Assessing Neonatal Mortality rates and its determinants in two health facilities in Bosaso, Puntland State of Somalia.

Promoting newborns survival means promoting a sense of humanity

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ABBREVIATIONS

-ANC	Antennal Care
-BQGH	Bender Qasim General Hospital
-EAUERB	East Africa University Ethical Review Board
-GHO	Global health observation
-KMC	kangaroo Mother Care
-LBW	Low Birth Weight
-HBV	Hepatitis B virus
-NMR	Neonatal mortality rate
-NRDS	Neonatal Respiratory Distress Syndrome
-MCH	Mother and child health
-MDGs	Millennium Development Goals
-WHO	World health organization
-UNICEF	United Nations International Children's Emergency Fund
-UNFPA	United Nations Population Fund
-STD	Sexually transmitted diseases
-SDGs	Sustainable Development Goals
-UTI	Urinary tract infection

ABSTRACT

Background

Child mortality is a core indicator of the social development and health conditions of a country. 5.6 Million Children under age five died in 2016, 15 000 every day. Somalia is among the countries with highest Under-five mortality rates the estimate of overall child death in 2016 was 133/1000 live births were infant mortality accounts 83/1000 live births and neonatal mortality rate of, 39/1000 live births.

Objective: The objective was to assess the neonatal mortality rate and its determinants in two health facility in Bosaso, Puntland State of Somalia.

Methods

This was a descriptive/cross sectional study conducted in two study sites one of which is Bender Qasim General Hospital a referral hospital of Bosaso and the second site which is Boqolka Bush MCH Bosaso Puntland State of Somalia. The study was conducted between Marchs to June 2017. A total of 204 mothers has been reached whom gave live birth to 207 children, were interviewed using a standard structured questionnaire. Neonatal deaths were classified as either early or late.

Results

The neonatal mortality rate was 67.6/1000 live births, 14 out of 207 live births, of which 13 (93%) occurred within 0-7 days considered early neonatal deaths while one case (7 %) neonatal death occurred day nine which is late neonatal death. Prematurity and birth asphyxia caused 6 (43%) of the neonatal deaths each. The remaining two (14%) of the neonatal deaths was caused by neonatal infections.

Conclusions

The high rate of neonatal mortality observed in this study suggests potential for prevention. Proper resuscitation and call for adequate accommodation of quality of care in neonatal intensive care unit was recommended.

Keywords

Neonatal mortality, Prematurity, Low birth weight, and birth asphyxia

INTRODUCTION

Background

Neonatal mortality and Its Determinants

World health organization (WHO) defines neonatal death as death of a child during the first 28 days of life, whereas neonatal mortality rate (NMR) as the number of neonatal deaths per 1000 live births.
In 2016 an estimated 5.6 million children under age five died among them 2.6 million (46 per cent) died in the first month of life, i.e. 15 000 every day, and whom 7000 (46%) were neonatal deaths.

Under-five mortality rate is highest in low-income countries that was reported 76.5 deaths per 1000 live births, almost 8 times higher than that in European Region (9.6 per 1000 live births). Many countries still have very high under-five mortality – particularly those in African Region, home to 5 of the 6 countries with an under-five mortality rate above 100 deaths per 1000 live births reported (1)
Globally, the neonatal mortality rate fell from 36 deaths per 1,000 live births in 1990 to 19 in 2015 - but the decline has been slower than that of post-neonatal under-five mortality (2).

The report notes that the biggest challenge remains in the period at or around birth. A massive 45% of under-five deaths occur in the neonatal period of the first 28 days of life.

The leading causes of death in children under 5 years are preterm birth complications, pneumonia, birth asphyxia, diarrhea and malaria. Malnutrition is the underlying contributing factor, making children more vulnerable to severe diseases (3).

"To prevent unnecessary newborn mortality. Quality care around the time of childbirth including simple affordable steps like ensuring early skin-to-skin contact, exclusive breastfeeding and extra care for small and sick babies can save thousands of lives every year*"*(4).

Reducing these inequities across countries and saving more children's lives by ending preventable child deaths are important priorities.

The neonatal period carries the highest risk of mortality per day than any other period during the childhood. The daily risk of mortality in the first 4 weeks of life is ~30 fold higher than the post-neonatal period, that is, from 1 month to 59 months of age (5).

In international public health policy and programs, neonatal deaths still do not receive sufficient attention in comparison with its burden (6)

As reported in 2016 alone, 7,000 newborns died every day. Newborn deaths made up 46 per cent of all child deaths, an increase from 41 per cent in 2000 (7). Somalia ranks the third after Pakistan and Afghanistan among the top ten list were neonatal mortality rate ranges 46/1000 live birth in Pakistan, 40/1000 live births in Afghanistan 39/1000 live births in Somalia dead in first year in 2016.
But these children are also dying because of who they are and the environment they were born into whether it be an impoverished family, a marginalized community or a country consumed by conflict a new report from (8). Which means the countries living with poverty and political unrest exhibit higher child mortality rate than other countries

Among the sustainable development goals (SDG) regions, neonatal mortality was highest in sub-Saharan Africa and Southern Asia, which each reported 28 deaths per 1,000 live births. Marked disparities in neonatal mortality exist across regions and countries. A child in sub-Saharan Africa or in Southern Asia is nine times more likely to die in the first month than a child in a high-income country. Across countries, neonatal mortality rates ranged from 46 deaths per 1000 live births in Pakistan to 1/1000 live births each in Iceland and Japan (7-9).

