Maternal Mortality in Bosaso District of Somalia

Retrospective Case Study on Causes and Contributing Factors

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ABBREVIATIONS

CHW:	Community Health Worker
EmOC:	Emergency Obstetric Care
GDP:	Gross Domestic Product
LB	Live Birth
MMR:	Maternal Mortality Ratio
PHC:	Primary Healthcare
SB	Still Birth
TBA:	Traditional Birth Attendant
UNFPA:	United Nations Fund for Population Affairs
UNICEF:	United Nations Children's Fund
VA:	Verbal Autopsy
VAQ:	Verbal Autopsy Questionnaire
VHW:	Village Health Worker
WHO:	World Health Organization

ABSTRACT

Rationale for the Study:

Somalia is a country located in the Horn of Africa of about 637,657 square kilometres with the estimated population of 14 million inhabitants (World Population Prospects, 2017). The Somalia economy is based on livestock, fishery, remittance/money transfer companies and telecommunications. The country is ranked among the poorest countries in the world with a Gross Domestic Product (GDP) of US $400 per capita (CIA World Factbook. 2014).

Healthcare in Somalia is largely in the private sector. It is regulated by the Ministry of Health of the Federal Government of Somalia. Somalia's public healthcare system was largely destroyed during the civil war. Consequently, many hospitals, health centres and pharmacies have been established since privately.

Somalia's maternal health status has been ranked at the bottom out of 178 countries by Save the Children Fund annual report to be one of the most difficult places to be a woman. The maternal mortality ratio is estimated at above 732/100,000 live births, according to latest United Nations Children's Fund (UNICEF), World Health Organization (WHO) and United Nations Fund for Population Affairs (UNFPA) Word Bank Group, and United Nations Population Division, (2015).

Objectives: To explore and describe the causes and contributing factors surrounding cases of maternal deaths that have occurred within Bosaso District, Somalia.

Materials and Methods: This study is a retrospective case study combining both qualitative and quantitative methods. Verbal autopsy techniques were utilized in reviewing all of the thirty maternal death cases that occurred in Bosaso district. The study period was from 1st March 2016 to 30th March 2017. All the cases of maternal deaths identified were reviewed following the "road to maternal death" concept and verbal autopsy were performed. There were three reviewers who performed independent classification to diagnose the cause of death and the

contributing factors to these deaths. A descriptive analysis of the quantitative and qualitative data was made and was presented.

Results:

Direct obstetrical deaths accounted for 28 (93.3%) of the cases. Haemorrhage was the most prominent cause of death, accounting for 13 (46.4%) deaths. In addition, five cases had haemorrhage as level two i.e. underlining cause of death, total of 18 (64.3%), more than half of the deaths. Eclampsia followed 8 (28.6%) of the women died from this cause. Sepsis and obstructed labour accounted for four and three direct obstetric deaths respectively. Two (6.7) of the cases were indirect obstetric deaths. Anaemia accounted for these two deaths.

Verbal autopsy was performed in 30 cases of death. After applying the Three Delay Model in the analysis of the qualitative data which is generated from the key informants a delayed decision to seek medical care in 25 of the cases were indicated. Twenty-two in 30 of the women had delays in reaching an appropriate obstetric care facility once the decision to seek care was made. Even though an appropriate obstetric care facility was reachwd, 24 out of the 30 cases had not received the care services they needed. Looking at the phases of delay cases, twelve of the 30 cases had all three delays; 21 in 30 experienced two phases of delays and two experienced only one type of delay.

Conclusion: Haemorrhage, eclampsia, sepsis and obstructed labour were the main cause of direct obstetric deaths. Anaemia accounted for the indirect obstetric deaths. Patient factors such as delaying the decision to seek care as obstetric complications arise and health service factors were identified as the most frequent contributing factors to maternal deaths in this study.

There should be national policies or protocols put in place to track and to review all maternal deaths. Furthermore, statewide and regional maternal death review committees should be set up that meets regularly to review and audit cases of maternal mortality. An annual report of maternal deaths to disseminate findings and recommendations should be also rewritten and issued. Institutional delivery is the key to reduce high maternal mortality (Campbell OMR,

2006), mother needs to access adequate facility based delivery. Therefore, the contact with the skilled birth attendance and an access to emergency obstetric care is made as soon as labour starts.

Keywords: Maternal mortality, Underlying causes, Contributing factors, Three Delay Model, Verbal autopsy, Emergency obstetric care, Road to death

INTRODUCTION

According to World Health Organization (WHO), United Nations Children's Funds (UNICEF) and United Nations Funds for Population Affairs (UNFPA) joint estimates, 293 000 women die each year of pregnancy related causes. Of these, over half takes place in Africa, 42% in Asia, 4% in Latin America and Caribbean, and less than 1% in the more developed countries. In other words, over 99% of maternal deaths take place in developing countries (WHO et al., 2001).

This major difference in maternal mortality rates among the developed and the developing countries is the most striking fact in the world today about maternal health. The difference in levels of maternal mortality between the industrilised and the developing countries show the greatest disparity than any other public health indicator monitored by WHO. Furthermore, the disparity illustrates that the vast majority of maternal deaths in developing countries are preventable by timely and adequate treatment. An international summit was held at the millennium where development goals were set to improve maternal health and has been adopted by the United Nations, Organization of Economic Cooperation and Development, International Monetary Fund and World Bank and endorsed by 149 heads of states (UN, 2000). The target was to reduce maternal mortality three quarters 2015. The maternal mortality consequently was reduced almost by half globally from 515,000 in 1990 to 303,000 in 2015 maternal deaths per 100,000 live births (UNICEF, WHO and UNFPA 2015). However, many countries especially Sub-Saharan Africa where maternal mortality was high showed little reduction. A new international sustainable development goals were set from 2016 to 2030 where the global target for maternal mortality is to reach 70 maternal deaths per 100,000 live births by 2030

PROFILE OF SOMALIA

Geography

Somalia is located in the Horn of Africa. This coastal country's land area is about 637,657 square kilometres in bordering Djibouti and the Gulf of Aden in the north, Ethiopia in the west, Kenya in the south, and the Indian Ocean in the east. There are three topographically distinct zones in the country. These zones are divided geographically and politically into the South Central Somalia, Somaliland (the north-west) and Puntland (the north-east). These zones are further divided into a total of 18 administrative regions.

