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A Study of Causes And Rate of Neonatal Mortality in A Teritiary Care Teaching Hospital

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Abstract: *The first 28 days of life is known as neonatal period. Neonatal death is defined as the death of live birth during first 28 days of life. It is highly vulnerable period that the infants are susceptible to certain problems which lead to illness and death. About 40% of the 10 million deaths among children below 5 years occur during the neonatal period; this is twice as high as the number of deaths attributable to HIV/AIDS. The study was conducted between March 2014 and August 2014. It is a prospective observational study. Both male and female were included. All live neonates admitted to Neonatal Care Unit, Mahatma Gandhi Memorial Hospital were included in the study. Unknown babies also included in the study. Died neonates who brought to Mahatma Gandhi Memorial Hospital were excluded from the study. Cesarean deliveries in early term are more when compared to Normal and Assisted vaginal deliveries in early term. Major causes of deaths include LBW (62.16%) followed by sepsis (54.59%), RD (51.89%), HIE (22.16%) and Congenital abnormalities (15.13%). In LBW major causes of death include Sepsis (87.8%) followed by RD (83.5%) and preterm deaths (87.8%) are more when compared to term gestation (12.27%). Further much work is needed to educate community members about neonatal danger signs and to engage them in effective care-seeking behavior .The process of delivery should be made safe for the mother and neonate. We found LBW, Sepsis and RD to be the major cause's neonatal death.*

Keyword: *Mortality, Low Birth weight, Sepsis, Respiratory distress*

I. Introduction

The first 28 days of life is known as neonatal period. Neonatal death is defined as the death of live birth during first 28 days of life. It is highly vulnerable period that the infants are susceptible to certain problems which lead to illness and death. About 40% of the 10 million deaths among children below 5 years occur during the neonatal period; this is twice as high as the number of deaths attributable to HIV/AIDS. Almost 99% of neonatal deaths occur in developing countries and about two-third occurring in Africa and Southeast Asia [1]. Every year there is an estimated 3.1 million neonatal deaths occurring world wide [2]. The vast majority (up to 98.5%) of neonatal deaths occur in developing countries [3]. In India, neonatal mortalities declining sluggishly and the statistics were in 2001 (40 per 1000 live births) in 2007 (36 per 1000 live births) and in 2010 (32 per 1000 live births). Within the neonatal period, 80% of all new born deaths occur during first week of life, it is called early neonatal period [4]. Neonatal mortality in United States in 2005 declined largely due to improvement in obstetric and neonatal intensive care as well as advances in diagnosis and treatment. Neonatal morbidity and mortality is still high in developing countries that are primarily due to negligence of female health, nutrition deliveries by unskilled personnel and poor antenatal care. In a global perspective the major causes of neonatal death are found to be prematurity, low birth weight, birth asphyxia and neonatal infections [5]. In 2005 about quarter of global neonatal deaths occur in India, which has a neonatal mortality of 43 per 1000 live births [6], Whereas in Bangladesh high maternal and neonatal mortality rates are high at 194 per 10,000 live births and 37 per 1000 live births [7]. Most deaths in India, including of children, are not medically certified since most occur at home, in rural areas, and without attention by a health-care worker. Understanding of the causes of child death might be helpful to guide the use of widely practicable interventions for neonatal and child survival [8]. The proportion of early neonatal mortality (deaths in the first week of life) has increased as compared to the late neonatal mortality (deaths from 7 to 28 days of life) and it accounts for three quarters of all neonatal deaths. Among the early neonatal deaths, two thirds occur in the first 24 hours (very early neonatal mortality) [9]. In the ASIAN region, it is estimated that preterm birth complications account for (45%), birth asphyxia for (25%), congenital anomalies for (16%), and sepsis or pneumonia for (14%). These proportions vary among individual countries [10]. Low birth weight is an important cause of perinatal mortality and both short and long term infant and childhood morbidity. Low birth weight infants die at rates of up to 40 times those of infants of normal weight [11]. PRETERM BIRTH: Preterm birth is defined as babies born alive before 37 weeks of pregnancy. Preterm birth is a major determinant of

