

## Data Article

# Examining the Causes of Neonatal Mortalities in the Tamale Metropolis

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### ABSTRACT

**Background:** Neonatal Mortality is the death of a child within the first 28 days of life. It accounts for most of the under-five deaths but has not been given serious attention by academics, especially in the Tamale Metropolitan area. As a result, very little is known about its cause and the calibre of women most affected.

**Aim:** This study focuses on cause of neonatal mortality in the three major hospitals in Tamale.

**Materials and Methods:** The study involved 282 women who have suffered from neonatal deaths using hospital records to identify them. The study also includes 21 health workers from these facilities. Data was collected using interviews and questionnaires and review of records.

**Results:** The study found that from 2012 to 2016 there has been a downward trend in both neonatal deaths and neonatal death rate. This trend was observed in all three major hospitals. The study found that the majority (70.8%) of women had normal gestational periods, while nearly 50% (49.7%) of the babies cried immediately after birth.

**Conclusion:** The study concludes that improved medical health care services, encouraging regular attendance of antenatal clinics and improving the mothers' diet could be responsible for the decrease.

*Keywords: Neonatal mortality, Mother, Child, Gestational Period at birth, Tamale Metropolis.*

### 1. INTRODUCTION

The neonatal period is the period of the first 28 days of life and it is the most crucial time for a child's survival. Blencowe et al [1] explained neonatal death as the death of a live birth baby in the first 28 days of life. Coalition of NGOs, UNICEF, WHO and World Bank [2] established that, globally neonatal mortality rate fell from 36 deaths per 1000 live births in 1990 to 19 in 2015 and the number of neonatal deaths declined from 5.1 million in 1990 to 2.7 million in 2015. Globally, the mean annual rate of reduction in neonatal mortality rates was 2.6 percent from 1990 to 2020 [3]. However, [4] revealed that globally, under-five mortality rate is declining but the proportions of neonatal deaths are still high. It is estimated that about 2.96 million infants worldwide die each year during the neonatal period and about 98% of these deaths occur in low and middle-income countries with the highest proportions occurring in Sub-Saharan Africa and south-east Asia [5]. There has been an invariable decline in neonatal deaths in Ghana between 1998 and 2017 but at a slower rate which has made the neonatal death rate moderately stagnant. For example, neonatal deaths reduced from 30 per 1000 live births in 1998 to 25 per 1000 live births in 2017 [6]. There was a descending trend in neonatal mortality over 5-year period between 2013 to 2017 [7].

The risk of neonatal deaths globally included; Previous neonatal death, urban dwellers and undesirable sources of drinking water [8]. Selemeni et al. [9] elicited the risk of neonatal death in Africa to be higher among male newborns than the female counterpart due to higher mean birth weight in males as compared to females which leads to more difficult births, asphyxia and birth trauma which are the leading causes of neonatal deaths. Freen et al. [10] revealed that newborns that experienced danger signs after delivery were two times more likely to die compared to those who never experienced any danger signs. Ghana Health Service [11] attested that most neonatal deaths occur as a result of factors such as inadequate equipment to diagnose sick newborns present with non-specific signs and symptoms, delay in care-seeking by the family, and lack of access to appropriately trained health workers, high cost of treatment. Determinants of neonatal deaths in Ghana include multiple births, household size, parity, contraceptives use, birth weight, and population density [6]. The predictors of early neonatal death for Normal Birth Weight Babies in Tamale Metropolis include gender, being born at Tamale Teaching Hospital and Birth Asphyxia while Low Birth Weight are the place of delivery and Birth Asphyxia [7].

Siakwa et al. [4] stated the global three top causes of neonatal deaths as birth asphyxia (41%) infection (29%), preterm (29%) and prematurity and Low Birth Weight (15%). UNICEF [2] extrapolated that neonatal mortality reduced by 4 per cent between 1990 and 2015 from 36 to 19 deaths per 1000 live births and dropped from 5.1 to 2.7 million over the same period. Causes of neonatal deaths in Africa included; Preterm birth, intrapartum related complications such as Birth Asphyxia, infections and birth defects [12]. Annan and Asiedu [13] indicated the primary causes of newborn deaths as Infection (32%), Asphyxia (23%), prematurity and Low Birth Weight (27%). However, Dare et al. [14] indicated the leading causes of neonatal deaths in Ghana as Infection, Asphyxia and prematurity/LBW. The leading causes of neonatal deaths in the Tamale Metropolis were preterm birth complications (49.6%), Birth Asphyxia (21.7%), neonatal infections (14.6%) and congenital anomalies (8.2%) [7].