Population and Demographic Characteristics

The current size of the population is estimated to about 14 million inhabitants ("World Population Prospects: The 2017 Revision"). The size of the population is estimated because the last census was performed 40 years ago, in the early 1970s. According to estimates, more than two thirds of the population live in rural areas. The rural population can be divided, partly based on their livelihood, into pastoralists, agro-pastoralists and riverine populations.

Political Context

According to Failed States Index, Somalia is considered the world's most fragile state characterized by over two decades of conflict and civil unrest. The war and natural calamities, such as drought and famine, has taken the lives of hundreds of thousands of Somalis and left many more destitute. This country faces food insecurity, which is exacerbated by poor healthcare, lack of access to safe drinking water and safe sanitation facilities.

Economy

Puntland State economic activities include fishery where a great proportion of the total marine resources of Somalia are found. Livestock production is another major component of the economy and the harvesting of frankincense and their exportation. The state policy is to import manufactured goods and petroleum products. Remittance/money transfer companies and telecommunications, economic contribution are also prominent. Their services include services such as the operation of a chain of inland road transportation fleets, the establishment of an expanded network of electronic communication technologies and the management of shipping line companies that predominantly link the state with the Middle East Gulf countries.

Furthermore, the Diaspora play a role in the economy of the country it was estimated at US$1.3 billion (USAID, 2014).

Table 1: Estimated health indicators of Somalia: Reference numbers are below

Indicator	Estimate
Maternal Mortality Ratio	732/100,000 live births[1]
Under Five Mortality Rate	137 per1000 live births[1]
TFR	6.6 per woman[1]
Antenatal Care Coverage	26% (at least 1 visit) (24.2 Puntland State) [2] 6% (4+ visits) (3.3 Puntland State) [3]
Skilled Birth Attendant Institutional Deliveries Traditional Birth Attendant(TBA)	33%[2] 9%[2] 51%[2]
Contraceptive Prevalence Rate	15% (all methods)[2] 14% (modern methods)[2] 2.6% (Puntland) [3]
Neonatal Mortality Rate	39 per 1000 births[1]
Pregnant women living with HIV	7% (receiving ARVs for PMTCT) [1]
Prevalence of anaemia in women aged 15-49	44%[1]
Immunization Coverage BCG(11)	37% (less than 1 year of age)[1] 76% (up to 2 years of age) [1]
[1]UNICEF (2016) Situation Analysis of Children in Somalia	[2]UNICEF, (2006). Multiple Indicator Cluster Survey (MICS), Somalia [3]UNICEF, (2014). Final report (MICS, 2011), North East Zone, Somalia

Health Services in Somalia

Organisation and Administration

Somalia's healthcare is mainly in the private sector. The Ministry of Health of the Federal Government of Somalia tries to regulate the public and private sector. The civil war caused the Somalia's public healthcare system to be destroyed. Consequently, many hospitals health clinics and pharmacies have been established since throughout the country. Each of the three zones in Somalia has its Zonal administration. This study area is within Northeast Zone of Somalia (Puntland State). In Puntland state, the ministry of health tasked with social services works in tandem with local NGOs, the UN and aid agencies facilitate modest levels of access to basic health.

Health services in Puntland State Government are organized into two-tier system comprising of primary and secondary levels. The primary level includes the health centres which are staffed with both auxiliary and registered nurses and midwives. Also health posts which is staffed with a Community Health Workers (CHW) they provide mainly preventive care and treatment of minor ailments. There are also in this level community midwife students that work as part of their trainings one year in the community. Traditional Birth Attendants (TBA) and Village Health Workers (VHW) work are in private sector. Efforts are made to get TBAs employed at the Public health facilities specially MCHs for referral purposes unfortunately the funding for the program stopped and some currently work with the health centres voluntarily.

In Bosaso District the total number of public health facilities are 15. One regional hospital called Bosaso regional hospital, eight major health canters, five health units (minor health posts and one TB centre. The hospital and the TB centre are run by the MoH. While health centers and health posts are partnered in their implementation by an organization called MDM Bari.

Emergency Obstetric Care Services

Bosaso district hospital is a public hospital that provides comprehensive emergency obstetric care (EmOC) that the hospital performs. The functions include the administration of parenteral

antibiotics, oxytocic drugs and anticonvulsants, as well as the manual removal of the placenta, the removal of retained products, assisted vaginal delivery, surgery (caesarean sections) and blood transfusion. The four maternal and child health centres provide Basic EmOC, functions include the first six signal functions. As a result, the women who develop an obstetrical complication and need a comprehensive EOC must be referred to the district hospital.

Bosaso hospital offer	
The basic services	**Special and auxiliary services**
short-term hospitalization	paediatric specialty care
emergency room services	prescription services
general and specialty surgical services	nutritional counselling
x ray/radiology services	mental health care
laboratory services	family support services
blood services	

Maternal Health Centres Services In addition to Basic Emergency Obstetric Care provide Antenatal Care Services		
Examinations to be Performed	***First visit (yes or No)***	***Subsequent visits***
Personal and obstetric history	Yes	No
Health education	Yes	No
Delivery referral	Yes	No
Weight measurement	Yes	No
Height measurement	Yes	No
Blood pressure	Yes	No
Check for oedema	Yes	No
Haemoglobin testing	Yes	No
Urine testing	Yes	No
Tetanus toxoid immunization	Yes	No
Syphilis screening	Yes	No

The Bosaso Regional Hospital cover area population is the entire Bari region. There are no District hospitals in the region. The total population covered by the three maternal health centres in 2016 and 2017 are respectively 155,808 and 160483 according to Puntland Ministry of Health report. The population uptake for the five TBAs are unknown as they have no registration. Appendix 9 shows the total population uptake for the district which of total population in the district 434,960 and 448,009 in the year 2016 and 2017. Note estimated total population in Bari region is 719,512 according to population estimation survey in 2014 of Somalia.

In this Study nearly a third of the maternal deaths have occurred without being registered by the service facilities and thus have been missed, as a consequence from data generated in the study one could not estimate the maternal mortality in the district.

A Prospective population-based research on Maternal, and Neonatal Outcomes in the setting of urban and rural Somalia in Three Demographic Surveillance Sites in Bosaso district, Bari Region, Puntland, Somalia is necessary to be conducted for obtaining a reliable information for health strategic planning purposes.

Health indicators

In the 2014 a yearly global report produced by Save the Children Fund, an international non-governmental org anisation a promoter of children's rights, ranked Somalia at the bottom out of 178 countries for the worst place in the world in which to be a mother. Hence, qualifying to be the toughest place to be a mother. Furthermore, it is also one of the countries with the higher lifetime risk of death in the world, where one woman in 22, apart from Chad and Sierra Leone (UNICEF, 2016).