The burden of neonatal deaths is also unevenly distributed across regions and countries. Two regions account for almost 80 per cent of the newborn deaths in 2016 – Southern Asia accounted for 39 per cent of all such deaths and sub-Saharan Africa accounted for 38 per cent. At the country level, half of all neonatal deaths are concentrated in five countries, namely, India (24 per cent), Pakistan (10 per cent), Nigeria (9 per cent), the Democratic Republic of the Congo (4 per cent) and Ethiopia (3 per cent). India and Pakistan alone accounted for about a third of all newborn deaths (7-10).

Overview of health situation in Somalia

The health system has been extensively damaged as a resulted of long standing civil war and weak governance that took 28 years. However, this lead disruption of health infrastructure. The loss of governmental health system in Somalia has been encouraged the private hospitals and clinics to serve the Somali population. Though there are large number of government operated health centers yet these services are in sufficient to meet to cope the population need with greater neglect on mother and child health facilities.

Children and women face more health challenges in Somalia than in almost any other country in the world. The under-five mortality rate (U5MR) of 137 per 1,000 live births is presently the third worst in the world after Angola and Chad (11).Neonatal deaths (those in the first 28 days of life) occur at a higher rate in Somalia than in any other country apart from Angola and Central African Republic.

The under-five mortality rate (U5MR) in Somalia is presently the third worst in the world after Angola and Chad (11). One in seven Somali children die before their fifth birthday. Furthermore, child death rates in Somalia have been reduced much more slowly over the whole Millennium Development Goals (MDG) period (1990- 2015).

In urban population based cohort study conducted in Pakistan in 2009 displayed the neonatal mortality rate of 47.3/1000 live births and preterm complications were among the highest risk factor (12*)*.According to rural community based study carried out in Eastern Uganda shows that neonatal mortality rate in three districts ranges between 30-34/1000 live births (13*).*
The major causes of neonatal deaths in Uganda like in other Sub Saharan African countries include; sepsis/pneumonia, tetanus, diarrhea, prematurity, and birth asphyxia (13). In Uganda, underlying causes of death were related to poor access and low utilization of health services during pregnancy and childbirth. As a result more newborn deaths occur at home among the poor rural communities (14).

In Nigeria evidence from demographic and health survey indicates that the NMR for singleton live-born infants between 2003 and 2008 was 40 deaths per 1000 live births. In 2008 NMR was 37/1000 live births However other report from the 2013 NDHS indicated that the NMR

slightly fell by approximately 8% from 40 deaths per 1000 live births in 2008 to 37 in 2013 (15).

In Zambia general population based study on factors associated with neonatal mortality shows that neonatal mortality was 34 per 1000 live births and one of the primary cause of death was birth weight (16). In another study conducted in Zambia, there were 32 neonatal deaths observed, and 84 percent of these occurred within the first week of life, primarily because of infections and prematurity (15).

Prospective rural based study conducted in Burkina Faso shows that Neonatal mortality rate of 46.3/1000 live births which revealed that it is the rarest study in that country. The probable causes of neonatal mortality in Burkina Faso were preterm birth and infections **(**17).

A registry based cohort conducted in Tanzania shows the cause of specific neonatal mortality was birth asphyxia and prematurity (18).

A house hold survey in neonatal mortality has been conducted in Sudan which revealed that neonatal mortality rate was 34/1000 live births in 2010 the direct leading causes of neonatal mortality was not clear in this study however the associated risk factor include advanced maternal age and poverty (19).

Problem statement

Child mortality is a core indicator of the social development and health conditions of a country. In preparing child-mortality-reduction strategies it is important for countries to know the magnitude of neonatal mortality in order to assess needs and develop programs that will reduce avoidable child deaths reasonably. However national indicators of the health of mother's and newborn infants are often not readily available, especially in countries that lack vital registration systems like Somalia.

Somalia has experienced a long standing civil war over 28 years and that had major impact in disruption of all existing sectors. The health infrastructure is very weak and limited throughout the country. Currently there is an opportunity sign of peace and stability restoration of Somali

federal state Government. However due to the 28 years of civil war and insecurity in Somalia the number of studies in health sector has been diminished and there is less health researches published. Since there is no evidence to emphasize the magnitude of neonatal mortality and no study has been carried out to investigate neonatal mortality in two study health facilities in Bosaso, Puntland State and Somalia at large.

Rationale for the study

The greatest gap in newborn survival is often during the critical first week of life when most neonatal and maternal deaths often occur at home and without any contact with the formal health sector. Some unacceptable practices such as unskilled birth attendants during delivery, unhygienic delivery practices, taboos and superstitions associated with caring of the newborn, which greatly affect newborn survival in the rural and urban regions of Somalia. This study therefore, sought to identify the magnitude of neonatal mortality and to find out the preventable determinants that cause neonatal deaths and to provide inputs into developing feasible and sustainable community-based interventions to improve neonatal survival in the region.

Justification of the study

UNICEF (2015) data shows that little progress has been made in reduction of neonatal mortality between 1990_2016 from 1990 45/1000 to 39/1000 in Somalia.

In order to improve the situation it is very important to review up to the date literature, to get clues about the magnitude of neonatal mortality and associated factors and learn from evidence based practice in the study health facilities in Bosaso Puntland Somalia.

Since there is no evidence to emphasize the truth of neonatal mortality and unavailability of previous studies regarding the situation of neonatal health and survival in Bosaso, Puntland State and Somalia at large.

This research will be valuable to expose public health gaps that need to be addressed.

General Objective

The main objective of this thesis was to assess the neonatal mortality rate and its determinant in two health facilities from March to June 2017 in Bosaso, Puntland State of Somalia.

Specific objectives

To assess neonatal mortality rate in two study health facilities in Bosaso district.

To determine the causes of neonatal mortality in two study health facilities in Bosaso, Puntland State of Somalia.

