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Pattern of Neonatal Mortality at a Special Care Baby Unit in Rivers State, Nigeria

Boma Awoala West [a,b*], Uchenna Onubogu [a,b] and Adaku Arthur [a,b]

[a] Department of Paediatrics, Rivers State University Teaching Hospital, Nigeria.
[b] Department of Paediatrics and Child Health, College of Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Author BAW had the concept, designed the study, literature search and wrote part of the manuscript. Author UO analysed the data and wrote part of the manuscript. Author AA did the literature search and wrote part of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Neonatal mortality rate is an important indicator which does not only reflect the overall health of a child and well-being but also assesses the social and economic development of a country.
Aim: The study was carried out to determine the pattern and factors associated with neonatal mortality.
Methods and Materials: It was a retrospective study carried out in the Special care Baby Unit of the Rivers State University Teaching Hospital from January 2016 to December 2020.
Results: Of 2,944 neonatal admissions, 358 died giving a mortality of 12.2% with male preponderance (M:F ratio of 1.5:1). Majority of the neonates who died were admitted within the first 24 hours of life 289(80.7%) and were delivered via Caesarean section 195(54.4%). Most deaths occurred in the first 7 days of life 189(52.8%). The commonest cause of mortality was neonatal sepsis 183 (51.1%) followed by perinatal asphyxia 178(49.7%) and prematurity 176(49.2%). Most mortalities occurred between 4.00pm and 7.59 am 218(61.0%) outside regular work hours. The lowest annual mortality was recorded in the year 2020 (6.36%) while the highest was in the year 2018 (19.27%). There was significant mortality within 24hours of admission among neonates < 1.5 kg as well as those with sepsis, anaemia and neonatal jaundice.

**Corresponding author: Email: westboma@yahoo.com;*

Conclusion: The mortality rate of neonates in the Rivers State University Teaching Hospital was high, 12.2% with neonatal sepsis, perinatal asphyxia and prematurity being the commonest causes which are largely preventable. There is therefore need to improve obstetric and newborn care to improve neonatal outcome.

Keywords: Neonates; mortality; special care baby unit; Rivers State.

1. INTRODUCTION

Neonatal mortality defined as the death of a live birth within the first twenty-eight days of life, has been responsible for nearly half (47%) of all under-five child deaths in the year 2020 [1]. While global efforts have produced a substantial reduction in newborn deaths from 5 million in 1990 to 2.4 million in 2020, the rate of decline has been slower than that of post-neonatal under-5 deaths [1,2]. Thus, increased efforts to improve this progress are still needed to achieve the Sustainable Development Goal (SDG) target of ending preventable newborn death and reduce neonatal mortality to as low as 12 per 1,000 live births by 2030 [1-3]. The Neonatal Mortality Rate (NMR) expressed as the number of newborn deaths per 1000 live births, is an important indicator that does not only reflect overall child health and well-being, but also used to assess social and economic development of a country [2,4]. The regions with the highest NMR are Sub-Saharan Africa (at 27 per 1000 live births) followed by Central and Southern Asia (at 26 per 1000 live births) [1-3].

Nigeria ranks second to India among countries with the highest NMR in the world at 35.5 per 1000 live births [1,5]. However, there are variations within and between geopolitical zones with NMR found to be highest in the Northwest region and lowest in the Southern region [6]. Though there has been steady decline in NMR rate over the past two decades in Nigeria, the rate of the decline is very marginal [1,5,7].

Available literature confirms neonatal infection, preterm birth, low birth weight, and birth asphyxia as leading causes of neonatal deaths in developing countries, and these are largely preventable [1,7,8]. Additionally, various factors have also been associated with NMR and includes neonatal and maternal factors such as age, sex, as well as access to, and quality of available healthcare [7-9].

To effectively plan adequate interventions to curb the undesirably high NMR in our country Nigeria, the need to have an extensive database cannot be over-emphasized. Since no study has been done on this subject matter in our health facility, we aimed through this research to determine the prevalence of neonatal mortality in our hospital and its trend over a 5-year period, as well as describe the pattern, associated factors and the characteristics of newborns who died.

2. MATERIALS AND METHODS

This was a retrospective study carried out in the Special Care Baby Unit (SCBU) in the Department of Paediatrics of the Rivers State University Teaching Hospital (RSUTH) over 5-years from January 1st 2016 to December 31st, 2020.

The Rivers State University Teaching Hospital is a tertiary hospital owned by the Rivers State Government. It is a 375 bedded hospital and comprises of clinical and non-clinical departments. The clinical departments comprise of Paediatrics, Obstetrics & Gynaecology, Surgery, Internal medicine, Pathology, Radiology, Pharmacy, Nursing etc. It serves as referral for all the primary health centers and general hospitals located in the 24 Local Government areas in the state as well as private hospitals and health facilities in neighbouring states.

