

Title : Causes of Neonatal Morbidity & Mortality at Neonatal Unit in Marathwada, Maharashtra.**Author :** *Dr. Khaire P B, ** Dr. Parihar M, ***Dr. Savaskar

Head & Professor, *Asso. Prof, Dept. of Paediatrics.

Address for Correspondence : Department of Paediatrics, Govt. Medical College, Latur, Maharashtra.**Objective:-**

To know the causes of neonatal morbidity and mortality among newborns admitted to the neonatal intensive care unit of tertiary care teaching hospital in the Marathwada region of Maharashtra. **Methods:-** It was descriptive study conducted from 1st June 2011 to 31st May 2012. Data of all the babies admitted to the neonatal intensive care unit was recorded in prefixed format. The causes of admissions, referral and deaths were recorded and studied statistically. **Results:-** A total 929 neonates were admitted during the study period. Among them 536 (57.69 %) were male and 393 (42.30 %) were female. The inborn delivered babies were 559 (60.17%) and outborn were 370 (39.83%). Majority of babies i.e.625 (67.72%) were admitted in first 24 hours of life. 585 (62.97%) babies weighed below 2.5 kgs. Majority of deaths were within early neonatal period (94.95%). Birth asphyxia (29.58%), sepsis (25.72%) and preterm with low birth weight (13.82%) were the main causes for referral to the hospital. Out of total 929 admissions 358 (38.53%) were preterm and 571 (61.46%) were full term. Among the preterm babies, preterm with LBW were 279 (30.03%), preterm with sepsis were 106 (11.41%), only preterm were 60 (6.45%), preterm with RDS were 44 (4.73%) and other were 5 (0.53%). Among full term baby's birth asphyxia (16.79%), sepsis (13.34%) and respiratory distress syndrome (9.47%) were most common diagnosis. Prematurity with low birth weight (44.95%), hypoxic ischemic encephalopathy (19.32%) sepsis (17.64%) was the common causes for the deaths. **Conclusions:-** Prematurity, low birth weight, birth asphyxia, hypoxic ischemic encephalopathy and sepsis are the major causes of admission and mortality to the neonatal intensive care unit. The high neonatal mortality warrants an urgent need to identify and reduced the risk factors with emphasis on prematurity,

low birth weight, birth asphyxia and sepsis.

Keywords :- NICU, prematurity, sepsis, low birth weight

Background : India the world's biggest democracy and the largest country in the South Asia, has great disparities in the health profiles of the people all over the country and mainly the children. Every year 130 million of children take birth in the whole world of which nearly 20 percent i.e. nearly 27 million are born in our country^[1, 2]. 67 percent of global neonatal deaths occur in just ten countries and India contributes 30 percent i.e. more than 1.2 million of global neonatal deaths thus ranking first in top ten countries^[3, 4]. Then neonatal mortality successfully reduced from 70/1000 live births in 1981 to 37/1000 live births in 2003^[5]. However this rate slowed down with merge 3 point reduction in neonatal mortality rate up to 2009 i.e. 34/1000 live births^[6, 7]. Early neonatal deaths i.e. deaths within first week of life declined only 27 percent during the period from 1990 to 2008. The neonatal mortality rate contributes about 72 percent of infant mortality rate and about 50 percent of Under-5 mortality rate^[8]. This clearly shows that neonatal mortality is major contributor of infant mortality and Under-5 mortality rates. Thus a substantial reduction in neonatal mortality is absolutely necessary to achieve the further gain in child survival. Hence we need to place children especially newborn at the heart of "Inclusive Growth" strategies to ensure India's continuing progress on the economic, social and political fronts.

With the alarming conditions for infant and maternal mortality, especially in developing world; a considerable importance has been given to maternal and child care in the United Nations mission. The Millennium Development Goals (MDGs) is one of the dream projects by the united nation's to achieve health for all ^[9]. As a signatory nation India is committed to achieve the targets under MDGs. One of the eight goals under MDG is to attend infant mortality rate of less than 28/1000 live births and under 5 child mortality rate less than 42/1000 live births by the year 2015. Many of the health programmes in India like Child Survival and Safe Motherhood (CSSM), National Rural Health Mission (NRHM) and National Family Health Survey III (NFHS III) focuses on basic maternal and

neonatal care. Reproductive Child health II aims to achieve infant mortality rate to 30/1000 live births and Under-5 mortality rate to 38/1000 live births in order to achieve MDGs^[10,11].