The Puntland Ministry of Planning together with UNICEF for international cooperation with financial and technical support conducted an international household survey which is developed by UNICEF in 2011 as part of fourth global Multiple Indicator Cluster Surveys (MICS4). This survey provided estimates for multiple health indicators for North East Zone of

Somalia to evaluate progress towards internationally agreed goals such as Millennium Development Goals (MDGs). This survey which was a representative sample survey contained 4,954 households in North Eastern Zone.

Maternal mortality ratio in Somalia is estimated at above 732 down from 1,044 maternal deaths per 100,000 live births in the year 2012 according to the latest estimates of Somalia health indicators report (UNICEF, 2016) (Table 1). The fertility rate is 6.6 per woman which is third highest in the world (UNICEF, 2016). Only three in ten married women are using any method of contraception, the most common non modern method is the Lactational Amenorrhea Method (LAM) and the use of any modern method is (15 %) across the country (Somali MICS 2006). Only nine percent of births in the year of 2016 were delivered in institution and 26% delivered with the assistance of a skilled attendance. The majority of the women more than four in five births (84 percent) occur at home. Followed by public sector facilities nine percent and four percent occur in private sector facilities. The proportion of health facility deliveries was higher for women living in urban areas than those in the rural areas by three folds 17 and 5 percent respectively. According to UNICEF there are no major differences by woman's age in the choice of a place of delivery. Twenty six percent of women make Antenatal Care (ANC) visits for at least once during their pregnancy and 6% of those women make ANC visits four or more times but 74 percent did not receive ANC (UNICEF, 2014). Table 1 Estimated of Somalia health indicators: See reference numbers in the table

BACKGROUND AND AIMS OF THE STUDY

EPIDEMIOLOGY AND BURDEN

Pregnancy must be considered as a normal physiological process that women engage in for humanity reproduction. According to AbouZahr (2003), the case about then the elimination or eradication of disease is a reasonable and creditable solution. AbouZahr (2003) states that "There is no pathogen to control, no vector to eradicate. Women will continue to need care during pregnancy and childbirth as long as humanity continues to reproduce itself. Failure to take action to prevent maternal death amounts to discrimination because only women face the risk" (AbouZahr, 2003).

DEFINITION, CAUSES AND MEASURES OF MATERNAL MORTALITY

As explained in (Shah and Say, 2007), maternal mortality is defined by the death of a woman while pregnant, or within 42 days of termination of pregnancy, irrespective of the duration of the pregnancy. These causes could be caused by other causes related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Furthermore, there is a contributing cause which is defined as a condition that may exist prior to the development of the underlying cause of death and contributes to the death (WHO et al., 2012). There are two categories of medical causes of maternal deaths: direct and indirect obstetric deaths. Direct obstetric deaths are those arising from obstetric complications of the pregnant state (pregnancy, labour and the postpartum period), from any interventions, omissions, incorrect treatment, or from a chain of events resulting in any of the above.

It is common that obstetric deaths to arise from indirect obstetric complications resulting from previous existing disease during pregnancy and maybe aggravated by pregnancy itself (WHO et al. 2012).

MEASURING MATERNAL MORTALITY

Measuring maternal mortality is a challenge both conceptually and practically. The reason is that maternal deaths are hard to identify, while maternal mortality is a rare event (WHO et. al.1996). Methods in measuring maternal mortality are:

Vital Registration

Vital registration is a system of registration of all births and deaths. This system is used in the developed countries and few of developing countries. Information about maternal mortality can be retrieved from the system of vital deaths by cause. Unfortunately, the majority of the developing countries do not have the system and those few countries that do only have for the urban proportion of the population. In addition, most of the maternal deaths in the developing countries take place out of the healthcare facility. Therefore, most of the deaths will be unidentified and when identified the cause of death may be unknown (AbouZahr, 2000).

House-hold Surveys

An alternative method of measuring maternal mortality is household surveys or community-based studies. This method involves surveying a large number of house-holds to achieve statistically reliable results which make this approach complex, time consuming and costly (WHO et. al.1995 and AbouZahr, 2000).

Sisterhood Method

Sisterhood method is developed as an alternative to household survey to reduce the cost involved the uses of large sample-size. This is an indirect method for deriving population-based estimates of maternal mortality. The method obtains information by interviewing respondents about the survival of all their adult sisters (WHO et.al.1997). Its limitations include that it cannot be used when the total fertility rate is below three. The places with high migration are not suitable. In addition, the result it obtains is for 10 – 12 years before the study period (Graham W, 1989).

Reproductive Age Mortality Studies

Reproductive Age Mortality Studies (RAMOS) method uses multiple sources of information to identify the causes of all deaths among women of the reproductive age. The sources of information include vital death registration, health facility records, and community leaders and cemetery officials (WHO et al., 2001). Although RAMOS method is considered as the "gold standard" for measuring and estimating maternal mortality the method is expensive, complex and time consuming.

Major limitations to all the above methods is that they only provide information on the level and cause of death which cannot be put into effective use. For example, the estimated maternal mortality ratio 732 per 100,000 live births, only tells us that it is high. It does not tell us where the focus of the program should be or what should be done now and later.

MATERNAL MORTALITY IN SOMALIA

The Maternal Mortality ratio in Somalia are amongst the highest in the world, exceeded by the following five countries: Central African Republic, Chad, Nigeria, Sierra Leone and South Sudan. Furthermore, the lifetime risk of maternal death in Somalia among the world's highest, at 1 in 22, exceeded by only Chad and Sierra Leone (UNICEF, 2016). According to UNICEF report one out of every 12 women dies due to pregnancy related causes. It is vital to analyse the background factors and determinants of maternal mortality (UNICEF, 2016).