Despite a number of scholarly research on neonatal death and its consequences to the mother and family. However, in the Tamale metropolis, studies on the causes of neonatal mortality are limited. This study, therefore, attempts to address the following questions: i) what are the neonatal deaths and gestational ages at birth in the Tamale Metropolis?, ii) Does the length of stay at the facility after birth have an impact on neonatal death?, iii) what is the relationship between neonatal deaths and the ages of babies?, and finally, iv) what are the current causes of neonatal deaths in Tamale Metropolis?

## 2. METHODOLOGY

This paper is part of a larger study conducted in the Tamale Metropolitan area and covered three major hospitals. This paper uses the quantitative data aspect to examine the causes of neonatal mortality in the Tamale Metropolis. This section discusses the study design, the study population, sampling techniques, and data collection processes.

### 2.1 Study Design

This was a cross-sectional study carried out from May 2017 to May 2018. A Mixed-method approach was used; associating both qualitative and quantitative forms of research to enhance the quality of the study [15]. This method was employed because it provides a better understanding of the research problem than one approach. This approach was also used because not much has been done on the research topic. It further enabled the researcher to gain wider views/perspectives of the study. The primary method guided the study while the secondary database provided a supporting role in the procedures. Data was mixed by integrating the information and comparing one data source with the other during the analysis and discussion of the results.

Secondary data was used to examine the trend of neonatal mortality and to assist the researcher to understand the pattern of neonatal deaths for the previous five years at the Metropolis and also offered the opportunity for future neonatal deaths to be projected.

### 2.2 Study Population and Sample Size

The study population was women who have lost their babies within five years and six months. Mothers who lost their babies within five years were interviewed with a structured questionnaire while mothers who lost their babies within six months and currently experiencing the effect of neonatal deaths were interviewed with an interview guide to explore more on the subject matter.

From the above, the study covered a sample size of 384 mothers who lost their babies in the Tamale Metropolis. Two sample sizes were determined, one for the quantitative study and the other for mothers who lost their babies within five years using Nsowah, 2005 mathematical formula, and the other hand qualitative study sample size was determined by data saturation principle.

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### 2.3 Sampling Technique

For the quantitative aspect of the study, the non-probability sampling technique, convenience sampling was used to select the three major health facilities in the Tamale Metropolis of the Northern region. These hospitals were Tamale Central, Tamale West and Tamale SDA. The sample size of 384 was divided by three to get the sample size for each hospital which was 128. Convenience sampling was also done at each hospital to select respondents.

For the qualitative phase, three mothers who lost their babies within six months in each of the three hospitals making nine mothers were purposefully selected to conduct in-depth interviews on the subject matter as key informants.

### 2.4 Data Collection Instruments

Questionnaires and interview guides were the data collection tools used in the study.

#### 2.4.1 Questionnaire

A structured questionnaire was used to solicit information from mothers who lost their babies within five years. This method was used because it identified the relationship between the data and the unknown in the universe.

### 2.5 Data Collection Procedures

For the quantitative aspect of the study, Data was collected using an interviewer-administered structured questionnaire which was administered by the principal investigator with the help of four research assistants after respondents signed a consent form. In each of the selected hospitals, the purpose of the study was explained to participants and consent from each participant was sought before questionnaires were administered and in-depth interviews were conducted. The interview lasted 30minutes. Dagbani and English languages were used since the majority of the respondents understood Dagbani and could speak or understand English. Audio recordings and note-taking were done by the principal investigator to collect detailed information from the respondents.