The rural population of India which accounts for 70 percent of total population still needs easily accessible mother and child health care facilities. The neonatal intensive care facilities are still scarce and mostly concentrated in urban areas. The tertiary level neonatal care intensive unit (NICU) are also scanty all over country mainly located in metro cities. The available statistical data about neonatal mortality and morbidity is mainly from metropolitan cities and fails to represent the country completely. Thus inverse care law remains valid which states that "The availability of good medical care tends to vary inversely with the need for it in the population served"^[11]. For newborn babies, this law could appropriately be renamed the inverse information and care law i.e. the communities with the most neonatal deaths have the least information on these deaths and the least access to cost-effective interventions to prevent them^[10,11].

Maharashtra is the second most populous state after Uttar Pradesh and the third largest state by area in India. The health statistics for the state show substantial reduction in infant mortality rate from 58/1000 live births in 1990 to 33/1000 live births in 2008. However this is still far from the MDGs^[12, 13]. Beside this the neonatal mortality rate is still high (24/1000 live births) and contributes 72 percent of infant mortality rate and 58 percent of Under-5 mortality rate^[14, 15]. The data regarding the neonatal morbidity and mortality patterns in the neonatal intensive care unit of the state is rare and even if available is mainly from metropolitan cities. The data from tertiary care neonatal intensive care units which mainly serves the rural and low socio economic strata of society is scanty. The Marathwada region of the state is socially and economically backward as large proportion of population lives in rural area and belongs to below poverty line. Though the health care facilities are reaching the rural and inaccessible population, the infant mortality especially the neonatal mortality are still alarming. To the best of our knowledge there is hardly any data from the neonatal intensive care unit from the region. Hence in view of this a study to audit the

neonatal morbidity and mortality was undertaken to represent the rural population of our country.

Methods : This was descriptive study conducted from 1st June 2011 to 31st May 2012, after getting approval from Institutional Ethics Committee. The neonatal admissions were included in the study only after getting a valid consent from their parents. According to their place of birth they were divided as inborn or outborn and hence were kept in two separate blocks; inborn in aseptic NICU and outborn in septic NICU. Data of all the babies was recorded in prefixed format. The data included the basic information for the baby i.e. name, name of parents, informant and demographic factors (age, weight at time of admission, sex), reason for admission, anthropometric measurements, referral history, detailed examination findings, duration of hospital stay, progress during admission, prognosis and final outcome (cured and discharged/ died/referred out /LAMA/discharge on request) of the patient. Their referral source and reason was also recorded. The data also included investigation done at the hospital. The diagnosis was finalised as per the working definitions depending on the clinical examination and was supported by the investigations. The whole data was compiled and analysed. The statistical analysis was done to find out the significance for the observations.

Results and Discussion : During the study period, total 929 babies were admitted to the NICU and all were included in the study. The monthly average for admission was 77.41.

Out of total 929 admissions, 691 survived and 238 died (Table I). Thus the survival rate was 74.38 % and death rate was 25.61%. The neonatal mortality was high and a cause of concern for the institute. However this high rate is explainable on basis of poor antenatal care and low socio economic conditions of the serving population. Beside this untimely reference for high risk mothers and neonates was also cause of concern. The other studies from India also showed great variations in death rate. Pankaj Garg^[16] et al and Mani Kant Kumar^[17] et al reported 42 % and 16.9 % neonatal mortality rate in NICU respectively. The studies from neighbouring countries like Pakistan^[18,19,20,21,22], Nepal^[23] and Bangladesh^[24] also reported a great

variation in death rate for NICU admission extending from 4 % to 30.9 %. The studies from Saudi Arabia^[25], Kenya^[26], Togo^[27] and Egypt^[28] reported the death rate of 22.4%, 24.6%, 27% and 29% respectively. However the studies from developed countries like Canada^[29] and Brazil^[30] reported death rate of 4% and 6% respectively. Such a large variation in death rate is due to infrastructure and facilities provided by the NICU. Highly equipped centres which can provide level III NICU care are able to bring down the neonatal mortality significantly. Out of 929 admissions, 536 (57.69 %) were male and 393(42.30 %) were female(Table I). This shows male predominance for neonatal admissions. This result coincides with the results from other studies from India. Pankaj Garg et al and Mani Kant Kumar et al both reported male predominance in neonatal admissions with 76 % and 59.8 % admissions respectively. Similarly Tallat Seyal et al and Fazlur Rahim et al reported 59.5 % and 71.96 % male admissions respectively in their studies. The results from Mostafa A Arafa et al 25 et al and M. Hoque³¹ et al also coincides with 60% and 57.8% male admissions respectively. The male predominance in neonatal admission is explainable on the basis of male preference in the society and biological vulnerability to infections.

