Original Article

An Analysis of Five years Neonatal Mortality in NICU of a Tertiary Care Hospital of Rawalpindi 2014-2019

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Abstract

Objective: This study was done to find out the main causes and magnitude of neonatal mortality in the neonatal intensive care unit (NICU) of Benazir Bhutto Hospital, Rawalpindi over a period of five years.

Material and Methods: A hospital-based cross-sectional study was done from June 2014 to July 2019. The registration book of admitted neonates was reviewed by using a checklist to collect data. Data was analyzed in SPSS 24 for descriptive and bi-variate analysis applying the chi-square test and presented in text, frequencies, tables, and percentages.

Results: The study assessed a total of 24,459 neonates admitted to the NICU at Benazir Bhutto Hospital over a span of five years (June 2014 to July 2019). The mean birth weight was 2432 grams ± 740 g (range: Between 800 and 6000 g). Male neonates accounted for 59.8% with male to female ratio of 1.5:1. Overall 19,832 neonates (81.1%) were discharged, while 4636 (18.9%) died, making a Neonatal Mortality Rate of 18.9% (189 per 1000 admissions). 67.5% male neonates and 32.5% female neonates expired. 86.21% of these deaths were early neonatal that occurred in the first week of life. The causes of death were pre-maturity/ low birth weight (LBW), suspected sepsis, birth asphyxia, neonatal jaundice, and meconium aspiration syndrome, accounting for 32%, 31%, 30%, 4%, and 3% respectively.

Conclusion: In our NICU the neonatal mortality is high with prematurity/low birth weight (LBW), birth asphyxia (BA), neonatal jaundice (NNJ), and meconium aspiration syndrome (MAS) accounting for most of the deaths. These deaths are largely preventable with better antenatal, perinatal, and neonatal care.

Keywords: Neonatal Mortality, Neonatal Intensive Care Unit.

Introduction

The neonatal period accounts for more than 40% of all deaths in children less than 5 years of age.[1] The vision of the new Global initiative by the World Health Organisation is to end preventable deaths of newborns and children less than 5 years of age by 2030. In this Target 3.2 of Sustainable Development goals (SDGs) the aim is to reduce neonatal mortality to as low as 12 per 1000 live births and less than five years old mortality to as low as 25 per 1000 live births by all member states of the United Nations, with the achievement of this SDGs between 2016-2030.[2]

Between 1990 and 2017 the estimated number of neonatal deaths was reduced from 5 million deaths in 1990 to 2.5 million deaths in 2017.[3] The latest nationwide survey of Pakistan showed that considerable progress has been made towards reducing all childhood mortality indicators except neonatal mortality.[4] Pakistan has the highest neonatal mortality rate in low to middle-income countries with Argentina the lowest.[5] A high Infant and neonatal mortality rate of 47 per 1000 live births with the highest mortality of 70 per 1000 live births in the early neonatal period has been reported in urban Pakistan.[6]

The major causes of neonatal deaths reported worldwide are infections, prematurity, intrapartum complications, and birth asphyxia.[7,8] Neonatal sepsis is a significant cause of neonatal mortality, however, the disease burden is different in low-income countries compared with middle-income countries.[9] Neonatal mortality of 33.1% is due to infection in poor countries.[10]

We conducted this study to find out the main causes and magnitude of the mortality in the neonates who were admitted to the Neonatal Intensive Care Unit of Benazir Bhutto Hospital so that the extent of preventable causes can be identified which in turn will help in making strategy to reduce neonatal mortality.

Materials and Methods

Study area: This study was done at the Neonatal Intensive Care Unit (NICU) in Benazir Bhutto Hospital, Rawalpindi.

Study duration: The study was conducted from 5th of Aug to 5th of September, 2019.

Study design: A five years hospital-based retrospective cohort was used to review new-borns admitted in the NICU of Benazir Bhutto Hospital, from June 2014 to July 2019.

Inclusion criteria: New-borns up to the age of 28 days who were admitted in the NICU from June 2014 to July 2019 were included in this study.

Exclusion criteria: Individual recordings in the register which were improperly filled were excluded.

