SURVIVAL OF VERY LOW BIRTH WEIGHT NEONATES FOR AGE 0-7 DAYS AMONG DELIVERIES IN SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE (SPHMMC), ONE YEAR CROSS SECTIONAL STUDY

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ABSTRACT

BACKGROUND:

Very low birth weight babies are neonates with birth weights of 1000-1499g, constituting approximately 4–7% of all live births. Very low birth weight infants are known to have high morbidity and mortality.

OBJECTIVE:

The purpose of this study is to determine the early neonatal survival rate and to determine the prognostic indicators for the survival of very low birth weight neonates delivered at St Paul's Hospital Millennium Medical College (SPHMMC).

METHOD:

All neonates delivered from January 1- December 31, 2016 were consecutively included in the study. A total of 161 very low birth weight infants were included in the study. Newborns were followed for the first seven days of life, or time of discharge, or time of death as confirmed by the managing physician. The first of these was considered during the last data collection. Statistical analysis was carried out using SPSS version 20. The mean, 95% confidence intervals and two-tailed *P* values were calculated.

RESULTS:

Very low birth weight infants account for 2.7% of all deliveries in this study. Early neonatal survival was found to be 77%. Gestational age, birth weight and APGAR score were found to be associated with survival rate with p-value of <0.05. Maternal obstetrics complication, antenatal use of corticosteroid, and management in Neonatal Intensive Care Unit were not found to be associated with neonatal outcome.

Key Words: Very Low Birth Weight, preterm birth, Neonatal Intensive Care Unit

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INTRODUCTION

Three quarters of neonatal deaths occur in the first week, and more than one-quarter occur in the first 24 hours. Neonatal death accounts for 40% of deaths under the age of 5 years worldwide[1, 2]. Preterm birth is one of the major clinical problems in obstetrics and neonatology as it is associated with low perinatal survival, serious neonatal morbidity, and in some cases, childhood disability[1, 2, 3].
Very low birth weight (VLBW) babies are neonates with birth weights of 1000-1499gram, which constitute approximately 4–7% of all live births. The primary cause of VLBW is prematurity. Mortality of VLBW neonates is 30 times more than that of normal weight[1, 2]. They are also associated with high hospital charges and long hospital stays. In 2006, the Institute of Medicine estimated the annual cost of preterm births in the United States at $26 billion[6].

Over the last few decades various studies have been conducted that indicate a decline in neonatal mortality in the developed world. This decline in mortality was achieved through advanced intensive neonatal care and improvement in the care of high-risk mothers.(2, 3, 4) However African studies are still showing unacceptably high neonatal mortality rates[8, 9].

Ethiopia is one of the countries with high neonatal and infant mortality rates. According to the 2016 Ethiopia Demographic and Health Surveys (DHS), the country is experiencing a high neonatal mortality rate at 29 per 1000 live births[18].
Although the outcome of VLBW has been reported extensively in developed countries, less is known from developing countries[4, 7]. Thus, it is hard for obstetricians to predict the chance of survival when multiple factors are involved[5].

In the case of VLBW newborns, the study of neonatal survival and factors associated with survival may lead to the critical analysis of healthcare services and actions aimed at improving care for this group. Therefore, our study may help to identify the different healthcare needs and provide subsidies for interventions aimed at reducing infant death during the early prenatal period[11].

MATERIALS AND METHOD

A hospital based cross-sectional analytic study was conducted from January 1 to December 31, 2016 to determine the survival rate of VLBW infants, and to identify prognostic indicators of the survival of VLBW infants delivered at St. Paul's Hospital Millennium Medical College (SPHMMC), Addis Ababa, Ethiopia. All neonates delivered alive with birth weights of 1000-1499gm at SPHMMC in the study period were consecutively included, but newborns with lethal congenital anomalies were excluded.
Early neonatal survival was defined as neonates survived till the seventh day of life or discharged from hospital, whichever comes first[1].