In our study 559 (60.17%) babies out of total 929 were born at our institute i.e. inborn and 370 (39.83%) babies where delivered outside our institute i.e. out born (**Table I**).This high

Table I: Demographic Characteristic of Study Population (number in brackets denotes percentage out of 'n' as total)

	No. of admissions (n=929)	No. of deaths (n=238)
Sex		
Female	393 (42.30)	97 (40.75)
Male	536 (57.69)	141 (59.24)
Place of delivery		
Inborn	559 (60.17)	81 (34.03)
Outborn	370 (39.82)	157 (65.96)
Age at admission (days)		
<1	625 (67.27)	155 (65.12)
1-3	166 (17.86)	60 (25.21)
3-7	67 (7.21)	10 (4.20)
8-28	71 (7.64)	13 (5.46)

percentage of inborn babies is because the catchment area of our hospital is large and mainly serves the low socio economic class of society. Beside this most mother admitted were referred from the peripheral hospital for intra partum complications.

Out of 559 inborn babies in NICU, 478 (85.51%) survived and 81 (14.49%) died. Whereas among 370 outborn babies 213 (57.57%) survived and 157 (42.43%) died. The death rate was significantly large in outborn babies when compared with inborn babies (p<0.001).

Mani Kant Kumar et al reported 65% of neonatal admissions from inborn deliveries and 35 % as outborn with 9.8% and 20.5 % deaths in respective group. TallatSeyal et al in their study showed lack of significant difference between inborn and outborn deliveries. Fazlur Rahim et al reported 22.60% deaths were among the babies in their own hospital.

When the data was analysed on the basis of the age of baby at time of admission (Table I) it was found that most of the admission i.e. 67.27 % were within 24 hours of life and this figure increased to 92.35 % for early neonatal period i.e. within 7 days of life. Similarly 225 deaths out of 238 (94.53%) were within first week of life and 13 (5.46%) deaths were after first week of life. This figure clearly shows the significance of early neonatal period. In our analysis for early neonatal deaths we also found that 65.12% of deaths occurs on the first day of life and 27.73% from 1-3 days of life which clearly showed that among early neonatal period first 3 days of life most hazardous. Early neonatal period was also statistically hazardous when compared with late neonatal period (p<0.0001).

The significance of early neonatal period was also reported by Shah U^[34] et al and Pratinidhi A^[35] et al but these were community based trials. Tallat Seyal et al also reported 68.1 % of admission by 24 hours of age. Similarly Prakash J et al, Fazlur Rahim et al, Chisti A Z^[32] et al and Abbasi K A^[36] et al reported that most neonatal problems occurs within first 24 hours of life with 36.6%, 35%, 75% and 44.47% admission within 24 hours of life respectively. ICMR study showed that 21.5-39.5 % deaths occurred within 24 hours of life which increased significantly to 70-80 % for first week of life. NNPD also reported 87.8 % and 81.2% of deaths

within first week of life for intramural and extramural admissions respectively. Similarly A H Baqui^[37] et al also reported that 32% babies dies on the day of birth which increases to 50% for first 3 days of life and 71% for first week of life.

Out of total 929 admissions (Table II), 585 babies weighed below 2.5 kilograms i.e. low birth weight and 344 were above 2.5 kilograms. Low birth weight babies accounted for 62.97 % of total admissions. Among all low birth weight babies 151 (16.25%) were below 1.5 kilograms i.e. very low birth weight and 32(3.44%) were below 1 kilogram i.e. extreme low birth weight babies. Mani Kant Kumar et al reported 40 % admission rate for LBW babies. Similarly, Prakash J et al reported 20 % admissions rate for LBW babies.

Fazur Rahim et al and Islam M N et al both reported 41.20% and 13.5% of admissions as LBW. Chisti A Z^[32] et al also reported 39 % of total admissions to neonatal care unit as LBW. M Hoque^[31] et al reported 53%, 13.9% and 6.1% admission rate for LBW, VLBW and ELBW babies respectively.

