	YES	YES	YES	02-07-2022	115	POOLED	02-06-2022	02-07-2022	D1OL,4hr	M	21	1	3	3	1	2	YES	15	36+5	LSCS	2300	8	3,4	1,5,6	MOM+PDHM	MOM	MOM	MOM	8	9	12	15	40	None	None	None	SF+DBF	DBF	DBF	DBF	2120	2000	2230	2700	49	49.1	50.8	51.3	33	33	33.8	34.7	7.5	7.5	8	8	None	None	None	None	8	02-07-2022	POOLED	170	0	5	3	5
42	1095349	NIKITA RAJU PATIL	1163/363	YES	YES	YES	YES	02-11-2022	119	UNPOOLED	02-11-2022	02-11-2022	D1OL,1hr	M	19	1	3	2	1	1	YES	15	35+3	NVD	2000g	`9	3,4	1,6	PDHM+MOM	MOM	MOM	MOM	12	10	12	15	60	None	None	None	SF+DBF	DBF	DBF	DBF	2060	1960	2200	2600	46	46	46.6	47.5	31	31.1	31.5	32.5	7	7.5	7.5	8	None	None	None	None	7	02-11-2022	UNPOOLED	220	0	5	2	5
43	1095177	SUMITRA DURADUNDI	1164/364	YES	YES	YES	YES	02-12-2022	120	UNPOOLED	02-10-2022	02-12-2022	D2OL, 32hr	M	32	4	3	3	1	2	YES	9,15	36	LSCS	2500	`8	2	1,6	MOM+PDHM	MOM	MOM	MOM	10	9	15	12	30	None	None	None	SFs	DBF	DBF	DBF	2300	2230	2360	2860	48	48.2	48.9	49.8	32	32	32.5	33.4	8	8	8	8	None	None	None	None	9	02-12-2022	UNPOOLED	140	0	5	4	5
44	1095698	MANJULA LAXMAN MUSALAMAI	1165/365	YES	YES	YES	YES	14/2/22	114	UNPOOLED	02-12-2022	14/2/22	D2OL,38hr	M	29	1	3	3	1	1	YES	3,10	32+1	LSCS	1300	`8	3	1,6	PDHM	PDHM+MOM	MOM	MOM	3	12	12	12	3	10	None	None	RTF	DBF+SF	SF+DBF	SF+DBF	1260	1200	1250	1670	41	41.3	41.3	42.5	29	29.3	29.3	31.5	7	7	7.5	7.5	None	CONS	None	None	13	14/2/22	UNPOOLED	311	5	6	0	6
45	1095776	NETRA ADIVEPPA MIRAKHOR	1166/366	YES	YES	YES	YES	15/2/22	172	UNPOOLED	13/2/22	15/2/22	D2OL,25hr	F	26	2	3	3	1	2	YES	3,10,15	35+4	NVD	1300	`8	2,3	1	PDHM	MOM	MOM	MOM	8	12	15	15	8	None	None	None	SFs	DBF+SF	SF+DBF	SF+DBF	1300	1280	1340	1860	42	42.5	42.9	43.6	29.9	30.3	30.3	31.4	7	7	7.5	7.5	None	None	None	None	11	15/2/22	UNPOOLED	140	3	5	3	5
46	1095753	ASIA MOHAMMAD MUSTAFA	1167/367	YES	YES	YES	YES	14/2/22	143	POOLED	13/2/22	14/2/22	D2OL ,24hr	M	22	1	3	2	1	2	YES	15	36+1	LSCS	2200	8	2	1,6	PDHM	MOM+PDHM	MOM	MOM	8	12	12	15	20	20	None	None	SF+DBF	DBF +SFs	SF+DBF	SF+DBF	2100	1900	2260	2600	47	47.2	48.2	49.2	32.5	32.5	33.5	34.2	7.5	7.5	8	8	None	None	None	None	7	14/2/22	POOLED	300	1	5	1	5
47	1096225	SAROJINI SUNIL YADHUDI	1168/368	YES	YES	YES	YES	15/2/22	184	POOLED	15/2/22	15/2/22	D1OL,3hra	M	23	1	3	3	1	1	YES	9,15	33+6	NVD	1820	8	3	1,6	PDHM	PDHM+MOM	MOM	MOM	12	12	12	15	12	40	None	None	SFs	DBF +SFs	SF+DBF	SF+DBF	1700	1680	1900	2360	44	44.3	45	45.9	30.5	30.5	31.5	32	7.5	7.5	7.5	7.5	None	None	None	None	10	15/2/22	POOLED	564	3	7	0	7