neonatal mortality and morbidity which has long term adverse consequences on health [12]. Premature infants are at greater risk for short and long term complications, including disabilities and implements in growth and mental development [13]. Of all early neonatal deaths (deaths within the first 7 days of life) that are not associated with congenital malformations, 28% are due to preterm birth [14]. Preterm birth rates have been reported to range from 5% to 7% live births in some developed countries, but are estimated to be substantially higher in developing countries [15]. LOW BIRTH WEIGHT: Low birth weight (LBW) is defined as birth weight of a live born infant of less than 2,500g (5 pounds 8 ounces) regardless of gestational age [16]. Subcategories include Very Low Birth Weight (VLBW) which is less than 1500 gm, and Extremely Low Birth Weight (ELBW) which is less than 1000 gm [17]. Normal Weight at term delivery is 2500 gm to 4200 gm.

II. Materials And Materials

MGM Hosital is a large government tertiary care teaching hospital located in Warangal District of Telangana State. It is a 1200 bed strength hospital with an area of 13 acres, which provides teaching facility to Kakatiya Medical College (KMC) students. The study was conducted between March 2014 and August 2014. It is a prospective observational study. Both male and female were included. All live neonates admitted to Neonatal Care Unit, Mahatma Gandhi Memorial Hospital were included in the study. Unknown babies also included in the study. Died neonates who brought to Mahatma Gandhi Memorial Hospital were excluded from the study.

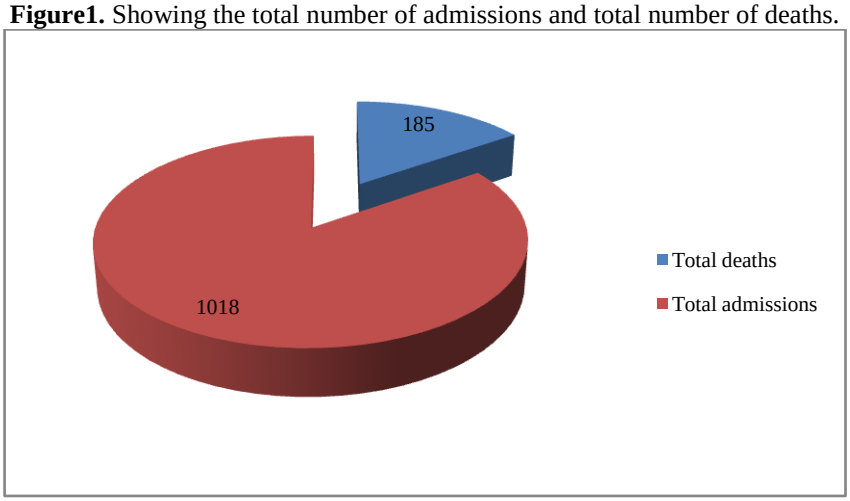
III. Results

During the study period, a total of 1018 Neonates were admitted to SNCU. All cases were included in the study who met the study criteria. Out of 1018 total admissions 185 deaths were occurred and Neonatal Mortality Rate was found to be 18.172 per 100 live births (Table 1, Figure 1).

Table 1. Total number of admissions and deaths

Total admissions	Total deaths
1018	185

Figure1. Showing the total number of admissions and total number of deaths.

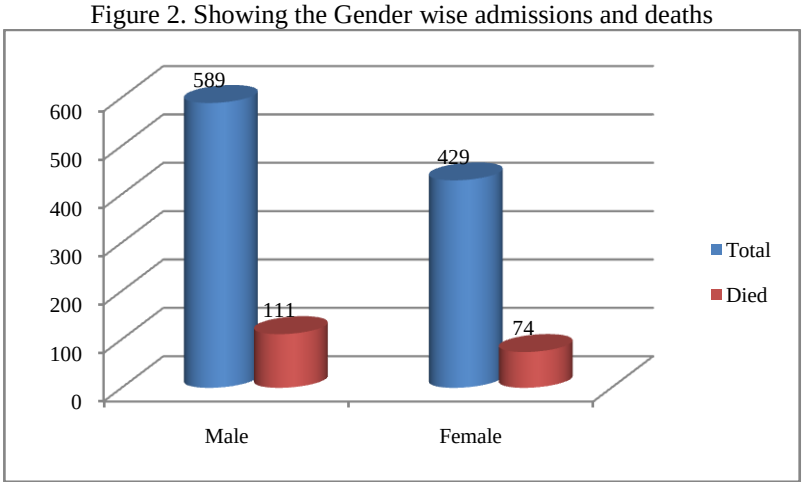


Out of all admissions 589 were males in which 111 (60%) died and 429 were females in which 74 (40%) died indicating that male neonatal deaths are more when compared to females (RR = 1.093; CI= 0.8369-1.426; P = 0.5647), (Table 5, Figure 2).

