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Original Research Article

A four-year retrospective assessment of neonatal mortality in a neonatal intensive care unit

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ABSTRACT

Background: Neonatal mortality continues to be a public health problem globally. Sub-Saharan African countries continue to record high figures, recording almost 1 million neonatal deaths annually over 30 years. This makes it the only SDG region without decreasing neonatal deaths between 1990 and 2019. The neonatal mortality burden in Ghana is unevenly distributed, with the Eastern Region recording an increase in deaths per 1000 live births. This study examined admission into the neonatal intensive care unit to understand the conditions and factors contributing to neonatal admission and deaths in the region.
Methods: A cross-sectional study design was used to gather data on admissions to the neonatal intensive care unit from 2017 to 2020. Variables used for statistical analysis and inferences included gender, age of neonates, maternal employment, education, principal diagnosis on admission, treatment outcome, and the mother's National Health Insurance Scheme status.
Results: The study's leading causes of neonatal admission included, infections, neonatal sepsis and jaundice, birth asphyxia, macrosomia, prematurity, and pneumonia. Neonatal and maternal factors were not important determinants of neonatal mortality at the neonatal intensive care unit. On the other hand, having a valid National Health Insurance Scheme significantly mitigates the likelihood of neonatal death.
Conclusions: Neonatal mortality remains a public health concern in Ghana. Based on the findings, it is recommended that there should be efforts to decrease prematurity and neonatal infections such as sepsis and birth asphyxia. Again, the hospital should increase the skills of its staff in handling these morbidities to increase the survival rate.

Keywords: Neonatal, Mortality, Admission, Intensive care, Retrospective

INTRODUCTION

The most crucial period for every newborn baby is the first twenty-eight days of birth, also called the neonatal period.[1-3] Experts have indicated that the risk of death during this period is high.[4] It has been shown that many babies are lost daily around the world within the neonatal period, and available statistics further suggest that in 2019, 2.4 million babies died globally during the first month (UNIGME).[5,6] Despite the government's commitment to reducing neonatal mortality, the decline is relatively stagnant, and sub-Saharan Africa continues to record the highest burden of neonatal mortality with one death in every 38 newborns before they reach one month.[7,8] It is important to note that among all the regions of the sustainable development goal

(SDGs), the area with the highest neonatal mortality rate of 28 deaths per 1000 live births is sub-Saharan Africa.[9]

In 2014, an estimated neonatal mortality rate in Ghana stood at 29 per 1000, a rate greater than Africa's average of 27 per 1000, and appeared to be one of the highest neonatal mortality rates in West Africa.[8,10] In 1990, nearly 5 million babies died before they were more than one month old. Thus, for every 1000 live births, 38 of them died. Over the years, there has been a consistent decrease in the absolute figures and the per 1000 live birth statistics.[6] Research indicates that Ghana recorded 25 per 1000 live births in 2017, and 27 per 1000 live births in 2017–2018, with about 92% of newborns' deaths occurring before they reach 7 days.[11-13]

According to the Ghana multiple indicator cluster survey (MICS) 2017/2018, the Eastern region of Ghana had a neonatal mortality rate of 27 deaths per 1000 live births.[14] This made it the third-highest after the Ashanti region (52 per 1000 live births) and Upper East region (28 per 1000 live births). Comparing this to the previous survey reveals that the Easter regions' statistics have deteriorated. In the 2011 survey, the Eastern region recorded a neonatal mortality rate of 25 deaths per 1000 live births, indicating that the current figures are retrogressing. The Eastern region is the only region that recorded a deterioration in the neonatal rate between the 2011 and the 2017/2018 surveys. The same decline has been observed in the Eastern region's UFMR, which increased from 61 deaths per 1000 live births in the 2011 MICS to 63 deaths per 1000 live births in the 2017/2018 MICS.[14] This study was a retrospective cross-sectional study conducted at the neonatal intensive care unit of the Eastern Regional Hospital in Ghana using 2017 to 2020 data.

