Survial Of Preterm Infants Admitted To Tikur Anbessa Hospital Nicu, Addis Ababa

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Abstract: *Neonatal mortality accounts for about 1/3 of deaths < 5 years of age and preterm infant mortality for approximately 1/3 of neonatal mortality. Intervention programs must be based on reliable statistics applicable to the local setting.*

Objectives: *The objective of this study is to identify factors associated with survival of preterm infants among preterm infants admitted to Tikur Anbessa Hospital Neonatal Intensive Care Unit (NICU). This was a retrospective chart review of 397 preterm infants admitted from July 1, 2011 to June 30, 2012 G.C to the neonatal unit. Overall survival was 69.3% Survival of infants below 28 weeks of GA 40%, survival for infants between 28-31wks of GA is 54.5%, for those between 32-34wks of GA is 74.6% and the survival rate for late preterm infants(35-36+6days) is 100%.GA, birth weight, gender and place of delivery are among the factors associated with survival of preterm infants. This study evidently indicates that the survival rate of preterm infants admitted to TAH is lower than other developing countries that must be improved.*

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INTRODUCTION

Preterm birth, defined as childbirth occurring at less than 37 completed weeks or 259 days of gestation, is a major determinant of neonatal mortality and morbidity and has long-term adverse consequences for health (1-4). The morbidity associated with preterm birth often extends to later life, resulting in enormous physical, psychological and economic costs (5-6). Of all neonatal deaths 28% are due to preterm birth (7). Preterm birth rates have been reported to range from 5% to 12% of live births in some developed countries, but are estimated to be substantially higher in developing countries (8). Save for most strikingly, these figures are on the rise both in the developed and developing world (9).

Estimation of preterm birth rates and, ideally, their proper categorization (e.g. spontaneous versus indicated) are essential for accurate determination of global incidence in order to inform policy and programs on interventions to reduce the risk of premature delivery survival. World Health Organization (WHO) states that no data have been published on the global incidence of preterm birth (1). Preterm birth rates available from some developed countries, such as the United Kingdom, the United States and the Scandinavian countries, show a dramatic rise over the past 20 years (10-11). In most developing countries including Ethiopia, however, accurate and complete population data and medical records usually do not exist. Furthermore, estimates of the rate of preterm birth in developing countries are influenced by a range of factors including varying procedures used to determine gestational age, national differences in birth registration processes, heterogeneous definitions used for preterm birth, differences in perceptions of the viability of preterm infants and variations in religious practices such as local burial customs, which can discourage the registering of preterm births (12). These issues make measurement of preterm birth and comparisons across and between developing countries difficult.

Nevertheless, preterm birth is the single most common causes of perinatal mortality in Europe and North America (13). In Ethiopia, study done at Tikur Anbessa Hospital showed that preterm birth has increased from 5.5% to 8.7% between 1980's and 1990's (14). The present study, hence, was carried out to assess the effect of gestational age, weight, type of gestation(singleton/multiple birth), gender and other factors on survival in preterm infants admitted to Tikur Anbessa Neonatal Intensive Care Unit (NICU); to determine the survival rate of preterm infants.

MATERIALS AND METHODS

Tikur Anbessa Hospital Neonatal Care Unite was the only unit providing neonatal care in Ethiopia till recently and still delivering service for many thousand neonates every year. Thus, it has long years record of neonates in general and preterm babies in particular. The unit admits infants under the age of eight days and admits infant born in the hospital as well as outside the hospital. It has a special arrangement for preterm neonates with their own separate room with appropriate room temperature. The respiratory supports available for these preterm infants are administration of oxygen via nasal catheter, prongs, hood and CPAP. Incubators are also available for these infants when needed. Mothers have their own beds and there is also a separate room for kangaroo mother care which is well-practiced in the setting. The unit didn't start respiratory support with

mechanical ventilation and administration of surfactant for preterm infants with respiratory distress syndrome.

Now, a retrospective cohort study of preterm infants admitted from July 2011 to June 2012, to the neonatal unit of Tikur Anbessa specialized hospital at Addis Ababa university medical faculty were considered in this study. All Preterm infants admitted to NICU with a gestational age of 26 weeks or greater and less than 37 completed weeks were included; whereas, preterm infants with gross congenital malformation are excluded because they have different mortality and morbidity risk. Incomplete chart with no GA and outcome of the neonates.