Table 2. Gender wise admissions and deaths

Gender	Males	Females
Total	589	429
Deaths	111	74s

Figure 2. Showing the Gender wise admissions and deaths



In our study most of admissions were from rural area and accounted for 802 in which 151 (81.62%) babies died and 651 survived. From urban area total admissions were 216 out of which 34 (18.3%) died and 182 survived (Table 3, Figure 3).

Table 3. Area wise Total admissions and deaths

Neonates	Rural	Urban
All births	802	216
Deaths	151	34

Figure 3. Showing the Area wise Total admissions and deaths

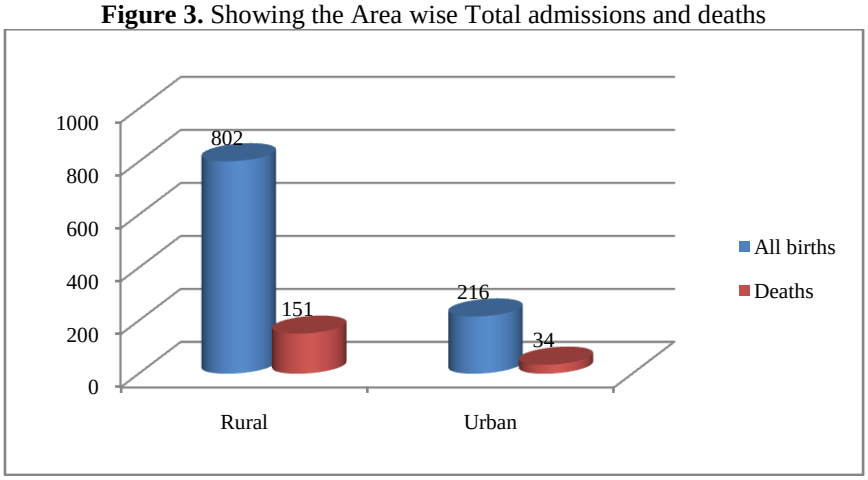


Table 4. Neonatal deaths according to area

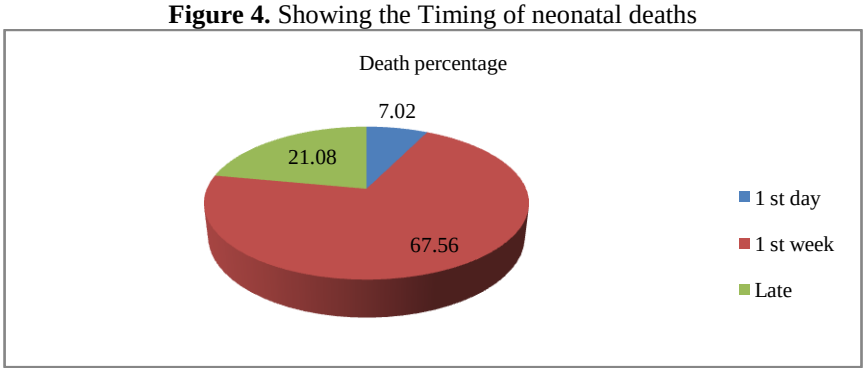
Area	All birth	Died	Survived	P value	Relative risk	95% CI
RURAL YES NO	 802 216	 151 34	 651 182	0.3213	1.196	0.8510,1.081
URBAN YES NO	 216 802	 34 151	 182 651	0.343	0.8360	0.5948,10175

13 (7.02%) death out of 185 occurred during first day of life i.e. day 0,125 (67.57%) death occurred during first week of life i.e. day 1-6. Collectively known as ear deaths. Late deaths at 7-27 days were 39 (21.08%) (Table 8, figure 4).