### 2.6 Data Analysis and Presentation

Data captured in the questionnaire were checked for completeness and entered into a Microsoft Excel program where data cleaning was done and then exported to a computer software Statistical Package for Social Science (SPSS) version 20.0 where all analyses were done. Descriptive analysis was done to simplify the large amount of data obtained. Univariate analysis was done to examine across cases of one variable at a time where three major characteristics of a single variable were looked at in the form of distribution using percentages and frequencies for all variables and data presented in tables and charts while central tendency in the form of mean, median and standard deviation was computed for a continuous variable age.

In the qualitative study, data was analyzed manually based on the objectives which represented the themes of the study. In this analysis, the interest was to look at how individual research participants responded to each question within the schedule. Interviews were recorded and transcribed verbatim. Transcriptions were carefully read and double-checked for accuracy.

Manual coding of the data was done systematically to ensure that all data are coded and collated.

### 2.7 Ethical Issues

Mbabe, et al. [16] established that ethical clearances are necessary for most research studies that involve humans, animals and the environment. Ethical approval was granted from Tamale Regional and Metropolitan Health Directorates as well as necessary guidance is given to the researcher to conduct the study in the Metropolis. Confidentiality, respect for persons, non-maleficence and beneficence were the main ethical principles considered during the research study.

## 3. RESULTS AND DISCUSSION

### 3.1 Causes of Neonatal Deaths in the Tamale Metropolis

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This section focuses on the causes of neonatal deaths in Tamale Metropolis using evidence from both primary data obtained from mothers and secondary data from the records of the three major health facilities in the Tamale Metropolis. The study establishes neonatal deaths resulting from the health of babies after delivery, diagnosis, age, sex, gestational age and length of stay in the health facilities while the secondary data included a five-year analysis of neonatal deaths in the three major health facilities in the Tamale Metropolis in absolute figures and rates.

The paper found that mothers who lost their babies within five years of their babies' diagnosis indicated that, 49.7% of the mothers had their babies cried immediately after birth without any interventions by midwives 42.4% had their babies cried after intervention by health professionals while 7.8% babies were hospitalized right after birth. Of mothers whose babies died within six months, seven of them indicated their babies were hospitalized immediately after delivery while two of them said their babies were admitted three days after discharge.

The findings further show that 43.5% of babies suffered birth asphyxia, 30.4% of babies suffered sepsis, 11.0% of mothers had their babies suffered from prematurity, and 10.5% did not know the diagnosis of their babies, 4.7% of mothers who indicated that their babies suffered from jaundice. The nine mothers who were key informants admitted that their babies died of birth asphyxia with the explanation that their babies did not cry after birth.

The study findings on the sex of babies evaluated that a greater number of babies 63.4% were males while 36.6% of babies were females. With regards to the mothers who lost their babies within six months, eight of them admitted their babies were males while one baby was a female.

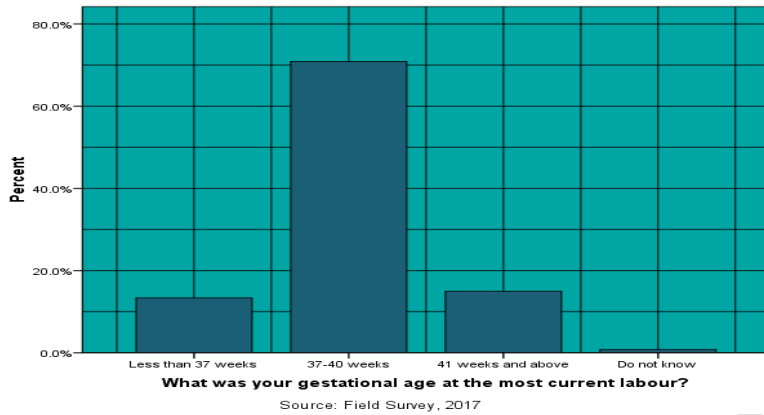
**Table 1. Health of babies at birth, diagnosis and sex of babies' health**