The study was approved by the Institutional Review board of SPHMMC. Data was collected with structured questionnaire by trained nurses by reviewing the chart and interviewing the mother. Informed consent was obtained from each study participants after the objectives of the study are explained. The participants were also informed that confidentiality of the information collected would be insured. Data were collected until the 7th day of life of the newborn, or up to the time of discharge, or up to the time of death as confirmed by the managing physician. (Whichever comes first was considered as the last day of data collection). Data were entered and analyzed using SPSS version 20. Descriptive statistics (mean, medians and proportions) were used to characterize the variables and, bivariate and multivariate analyses were performed to determine the relationship between dependent and independent variables. Statistical significance

was considered to be a P value of <0.05. The survival rate of VLBW neonates for age 0-7 days was the dependent variable of the study. Gestational age, birth weight, APGAR score, antepartum use of steroid, mode of delivery, and NICU set up were the independent variables.

RESULTS

Among the 9,531 deliveries attended at SPHMMC from January 1 to December 31, 2016, there were 9,883 babies born. Out of all the babies, there were 264(2.7%) VLBW infants; 193 were delivered alive.

The remaining 71 were IUFDs, so automatically excluded. Among live born VLBW infants, 161 infants were recruited for the study, and 32 were excluded because of lethal congenital anomalies.

The mean maternal age of the study participants was found to be 26.65 (SD=5.25). A significant proportion of the women were Orthodox by religion 120 (74.5%) and married 158 (98.1%) (Table 1).

Table1. Socio-demographic characteristics of mothers of VLBW infants, (n=161), SPHMMC

VARIABLES	FREQUENCY	PERCENTAGE	MEAN ±SD
AGE (IN YEARS)			26.65±5.25
<=14	0		
15-19	13	8.1	
20-29	105	65.2	
30-39	39	24.2	
>=40	4	2.5	
RELIGION			
ORTHODOX	120	74.5	
MUSLIM	31	19.3	
PROTESTANT	10	6.2	
MARITAL STATUS			
SINGLE	1	0.6	
MARRIED	158	98	
DIVORCED	2	1.2	
ETHNICITY			
AMHARA	44	27.3	
OROMO	102	63.4	
GURAGE	7	4.3	
TIGRE	3	1.9	
OTHER	5	3.1	
PLACE OF RESIDENCY			
URBAN	112	69.6	
COUNTRY SIDE	49	30.4	
EDUCATIONAL STATUS			
NO FORMAL EDUCATION	60	37.3	
PRIMARY SCHOOL	48	29.8	
SECONDARY	33	20.5	
ABOVE SECONDARY	20	11.8	
OCCUPATION			
GOVERNMENT. EMPLOYEE	19	11.8	
MERCHANT	25	15.5	
DAILY LABORER	13	8.1	
HOUSEWIFE	92	57.1	
FARMER	8	5	
OTHER	4	2.5	

The majority of the mothers (100 (62.1%)) didn't receive dexamethasone for lung maturity. A full course of dexamethasone (4 doses) was given for 39 mothers (24.2%). The remaining took incomplete dose that were discontinued for emergency conditions per hospital protocol.

With regards to mode of delivery, the majority of the mothers (103 (64.0%)) had cesarean sections; of whom 48 mothers had cesarean sections after spontaneous onset of labor or after the start of induction for obstetrics indications per hospital protocol. Hypertensive disorder of pregnancy was the most common obstetrics complication found in this study participants. A total of 78 (48.4%) mothers were diagnosed with hypertension, from which 62 mothers had pregnancy-induced hypertension and 16 had chronic hypertension with superimposition of preeclampsia.

Majority of the mothers 50. (31.0%) had gestational ages between 34-36+6weeks, while 37 mothers (23.0%) had gestational ages less than 32 weeks. However, 32 of the mothers (19.9%) didn't recall their LNMP, and also didn't have early mile stones. In addition, the majority of the newborns had birth weights between 1400-1499 gm 84, (52.2%), and 52.8% had good APGAR scores of 8 and above.