48	1096591	SUNITA RAVI	1170/370	YES	YES	YES	YES	16/2/22	193	UNPOOLED	16/2/22	16/2/22	D1OL,1hr	F	22	1	3	3	1	2	YES	3	33+6	LSCS	1440	8	3	1,2,6	PDHM	PDHM+MOM	MOM	MOM	3	12	12	15	3	60	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1440	1400	1680	2100	45.2	45.7	46.3	47.2	32.2	32.5	33.3	34	7	7	7.5	7.5	None	None	None	None	9	16/2/22	UNPOOLED	430	7	2	0	2
49	1097868	RATNA IRAPPA HATTARWAD	1173/373	YES	YES	YES	YES	24/2/22	181	POOLED	22/2/22	24/2/22	D3OL,50hr	M	23	3	3	3	1	1	YES	3,4	33+3	LSCS	1800	7	3	1,2,6	PDHM	PDHM+MOM	MOM	MOM	3	12	12	15	3	80	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1800	1760	1940	2500	45	45	45.9	46.9	29.5	30	30.8	31.9	7	7	7.5	7.5	None	None	None	None	8	24/2/22	POOLED	320	2	4	0	4
50	1098427	MAYURI JOTIBA TOPKAR	1174/374	YES	YES	YES	YES	03-06-2022	156	POOLED	26/2/22	03-06-2022	D10OL	F	22	1	3	3	1	2	YES	10,15	31+2	LSCS	1100	7	3	1,2,6	PDHM	PDHM+MOM	MOM	MOM	3	12	12	15	3	80	None	None	RT Feeds	DBF+SF	DBF+SF	DBF+SF	1080	1100	1080	1380	40	40.5	40.5	41	27.5	30.1	30	30.6	7	7	7	7	CONS	None	None	None	18	03-06-2022	POOLED	384	7	3	0	3
51	1098677	MINAZ CHANDA SAHIL	1175/375	YES	YES	YES	YES	28/2/22	173	UNPOOLED	28/2/22	28/2/22	D1OL,1hr	M	30	3	3	3	1	1	YES	15	36	NVD	2200	8	3	1,6	PDHM+MOM	PDHM+MOM	MOM	MOM	8	12	12	15	20	20	None	None	SF+DBF	SF+DBF	DBF	DBF	2200	2120	2320	2960	45	45.2	45.7	46.7	32.5	32.5	33.2	34.2	8	8	8	8	None	None	None	None	4	28/2/22	UNPOOLED	100	0	4	0	4
52	1098237	SHREYA UDAY MEDAR	1176/376	YES	YES	YES	YES	03-01-2022	159	UNPOOLED	25/2/22	03-01-2022	D4OL	F	24	1	4	4	1		YES	9,15	36+2	LSCS	2400	7	3,6	1,4,5	MOM+PDHM	PDHM+MOM	MOM	MOM	12	12	15	12	100	60	None	None	DBF +SFS	SF+DBF	SF+DBF	DBF	2160	2060	2300	2800	46.2	46.2	47	47.9	32	32.5	33.1	33.7	8	8	8	8.5		None	None	None	7	03-01-2022	UNPOOLED	220	0	3	4	3
53	1099667	UJWALA VISHAL PATIL TWIN 1	1178/378	YES	YES	YES	YES	03-05-2022	146	POOLED	03-05-2022	03-05-2022	D1OL	M	25	1	4	4	1	1	YES	9,11	35	LSCS	2300	`8	3	1,6,	PDHM +MOM	PDHM+MOM	MOM	MOM	12	10	12	12	60	30	None	None	DBF + SFs	SF+DBF	SF+DBF	SF+DBF	2060	2000	2400	2900	47.2	47.2	47.9	48.6	32.9	32.9	33.7	34.5	8	8	8	8.5	None	None	None	None	6	03-05-2022	POOLED	350	0	6	0	6
54	1099668	UJWALA VISHAL PATIL TWIN 2	1179/379	YES	YES	YES	YES	03-05-2022	198	POOLED	03-05-2022	03-05-2022	D1OL	F	25	1	4	4	1	1	YES	9,11	35	LSCSC	2100	`8	3	1,6	PDHM+MOM	PDHM+MOM	MOM	MOM	12	12	10	12	60	60	None	None	SF+DBF	SF+DBF	SF+DBF	SF+DBF	1900	1840	2200	2700	47.2	447.2	47.9	48.6	32	32	33	34	8	8	8	8	None	None	None	None	6	03-05-2022	POOLED	440	0	6	0	6