Sex	Frequency	Percentage (%)
Male	244	63.6
Female	140	36.4
Total	382	100.0
Health of babies after delivery	Frequency	Percentage
Baby cries immediately after birth	191	49.7
Intervention before baby cry	163	42.4
The baby was hospitalized immediately	30	7.8
Total	384	100.0
Diagnosis	Frequency	Percentage (%)
Birth Asphyxia	166	43.5
Sepsis	116	30.4
Prematurity	42	11.0
Jaundice	18	4.7
Do not know	40	10.5
Total	382	100.0

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### 3.2 Neonatal Deaths by Gestational Period at Birth

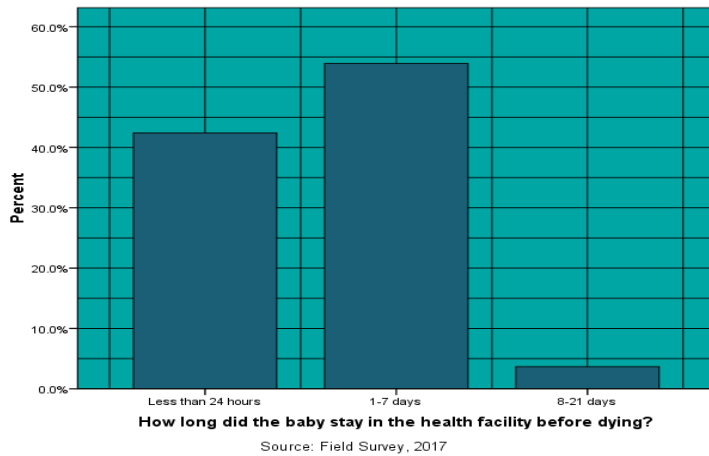
On the part of gestational age at labour, the findings indicated that the majority of the mothers (70.8%) said their pregnancies were within 37-40 weeks gestation, 15.1% of mothers' pregnancies were 41 weeks and above, 13.3% of mothers pregnancies were less than 37weeks while 0.8% did not know about their gestational ages. Figure 1 illustrates that findings from mothers who were bereaved within six months on the part of gestational age stipulated that all the nine mothers delivered their babies at nine months.



**Figure-1. Gestational ages at time of delivery**

### 3.3 Neonatal Deaths by Length of Stay at the Facility

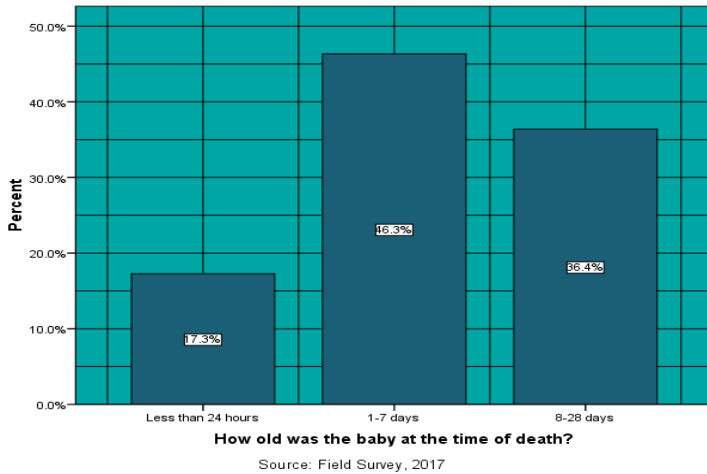
The study found that, 53.9% of the mothers interviewed stated that their babies stayed in the ward between 1-7 days, 42.4% of babies stayed in the facility less than 24hours before death while 3.6% of babies stayed within 8-21days before death. Again on the part of mothers who lost their babies within six months, all the nine mothers admitted that their babies stayed in the health facilities for 1-7 days before they died. This is shown in Figure-2.



**Figure 2. Length of stay of babies in the health facilities**

### 3.4 Neonatal Deaths by Ages of Babies

The study findings show that 46.4% of the mothers interviewed had their babies ages within 1-7days, 36 of the babies were within 8-28days while 17.2% testified that their babies were less than 24hours as indicated in Figure 4.8. Furthermore, all the nine mothers who lost their babies within six months said their babies were within the age group of 1-7 days.