Research Question

What is neonatal mortality rate in two health facilities in Bosaso Puntland State of Somalia?
What are the determinants of neonatal mortality in the study health facilities in Bosaso Puntland State of Somalia?

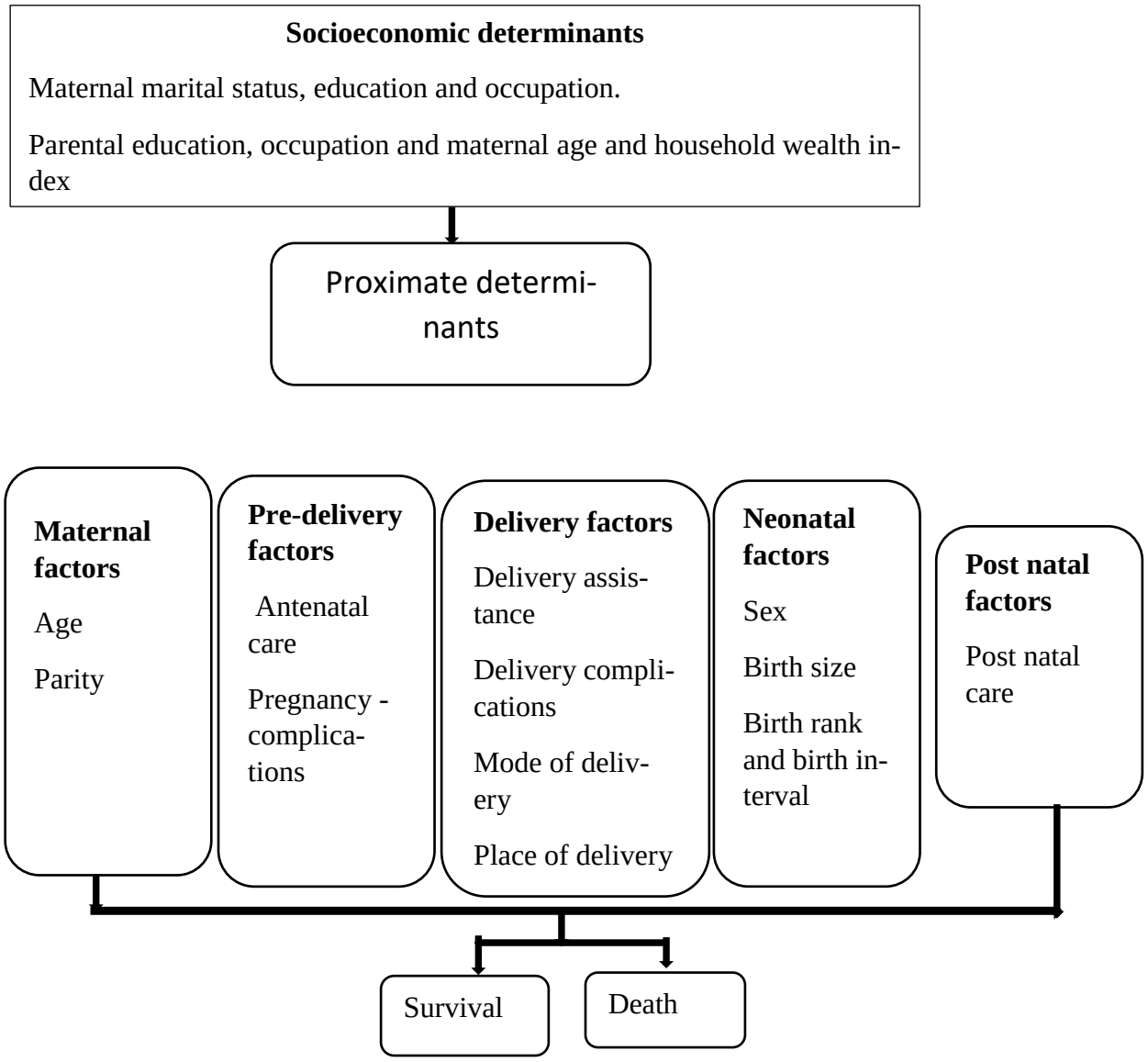
Materials and Method

Study design and Sample size

The simple quantitative descriptive cross sectional study design was adopted in which two study health facility sites were selected.

Primary data was obtained from two health facilities using standard questionnaire based on variables shown in (figure1). Detailed information were collected from mothers delivered at Bender Qasim General hospital and Boqolka bush MCH with in 24hours of delivery based on maternal socio-demographic and, heath status, number of pregnancy situations and neonatal conditions and follow-up history, episodes of morbidity and mortality of the neonates etc.

Modified Mosley Chen framework proximate determinants of child survival



For this study, data were obtained from the Women's Questionnaire (aged 14-40 years), which included information on demographic characteristics, and then details of births within the three months preceding history of antenatal care, delivery assistance, and mode and place of delivery for births.

Figure1

Conceptual framework for factors influencing neonatal mortality.

Conceptual framework

A previously designed conceptual framework for the study of child survival in developing countries (20). Was adopted and slightly modified based on the available data from the questionnaire.

The sample size selection depends on many factors including feasibility and reliability. However high mobility of families has occurred due to seasonal high temperature particularly starting from April to September reaching 35-45℃ during data collection we reached 204 newly delivered mothers in two selected health facility one of which is referral hospital and other health facility whom delivered total 207 neonates. This indicates that sample size was quite enough to find neonatal mortality rate and of neonatal mortality rate within three months period.

Study Area and Setting

Bosaso, Puntland state of Somalia. Bosaso is situated the North Eastern of Somalia on the Gulf of Aden. It is one of oldest city and the biggest city in Puntland State of Somalia. The city has newly constructed International airport and a big harbor. It is inhabited almost 750,000 population experiencing a rapid growth. A high number of this population is internal displaced people who fled from conflicts in southern part of Somalia.