Table 5. Timing of neonatal deaths

Number of days	Total number of deaths	Death percentage
1st day of life (i.e. Day 0)	13	7.02%
1st week of life (i.e.Day1-6)	125	67.56%
Late (7-27 Days)	39	21.08%

Figure 4. Showing the Timing of neonatal deaths



Mode of delivery:

535 Mothers has cesarean deliveries. And of these 91 neonatal deaths were noted. The major indications for cesarean delivery were Breech presentations, fetal distress, previous Cesarean delivery, absence of labor pains, Oligohydromnios cephalopelvic disproportions, polyhydromnios, twin gestation.

416 mothers had normal vaginal deliveries among which 81 neonatal deaths were noted 64 mothers had assisted vaginal deliveries of which 13 deaths were note (Table 6, Figure5).

Table 6. Deaths based on Mode of delivery

Total	Cesarean	NVD+ AVD
All births	535	480
Deaths	91	94

Nvd: normal vaginal delivery
Avd: assisted vaginal delivery

Figure 5. Showing the Deaths based on Mode of delivery

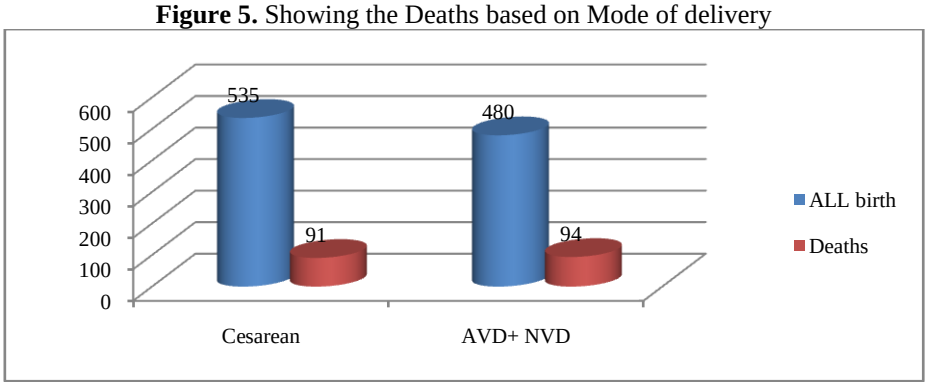


Table 7. Neonatal deaths in early term based on Mode of delivery

Total	ET+ Cesarean	ET+ NVD
All birth	159	152
Died	20	15

Figure 6. Showing the Neonatal deaths in early term based on Mode of delivery

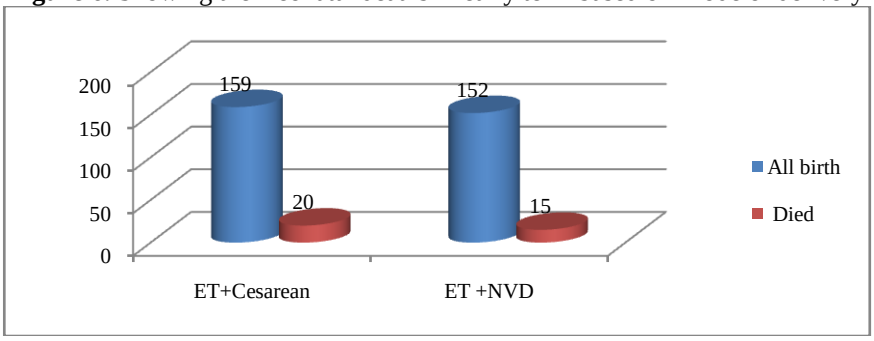


Table 8. Neonatal deaths in early term based on Mode of delivery

TERMS	All birth	Died	Survived	P value	Relative risk	95% CI
ET+ LSCS						
YES	159	20	139	0.4742	1.317	0.6996,
NO	157	15	142			2.478
ET +NVD						
YES	152	15	137	0.5918	0.8092	0.4300,
NO	164	20	144			1.523

Gestational age:

Table 9. Showing Gestational age classification.

Classification	Gestational age in weeks
Preterm	< 37 weeks
Early term	37-38 weeks
Full term	39-40 weeks
Late term	41 weeks
Post term	> =42 weeks

1009 Neonates were born at term. Of 489 preterm 106 (21.5%) died, 320 terms babies 35(11.1%) died and of 200 full term babies 34 (17%) died. 6 were born at post term in which 2 (33.3%) died. No neonatal admissions and deaths occurred at late term (Table10, Figure 7).