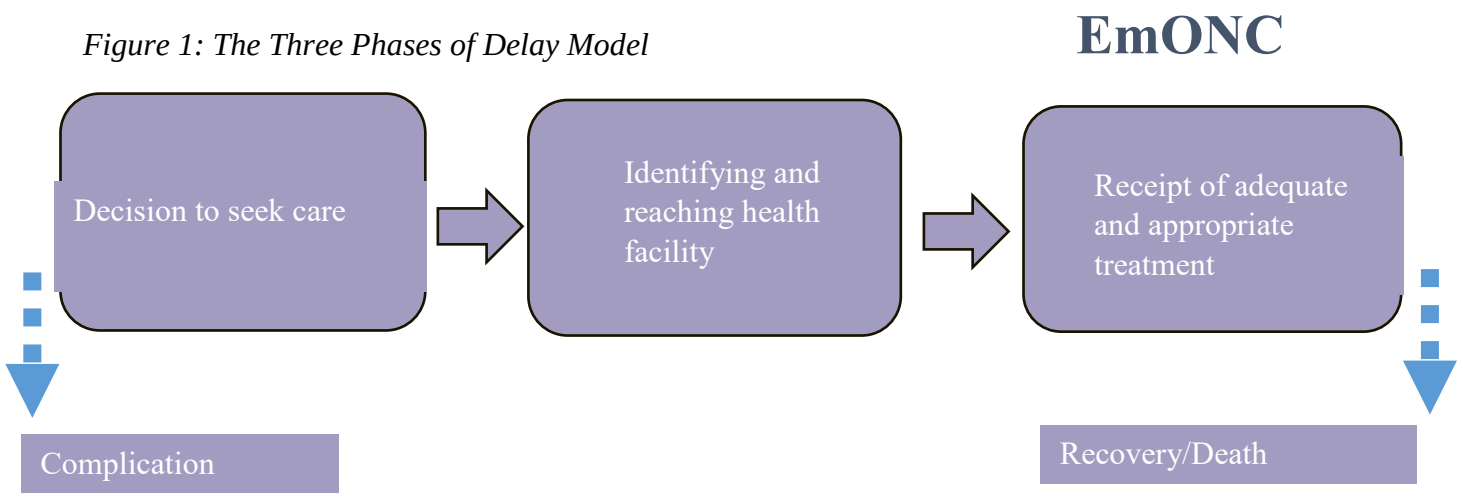
MATERNAL DEATH REVIEW/AUDIT

In Somalia, there is no system of governance in place to review maternal deaths that occurred. Data on civil society involvement in review of maternal deaths are unavailable. As a result, maternal deaths remain unnoticed to government and agencies necessary to know them. Currently, the health facilities classify and record maternal deaths by medical causes. This may conceal what happened as assigning a medical cause to a death only by saying the woman has died from haemorrhage or sepsis and not seeking to understand its underlying causes and determinants. For example, tracing the route taken by the deceased woman prior to arrival at the health facility will not offer clues about possible physical, socio-cultural and economic barriers that impede access to appropriate care in a timely manner. Therefore, an in-depth qualitative case by case study needs to be conducted following the "road to death concept". This approach in gathering information on how and why maternal deaths occur will eventually improve the service delivery. Furthermore, may raise awareness among health professionals about those factors in the facilities and the community which if avoided, the death may not have occurred. It may stimulate action to address those avoidable factors so as to prevent future maternal deaths.

MODEL

One of the main strategy to reduce maternal mortality is providing adequate medical care in obstetric emergencies in a timely manner (Paxton A, et al. 2005). Thaddeus and Maine Three delays model was developed (Figure 1) 20 years. This was done to evaluate the circumstances surrounding access to adequate emergency obstetric care (Thaddeus S, et. al. 1994). A number of studies used the model to identify barriers and potential points of intervention to access appropriate emergency obstetric care (Cham, M. 2005, Combs Thorsen V. 2012 and Pacagnella RC. 2014).

Figure 1: The Three Phases of Delay Model



Source: Maine, D., et al. (1997). The design and evaluation of maternal mortality programs. New York, NY, USA: Columbia University.

PURPOSE OF THE STUDY

To explore and describe the causes and contributing factors surrounding cases of maternal deaths that have occurred within Bosaso District, Puntland State of Somalia.

OBJECTIVES OF THE STUDY

1. To identify and describe the causes contributing to maternal deaths.
2. To explore the socio-cultural and economic factors with maternal deaths.
3. To determine and investigate health service factors associated with maternal death cases.

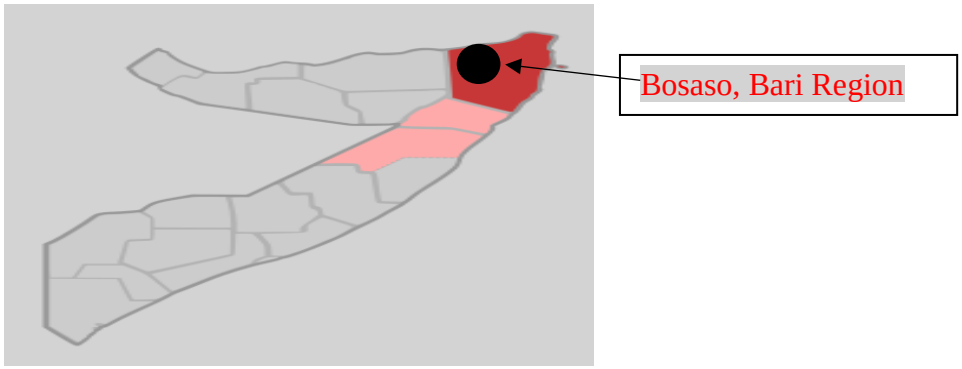
MATERIALS AND METHODS

STUDY AREA

Population and Demographic Characteristics of the study area

The study area is in Bosaso District, Administrative Divisions of Bari region (Figure 2). Bosaso City is the third most populated city in Somalia and the densest city in Puntland State of Somalia. It is situated in the North-eastern of Somalia on the coast of the Gulf of Aden. Bosaso district and the state's economy as a whole are very dependent on commercial trade through its seaport. Moreover, on the remittances from the diaspora. Traditionally Bosaso community migrates from coastal city during the hot months of June, July and August to the inland, where the temperature is cooler. Afterwards, the community return back to their original locations. However, many economically poorer families cannot afford the cost of migrating and stay back.