There were five (3.1%) neonatal deaths at the labor ward, and the other newborns (156, (96.9%) were transferred to the NICU. Hyaline membrane disease (HMD) was the top diagnosis at the NICU, accounting for 103 (64.0%) newborns, followed by Early Onset Neonatal Sepsis (EONS) 32 (19.9%) newborns. Hypothermia was diagnosed in approximately 152 (94.4%) newborns, of which the temperature was corrected within 6 hours of admission in 76%. Among newborns who were transferred to NICU, 63.3% were managed with IV antibiotics and CPAP, while antibiotics only were used for 15.5% of the newborns. A total of 21.2% of the newborns were admitted to NICU for observation and feeding purposes only. At the 7th day of life, 91 newborns were still in the ward, accounting for 56.5% of the study groups. A total of 33, (20.5%) newborns were discharged after observation at the NICU, with the mean stay at the NICU of 2.9 days.

There were 37(23%) neonatal deaths, of which 21 (56.8%) of the neonatal death occurred after 24 hours of life, and 16(43.2%) were deaths within 24 hours of life, which includes five deaths in the labor ward (Table 2 and table 3).

Table 2. Obstetrics characteristics of mothers of VLBW neonates, SPHMMC, Addis Ababa, Ethiopia

VARIABLES	FREQUENCY	PERCENTAGE
PARITY		
PRIMIPAROUS	76	47.2
MULTIPAROUS	85	52.8
ANC FOLLOW-UP		
YES	154	95.7
NO	7	4.3
DEXAMETHASONE USE		
NONE	100	62.1
ONE DOSE	10	6.2
2-3 DOSES	12	7.5
4 DOSES	39	24.2
ONSET OF LABOR		
SPONTANEOUS	86	53.4
INDUCED	20	12.4
DIRECT CESAREAN SECTION	55	34.2
MODE OF DELIVERY		
SVD	56	34.8
C/S	103	64
INSTRUMENTAL DELIVERY	1	0.6

ABD	1	0.6
INTRAPARTUM AMPICILLIN USE		
YES	66	41
NO	95	59
OBSTETRIC & MEDICAL COMPLICATIONS		
HYPERTENSION	78	48.4
PPROM	45	28
APH	12	7.5
DM	3	1.9

Table 3 Characteristics of VLBW neonates (n=161), SPHMMC, Addis Ababa, Ethiopia

Variables	Frequency	Percentage
Sex		
Male	82	50.9
Female	79	49.1
Multiple gestation		
Yes	43	26.7
No	118	73.3
Gestational age		
<32 weeks	37	23
32-33+6 weeks	33	20.5
34-36+6 weeks	50	31.1
>=37 weeks	9	5.6
Unknown date	32	19.9
Birth weight		
1000-1199 gm	33	20.5
1200-1399 gm	44	27.3
1400-1499 gm	84	52.2
5th min APGAR scorew		
<=4	8	5
5-7	68	42.2
8-10	85	52.8
NICU admission diagnosis (156)		
HMD	103	66
EONS	32	20.5
OTHERS	21	13.5
Management in NICU		
Antibiotics	123	76.4
CPAP	118	73.3
Observation	33	20.5
Out come at 7th day of life		
Still in the ward	91	56.5
Discharged	33	20.5
Death within 24 hours	16	9.9
Death after 24 hours of life	21	13

DISCUSSION

In our study, VLBW newborns accounted for 2.7% of babies delivered in SPHMMC. This number is comparable to a report from Chris Hani Baragwanath Hospital, Johannesburg at 3.0%, but lower than a report from Iran at 4.3% (12, 17).

The early neonatal survival rate was found to be 77.0% (Figure 1), which is comparable to Survival in Thailand (63.4-81.0%), and Johannesburg, South Africa (72-74%), (12, 14). The result was higher than previous reports in Ethiopia (Jimmaa from January 2012 to December 2012, 56%; and Tikur Anbessa Hospital from July 2011 to June 2012, 60.8%)[10,16]. However, this result is lower than reports from developed countries (84-89%)[10, 16].