Figure 2.1 Map of Somalia, indicating study area Bosaso, Puntland

Economy

Bosaso is a city that is experiencing a period of rapid growth. Prior to the Somali civil war, it had a population of under 50,000 inhabitants. Since the conflict the large of people originated from Bari migrating back to their ancestral areas. As a consequence of these migrations, Bosaso's population and the local housing industry have grown tremendously. The city population's socioeconomic condition varies into very low income groups, low income and moderate income groups and very few of Bosaso population fall in the high income groups.

The economy mainly depend on the port and newly structured Airport and trade. Following are also other potential sources of the income as well.

- Fishery
- Live stock
- Business trade
- Telecommunication companies
- Money transfer
  Small banks

The Gross Domestic Product per capita in Somalia was last recorded at 547.37 US dollars in 2015.

Climate of Bosaso

Bosaso has a hot desert climate. It has a mean annual relative humidity of around 60%. The average daily mean temperature year-round is 30 °C, with an average annual high of 35 °C - 39°C. The hottest period is between May and August which results population movement of mainly women and children move towards the villages of about 100 KM^2 distance or more.

Education

Bosaso has a number of academic institutions. According to the Puntland Ministry of Education, there are 74 primary, 12 secondary schools, in the Bosaso District. The higher education institutions working Bosaso include East Africa University (EAU) which is the largest university in Puntland and Somalia, University of Health Science (UOH), Boso University (BU), Red sea University and number of colleges.

Healthcare system in Bosaso city:

Health care service is largely in the private sector. There is limited number of hospitals regulated by the Ministry of Health of Puntland State of Somalia. There is one general referral public hospital, four private hospitals, and eight mother and child health care (MCHs) in which four of these have basic obstetric care services.

Study sites

Two study sites have been selected based on feasibility to visit and gather information from them.

Study site one

Bender Qasim General Hospital of Bosaso, which is referral hospital of Bosaso town. However, the hospital receives ≥ 10 delivery per day in winter season while in summer season the number of delivery decreases as low as ≤5 delivery per day. Prior the study the principle investigator made an introductory and briefing session with hospital administration including doctors, midwives and nurses in the maternity unit to inform the study and to ask their help during the study period. The staff accepted with interest and welcomed in supporting to pursue the study.

Bendere Qasim Hospital is not the only hospital with delivery service but there are number of public mother and child health services MCHs and, private delivery centers in the city in which large number of pregnant females seek medical support, but almost all complicated cases from other health centers are referred to the Bender Qasim General Hospital.

Study site two

Boqolka bush is the second study site, which is public government operated MCH. The average number of neonates born in this MCH depend on the weather the number of delivery, therefore the MCH receives up to 5 delivery/ day in winter while the number of delivery decreases as low as 2 delivery/day in the summer season. This MCH is well equipped with all necessary facilities required for delivery and some necessary equipment required for baby care including, suctions, vitamin K, antibiotics etc., The MCH provides free delivery services including provision of take home hygienic material for the mothers. The MCH works 24/7, and is located close to the internal displaced community setting who fled from southern parts of Somalia for security purposes for this the females that benefit most in this MCH are displaced community.

Also communities in the neighborhood get service from this MCH this health facility is situated near the Airport road in Bosaso which is close to the investigator's residence no transport is needed.

Study Population

Mothers delivered at Bender Qasim General hospital and Boqolka bush MCH with in 24hours whom accept voluntary participation has been recruited and interviewed using standard pre-tested questionnaire and detailed information were collected on socio-demographic, heath status, number of pregnancy, situations of the new live born babies. The newborns were follow-up for 28 days to collect their episodes on morbidity and mortality.

Target Population

The target population of this study was all live born neonates through interview with their mothers delivered in the two selected public health sectors during three months period from March 9th march to 8th June , 2017 in Bosaso , Puntland State of Somalia

Selection criteria

Inclusion criteria: Delivering mothers living in Bosaso who gave live birth babies and who gave their informed consent

Exclusion criteria: Delivering mothers from districts outside Bosaso and who delivered still birth of prenatal death and those who refused.

Data collection

Data collection tool (questionnaires) (see the Appendix)

Maternal and neonatal data of structured standard questionnaire were the instrument.

The allotted time for data collection was three consecutive days dividing morning and afternoon for the two study sites. Participating mothers were those accept voluntary participation of the study, of those who gave live births in the selected health facilities in three months period started from 9March 2017 and 8 June 2017.

Data Analysis

Collected data was analyzed using descriptive statistical Package for Social Science (SPSS) version 21.for reporting purposes maternal socio-demographic variables were combined into one category, maternal health variables into another category, and all neonatal health variables represent as one category, while the causes of neonatal deaths and timing of death were presented separately.

Ethical Consideration

Ethical approval has been obtained from East Africa university ethical review board (EAU-ERB).

At the time of enrollment the participating mothers were fully briefed on the purpose of the study project and written signed or thumb print verified informed consent has been taken from the mothers. For confidentiality filled questionnaires from participating mothers have been recorded and stored at the research department of East Africa University.

Bias

The possible sources of bias was greatly prevented in this study however the possible sources of bias in this study could be limited duration of data collection.

RESULTS

In the result section it's been dived into sub sections or categories including maternal socio-demographic characteristics, maternal health variables, neonatal health variables and determinants of neonatal mortality will be presented in the tables 1, 2, 3, 4 and 5.

