IMMEDIATE OUTCOME OF PRETERM BABIES BORN IN A TERTIARY RURAL CARE CENTER

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ABSTRACT

Introduction. In neonatology preterm birth is one of the major issues as it leads to perinatal mortality and serious neonatal morbidity. Complications related to preterm birth are the leading cause of under five children death responsible for approximately 1 million death worldwide in 2015.[2]

Though Preterm births is a worldwide problem, >60% of preterm happen in South Asian countries and Africa. Since few studies have been done in rural setup this observational study of immediate outcome of preterm babies born in a rural tertiary care center has been taken up.

Material and methods. This prospective observational study was done in Adichunchanagiri Institute of Medical sciences, Mandya from 1st August 2019 – 31st July 2020. Study sample comprised of 100 preterm babies who were born in the study period. Data was collected on a preformed Performa, it was complied and entered in a MS excel sheet.

Results. Majority of preterm births in this study were in 32-36weeks which accounted for 86% of the babies. In this study male to female ratio was 0.81:1. More babies were AGA (71%) then SGA (29%). Common fetal morbidities were RDS (28%), NNH (28%), Birth asphyxia (17%), sepsis (13%). CPAP was required in 19 babies and majority of them had RDS. Ventilatory support was required in 7 babies. Mean duration of total stay was 10.64±7.65 days. In our study preterm mortality was 3% which was caused by RDS.

Conclusion. Early recognition of preterm morbidities and prompt treatment can reduce preterm mortality.

KEYWORDS : Preterm morbidity, preterm mortality

INTRODUCTION

According to 2017 data, worldwide 25 lakhs newborn death occurred out which 47% of deaths occurred in children less than 5years of age. In which preterm birth caused 60%-80% of neonatal mortality and morbidity.[1]

Preterm birth rates range from 5% to 18% across the 184 countries.[2]

Every year out of 10 more than 1 baby is born preterm, which results in 15 million preterm babies.[2]

Risk is higher in poorer families within countries. Preterm baby survival also depends on where they are born; in high income countries almost 9 out of 10 babies survive in contrast to low-income countries where it is 1 out 10.[2,3]

Thanks to the advancement in NICU facilities and obstetric interventions, survival of babies is now even possible at 20wks of gestation in developed countries. However, in contrast to developed countries in developing countries survival below 28weeks is rare.

More than seventy five percent of the preterm babies can be saved if they are given inexpensive care like essential care during child birth, antenatal steroid injections and kangaroo mother care after the birth of the baby and basic care for infections and breathing difficulties.[2]

Common Causes of preterm morbidity are neonatal jaundice, Respiratory distress syndrome (RDS) Neonatal sepsis, Birth asphyxia, Necrotizing enterocolitis (NEC), acute renal failure.[4]

Many of the preterm babies who survive have to deal with various disabilities like cerebral palsy, sensory deficits, learning disabilities and respiratory illnesses.

Since few studies have been done in a rural setup on preterm babies to determine their morbidity and mortality pattern this observational study of immediate outcome of preterm babies was taken up.

MATERIAL AND METHODS

Study Place	Study was conducted in Tertiary Rural Care Hospital i.e., Adichunchanagiri Institute of Medical Sciences
Study Duration	1st August 2019 to 31st July 2020
Study Subjects	Preterm babies that are less than 37 weeks of gestation born at Adichunchanagiri Institute of Medical Sciences
Study Design	Prospective Observational Study
Study Size	100 preterm babies

INCLUSION CRITERIA:
1. All preterm born at less than 37 week of gestation age.
2. Preterm babies who are small gestational age (SGA), appropriate for gestational age (AGA), large for gestational age (LGA).

EXCLUSION CRITERIA:
1. All babies who were referred from outside.
2. Babies born to unbooked maternal cases.

A total of 100 preterm babies delivered at ADICHUNCHANAGIRI INSTITUTE OF MEDICAL SCIENCES in the study period were included in the study.