METHODS

Study design

The study was a descriptive assessment of a hospital-based retrospective cross-sectional study design. The cross-sectional research covered a four (4) year period from January 2017 to December 2020 in the NICU of ERHK. The study involved admissions into the NICU and relied on records already stored in the hospital's database. The neonatal register for the period of interest was reviewed, and the necessary data were extracted for the study. In all, there were 7,531 cases used in the study. Cases that were not more than 28 days at the time of the admission outcome were considered. A sample of 7,437 was selected for the current research out of the 7531 cases in the entire population of admissions to the NICU over the four years to December 2020.

Data collection and analysis

Demographic and clinical details were extracted from each NICU database. Information extracted includes dates of admission, discharge, or death. Others were the primary diagnosis, secondary diagnosis, surgical procedure, and cost of treatment. Again, the age of the neonate at admission, occupation of the mother, education of the mother, and the national health insurance status of the mother of the neonates were extracted from the NICU ward database over the four years. As an important variable for this study, we also pulled data on the admissions outcome. An outcome of death was recorded for any neonate who died. All other outcomes in terms of whether the neonate was discharged satisfactorily, discharged against the doctor's advice, absconded, or transferred/referred to other facilities were deemed as "not dead" for this study.

From these variables, other variables were inferred to get a better understanding of the information requested. Data was first extracted into excel format from the NICU database. Microsoft excel was used to clean the data and organized it in a way usable by other statistical packages without a lot of work. The cleaned data was saved as a .csv file and then imported into Stata 14, Mac version, for further analysis. Simple descriptive statistics were computed and presented in tables and graphs. For this purpose, a chi-square test was used. This test is a non-parametric test used to determine any possible relationship between categorical variables or between categorical and non-categorical variables.

Inclusion and exclusion criteria

Data on the relevant variables were extracted for all admissions to the NICU ward of ERHK from January 2017 to December 2020. As stated in the sampling section, neonates who were more than 28 days at the time of the admission outcome were excluded from the study. Also, for the purpose of ensuring the privacy of neonates and their mothers, no data on their identities were extracted.

Ethical approval and consent to participate

The research protocol was submitted to the University for Development Studies institutional and ethical review committee. Approval was granted after the review. Consent was sought from the NICU of ERHK. The data was extracted to ensure the anonymity of the individuals associated with any of the cases.

RESULTS

Descriptive statistics and trends in cases

A total of 7,5107 admissions were recorded over the four years during the study period. However, as stated earlier, only 7,437 admissions were used as samples for this study, about 99% of the total admissions during the study period. The remaining 1% were admitted neonates whose outcomes were determined after 28 days and thus were excluded from the study. Thus, their age at the outcome was more than the classification for the neonate. A yearly decomposition of the admissions shows that the admissions were not evenly distributed over the study

period. 16.6% of the admissions occurred in 2017; 28.5% in 2018; 25.95% in 2019, and 28.99% in 2020.

Table 1: Trends in neonatal admissions.

Year	Frequency	Percentage
2017	1,231	16.55
2018	2,120	28.51
2019	1,930	25.95
2020	2,156	28.99
Total	7,437	100

Demography of neonates

There were 4,075 male neonates in the study representing 54.79% while the remaining 45.21% were female neonates. The difference between male and female neonates in the sample was statistically significant at a 1% alpha level (p=0.547, p value=0.000). The majority of the admitted neonates were admitted within the first day after birth. Their age at admission was between 0–11 days. Again, 7,358 out of the total 7,437 samples were admitted within the first day of delivery representing about 98% of the cases (Table 2). The neonates admitted on the first day after birth were predominantly male neonates. Of the 7,358 admissions on the first day, 4,022 cases representing about 55%, were male neonates.

Outcome of admissions

Out of the total sample of 7,437, about 6,321 cases were discharged satisfactorily over the four years. This was almost evenly distributed across the four years. 2017 recorded 1,142; 1,888 in 2018; 1,647 in 2019; and 1,644 in 2020. Within the cohort, there were 866 deaths. Deaths recorded in 2017 were 88 while that in 2018 was 206, 274 in 2019, and 298 in 2020 indicating an upward trend in the number of deaths within the NICU. In 2020 alone, 202 cases were asked to be returned for review, which was unique to that year. The remaining cases were either discharged against medical advice (8), referred to other facilities (19), or absconded. The admission outcomes were further converted into a binary of dead or alive. Thus, except for the dead, all other outcomes were deemed alive at the outcome date. In other words, absconding, discharged satisfactorily, discharged against medical advice, referred to other facilities, and returned for review were all reclassified as alive the day they exited the NICU.