Table 10. Neonatal deaths based on Gestational age

Terms	All births	Died (n)	%
Preterm	489	106	21.5
Early term	320	35	11.1
Full term	200	34	17
Post term	6	2	33.3

Figure 7. Showing the Neonatal deaths based on Gestational age

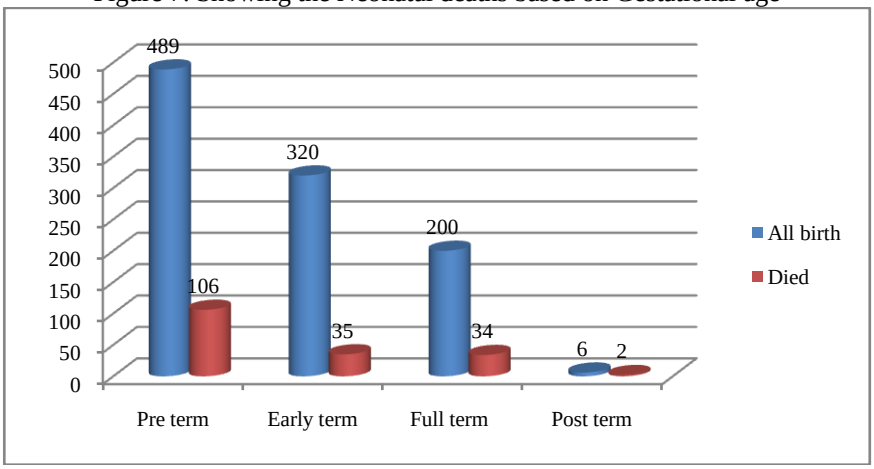


Table 11. Gestational age wise neonatal deaths

TERMS	All birth	Died	Survived	P value	Relative risk	95% CI
PRE TERM						
YES	489	106	383	0.0057	1.452	1.115,1.890
NO	529	79	450			
EARLY TERM						
YES	320	35	285	<0.0001	0.5090	0.3610,0.7175
NO	698	150	548			
FULL TERM						
YES	200	34	166	0.6831	0.9209	0.6565,1.292
NO	818	151	667			
POST TERM						
YES	6	2	4	0.2997	1.843	0.5899,5.761
NO	1012	183	829			

Causes Of Death

The main causes of neonatal deaths were low birth weight, sepsis, respiratory distress, hypoxic ischemic encephalopathy, congenital abnormalities.

Low Birth Weight (LBW) had highest attributable causes of death. Out of total 484 LBW babies admitted, 115 deaths were reported i.e. LBW accounts 62.16% of total deaths (RR= 1.813; CI= 1.383-2.376; P= <0.0001). Out of total 470 **Sepsis** babies admitted, 101 deaths were reported i.e. sepsis accounts 54.59 % of total deaths (RR= 1.402; CI= 1.079-1.822; P= 0.0116).

Out of total 407 **Respiratory distress** babies admitted, 96 deaths were reported i.e. RDS accounts for 51.89% of total deaths (RR= 1.619; CI= 1.249-2.100; P= 0.0003).

Out of total 182 **HIE** babies admitted 41 deaths were reported i.e. HIE accounts 22.16% of total deaths (RR= 1.308; CI= 0.9614-1.779; P= 0.1110).

Out of total 95 **Congenital abnormalities** babies admitted, 28 deaths were reported i.e. Congenital abnormalities accounts 15.135% of total deaths (RR=1.733;CI= 1.231-2.440; P= 0.0048).

Out of total 219 babies admitted with **other reasons**, 47 deaths were reported accounts for 25.41% of total deaths (RR=1.243; CI=0.9248-1.670; P=0.1662).These reasons include syndrome babies, respiratory failure, hypothermia, hyperthermia (Table12 Figure 8).