Data collection technique: The source of data for this study was the NICU register at Pediatrics Department of Benazir Bhutto Hospital, Rawalpindi which consisted of new-born information recorded at admissions such as date of admission, mode of delivery, age, the weight of the child, status at birth, diagnosis, and outcomes. All data was collected using a uniform extraction format developed by taking into account all the relevant variables in the standard NICU registration book.

Methods of data analysis: The raw data were entered into excel and checked for incomplete and inconsistent data, then missing values were excluded before exporting to SPSS version 24. Cross-tabulation of admission and death events and graphs were used to summarize and present the data. "Neonatal mortality rate was calculated using the total neonatal deaths recorded at the NICU divided by the total number of new-borns admitted at the NICU in the five years reviewed". The causes of death were analysed by socio-demographic and new-born characteristics. The level of significance was set at $P<0.05$. A bi-variate analysis using the Chi-square test or Fisher exact test, where appropriate, was performed to determine predictors of neonatal hospital mortality pertaining to neonatal characteristics for each variable one at a time.

Data quality assurance: Data was extracted and collected by the research cell of the paediatrics department at Benazir Bhutto Hospital. Cross-checking with the source registration book was applied for any observed incompleteness, error, and/ambiguities in the recording.

Study variables:

Dependent variable: Neonatal outcome (Survived, Died)

Independent variables: Socio-demography/ Neonatal factors.

Results

This study assessed a total of 24,459 Neonates, who were admitted to the NICU at Benazir Bhutto Hospital over a span of five years (June 2014 to July 2019). The mean birth weight was 2432 grams ± 740 g (range: Between 800 and 6000 g). Male neonates accounted for 59.8% with male to female ratio of 1.5:1. 67.5% of the

male neonates expired compared to 32.5% mortality in females.

Overall 19,832 new-borns (81.1%) were discharged while 4636 (18.9%) died, making a Neonatal Mortality Rate of 18.9 (189 per 1000 admissions). 86.21% of these deaths were early neonatal that occurred in the first week of life

Table 1: Neonatal Demographic Variables

Newborn variables		**TOTAL (%) n=24459**		**Died (%) n=4636**		**Survived (%) n=19,823**		**P-value**
		Freq	**%**	**Freq**	**%**	**Freq**	**%**	
Gender	Males	14626	59.8	3128	21.3	11498	58.0	<0.05
	Females	9832	40.2	1508	15.3	8324	41.9	
Birth weight(grams)	<1500	1200	4.9	488	40.6	712	59.3	<0.05
	1501–2499	7206	29.5	1445	20.0	5761	79.9	
	2500–3999	15226	62.3	2583	17.0	12643	84.0	
	4000+	827	3.4	120	14.5	707	79.4	
Age at admission	≤6	20,562	84.1	3997	19.4	16565	80.6	<0.05
	≥7	3897	15.9	639	16.4	3258	83.6	
Pre-maturity	No	19,783	80.9	3478	18.5	16305	72.9	<0.05
	Yes	4676	19.1	1158	24.8	3518	75.2	
Feeding	Human Milk	20465	83.7	3742	18.3	16723	81.7	<0.05
	Mixed	3136	12.8	663	21.1	2473	78.9	
	Other	858	3.5	231	26.9	627	73.1	
Mode of delivery	Assisted Vaginal	2445	10.0	187	7.6	2258	0.5	<0.05
	C-Section	7337	30.0	1314	17.9	6023	0.7	
	SVD	14,677	60.0	3135	21.4	11542	4.6	

There are an increasing number of patients in our NICU both because of a high number of referrals from within the twin cities of Rawalpindi and Islamabad and from other districts. Most of these referrals were of very sick and pre-term neonates and this contributed to high mortality in our NICU.

