

Pattern Of Morbidity And Mortality Of Newborns Admitted In The Sick Newborn Care Unit (Snuck) Of A Rural Based Medical College Hospital In West Bengal; India

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Abstract:

Background: Being the highest contributor to under -5 mortality, neonatal mortality and morbidity has great impact to the attainment of millennium development goals 4 (MDG 4). In India and other developing countries, this indicator strongly poses a major challenge in achieving this goal.

Objectives: To determine the morbidity and mortality pattern of admitted babies in the Sick Newborn Care Unit (SNCU) of Bankura Sammalini Medical College and Hospital, Bankura, West Bengal.

Materials and Methods: This is a comparative and descriptive longitudinal study of causes of morbidity and mortality between babies born within (inborn) and outside our hospital facilities (outborn) based on information on place of birth, APGAR scores, age on admission, diagnosis on admission, duration of hospital stay, and outcome of newborns admitted into the sick newborn care unit (SNCU) over a 1 year period.

Results: A total of 6955 neonates were admitted during the period January 2107 to December 2107 under review. The common causes of admissions seen from the study were perinatal asphyxia (2023, 29.1%), low birth weight (1071, 15.4%), neonatal sepsis (1180, 17%), and neonatal jaundice (970, 13.9%). A total of 688 (10.09%) deaths were recorded during the period. The leading causes of deaths were severe form of perinatal asphyxia (276, 40.1%), neonatal sepsis (195, 28.3%), prematurity (137, 19.9%) and extremely low birth weight (33, 4.8%). Death due to asphyxia was more in babies born inside the hospital (inborn) than in babies outside the hospital (outborn). Death due to sepsis is more in outborn babies (108, 41.5%) than inborn babies (87, 20.3%). The age at presentation to the sick baby unit was significantly lower in inborn. The age at presentation to the sick newborn care unit was significantly higher in outborn, while age at death was not different in both group of newborns. **Conclusion:** The neonatal mortality rate and the causes of death in this study are similar to those documented by other studies in Nigeria and other parts of India also and are largely preventable. Strengthening perinatal care, emergency obstetric services, and enhancement of neonatal resuscitation skills to traditional birth attendants (TBAs) and other community health workers are necessary to reduce the neonatal mortality in our setting and other rural settings across developing countries.

Keywords: India, Morbidity, Mortality, SNCU

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I. Introduction

Though India accounts for highest burden of under-5 deaths, it has shown faster decline in under-5 mortality reduction compared with the global fall. Worldwide, the under-5 mortality rate reduced by 49 per cent from 90 per 1000 live births in 1990 to 46 per 1000 live births in 2013, while India achieved a reduction of 59 per cent in under-5 mortality from 126 in 1990 to 52 in 2012. India has shown good progress in the MDGs' era and narrowly missed its MDG 4 target for under five mortality, achieving an under five mortality rate of 43 per 1000 against the target of 42 per 1000 live births.

However in spite of these gains, the burden still remains high with India contributing to one fifth of under-five mortality burden and a quarter of neonatal deaths globally. In terms of absolute numbers, this translates into 1.1 million under 5 deaths, of which 630,000 happen during the first four weeks of life.

In India, both perinatal and neonatal care have been improved remarkably over the last few decades, bringing down the neonatal mortality rates substantially from 37 in 2005 to 25 in 2015. In West Bengal similarly, neonatal mortality has reduced substantially and stands at 18 per 1000 live births (SRS 2015). Establishment of Sick Newborn Care Units (SNCUs) at all District and Sub divisional Hospitals in addition to Medical College and Hospitals has contributed to reduction of neonatal mortality to a large extent.