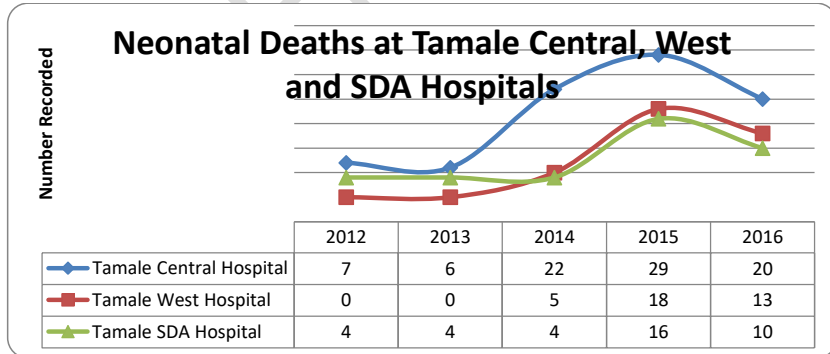


**Figure 3.** Ages of babies

The study presents the estimates of neonatal mortalities from 2012 to 2016. Trends of neonatal mortality were analyzed using two indicators neonatal mortality rate and the absolute number of neonatal deaths. The two indicators measure complementary information. The neonatal mortality rate is an indication of the risk of newborn deaths per 1000 live births across facilities and within the Metropolis. Both indicators are needed by public health programs to comprehend the scope of newborn deaths. The secondary data on neonatal deaths were obtained from daily returns within the three major health facilities and monthly and yearly returns from the hospital and sub-districts centers to the Metropolis.

### 3.5 Trend of Neonatal Deaths in the Tamale Metropolis

Data obtained from the three major health facilities in the Tamale Metropolis, Tamale Central Hospital indicate seven (7) deaths in 2012 which decreased by one to 6 in 2013 as the lowest deaths but sharply increased to 22 deaths in 2014 and again increased to 29 deaths in 2015 as the highest deaths. This sharply decreased to 20 deaths in 2016. Tamale West Hospital recorded no deaths in 2012 and 2013 but recorded 5 deaths in 2014 as the lowest deaths which increased to 18 deaths in 2015 as the highest deaths but gradually reduced to 13 in 2016. Tamale SDA Hospital also recorded 4 deaths in 2012, 2013 and 2014 each but increased sharply to 16 deaths in 2015 but gradually decreased to 10 in 2016. The hospital recorded its highest neonatal deaths in 2015 and the lowest deaths in 2012, 2013 and 2014. These trends are shown in figure 4.9 elucidates other details.



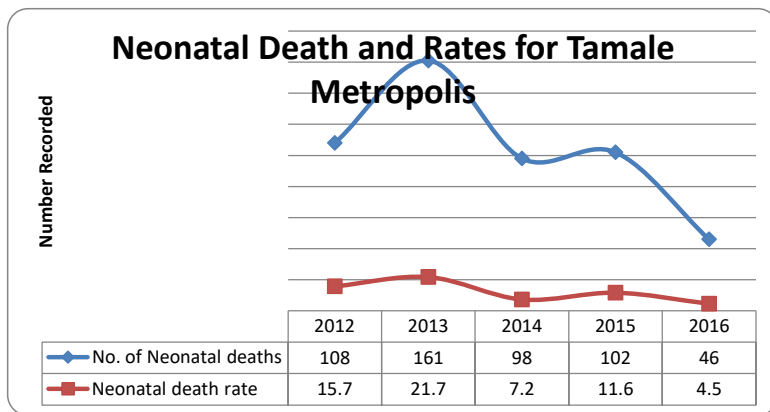
**Figure 4.** Trend of neonatal deaths in the three major hospitals (Tamale Central, Tamale West and Tamale SDA hospitals) in the Tamale Metropolis

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From the data, it is clear that Tamale Metropolis recorded neonatal deaths of 108 in 2012 with a death rate of 15.7 which sharply increased to 161 in 2013 with a death rate of 21.7 but decreased to 98 in 2014 with a death rate of 7.2 and increased again to 102 deaths in 2015 with a death rate of 11.6 and sharply decreased to 46 deaths in 2016 with a death rate of 4.5. The Metropolis had its highest neonatal deaths recorded in 2013 and its lowest deaths in 2014. Figure 4.10 illustrates more details of the trends of neonatal deaths in the Tamale Metropolis.