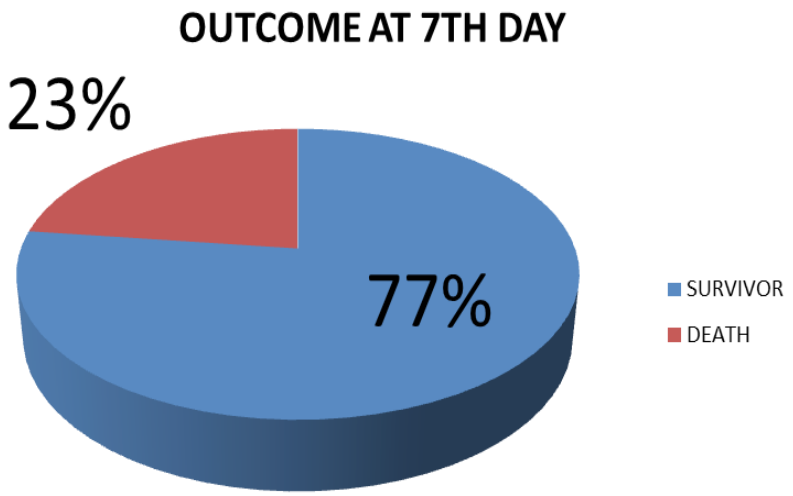

Figure1: Proportion of VLBW newborns with respect to the 7th day outcome; SPHMMC, Addis Ababa, Ethiopia

The mean maternal age was found to be comparable between the two groups, so no association was found with the survival of VLBW infants. Additionally, no association was found with place of residency, or parity of the mother between the two groups (Table 4).

Antenatal clinic attendance helps in identifying patients at risk for delivering preterm, and this would allow better monitoring and early hospital admission of these patients (12). ANC coverage was found to be 95.7% in this study, which is higher than the national figure reported in 2016 by Ethiopian Demographic Health Survey (EDHS) (62.0%) (18). Because of the high ANC coverage, a significant association between ANC follow-up and the neonatal survival rate (p=0.139) was not found. Only 37.9% of mothers were given at least one dose of dexamethasone, with 24.2% of mothers receiving a complete course of antenatal corticosteroids. Antenatal corticosteroid use in gestational age less than 34 weeks was only 50%. Different papers conclude that use of antenatal corticosteroid significantly improves the survival rate[11], but this was not found in our study, likely because of low use (p=0.445) (Table 4).

Table 4. Association between maternal variables and the survival of VLBW newborns at SPHMMC Addis Ababa, Ethiopia (n=161).

VARIABLES	DEATH		SURVIVOR				
	NO	%	NO.	%	COR	P-VALUE	C/I
AGE							
<20	4	10.8	8	6.5	1.7	0.381	0.498-6.202
>=20	33	89.2	116	93.5			
PLACE OF RESIDENCY URBAN	22	59.5	90	72.6	2.3	0.131	0.258-1.192
RURAL	15	40.5	34	27.4			
PARITY							
PRIMIPAROUS	15	40.5	60	48.4	0.7	0.402	0.345-1.532
MULTIPAROUS	22	59.5	64	51.6			
ANTENATAL CORTICOSTEROID							
GIVEN	16	43.2	45	36.3	0.7	0.455	0.354-1.577
NOT GIVEN	21	56.8	79	63.7			
MODE OF DELIVERY							
VAGINAL	15	40.5	44	35.5	1.2	0.577	0.584-2.631
CESAREAN SECTION	22	59.5	81	64.5			
HYPERTENSION							
YES	14	37.8	64	51.6	0.5	0.138	0.290-1.210
NO	23	62.2	60	48.4			

Obstetric complications correlated significantly with the survival of the infants. It could be explained that, VLBW infants who were born to mothers with obstetric complications were taken care better than other types of mother. These include giving dexamethasone and early communication with NICU teams[5].

Hypertensive disorder of pregnancy was found to be the most common (48.1%) obstetrics complication associated with delivery of VLBW newborn in this study. But significant association was not found in our study (P=0.138).