The first 28 days of life is the most vulnerable period of life. This period accounts for 50-70% of infant mortality and 39% of under-5 deaths [1] and 40% of preventable child death in the USA. [2]

The survival of the newborn is dependent on the care received at the time of birth as well as during the stay at the neonatal unit.[3] Neonatal deaths in advanced countries are largely due to unpreventable causes like congenital abnormalities; while in developing countries, newborns die mainly from preventable causes like infections, birth asphyxia, and prematurity.[4]

Regular neonatal auditing is very vital as disease pattern vary from place-to-place and with time, even in the same place.[5] This study assess the pattern of morbidity and mortality of newborns admitted in the special newborn care unit (SNCU) of rural medical college and teaching hospital, Bankura over 1 year period from January 2017 to December 2017

II. Materials and Methods

This hospital based comparative and descriptive longitudinal study was carried out in the sick newborn care unit at BSMCH Bankura, over a period of 1 year from January 2017 to December 2017. The SNCU of BSMCH Bankura, admits sick babies born outside and within the hospital respectively in their first 28 days of life. Following admission of sick newborns the following information were collected from the mother or attendant at the time of admission. The mother's age, sex of baby, birth weight, age at admission, gestational age at birth, Apgar score at 1 and 5 min after birth, provisional diagnosis at admission were recorded. For patient delivered outside the hospital, information from the referral notes were used (which usually contains the time of birth, birth weight, Apgar score, etc.). For those delivered by traditional birth attendants (TBAs) and other untrained personnel, the Apgar score was estimated from the mothers based on information such as whether child cried immediately after birth, activity, colour, and respiratory effort of the newborn after birth. The 5 min Apgar score was used to diagnose and grade the degree of perinatal asphyxia. Diagnosis of neonatal illness and cause of death was done using clinical information and where necessary laboratory reports.

Data Recording and Analysis: Data in relation to admission profile, antenatal risk factors, neonatal complications, treatment profile and outcome was collected with the help of case sheets of newborns obtained from Medical Records dept. (MRD) and SNCU online monitoring software. Data analysis was done using SPSS 20 software. Standard statistical tests were applied. Rates and proportions were calculated with 95% confidence intervals and level of significance was set up at $p < 0.5$. Permission from IEC/IRB- Necessary permission for conducting the study and to publish the results observed was obtained from the institutional Ethics Committee/Institutional review board of this college.

III. Results

A total of 6955 newborns were admitted during the period under review. Four thousand fifty nine (58.3%) were males and two thousand eight hundred thirty nine (40.8%) were females giving a male: female ratio of 1.4:1. Among admissions 4658 (66.9%) were inborn, while 2297 (33%) were outborn. Regarding age on admission 3196 (68.6%) inborn were admitted within 24 hrs of birth whereas for outborn 734 (32%) were admitted between 24 hrs and 72 hrs of birth respectively*. The time between birth and presentation to the sick newborn care unit ranged from 0 to 172 h for inborn and 3 to 700 h for the outborn babies. The mean age on admission for the inborn babies which was 22.5 h (<1 day) after birth was significantly lower than the age at presentation for outborn babies 84.32 h (3.51 days) after delivery.

Pattern and causes of morbidity in newborn in SNCU, Bankura

As shown in Table 1 below perinatal asphyxia with HIE accounted for 1963 (28.2%) newborn admission in the study period. Of these newborn, prolonged obstructed labor accounted for 1080 (55%); eclampsia 187 (9.5%); meconium aspiration 22, (1.1%); post-dated 129 (6.5%); mal-presentation 117 (5.9%); (3.8%); oligohydramnios 58 (2.9%); precipitate labor 50 (2.5%); cord compression 29 (1.4%); and unidentified cause, 296 (15%). Seventy six neonates presented with HIE III with neonatal seizure activity on admission. 1289 (65.6%) neonates were moderately asphyxiated (APGAR score 4-6) and 598 (30.4%) were severely asphyxiated (APGAR score 0-3). The inborn accounted for 1588 (80.8%) of the asphyxiated newborns compared to 379 (19.3%) of asphyxiated outborn babies. Out of 1221 neonates admitted for suspected sepsis 71 (5.8%) were culture proven sepsis, while in 1132 (92.7%) the diagnosis was made clinically and were presumed with documented response to antibiotic therapy. Out of these 11 neonates were proven to be meningitis and 7 Pneumonia supported by csf study and CXR respectively. Of this number, 609 (49.8%) were inborn and 602 (49.2%) were out born ($P = 0.027$). *Staphylococcus aureus* was the commonest organism cultured and accounted for 21 (29.5%) out of the 71 culture proven sepsis. Others were *Escherichia coli* 12 (16.9%), *Enterococcus faecalis* 11 (15%), *Klebsella* 9 (12.6%), and *Candida species* 8 (11%) and rest were contaminant growth.

