

Research Article

Trend and Determinants of Neonatal Mortality at the Buea and Limbe Regional Hospitals, Southwest Region, Cameroon

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Citation: Monono N, et al. Trend and Determinants of Neonatal Mortality at the Buea and Limbe Regional Hospitals, Southwest Region, Cameroon. J Pediatric Adv Res. 2024;3(1):1-7.

<http://dx.doi.org/10.46889/JPAR.2024.3103>

Received Date: 12-02-2024

Accepted Date: 05-03-2024

Published Date: 12-03-2024



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Abstract

Background: Over the years the rate of neonatal mortality in low-income settings has been on the increase and most cases of neonatal mortality can be associated with modifiable risk factors. However, the rate of neonatal mortality remains high in Cameroon with the Southwest Region having one of the highest rates of neonatal mortality.

Objectives: We aimed to determine the trend and determinants of neonatal mortality in Buea and Limbe Regional Hospitals.

Method and Materials: A hospital based retrospective study of files of neonates was conducted from the 1st of January 2017 to the 31st of December 2022. Socio-demographic, clinical and outcome data were obtained using a data extraction form and analyzed using Statistical Package for Social Science (SPSS) Version 27.

Results: The trend of neonatal mortality was apparently constant (16.1% and 17.8%) between 2017 to 2022. Birth asphyxia 150(53.4%) was found to be the most common cause of neonatal mortality. Identified determinants were: acute fetal distress (AOR:2.6 [1.333-5.346]), no ANC visit (AOR:13.1 [3.849-44.284]), birth weight less than 2500g (AOR:2.050 [0.039-4.216]), birth weight greater than 4000 g (AOR:2 [1.002-3.43]), Apgar Score < 3 (AOR:99.9 [87.036-100.000]) and Apgar score < 6 (AOR=5.164 [1.768-15.082]).

Conclusion: Neonatal mortality in our context is still below the expectations of SDG3 with perinatal asphyxia and its related modifiable factors influencing neonatal mortality the most. Therefore, more impactful community education and information sessions to build a positive mind set on pregnant women and their families to reduce neonatal mortality is required from all health sectors.

Keywords: Trend; Etiologies; Determinants; Neonatal Mortality

Introduction

Neonatal mortality according to the World Health Organization is the death of a liveborn infants that occur within the first 28 completed days of life. The first month of life is the most vulnerable period for child survival, with 2.4 million newborns dying in 2020 [1]. Due to the fact that the global rate of under-5 mortality is decreasing at a faster rate than the rate of neonatal mortality, in 2020, nearly half (47%) of all deaths involving children under the age of five occurred during the newborn period (the first 28 days of life), which represents an increase from 40% in 1990 [1]. More than 98% of these deaths occur in developing countries with 27 deaths per 1000 live births where access to health care is low [2,3]. Concerning neonatal mortality, the gap between developed and developing nations remains significantly high. A child born in a developing nation is 14 times more likely to die within the first 28 days than a child born in a developed nation with Sub-Saharan Africa having the highest neonatal mortality rate in the world, Central and Southern Asia come in second with 36% of all newborn deaths [1]. In 2020, neonatal mortality rate for Cameroon was 26.2 deaths per 1,000 live births. Between 1971 and 2020, neonatal mortality rate of Cameroon was declining

at a moderating rate from 57.2 deaths per 1,000 live births in 1971 to 26.2 deaths per 1,000 live births in 2020 [4]. Neonatal mortality rate at the Buea health district in 2020 was 45.5% with 86% occurring within the first 24 hours, preterm complications was the leading cause of death [5].

Majority of neonatal deaths are caused by preterm birth, intrapartum complications (birth asphyxia, or inability to breathe at birth), infections and birth defects [1]. Prematurity is the first cause of neonatal mortality and is directly responsible for an estimated one million neonatal deaths annually. It is also an important contributor to child and adult morbidities. Low- and middle-income countries are greatly affected by preterm birth and carry a greater burden [6].