With Similar reason to obstetrics complications, an association of improved survival with cesarean section was reported in other studies[2, 7, 12]. However, mode of delivery was not found to be associated with the survival of VLBW newborns in this study (p=0.576). This might be due to a higher cesarean section rate in this study's groups, which amounts to 64% (Table 4).

The sex distribution was found to be comparable in this study. Unlike other studies, female gender has continued to show its advantage over male gender[12], this was not found to be associated with the survival rate. (p=0.665) (Table 5).

Table 5. Association between infant variable and survival of VLBW newborns at SPHMMC Addis Ababa, Ethiopia. (n=161)

VARIABLES	DEATH		SURVIVOR				
	NO.	%	NO.	%	COR	P-VALUE	C/I
SEX							
MALE	**20**	**54**	**62**	**50**	**1**	**0.665**	**0.401-1.775**
FEMALE	**17**	**46**	**62**	**50**			
5TH MIN APGAR SCORE							
<8	25	67.6	47	37.9	3.41	0.01	1.844-13.069
>=8	12	32.4	77	62.1			
BIRTH WEIGHT							
<1200	16	43.2	17	13.7	4.79	0.001	2.096-10.971
>=1200	21	56.8	107	86.3			
GESTATIONAL AGE (129)							
<34	24	80	46	46.5	4.9	0.001	1.844-13.069
>=34	6	20	53	53.5			
MULTIPLE GESTATION							
YES	10	27	33	26.6	1	0.960	0.446-2.337
NO	27	73	91	73.4			

Newborns with 5th minute APGAR scores of eight and above were found to have 3.55 times higher survival. (p=0.006). Newborns with birth weights of 1200 grams or above were found to have 2.88 times higher survival than newborns with birth weights less than 1200 gram (p=0.029). This finding is consistent with different previous studies[5] (Table 6).

Table 6 -Association of various factors with the survival of VLBW newborns using multivariate analysis at SPHMMC, Addis Ababa, Ethiopia

VARIABLES	DEATH		SURVIVOR				
	No	%	**No.**	%	**AOR**	**P.VALUE**	**C/I**
GESTATIONAL AGE							
<34	24	80	46	46.5	3.09	0.013	1.25-10.219
>=34	6	20	53	53.5			
BIRTH WEIGHT							
<1200 GM	16	43.2	17	13.7	2.88	0.029	1.276-6.427
>=1200 GM	21	56.8	107	86.3			
5TH MIN APGAR SCORE							
<8	25	67.6	47	37.9	3.55	0.006	1.275-9.896
>=8	12	32.4	77	62.1			

The neonatal survival rate was evaluated for each 100-gram increment. Weight below 50 grams was averaged down and above 50 grams was averaged up. For every 100-gram increment in birth weight, there was an improvement in the survival of the newborns (Figure 2).

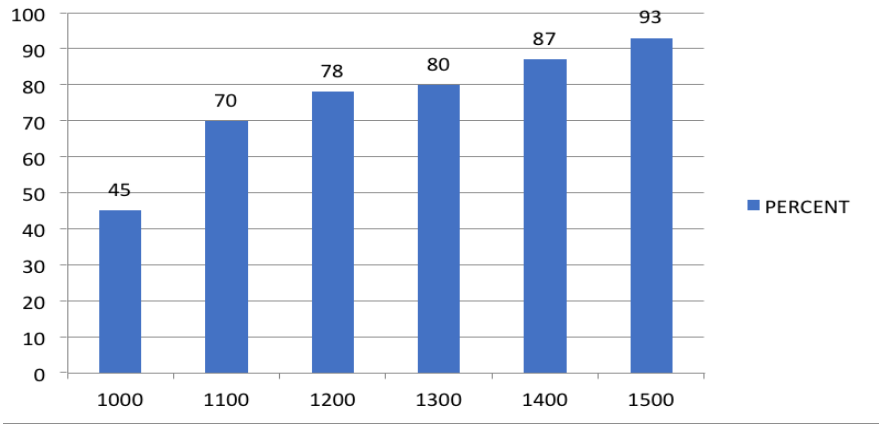

Figure 2- Survival rates of VLBW infants according to birth weight in grams (numbers at the top of the bars are percentages).