Table 3. 1 Maternal socio-demographic variables

Maternal demographic data	**Number and %**
Maternal age	n=204(100%)
14-19 years	53 (25.9%)
20-24 years	45 (22.0%)
25-29 years	53 (25.9%)
30-35 years	34 (16.7%)
≥36 years	19 (9.3%)
Maternal education	
Primary education	83 (40.6%)
Secondary education	12 (5.9%)
University	4 (2%)
Non attend school	105 (51.5%)
Parental occupation	
Employed	182 (89.2 %)
Unemployed	22 (10.8 %)
Socioeconomic status	
Rich (>$20/ day)	0 (0%)
Middle ($10-20/day)	96 (47.0%)
Poor ($5-2/day)	108 (53 %)
Maternal residence	
Bosaso residents(10km^2)	194 (95.0%)
Villages 50km to Bosaso	3 (1.5%)
Villages 50-100km	1 (0.5%)
>100km linear road	4 (1.9%)
≥100km rough road/sea	4 (1.9%)

Total 204 delivering mothers were interviewed in two study health facilities namely Bender Qasim general hospital and Boqolka bush MCH. Approximately 95% were mothers who lived in Bosaso city, 51% of mothers were illiterate or whom have not been enrolled in school at all,

49% of the women were literate though they did not gained more than primary education. The majority of 108 (53%) mothers belong to lower index families while the remaining of 96 (47%) belong to middle income families. The employment status of participating parents were 182 (89.2%). The majority of the mothers 184 (90%) were married. The mean age of the mothers were 27years old.

Table 3. 2 Maternal health variables

Maternal factors	**Number and %**
Antenatal follow up	
Yes	111(54.4%)
No	75 (36.8%)
Unknown	18 (8.8%)
Tetanus vaccine	
Received	152 (74.5%)
Not received	52 (25.5%)
Suffering chronic disease	
Yes	24 (11.8%)
No	180 (88.2%)
Type of chronic disease	
Hypertension	19 (9.3%)
Diabetes	5 (2.5%)
Routine glucose and BP monitoring	
Yes	17 (8.3%)
No	187 (91.7%)
Hemoglobin status	
Normal 10-13.5mg/dl	123 (60.3%)
Moderate anemia 9-7mg/dl	25 (12.3%)
Severe anemia <7mg/dl	9 (4.4%)
Not known	47 (23.0%)
Urinary tract infections	
Yes	100 (49.0%)
No	104 (51%)
Sexually transmitted disease	
Yes	7 (3.4%)
No	197(96.6%)
Type of STD	
HBV	4 (1.9%)

Gonorrhea	2 (1%)
Syphilis	1(0.5%)
Mode of delivery	
Normal delivery	152 (74.5%)
Caesarian section	52 (25.5%)
Parity	
Primipra	67 (32.9%)
2-5 baby	69 (33.8%)
≥ 6	68 (33.3%)
Birth interval	
<2 years	64 (31.3%)
>2 years	73 (35.8%)

Maternal health variables

The overall health status of participant mothers were good, although the frequency of attending antenatal clinic was poor, a total of 111 (54.4 %) out of the 204 delivered mothers visited antenatal care at least once during their pregnancy. Majority of 74.5% had received at least single dose of tetanus toxoid vaccine, 32.8%per cent of the mothers were primiparae or mothers who gave birth for their first time, 74.5% of the deliveries were vaginal. In maternal chronic conditions there was no significant relationship between neonatal deaths and complications from maternal hypertension. Neonatal mortality was very common in normal delivered mothers while neonatal mortality was quite less frequent in caesarian delivery. Four (28.6%) of the 14 dead babies were from primiparaes mothers aged 14-19 years old, and advanced maternal age, 19 mothers who's their age was ≥ 36 years old presented higher neonatal death 4 (28.6%) out of 14. Thus the neonatal mortality was highest in both age groups accounting eight of the 14 deaths.

Table 3. 3 Newborn health variables.

Newborn health variables	Number and %
Newborn gender	
Male	114 (55%)
Female	93 (45%)
Fetus number	
Single skeletal	201 (97.1%)
Twins 3	6 (2.9%)
Gestational age in weeks	
Preterm (28-32 weeks)	13 (6.3%)
Moderately preterm (33-36weeks)	1 (0.5%)
Full term (37-42 weeks)	192 (92.7%)
Post term(≥42 weeks)	1 (0.5%)
Birth weight in kg	
Low birth weight Birth weight <2.5kg	18 (8.7%)
VLBW 1.5kg	2 (1%)
Normal birth weight Birth weight(2.5-3.5kg)	141 (68.1%)
≥ 3.5 kg	27 (13.0%)
Not weighed	19 (9.2)
Birth asphyxia	
Yes	30 (14.5%)
No	177 (85.5%)
Bathing after birth	
Yes	30 (14.5%)
No	177 (85.5%)
Breastfeed initiation	
Within 1 hour	70 (33.8%)
2-6 hours	48 (23.2%)
6-12 hour	21 (10.1%)
12-48 hours after delivery	52 (25.1%)
Not breast fed	16 (7.7%)
Performed Kangaroo mother care	
Yes	53 (25.6%)
No	154 (74.4%)
Neonatal infection	
Yes	27 (13.0%)
No	180 (87%)

Neonatal Mortality and Its Determinants

The information of total, 207 newborns delivered at two selected health facility has been included in the analysis. The neonatal mortality rate in two selected health services was 67.6/1000 live births. The neonatal deaths of 4 (28.6 %.) has occurred 0-2 days after delivery, while the majority of 9 (64.3%) of deaths occurred within 3-7 days, and only one case (7.1%) of death occurred day nine. The majority of newborn deaths of 9 (64.3%) observed belonged in middle income families, while the rest of 5 (35.7%) belong to low-income families. Approximately 55.1% of the newborns were male, while 44.5% of the remaining newborns were female, four (28.6%) of the newborns were born to a mother in the 14-19 year's age group, 96 (47%) of the newborns were belong to middle income families (medium wealth index).