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**Figure 5.** Trend analysis of the Tamale Metropolis at large

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#### 4. DISCUSSIONS

##### 4.1 Causes of Neonatal Mortality

The data presented above was analysed in two categories; the first one was interviews with mothers and hospital staff and the second category was data from the hospital records. The first set of data focused on specific causes of neonatal mortality, while the second category presented the absolute figures of neonatal mortality generally for five years period.

Findings explicated that 63.4% of mothers said their babies were males and died of Birth Asphyxia. This shows that males are more vulnerable to neonatal deaths due to their anatomical and physiological makeup if all things are equal. This finding is consistent with a study carried out in [17] that disclosed that infant mortality is higher among boys than girls in most of the world due to the differences in genetic and biological make-up with boys more susceptible to death. This is also similar to [8] findings that elicited the risk of neonatal death to be higher among male newborns than female counterparts due to higher mean birth weight in males as compared to females which leads to more difficult births, more asphyxia and birth trauma in males as compared to females.

Findings also reported that the majority of babies died within the age group of 1-7 days. This is consistent with [18] which demonstrated that 50 % of neonatal deaths occur within the first 24 hours of birth and 75% of deaths take place by the end of the first week.

The study also found that the majority of the babies who died cried only after the intervention was carried out by health personnel; this is a sign of birth asphyxia and a danger sign for that matter. This is in line with Kananura et.al.[10] who revealed that newborns that experienced danger signs after delivery were two times more likely to die compared to those who never experienced any danger signs.

The findings again stipulated that Birth Asphyxia and sepsis are the major causes of neonatal deaths in the Tamale Metropolis. This is consistent with [8], in their study in the Tamale Metropolis that indicated Birth Asphyxia and neonatal infection as the major causes of neonatal deaths but contradicts [6] in their studies which indicated that almost all the deaths that occurred were as a result of birth asphyxia occurring in the first week of life, 70% of them occurring within the first 24 hours. Three-fourth of death were due to prematurity with 78.8% occurring in the first week of life, 30% occurring in the first 24 hours while less than 50% of neonatal deaths were secondary to sepsis occurring in the first week of life. Additionally, their findings contradict [19] whose study argued that Birth Asphyxia is the third leading cause of neonatal deaths after preterm and sepsis. This is also contrary to [19] report which stated the primary causes of neonatal death as: Infection (31%) and preterm birth complications (29%). Findings further elicited that babies who died in the Tamale Metropolis stayed in the health facility between 1 to 7 days as 53.9% of the babies died in the hospitals within the days of 1 to 7. This may be because babies are not able to adjust and adapt to the new environment they find themselves.

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The trend analysis from the secondary data compiled from the three main hospitals in the Tamale Metropolis and the Metropolis at large informed that neonatal deaths in the Metropolis are inconsistent from 2012 to 2016. This was attributed to multiple factors such as unstable resources to acquire and sustain newborn care logistics, instruments and trained health care professionals on advanced newborn care. This is consistent with Siakwa. et. al., [6] work on pregnancy outcomes in Cape Coast, Ghana, which established that the trend of neonatal deaths in Ghana varies by region because of differences in cultural practices, availability of medical resources and other social determinants. However, the findings is similar to [18] which attested that most neonatal deaths occur as a result of factors such as inadequate equipment to diagnose sick newborns who present with non-specific signs and symptoms, delay in care-seeking by the family, lack of access to appropriately trained health workers and high cost of treatment.

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## 5. CONCLUSION

Neonatal mortality is on the decrease since 2012 in the Tamale Metropolis. Nearly 50% of children cried immediately after birth indicating that they are healthy. The majority of the women (70.8%) delivered at a normal gestational period, while those born prematurely were given serious medical attention.

## ETHICAL APPROVAL

Ethical clearance was given for this study.

## COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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