Table 2: Age and gender of neonates.

Age (days)	Gender		
	Female	**Male**	**Total**
0	3,336	4,022	7,358
1	6	22	28
2	5	5	10
3	3	8	11
4	3	3	6
5	2	3	5
6	2	3	5
7	1	0	1
8	1	0	1
9	1	4	5
10	2	2	4
11	0	3	3
Total	3,362	4,075	7,437

Table 3: Trend in the outcome of admission.

Outcome	Year				
	2017	**2018**	**2019**	**2020**	**Total**
Abscond	1	12	4	4	21
Dead	88	206	274	298	866
Discharged against advice	0	4	3	1	8
Discharged satisfactorily	1,142	1,888	1,647	1,644	6,321
Referred externally	0	10	2	7	19
Return for review	0	0	0	202	202
Total	1,231	2,120	1,930	2,156	7,437

Demography of mothers

Over the study period, 7,209 (96.9%) out of the 7,437 sampled cases were neonates whose mothers had no formal education. 89 (1.2%), 116 (1.56%), 13 (0.17%), and 10 (0.13%) mothers had primary, junior high school, senior high school, and tertiary education, respectively (Table 4). Different types of employment were indicated from the data ranging from public servants, accountants, and typists. All these were reclassified into self-employed, formal employment, pupils/students, and unemployed. Two hundred and forty cases had missing information on maternal employment. Of the remaining 7,197 cases, about 53% (3,818 mothers) were pupils/students. Again, 39% (2,856 mothers) were informally employed in trading, farming, and artisanal works. Only 0.28% (20 mothers) had employment within the formal sector such as Accountants, typists, public and civil servants, and teachers. Five hundred and three mothers representing 6.99%, were unemployed.

NHIS covered almost all the cases. 7,006 (94.2%) of the mothers in the sampled cases were covered by NHIS. Thus, the NHIS was active or renewed at the time of admission.

On the other hand, the remaining 431 (5.8%) were not covered by NHIS at the time of admission either because they had never registered or their insurance had expired.

Table 4: Demographics of mothers.

Variables	Frequency	Percentage
Education		
None	7209	96.93
Primary	89	1.2
JHS/middle	116	1.56
SHS/secondary	13	0.17
Tertiary	10	0.13
Total	7437	100
Employment		
Formal employment	20	0.28
Informal employment	2856	39.68
Pupil/student	3818	53
Unemployed	503	6.99
Total	7197	100
Health insurance status		
No	431	5.8
Yes	7006	94.2
Total	7437	100

Treatment cost and length

The average day for treatment for the sampled cases was 4.87 days, with a standard deviation of 4.09. The treatment cost at the NICU was up to a maximum of Ghs 4,823.64, (322.098 USD). The average treatment cost was Ghs 471.78. The standard deviation of the cost of treatment was 232.9.

Diagnosis of admissions

Four (4) cases of the total sample had missing data for the principal diagnosis. There were about 97 unique principal diagnoses of the cases from the NICU. However, most of the cases were low frequency or did not result in neonatal death. As a result, such a diagnosis was classified as other diagnoses. Others were by their nature classified as other infections. Given the above, Table 5 summarizes the principal diagnoses. It was observed from the results that prematurity was the highest cause of admission to the NICU. There were 2,265 prematurity case admissions representing about 30.47% of the sample. Next was Sepsis and Neonatal jaundice, which recorded 1,465 (19.71%) and 1,211 (16.29) respectively.

Few (185) cases had additional diagnoses to the principal diagnosis. Of this additional diagnosis, Respiratory distress, neonatal jaundice, asphyxia, congenital anomalies, and neonatal sepsis contributed to about a total of 70% of the cases. Again, it was observed from the data that prematurity as a principal diagnosis was most of the time associated with neonatal jaundice (26 cases) and respiratory disorders (23 cases) as the additional diagnosis.