The SCBU which was initially run by only one consultant Paediatrician with a registrar or medical officer and house officers, now has 3 consultant Paediatricians in addition to a senior registrar, a registrar and house officers. The unit has a nurse-to-patient ratio of 1:4 during the day and 1:7 ratio during the night. It consists of an inborn unit, an outborn unit and 2 mothers' rooms for the purposes of breast feeding and bonding with their babies. The unit is equipped with 3 resuscitaires/radiant warmers, 12 photo-therapy machines, 10 incubators, handheld pulse oximeters, oxygen cylinders and concentrators. This unit admits sick newborns within the first 28 days of life delivered in the hospital or any of the Government owned primary health centers and general hospitals into the inborn unit whereas babies referred from other hospitals are admitted into the outborn unit.

All babies who died from January 2016 to December 2020 were included in the study and analyzed. Information of mortality in the SCBU was obtained from the admission notes which included the names of patients indicated by initials, date of delivery, mode of delivery, date of admission, age at presentation, gender, birth weight, diagnosis, age at time of death, time of death as well as total number of admissions per year. Diagnosis of sepsis was based on the presence of clinical symptoms with complete blood count in keeping with sepsis with or without blood culture positivity. Apgar score was used in making diagnosis of asphyxia, 0-3 for severe birth asphyxia and 4-6 for moderate birth asphyxia. Babies born less than 37 completed weeks of gestation were classified as premature babies whereas hypoglycaemia was diagnosed using point of care glucometer in the SCBU at values below 3.0mmol/L. Diagnosis of other conditions were also based on the units standard operating procedures either clinically and/or with the use of laboratory investigations where necessary.

Ethical clearance of the study was gotten from the Rivers State University Teaching Hospital Health Research Ethics Committee.

Data was entered in an Excel spread sheet and was analyzed using IBM SPSS version 23. Results were presented as frequencies, percentages, bar charts, Pie charts and graphs. Test of association was done using χ^2 test and Fishers' Exact test. Statistical significance was set at *P* value < .05 while results were reported as odds ratios and 95% confidence intervals.

3. RESULTS

3.1 Characteristics of Neonates that Died in the SCBU

There were 2,944 admissions during the 5-year study period of which 358 mortalities occurred giving a mortality of 12.2% and an average annual mortality rate of 72 ± 24 deaths per annum. The highest mortality was recorded in 2018, 106(29.6%) while 2020 recorded the least mortality 41(11.5%). The age range of the babies on admission was 29 mins to 27 days with a mean admission age of 1.6 ± 4.2 days. Majority 289(80.7%) of the neonates were admitted within the first 24 hours of life, while only one neonate was older than 21days on admission. There were more males than females with an M:F ratio of 1.5:1. Most 209(58.6%) of them weighed < 2.5kg on admission, with 52(14.5%) weighing less than 1.0kg on admission. Majority 195(54.4%) were delivered via caesarian section. Most deaths, 189 (52.8%), occurred between 1 and 7 days of admission with the mean length of hospital stay till mortality being 3 ± 7days, Table 1.

3.2 Pattern of Neonatal Mortality

The most common cause of neonatal mortality was neonatal sepsis, 183(51.1%) followed by perinatal asphyxia 178(49.7%) and Prematurity 179(49.2%). Other pathologies seen in neonates who died included hypoglycemia 73(20.1%), respiratory distress syndrome 58(16.2%), anaemia, 56(15.6%) and neonatal jaundice 43(12%) in order of decreasing frequency, Fig. 1.

3.3 Time Segment of Mortalities

Most mortalities 218(60.8%) occurred between 4pm and 7.59am, outside regular work hours also known as call period, Fig. 2.

3.4 Annual Neonatal Mortality

The lowest annual mortality rate was recorded in 2020 (6.36%) while the highest was recorded in 2018 (19.27%), Fig. 3.

3.5 Number of Mortalities per Month

There was an overall decrease in the trend of cumulative mortalities from January to December with the highest cumulative mortality recorded in the month of January while the least cumulative mortality was recorded in March. The average monthly mortalities recorded in each was 6±2 deaths, Fig. 4.

3.6 Factors Associated with Mortalities Occurring Less than 24 Hours of Admission in the SCBU

Among the female neonates in whom mortality was recorded, it significantly occurred within 24 hours on admission (OR: 1.3, 95% CI: 1.02 – 1.6, *P*: 0.03). Mortalities from neonates weighing < 1.5kg as well as those with sepsis, anemia and neonatal jaundice significantly occurred within 24 hours of admission (*P* values < .05), Table 2.