Gestational age was calculated from mothers LMP and New Ballard score (NBS).

In case of discrepancy between gestational age calculated from mothers LMP and New Ballard score, gestational age calculated via NBS was taken into consideration.

Babies were weighed using electronic weighing machine present in our NICU with standard error of ± 5 grams.

Babies were categorized into small for gestational age (SGA), appropriate for gestational age (AGA) and large for gestational age (LGA) by plotting on Fenton chart for both sexes.

Babies with birth weight less than 10th percentile were categorized as SGA, between 10th & 90th percentile as AGA and above 90th percentile as LGA.

Babies were analyzed for the following factors till discharge:
1. Weight of babies
2. Sex of babies
3. Babies requiring Ventilatory Support
4. Morbidity in babies
5. Mortality of babies
6. Causes of mortality of babies.

STATISTICAL ANALYSIS:
Patient data was entered into the MS Excel sheet and was analyzed using SPSS v23.

Data analysis was done using Shapiro-Wilk Test, Wilcoxon-Mann-Whitney U Test, t- Test, Spearman Correlation, Kruskal Wallis Test and Fisher's Exact Test.

A 'p' value less than 0.05 is taken to denote significant relationship. If value of 'p' is more than 0.05 then it is taken to denote absence of relationship between the two variables.

RESULTS
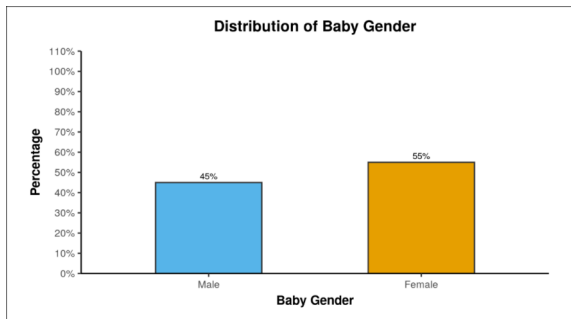
Graph 1- Distribution of baby gender

Male to female ratio was 0.81:1

Table 1: Distribution of the Participants in Terms of Birth Weight (Kg) (n = 100)	
Mean (SD)	1.85 (0.48)
Median (IQR)	1.85 (1.5-2.2)
Range	0.62 - 2.97

Table 2: Distribution of the Participants in Terms of Gestational Age (Completed Weeks) (n = 100)	
Mean (SD)	33.44 (2.53)
Median (IQR)	34 (32-35)
Range	24 - 36

Table 3- Preterm classification	Babies	
	No. of cases	%
Extremely preterm (<28weeks)	3	3
Very preterm (28 to 32 weeks)	11	11
Moderate to late preterm (32 to 37 weeks)	86	86
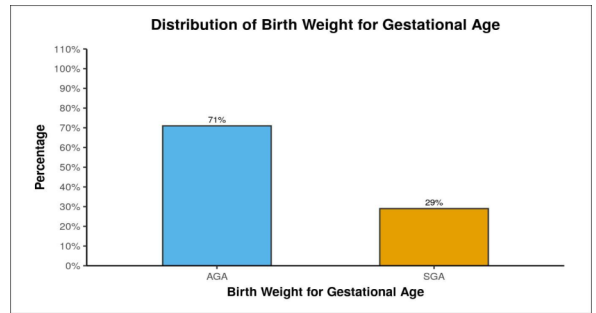
Graph 2- Distribution of birth weight for gestational age