Table 5: Principal diagnosis of admissions.

Principal diagnosis	Freq.	Percent	Cum.
Anaemia	88	1.18	1.18
Asphyxia	800	10.76	11.94
Congenital anomaly	106	1.43	13.37
Digestive defects	28	0.38	13.75
Haemorrhages	31	0.42	14.17
Heart failure	2	0.03	14.19
Hydrocephalous	5	0.07	14.26
Kernicterus	20	0.27	14.53
Low birth weight	8	0.11	14.64
Macrosomia	253	3.4	18.04
Meconium aspiration syndrome	125	1.68	19.72
Meningitis	30	0.4	20.12
Neonatal jaundice	1,211	16.29	36.41
Other infections	64	0.86	37.27
Others	633	8.52	45.79
Pneumonia	216	2.91	48.7
Prematurity	2,265	30.47	79.17
Respiratory distress	83	1.12	80.29
Sepsis	1,465	19.71	100
Total	7,433	100	

Diagnosis and outcome

From the bivariate analysis results of the causes or the principal diagnosis and the admission outcome over the study period (Table 6), the overall survival rate was 88.35%, while the death rate was 11.65%. The results show a principal diagnosis with high frequency but recorded low death rates due to their higher survival rate. Even though prematurity had the highest admissions count, it had a relatively low death rate. In the same way, sepsis had a large count of admissions. Still, a good survival rate of 96% recorded a low death rate of 4%, indicating the proficiency of the medical team at the NICU in handling admissions due to sepsis. On the other hand, heart failure was a very low principal diagnosis with a very high death rate.

Binary logistic regression

Under the principal diagnosis variable, 19 categories were used in the model and reported. Anemia was used as the reference diagnosis for admission into the NICU of the ERHK. For this variable, 13 of the remaining 18 categories had a higher likelihood of neonatal deaths concerning the reference diagnosis. A neonate with a principal diagnosis of birth asphyxia was 6.96 times more likely to die after treatment than those diagnosed with anemia at the NICU of the ERHK (OR=6.96; 95% CI=2.7-17.4; p value <0.0001) (Table 7). For those who were diagnosed with congenital anomalies as a primary diagnosis, they were 5.4 times more likely to die on admission (AOR=5.4; 95% CI=1.9-14.9; p value=0.001). Again, neonates that presented meconium aspiration syndrome (AOR=5.6; 95%

CI=1.88-13.66; p value=0.067), hydrocephalous (AOR=35.84; 95% CI=3.07-418.02; p value=0.004), kernicterus (AOR=20; 95% CI=5.2-76.57; p value <0.0001) were 5.6, 35.8 and 20 time likely to die than those who presented anemia at admission respectively.

In the same way neonates admitted with respiratory distress (AOR=4.48; 95% CI=1.58-1.58; p value=0.005), digestive disorders (AOR=5.42; 95% CI=1.55-18.9; p value=0.008), low birth weights (AOR=8.69; 95% CI=1.58-47.66; p value=0.013) and prematurity (AOR=3.04; 95% CI=1.22-7.57; p value=0.017) were 4.48, 5.42, 8.69 and 3.04 times likely to die at the NICU than their counterparts that presented anemia at admission. The difference in the likelihood of death for all the above diagnoses from anemia is statistically significant at a 5% significance level. Even though neonates who presented heart failure (AOR=15.2; 95% CI=0.82-283.4; p value=0.06), meningitis (AOR=3.4; 95% CI=0.89-12.59; p value=0.07) and pneumonia (AOR=2.3; 95% CI=0.87-6.3; p value=0.92) were more likely to die as compared to those with anemia, the difference in the likelihood of death from anemia was not statistically significant at an alpha level of 5 percent. There was however a 10% significance level. Haemorrhagic conditions (AOR=1.9; 95% CI=0.43-8.6; p value) admitted to the NICU had a higher probability of death than anemia, but the difference was neither statistically significant at 5% nor 10% significance.