Table12. Causes of Neonatal deaths

Death reasons	All births	Deaths (n)	%
Low birth weight (LBW)	484	115	23.8
Sepsis	470	101	21.5
Respiratory distress (RD)	407	96	23.6
Hypoxic ischemic encephalopathy(HIE)	182	41	22.5
Congenital abnormalities (CA)	95	28	29.5
Others	219	47	21.5

Figure8. Showing the Causes of Neonatal deaths

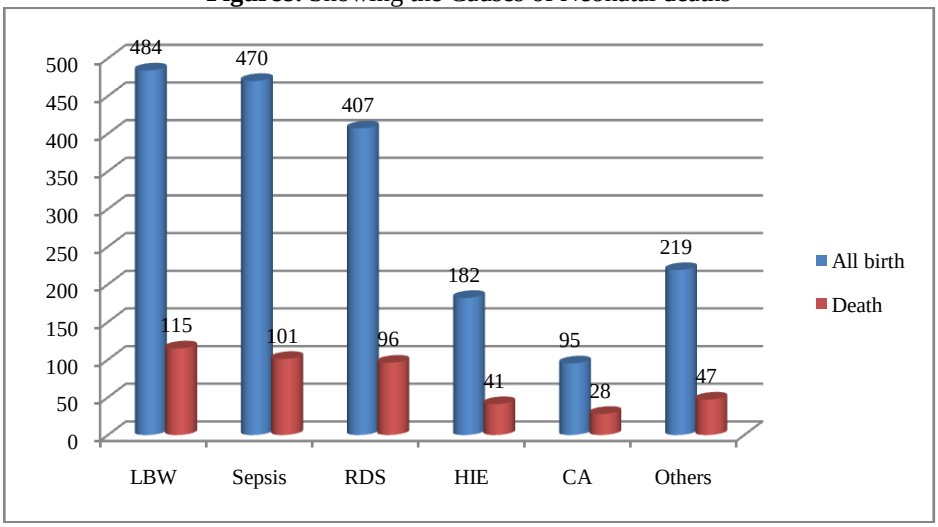


Table13. Major causes of neonatal deaths

Death reason	All birth	Died	Survived	P value	Relative risk	95% CI
LBW						
YES	484	115	369	<0.0001	1.813	1.383,2.376
NO	534	70	464			
Sepsis						
YES	470	101	369	0.0116	1.402	1.079,1.822
NO	545	84	464			
RDS						
YES	407	96	311	0.0003	1.619	1.249,2.100
NO	611	89	522			
HIE						
YES	182	41	141	0.1110	1.308	0.9614,1.779
NO	836	144	692			
Congenital						
YES	95	28	67	0.0048	1.733	1.231,2.440
NO	923	157	766			
Others						
YES	219	47	172	0.1662	1.243	0.9248,1.670
NO	799	138	661			

Associated causes of deaths:

Out of total 31 babies with **Birth asphyxia** admitted, 12 babies deaths were reported i.e. it accounts 6.49%of total deaths (RR=2.208; CI=1.390-3.510;P=0.0070).

Out of total 31 babies admitted with **Meconium aspiration**, 10 deaths were reported i.e. it accounts 5.405% of total deaths (RR=1.819; CI=1.073-3.084; P=0.0548).

Out of total 54 babies with **Meconium stained liquor** admitted 7 babies deaths were reported i.e. it accounts 3.783% of total deaths (RR=0.7020;CI=0.3473-1.1419;P=0.3678).

Out of total 196 babies admitted, with **Jaundice**, 6 deaths were reported i.e. it accounts 3.243%of total deaths (RR=0.1406;ci=0.06325-0.3124;P=0.0001).

Out of 36 babies admitted with **Neonatal convulsions**, 6babies death were reported i.e. it accounts 3.243% of total deaths (RR=0.9143; CI=0.4351-1.921; P=1.00) (Table16, figure9).

Table14. Associated causes of Neonatal deaths

Death reasons	All births	Deaths (n)	%
Birth asphyxia (BA)	31	12	38.7
Meconium aspiration(MAS)	31	10	32.2
Meconium stained liquor(MSL)	54	7	12.9
Neonatal jaundice(NNJ)	196	6	3.1
Neonatal convulsions (NNC)	36	6	16.7