Table 4: Summary of Preterm Morbidity	Present	Absent
RDS	28 (28.0%)	72 (72.0%)
TTNB	4 (4.0%)	96 (96.0%)
Birth Asphyxia	17 (17.0%)	83 (83.0%)
Sepsis	13 (13.0%)	87 (87.0%)
Hypocalcemia	19 (19.0%)	81 (81.0%)
Hypoglycemia	3 (3.0%)	97 (97.0%)
NNH	28 (28.0%)	72 (72.0%)
CHD	1 (1.0%)	99 (99.0%)
Feed Intolerance	4 (4.0%)	96 (96.0%)
Thrombocytopenia	6 (6.0%)	94 (94.0%)
NEC	2 (2.0%)	98 (98.0%)
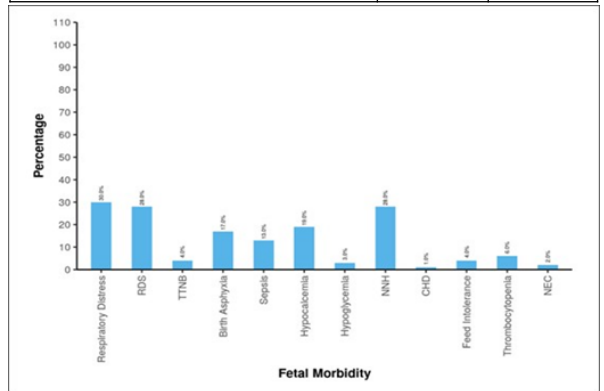
Graph 3- Distribution of Preterm morbidity

| Table 5-Duration of Stay	Mean ± SD	Median (IQR)	Min - Max
NICU	9.62 ± 8.04	8.00 (5.00-11.00)	0.0 - 40.0
PNC ward	2.73 ± 2.55	2.00 (1.00-4.00)	0.0 - 13.0
Total	10.64 ± 7.65	9.00 (5.00-12.25)	1.0 - 41.0
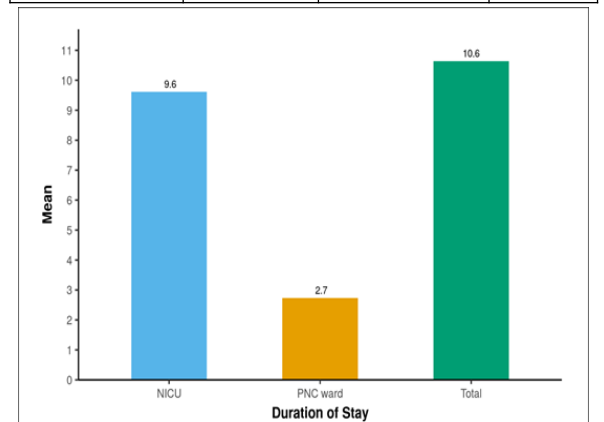
Graph 4- Distribution of stay

The mean Duration of Stay: NICU was 9.62 ± 8.04. The mean Duration of Stay: PNC ward was 2.73 ± 2.55. The mean Duration of Stay: Total was 10.64 ± 7.65.

Table 6-Preterm Mortality	Frequency	Percentage
Present	3	3.0%
Absent	97	97.0%
Total	100	100.0%

Table 7-Causes of Preterm Morbidity	Mortality	
	No.	%
RDS	3	100
Total	3	100
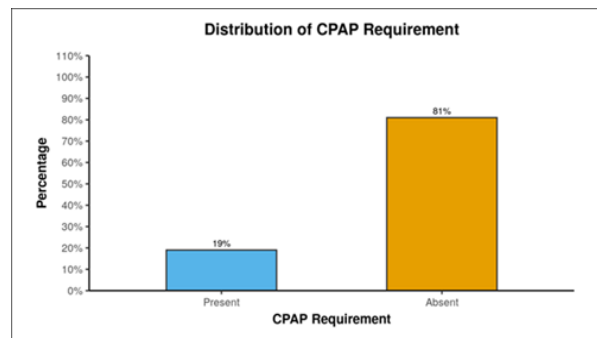
Graph 5- Distribution of CPAP requirement
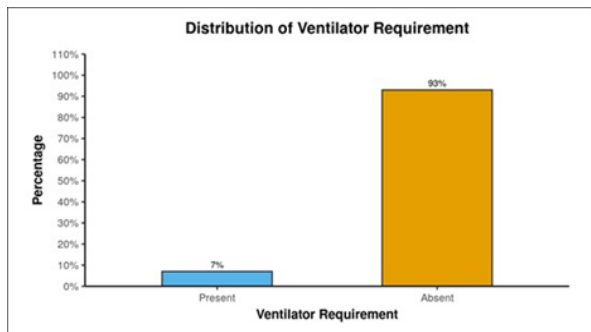
Graph 6- Distribution of ventilator requirement