In a study done in Tanzania the leading causes of neonatal mortality were; neonatal sepsis, birth asphyxia, acute respiratory distress [7]. In another study done in Cameroon the major causes of neonatal mortality were; neonatal sepsis, prematurity, birth asphyxia, low birth weight and congenital abnormalities [8]. In a study done in Ethiopia the determinants of neonatal mortality were; pregnancy induce hypertension, prematurity, public hospital delivery, being refer, hypothermia [9]. In another study done in Cameroon its determinants were; premature rupture of membrane, low birth weight, Apgar score less than 7 at the 5 min, congenital abnormalities [10]. Identifying causes and determinants of neonatal mortality is crucial to achieve Sustainable development goal 3.2 which aim to end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births by 2030 [11]. It is of utmost importance that we analysis the trend of neonatal mortality in our context and evaluate factors that have greatly influenced neonatal mortality. This will add to existing knowledge on neonatal mortality and will go a long way to serve as a pointer to medical practitioners and state holder on basic simple strategies to be applied to reduce neonatal mortality.

Material and Methods

A hospital-based retrospective study was carried out from 1st January 2017 to 31st December 2022 at the Buea Regional Hospital (BRH) and Limbe Regional Hospital (LRH) of the Fako Division of southwest Region of Cameroon. The Fako Division is the biggest amongst six divisions of the southwest region of Cameroon. This Division covers an area of 2,093 km² and as of 2005 has a total population of 466412 [12].

These are the principal referral level hospitals in the region with moderately equipped neonatology units, with the largest turnover of hospitalized neonates. A consecutive sampling of files of all neonates who were admitted including those who died at the neonatology units of the Buea and Limbe Regional Hospitals was done and incomplete files were excluded. Ethical approval was obtained from the University of Buea Institutional Review Board, the Regional Delegation of Public Health for the Southwest region and from the Directors of the Limbe and Buea Regional Hospitals. Data was collected using a data collection form and later keyed into Microsoft Excel sheet 2016 and analyzed with SPSS Version 27. All patients' information was coded to ensure confidentiality and the data was stored in a computer whose password was known by the investigators. Some of the data collected included: maternal socio-demographic data (age, occupation, marital status, level of education), maternal medical condition: chronic kidney disease, hypertension, diabetes mellitus, maternal gynecological condition: pre-eclampsia, eclampsia, gestational diabetes mellitus and the final diagnosis of the patient (preterm birth, neonatal sepsis, birth asphyxia, low birth weight. Continuous variables were presented as means, standard deviations and graphs while categorical variable were presented as frequency and percentages. Bivariate logistic regression test was used to Test for Association between neonatal death and determinants, after which Multivariate analysis was done to eliminate confounders with a Statistical significance of p value < 0.05 at 95% confidence interval.

Results

In this study, 2100 files were reviewed, 1100 from LRH and 1000 from BRH. 840 files were retained for analysis at the LRH and 267 cases files at the BRH. A total of 1107 files were included in the study. Of the 1107 participants recruited for the study, 666(60.2%) mothers were within the age group 25-34 years and 773 (69.8%) were married. About 740 (66.8%) had at least secondary education and a higher proportion of the mothers were from the urban area 957 (86.4%). Regarding the occupation, most of the participants were unemployed 435 (39.3%). With respect to the baby's history, about 314(28.4%) of babies went through resuscitation while 793(71.6%) did not. Most of the babies, had a gestational age between 37-40 weeks 704(63.6%) and most of the babies had a birth weight between 2500-4000 g (79.8%) (Table 1). Regarding the maternal pregnancy history,

485(43.8%) of the mothers had a history of infection during pregnancy [malaria 388(35%), STI (84(7.6)], followed by preeclampsia 41(3.7%), anaemia in pregnancy 13 (1.2%), eclampsia 8(0.7%) and gestational diabetes 1(0.1%) respectively. Regarding the labour history of mothers, majority of the mothers gave birth at the hospital 977(88.3%), 580(52.39%) of women had premature rupture of membrane as well as a clear colour liquor 892 (80.58%). Concerning the medical history of mothers, 6 (0.5%) were hypertensive, 5(0.5%) had diabetes and 1(0.1%) had chronic kidney disease.