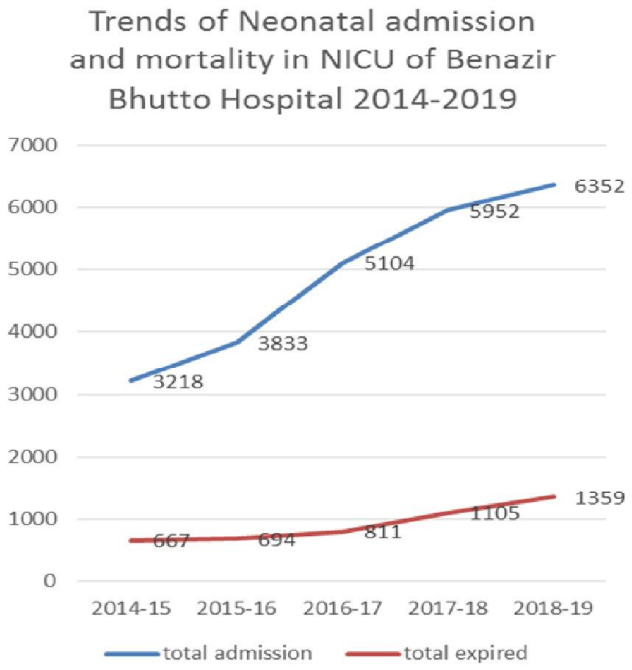

Figure 1: Trends of Neonatal admission and mortality in NICU of Benazir Bhutto Hospital 2014-2019

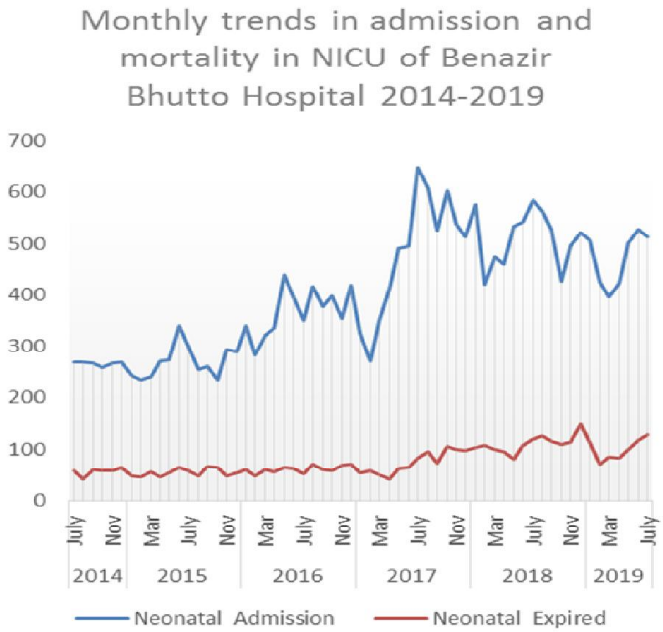

Figure 2: Seasonal Trends of Neonatal admission and mortality in NICU of Benazir Bhutto Hospital 2014-2019

The main causes of admission were: pre-maturity, neonatal sepsis, birth asphyxia, neonatal jaundice, and meconium aspiration syndrome. The main causes of death were prematurity/LBW, Neonatal sepsis, birth asphyxia, neonatal jaundice, and meconium aspiration syndrome which accounted for 32%, 31%, 30%, 4%, and 3% respectively.

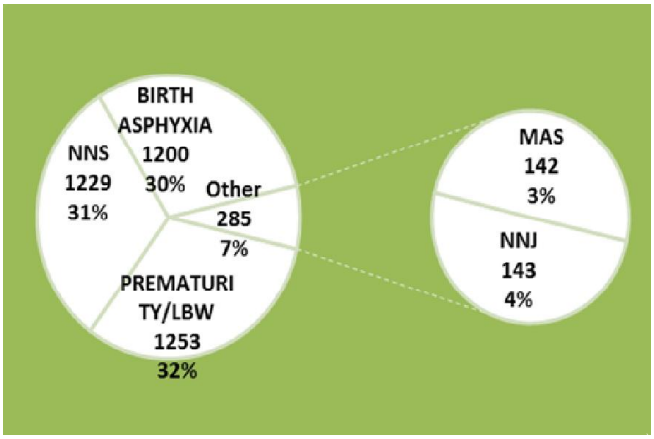

Figure 3(a): Top five causes of mortality in NICU of Benazir Bhutto Hospital Rawalpindi June, 2014-July 2019