Table 8: Association between Gestational Age (Completed Weeks) and Parameters	Gestational Age (Completed Weeks)	p value
Fetal Morbidity: RDS***		<0.001[1]
Present	30.73 ± 3.25	
Absent	34.21 ± 1.62	
Fetal Morbidity: TTNB		0.300[1]
Present	34.75 ± 0.96	
Absent	33.39 ± 2.56	
Fetal Morbidity: Birth Asphyxia***		0.031[1]
Present	31.76 ± 3.73	
Absent	33.78 ± 2.07	
Fetal Morbidity: Sepsis		0.365[1]
Present	33.00 ± 2.52	
Absent	33.51 ± 2.54	
Fetal Morbidity: Hypocalcemia		0.213[1]
Present	33.37 ± 1.38	
Absent	33.46 ± 2.73	
Fetal Morbidity: Hypoglycemia		0.902[1]
Present	32.67 ± 4.16	
Absent	33.46 ± 2.49	
Fetal Morbidity: NNH		0.219[1]
Present	33.14 ± 2.29	
Absent	33.56 ± 2.62	
Fetal Morbidity: CHD		0.135[1]
Present	29.00 ± 0	
Absent	33.48 ± 2.50	
Fetal Morbidity: Feed Intolerance		0.300[1]
Present	34.75 ± 0.96	

Absent	33.39 ± 2.56	
Fetal Morbidity: Thrombocytopenia		0.723[1]
Present	33.00 ± 3.10	
Absent	33.47 ± 2.50	
Fetal Morbidity: NEC***		0.028[1]
Present	28.50 ± 0.71	
Absent	33.54 ± 2.45	
CPAP Requirement***		0.001[1]
Present	31.58 ± 3.17	
Absent	33.88 ± 2.15	
Ventilator Requirement***		0.001[1]
Present	29.57 ± 3.26	
Absent	33.73 ± 2.23	

*** *Significant at p<0.05, 1: Wilcoxon-Mann-Whitney U Test*

Table 9: Association between Birth Weight (Kg) and Parameters	Birth Weight (Kg)	p value
Baby Gender		0.717[1]
Male	1.87 ± 0.52	
Female	1.84 ± 0.45	
Gestational Age (Completed Weeks)***	Correlation Coefficient (rho) = 0.63	<0.001[2]
Birth Weight for Gestational Age***		<0.001[1]
AGA	1.95 ± 0.50	
SGA	1.62 ± 0.32	
Fetal Morbidity: RDS***		<0.001[1]
Present	1.44 ± 0.46	
Absent	1.97 ± 0.42	
CPAP Requirement***		0.015[1]
Present	1.58 ± 0.51	
Absent	1.92 ± 0.45	
Fetal Morbidity: TTNB		0.080[4]
Present	2.17 ± 0.09	
Absent	1.84 ± 0.49	
Ventilator Requirement***		0.005[4]
Present	1.29 ± 0.48	
Absent	1.89 ± 0.46	
Fetal Morbidity: Birth Asphyxia***		0.027[1]
Present	1.57 ± 0.56	
Absent	1.91 ± 0.44	
Fetal Morbidity: Sepsis		0.145[4]
Present	1.69 ± 0.39	
Absent	1.88 ± 0.49	
Fetal Morbidity: Hypocalcemia		0.328[1]
Present	1.93 ± 0.37	
Absent	1.83 ± 0.50	
Fetal Morbidity: Hypoglycemia		0.872[4]
Present	1.87 ± 0.78	
Absent	1.85 ± 0.47	
Fetal Morbidity: NNH		0.907[1]
Present	1.86 ± 0.41	
Absent	1.85 ± 0.51	
Fetal Morbidity: CHD		0.260[4]
Present	1.38 ± 0	
Absent	1.86 ± 0.48	