55	1100046	MANISHA PRAVEEN	1182/382	YES	YES	YES	YES	03-08-2022	167	POOLED	03-07-2022	03-08-2022	D2OL	F	24	2	4	5	1	1	YES	15	36	NVD	2100	8	3	1,6	PDHM+MOM	PDHM+MOM	MOM	MOM	10	10	12	15	20	10	None	None	SF+DBF	SF+DBF	SF+DBF	DBF	1900	1840	2230	2700	48	48	48.9	49.7	32	32	32.6	33.5	8	8	8	8.5	None	None	None	None	6	02-08-2022	POOLED	90	0	5	1	5
56	1101015	LAXMI BABU DOMBAR TWIN 1	1183/383	YES	YES	YES	YES	03-12-2022	166	UNPOOLED	03-12-2022	03-12-2022	D1OL	M	22	1	3	3	1	1	YES	3	33+5	LSCS	1800	`8	3	1,6,7	PDHM	PDHM+MOM	MOM	MOM	12	10	12	15	12	60	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1800	1760	1960	2460	43	43	44	45	32	32	33	33.7	7.5	7.5	8	8	None	None	None	None	4	03-12-2022	UNPOOLED	126	2	2	0	2
57	1101016	LAXMI BABU DOMBAR TWIN 2	1184/384	YES	YES	YES	YES	03-12-2022	196	PRETERM	03-12-2022	03-12-2022	D1OL	F	22	1	3	3	1	1	YES	3	33+5	LSCS	1850	8	3	1,6,7	PDHM	PDHM+MOM	MOM	MOM	12	12	12	8	12	60	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1850	1800	2050	2400	43	43	44.5	45.5	32.2	32.2	34.2	35.5	7.5	7.5	8	8	None	None	None	None	4	03-12-2022	UNPOOLED	176	2	2	0	2
58	1101086	MALAVVA ISHWAR BADRODI	1185/385	YES	YES	YES	YES	13/3/22	135	UNPOOLED	13/3/22	13/3/22	D1OL	M	25	1	4	4	1	1	YES		34	LSCS	1900	8	3	1,6	PDHM	PDHM+MOM	MOM	MOM	9	12	9	12	30	10	None	None	SF	SF+DBF	SF+DBF	SF_DBF	1840	1800	2140	2430	45.5	45.5	46.5	47.4	31.7	31.7	32.5	33	8	8	8	8	None	None	None	None	5	13/3/22	UNPOOLED	150	3	2	0	2
59	1101292	MALA MANJUNATH	1186/386	YES	YES	YES	YES	14/3/22	137	UNPOOLED	14/3/22	14/3/22	D1OL	F	22	2	3	3	1	1	YES	10	34+4	LSCS	1400	8	3	1,6,7	MOM+PDHM	PDHM+MOM	MOM	MOM	12	12	11	12	60	60	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1460	1380	1640	1920	45	45.5	46.2	47	32	32.5	33.2	34	7	7	7	7	None	None	None	None	8	14/3/22	UNPOOLED	640	0	8	0	8
60	1101391	PRIYANKA PRABHAKAR MUTNAL	1188/388	YES	YES	YES	YES	15/3/22	132	POOLED	15/3/22	15/3/22	D1OL	F	23	1	4	4	1	1	YES	15	36+3	LSCS	1700	8	2,3	1,6,7	PDHM+MOM	MOM	MOM	MOM	10	10	9	11	20	None	None	None	SF	SF+DBF	SF+DBF	SF+DBF	1760	1680	1940	2420	47	47	47.8	49.2	33.1	33.1	33.9	35	8	8	8	8	None	None	None	None	7	15/3/22	POOLED	170	0	5	2	5
61	1101571	RENUKA DEEPAK PATIL	1190/390	YES	YES	YES	YES	16/3/22	110	UNPOOLED	16/3/22	16/3/22	D1OL	F	23	1	3	3	1	1	YES		34+6	NVD	2000	8	3	1,6	PDHM	PDHM+MOM	MOM	MOM	10	10	11	12	120	80	None	None	SF	SF+DBF	SF+DBF	SF+DBF	1800	1740	2080	2540	46	46.2	47.3	48.2	31.5	31.5	32.4	33.2	7.5	7.5	8	8	None	None	None	None	6	16/3/22	UNPOOLED	860	3	3	0	3