Table 1. Characteristics of neonates that died in the SCBU

Variables	Frequency N= 358 (%)
Age on admission (days)	
≤ 24 hours	289 (80.7)
>1 to 7	45 (12.6)
>7 to 28	24 (6.7)
Gender	
Female	142 (39.7)
Male	216 (60.3)
Weight on admission (kg)	
<1.0	52 (14.5)
1.0 - <1.5	70 (19.6)
1.5 - <2.5	87 (24.3)
2.5 - <4.0	135 (37.7)
≥4.0	14 (3.9)
Mode of delivery	
Spontaneous vaginal delivery	163 (45.6)
Cesarian section	195 (54.4)
Number of mortalities per year	
2016	67 (18.7)
2017	80 (22.3)
2018	106 (29.6)
2019	64 (17.9)
2020	41 (11.5)
Length of hospital stays till mortality (days)	
< 24 hours	162 (45.3)
1 to 7 days	189 (52.8)
> 7 days	7 (1.9)

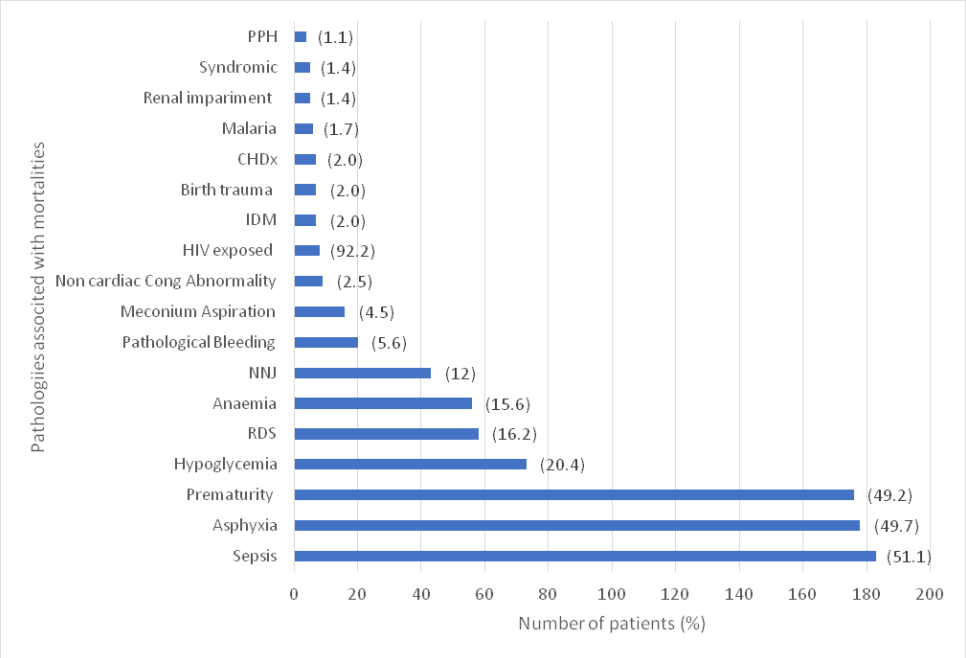

Fig. 1. Pattern of neonatal mortality

PPH= Persistent pulmonary hypertension of the newborn, CDHx= Congenital disease of the heart, IDM= Infant of diabetic mothers, NNJ= Neonatal jaundice, RDS= respiratory distress syndrome