Pattern Of Morbidity And Mortality Of Newborns Admitted In The Sick Newborn Care Unit (Snuck)

Neonatal Hyperbilirubinemia was the cause of morbidity in 970(13.9%) of total admission. ABO blood group incompatibility accounted for 26%, Rh incompatibility 7%, Neonatal Sepsis in 21%, Exaggerated Physiological Jaundice requiring phototherapy 26%, Glucose 6 phosphate dehydrogenase deficiency 9%, while the cause of jaundice was idiopathic in 11% cases in our study.

Low birth weight (birth weight <2.5 kg) accounted for 4137 (59.4%) of the admitted newborns during the period under review. Of this number, 2822 (68.2%) were inborn and 1315 (31.7%) were outborn. Two thousand nine hundred forty two (71.1%) of them were premature (< 37 weeks), while the rest 1195 (28.8%) were small for gestational age (SGA) babies.*

Of 2942 premature newborns; premature rupture of membrane accounted for 1102 (37.4%); multiple gestation with premature rupture of membrane, 450 (15.2%); preeclampsia, 258 (8.76); placenta previa, 278 (9.4%); abruption placenta, 59 (2%); severe eclampsia, 112 (3.8%); chorioamnionitis with premature rupture of membrane, 129 (4.3%); cervical incompetence, 75 (2.5%); and idiopathic 512 (17.4%). Five hundred forty four (18.4%) of the premature babies were very low birth weight (birth weight <1.5 kg), and one hundred sixty five (5.6%) were extremely low birth weight (birth weight < 1000 kg) while the rest were equal to or greater than 1.5 kg. Other disease conditions caused hospital admission in 948 (13.6%) of all admitted newborns. These conditions were Transient tachypnea of newborn (TTNB), Large baby, Fracture femur/clavicle, HDN, Milk

aspiration, dehydration fever. Other conditions which required SNCU admission are shown in table A. This includes prematurity (< 34 weeks) 200 (2.9%), low birth weight (Wt < 1800 gm) 1071 (15.4%), Meconium aspiration 42 (0.6%), congenital malformation 53 (0.8%), hypoglycaemia (< 45mg%) 48 (0.7%), Hyperthermia (temp > 37.5 C) 108 (1.6%), respiratory distress (Rate > 60 or Grunt/Retractions) 185 (2.7%)

