

Pattern, Causes and Treatment Outcomes of Neonatal Admission in the Tamale Teaching Hospital

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Abstract

Background: The burden of neonatal morbidity and mortality remains a major health challenge, and contributes hugely to deaths among children under five years old, especially in developing countries.

Objective: This study established the pattern, causes and treatment outcomes of admitted babies at the neonatal intensive care unit of the Tamale Teaching Hospital.

Method: A retrospective health facility based study was conducted by reviewing available data covering the period January 2013 to December 2015.

Results: A total of 4409 cases were reviewed out of which demographic data were complete for 3973 cases. Males were dominant 54.0% (2146) compared to females 46.0% (1827). Admissions were significantly common ($\chi^2=457.3$, $P<0.001$) among neonates ≤ 2 days old 62.0% (2947). The commonest cause of neonatal admission was sepsis (29.2%), followed by prematurity/low birth weight (26.9%), birth asphyxia (16.2%) and congenital anomalies (7.1%). Majority 82.7% (3220) of the neonates were successfully treated and discharged. However, 16.0% (621) of the neonates expired before or during treatment, while 1.1% (42) were transferred and 0.3% (10) absconded. Neonatal deaths were commonly associated with prematurity/low birth weight (44.8%), birth asphyxia (24.6%), neonatal sepsis (13.5%), and congenital anomalies (6.8%).

Conclusion: The relatively high number of neonatal cases coupled with the mortality rate observed requires a holistic approach to pregnancy care from conception to delivery, aimed at reducing neonatal morbidity and mortality.

Keywords: Neonatal; Sepsis; Prematurity; Low birth weight

Introduction

Neonatal admission generally refers to the admission of newborns under 29 days old into a health facility for medical care. Because neonates are fragile and yet to develop competent immune system, they are prone to infections, and most of the illnesses they acquire usually require critical care, hence their admission to the neonatal intensive care units (NICUs). Neonatal infections may begin in-utero, early in labour or postpartum [1,2]. The causes of neonatal admissions are not limited to infections but also non-infectious causes including metabolic, genetic and developmental defects [3,4].

Factors influencing neonatal admissions include socio-cultural and behavioral effects such as illiteracy, socioeconomic deprivation, traditional beliefs, and foetal gender bias preferences of parents [5]. In addition, premature birth, and genetic defects such as G6PD deficiency, sickle cell anaemia, congenital heart defects and thalassaemias also contribute to neonatal admissions [6]. Furthermore,

infections caused by bacteria, viruses and fungi, contracted either during delivery, at health care facilities or at homes, have been reported as common aetiologies in neonatal morbidity [7,8]. The soaring rates of neonatal admissions pose an increasing medical, economic and social burden to parents, families and society, especially in developing countries where higher cases are recorded annually [9].

Globally, the prevalence of neonatal morbidity and mortality remain relatively high. An estimated 6.3 million under-five deaths occurred in 2013, and 44 percent, which translates into approximately 2.8 million of these deaths, were neonates [10]. The burden of neonatal mortality is huge in developing countries as approximately 98% of the global neonatal deaths occur in such areas [11]. Generally, there have been significant reductions in infant deaths and under five mortalities. However, the rates of reduction in neonatal deaths seem marginal in Sub-Sahara Africa (SSA) as 20 deaths per 1000 live birth occurred in 2013, compared to 33 deaths per 1000 live births in 1990 [12]. The huge contribution of neonatal deaths to under-five mortality may have hindered the aspiration of achieving the millennium development goal four which aimed at reducing under-five mortality by two-third at the

end of 2015 [13]. Even though the World Bank Report (2015) revealed that Ghana had a stable neonatal death rate of 30/1000 from 2010 to 2013, with a marginal decline to 29/1000 in 2014 [14], the rate is still on the high side, and further reduction is required to bring the rates to acceptable level.

Neonatal deaths are high in poverty stricken regions and the Northern Ghana is among the poorest regions in the country, hence the hypothesis that the region may have relatively high neonatal deaths. The reasons for this observation are multifaceted which include inadequate infrastructure for neonatal healthcare and limited obstetric and neonatal specialists care. Even though several policy interventions have been rolled out to curb under-five health complications, neonatal associated health problems still remain a major challenge, especially in resource poor communities. There is paucity of data regarding neonatal morbidity and death emanating from the regional and individual facility level that contribute to the national rate. Establishing the pattern, causes and outcomes of neonatal admissions in the Tamale Teaching Hospital will be essential in informing policy interventions aimed at reducing neonatal death in the region.