Sampling, Data collection and analysis: Records of preterm births were retrieved from neonatal record office and their chart reviewed. The sampled population was, thus, large enough to make the use of formula for determining sample size for estimating proportion (15). In determining the sample size particular attention was given to getting adequate and relevant sample size that would ensure the generalizability of the study findings. The sample size with Margin of error = 0.05; and, 95% confidence was calculated. Thus, the final sample size under consideration were 480 cases. Gestational age, birth weight, Sex, singleton vs. multiple, age at admission, mothers health, presence or absence of mothers were considered as independent variables where as Preterm infant death, preterm infant survival, preterm infant morbidity were considered as dependant variables. A structured questionnaire was used for data collection. The collected quantitative data were first checked for its completeness and then Data was coded, entered, and analyzed using latest version of Statistical Package software (SPSS version 18). Continuous variables were transformed into categorical variables before they are analyzed.

RESULTS

In the study period from July 1, 2011 to June 30, 2012 G.C 3,277 neonates were admitted to Tikur Anbessa hospital. Out of this, 855 newborns were found to be preterm babies. This indicates that 26% of the newborn infants admitted to Tikur Anbessa Hospital NICU were preterm infants, where 205 (51.6%) of the preterm cases were found to be male. Of the preterm infants admitted during the study period 69.3% had survived at discharge, making the mortality rate of preterm infant during the study period 30.7% 95%CI (26.2, 35.3). A slightly higher proportion of survivors are female infants and most are born from singleton pregnancy.

Table 1: Frequency distribution of preterm infants' survival by their gender

		Outcome		Total
		Survived	Death	
Gender	Male	66.34% (36)	33.65% (69)	51.64% (205)
	Female	72.40% (139)	27.60% (53)	48.36% (192)
Total		69.27% (275)	30.73% (122)	100% (397)

Table 2: Frequency distribution of preterm infants' survival by their type gestation

		Outcome		Total
		Survived	**Death**	
Type of the newborn	Singleton	78.84% (204)	24.16% (65)	67.76 (269)
	Multiple	55.47% (71)	44.53% (57)	32.24 (128)
Total		69.27% (275)	30.73% (122)	100% (397)

(P value 0.000)

The survival of preterm infant and 5th APGAR score is highly associated with a p value=0.000

Table 3: Outcome of preterm infants by 5th APGAR score

Count				
		Outcome		Total
		Survived	Death	
APGAR Score at 5th Minutes	APGAR 0-3	26.67% (4)	73.33% (11)	15
	APGAR 4-6	59.52% (100)	40.48% (68)	168
	APGAR 7-10	79.91% (17)1	20.09% (43)	214
Total		69.27% (275)	30.73% (122)	397

(P value < 0.05)

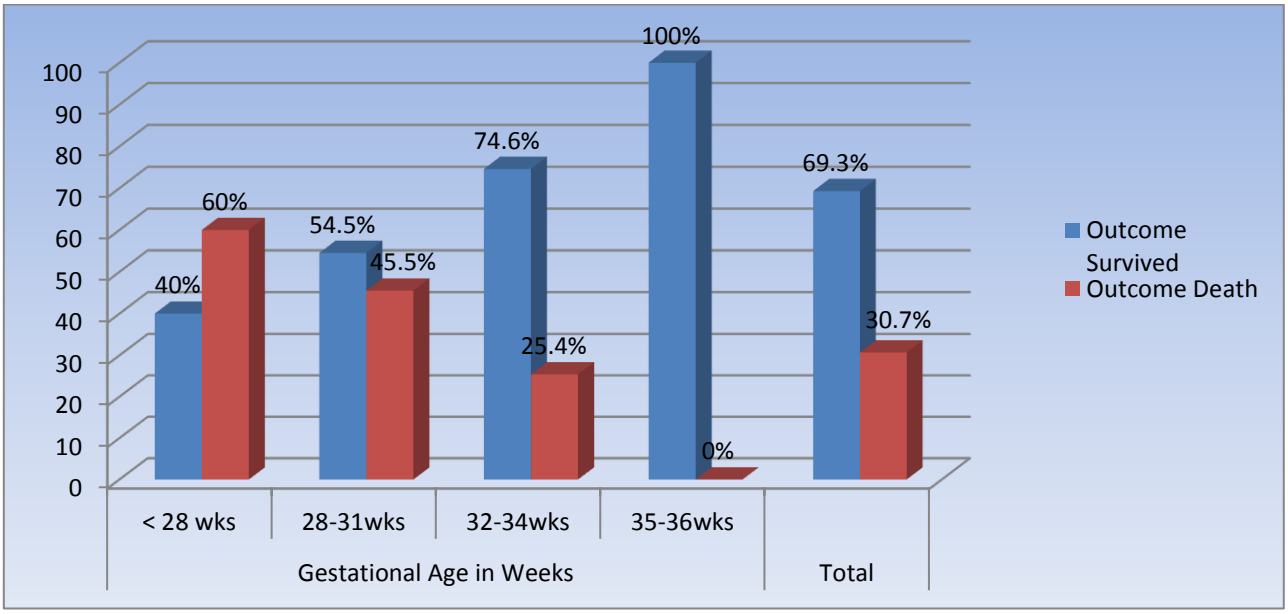
The study shows that of the preterm infant who died 95.9% had a temperature of <36.5 and there is association between hypothermia and increased mortality of preterm infants (P <0.05).