62	1101715	SHOBHA BASAPPA	1191/391	YES	YES	YES	YES	18/3/22	118	POOLED	16/3/22	18/3/22	D2OL	F	33	4	3	4	1	1	YES	1,4,15	29+6	LSCS	1280	7	2,3	1,2,6	PDHM	PDHM+MOM	MOM	MOM	10	10	12	15	30	120	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1260	1150	1220	1520	39.5	40.3	40.5	41.4	29	29.8	29.8	30.8	6.5	6.5	6.5	6.5	None	None	None	None	13	18/3/22	POOLED	1980	8	3	0	3
63	1102066	POOJA SUNIL VADAGOLE TWIN 1	1194/394	YES	YES	YES	YES	19/3/22	141	POOLED	19/3/22	19/3/22	D1OL	F	24	1	4	4	1	1	YES	5,10,11,15	34+3	LSCS	1800	8	3,6	1,6,7,	PDHM+MOM	PDHM+MOM	MOM	MOM	11	11	12	12	30	60	None	None	SF+DBF	SF+DBF	SF+DBF	SF+DBF	1820	1760	2060	2400	45	45	46.2	47.1	32	32	33.4	34.2	8	8	8	8	None	None	None	None	6	19/3/22	POOLED	400	0	6	0	6
64	1102069	POOJA SUNIL VADAGOLE TWIN 2	1195/395	YES	YES	YES	YES	19/3/22	157	POOLED	19/3/22	19/3/22	D1OL	M	24	1	4	4	1	1	YES	5,10,11,15	34+3	LSCS	1500	`8	3,6	1,6,7	PDHM+MOM	PDHM+MOM	MOM	MOM	12	12	10	12	30	80	None	None	SF+DBF	SF+DBF	SF+DBF	SF+DBF	1520	1480	1660	2000	43.5	44	45	46	31	31.1	32	32.9	8.5	8.5	8.5	8.5	None	None	None	None	6	19/3/22	POOLED	530	0	6	0	6
65	1103173	MALASHRI NAGAPPA KALERI	1197/397	YES	YES	YES	YES	24/3/22	149	UNPOOLED	24/3/22	24/3/22	D1OL	F	20	1	3	3	1	1	YES	9,15	35+6	NVD	2100	`8	2,3	1,6,7	PDHM+MOM	MOM	MOM	MOM	12	12	11	15	40	None	None	None	SF+DBF	DBF	DBF	DBF	2000	1920	2230	2620	46	4646.8	47.5	33.5	33.5	33.5	34.3	35.2	8	8	8.5	8.5	None	None	None	None	6	24/3/22	UNPOOLED	110	0	3	3	3
66	1102861	SNEHA SURAJ BIRGE	1198/398	YES	YES	YES	YES	25/3/22	165	UNPOOLED	23/3/22	25/3/22	D2OL	F	22	1	3	3	1	1	YES	15	36+3	LSCS	2500	8	6	1,4	PDHM+MOM	PDHM+MOM	MOM	MOM	12	11	10	12	100	80	None	None	DBF+SFs	DBF+SF	SF+DBF	DBF	2340	2260	2520	2880	48	48	48.8	49.5	32.2	32.2	33	34	8	8	8	8	None	None	None	None	9	25/3/22	UNPOOLED	460	0	7	2	7
67	1103192	ANITA MARUTI NAIK	1199/399	YES	YES	YES	YES	25/3/22	140	POOLED	25/3/22	25/3/22	D1OL	M	23	1	3	3	1	1	YES	3,15	36+1	NVD	1800	8	6	1,6	PDHM	PDHM+MOM	MOM	M	11	11	12	M	10	10	None	M	SF	SF+DBF	SF+DBF	M	1800	1720	1840	M	46.5	46.5	47	M	33.2	33.2	34	M	8	8	8	M	None	None	None	M	5	25/3/22	POOLED	380	2	3	0	3
68	1103395	TAIBA TAJODOIR DEPARI	1200/400	YES	YES	YES	YES	27/3/22	145	POOLED	25/3/22	25/3/22	D1OL	M	22	1	3	3	1	1	YES	HM+	36+2	NVD	2000	8	3	1,6	PDHM+MOM	MOM	M	M	12	12	M	M	20	40	M	M	SF+DBF	DBF +SFs	M	M	2120	19400	M	M	46	46.2	M	M	33.2	33.2	M	M	8.5	8.5	M	M	None	None	M	M	7	27/3/22	POOLED	120	0	4	3	4
69	1103983	RESHMA UMESH PATIL	1201/401	YES	YES	YES	YES	30/3/22	178	POOLED	29/3/22	29/3/22	D2OL	M	21	1	4	4	1	2	YES	10	34	LSCS	1440	7	3	1,2,6	PDHM	MOM	PDHM	MOM	10	12	12	12	20	None	60	None	RTF	SF+DBF	RTF+SF	SF+DBF	1440	1500	1380	1500	46	47.5	46.6	47.5	32	33.3	32.8	33.3	7.5	7.5	7.5	7.5	Enterobacter fecium	None	None	None	32	30/3/22	POOLED	840	15	2	9	2