Methodology

Study area

The study was carried out at the neonatal intensive care unit of the Paediatrics Department of the Tamale Teaching hospital (TTH). The TTH is the only teaching hospital and the main referral hospital in the northern part of Ghana, located in Tamale, the capital of the northern region. The hospital provides various health care services to the people in the Northern, Upper East, Upper West regions and the northern parts of the Brong-Ahafo Region. The hospital also serves patients from neighbouring countries including La Cote D'ivoire, Burkina Faso and Togo. The hospital runs six clinical departments including the Paediatrics Department which attends to neonates and children up to 14 years old. The department is also involved in training medical students in paediatrics.

Age	Female	%	Male	%	Total	%	χ^2	p-value
≤ 2	1144	46.4	1320	53.6	2464	62.0	457.3	<0.001
≥ 3	683	45.3	826	54.7	1509	38.0		
Total	1827	46.0	2146	54.0	3973	100.0	0.5	0.494
Missing values=436								

Table 1: Age and gender distribution of neonatal admissions.

Causes of neonatal admissions

As indicated in Figure 1, diagnoses of neonatal cases were classified under 21 groups. Data for diagnoses were complete for 4222 out of 4409 admissions. The predominant cause of admission was neonatal sepsis (29.2%). Prematurity/Low birth weight, birth asphyxia and congenital anomalies were the next common causes of neonatal admission, recording 26.9%, 16.2%, and 7.1% respectively. Eye infections and post-term complications were the least frequent causes of neonatal admission recording 0.1% each.

Study design

This retrospective health facility-based study was conducted at the Neonatal Intensive Care Unit (NICU) of the Department of Paediatrics of the TTH. Available data starting from January 2013 to December, 2015 were reviewed, and data on sex, age, diagnosis, and treatment outcomes were manually extracted and entered into Microsoft excel template.

Data analysis

The data extracted were double entered to minimize data entry errors. Data cleaning and analysis were done using Microsoft Excel 2013 and Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics were used to compare frequencies of various variables.

Ethical approval

Ethical clearance for the study was obtained from the Ethical Review Committee of the research unit of the Tamale Teaching Hospital, Tamale. Permission to undertake the study at the facility was granted by the hospital management and the head of the Paediatrics Department.

Results

Age and gender distribution of neonatal admissions

Out of a total of 4409 admission recorded for the period under review, data for gender and age were complete for 3973 neonates. The dominant sex were males 54.0% (2146) and the remaining were females 46.0% (1827). Admissions were significantly common ($\chi^2=457.3$, $P<0.001$) among neonates within the age group ≤ 2 days 62.0% (2947) compared to those in the age group ≥ 3 day 38.0% (1114), as shown in Table 1.

Treatment outcomes of neonatal admissions

Treatment outcomes were completed for 3893 out of 4409 neonatal admission. Majority 82.7% (3220) of the neonates were successfully treated and discharged. However, 16.0% (621) of the neonates died before or during treatment. Forty-two neonates (1.1%) were either transferred to other wards or hospitals for further management, while 0.3% (10) were absconded by their parents (Figure 2).

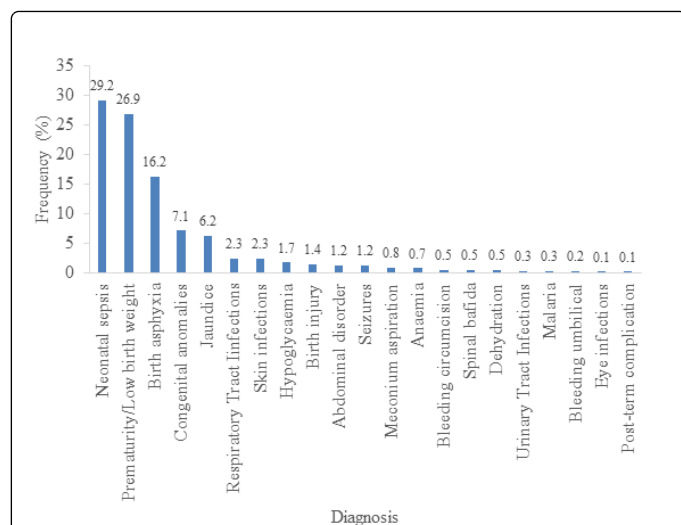


Figure 1: Causes of neonatal admissions.