Causes of admission in SNCU, Bsmch

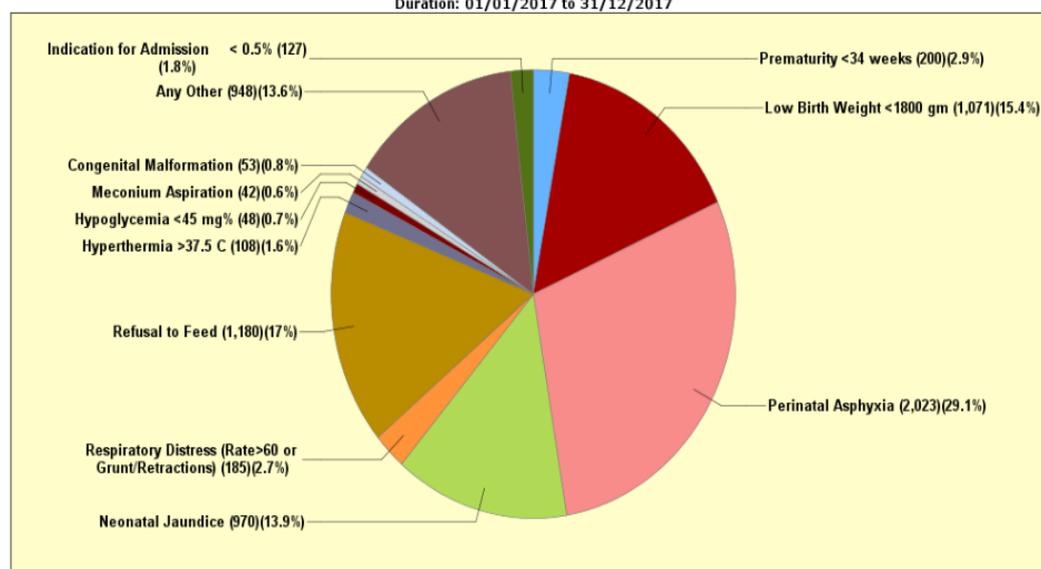
Table: 1

Admission Diagnosis	Inborn n(%)	Outborn n(%)	Total
Perinatal Asphyxia	1651 (35.4)	372 (13.2)	2023
Sepsis/Pneumonia/Meningitis	613 (13.2)	567 (24.7)	1180
Jaundice requiring phototherapy	671 (14.4)	299 (13)	970
Major Congenital Malformation	32 (0.7)	21 (0.9)	53
Low birth weight (< 1800 gr)	768 (16.5)	303 (13.2)	1071
Prematurity (< 34 wks)	120 (2.6)	80 (3.5)	200
Respiratory Distress or Grunt	70 (1.5)	115 (5)	185

Indication of Admission Profile: NICU SMCH Bankura, WB

Total Admission: 6955

Duration: 01/01/2017 to 31/12/2017



Note: % shown in graph are rounded to their integer value

Fig: 1

Mortality pattern

Out of the 6955 neonates admitted, 688 died, giving a death rate of 9.89%. 428 (62.2%) out of these were males and 259 (37.6%) were female.

The causes of death are shown in the below. TABLE 2

Table: 2

Final Diagnosis at Death	No. of Deaths	Inborn	Outborn
HIE / Moderate-Severe Birth Asphyxia	276	201	75
Major Congenital Malformation	12	6	6
Prematurity (<28 weeks of Gestation)	137	92	45
E.L.B.W. (Wt. less than 1000g)	33	26	7
Sepsis	195	87	108
Any Other	25	12	13

Any other includes: Meconium aspiration syndrome, hypothermia, meningitis, RDS *

As found in the study of the 4655 admitted inborn newborns, 428 (9%) died compared to 260 (11.3%) of the 2297 outborn admissions. Though the proportion of deaths due to asphyxia was significantly different for both newborn categories ($P = 0.741$), the case fatality for perinatal asphyxia was higher for outborn babies (19%) compared to 12.6% for inborn. Similarly case fatality for neonatal sepsis was higher in outborn 17.9% than inborn babies (14.2%). On an average, outborn had a higher case fatality rate than inborn neonates (11.3% vs. 9.19%).

IV. Discussion

In this study, a total of 6955 patients were seen over a 1 year period. More males (4059, 58.3%) were seen in this study than females (2893, 41.5%) in keeping with findings in other similar studies in Nigeria which reported more males than females. [6]

Similarly mortality was also more in male babies (10.54%) versus females (8.95%). There was predominance of inborn babies (66.9%) compared to outborn babies (33%). This may be attributable to high delivery load in our hospital. There were 20978 deliveries in the said period and this hospital caters many adjoining districts patients. Other reason for this trend may be due to closer observation of the inborn babies by trained medical officers and nurses who pick up early subtle signs of disease in these newborns. Babies born elsewhere have other options of availing newborn services from other nearby Sick Newborn Care units as there are more than one well equipped SNCU in each district in the state of West Bengal.