Figure 2: Map of the Study area

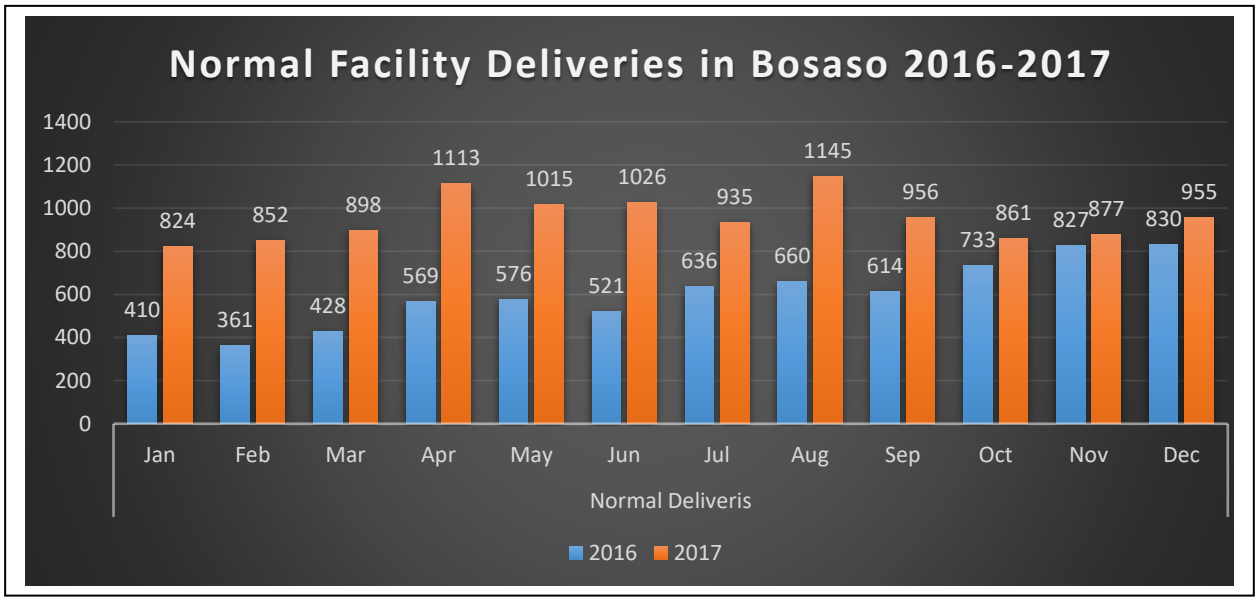


Health Facilities in the study area

Health Facilities of the study area include Bosaso General Public Hospital and other health facilities in its catchment area. The Hospital is one of the largest public hospitals in Somalia. Its comprehensive emergency obstetric care (CEmOC) facility serves as a referral hospital for four of the eight maternal health centres (MCH) within its health area, but also the hospital receives a considerable number of patients from all the other districts in the Bari and Sanag region. During the study periods March 2017 a total of 898 normal deliveries took place (Graph 1) in health facilities in Bosaso (hospital and four MCHs).

The annual 2016 and 2017 retrieved data of the maternal delivery (from four MCHs and the Hospital in the district) from the district office of Minister of Health was not realistically convincing, it depicted more than double increases in the number of deliveries comparing in some months of 2016 and 2017.

Graph 1: The number of normal deliveries health facilities in Bosaso Regional hospital and MCH
According to Ministry of Health, Bari Region, Puntland State of Somalia.



Selection of Study Area

The study area was selected mainly because of cost effectiveness in resources available as the principle investigator lives and works in the district therefore, the study will demand a minimum traveling for follow up. In addition, the district is one of the densest cities in Somalia with rich demographic characteristics socially, culturally and economically.

STUDY POPULATION

The study population for this research was women who have died recently while pregnant or delivered. These are women of any age who were living within Bosaso District, Puntland State of Somalia during their last pregnancy until death.

SAMPLE SIZE AND SELECTION

Thirty maternal mortality cases, according to the WHO ICD 10 definition, were retrieved from the health records in the hospital, three MCHs and five TBAs for the last one year.

The cases eligible for inclusion were those which:

- Qualified to be classified as a maternal death or suspected maternal death, according to the WHO ICD 10 definition;
- The deceased must have been resident in Bosaso district before her death;
- The death occurred in a health facility (hospital, health centre, health posts), in the community or route to a health facility;
- Death must have occurred between the time intervals of 1st March 2016 and 30th March 2017.

The exclusion criteria used were:

- The death does not meet the WHO definition of a "maternal death";
- Death occurred out of the study area – Bosaso; and
- Death of women not a resident of Bosaso District

STUDY DESIGN

A descriptive retrospective case study was used. Both qualitative and quantitative were selected, to do an in-depth investigation of the events preceding the death. The study involved using primary data collected from records for the last one year at the only public health hospital in Bosaso, three maternal and child health centres (MCH) and five traditional birth attendees (TBA). The "road to death" concept was followed in a quest to generate more information (WHO et al.1996).

DATA COLLECTION

The verbal autopsy (VA) interviews were conducted with the communities; the families and relatives (husband, sisters, mother in law) neighbours, traditional birth attendees (TBA) community health workers (CHW) and others who have knowledge of the particular case.

Data Collection Tools

Precoded verbal autopsy questionnaires (VAQ) were used, developed by WHO (Ronsmans C, Verbal Autopsies: 2004). The questionnaire contains sections on structured questions to probe for specific signs and symptoms and the background characteristics of the deceased. In addition, the questionnaires includes a section for open ended questions for qualitative analysis. For example, relatives' account of events around the woman's illness and death and symptoms developed during her final illness. There were sections on during pregnancy, labour, or within six weeks after delivery (Appendix 6).

The qualitative approach was incorporated in this study and a technique intended to obtain quantitative results. This produces the collection of valuable information that otherwise would be impossible to generate in the course of health research. This approach has been used in similar studies carried out in developing countries (Castro R, 2000 and Barnes-Josiah D. 1998).

As a tool, classification form has been used for verbal autopsy developed by WHO guidelines for Maternal Death Review (Ronsmans C, 2004). The tool is used to review and assign the medical cause of death and the contributing factors. This application of the tools has two main variables: the first is used for the cause of death (either direct or indirect cause of maternal death). The second variable is a checklist which looks at the contributing aspect of the death (Appendix 7).

Interview guide was used as a tool for conducting interviews with health staff. This guide contains five questions (Appendix 8). The health staff interviewed were those who have knowledge of the particular case.

Classification by Reviewers

All the cases have been reviewed by three obstetricians using a tool of standard classification form and the medical cause of death and the contributing factors are assigned to them. The reviews were based on the information collected through the verbal autopsy questionnaire and the deceased's health facility records (case notes) for 30 of the cases identified. Medical cause of death assigned for each case was accepted when two of the reviewers agree to one main

cause of death and if the three reviewers did not agree then the cause of death were reported as unknown.