Table 4: Frequency distribution of Temperature at admission by their outcome

		Outcome		Total
		Survived	Death	
Temperature at admission	Less or equal to 33°c.	63.93% (39)	36.07% (22)	15.37% (61)
	33-35.9°c	69.87% (109)	30.13% (47)	39.29% (156)
	36 - 36.4 °c	64.18% (86)	35.82% (48)	33.75% (134)
	36.5-37.5 °c	89.13% (41)	10.87% (5)	11.59% (46)
Total		69.3% (275)	30.7% (122)	100% (397)

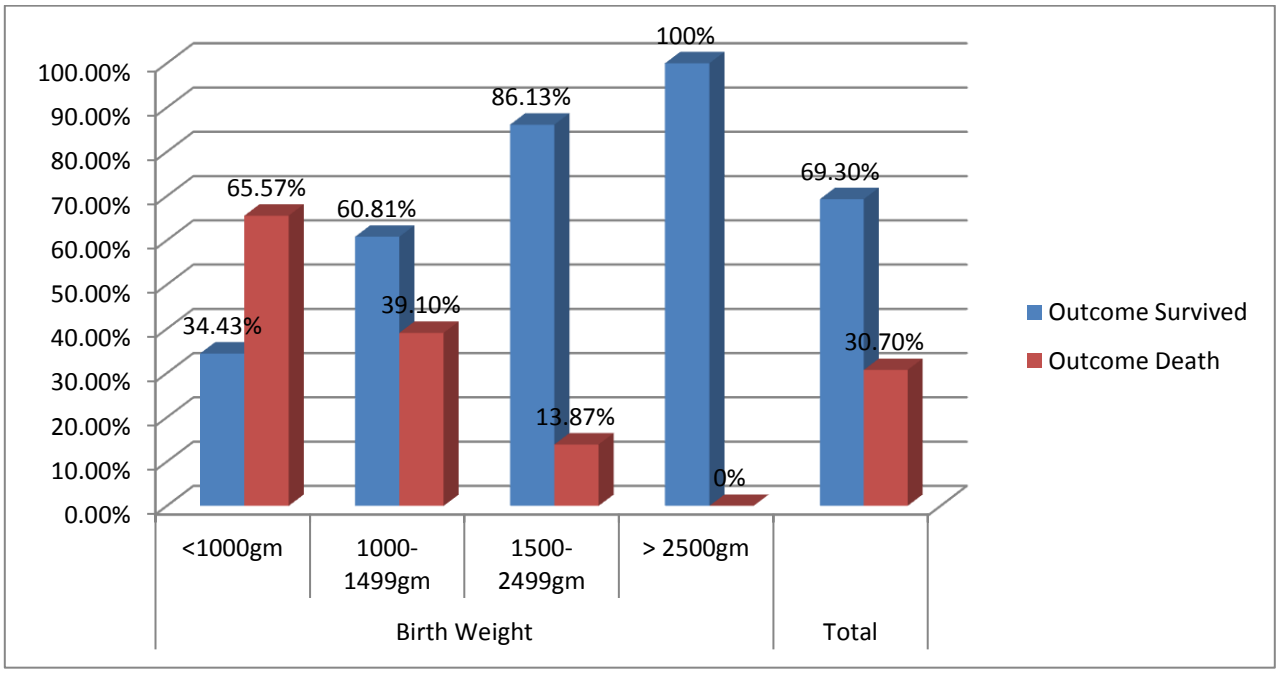
The study revealed that there is association between gestational age and survival rate, as the gestational age increases the survival of the preterm infants increases and this is statistically significant.(p value <0.05).