70	1103747	PRIYANKA PRAMOD MORE	1202/402	YES	YES	YES	YES	30/3/22	195	UNPOOLED	30/3/22	30/3/22	D1OL,1hr	F	26	3	3	3	1	1	YES	3,4	33+5	LSCS	1600	8	3	1,6	MOM+PDHM	MOM	MOM	MOM	10	10	12	15	100	None	None	None	DBF+SFs	SF+DBF	SF+DBF	SF+DBF	1540	1480	1740	2060	44.7	44.7	45.5	46.4	32	32.3	33.2	34	7	7	7	7.5	None	None	None	None	9	30/3/22	UNPOOLED	380	0	6	3	6
71	1105011	BHAGYASHREE VIVEK PATIL TWIN 1	1205/405	YES	YES	YES	YES	04-05-2022	134	UNPOOLED	04-05-2022	04-05-2022	D1OL	F	26	1	3	3	1	1	YES	10,11	36+5	LSCS	2500	8	3	1,6,7	MOM+PDHM	MOM+PDHM	MOM	MOM	10	12	12	15	50	40	None	None	SF+DBF	SF+DBF	SF+DBF	SF+DBF	2300	2240	2500	2860	47	47	47.8	48.3	33.2	33.2	34	34.8	8	8	8	8	None	None	None	None	4	04-05-2022	UNPOOLED	160.00	0.00	4.00	0.00	4.00
72	1105003	BHAGYASHREE VIVEK PATIL TWIN 2	1206/406	YES	YES	YES	YES	04-05-2022	158	UNPOOLED	04-05-2022	04-05-2022	D1OL	F	26	1	3	3	1	1	YES	10,11	36+5	LSCS	1900	8	3	1,6,7	MOM+PDHM	MOM+PDHM	MOM	MOM	10	12	12	15	40	60	None	None	SF+DBF	SF+DBF	SF+DBF	SF+DBF	1900	1850	2360	2540	46.5	46.5	47.3	48	33.2	33.2	34	34.5	8	8	8	8	None	None	None	None	4	04-05-2022	UNPOOLED	200.00	0.00	4.00	0.00	4.00
73	1105177	ANUSHA VINAY KALMATH	1207/407	YES	YES	YES	YES	14/4/22	169	UNPOOLED	04-07-2022	714/4/22	D7OL	F	22	1	4	4	1	2	YES	9,15	28+4	LSCS	1000	7	3	1,2,6,7	PDHM	MOM	PDHM+MOM	MOM	6	12	12	15	6	20	80	None	RTF	SF+DBF	RTF	SF+DBF	1100	1570	1120	1500	37	38.7	38	38.7	26.5	28	27.5	28	7	7	7	7	CONS	None	None	None	34	14/4/22	UNPOOLED	740	6	8	13	8
74	1105414	BISMILLA LALASSAB	1208/408	YES	YES	YES	YES	04-07-2022	144	POOLED	04-07-2022	04-07-2022	D1OL	F	26	3	3	3	1	2	YES	4,5,15	36+2	NVD	1900	8	2	1,6	PDHM	PDHM+MOM	MOM	MOM	10	12	12	12	80	20	None	None	SF	SF+DBF	SF+DBF	DBF	1840	1780	2050	2360	46	46.1	47.2	48.3	33.2	33.2	34.5	35	8	8	8	8	None	None	None	None	5	04-07-2022	POOLED	280	2	3	0	3
75	1105154	PRIYANKA NITISH NANDIKAR	1209/409	YES	YES	YES	YES	04-08-2022	175	UNPOOLED	04-05-2022	04-08-2022	D3OL,50hr	M	23	1	3	2	1	2	YES	15	36+5	LSCS	2400	7	3	1,2	MOM+PDHM	MOM+PDHM	MOM	MOM	10	12	12	12	80	40	None	None	SF+DBF	SF+DBF	SF+DBF	DBF	2260	2200	2500	2900	46	46	46.8	47.5	32	32.5	32.5	33.5	8	8	8	8	None	None	None	None	7	04-08-2022	UNPOOLED	260	0	4	0	4
76	1105646	ALMEERA JAFAR SADIK	1210/410	YES	YES	YES	YES	04-09-2022	117	UNPOOLED	04-07-2022	04-09-2022	D2OL	F	18	2	3	3	1	2	YES	5,7,9,13	31+1	LSCS	1400	8	3	1,2,4,6	PDHM	PDHM+MOM	PDHM+MOM	MOM	12	12	12	12	24	60	200	None	RTF	SF+DBF	SF+DBF	SF+DBF	1420	1400	1380	1650	40	41	40.5	41.5	27.5	27.5	28	28.7	7	7	7	7	Staph epidermidis	None	None	None	26	04-09-2022	UNPOOLED	3136	12	11	0	11