DATA HANDLING

Data collected in the field work each day through verbal autopsy. The 24 of the 30 cases the interviews of the families were recorded. Notes were taken for all of the interviews. The recordings and the notes were cross-checked at the same night of data collection to assess for accuracy and clarity. Three health worker (a village health worker, a TBA, and a nurse) declined the interview, the rest of the health workers that had knowledge about the cases and were approached accepted for participation of the study. In addition, a summary of the recorded interviews and notes taken was made and transferred to section two (family or relative's account on event surrounding the death) on the questionnaire. The summarised information was used by reviewers during the review process. The interviews were translated to document the respondents' verbatism views of the deceased's final cause of death. The translated materials were fed into a software package Open Code for qualitative analysis. All data collected from the same case (verbal autopsy and case notes) were given the same case review number specifically assigned. Furthermore, interviews recorded on tapes were also given case review number for that particular case. The VAQ was pre-coded, so the quantitative sections contained in it could be put into Software Package for analysis. The principal investigator collected and handled all data generated and was not made accessible to any other person except the reviewers during the review process.

PILOTING

Prior to data collection, the verbal autopsy questionnaire was pre-tested on two separate families that had suffered a maternal loss in less than a year. This was necessary because this tool has not been used before in Somalia and it was also necessary to acquaint principal investigator who has never used the tool before. Furthermore, the pre-testing helped in checking for clarity, applicability, and the length of time it may take to administer this tool.

ETHICAL CONSIDERATION

Ethical approval to undertake this study was obtained from East Africa University Institutional Review Board (EAUIRB). Participation of the study was voluntary and free from any form of coercion. Individuals or families approached to participate in the study was first fully briefed on the purpose of the study and as well as their roles. It was also explained to them that should they decide not to participate or decide to withdraw during the process no penalty will be levied against them. All the explanations were done comprehensively in Somali language. Upon this a verbal consent was sought in the cases where participants were more comfortable with giving verbal consent instead of signing or thumb printing. However, for the majority of participants verbal consent form was used in this study to sign or thumb print. Permission to access health facility kept records was requested from the Director of Bosaso General Hospital, Directors of the three MCHs and the Traditional Birth Attendees.

DATA ANALYSIS

Statistical analysis of data collected involved two approaches: quantitative and qualitative. The quantitative data are analysed using the R program to make a simple descriptive analysis of the data. Whiles qualitative data was being analysed using Open Code software and was coded according to different categories in the "Three Phase Delay" model. The collected data were formed into the different categories of the model. The categories were framed into a framework for the analysis. However, categories were also derived inductively as new issues and concepts were identified.

Direct approach of content analysis was utilised for rigorous and systematic analysis of the data. High quality qualitative data depends on the skills, vision and integrity of the researcher and not through the use of software package. The steps used in the analysis of the qualitative data can be summarized into:

1. Familiarisation to the data by listening to the tapes and reading through the transcribed materials in order to list the key ideas,
2. Identifying the key ideas, issues and concepts according to the model,

3. Indexed systematically to all the data by colouring with the use of varied colours into the different categories of the model,
4. Re-organising the data in relation to the components in the model to which it relates, and
5. Interpretation of data to explain the finding.

RESULTS

QUANTITATIVE

Social and demographic characteristics of the women

A total of 30 maternal deaths had been identified. The average age of the deceased women were 31.1 (SD=8.4). The majority of the women were at the age between 26 and 35. Five (16.6%) aged between 15 to 20 years and eight (26.7%) were the age of 36 and above. The youngest among the deceased was aged 15 years whiles the oldest was 50 years old giving an age range of 35 years. Of the 30 autopsied cases, only seven (23.3%) had attended formal schooling of which three of them reached secondary school level. The majority of the woman 17(56.7%) attended madrasah for Islamic studies such as Quran recitations. Graph 2 shows level of education of the women and their husbands. The x-axis shows the mothers' education level and the colours indicates the husband's education level. All the mothers with secondary education where married to husbands with secondary education whereas mother with no formal education had no husbands with secondary education. Furthermore, there no husband with no formal education in this study while one-fifth of mothers had no formal education.

Of the 30 cases with information on marital status, all were married. The average number of wives and the husband had been 1.3. Table 2 provides a detailed enumeration of the profile of the cases and Appendix 1c has statistics on numerical data. More than halve of the women (56.7%) were housewives. The husband's work varied from technical work six (20.0%), seven working in the construction sector. Some husbands work as labourers, soldiers, teachers, farmers, government workers, and some are business owners in the food catering and store business.

Pregnancy and birth characteristics of the cases

Ten (33.3%) of the woman made no antenatal care visitation. Of those twenty women who attended prenatal care, on average, had two antenatal care visits for their last pregnancy (range=0-5, SD= 2.). 16 (80.0%) of them attended the clinic three or more times. Clients' antenatal care record card was retrieved from the relatives in only six of the cases as the rest of the cases where unavailable. Out of the 30 cases, six (20.0%) were first to third pregnancies, nine (30.0%) fourth to sixth pregnancy and halve of the women 15 (50.0%) had seven or higher in number of pregnancies. The average number of pregnancies was 7.1 (range=1–17, SD=4.3). The average age of gestation was 8.4 (range = 6-9, SD =1.0) (Table 4).

Medical causes of direct and indirect obstetric deaths

A total of 30 maternal deaths identified 18 mothers died at home, nine at the referral hospital, one at MCH, one at a private hospital and another one on the road to the hospital. Table 3 presents the distribution of deaths, according to the causes determined, confirmed, tallied, and grouped by three reviewers according to whether the cause contributed directly or indirectly to the death.

Direct obstetric deaths accounted for 28 (93.3%) of the cases. Haemorrhage was the most prominent cause of death, accounting for 13 (46.4%) deaths. In addition, a further five cases had haemorrhage as underlining cause of death (level 2), these five cases, if added to the 13 case where haemorrhage was the main cause of death will became 18 (64.3%), more than half of the deaths. This is followed by eclampsia as the cause of direct obstetric death. Eight (28.6%) of the women died from this cause. Obstructed labour accounted for four (14.3%) deaths. Sepsis accounted for three direct obstetric deaths. In addition, three more cases sepsis was presented as the underlining cause of death. Two (6.6) of the cases were indirect obstetric deaths. Anaemia accounted for these two (100%) of deaths.

Outcome of the pregnancy

Looking at the period of death, 26 (86.6%) died after delivery. Of the postpartum deaths more than halve of the deaths occurred between 1 and 42 days after delivery. One (3.3%) of the cases died during the ante partum period, of which both the cause was anaemic. Three (10.0%) of

the cases died during labour before the delivery of the baby and all three cases had obstructed labour as the primary or secondary cause of death.