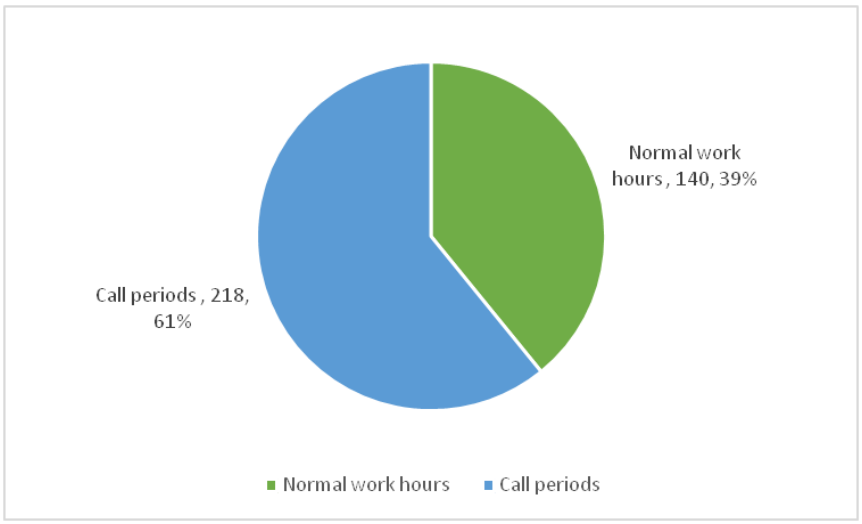

Fig. 2. Time segment of mortalities

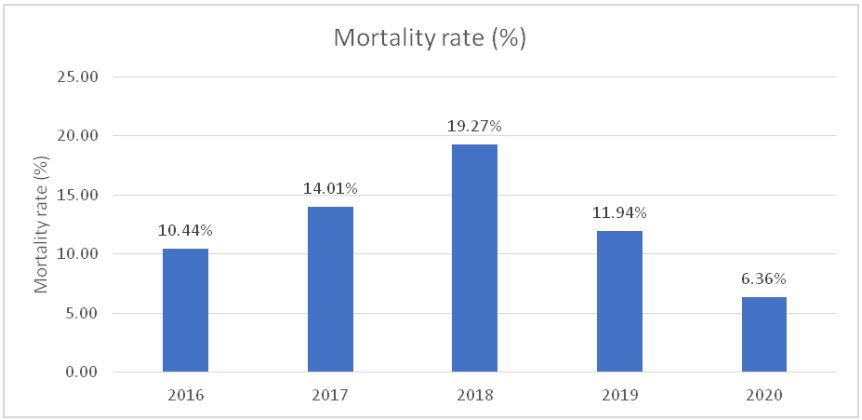

Fig. 3. Annual neonatal mortality

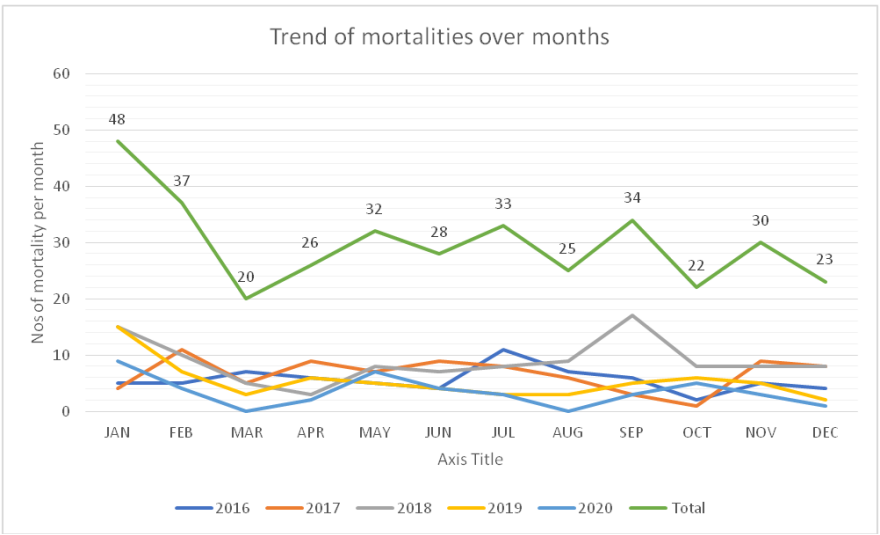

Fig. 4. Number of mortalities per month from 2016 to 2020

Table 2. Factors associated with mortality within 24 hours of admission

Variable	Mortality < 24 hours of admission (n= 162) (%)	Odds ratio	95% confidence interval		*P* value
			Lower	Upper	
Age					
≤ 24 hours	130(45)	0.94	0.55	1.6	0.83
> 1 day	32(46.7)				
≥ 7 days	11(45.8)	1.025	0.44	2.3	0.95
< 7days	151(45.2)				
Weight					
< 1.5kg	45(36.9)	0.59	0.38	0.93	**0.02***
≥ 1.5kg	117(49.6)				
≥ 4kg	6(42.9)	0.9	0.31	2.66	0.85
< 4kg	156(45.3)				
Mode of delivery					
Spontaneous Vaginal delivery	83(43.1)	0.81	0.53	1.2	0.34
Caesarian section	77(48.1)				
Sex					
Female	74(52.1)	1.3	1.02	1.6	**0.03***
Male	88(40.7)				
Time of admission					
Normal work hours	55(40.4)	0.75	0.48	1.16	0.2
Call duty hours	100(47.4)				
Pathologic Diagnosis					
Sepsis	54(29.5)	0.25	0.16	0.40	**0.001***
Asphyxia	89(50.0)	1.46	0.96	2.2	0.07
Prematurity	76(43.2)	1.5	0.6	3.5	0.3
Hypoglycemia	34(46.6)	1.06	0.63	1.79	0.79
RDS	25(43.1)	0.9	0.51	1.58	0.72
Anaemia	14(25)	0.34	0.18	0.66	**0.001***
Neonatal Jaundice	8(18.6)	0.23	0.11	0.53	**0.0001***