Figure1: Distribution of preterm infant by GA and their outcome



Similarly, the birth Weight and survival rate of preterm infants were significantly associated, as birth weight increase death rates significantly decrease (P value<0.05)

Figure 2: Distribution of preterm infant's weight by their outcome



Male preterm neonates had higher (78%) risk of death compared to their female counterparts, OR being 1.78 [95% CI (1.05, 2.85)] adjusted association with survival. Neonates from multiple birthshave close to 3 times higher risk of death compared to singleton preterm.

Neonates with 5th min Apgar score of less than 3 had 6 times higher risk of death compared to those with Apgar score between 7 and 10.

Antenatal steroid administration was shown to have protective effect. Mothers of preterm neonates that were administered with steroid, showing 80% lesser risk of death after adjusting for birth weight and gestational age compared to those who did not [OR, 0.21 95% CI (0.10, 0.46)].

Temperature at admission has strong association with survival in a multivariate model adjusted for gestational age and birth weight. However, no characteristic pattern was observed. With the neonates whose temperature at admission was less than or equal to 33°c have a 5.43 times higher risk of death compared to those with T° at admission was between 36.50 - 37.5°c, while the corresponding Odds Ratio for those with temperature between 33.10 and 35.9°c and 36 to 37.5°c are 3.89; 95%CI (1.34, 11.32) and 5.32; 95%CI (1.83, 15.43) respectively.

Regarding place of delivery, neonates born in Tikur Abesa hospital had 79% lesser risk of death compared to the neonates born outside [OR=0.21, 95%CI (0.10, 0.43)] after controlling for gestational age, birth weight.

Table 5: Adjusted odds ratio of survival among preterm neonates in Tikur Anbesea Hospital July-June, 2011-12.

		OR	95%CI	P-value
Gender	Female	1		
	Male	1.78	1.05, 2.85	0.03
Type of pregnancy	Multiple	1		
	Singleton	0.34	0.18,0.63	0.001
5^{th} minute APGAR score	0-3	6.00	1.24, 29.1	0.03
	4-6	1.48	0.80,2.80	0.21
	7-10	1		
Steroid administration	No	1		
	Yes	0.21	0.10,0.46	0.000
	Unknown	1.09	0.51,2.3	0.76
Place of delivery	In-born	0.21	0.10,0.43	0.000
	Out-born	1		
Temp. at Admission	< or = 33^0C	5.43	1.70,17.41	0.04
	33.1^0C-35.9^0C	3.89	1.34,11.32	0.01
	36^0C-36.4^0C	5.32	1.83,15.43	0.02
	36.5^OC-37.5^0C	1		

DISCUSSION

This study shows that around 26% of newborn infants admitted during the study period were preterm infants. Preterm birth occurs in about 5% to 10% of all births in resource-rich countries and it is on increasing trend and is around 12% in the US and it is expected to be higher in developing country (8). Study done on Malawi shows that around 20% women of delivered preterm (16). Another study done in northwestern Ethiopia has been reported to vary from 11% to 22% depending on the age group of mothers studied, and is highest in teenage mothers (17). The result of this study is slightly higher than those figures but comparable with a study done in other developing country. This may be explained by the fact that TAH NICU is the only tertiary care center giving care for very sick preterm infant.

During the study period, the overall survival rate of preterm infants 69.3 % (mortality rate being of 30.7%) and the mortality rate for preterm LBW infants were 31.9%. The World Health Organization reported that 15 million babies are prematurely born each year. Of these 15 million, one million of them die Shorty after birth (18). The survival chance of these infants is affected by several factors. In this study some of the major factors that affect the survival of these preterm infants were found to be gestational age and birth weight, as GA and birth weight increases the survival chance increases. This finding was also seen in many literatures; as well the value of using birth weight and GA for predicting survival is also pointed out in many publications.

In this study, the survival rate for preterm infant<28, 28-31, 32-34weeks of GA were 40%, 54.4% and 76.6% respectively. The survival chance of the late preterm infant is very high. A study in Canada 15 years ago on the survival of preterm infants shows that survival at 26 weeks is 82%, at 30weeks 95% (19). Comparing this result to our setup, there is a significant gap; and, this may shows the possibility of preventing preterm death. Another study done in Nigeria university of Ilorin Teaching Hospital, on the survival of 185 preterm infant shows that the survival rate in <28 weeks of GA is less than 20% (20). The figure in our study shows better situation than this study done in Nigeria.