There was evidence that the NMR varied between the two health facilities we found that Bender Qasim General Hospital with very high observed mortality of 13 (93%) of all neonatal deaths. The potential causes of neonatal death were birth asphyxia (6 cases), preterm birth (6 cases), and neonatal infection (2 cases).

Newborn feeding patterns

The analysis of early feeding behavior in this study shows that 70 (33.8%) newborns benefited from early initiation breast feeding, while 48 (23.2%) has been breast fed 2-6 hours, while 52 (25.1%) babies whose born to caesarian section has been started breast feeding the second day, and 16 (7.7%) newborns have not been breast fed due to neonatal incompetence. The proportion of live births reported to be exclusively breast fed by 4 weeks of age were 105 (50.7%) while 89 (43%) of the children were benefited from combination of breast milk and formula and 16 children has not been breast fed at all due to neonatal related incompetence.

Table 3. 4 duration of death and resuscitation

Neonatal factors	**Duration of Deaths**			
	Total deaths No. (%)	Within 1_2 days No (%)	Within 3-7days No. (%)	Within 8-10 days No. (%)
Neonatal death	14 (100%)	4 (28.6%)	9 (64.3%)	1 (7.1%)
Mode of delivery				
Normal delivery	12 (85.7%)	3 (21.4%)	9 (64.3%)	0 (0%)
Caesarian section	2 (14.3%)	0 (0)	1 (7.1%)	1 (7.1%)
Place of death				
Hospital	13 (93%)	2 (14.3%)	10 (71.4%)	1 (7.1%)
MCH	1 (7%)	1 (7.1%)	0 (0)	0 (0%)
Resuscitation				
Yes	13 (93%)	4 (28.6%)	8 (57.1%)	1 (7.1%)
N0	1 (7%)	1 (7%)	0 (0%)	0 (0%)

Table 3. 5 Causes of neonatal deaths

variables of death	**Percentage of deaths**
Asphyxia	6 (43%)
Prematurity plus LBW	6 (43%)
Neonatal infections	2 (14%)
Early bathing	0 (0%)
Kangaroo mother care	0 (0%)

The total neonatal deaths acounts14 (6.7%) out of 207 live birth. Majority of neonatal deaths was due birth asphyxia and prematurity was accompanied by low birth weight and birth asphyxia were counted as the leading cause of death total 12 (85.75) out of 14 deaths, while the remaining two (14%) causes of death was due to infection.

Discussion

The aim of this study was to assess the neonatal mortality rate and its determinants in two selected health facilities in Bosaso, Puntland Somalia from 9th March to 8th June 2017. In this study the NMR was found to be higher 67.6/1000 live births than the available estimates of 39/1000 live births. In Somalia there is no proper reporting system of neonatal mortality and no population base study conducted. The main results are consistent with global pattern of neonatal mortality were the major causes of death are prematurity, birth asphyxia and neonatal infections (1, 2, 3).

Neonates who were born at BQG hospital presented high rates of neonatal mortality of 13 (93%) as a result hospital receives all complicated cases of Bari province. The referral hospital receives pregnant females living in Bosaso city regardless of wealth index, displaced community who has fled from droughts and famine, as well as very few complicated cases from remote areas of up to 350 Kilometers of rough road which may take 7-10 hours in very uncomfortable journey.

The overall neonatal deaths observed was 14 (6.7%) out of 207 live birth ,similar to study done in regional referral hospital in northern Tanzania which was registry based cohort study that shows neonatal mortality of 10.7% and the leading causes of death were birth asphyxia and prematurity (18).

Most neonatal deaths observed in this study has been early neonatal deaths that occurred 0-7 days of 13 (93%) while the remaining of 1 (7%) occurred day nine. None on the remaining 193 newborns died after the day nine. The reason of high early neonatal deaths may be due to limited knowledge of mothers to recognize high risk pregnancies and danger signs also in low resource setting where there is low staff competence due to inadequate training and medical equipment for neonatal resuscitation and medication are part of contributing factors of early neonatal death.

In this study the prematurity along with low birth weight and birth asphyxia were the leading causes of death, each presented 6 (43%), respectively. the remaining causes of death was neonatal infections 2 (14%). This study is consistent with study conducted in Burkina Faso where the main causes of deaths were preterm complications 42% and infections 18% (17).

The reason of less observed infections may be due prophylactic use of antibiotics introduced in 2015 at Bender Qasim General Hospital to reduce neonatal infections which could reduce higher neonatal mortality of low-income countries.

In this study the practice of breast feeding was normal but early initiation of breast feeding was low 70 (33.8%) out of 204 mothers. The reason behind of the malpractice of early initiation of breast feeding may be due to cultural practice in which certain mothers believe that early breast feeding may not be appropriate for their newborn. For this they prefer to initiate a solution containing glucose, water or formula milk right before breast feeding and then they start to breast feed and continue with or without combination of infant formula.

Majority of 74.4%of newborn babies were not supported towards mother and newborn skin to skin contact immediately after delivery. There is a need to strengthen the use of kangaroo mother care (KMC) encouraged in different health facilities due to it is effectiveness and association to increase neonatal survival. A recent meta-analysis review found hospital-based kangaroo mother care (skin to skin contact) implemented within first week of life for stable preterm and low birth weight babies was shown to be effective and could reduce neonatal mortality up to 51% (21).

Low birth weight (less than 2.5kg), is mostly a sign of prematurity associated with higher risk of neonatal mortality. Low Birth weight (LBW) expose newborns to increased risk of infections, low body temperatures, which increased the risk of death compared to normal weight newborns.