*RDS= Respiratory disress syndrome, *= Statistically significant*

4. DISCUSSION

The mortality rate of neonates admitted in the Special Care Baby Unit of the Rivers State University Teaching Hospital was 12.2%. This was comparable to the 12.4%, 12.9% and 13.2% documented in a previous study in Port Harcourt [10], Uyo [11] and Jigawa [12] in Nigeria but lower than the 14.1%, 15.5%, 16.0%, 18.8% and 19.4% documented in other parts of Nigeria [13-17]. Much higher mortality rates of 25.45%, 30.0% and 34.7% were documented in India [18] and some other parts of Nigeria [19,20] respectively. In contrast, lower mortality rates of 10.5%, 6.6% and 8.93% were reported in similar studies in Lafia, [21] Zamfara, [7] Nigeria and Ghana [22] respectively. Although all the studies were retrospectively done, varying geographic locations, variation over time even in the same locality as well as varying sample size could account for the differences in the mortality rates. In addition, the quality of medical care in terms of man-power and technological advancement in the various neonatal units could also account for the varying mortality rates as survival of newborns is also a reflection of the care they receive.

Close to half of the neonates (45.3%) in the present study died within 24 hours of admission as similarly observed in other parts of Nigeria [11,12,15,17]. However, a much older study carried out close to a decade earlier in Ibadan, [16] Nigeria documented a much higher rate of 88.0% while in Pakistan [23], 70.55% of neonates died within 24 hours of admission. The present study showed that neonates with sepsis, anaemia and neonatal jaundice were significantly more likely to die within 24 hours of admission. This thus reflects the severity of the illnesses.

Males had higher mortality than females with M:F ratio of 1.5: 1. Similar observation was made by other researchers [11,15,17,20,23-25]. This higher mortality rate recorded in males is not surprising as male newborns have been found to be biologically weaker and more predisposed to diseases and premature deaths [26,27]. It is pertinent to note that male hormones have been found to inhibit T and B lymphocyte maturation which are two main components of the immune system [28]. Thus, females have a stronger immune response than their male counterparts and a better survival rate [28,29].

More than half (58.6%) of the mortality in the present study were low birth weight(LBW) babies with weights < 2.5kg. Similarly, Low birth weight accounted for most mortalities (26.4%) in Markurdi, [13] while in Ibadan, [16] Nigeria preterm LBW babies were observed to account for 27.4% of mortalities. This trend corroborates findings by Weddih et al. [20] in Mauritania stating neonates with LBW significantly having almost 4 times chance of dying as compared with babies with normal weights. This is because they are more likely to be born premature, are prone to congenital anomalies with complications, are susceptible to infections and in resource poor settings may lack access to adequate health care. It is worthy of note that the lower the birth weight and the gestational age, the greater the chance of death in the first year of life [30]. The estimated relative risk of LBW for neonatal mortality is almost 200 times higher when compared with newborns with adequate birth weights [31].

Among neonates who died in the SCBU, more were delivered via Caesarean section(CS). This may not be strange as most high-risk pregnancies are terminated via Caesarean section. This corroborates the findings in the United States vital statistics data which indicates a 1.5-fold increased risk of neonatal mortality after Caesarean delivery (both elective and emergency) compared to vaginal delivery [32]. This was contrary to the study carried out by Mukhtar & Mshelia [14] and Eke et al. [15] in a 1-year retrospective study in Abuja and Umuahia in Nigeria respectively, in which neonates delivered via CS had a much lower mortality rate. This difference could be because the duration of study was much shorter with a much smaller sample size.

Neonatal sepsis, perinatal asphyxia and prematurity were the commonest causes of mortality in descending order in the SCBU of the RSUTH as also reported by the World Health Organization [33,34]. These 3 disease conditions in the same order were similarly reported in other parts of Nigeria [25], [15,35,36]. Neonatal sepsis and perinatal asphyxia were also observed as the commonest causes of mortality in a previous study carried out in a bigger tertiary centre in the same locality, Port Harcourt [10]. In contrast, asphyxia was reported as the commonest cause of mortality in some parts of Nigeria [24,37,21,15,7] and India [38] while prematurity was documented as the commonest cause of mortality in other parts of Nigeria [14,12,11,16,17] and Ghana [22]; low birth weight in Benue State [13] Nigeria; respiratory distress in India [18] whereas