Parameters	Birth Weight (Kg)	p value
Fetal Morbidity: Feed Intolerance		0.778[4]
Present	1.79 ± 0.36	
Absent	1.85 ± 0.49	

Fetal Morbidity: Thrombocytopenia***		0.045[4]
Present	1.51 ± 0.33	
Absent	1.87 ± 0.48	
Fetal Morbidity: NEC***		0.027[4]
Present	1.05 ± 0.03	
Absent	1.87 ± 0.47	
Duration of Stay: NICU***	Correlation Coefficient (rho) = -0.22	0.044[2]
Duration of Stay: PNC ward***	Correlation Coefficient (rho) = 0.47	<0.001[2]
Duration of Stay: Total***	Correlation Coefficient (rho) = -0.29	0.003[2]
Fetal Mortality***		0.004[4]
Present	0.87 ± 0.21	
Absent	1.88 ± 0.45	

*****Significant at p<0.05, 1: t-test, 2: Spearman Correlation, 3: Kruskal Wallis Test, 4: Wilcoxon-Mann-Whitney U Test*

Table 10: Association between Fetal Mortality and Parameters	Fetal Mortality		p value
	Present (n = 3)	Absent (n = 97)	
Baby Gender			0.088[1]
Male	3 (6.7%)	42 (93.3%)	
Female	0 (0.0%)	55 (100.0%)	
Birth Weight (Kg)***	0.87 ± 0.21	1.88 ± 0.45	0.004[2]
Gestational Age (Completed Weeks)***	26.67 ± 2.31	33.65 ± 2.24	0.004[2]
Birth Weight for Gestational Age			0.554[1]
AGA	3 (4.2%)	68 (95.8%)	
SGA	0 (0.0%)	29 (100.0%)	
Fetal Morbidity: RDS (Present)***	3 (13.6%)	19 (86.4%)	0.010[1]
CPAP Requirement (Present)	0 (0.0%)	19 (100.0%)	1.000[1]
Fetal Morbidity: TTNB (Present)	0 (0.0%)	4 (100.0%)	1.000[1]
Ventilator Requirement (Present)***	3 (42.9%)	4 (57.1%)	<0.001[1]
Fetal Morbidity: Birth Asphyxia (Present)	2 (11.8%)	15 (88.2%)	0.074[1]
Fetal Morbidity: Sepsis (Present)	0 (0.0%)	13 (100.0%)	1.000[1]
Fetal Morbidity: Hypocalcemia (Present)	0 (0.0%)	19 (100.0%)	1.000[1]
Fetal Morbidity: Hypoglycemia (Present)	0 (0.0%)	3 (100.0%)	1.000[1]
Fetal Morbidity: NNH (Present)	0 (0.0%)	28 (100.0%)	0.557[1]
Fetal Morbidity: CHD (Present)	0 (0.0%)	1 (100.0%)	1.000[1]
Fetal Morbidity: Feed Intolerance (Present)	0 (0.0%)	4 (100.0%)	1.000[1]
Fetal Morbidity: Thrombocytopenia (Present)	0 (0.0%)	6 (100.0%)	1.000[1]
Fetal Morbidity: NEC (Present)	0 (0.0%)	2 (100.0%)	1.000[1]
Duration of Stay: NICU***	1.00 ± 0.00	9.94 ± 8.01	0.005[2]
Duration of Stay: PNC ward	-	2.73 ± 2.55	-
Duration of Stay: Total***	1.00 ± 0.00	10.94 ± 7.57	0.004[2]

DISCUSSION
Birth weight-
In this study the mean birth weight of babies was 1.85. There was a significant correlation between birth weight and Gestational age (p value= <0.001), RDS (p value= <0.001), CPAP requirement (p value=0.015), Birth Asphyxia (p value=0.027), Thrombocytopenia (p value=0.045), NEC (p value=0.027), NICU stay (p value= 0.044), PNC ward stay (p value=<0.001), Total hospital stay (p value=0.003), preterm mortality (p value=0.004).