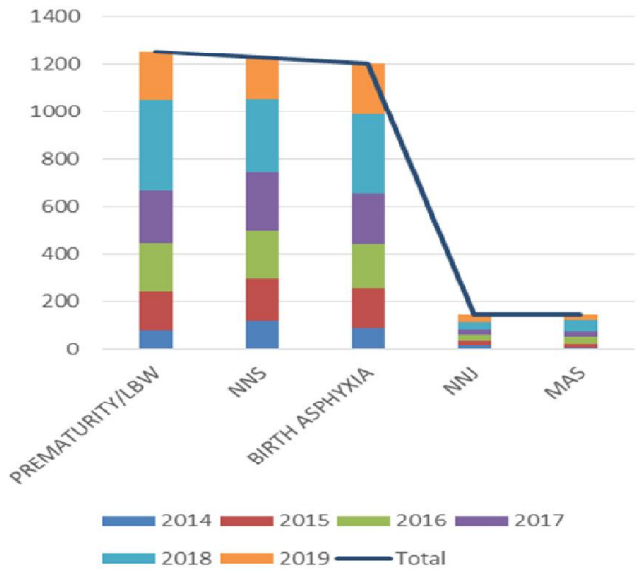

Figure 3(b): Top five causes of mortality in NICU of Benazir Bhutto Hospital Rawalpindi June, 2014-July 2019

Discussion

We found the results of our study consistent with regional and international studies though with some differences. This study showed male preponderance both in admitted and deceased neonates. It is consistent with other studies by Ugwu GiMG.[11] (54.3% male versus 45.7% female) with a male to female ratio

of 1.2:1. A male preponderance is also reported by Rubina Zulfiqar, et al[12], Manzar et al[13], Haider Sherazi et al[14] (54% male and 46% female) Kumar et al[15] (1.16:1).

The mortality rate in our study is 18.90%. In one study from Ghana the neonatal mortality of 20.2% has been reported.[16] Rubina, et al[12] reported mortality of 23.48% while Johanna[17] reported an overall neonatal mortality of 13.5%. The neonatal mortality in other studies in Islam[18] 20.6%, Shirazi, et al[14] 22.4%, Ugwu GiMG [11] 20.3%, Kumar et al[15] 11%. This variation may be due to sampling nature and facilities available in the neonatal unit because the survival of neonates also depends upon care provided to them.

Case fatality in our study for prematurity/LBW is 41.6% which is high when it is compared to 27.8% from Nigeria[11] and 38.6% from India.[15] These variations might be due to the availability of modern facilities like ventilation and surfactant used in these neonatal units.

Our case fatality for birth asphyxia is 30%. A study reported the case fatality from birth asphyxia at 18%.[20] While Rubina, et al[12] has reported mortality from birth asphyxia at 43.8%. It is however comparable to 24.1% reported by Ugwu et al from Nigeria[11], 38, 9% by Islam et al from Bangladesh[18], and 31% from India.[15] but a very low figure of 9.2% in yet another study.[17] However it is lowest (4%) reported from Nepal where its incidence is 2-9/1000 live births.[21] Reason for these variations are related to the standard of perinatal care

Case Fatality for sepsis in our study is high at 31%. Other studies have reported sepsis mortality of 30.7%[22], 8.06%[23], 38.24%[24], and 49.7%.[17] Neonatal sepsis is related to a lack of antiseptic measure practices in neonatal units and during birth. Antiseptic measures and practices have changed over time and places have contributed to these differences.

Case fatality for NNJ is 4% as compared to a previous study in Rawalpindi where it was 10.27%.[12] Again this low incidence might be due to differences in neonatal condition at admission, public awareness of the disease, and local practices.

Conclusion

Neonatal mortality is very high in our study. Sepsis, birth asphyxia, and LBW or prematurity are the main causes of this mortality. All these causes can be prevented by the improvement of antenatal, and neonatal care.

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