Figure 9. Showing the Associated causes of Neonatal deaths

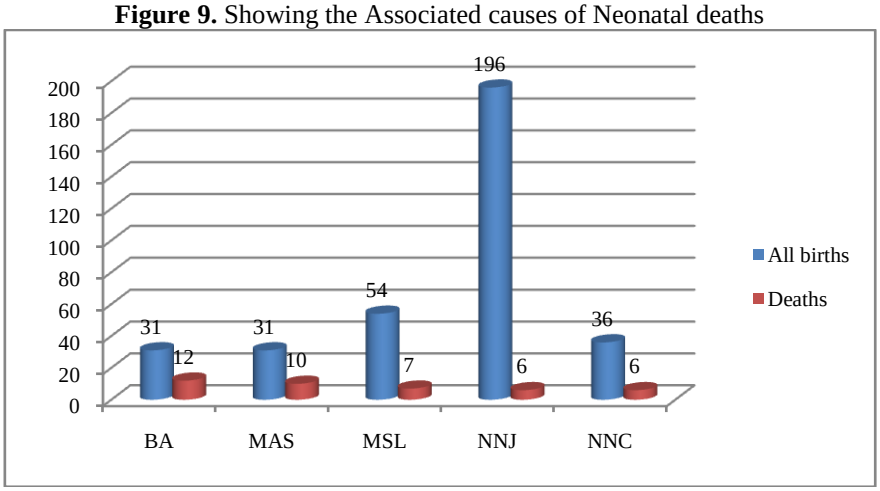


Table15. ASSOCIATED CAUSES OF DEATH

Death reason	All birth	Died	Survived	P value	Relative risk	95 %CI
Birth asphyxia YES NO	 31 987	 12 173	 19 814	0.0070	2.208	1.390,3.510
MAS YES NO	31 987	10 175	21 812	0.0548	1.819	1.073,3.084
MSL YES NO	54 964	7 178	47 786	0.3678	0.7020	0.3473,1.419
Jaundice YES NO	196 822	6 179	190 643	0.0001	0.1406	0.06325,0.3124
Seizures YES NO	36 982	6 179	30 803	1.000	0.9143	0.4351,1.921

In lbw neonates:

Major causes of deaths include sepsis (87.8%), RD (83.5%), HIE (35.7%), Congenital abnormalities (24.3%) (Table 16, Figure10).

Gestational age wise deaths include preterm (87.8%), term (12.2%) (Table14, Figure 10).

Table16. deaths based on neonatal characteristics

Characteristics	Died	Survived	Chi square	P value
GENDER				
Males	111	478	0.4252	0.8085
Females	74	355		
Total	185	832		
GESTATIONAL AGE				
Pre term (<37)				
Term (37-41)	106	383	13.43	0.0012
Post term(>=42)	69	451		
	2	4		
BIRTH WEIGHT				
< 1	20	2	116.8	<0.0001
1-1.49	29	38		
1.5-2.49	66	330		
2.5-3.99	69	460		
>/4.0	1	3		

Table17. Death reasons in LBW neonates (Total deaths in LBW 115)

Reason for Death	Total births	Total Survival	Total Deaths (n)	Death %in LBW
Sepsis	242	141	101	87.8
RD	224	128	96	83.5
HIE	64	23	41	35.7
CA	33	5	28	24.3
Others	136	85	51	44.3

Figure10. Showing the Deaths reasons in LBW neonates

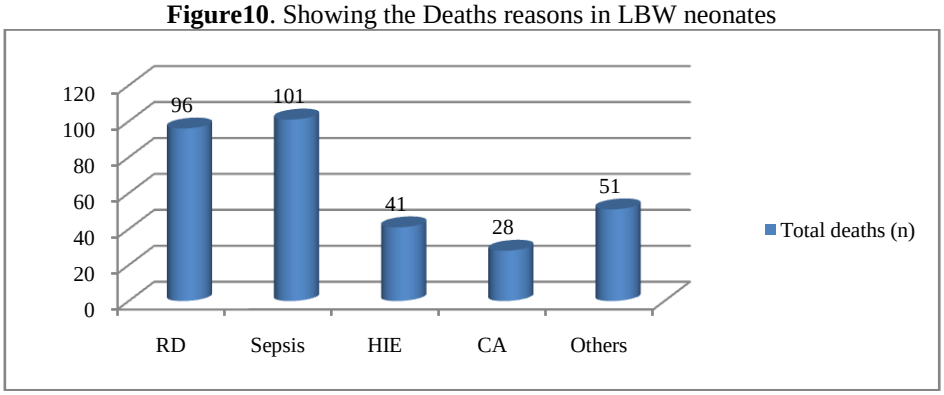
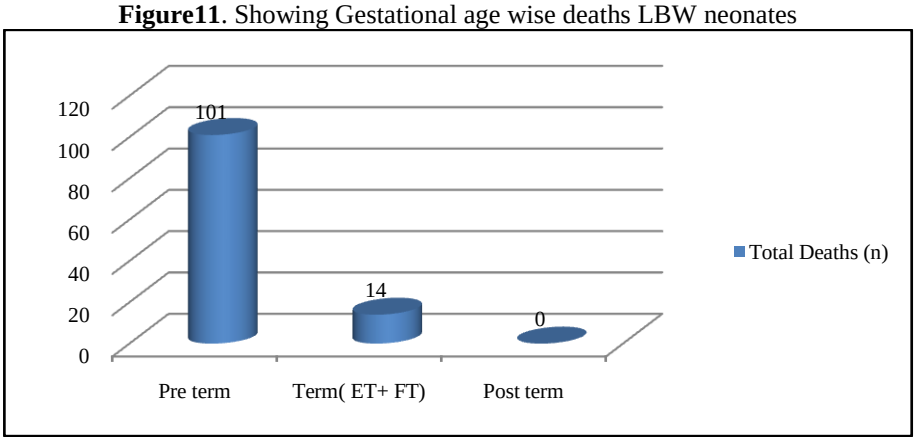