According to National Neonatal Perinatal Database the intramural admissions recorded 31.3%, 3.4% and 0.7% admissions as LBW, VLBW and ELBW respectively. However the extramural admission recorded 52.1 % admission rate for LBW babies.

This high percentage for LBW is acceptable as our hospital predominantly serves the rural population with high degree of unemployment and poverty. Beside this poor maternal health status, low socio economic status, poor antenatal care along with scanty health care facilities is the explainable reasons for high rate of LBW babies.

Table II :Distribution & Outcome of Neonates According to Weight on Admission (number in brackets denotes percentage out of 'n' as total)

Weight (kgs)	No of admissions (n =929)	No. of deaths (n=238)
<1	32 (3.44)	26 (10.92)
1-1.499	151 (16.25)	80 (33.61)
1.5-1.999	223 (24.00)	55 (23.10)
2-2.499	179 (19.26)	34 (14.280)
>2.5	344 (37.09)	43 (18.06)

Out of 238 deaths; 195 (81.93%) were among babies weighing less than 2.5 kilograms (**Table II**). The percentage of deaths is inversely proportional to birth weight i.e. percentage of deaths increases as the birth weight decreases. Among total LBW, VLBW and ELBW babies 22.13%, 52.98% and 81.25% expired in respective group.

The above figures are far high when compared with the National Neonatal Perinatal Database (NNPD) figures. NNPD intramural data showed 6.1 %, 29.7% and 55% mortality rate for LBW, VLBW and ELBW babies respectively. Similarly the NNPD extramural data showed 14.2%, 32.8 % and 28.8 % mortality rate for LBW, VLBW and ELBW neonates respectively. The difference in above figures from our study was explainable on the basis of infrastructure difference. Most centres under NNPD were highly equipped and tertiary care centres with level III neonatal care. The difference clearly showed the unavailability of infrastructure can make a great difference.

Mani Kant Kumar et al and Tallat Seyal et al reported 59.2% and 67.2 % death rate among LBW babies respectively. Also when statistically compared, neonatal mortality increased significantly for birth weight is below 2 kilograms ($p < 0.0001$). M S Sarna^[33] et al reported similar significance in deaths for below 2 kilograms birth weight babies.

When data was studied for the total duration of stay at neonatal intensive care unit, it was observed that 197 babies out of 929 stayed for less than 24 hours. Among this 197, 123 died and 74 survived. Among the survival most of them were referred to higher centres for further management or left against medical advice or were discharged on request of their caretaker. Thus striking 51.68% deaths were within 24 hours of life. This figure increased to 95.79% when the duration up to 7 days was considered.

Not much data was available to compare the duration of NICU stay with neonatal outcome. NNPD extramural data showed that 65.6% deaths occurred within 7 days of NICU stay.

Tallat Seyal et al reported in their study that 25.8 % of admissions stayed for 48 hours in NICU, among this 16.8 % were discharged and 38.8% died or left against medical advice. Imitaz Jehan et al^[21] reported 45%

deaths occur within 48 hours of admission and 73% within 7 days of admission. Mostafa A Arafa^[25] et al showed that 46.8% deaths occur within 24 hours of admission and this figure increased to 61% up to 3 days of stay. M Hoque^[31] et al showed 64.7% of total admissions stayed for 7 days and 74.5% of deaths occurred within 7 days of hospital stay. Mukhtar Yola M^[38] et al reported that 16.9 % of all deaths occurred within 48 hours of stay at NICU.

So it was concluded that getting delivered at tertiary care centre and being admitted to the neonatal care unit within 24 hours of birth still ends in high neonatal mortality. The causes of this were lack of proper utilisation of antenatal services which were already scanty and lack of trained birth attendants who can timely diagnose the high risk pregnancies. This ultimately over burdened the obstetric unit and consumed the major resources of the NICU and adds to neonatal morbidity and mortality.