No. of babies delivered in different gestational age groups in various groups-
The mean gestational age in present study was 33.44 which was similar to a study done by Laxman Paudel et al[5] where mean gestational age was 31.1 ± 2.33 weeks.

In our study we found that majority of babies delivered in 32-34 weeks of gestation 47% followed by 39% in 35-36 weeks of gestation, 8% in 29-31 weeks of gestation, 4% in 26-28 weeks of gestation and 2% in 23-25 weeks of gestation which is similar to the studies done by Laxman paudel et al[5], Mahajan A and Magon S[6]. Tinu Philip and Pramod Thomas[7] and kou- Huang Chen et al[8] found that that majority of preterm birth occur in 32-36 weeks of gestation.

Table 11-Comparison of gestational age of babies in different studies.	Present study	Mahajan et al	Philip T et al	Chen K et al
	%	%	%	%
<32 weeks	14	22	8	9.1
32-36 weeks	86	78	91.46	92.9

However, study done by karen cupen et al[9] found that 59.7% were between 32 to <37 weeks and 40.3% were less than 32 weeks of gestation.

In our study there was a significant correlation between Gestational age and RDS (p value=<0.001), CPAP requirement (p value=0.001), Ventilator requirement (p value=0.001), Birth asphyxia (p value=0.031) and NEC (p value=0.028).

Baby gender-
In this present study there were more female babies when compared to male babies with male to female ratio of 0.81:1 which was similar to studies done by Ankur Gupta et al[10] which also reported male to female ratio of 0.84:1, Satish D. Ashtekar et al[11] found male to female ratio of 0.6:1, Azam Mohsenzadeh et al[12] found male to female ratio of 0.94:1 followed by study by Sumit Bansal et al[13] which also found male to female ratio of 0.6:1.

However, studies done by M Hassan et al[14], Blessing C Umeigbo et al[15], Karen Cupen et al[16] found more male preterm then female preterm with male to female ratio of 1.72:1, 1.2:1 and 1.43:1 respectively.

Table 12- Comparison of baby gender in different studies	Present study	Azam Mohsenzadeh et al	Sumit Bansal et al	Satish D. Ashtekar et al	M Hassan et al	Blessing C Umeigbo et al	Karen cupen et al
Male	45%	48.6%	40%	37.3%	63.3%	55.4%	58.9%
Female	55%	51.4%	60%	62.7%	36.7%	44.6%	41.1%

Many studies have found better survival rate in girls than boys, however in our study even though mortality was present only in male preterm infants it was not statistically significant (p value=0.088) which was similar to study done by Azam Mohsenzadeh et al[12]

Birth weight for gestational age-
In our study babies delivered in various gestational age varied from 71% in AGA group and 29% in SGA group and none in LGA group.

Table 13- Comparison of birth weight for gestational age in different studies	Present study	Satish D. Ashtekar et al
AGA	71%	58.2%
SGA	29%	25.3%
LGA	0%	17.9%

In our study there was no significant correlation between birth weight for gestational age and preterm mortality.

Preterm morbidity pattern-
The Most common preterm morbidities in the present study were Neonatal hyperbilirubinemia (28%) and Respiratory distress syndrome (28%).

The other common. morbidities found in our study were CPAP requirement (19%), Hypocalcemia (19%), Birth asphyxia (17%), sepsis (13%).

Morbidities like TTNB (4%), Hypoglycemia (3%), CHD (1%), Feed intolerance (4%), Thrombocytopenia (6%) and NEC (2%) were also present.