respiratory distress syndrome was commonest in Pakistan [39]. These varying patterns of mortality could be attributable to the different geographic locations as well as the varying pattern of morbidities in these locations. Varying diagnostic criteria could also be accountable. In the present study as well as the previous study in Port Harcourt [10], NNS was defined as those with either culture proven or probable sepsis unlike some other studies [14] where NNS was strictly defined as only those with suspicious clinical symptoms and signs with positive blood culture. It is pertinent to note that these causes of neonatal mortality are preventable and thus, high coverage of quality antenatal care for all pregnant women, skilled care at birth and quality care of small and sick newborns will reduce neonatal mortality significantly. In addition, simple actions such as ensuring hygiene, early treatment of infections, provision of warmth and exclusive breastfeeding will also prevent deaths in the newborns [34]. Basic training and re-training on newborn resuscitation skills has proven to reduce deaths in newborn with perinatal asphyxia by up to 40% [40-42]. Measures to prevent deaths related to prematurity and LBW especially in low-income countries includes the prophylactic use of steroids during premature labour, antibiotics for prolonged rupture of membranes (PROM), early breastfeeding, treatment of neonatal infections, kangaroo mother care and prevention of hypothermia [43,44].

Close to 2/3rd (61%) of the mortalities occurred outside regular work hours, known as the call period. This could be because fewer number of hospital staff are usually present during this time of day as seen in the present study where the nurse-to-patient ratio is reduced to almost half at night during call periods. It is pertinent to note that the nurse-to-patient ratio in the present study is far below the standard of 1:2.4 expected in critical units like the SCBU [45]. This is also the case with the doctor-to-patient ratio of 1:5000 observed in Nigeria like other developing countries as against the standard of 1:600 recommended by the World Health Organization [46]. It is however, worthy of note that positive outcomes of patients result when there is a balanced nurse-to-patient ratio as there would be improved quality of nursing care with fewer patients being managed. This therefore calls for increase in the number of health care workers during the call periods.

The annual mortality rate in the present study was observed to be on the downward trend from the year 2018 and was lowest in the year 2020. This lower mortality in recent times could be a reflection of increased manpower (consultants, senior registrar, registrar and other support staff) with strengthened quality of care in the SCBU as well as improved infrastructure with better health care delivery in the Rivers State University Teaching Hospital. Further reduction of mortality in the SCBU is however desirable in line with goal 3 of the Sustainable Development Goal (SDG) adopted by the United Nations in 2015 to end preventable deaths of newborns and under 5 children and reduce neonatal mortality rate to as low as 12 per 1000 births in every country by the year 2030 [47]. This could be achieved by further strengthening the existing health programs at improving maternal health, provision of adequate care of pregnant women, infrastructural development of health facilities and adequate newborn care.

5. CONCLUSION

The neonatal mortality rate in the Rivers State University Teaching Hospital is high being 12.2% with majority occurring within 24 hours of admission and male preponderance. Neonatal sepsis, perinatal asphyxia and prematurity were the commonest causes of mortality with 2/3rd occurring during call period. There was a reduction in the annual mortality rate from 2018 with the least mortality rate being recorded in the year 2020. Further reduction of neonatal mortality is however desirable in line with the SDG by ensuring improved obstetric care as well as improved immediate care of newborns after birth.

6. LIMITATION

Being a retrospective study, there were missing data. This therefore calls for better record keeping especially the use of electronic health management system.

CONCENT

It is not applicable.