Table III :Outcome According to Stay of Neonate in NICU (number in brackets denotes percentage out of 'n' as total)

Duration of stay (in days)	No.of admissions (n =929)	No. of deaths (n=238)
<1	197(21.20)	123(51.68)
1-3	315 (33.90)	78 (32.77)
4-7	247 (26.58)	25 (10.50)
8-2	155 (16.68)	8 (3.36)
8>28	15 (1.61)	4 (1.68)

Tallat Seyal et al reported in their study that 25.8 % of admissions stayed for 48 hours in NICU, among this 16.8 % were discharged and 38.8% died or left against medical advice. Imitaz Jehan et al reported 45% deaths occur within 48 hours of admission and 73% within 7 days of admission. Mostafa A Arafa et al showed that 46.8% deaths occur within 24 hours of admission and this figure increased to 61% up to 3 days of stay. M Hoque^[31] et al showed 64.7% of total admissions stayed for 7 days and 74.5% of deaths occurred within 7 days of hospital stay. Mukhtar Yola M^[38] et al reported that 16.9 % of all deaths occurred within 48 hours of stay at NICU.

In our study, it was observed that most of the outborn babies were referred for acute perinatal complications (like respiratory distress, birth asphyxia, sepsis) or

suffered from intrapartum complications (like obstructed labour, premature rupture of membranes). Beside this improper neonatal transportation and lack of adequate neonatal care also contributed to higher deaths for outborn admissions. There were total 311 babies which were referred from other hospital during our study period (figure 1). These included the babies from other government hospitals in the city and outside the city along with the private hospital. Birth asphyxia (29.58%), sepsis (25.72%) and preterm with low birth weight (13.82%) were the most common causes for referral at our hospital.

Mani Kant Kumar et al reported severe birth asphyxia with hypoxic ischemic encephalopathy, neonatal sepsis and preterm with LBW as most common causes for referral with 32.5%, 22.9% and 13.4% cases respectively. M Hoque et al in their study reported preterm, infection and birth asphyxia as most common causes with 33.6%, 23.5% and 9.4% cases respectively.

The causes for referral varies from region to region depending upon the availability of trained health care workers, it is also influenced by the socio economic status and educational status of parents. Most of the babies were referred without proper neonatal transportation care and so suffered greatly. It was observed that the referral system was inadequate and lacks the specific knowledge about when, how and where to refer the newborn correctly. Most of the referred babies could have been managed at the referring hospital if minimal neonatal care facilities were available. This figure shows although the neonatal care facilities are scanty at peripheral level minimal assistance to the health care staff with basic facilities can avoid unnecessary referral to high centres.

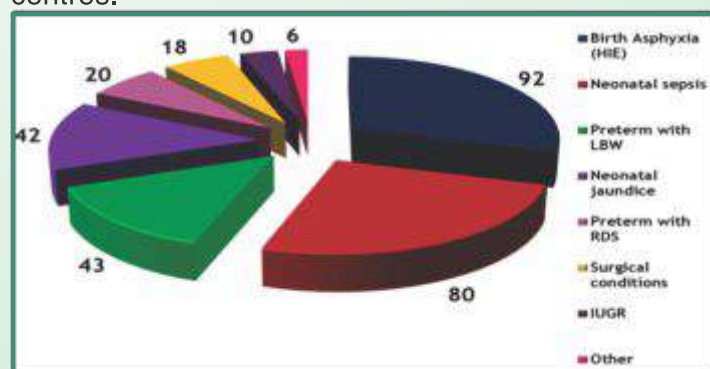


Figure 1 : Causes of referral to NICU.

During the study period we classified all the admissions mainly in two categories i.e. preterm and full term based on the New Ballard Score charting. Each baby from respective group was further diagnosed based on the prefixed working definitions and supported by investigations for a certain diagnosis.

In our study out of total 929 admissions 358(38.53%) were preterm and 571(61.46%) were full term. Among the 358 preterm babies, preterm with LBW were 279(77.93%), preterm with sepsis were 106(29.60%), only preterm were 60 (16.76%), preterm with RDS were 44 (12.29%) and other were 5(1.39%). The other included 2 hydropsfetalis, 2 Hepatitis B prophylaxis and 1 birth asphyxia.

Table IV : Indications of NICU admission for preterm neonates#

Indications	Numbers(n=358)	Percentage
Preterm with LBW	279	77.93
Preterm with sepsis	106	29.60
Preterm without sepsis	60	16.76
Preterm with RDS	44	12.29
Other	05	1.39

[# A neonate having more than one morbidity is counted in each category. Hence the sum may be more than the total neonates in the group.]