The four predominant cause of admission seen in this study are perinatal asphyxia, Low birth weight, Sepsis and Neonatal Jaundice were consistent with the leading cause of admission documented in other studies. (7)

Table: 3

Final Diagnosis at Death	No. of Deaths
HIE / Moderate-Severe Birth Asphyxia	276
Meconium Aspiration Syndrome	1
Pneumonia	0
Respiratory Distress Syndrome	7
Neonatal Tetanus	0
Cause not established	0
Meningitis	2
Major Congenital Malformation	12
Prematurity (<28 weeks of Gestation)	137
E.L.B.W. (Wt. less than 1000g)	33
Sepsis	195
Any Other	25

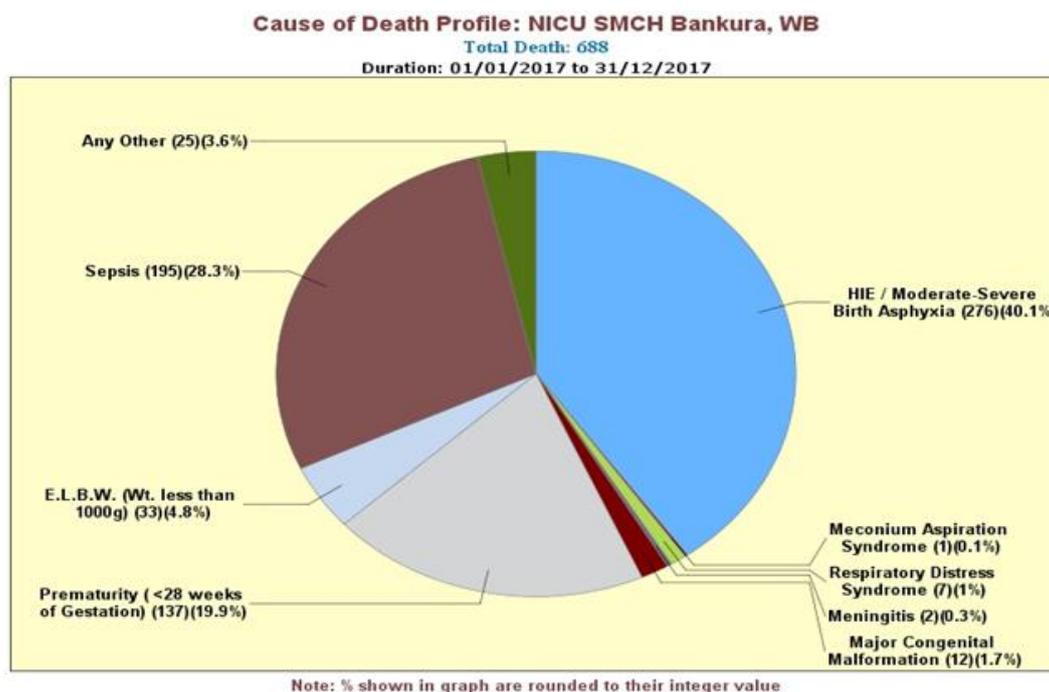


Fig: 2

The mortality rate in our study was 9.89% which is slightly lower than our state average. The lower mortality rate may be attributed to better infrastructure as well as more skilled manpower at SNCU, Bankura being a post graduate teaching institute as well. In our study mortality was highest in babies below 1000g (ELBW) 83.6% and lowest in babies of birth weight of 2500 gr and more 9.8%.