ETHICAL CLEARANCE

Ethical clearance was obtained from the Rivers State University Teaching Hospital Health Research Ethics Committee.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. WHO. Newborn Mortality – WHO / World Health Organization; 2022. Available:https://www.who.int
2. UNICEF. Neonatal mortality; 2022. Available:https://data.unicef.org > topic >
3. Hug L, Alexander M, You D, Alkema L. UN Inter-agency group for child mortality estimation. National, regional and global levels and trends in neonatal mortality between 1990 and 2017, with scenario-based projections to 2030: A systematic analysis. Lancet Glob Health 2019;7(6): e710-e720. DOI: 10.1016/S2214-109X(19)30163-9
4. Engin E, Meliha E, Feyza A. The strategic role of infant mortality in the process of economic growth: An application for high income OECD countries. Procedia - Social Behavioral Sci. 2013;99:19-25. ISSN 1877-0428 Available:https://doi.org/10.1016/j.sbspro.2013.10.467
5. Knoema. World Data Atlas > Nigeria > Health - Neonatal mortality; 2022. Available:https://knoema.com/atlas/Nigeria/Neonatal-mortality-rate#
6. Patel KK, Prasad JB, Biradar RA. Trends in and determinants of neonatal and infant mortality in Nigeria based on demographic and health survey data. J Biosocial ScI. 2021;53(6):924-34 DOI:https://doi.org/10.1017/S0021932020000619
7. Onazi SO, Akeredolu FD, Yakubu M, Jiya MN, Hano IJ. Neonatal morbidity and mortality: A 5-year analysis at Federal Medical Centre, Gusau, Zamfara State, Northwest Nigeria. Ann Med Res Pract. 2021;2:10.
8. UNIGME. Levels and trends in child mortality: Report, New York: UNICEF; 2018.
9. Dare S, Oduro AR, Owusu-Agyei S, Mackay DF, Gruer L, Manyeh AK et al. Neonatal mortality rates, characteristics and risk factors for neonatal deaths in Ghana: Analyses of data from two health and demographic surveillance systems. Global Health Action 2021;14(1):1938871. DOI: 10.1080/16549716.2021.1938871
10. Okagua J, Obikwu U. Morbidity and mortality pattern of neonates admitted into the special care baby unit of University of Port Harcourt Teaching Hospital, Nigeria. East Afri Med J 2017;94(4):259-65.
11. Akpani MU, Nyong EE. Pattern of admissions into the newborn unit of University of Uyo Teaching Hospital, Nigeria. Int J Med Res Rev. 2017;5(9): 851-6. DOI: 10.17511/ijmrr.2017.i09.04
12. Also U, Gwarzo GD. Patterns of morbidity and mortality among neonates seen in a Tertiary Hospital. Sahel Med. J. 2020;23 (1):47-50. DOI: 10.4103/smj.smj-21-19
13. Ochoga M, Abah RO, Micheal A, Yaguo-Ide LE, Onalo R, Idoko A et al. Retrospective assessment of neonatal morbidity and mortality in the special care baby unit of a private health facility in Benue State, Northcentral Nigeria. Niger J Paediatr. 2020;47(4): 353-357. DOI: http://dx.doi.org/10.4314/njp.v47:4.9
14. Audu LI, Otuneye AT, Mairami AB, Mukhtar-Yola M, Mshelia LJ. Determination of neonatal case-specific fatality rates in a tertiary health institution in North central Nigeria. BMC Paediatr. 2021;21:302-10.
15. Eke CB, Ezomike UO, Chukwu BF, Chinawa JM, Korie FC, Chukwudi N et al. Pattern of neonatal mortality in a tertiary health facility in Umuahia, Southeast Nigeria. Int J Trop Dis Health. 2014;4 (2):136-46.
16. Ike EU, Modupe OO. Pattern of diseases and care outcomes of neonates admitted in special care baby unit of University College Hospital, Ibadan, Nigeria from 2007 to 2011. IOSR J Nurs Health Sci. 2015;4(3):62-77. DOI: 10.9790/1959-04316271
17. Toma BO, Ige OO, Abok II, Onwuanaku C, Abah RO, Donli A. Pattern of neonatal admissions and outcome in a Tertiary Institution in North central Nigeria. J Med Trop. 2013;15(2):121-5. DOI: 10.4103/2276-7096.123590
18. Sharma AK, Gaur A. Profile of neonatal mortality in special newborn care unit of

tertiary care hospital. Int J Contemp Pediatr. 2019;6(6):2319-25.
DOI:http://dx.doi.org/10.18203/2349-3291.ijcp20194205