Among the 1107 birth during this period, 281(22.2%) neonates died while 826(77.8%) survived (Fig 1). The trend of neonatal mortality was constant from the year 2017 to 2018 and 2019 to 2020 while in the year 2018 and 2019 the was a slight deceased in neonatal mortality. There was a drastic increase in the trend of neonatal mortality in the year 2021, followed by a sharp decreased the year 2022 (Fig 2). With regards to the causes of neonatal mortality, birth asphyxia 150(53.38%) was found to be most prevalent cause of neonatal mortality, followed by neonatal sepsis 111(39.50%), prematurity 58(20.64%) (Table 2). With bivariate analysis it was found that, self-employment (COR:1.787 CI , 1.037-3.081 ,p=0.037) , level of education (COR:4 CI,1.115-13.017 p=0.033), acute fetal distress (COR:4 CI, 2.423-5.290, p<0.001), duration of labor (COR:3 CI, 1.827-4.722, p<0.001), no ANC visits (COR:8 CI, 3.879-16.2, p<0.001) , Apgar scoreless 6 (COR:5.425 CI,2.143-13.729, p<0.001), Apgar score <3 (COR:25.55 CI, 18.595-124.700 ,p<0.001) and birth weight <2500g(COR:5.727 CI, 3.478-9.431, p<0.001), >4000g (COR:2.645 CI,1.298-5.391).were associated with neonatal mortality. After adjusting for confounders for logistic regression model, acute fetal distress (AOR:2.6 CI, 1.333-5.346, P=0.006), No ANC (AOR:13.1 CI ,3.849-44.284, P<0.001), birth weight < 2500g (AOR:2.050 CI, 0.039-4.216, p<0.001) , birth weight >4000g (AOR:2 CI,1.002-3.435 ,p=0.010), Apgar Score < 3 (AOR:99.920 CI , 87.036-100.000 ,p<0.001) , Apgar < 6 (AOR=5.164 CI , 1.768-15.082 ,p=0.003). were statistically significant. (Table 3).

Variables	Frequency (N=1107)	Percentage (%)
Fetal resuscitation		71.6
No	793	
Yes	314	28.4
Gestational age (in weeks)		
<37 weeks	206	18.6
37-40 weeks	704	63.6
40-42 weeks	173	15.6
>42 weeks	24	2.2
Weight (in g)		
< 2500	149	13.5
2500-4000	884	79.8
>4000	74	6.7
Sex		
Female	509	46.0
Male	598	54.0

Table 1: Neonatal characteristics on admission.

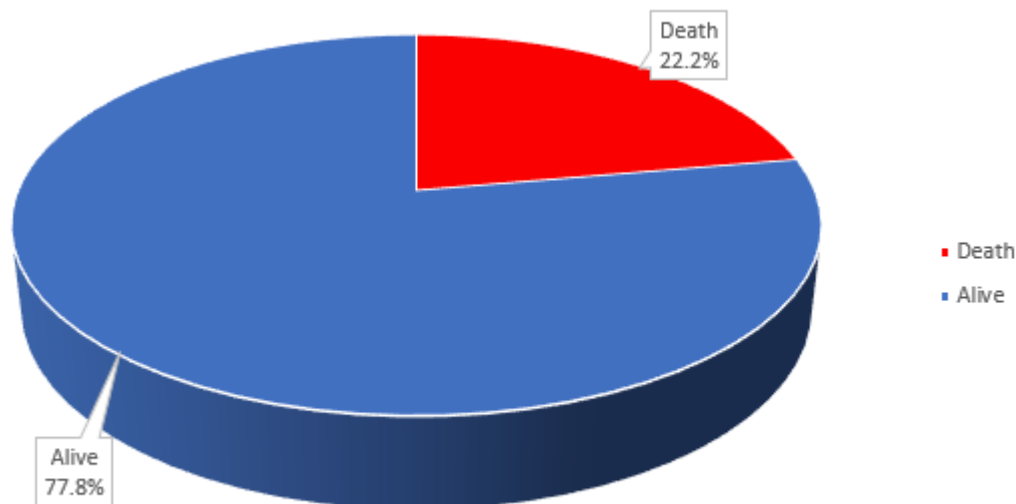


Figure 1: Overall neonatal mortality rate.