Table18. Gestational age wise deaths in LBW neonates

Gestational age	Total births	Total Survival	Total Deaths (n)	%Of deaths
Pre term	378	278	101	87.8
Term (ET+ FT)	105	91	14	12.2
Post term	1	1	0	0

Figure11. Showing Gestational age wise deaths LBW neonates



IV. Discussion

The study of mortality risk measurement among the new born admitted to the neonatal intensive care units is attaining an increasing level of importance. This study has determined the burden and associated with neonatal mortality. The neonatal mortality rate was 18.17 per 100 live births which are 6 times more when

compared to study by Anthony O. Adetola et al [1] they have reported the NMR was 3.21 per 100 live births male babies have a higher risk than females of dying during the neonatal period. 81.62% of deaths accounts for rural area admissions hence more care should be taken for rural area admissions. High neonatal deaths (74.6%) have been reported at early days of life (0-6). Preterm birth is generally attributed as a direct cause of death while LBW is considered as a risk factor or underlying condition. Cesarean deliveries in early term are more when compared to Normal and Assisted vaginal deliveries in early term. Major causes of deaths include LBW (62.16%) followed by sepsis (54.59%), RD (51.89%), HIE (22.16%) and Congenital abnormalities (15.13%). In LBW major causes of death include Sepsis (87.8%) followed by RD (83.5%) and preterm deaths (87.8%) are more when compared to term gestation (12.27%). And major associated causes of the deaths include Birth asphyxia followed by Meconium aspiration, Meconium stained liquor, Neonatal jaundice and Neonatal convulsions. Here in our study sepsis includes both viral and bacterial infections of various etiologies. No standard definition for birth asphyxia exists, particularly at community level, and remedying of this situation has been identified as a research priority. More than fifty percent of deaths occurred at preterm. Early initiation of breast feeding may reduce neonatal mortality by decreasing the ingestion of infectious pathogens. For unknown babies we did not get the maternal information which includes mode of delivery, gestational age, antenatal care, previous illness to mothers and drug use. Silverman retraction score, Downs score, Ballard scores also collected but the data was not available for all neonates hence their significance in study was not mentioned. As with previous studies, it was observed that breech presentation had 5 times higher risk of neonatal death compared with cephalic presentation but here in our study due to lack of data and information from patients attendants this was not clearly known.

V. Conclusion

Improvement in the neonatal resuscitation skills in this environment is evident as RD, asphyxia continued to be leading cause of death with basic neonatal resuscitation kills, up to 90% of the babies who die because of asphyxia might be saved. Instrapartum problems, such as meconium-stained or foul-smelling liquor, and meconium aspiration were factors that increased the risk of neonatal deaths. These factors predispose the newborn to significant risk of infection. Clean delivery may be necessary but not sufficient to reduce neonatal mortality. Innovative approaches to improve access to essential health services for neonatal complications Should be tried within the existing health systems to ensure sustainability. Further much work is needed to educate community members about neonatal danger signs and to engage them in effective care-seeking behavior .The process of delivery should be made safe for the mother and neonate. We found LBW, Sepsis and RD to be the major cause's neonatal death.

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