Table 14- Comparison of preterm morbidities in different studies	Present Study	Sumit Bansal et al	Laxman Paudel et al	Satish D. Ashtekar et al
RDS	28%	36.2%	14%	37.3%
Jaundice	28%	71.2%	28%	44.7%
Sepsis	13%	33.7%	40.9%	14.9%
Birth Asphyxia	17%	7.5%	9.7%	7.4%

In studies done by Sumit bansal et al[13], Ananya Das et al[17], Satish D. Ashtekar et al[11] the common morbidities were in the following order Jaundice, RDS and sepsis.

In study done by Laxman Paudel et al[5] the most common morbidities were sepsis followed by jaundice and RDS.

The lower sepsis percentage in our NICU can be because of high degree of sanitization maintained by the nursing staffs and doctors.

CPAP requirement-
19 babies required CPAP out which 18 babies were diagnosed as RDS and one was diagnosed as transient tachypnea of newborn.

CPAP had a significant correlation with Gestational age (p value= 0.01) and birth weight (p value= 0.015).

In our study no significant correlation was found between CPAP requirement and preterm mortality (p value= 1.000).

Ventilator requirement-
In our study ventilator was required for 7 babies of which 5 babies had both RDS and birth asphyxia and out of remaining two babies one had RDS and other one had birth asphyxia.

In a study by Sumit bansal et al[13] 37.5 % of babies required mechanical ventilation.

A Study by K.K. Roy et al[18] found that 83.3% of ELBW babies and 40% of VLBW babies require ventilatory support.

In our study significant correlation was found between ventilator requirement and GA (p value=0.001), birth weight (p value= 0.005) and preterm mortality (p value= <0.001).

Duration of stay-
In our study the mean duration of stay in NICU and PNC ward was 9.62 ± 8.04, 2.73 ± 2.55 respectively and the mean duration of total stay was 10.64 ± 7.65 days.

Table 15- Comparison of duration of stay in different studies	Present Study	Sumit bansal et al	M Hassan et al	Karen cupen et al
Mean duration of stay (days)	10.64	34	18.32	21.7

In other studies, done by Sumit bansal et al[13], M Hassan et al[14] and Karen Cupen et al[16] the mean duration of hospital stay was 34, 18.32 and 21.7 days respectively.

The mean duration of total hospital stay was less in our study when compared to other studies. This was due to effective management in NICU and earlier handing over of babies to mothers in the wards.

In our study mean duration of stay had significant correlation with birth weight (p value=0.003), preterm mortality (p value=0.004).

Preterm mortality-
In our study mortality was present in 3 babies (3%) and the cause of mortality in these babies was RDS.

In studies done by Sumit bansal et al[13], Singh Uma et al[19] and Ananya Das et al[17] mortality was present in 18.7%, 12.7 % and 20.4% of the babies where the common causes of mortality were RDS, sepsis and birth asphyxia.

The lower mortality in our institute can be because of prompt and effective management of sick preterm infants and higher standard of hand hygiene followed in our NICU.

In present study significant correlation was found between preterm mortality and Birth weight (p value=0.004), Gestational age (p value=0.004), RDS (p value=0.010), Ventilator requirement (p value=<0.001), NICU stay (p value=0.005), Total stay (p value= 0.004).

Similar correlation between preterm mortality and birth weight as well as gestational age of the baby was found in other studies by Vidyahar B. Bangal et al[20] and Devi et al[21].

CONCLUSION
Among 100 preterm babies, 30% had no morbidity & the rest 70% had a single or multiple problem of which neonatal hyperbilirubinemia (28%) and RDS (28%) were the most common morbidity. 17 % of babies had birth asphyxia. Ventilator support and CPAP was required by 7% and 19% of babies respectively.

13 % of babies had sepsis & were treated accordingly. 22 % of babies had metabolic abnormalities of which 19 % had hypocalcemia & 3 % had hypoglycemia.

One baby was diagnosed with congenital heart disease in the form of PDA.

All the above-mentioned factors may lead to preterm mortality but in our study RDS contributed to all of the preterm mortalities (3%).

Hence, early identification of preterm morbidities and prompt management can reduce preterm mortality.

CONFLICT OF INTEREST
There are no conflicts of interest.

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