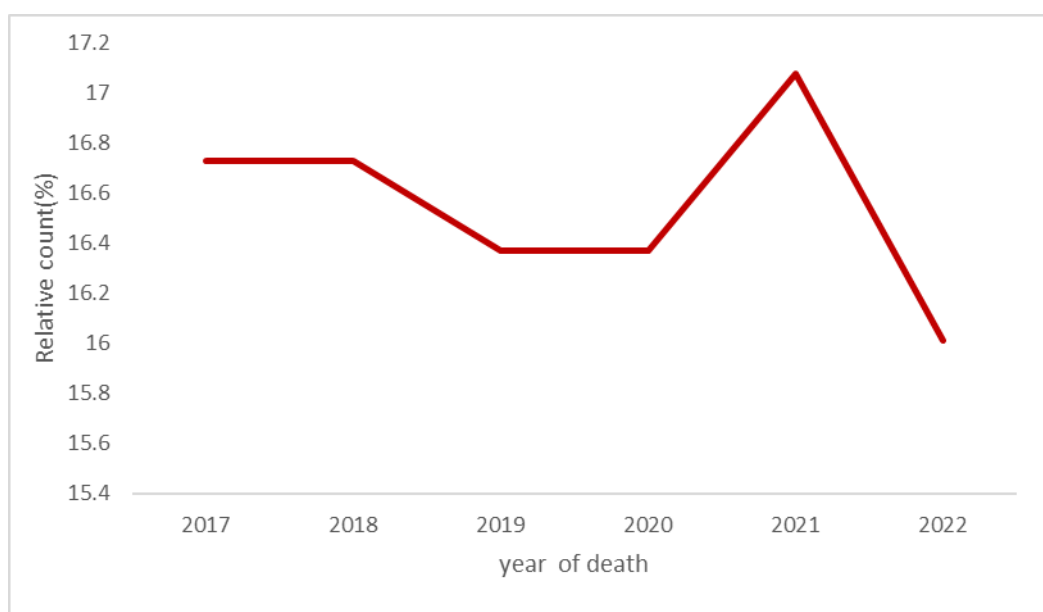


Figure 2: Trend of neonatal mortality.

Variable	Frequency (N=281)	Percentage (%)
Birth asphyxia		
No	131	46.62
Yes	150	53.38
Neonatal sepsis		
No	170	60.50
Yes	111	39.50
Prematurity		
No	223	79.36
Yes	58	20.64
Low birth weight		
No	231	82.20

Yes	50	17.80
Congenital abnormalities		
No	261	92.88
Yes	20	7.12
Kernicterus		
No	266	94.66
Yes	15	5.34
Tetanus		
No	271	96.44
Yes	10	3.56

Table 2: Causes of neonatal mortality.

Variable	AOR	Lower Limit 95%CI	Upper Limit 95% CI	P-value
Occupation				
Self-employed	1.110	0.445	2.767	0.823
Unemployed	0.577	0.217	1.535	0.271
Employed	1			
Acute Fetal distress				
Yes	2.670	1.333	5.346	0.006
No	1			
Number of ANC				
0	13.055	3.849	44.284	<0.001
<4	1.795	0.813	3.962	0.148
≥4	1			
Birth Weight(g)				
<2500	2.050	0.039	4.216	<0.001
>4000	2.0	1.002	3.435	0.010
2500-4000	1			
Duration of Labor				
Prolonged	1.158	0.406	3.302	0.784
Normal	1			
APGAR Score				
0-3	99.920	87.036	100.000	<0.001
4-6	5.164	1.768	15.082	0.003
7-10	1			

Table 3: Predictors of Neonatal mortality using multivariate analysis.