77	1105937	SHAKUNTALA DODDAGANAGI TWIN 1	1212/412	YES	YES	YES	YES	04-09-2022	121	POOLED	04-09-2022	04-09-1944	D1OL	M	21	1	3	3	1	1	YES	11,15	36+3	LSCS	2400	8	3	1,6	PDHM	PDHM+MOM	MOM	MOM	12	12	15	12	40	40	None	None	SF	SF+DBF	SF+DBF	SF+DBF	2360	2280	2600	3000	47	47	47.8	48.5	32	32	33.1	34	8	8	8	8	None	None	None	None	6	04-09-2022	POOLED	380	3	3	0	3
78	1105935	SHAKUNTALA DODDAGANAGI TWIN 2	1213/413	YES	YES	YES	YES	04-09-2022	105	UNPOOLED	04-09-2022	04-09-2022	D1OL	F	21	1	3	3	1	1	YES	11,15	36+3	LSCS	2000	8	3	1,6	PDHM	PDHM+MOM	MOM	MOM	12	12	12	12	60	60	None	None	SF	SF+DBF	SF+DBF	SF+DBF	1980	1900	2300	2720	46.5	446.5	47.4	48.6	32	32	32.8	34.5	8	8	8	8	None	None	None	None	6	04-09-2022	UNPOOLED	480	3	3	0	3
79	1106083	B/O AISHWARYA SAGAR CHAWAN	1214/414	YES	YES	YES	YES	04-10-2022	129	POOLED	04-10-2022	04-10-2022	D1OL	F	23	3	3	3	1	2	YES	7	35+4	LSCS	2000	8	2	1,6	PDHM	MOM	MOM	M	12	8	12	M	60	None	None	M	SF	SF+DBF	SF+DBF	M	1920	1860	2260	M	46	46	46.8	M	31.5	31.5	32	M	7.5	7.5	8	M	None	None	None	M	6	04-10-2022	POOLED	300	2	2	2	2
80	1107216	B/O TAMIM NABIL PATEL	1215/415	YES	YES	YES	YES	18/4/22	138	UNPOOLED	15/4/22	18/4/22	D3OL,50hr	M	36	2	3	3	1	1	YES	9	31+4	LSCS	1420	7	3	1,2,6,7	PDHM	MOM	MOM	MOM	6	9	11	12	12	None	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1420	1450	1450	1700	43	43.8	43.8	45	29	29.7	29.7	30.8	7	7	7	7.5	12	None	None	None	15	18/4/22	UNPOOLED	996	6	5	1	5
81	1107338	B/O SNEHAL GAJAWAN MANE	1217/417	YES	YES	YES	YES	16/4/22	111	UNPOOLED	16/4/22	16/4/22	D1OL	F	22	2	3	3	1	1	YES	10,15	36+5	LSCS	2100	8	2,3	1,6,7	PDHM	MOM	MOM	MOM	8	12	12	15	80	None	None	None	SF	SF+DBF	SF+DBF	DBF	2090	2040	2230	2700	47	47	47.8	48.6	32.5	32.5	33	34	8	8	8	8	80	None	None	None	6	16/4/22	UNPOOLED	280	2	2	2	2
82	1106985	B/O VANISHRI PRASHANT MUNNOLI	1219/419	YES	YES	YES	YES	17/4/22	123	POOLED	17/4/22	17/4/22	D1OL	M	22	2	2	3	1	2	YES	4	35+2	NVD	2300	8	2,3	1,6	PDHM +MOM	M0M	MOM	MOM	12	12	11	15	80	None	None	None	SF+SBF	DBF	DBF	DBF	2260	2200	2500	2800	47	47	47.9	48.8	33	33	33.8	34.5	8	8	8	8	80	None	None	None	6	17/4/22	POOLED	220	0	3	3	3
83	1107738	B/O SHANTAVVA GANGAPPA PUJARI	1220/420	YES	YES	YES	YES	18/4/22	174	POOLED	18/4/22	18/4/22	D1OL	M	24	1	3	3	1	1	YES		34+2	LSCS	1800	8	2,3	1,6	PDHM	MOM+PDHM	MOM	M	12	10	12	M	100	60	None	M	SF	SF+DBF	SF+DBF	M	1860	1800	2200	M	46	46	47	M	32	32	32.7	M	8	8	8	M	80	40	None	M	5	18/4/22	POOLED	240	2	2	1	1