19. Aboladje E, EKpebe P, Onyeaso U, Cummings H, Odion OH, Ovili C. Neonatal morbidity and mortality pattern in a tertiary health facility in the Niger Delta Region: A 2-year review. J Res Bas Clin Sci. 2021; 2(2):25-31.
DOI: doi.org/10.5281/zenodo.5768457
20. Weddih A, Ahmed MLCB, Sidatt M, Abdelghader N, Abdelghader F, Ahmed A et al. Prevalence and factors associated with neonatal mortality among neonates hospitalized at the National Hospital Nouakchott, Mauritania. Pan Afr Med J. 2019;34:152
DOI: 10.11604/pamj.2019.34.152.14683
21. Aboladje E. Neonatal mortality: Morbidity pattern and risk factors in a resource-limited centre in North Central Nigeria. Sri Lanka J Child Health. 2021;50(3):408-15.
22. Tette EM, Nartey ET, Nuertey BD, Azusong EA, Akaateba D, Yirifere J et al. The pattern of neonatal admissions and mortality at a regional and district hospital in the upper west region of Ghana; A cross sectional study. Plos One. 2020;15 (5):e0232406.
Available:https://doi.org/10.1371/journal.pone.0232406
23. Hussain S. Neonatal morbidity and mortality pattern in a tertiary care neonatal unit of a teaching hospital. Ann Pak Inst Med Sci. 2014;10(1):7-11.
24. Umma IA. Neonatal morbidity and mortality in a rural tertiary hospital in Nigeria. Chrismed J Health Res. 2018;5(1):8-10.
DOI: 10.4103/cjhr_64_17
25. McGil Ugwu GI. Pattern of morbidity and mortality in the newborn special care baby unit in a tertiary institution in the Niger Delta region of Nigeria: A two year prospective study. Global Adv Res J Med Med Sci. 2012;1(6):133-8.
26. Naeye RL, Burt LS, Wright DL, Blanc WA, Latter D. Neonatal mortality, the male disadvantage. Pediatrics. 1971;48:902-6.
27. Waldron I. Sex differences in human mortality: The role of genetic factors. Social Sci Med. 1983;17:321-33.
DOI:10.1016/0277-9536(83)90234-4
28. Ansar Ahmed S, Penhale WJ, Talal N. Sex hormones, immune responses and autoimmune diseases. Mechanism of sex hormones action. Amer J Path. 1985; 121:531-51.
29. Bouman A, Heineman MJ, Faas MM. Sex hormones and the immune response in humans. Human Reproduction update. 2005;11:411-23.
DOI:10.1093/humupd/dmi008
30. Watkins WJ, Kotecha SJ, Kotecha S. All cause mortality of low birth weight infants in infancy, childhood and adolescence: Population study of England and Wales. Plos Med. 2016;13(5): e1002018.
31. Sun J, Qu S, Zhang C, Xiang Z, Fu Z, Yao L. Neonatal mortality and risk factors in Northeast China: Analysis of 5277 neonates in 2005. Clin Exp Obstet Gynecol. 2014;41(5):512-6.
32. Macdorman MF, Declercq E, Menacker F, Malloy MH. Infant and neonatal mortality for primary caesarean and vaginal births to women with 'no indicated risk, United States, 1998-2001 birth cohorts. Birth. 2006;33:175-82.
33. World Health Organization. Maternal, newborn, child and adolescent Health programme.
Available:http://www.who.int/maternal-child-adolescent/epidemiology/newborn/en/
34. Lawn JE, Cousens SN, Wilczynska K. Estimating the causes of four million neonatal deaths in the year 2000. Int J Epidemiol. 2006;35:706-18.
35. Okechukwu AA, Achonwa A. Morbidity and mortality pattern of admissions into the special care baby Unit of University of Abuja Teaching Hospital, Gwagwalada, Nigeria. N J Clin Pract. 2009;12(4):389-94.
36. Guemer G, Oluyide B, Keramarou M, Grais R. High maternal and neonatal mortality rates in northern Nigeria: An 8 month observational study. Int J Women's Health. 20135:495-9.
37. Ekwochi U, Ndu IK, Nwokoye OU, Amadi OF, Osuorah DIC. Pattern of morbidity and mortality of newborns admitted into the sick and special care baby unit of Enugu State University Teaching Hospital, Enugu State. Niger J Clin Pract. 2014;17(3): 346-51.
38. Saini N, Chhabra S, Garg L, Garg N. Pattern of neonatal morbidity and mortality: A prospective study in a district hospital in urban India. J Clin Neonatol. 2016;5(3): 183-8.
DOI: 10. 4103/2249-4847.191258

39. Shirazi H, Riaz S, Mahmood RA. Morbidity and mortality pattern of newly born babies in a teaching hospital. J Rawalpindi Med College. 2015;19(3):204-8.
40. Carlo WA, McClure EM, Chomba E, Chakraborty H, Harwell T, Harris H et al. Newborn care training for midwives and neonatal and perinatal mortality rate in a developing country. Pediatr. 2010;126 (5):e1064-e1071.
41. Perlman JM, Wyllie J, Kattwinkel J, Atkins DL, Chameldes L, Hazinski MF et al. Neonatal resuscitation chapter collaborators. International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendation. Pediatr. 2010;126(5):e1319-44.
DOI: 10.1542/peds.2010-2972B.
42. Dawodu AH, Effiong CE. Neonatal mortality: Effects of selective interventions. Pediatr 1985;75:51-7.
43. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L. Evidence based, cost effective interventions: how many newborn babies can we save? Lancet. 2005;365 (9463):977-88.
44. Vinod PK. The current state of newborn health in low income countries and the way forward. Semin Fetal Neonatal Med. 2006; 11:7-14.
45. Fernandez-Tunas MC, Barrio-Tobio L, Couselo-Gracia L, Perez-Munuzuri A. Variability in the nurse-patient ratio in neonatal intensive care units and intermediate care units. Enfermeria Intensiva (English Edition). 2020;31(1): 46-47.
DOI:10.1016/j.enfie.2018.06.003
46. Muanya C, Onyenucheya A. Bridging doctor-patient ratio gap to boost access to healthcare delivery in Nigeria. The Guardian 4th February. Cited 16/10/2022; 2021.
47. WHO. Neonatal mortality; 2019.
Available:https://www.who.int.neonatal_ text

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