Place of delivery was home for the majority. Nineteen (73.1%) out of 26 women who died after giving birth, delivered at home assisted by traditional birth attendees (TBAs). Five delivered at the hospital; of these five were referred from the MCHs. One mother delivered at MCH referred by TBA, and another delivered at a private hospital. Four of the women died before labour and during labour one and three respectively.

Out of the 26 cases that had delivered, three were multiple pregnancies. However, none of them was diagnosed during the prenatal period by ultra-sound scan and was not detected during delivery. One of the cases did not attend the prenatal clinic. Among the other two cases, both made antenatal care visits of two and four times, one was referred by the pharmacist as the mother did not feel foetus movement for scanning at the hospital, but the ultrasound in the hospital was close.

Of the 23 single births, seven (30.4%) were live births and 16 (69.6%) ended as stillbirths. Among the three multiple pregnancies, for two women the outcome of delivery was a live birth and stillbirth twin and the other case twins' were live births.

Road to death

Healthcare seeking process

All of the cases seek healthcare from different places. The first place to seek care was from a traditional birth attendant in 16 (53.3%) of the cases, MCH seven (23.3%) cases, and at pharmacy or community health worker (CHW) in five (16.7%) and two (6.7%) of cases respectively. Only three cases seek care to only one health facility. The rest of the cases seek care from hospital in 12 (40.0%) of the cases, MCH seven (23.3%) cases, traditional birth attendant three (10.0%). In addition, private hospital, pharmacy, and CHW or village HW all had one (3.3%) each respectively. Sixteen of the cases seek no further care while the rest 14 (46.7%) of the cases made third contact.

Reaching a medical facility does not always mean that a woman will receive the treatment necessary to save her life. In this study 14 (46.7%) of the cases visited as many as three medical facilities, 13 (43.3%) visited two health facilities and only three contacted one facility. This indicates that 27 (90.0%) of the women reported themselves to centres where they were not able to provide the required services. Ambulance services was not available for 25 (92.6%) of these 27 women. The patient and her relatives had to arrange their own means of transportation. The relatives had to hire a vehicle to take them to two different facilities they were referred to.

Funds to purchase medical care

In only 10 of the cases money was readily available and the husband was the fund provider in all of these 10 (33.3%) cases; the rest 20 (66.7%) of the cases money was not available when the difficulty developed and this forces the family to find money from other sources. This expenditure covered transportation, things asked to buy at the medical facilities and fees. The average expenditure on medical care was $79.6 ranging between zero dollar and US $358 with a standard deviation of $93.5.

Twenty two (73.3 %) of the women in the study needed blood transfusion during pregnancy and after delivery. Blood transfusion services are only available at the Bosaso public hospital in the district. This service at the hospital, regardless of blood being donated by relatives or outside people costs patients $40 for the price of the blood bag container and testing blood group.

Table 2. Profile of Cases

Socioeconomical Characteristics of the Cases	N (%)	N	Mean	Min	Max
Age		**30**	**31.1**	**15**	**50**
15 – 2 0	**5 (16.7)**				
21-25	**1 (3.3)**				
26-30	**8 (26.7)**				
31-35	**8 (26.7)**				
36-40	**6 (20.0)**				
41-45	**1 (3.3)**				
46-50	**1 (3.3)**				
Mother's Education					
None	**6 (20.0)**				
Madrasah	**17 (56.7)**				
Primary	**4 (13.3)**				
High School	**3 (10.0)**				
Husband's Education					
Madrasah	**7 (23.3)**				
Primary	**7 (23.3)**				
High School	**13 (43.3)**				
Technical School	**3 (10.1)**				
Worked for Income	**13 (43.3)**				
Married	**30 (100)**				
No of wives husband has		**30**	**1.3**	**1**	**4**
Rank of the Mother		**30**	**1.0**	**1**	**2**
Husband's occupation					
Shop/store owner/manager	**2 (6.7)**				
Labourer/Informal sector	**3 (10.0)**				
Constriction industry	**5 (16.7)**				
Soldier	**3 (10.0)**				
Teacher	**3 (10.0)**				
Transportation	**3 (10.0)**				
Technical	**6 (20.0)**				
Farmer	**1 (3.3)**				
Government/Formal sector	**1 (3.3)**				
Food Catering Business	**3 (10.0)**				

Graph 2: Education level of the mothers and their husbands coupled in the graph below

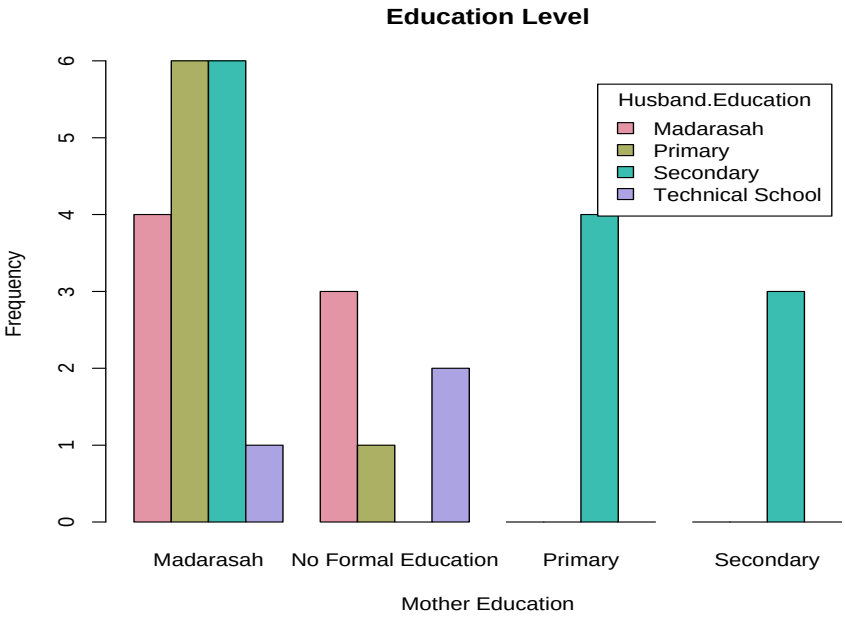


Table 3: Causes of direct and indirect obstetric deaths

Main Cause of Death			N	Total
Direct Obstetric Deaths				
Haemorrhage			13	(43.3%)
Postpartum	10	(75.0%)		
Antepartum	1	(8.3%)		
Intrapartum	2	(16.7%)		
Eclampsia			8	(26.7%)
Obstructed labour			4	(13.3%)
Sepsis			3	(10.0%)
Subtotal			***28***	***(93.3%)***
Indirect Obstetric Deaths			***2***	***(6.7%)***
Anaemia			2	(6.7%)
Total			**30**	**(100.0%)**