84	1108619	B/O GEETA MANJUNATH TWIN 1	1222/422	YES	YES	YES	YES	24/4/22	150	UNPOOLED	24/4/22	24/4/22	D1OL	F	23	2	4	4	1	1	YES	10,11,15	35	LSCS	2200	8	3,6	1,6,7	PDHM	MOM+PDHM	MOM	MOM	12	10	11	15	100	60	None	None	SF	SF+DBF	SF+DBF	SF+DBF	1980	1900	2260	2680	47	47	47.5	48.4	32	32	32.5	33.5	8	8	8	8	60	60	None	None	5	24/4/22	UNPOOLED	220	3	1	1	1
85	1108620	B/O GEETA MANJUNATH TWIN 2	1223/423	YES	YES	YES	YES	24/4/22	176	PRETERM	24/4/22	24/4/22	D1OLO	F	23	2	3	4	1	1	YES	10,11,15	35	LSCS	1650	8	3,6	1,6,7	PDHM	MOM+PDHM	MOM	MOM	12	10	11	15	80	60	None	None	SF	SF+DBF	SF+DBF	SF+DBF	1580	1500	1750	2060	46	46	46.6	47.3	32	32	32.4	33.2	7.5	7.5	8	8	60	60	None	None	5	24/4/22	UNPOOLED	250	3	1	1	1
86	1108667	B/O AKSHATA MANJUNATH TWIN 1	1224/424	YES	YES	YES	YES	26/4/22	187	UNPOOLED	23/4/22	26/4/22	D3OL,50hr	F	24	2	3	2	1	1	YES	11	31+4	NVD	1500	7	3,6	1,2,6,7	PDHM	MOM+PDHM	MOM+PDHM	MOM	6	12	11	12	60	60	100	None	RTF	SF+DBF	SF	SF+DBF	1500	1540	1460	1700	42.5	44	44	44.5	28.5	29.8	29.8	30.5	7	7	7.5	7.5	60	60	80	None	11	26/4/22	POOLED	780	6	3	0	0
87	1108669	B/O AKSHATA MANJUNATH TWIN 2	1225/425	YES	YES	YES	YES	26/4/22	188	POOLED	23/4/22	26/4/22	D3OL,50hr	M	24	2	3	2	1	1	YES	11	31+4	NVD	1600	8	3,6	1,2,6,7	PDHM	MOM+PDHM	MOM+PDHM	MOM	6	12	11	12	60	60	120	None	RTF	SF+DBF	SF	SF+DBF	1600	1680	1600	1800	43.2	44	44	44.5	29.6	30.2	30.2	31.6	7	7	7.5	7.5	80	60	60	None	11	26/4/22	POOLED	860	7	2	0	0
88	1108505	B/O NIKHAT IMRAN BAGEWADI TWIN 1	1226/426	YES	YES	YES	YES	22/4/22	161	POOLED	22/4/22	22/4/22	D1OL	F	26	2	3	3	1	1	YES	9,11	35+6	LSCS	1840	8	3,6	1,6	PDHM	MOM	MOM	MOM	12	12	15	12	100	None	None	None	SF	SF+DBF	DBF	DBF	1840	1800	2250	2700	46.5	46.5	47.4	48	32	32	33.3	34	8	8	8	8	60	None	None	None	6	22/4/22	POOLED	200	2	2	2	2
89	1108509	B/O NIKHAT IMRAN BAGEWADI TWIN 2	1227/427	YES	YES	YES	YES	22/4/22	170	UNPOOLED	22/4/22	22/4/22	D1OL	F	26	2	3	3	1	1	YES	9,11	35+6	LSCS	2100	7	3,6	1,6	PDHM	MOM	MOM	MOM	11	12	15	12	120	None	None	None	SF	SF+DBF	DBF	DBF	2100	2060	2260	2780	47	47	47.5	48.2	32	32	33.5	34.4	8	8	8	8	60	None	None	None	6	22/4/22	UNPOOLED	240	2	2	2	2
90	1109955	B/O RUDRAVVA RUDRAGAUDA SAVADTI	1128/428	YES	YES	YES	YES	29/4/22	197	UNPOOLED	29/4/22	29/4/22	D1OL	F	22	2	3	3	1	1	YES	5,9,10	36	LSCS	2400	8	3	1,6	PDHM+MOM	PDHM+MOM	MOM	MOM	8	12	10	12	120	None	None	None	SF+DBF	DBF	DBF	DBF	2300	2200	2560	2800	46.8	46.8	48	48.7	33	33.1	34	34.9	8	8	8	8	80	40	None	None	4	29/4/22	UNPOOLED	140	0	4	0	4