Below table and graph shows the admission and mortality rate accordingly to age in day of life. Most of the admission (54.06%) was within 24 hrs of birth and similarly death rate was high (73.9%) within 24 hrs of birth depicting the vulnerability of babies to develop complication leading to death within 24 hrs. Admission & mortality rate according to Age in Day of life [Table 4]

Table: 4

Age	Admission Rate	Mortality Rate
< 1 day	54.06	73.98
1-3 Days	27.41	16.56
4-7 Days	8.77	2.90
8-14 Days	4.83	2.47
>= 15 Days	4.91	4.06

See the admission rate declines in a linear fashion in initial 7 days of life while mortality rates decline in an exponential scale emphasising the increased vulnerability to death at day 1 of life [Fig 3]

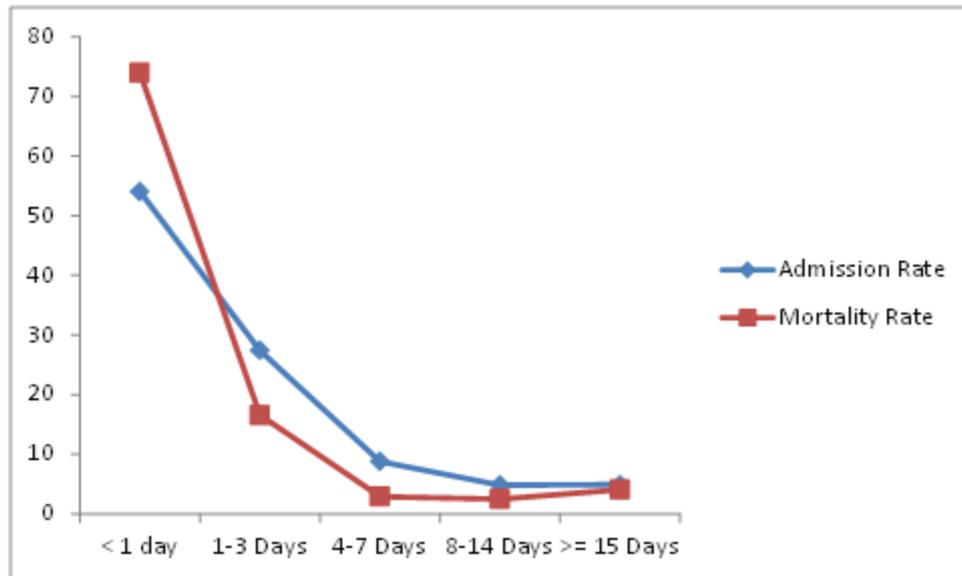


Fig: 3

Distribution According to Gestational Age [Table 5].

Table: 5

Gestational Age	Admissions	Death	Mortality rate (%)
POSTTERM	185	14	7.56
FULLTERM	4585	261	5.69
PRETERM	2185	413	18.90
TOTAL	6955	688	9.89

Lowest neonatal mortality noted with term babies and highest with preterm babies [Fig 4].