Among 571 full term babies admitted during the study period the three most common diagnoses were birth asphyxia (27.32%), sepsis including meningitis and pneumonia (21.71%) and meconium aspiration syndrome (12.6%). The other causes were neonatal jaundice (7%), congenital heart disease (5.77%), intrauterine growth retardation (8.05%), transient tachypnea of newborn (2.8%), surgical conditions (8.23%), antibiotics prophylaxis (10.85%) and other (2.62%). The other included Hepatitis B prophylaxis (4), Varicella zoster prophylaxis, neonatal thrombocytopenia, chylothorax, large for gestational age babies, pneumothorax and ambiguous genitalia .

The pattern of admissions to the neonatal intensive care unit varies from study to study depending mainly on the infrastructure and demographic factors of the serving population. Pankaj Garg et al reported 28.6% admissions as preterm and 71.4% admissions as

fullterm. Among the preterm, sepsis (33.33%) was most the common diagnosis. In full term group neonatal jaundice (32.85%), birth asphyxia (20.83%) and sepsis (13.33%) were the most common causes of admissions. Chavan Y S 39et al reported birth asphyxia (40.5%), preterm (29.7%), infection (27.01%) and congenital anomalies (2.8%) as the causes of neonatal admissions in their study

NNPD intramural data reported respiratory morbidities in 5.7% babies which included HMD (1.2%), TTN (3.2%), meconium aspiration (1.3%) and air leak syndrome(0.1%). It recorded 2.8% admissions with central nervous system morbidity which included HIE, seizures and IVH in 1.4%, 1% and 0.3% cases respectively. Beside these congenital anomalies were present in 1.6% admissions with congenital heart diseases and neural tube defects in 0.5% and 0.2% cases respectively. Hyperbilirubinemia, hypoglycaemia and hypothermia were present in 3.3%, 0.9% and 0.9% babies respectively. Extramural data from NNPD reported 67.7% admissions as full term while 31.5% were preterm. The causes for admissions were sepsis (39.7%), hyperbilirubinemia (22.1%), neonatal hypothermia (18.4%), neonatal seizures (18.1%), HIE (16%), hypoglycaemia (9.3%), MAS (7.9%), HMD (6.4%) and cardiac malformations (4%). Mani Kant Kumar et al in their study reported the causes as LBW(39.8%), preterm(38.6%), sepsis(23.3%), hyperbilirubinemia (20.4%), HIE(18.2%), IUGR(14%) and HMD(9.7%). Roy R N [40] et al in their study reported birth asphyxia (42.98%) as most common cause followed by sepsis (37.56%), prematurity (37.56%)and congenital anomalies (1.46%). Abhay T Bang et al in their community trial they reported LBW (42%) as most common cause neonatal morbidity followed by clinical sepsis(17%), prematurity(9.8%), birth asphyxia(4.6%) and hypothermia(1.7%).^[41]

Table V: Indications of NICU admission for full term neonates#

Indications of admissions	Numbers (n=571)	Percentage
Birth asphyxia	156	27.32
Sepsis	86	15.06
Neonatal jaundice	40	7.00
Meningitis	10	1.75
Pneumonia	28	4.90
Congenital Heart Disease	33	5.77
Meconium aspiration syndrome	72	12.60
IUGR	46	8.05
TTN	16	2.8
Surgical conditions	47	8.23
Antibiotics prophylaxis due to PROM	62	10.85
Miscellaneous	15	2.62

[# A neonate having more than one morbidity is counted in each category. Hence the sum may be more than the total neonates in the group. PROM :Premature Rupture Of Membranes]

Tallat Seyal et al reported preterm (23.5%), sepsis (21.9%) and birth asphyxia (18%) as the most common causes of admissions in NICU. Mostafa A Arafa et al reported preterm (55%) as most common cause of admissions followed by RDS (24%), birth asphyxia (7.6%) and sepsis with congenital malformations and IUGR (14%). Iman Seoud et al in their study reported neonatal jaundice as most common cause of admission in 35.8% babies followed by infection(22.5%), prematurity(19.6%), HIE (12.2%), RDS(9.6%), CHD(5.3%), TTN(4.8%) and congenital anomalies(4.8%). Mmbaga BT^[42] et al also reported birth asphyxia(26.8%) as most common cause of neonatal admission followed by prematurity and infections in 18.4% and 15.4% patients respectively.

Thus our findings coincides with most of the studies and concluded that even with increasing knowledge and advanced technologies; prematurity, sepsis and birth asphyxia are still the main cause for the neonatal admissions.