91	1110024	B/O RATIKA BASAVANI	1129/429	YES	YES	YES	YES	29/4/22	122	UNPOOLED	29/4/22	29/4/22	D1OL	F	21	1	3	3	1	2	YES	10,15	36+1	LSCS	1500	8	3	1,6	PDHM	MOM	M	M	8	12	M	M	60	None	M	M	RTF	SF+DBF	M	M	1480	1400	M	M	45	45	M	M	31.5	31.5	M	M	7.5	7.5	M	M	60	None	M	M	9	29/4/22	UNPOOLED	520	3	3	3	3
92	1110192	B/O LAXMI DEEPAK	1130/430	YES	YES	YES	YES	05-01-2022	124	UNPOOLED	05-01-2022	05-01-2022	D1OL	M	23	1	3	2	1	2	YES	15	35+4	NVD	2300	8	3	1,6	PDHM	MOM	MOM	MOM	10	8	12	12	40	None	None	None	SF	SF+DBF	DBF	DBF	2200	2160	2500	2800	47	47	47.8	48.2	33.5	33.5	34.5	34.9	8	8	8	8	40	None	None	None	7	05-01-2022	UNPOOLED	380	3	3	1	3
93	1111321	B/O SAROJINI SHINDE	1131/431	YES	YES	YES	YES	05-06-2022	180	POOLED	05-06-2022	05-06-2022	D1OL	M	28	2	3	2	1	2	YES	3,15	34+4	LSCS	1900	8	3,6	1,6	PDHM+MOM	PDHM+MOM	MOM	MOM	10	12	11	12	60	20	None	None	SF+DBF	SF+DBF	DBF	DBF	1900	1860	2260	2650	46	46	47.1	47.9	33	33	33.9	34.7	7.5	7.5	8	8	60	20	None	None	5	05-06-2022	POOLED	250	0	5	0	5
94	112008	B/O VIDYA HARSHAVARDHAN	1133/433	YES	YES	YES	YES	05-11-2022	153	POOLED	05-09-2022	05-11-2022	D3OLO	F	26	3	2	2	1	1	YES	3,5,7,10,15	36	LSCS	1200	7	3	1,2,5,6,7	PDHM	MOM	MOM	MOM	8	10	12	15	40	None	None	None	SF	DBF	DBF	DBF	1200	1300	1260	1430	43	44.1	44.1	44.7	31	32	32.1	32.6	7	7	7	7.5	40	None	None	None	18	05-11-2022	POOLED	500	4	3	9	3
95	1111712	B/O RESHMA SURAJ PATIL	1134/434	YES	YES	YES	YES	05-09-2022	182	POOLED	05-09-2022	05-09-2022	D1OL	F	22	1	3	3	1	2	YES	4,10	36	LSCS	2000	8	3	1,5,6,7,	PDHM+MOM	MOM	MOM	MOM	8	10-	12	15	40	None	None	None	SF+DBF	DBF	DBF	DBF	2000	1980	2300	2800	46	46	46.9	47.8	33	33	34.7	35	8	8	8	8	40	None	None	None	6	05-09-2022	POOLED	140	0	3	3	3
96	1112089	B/O JAYASHREE SHIVANAND	1135/435	YES	YES	YES	YES	05-10-2022	148	UNPOOLED	05-10-2022	05-10-2022	D1OL	M	22	1	3	3	1	1	YES	15	34	NVD	2000	8	3	1,6,	PDHM	MOM	MOM	MOM	9	10	12	12	40	None	None	None	SF	SF+DBF	SF+DBF	SF+DBF	2000	1920	2260	2560	46	46.1	46.7	47.5	32.5	32.5	34	34.7	8	8	8	8	40	None	None	None	6	05-10-2022	UNPOOLED	140	2	2	2	2
97	1112399	B/O AARTI MARUTI NAIK	1137/437	YES	YES	YES	YES	13/5/22	116	UNPOOLED	05-11-2022	13/5/22	D2OL	M	24	1	3	3	1	2	YES		32+1	NVD	1860	7	3	1,2,6	PDHM	PDHM+MOM	MOM	MOM	8	12	12	11	40	60	None	None	RTF	SF+DBF	SF+DBF	SF+DBF	1800	1850	1750	2240	43	44.5	44	45	32	33.5	33	34	7.5	8	7.5	8	40	60	None	None	17	13/5/22	UNPOOLED	780	9	6	6	0
98	1096234	B/O BHAGYASHREE ERRAPA	1169/369	YES	YES	YES	YES	16/2/22	130	POOLED	16/2/22	16/2/22	D1OL	M	23	1	3	3	1	2	YES	4	35	NVD	1800	8	3	1,6	PDHM	MOM	MOM	MOM	8	10	12	15	40	None	None	None	SF	DBF	DBF	DBF	1800	1780	2230	2670	44	44	44.5	45.5	34	34	34.5	34.9	8	8	8	8	40	None	None	None	6	16/2/22	POOLED	240	2	2	2	2