Neonatal jaundice (AOR=0.18; 95% CI=0.06-0.5; p value=0.001) and macrosomia (AOR=0.13; 95% CI=0.024-0.66, p value=0.014) were less likely to cause death at the NICU than anemia, and the difference in the probability of death was significant at 5%. Sepsis (AOR=0.7; 95% CI=0.28-1.83; p value=0.48) and other infections (AOR=0.84; 95% CI=0.19-3.7; p value=0.827) diagnosed for neonates at the NICU were less likely to cause death than anemia, but the difference in the likelihoods was not significant even at 10% level. The age of the neonate at the time of admission was a continuous variable in this study and was negatively associated with the probability of death (AOR=0.92; 95% CI=0.64-1.32; p value=0.66). The older the neonate, the less likely he or she is to die in the NICU. A day increase in the age of the neonate decreases the probability of death by about 8 percent. This association was however not statistically significant. The gender of the neonate was represented as male and female, with the female as the reference category. From Table 7, we observe that male neonates (AOR=1.06; 95% CI=0.91-1.239; p value=0.43) were 1.06 times more likely to die at the NICU, but this gender difference in probability of death was not statistically significant.

The NHIS status of the mother was also investigated with "no" as the reference category. Babies whose mothers had a valid NHIS were 0.587 times less likely to die than those whose mothers did not have a valid NHIS during admission (AOR=0.587; 95% CI=0.45-0.765; p value=0.000). The difference in the odds of death between having NHIS and not having it was statistically significant, even at a 1% significance level. The unemployed mothers' category was the reference category in maternal employment. Against this reference, babies with informally employed mothers were 1.12 times more likely to die at the NICU of the ERHK (AOR=1.127; 95% CI=0.834-1.524; p value=0.434). Finally, no education was used as the reference category for maternal education. From the table, we observed that primary education babies with mothers who received at most basic or primary education had 0.89 times the likelihood of death than babies with mothers who did not have any education (AOR=0.89; 95% CI=0.43-1.87; p value=0.76). For babies with mothers who had secondary (junior and senior) education (AOR=1.11; 95% CI=0.64-1.92; p-value=0.7) and those who had tertiary education (AOR=1.003; 95% CI=0.106-9.5; p value=0.997) were both almost as likely - that is 1.1 and 1.003 times respectively – to die as those whose mother was not educated at all.

Table 6: Bivariate analysis of diagnosis and outcome.

Principal diagnosis	Alive		Dead		
	Freq. (n)	n/N*	Freq. (n)	n/N*	Total (N)
Prematurity	1,887	83.31	378	16.69	2,265
Sepsis	1,400	95.56	65	4.44	1,465
Neonatal jaundice	1,198	98.93	13	1.07	1,211
Birth asphyxia	554	69.25	246	30.75	800
Others	617	97.47	16	2.53	633
Macrosomia	250	98.81	3	1.19	253
Pneumonia	189	87.5	27	12.5	216
Meconium aspiration syndrome	94	75.2	31	24.8	125
Congenital anomalies	79	74.53	27	25.47	106
Anaemia	83	94.32	5	5.68	88
Respiratory distress	63	75.9	20	24.1	83
Other infections	61	95.31	3	4.69	64
Haemorrhages	28	90.32	3	9.68	31
Meningitis	25	83.33	5	16.67	30

Continued.

Principal diagnosis	Alive		Dead		
	Freq. (n)	n/N*	Freq. (n)	n/N*	Total (N)
Digestive	21	75	7	25	28
Kernicterus	10	50	10	50	20
Low birth weight	5	62.5	3	37.5	8
Hydrocephalous	2	40	3	60	5
Heart failure	1	50	1	50	2
Total	6,567	88.35	866	11.65	7,433

Table 7: Logistic regression.