When the cause's deaths were studied (figure II) and it was found that prematurity in toto was the main culprit for most of the deaths. Prematurity led to 172 deaths out of total 238 deaths i.e. 72.26 %. This included prematurity with LBW (36.77%), prematurity with sepsis (13.75%) and prematurity with RDS (8.59%).

Following prematurity, HIE (15.81%) and septicaemia (14.43%) were leading cause of deaths. Congenital anomalies, meconium aspiration syndrome and neonatal jaundice contributed to 4.81%, 5.5% and 0.34% of total deaths.

NNPD intramural data reported that out of total deaths 28.8% were due to perinatal asphyxia followed by prematurity (26.3%), septicaemia (18.6%), HMD (13.5%) and congenital malformations (9.2%) whereas extramural data reported that 38% of total deaths were due to infections followed by perinatal asphyxia (18.7%), HMD (8.5%) and congenital malformations (5.9%). Kapoor RK^[44] et al in their study from urban slums reported that birth asphyxia, infections and prematurity are the most common causes for neonatal deaths with 42%, 22% and 14% deaths respectively. ICMR6 in its community based trial showed that infection contributes 32.8% deaths followed by birth asphyxia (22.3) and prematurity (16.8%).

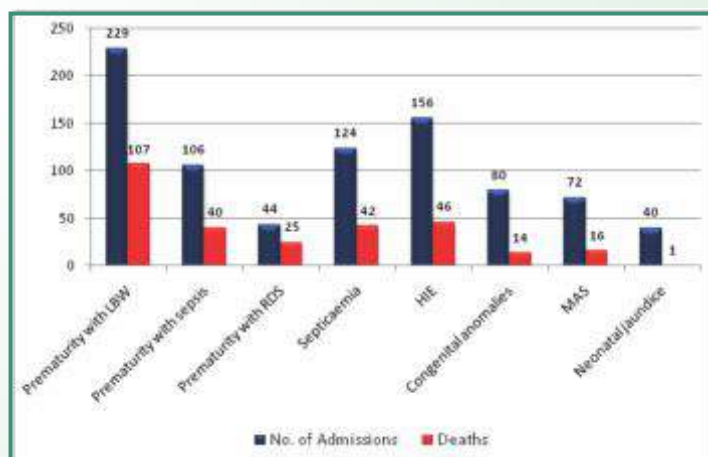


Figure II: Causes of deaths in neonates admitted in NICU.

[HIE :Hypoxic Ischemic Encephalopathy; LBW: Low Birth Weight; MAS : Meconium Aspiration Syndrome; RDS: Respiratory Distress Syndrome]

Tallat Seyal et al reported that prematurity, birth asphyxia and sepsis are major causes of deaths with 36.9%, 22.55% and 13.8% deaths respectively. Fazlur Rahim et al also showed that prematurity, sepsis and birth asphyxia are major causes of neonatal mortality with 21.60%, 14.51% and 21% deaths respectively. Imitaz Jehan et al reported that 26% of total deaths are due to prematurity followed by birth asphyxia (26%), infections (23%) and congenital malformations (8%). M Hoque et al also reported prematurity, birth asphyxia

and infection as the major contributor for deaths with 42.8%, 32.9% and 9.8% respectively whereas congenital anomalies and jaundice led to 9.2% and 1.9% deaths respectively in this study. Mmbaga BT et al recorded birth asphyxia (26.8%) most common cause of deaths followed by prematurity (35.1%), congenital anomalies (9.1%) and infections (8.6%).

Thus the death audit for our study also coincides with other studies and report prematurity, birth asphyxia (HIE) and sepsis as the main contributors for the neonatal morbidity.

Conclusions :

Male predominance is present for both neonatal admissions and mortality. Most of the neonates suffer from the perinatal complications within the first 24 hours of life and almost all by the first 3 days of life. Thus we conclude that first 72 hours of life among the early neonatal period are the most hazardous. The maximum deaths occurs within first 7 days of NICU stay that to within first 72 hours of admissions. The neonatal care facility needs an up gradation so as to avoid unnecessary referral to the higher centres which are already overburdened. Prematurity (with LBW), birth asphyxia and sepsis are the main causes of neonatal admissions and mortality. In order to reduce neonatal deaths we require to focus on improving antenatal, maternal and newborn care support system so as to provide appropriate care for both the mother and newborn during and immediately after birth. We also need to strengthen the cost effective and feasible interventions like home based treatment, keeping baby warm and dry, adequate breast feeding etc so as to prevent the early neonatal deaths.

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