In this study 32 (19.9%) mothers didn't recall their LNMP and did not have early mile stones of pregnancy. Because of this limitation and the known discrepancy between antenatal and postnatal assessment of GA, for the association of gestational age and survival of VLBW infants, excluding such mothers was found to be a more practical approach. This problem has also been mentioned in similar papers from other developing countries (12, 17). The remaining 129 women were analyzed for the association between gestational age and survival of VLBW newborns. Newborns with gestational ages at or above 34 weeks were found to have a 3.09 times higher early neonatal survival than those with gestational ages less than 34 weeks(p=0.013) (Table 6).

Neonatal survival was also analyzed with respect to the gestational age range. The survival rate for gestational age between 28-31+6 weeks was found to be 85.0% (17 out of 37), for gestational age between 32-33+6 weeks found to be 87.9% (29 out of 33), and for gestational age between 34-36+6 weeks was found to be 92.0%. The survival rate of VLBW newborns with gestational ages of 37 weeks and above was found to be 77.8% (7 out of 9); this low survival may have found due to the associated severe IUGR (Figure 3).

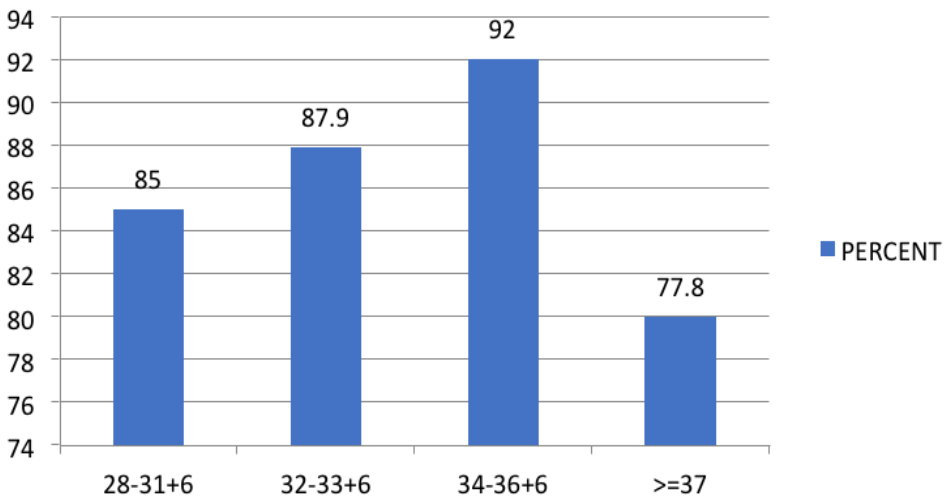

Figure 3- Survival rates of VLBW infants according to gestational age in weeks (numbers at the top of the bars are percentages).

The improvement of intensive neonatal care unit and medical technologies plays a major role in the increased survival rate of VLBW infants in recent decades[14]. However, for cases in this study, the primary management was IV antibiotics and CPAP. Neither Surfactants nor mechanical ventilators were used for management because they were not available in the hospital.

CONCLUSION

The analysis of this study revealed that VLBW newborns account for 2.7% of deliveries at SPHMMC. The survival of VLBW newborns for the first seven days of life was found to be 77.0%. In this study, Gestational age, birth weight & 5th minute APGAR score were found to be associated with the survival of VLBW infants. However, maternal obstetric complications, antenatal use of corticosteroids, or mode of delivery was not found to be associated with neonatal outcome. Further study is recommended to determine the long-term neonatal out comes of very low birth weight. In addition, a comparative study with normal birth-weight newborns is recommended to see the actual effect of variables on neonatal survival.

CONFLICT OF INTEREST

None

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