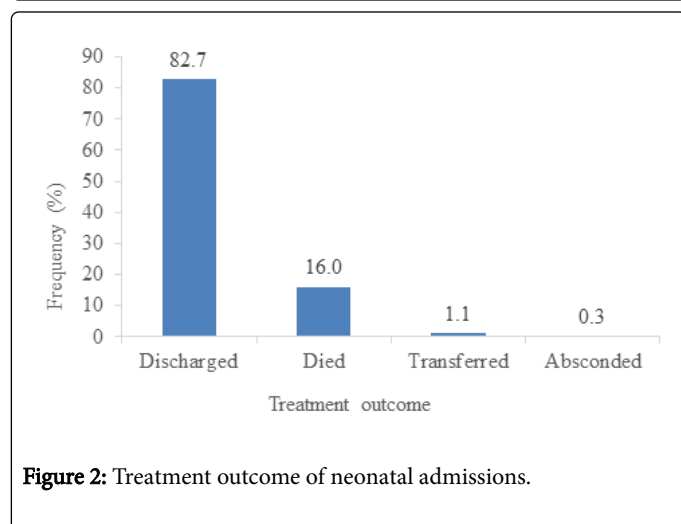


Figure 2: Treatment outcome of neonatal admissions.

Causes of neonatal deaths

Using the diagnoses made as the causes deaths, majority of the neonates 44.8% (278) died of Prematurity/Low birth weight. Birth asphyxia and neonatal sepsis were the next common causes of neonatal deaths, recording 24.6% (153) and 13.5% (84) respectively. The fourth common cause of neonatal death was congenital anomalies 7.6% (47). Neonatal deaths were less frequent with birth injury and skin infections (recording 0.3% each), bleeding circumcision and eye infections (recording 0.2% each) (Table 2).

Diagnosis	Death (N)	%
Prematurity/Low birth weight	278	44.8
Birth asphyxia	153	24.6
Neonatal sepsis	84	13.5
Congenital anomalies	47	7.6
Jaundice	17	2.7

Hypoglycaemia	8	1.3
Respiratory Tract Infections	8	1.3
Seizures	6	1.0
Anaemia	5	0.8
Meconium aspiration	5	0.8
Birth injury	2	0.3
Skin infections	2	0.3
Bleeding circumcision	1	0.2
Eye infections	1	0.2
Missing values	4	0.6
Total	621	100.0

Table 2: Causes of neonatal deaths.

Annual distribution of neonatal admissions

A total of 4409 admissions were recorded for the years under review (2013-2015). Neonatal admission was highest in the year 2013, recording 34.7% (1528), followed by the year 2014 and 2015 recording 32.9% (1452) and 32.4% (1429) admissions respectively. Generally, decreasing trend of neonatal admissions was observed during the period under review. Similarly, the yearly rates of neonatal deaths declined from 18.3% (280) in the year 2013 to 10.4% (149) in 2015 (Figure 3).

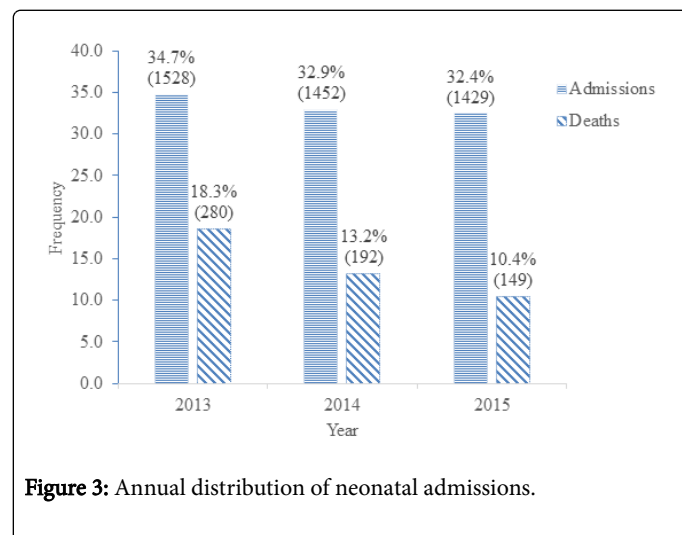


Figure 3: Annual distribution of neonatal admissions.

Discussion

This study assessed the pattern, causes and outcomes of neonatal admissions in the Tamale teaching Hospital of Ghana. The study revealed that more male neonates 54.0% were admitted compared to female neonates 46.0%, representing female to male ratio of 1:1.2. Some studies have reported similar observation [15,16], while others archived the contrary [17]. The preponderance of male neonates to suffer various conditions which usually result in admission cannot be explained by this study. However, this has been partly attributed to relatively well developed lungs in female neonates at the time of birth

compared to males, as surfactant markers such as lecithin, phosphatidylglycerol, and phosphatidylinositol appear much early in females than males [18]. In addition, a recent study has established the genetic influence in neonatal infection, revealing that x chromosome-linked diseases are predominant in males than females [19]. The present study revealed that almost a third (62.0%) of neonatal admissions occur within the first two days of life; an observation which has been reported by similar studies conducted elsewhere (Table 1) [20-22].