Discussion

This hospital-based retrospective cross-sectional study was aimed to determine the trend and determinants of neonatal mortality at the Buea and Limbe Regional Hospitals. With primary aim to add to existing knowledge and propose simple and feasible strategies to scale down on neonatal mortality in this region of the country after identifying some determinants.

We had a global neonatal mortality rate of 22.2%. This was similar to a study done by Mah, et al., in Yaounde [3]. Higher rates were noted in Kenya (31.5%) and Mali (33.2 %) [13,14]. These results reflect slight improvement in the services offered in this region of the country, with the creation of the neonatology services in Buea and Limbe, though a lot still must be done. This was in contrast to the low rate observed in the United State of American (Washington) 1.3% by Richter, et al. [15]. This could be explained by the fact that they have well equipped neonatal intensive care units and well-trained staffs. They also have a good health care system, where health is offered almost equitably to all, thus more pregnancies followed up properly. The trend of

neonatal mortality was constant between 2017-2019 and there was a slight increase of mortality between 2020 and 2021 this could be explained by the COVID-19 outbreak, this pandemic disrupted regular antenatal care (because of the fear of transmission), increased in the number of cases diagnosed with Small for Gestational Age. There was a decrease in the trend in 2022 and this can be because as the pandemic was gradually disappearing, the frequency of consultation and ANC visits were increasing thereby causing the drop in neonatal mortality.

Birth asphyxia was the most common cause of neonatal mortality in our setting with a rate of 53.4% this was similar to that recorded by Chowddury, et al., (44.9%) in 2010 in Bangladesh [16]. In contrast, our finding was higher than that obtained by Chacha, et al., in Tanzania (22.3%) from 2006-2015 and by Mah, et al., in Yaounde (16%) in 2014 that reported that asphyxia is the third cause of neonatal mortality [7,8,17]. This could be explained by the poor turnover of ANCs in this region due to cultural, socio-political reasons and late referrals. It could also be due to late diagnosis of the onset of perinatal asphyxia, thus warranting more training of personnel in this region.

After excluding confounders, Apgar less than 3 and less than 6 at fifth minute were the main determinants of neonatal mortality. This result is in line with that shown by many other studies done in different parts of Africa including Cameroon [10,18,19]. This could be explained by the fact that babies with low Apgar scores are at risk of developing hypoxic ischemic encephalopathy (that is a main complication of asphyxia) due to prolonged hypoxia to the brain. No ANC visit and less than < 4 ANC visits increased the risk of neonatal mortality by 13. These findings are in line with that shown by other authors [8,20,21]. This could be explained by inadequate follow up during pregnancy and failure to prevent, detect and manage maternal conditions during the pregnancy. Low birth weight (<2500g) and macrosomia (>4000g) were also statistically significant in favour neonatal mortality. Birth weight <2500g increased the risk of neonatal mortality by 2 [3,10,18]. This can be explained by the fact that these babies have immature systems pruning them to infections and other complications which could be reasons for death. Birth weight > 4000g increased the risk of neonatal mortality by 2. This can be explained by the fact that. Macrosomic babies are often born in the post term period. At post term, the placenta depreciates and leaves the baby wanting of nutrients hence leading to perinatal death. To add, macrosomic babies are prone to hypoglycaemia and other obstetric complications like cephalopelvic disproportion which could be the reasons for death.

Conclusion

The trend of neonatal mortality in the Southwest region of Cameroon has varied between 16.1% and 17.8% between the years 2017 to 2022, with perinatal asphyxia being the leading cause of neonatal mortality. Determinants of neonatal mortality cuts across antenatal, per-natal and postnatal factors which are all modifiable. To significantly reduce neonatal mortality, preventive measures towards these determinants need to be taken, such as information-education-communication, on the importance of antenatal care for early detection and appropriate management of high-risk pregnancies. Building capacity of health personnel to adequately manage high risk neonates with asphyxia, infections, prematurity and low birth weight is also a vital strategy to curb on neonatal mortality.

Conflict of Interest

The authors have no conflict of interest to declare.

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