Variables			95% CI	
	Odds ratio	P value	Lower	Upper
Diagnosis				
Anemia	Reference			
Asphyxia	6.9604	0.000	2.7803	17.4254
Congenital anomaly	5.4407	0.001	1.9882	14.8882
Heart failure	15.2782	0.067	0.8237	283.3786
Hydrocephalous	35.8447	0.004	3.0736	418.0223
Kernicterus	20.0163	0.000	5.2322	76.5751
Low birth weight	8.6860	0.013	1.5830	47.6616
Macrosomia	0.1257	0.014	0.0239	0.6613
Meconium aspiration syndrome	5.0638	0.001	1.8760	13.6682
Meningitis	3.3538	0.073	0.8930	12.5954
Neonatal jaundice	0.1757	0.001	0.0610	0.5058
Pneumonia	2.3432	0.092	0.8693	6.3157
Prematurity	3.0404	0.017	1.2210	7.5711
Respiratory distress	4.4815	0.005	1.5811	12.7028
Sepsis	0.7129	0.481	0.2784	1.8260
Digestive disorder	5.4211	0.008	1.5520	18.9364
Other infections	0.8483	0.827	0.1942	3.7064
Other diagnosis	0.4067	0.090	0.1437	1.1513
Haemorrhages	1.9221	0.394	0.4281	8.6302
Age (continuous)	0.9218	0.658	0.6423	1.3228
Gender				
Female	Reference			
Male	1.0635	0.431	0.9123	1.2396
NHIS				
No	Reference			
Yes	0.5868	0.000	0.4502	0.7650
Employment				
Unemployed	Reference			
Informal employment	1.1278	0.434	0.834	1.524
Formal employment	1.3494	0.665	0.348	5.235
Education				
None	Reference			
Primary	0.8912	0.760	0.4256	1.8665
Secondary	1.1119	0.703	0.6449	1.9171
Tertiary	1.0039	0.997	0.1061	9.4995
Obs	7,193	LL		-2220.9046
Chi-square (26)	780.08			
Prob	0.000			
Target variable	Outcome			

DISCUSSION

Results from the study show that all the neonates were admitted within the first days after birth. The logistic regression analysis also showed that the probability of a neonate dying at the NICU decreased as the duration of admission increased. This revelation is consistent with findings where a negative association was established between neonatal death and the duration of neonate on admission.[15,16] Of the number of admissions to the NICU, 55% were male. The dominance of males in NICU admissions is consistent with the study that found that, 52% of male admissions to the Upper West Regional Hospital and SJH in the Upper West regions of Ghana.[17] However, this contradicts other findings conducted in the Tamale Teaching Hospital in the northern region of Ghana where there were more female admissions than males.[15] Irrespective of significant differences in admissions, there was no significant difference in the admission outcome between male and female neonates. After controlling for all other factors and variables, there was no statistical difference in the likelihood of male neonates dying at the NICU. Thus, the male neonates were as likely to die on admission to the NICU as female neonates. This finding is supported by the insignificance of gender found in the study at the Tamale Teaching Hospital.[15,18]

It was found that the National Health Insurance Scheme (NHIS) cover of 94.2% served as a mitigating factor in neonatal deaths, as they were less likely to die in the NICU. In other words, having a valid NHIS almost halves the probability of death after the presentation. With a valid NHIS, the cost burden of seeking the right medical care during pregnancy will decrease the risk of birth complications. Thus, any presentation is expected to be minor and manageable to ensure a satisfactory discharge from the NICU.

The study observed that neonates' prematurity is the highest cause of admissions to the NICU. Consistently over the years of the study, admission of premature neonates increased from 274 admissions in 2017 to 815 admissions in 2020. The rate of premature neonate admissions may be evidence of the number of premature births in general. Most mothers were described as pupils from the sample, indicating that most were adolescent mothers. This strong association between adolescence and prematurity is supported by existing literature on the high risk of adolescent and relatively younger mothers having preterm or premature births.[19,20] This could indicate higher teenage pregnancy in the study area, which may require a separate inquiry. From the study, prematurity was associated with conditions such as neonatal jaundice (26 cases) and respiratory disorders (23 cases). Prematurity, either alone or in combination with other factors, contributed to the highest count of neonatal deaths in the NICU over the study period. From the logistic regression, we find out that prematurity has a higher probability of killing a neonate than Anemia and other principal diagnoses.