Explanation for high neonatal mortality noticed in this study may be due weak health system, insufficient service delivery and poor health seeking behavior of the community. The people living in Somalia after the government collapse face more challenges about the health system in terms of financial and service delivery. However some of the females believe that if they seek medical care they may be told that their case could be complicated. That increases feeling of tension consequently they prefer to deliver at home which further increases the complication of both mother and newborn.

The higher probability of preterm birth, low birth weight and birth asphyxia are among the factors that contributed poor outcome. There is also association between neonatal mortality and late initiation of breast feeding which is consistent with previous study conducted in Nepal

that provide evidence that early initiation of breast-feeding among newborns in a rural southern Nepal population was associated with a reduced risk of neonatal mortality (22).

In this study there seems a relationship between child mortality and maternal age. Childbirth at too young age of (14-19 years old) and advanced maternal age of (≥ 36 years old) both associated with increased risk of adverse neonatal outcomes, including preterm birth, low birth weight, and neonatal mortality. Thus too young and advanced maternal age show to increase the risk of neonatal death.

Strength and Limitations of the study

The strength of this study is that it's the first of its type investigating neonatal mortality rate and its determinants in the study health facility in Bosaso and in Somalia for last 28 years of civil war.

The medical data available in the country were only estimates, therefore, hopefully that it will contribute to the field as it might provide facts about current situation of neonatal mortality in Puntland, Somalia.

The study will also help regional authorities to maximize their efforts and to develop strategy to limit possible preventable deaths.

The major limitations of this study include limited data collection period and poor knowledge in analytical skills including multivariate analysis. Other challenge was that there was no other studies done in the region and whole Somalia which would be used as a literature explaining the context of neonatal mortality rate in the country.

In addition to that assessing neonatal mortality is not an easy task in countries with no vital registration available and lack of health demographic surveillance sites which makes easier to capture adequate sample population to draw valid conclusion.

Conclusions and Recommendations

The higher rate of neonatal mortality has been observed in this study, the prematurity and birth asphyxia were the leading causes of death. Assessment of neonatal mortality is extremely difficult where large number of female preferred to deliver at home with or without the help of traditional birth attendants.

However both cases are preventable if the health administration promote awareness and implement the effective use of evidence based cost effective interventions including, prophylactic use of corticosteroids safe oxygen, kangaroo mother care, early initiation of breast feeding, and improving health facility and well trained medical personnel.

Our finding call for improved quality of care in child birth services, indicating that there was in adequate functional usable incubators available to maintain premature babies which was one of the leading causes of neonatal death in this study. We therefore conclude that to reduce neonatal mortality and achieve the MDG efforts must be made by government to enforce overall adequate neonatal child health policy and introduce recording system of the neonatal mortality.

This study encourages maternal education and promoting health seeking behavior to manage high risk pregnancies at first place. This study also recommends to pursue further studies in the context especially house hold survey studies may expose more facts about neonatal mortality, health demographic and surveillance sites based studies will also be beneficial.

Dissemination

The results of the study will be disseminated to the to the faculty of medicine and health sciences at East Africa University and department of pediatrics at Bender Qasim General Hospital and ministry of health regional office in Bosaso Puntland State of Somalia and academic health institutions including six Somali universities in collaboration with five Swedish universities through the efforts and dedication of Somali Swedish Researcher's Association (SSRA).

Acknowledgement

First, I would like to express my gratitude to the mothers participated the study in this thesis, without them this work would not have been possible. There are so many people who have helped, supported and encouraged me in different ways during the work of this thesis and I am grateful to all of you.

My sincerest appreciation goes to my supervisors, Dr. Hinda Jama and Dr Andreas Martensson for their patience, motivation and the guidance provided towards the completion of this project.

Special thanks to EAU research team whom we shared ideas and supported me towards the completion of this work.

My heartfelt thanks are due to Administration East Africa University and Dr Khalif Bile Mohamoud and Mr Klasse Sahlen Goran and Anneli Ivarsson for their tireless effort and inspiration provided throughout the course.

I also express my sincere gratitude to the staff and administration of Bender Qasim General Hospital and Boqolka bush MCH.

Lastly but not least I express deepest gratitude to my beloved family fortheir enormous support, endless encouragement and love.

I feel so lucky having you all in my life may Allah protect and guide us all.

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Appendix

Standard questionnaire for the death of children aged under four weeks.

I. RESPONDENTS DEMOGRAPHIC DATA:

Study Site ……Date,……

No of case…….

Yes represents cross in the parches ( )

1) Maternal age at childbirth

14-19 years [ ] , 20-24 years [ ], 25-29 years [ ] 30-35 years [ ] ≥ 36 years[ ]

2) Gender: Female [ ]
3) Marital Status : divorced [ ] Married [ ] widowed [ ] separate [ ]
   marriage position: simple couple [ ] ,if polygamy 1st wife [ ] 2nd wife [ ] 3rd wife [ ] 4th wife [ ]
4) Marriage order: 1st marriage [ ] 2nd marriage [ ] 3rd marriage [ ]
   Residence: _____
5) Parental education : Never attended school [ ] Attended School [ ]
6) Level of education: primary education [ ] secondary education [ ]
   Higher education bachelor degree [ ] master's degree [ ]
7) Parental occupational Status: employed [ ] unemployed [ ]

a) Both parents are employed [ ]
b) Only father employed [ ]
c) Only mother employed [ ]
d) Father unemployed [ ]
e) Both mother and father are unemployed [ ]
f) Type of employment public sector [ ] private sector [ ]
   Independent small business [ ]
   If you perform any other type of work please specify ----------

8) Socioeconomic factors: Rich [ ], Middle [ ], Poor [ ]

II. Maternal Health Assessment questionnaire

1) What do you do when you realize you that you are pregnant?