In our studies, the survival of ELBW infant was found to be 34.43% and this figure is comparable with a study done in South Africa on survival of VLBW infants showing a rate of 34.9% (21). For infants between 1000 and 1500 gram the survival rate was 60.81%, this figure is lower than in the same study done in South Africa with a survival rate of 85.5%.

In this study, it was found that the mortality rate for LBW preterm infant is 31.9% and this result is slightly higher than a study done in TAH 15 years back in the survival of LBW which was 35.1% (22) and this could be explained by some improvement made in the NICU like caring for these very preterm infant starting from delivery room with early application of CPAP and maintaining their thermo neutral environment which affectsthe survival of these small infants.

In this study, it was also seen that type of pregnancy and gender of the infants affect their survival. It was demonstrated that female infants and singleton infants have more chance of survival. Other similar studies have also proved that girls have a better chance of survival and the advantage in survival for female infants is related to a more favorable hormonal milieu in the female fetus leading to accelerated lung maturation compared to the male (23-26). In contrast to the finding of this

study another study proves that Infants from multiple births had, for the same birth Weight, gestation, and ethnic origin as singleton infants, a greater chance of survival [odds ratio 1.4, 1.1 to 1.8] (27)

In this study it was found that 62.13% of the preterm infant died in the 1st seven days of life, and of this 40.5% of them died in the 1st 24 hours of life and this indicates that intensive cares during the few hours of life are crucial for the survival of these infants. Initial care for the newborn infants is still suboptimal in developing country as it was shown in this study.

Hypothermia is one of the common risk factor associated with neonatal death and especially for the preterm infants. In our study around 88.3% of the preterm infants admitted during the study period were hypothermic at admission, 95.9% of the preterm infants who died were hypothermic. There is a strong relationship between hypothermia and the survival of the preterm infants as it was mentioned above. This high incidence of hypothermia is due to poor thermal control at birth and subsequent prevention of hypothermia during transportation of infant. Previous study done in Tikur Anbessa Hospital shows that the incidence of body temperature below 36°camong LBW infants is 85% and the mortality increased linearly with decreased body temperature (28) which is comparable with our study. The above study also mentioned that 44%of neonatal death is associated with rectal temperature below 36°c.

The other finding of this study is that babies born in TAH has better chance of survival than out-born infants. This is most likely due to high degree of cold stressed during transportation of the infant. In this study, it was found that more than 90% of infants transferred from other health institutions are simply attended by relatives or parents and it is obvious that these infants are at a higher risk of hypothermia and may not get the necessary intervention on time which all have a negative impact on their survival. The outcome of ELBW infants is more favorable with maternal transfer rather than transfer after birth (29).

One of the key finding of this study is that maternal administration of steroid is associated with increased survival of preterm infants, which is the same finding in most of the published literature.

RECOMMENDATIONS AND CONCLUSION

This study found that 30.9% of all preterm births admitted to Tikur Anbessa Hospital in the specified period were died. The survival of these infants is below acceptable level by any standard and needs intervention.

Birth weight, gestational age, gender, type of gestation, place of delivery are major factors associated with survival of preterm infants in this study.

Infants born at TAH has a better chance of survival, most of the other preterm babies are coming to the hospital after some golden times of assistances are lapsed. This study recommends on establishing mechanisms of moving mothers than the preterm babies on time. The principle of warm chain in transport of preterm infants should be followed and supervised at a health institution conducting delivery services.

As gestational age and birth weight increases the survival rate of the preterm infant increases therefore very preterm and very low birth weight infants need very prompt and immediate assistance and more attention. The outcome of

ELBW infants is more favorable with maternal transfer rather than transfer after birth. Transport of sick infants from community hospitals to tertiary care centers, and transfer of high-risk mothers to the perinatal centre before delivery is very important in reducing the mortality of these infants.

From the study, it was shown that most infants died in the 24 hours of life, this shows that the initial new born care is still sub optimal that need due attention.

Respiratory failure followed by neonatal infection were found to be the two common causes of death in the preterm infants ,Thus, it is strongly recommended that the newborn unit should be equipped with important facilities like ventilators in order to reduce the mortality of these infants.

The units need to have properly functioning bacteriology service, available antibiotics in order to reduce the death of these infants. Simple measures like infection prevention will reduce the infant mortality rate significantly and this should be followed strictly.

The other key finding of the study is the use of antenatal steroid and the increased survival of the preterm infants as it was also proved in many other research but more than half of mothers who need steroid based on their GA were not administered. Even though there may be other obstetric reason why these mothers were not given, it is strongly recommended to give steroid to the mother with preterm delivery whenever possible.

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