Unlike prematurity, sepsis did not experience consistent growth over the four years. About 685 of the total sepsis cases occurred in 2018 alone. The remaining were distributed among the other three years, with 2020 recording the lowest count of 224 cases. This is consistent with a study that found sepsis as the common cause of admissions into the regional and district hospitals in the Upper West Region.[15] Since the Sepsis pathogen could be from in utro infection, maternal flora acquisition, or postnatal acquisition from the hospital or the community, it is better to analyze the findings in light of these possibilities for better understanding.[21] The immaturity of babies who have to stay in hospitals for more prolonged procedures exposes them to postnatal acquisition, especially those who require invasive procedures for survival. The study documented a higher percentage of teenagers as mothers of neonates admitted into the NICU. Only 12 cases of neonatal sepsis co-existing with prematurity out of the 183 cases that had additional diagnoses to their primary diagnosis within the sample. Despite the high frequency, sepsis had one of the highest survival rates of 96% and a low death rate of 4%.

Notwithstanding the high survival rate, it was one of the third highest (8%) contributors to the count of neonatal deaths in the NICU over the study period. This study's finding differs from the findings another study in two main ways.[17] First, the 7.5% contribution of sepsis to neonatal deaths is considerably lower than the 26.3 percent contribution found in the UWRH and SJH. Also, sepsis is third at the NICU in terms of contribution ranking, while it was the second-highest contributor at the UWRH.

Neonatal jaundice was the third-highest cause of admissions into the NICU of ERHK, contributing to about 16% of the total admissions used in the study. The survival rate for neonatal jaundice was the highest among all the primary diagnoses for admissions into the NICU. As a result, it was not among the top five contributors to neonatal deaths in the ERHK. Even with neonatal jaundice being the highest of the additional diagnoses documented with prematurity and other primary diagnoses, only four of those cases resulted in death, making it one of the least contributors to death. The less than 2% contribution to neonatal death for Neonatal jaundice is markedly different from the 6.7% recorded in the Upper East region of Ghana.[17,21] Birth asphyxia was the second-highest cause of admissions into the UWRH in the Upper West Region, contributing to about 15.1% of the total admissions in that study.[17] This was the fourth highest contributor to admissions into the NICU, contributing about 10.8% of the total admissions used in this study in terms of the survival rate of birth asphyxia; only 69% of the admitted cases survived, with the remaining 31% dying. This high death rate made it the second-largest contributor to neonatal death in the NICU.

Limitations

Some of the diagnoses were captured in a broader perspective in the data like respiratory conditions that

might contain diseases like birth asphysia, and respiratory distress syndrome among others. This could have served as effect modifiers to the study. In the opinion of the researchers, these were not material to alter the validity of the result.

The data did not contain information on some indicators of interest like maternal age, parity, the birth interval of the mother, the educational status of fathers, distance to the hospital, and the nature of the household. This limitation decreased the scope of the intended study, hence a separate study could be conducted to obtain such data to provide the relevant analysis.

CONCLUSION

Infections in general and prematurity were the leading causes of neonatal admissions at the NICU and neonatal mortality over the study period from 2017 to 2020. The top contributors to neonatal admission include prematurity, neonatal sepsis, neonatal jaundice, birth asphyxia, macrosomia, and pneumonia. Together, they contributed to 83% of the admissions. However, the order was slightly changed regarding neonatal mortality at the NICU. However, some conditions had better survival rates, indicating knowledge and skills improvement, including the NICU's capacity to handle those conditions. Together, about 89% of the total 866 deaths over the study period were due to prematurity, birth asphyxia, neonatal Sepsis, meconium aspiration syndrome, congenital anomaly, and pneumonia. While the data shows that the study facility is improving in the handling of neonatal jaundice and sepsis, as evidenced by the survival rate, it did not do so well in the handling of admissions of birth asphyxia over the study period.

From the data analysis, it appears conditions like prematurity have been increasing over the years as the principal diagnosis of neonatal admission at the ERHK is caused by a possible social anomaly of adolescent pregnancy, as was revealed by the data.

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