   Do you visit MCH Yes ( ) No ( )

   2) is there any MCH in your area?

   yes [ ]

   No [ ]

   3) How often do you visit MCHs?

   Once a month, [ ] Once every two months [ ] Once more than that [ ]

   5) Do you take tetanus toxoid vaccine during your pregnancy?

   If yes how many doses of tetanus toxoid vaccine you took?

   Single dose of TT [ ] two dose [ ] three doses [ ]

   6) How was your overall health prior and during your pregnancy?

   Good [ ] fair [ ] poor [ ]

   7) Do you suffer any of one the following chronic diseases?

a) hypertension
b) Diabetes

9) Do you perform routine blood glucose test?

   Yes [ ] , No [ ]

10) How is you Hemoglobin level? very good [ ] , good [ ], fair [ ], poor [ ]

11) Have you been diagnosed by any of the following infectious disease prior and during your pregnancy?

a) Urinary tract infection (UTI) Yes ( ) No (,,)
b) STD (syphilis yes ( ) No ( ), gonorrhea Yes ( ) No ( ), HIV Yes ( )and hepatitis B Yes ( )

Mode Of Delivery: Caesarian section [ ], Normal delivery [ ]

Place of delivery: Health facility [ ], Home delivery [ ]

Birth order: 1st baby [ ] 2nd baby [ ] 3rd baby [ ] etc.

Birth interval: <2 years [ ] >2years [ ]

Baby's gender: Female [ ], Male [ ]

III. Newborn health Assessment questionnaire

1. Age at onset < 24 hours, ____ >24 hours ____
2. Gestational age in months
3. What was the birth weight of the baby?
4. Less than 1.5kg [ ], less than 2.5 kg [ ] , 2.5-3.5 kg [ ] More than 3.5 [ ] Not weighed [ ]
5. Interventions of new born baby resuscitation is performed [ ] , not performed [ ]
   If performed how?
   Mechanical [ ], by the help of resuscitation bags, mask and mucus devices [ ]
   Was the baby premature? Yes [ ], No [ ]
   How many months or weeks along was the pregnancy?
   Indicate Period of Pregnancy Months [ ], Weeks [ ], Don't Know [ ]
   Did the child died? Survived [ ] not survived [ ]
6. Is the Newborn given bath immediately after birth? Yes [ ] , No [ ]
7. When breast feeding initiation occurred? within one hour after birth [ ] 2_6 hours after birth [ ] 6_12 hours after birth [ ], 12- 24 hours, ≥48 hours not breast fed [ ]Is the newborn given within 24hs any to other supplement like water ( ) formula milk ( ) animal fresh milk ( ) or any other thing ( )
8. How soon after birth did the baby suckle or bottle-feed? Hours [ ]1, Days [ ]2, Don't know [ ]3
9. Are you able to exclusive breast feed your baby?
   Yes [ ] , No [ ] ,
   If no why please specify?
10. How frequently you want feed your baby? 12 times a day [ ], 10 times a day [ ] 8 times a day [ ], 6 times a day [ ] .
11. What was the color of the baby at birth? Normal [ ] , pale [ ], blue [ ], don't know [ ]
12. Did the baby breathe after birth, even a little? Yes [ ] 1 , No [ ] 2 , Don't Know [ ] 3
13. Was the baby given assistance to breath? Yes [ ]1, No [ ]2, Don't know [ ]3
14. Did the baby ever cry even a little? Yes [ ] 1, No [ ]2, Don't know [ ]
15. Did the baby ever move even a little? Yes [ ] 1, No [ ] 2, Don't know [ ]3.

16. Did you hold on your chest to warm up your baby immediately after birth?

Yes [ ], No [ ]

Was there application of substances on umbilical cord of the newborn Yes ( ) No ( )

17. What do you think the level of your health care provider skill competence?
    Very good [ ], good [ ], bad [ ], very bad [ ]
18. How was over all heath of the baby after birth? Healthy [ ], sick [ ]
19. Did the baby received BCG vaccine Yes ( ) No ( )
20. How was the baby's sleep pattern? Normal [ ] less than normal [ ]
21. Did the child survived the first week? Yes ( ) No ( )
22. Does your baby acquire any infections immediately with in first week or later weeks after birth? Yes [ ] Not at all [ ] if yes when? ----1st week ( ), 2nd week ( ) l after three weeks or more ( )----------
23. Did your baby received polio vaccine ( ) how many dose ( )
24. Did you baby received Penta vaccine ( ) how many doses ( )
25. When you get to know that your baby acquired an infection? What did you do?.
26. What was the type of infection? Infectious diarrhea [ ] , pneumonia [ ] neonatal sepsis [ ]
27. Did you seek medical support from your nearest hospital? as required [ ]
28. What sort of treatment the baby received ……
29. How is your baby's growth and development? very good [ ] , good [ ] bad [ ]
30. Was the breastfeeding exclusive? Yes [ ] 1, No [ ] 2, [ ] formula milk only [ ] 3, combination of breast milk and formula milk [ ] 4 please explain your choice?
31. How long are planning to breast feed your baby? Less than a year [ ], more than a year [ ].
32. Lengthening birth interval is extremely beneficial for both mother and baby's health and well-being how do think? Strongly agree [ ], agree [ ] disagree [ ] strongly disagree [ ] I don't know
33. Does your husband encourages you to exclusively breast feed your child? Yes [ ] , No [ ] .
34. Do you get support from your husband? Yes [ ] 1, No [ ] 2