The causes of neonatal admissions as per the diagnoses were classified under 21 groups. The three predominant causes of neonatal admissions were neonatal sepsis (29.2%), prematurity/low birth weight (26.9%) and birth asphyxia (16.2%) (Figure 1). Studies conducted in other developing countries have reported similar findings [23,24]. Neonatal sepsis is a global problem and has no boundaries. The variation in neonatal sepsis (NNS) between developed and developing countries would be the degree of prevalence as higher prevalence rates are recorded in developing countries [25]. Even though this study could not reveal the common agents associated with NNS, previous studies have confirmed both Gram positive and Gram negative bacteria as frequent causes [26-28]. The sources of NNS are multifaceted and could be via vertical transmission, nosocomial, or community acquired [27].

Prematurity/Low birth weight (P/LBW) has been reported as a major cause of neonatal admission. Even though in this study, it was seen as the second common cause of neonatal admission, some studies have reported it as a lead cause [29]. The current study could not explain the causes of P/LBW. However, previous investigations have established multifactorial causes which include multiple births, age at conception, maternal health, genetic factors, and race. For instance, babies born to African-American mothers are more likely to be premature or underweight [30]. Also teen age mothers and mothers with a history of drugs and cigarette abuse, and alcoholism during pregnancy are more likely to have premature or underweight babies. In addition, mothers with low socio-economic status are usually predisposed to inadequate nutrition during pregnancy which subsequently results in premature or low birth weight [31].

Birth asphyxia was the third common condition frequently associated with neonatal admission. Globally, birth asphyxia plays a critical role in neonatal admission. In the developed world the prevalence of birth asphyxia per 1000 live births range between 2 to 30 cases [32,33]. Higher incidences have been reported in developing countries partly due to the level of quality of prenatal, perinatal, and obstetrics and gynaecological care in general [34,35]. The burden of neonatal asphyxia is huge, as it is responsible for over 42 million disabilities adjusted lives [22]. Approximately 23% and 8% of birth asphyxia associated deaths occur in neonates and children under the age five years old respectively [36]. The prevalence of birth asphyxia recorded in this study agrees with other finding in the sub-region [22,37].

An encouraging survival rate of over 82.7% was recorded, however, 16.0% death rate was noted (Figure 2). The death rate recorded in this study indicates that approximately 16 neonate die out of every 100 admitted neonates, which translates into 160 neonatal deaths per every 1000 neonatal admissions. These figures are on the high side when compared to the 29.30 neonatal death per 1000 live births in Ghana [14], and 31 neonatal deaths per 1000 live births in SSA [10,14]. The death rate observed in this study was lower than 25.85% reported by Mathews et al. [38], but higher than 6.8% and 14.87% revealed by Ali,

and Rahim et al., respectively [21,29]. Linking the number of deaths (621) to the diagnosis made in this study, it was observed that neonatal deaths were predominantly associated with P/LBW 44.8% (278), followed by birth asphyxia 24.6% (153), neonatal sepsis 13.5% (84), congenital anomalies 6.8% (42) and jaundice 2.7% (17). The preponderance of these conditions causing neonatal deaths has been reported [22,25]. The inference therefore is that eliminating these conditions among neonates will reduce neonatal deaths by close to 90%, thus resulting in a significant reduction in under five mortality. Obviously, the causes of these conditions are multifactorial and will need a multifaceted approach to curbing their contributions to neonatal deaths.

Generally, a marginal decline in neonatal admissions was observed over the period under review (Figure 3). Possibly, the expansion and improvement in the health system in Ghana in recent times have contributed to the reduction in neonatal admission in the TTH as other health facilities may be offering neonatal care services in the catchment area of the study. The marginal negative trajectory of neonatal admissions observed in the present study could suggest a scale up in prenatal, perinatal, and postnatal education among women, especially expectant mothers.

Conclusion

The study observed a marginal decline in the trend of neonatal admissions over the period reviewed. Male neonates dominated admissions compared to females. However, neonatal admissions were significantly associated with newborns ≤ 2 days old. Neonatal sepsis, prematurity/low birth weight, birth asphyxia, congenital anomalies and jaundice were the most common causes of neonatal admissions. However, neonatal deaths were associated with prematurity/low birth weight, birth asphyxia, neonatal sepsis, congenital anomalies and jaundice in a declining chronology. Even though the survival rate of admitted neonates was appreciably high, the death rate of 16.0% observed requires a scale up of efforts geared toward reducing neonatal morbidities and mortalities to acceptable limits. As in most developing countries, diagnoses of the neonates were mainly by clinical observation with no laboratory support. Also, the causes of neonatal deaths were by clinical features with no confirmation by postmortem. These admittedly, present some limitations to the study.

Competing Interest

The authors declare that they have no competing interests.

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