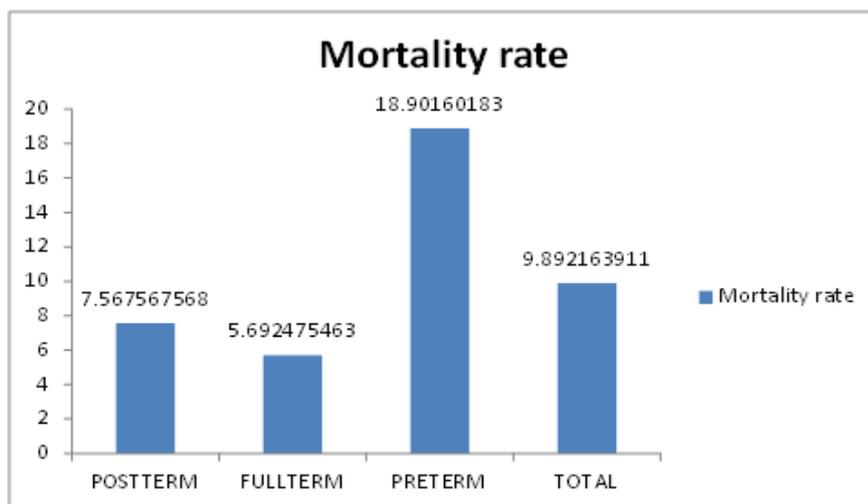


Fig: 4

The study shows a higher likelihood of death for outborn babies (110) admitted for neonatal sepsis compared to inborn babies (87). This may be due to late referral from peripheral center and delay in diagnosis at the first contact level. As seen in our study these outborn babies were non responder to first line antibiotics (Ampicillin & Amikacin). This may be attributable to inadvertent use of antibiotics at peripheral level. The organism detected from outborn baby were klebsiella and Stap Aureus whereas in inborn babies it was E coli and Proteus

Mortality rates and length of stay [Table 6]:

Table:6

Duration of Stay	Mortality rate
TOTAL	10.09
< 1 day	81.78
1-3 Days	14.89
4-7 Days	2.79
> 7 Days	4.87

First three days in SNCU is the key factor thereafter survival chances improve drastically [Fig5].

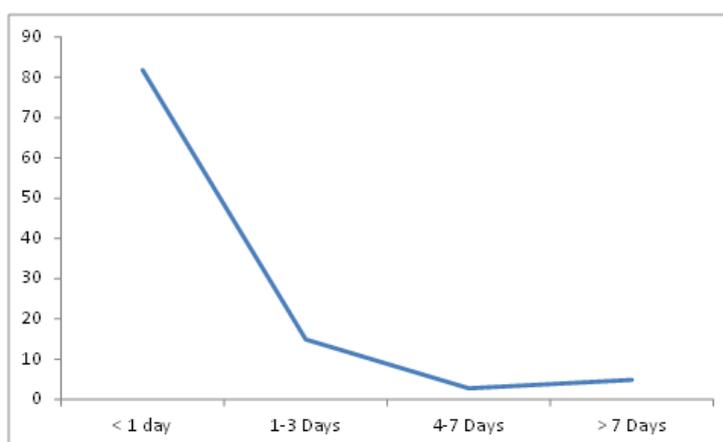


Fig:5

The number of inborn that died exceeds that of the outborn babies, the case fatality rate of outborn babies (11.3%) was higher than that of inborn babies (9.1%). The leading cause of death in this study is perinatal asphyxia 276 (40.1%) followed by neonatal sepsis 195(28.6%). Perinatal asphyxia is also the leading cause of death (21.7%) at University of Abuja Teaching Hospital Gwagwalada, Abuja. [7]. The second commonest cause of death in our study is neonatal sepsis. This trend was also documented as the commonest cause of death by Indian studies [8,9,10] and another study at Calabar [11]] where it accounts for 27.4%. In our study third commonest cause of death was prematurity 137 (19.9%) Similar study by Bhuta ZA showed similar trends.[12]

V. Conclusion

Strengthening perinatal care and improvement of obstetric care services with thrust on neonatal resuscitation at birth are indispensable tools to decrease the neonatal mortality. Overall mortality among preterm babies was 18.9 %.So comprehensive antenatal care with special focus on maternal nutrition of pregnant mother as well as adolescent girl child need to be addressed to further reduce the mortality of preterm babies.

Author's contributions:

Dey S conceived the idea and actually conducted the study. He collected the data and finally drafted the manuscript. Pal AC revised the manuscript and added some intellectual contents to it. He provided necessary guidance whenever needed. Das P S helped in every step of the study and maintained co ordination with other departments whenever necessary.Bid D. performed the statistical analysis and also added some intellectual contents.

Limitation of this Study

We were unable to carry out autopsy to determine the pathological cause of death in our babies due to lack of parental consent as well as limited resources. So cause of death were clinically determined supported by laboratory investigations

VI. Acknowledgements

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