Table 4. Profile of pregnancy outcome

Socioeconomical Characteristics of the Cases		n(%)N Mean Min Max
Parity		30 7.1 1 17
1-3		6 (20.0)
4-6		9 (30.0)
7-9		7 (23.3)
> = 10		8 (26.7)
Place of death		
Home		18 (60.0)
Facility:		11 (36.7)
Hospital		9 (30.0)
Health centre		1 (3.33)
Private hospital		1 (3.33)
En route		1 (3.33)
Timing of the death		
Ante-partum		1 (3.3)
Intra-partum		3 (10.0)
Postpartum		26 (86.7)
Place of delivery for 26 women		26 (86.7)
Home		19 (73.1)
Hospital		5 (19.3)
MCH		1 (3.8)
Private hospital		1 (3.8)
Died while pregnant		4 (13.3)
Outcome of 26 mothers who delivered		
Foetus still birth		16 (61.5)
Live Birth		7 (27.0)
Twin live births		1 (3.8)
Twin live and foetus still births		2 (7.7)
Duration of pregnancy		30 8.4 6 9
ANC Clinic visits		30 2.2 0 5
Healthcare Seeking Process	Healthcare Worker / Facility	No. of Cases visiting each place
First health service contacted	TBA, MCH, Pharmacy, CHW and No contact	1 6 7 5 2 0
Second health service contacted	Hospital, MCH, No contact, TBA, Spiritual, Pharmacy, CHW, VHW, P. Hospital.	12 7 3 3 1 1 1 1 1
Third health service contacted	No contact, Hospital, P. Hospital, MCH, TBA, CHW.	16 4 4 2 2 1
Funds to purchase medical care		30 79.6 0 358

Contributing Factors

Most ordinary of factors identified by the independent reviewers the cause of deaths were recognizing as: (i) severity of the problem, (ii) delay in decision making process, (iii) lack of knowledge of treatment possibilities, (iv) substandard obstetric referral care, (v) delay in getting to see professional health staff, (vi) substandard primary care, (vii) delay in reaching medical facility, (viii) essential people in making decision making not available, (ix) lack of money, (x) disagreement in decision making, (xi) obstruction in getting care, (xii) lack of transport, and (xiii) other perception of the disease.

Table 5: Frequency of contributing factors as per Reviewer

Contributing Factors	Reviewer		
	1	2	3
Substandard obstetric referral care	28	30	24
Substandard primary care	28	30	28
Obstruction in getting care	29	29	27
Delay in reaching medical facility	30	28	29
Not recognizing severity of the problem	30	28	28
Delay in decision making process	30	30	30
Lack of knowledge of treatment possibilities	29	30	29
Lack of transport	19	19	12
Lack of money	20	14	16
Disagreement in decision making	20	23	13
Essential people in making decision not available	26	25	27
Delay in getting to see professional health staff	30	30	29
Other perception of the disease	9	7	9

QUALITATIVE RESULTS

The qualitative results of verbal autopsies performed on 30 cases of maternal deaths are presented below. The aim of the study was to identify and describe the avoidable factors associated with these deaths. In this study three phase delay model is used to apply 30 maternal death cases identified, Appendix 4 illustrates the summary of delays experienced by individual cases.

Delay in Deciding to Seek Health Care (Phase 1)

The delay in this phase started from the moment the woman or her family realized there is a complication and up to the time the decision was made to seek healthcare. The following are the main factors which are classified as "patient factors" and are identified from this study as contributed to the delay in deciding to seek care:

Underestimation of Signs, Symptoms, and Severity of the Problem *Lack of knowledge about danger signs and warnings during pregnancy and failure to seek prompt treatment from health facility were the cause of delay. This phase identified in the following Cases 4, 8, 12, 13, 14, 15, 19, 20, 23, and 28. Some of the women or their relatives sought treatment from Traditional Birth Attendees (TBAs) and Village Health Workers (VHWs) as labour started and progressed slowly. Respectively, others purchased medicine from the pharmacy. On the other hand, some sought spiritual/traditional means of treatment. Families were often involved in the decision-making process such as mothers and sisters. As Case 13 sister narrated:*

"During pregnancy she complained breathlessness at the eighth month of pregnancy, her body was swollen too. Therefore she had a test for blood pressure and it was found to be high. She had no medication for the hypertension due to difficulty in finding money for the medicines. However, we occasionally bought medicines from the local pharmacy when we could afford, we got some medicine from MCH and also another health centre. Eventually, she delivered stillbirth at home, after delivery she lost large amount of blood, I was constantly changing her bed. Eventually, the bleeding subsided in the next six days. She was very weak and became pale, she had fever and headache, her swelling increased after delivery. The family applied traditional remedies to treat her illness. Health providers visiting the village examined her then gave her medicine in IV and told us to take her hospital. Therefore, she told me to go to the market and sell her earrings. I sold them for $50 worth of shillings but soon after I arrived she was dead at home. It was her ninth day after delivering".

Delay in Getting to See Professional Health Staff

The pregnant women contacted TBA for assistance instead of skilled birth attendee in a health centre. This resulted in a delay in receiving a prompt and adequate emergency care from a skilled birth attendee especially postpartum haemorrhage for many cases. All of these cases sought care from TBA. Case 1,4,5,6,8,9,13,14,15,16,18,19,20,21,23,24,25,26,27,29 and 30. Some of the reasons women delivered at home were the personalized care the TBA gives the women in the comfort of their homes, others prefer home to health facility based on previous problem-free experiences of home delivery and/or problematic health facility delivery. There were woman who refused the recommended caesarean section (CS) from the hospital and returned home to deliver Cases as Cases 14 and 28. The fear of CS is based on cultural or traditional reasons. Furthermore, money constraints play a role a large amount of money, the fee charged for the surgery alone is $300, there may be extra services such as bed stay and blood transfusion added to the fees charged. Lack of knowledge of treatment possibilities were identified in the Case 10, 12, 13 14, 15, 20, and 21. In some cases (Case 1 and 8) the women and their relatives had the wrong perception of the complication.

Delay in Reaching Obstetric Care Facility (Phase 2)

The delay in this phase started from the moment the decision to seek medical care is made to the moment an appropriate obstetric care facility is reached. Transport availability is contributing factor in accessing quality emergency obstetric care. In addition, visiting many different health facilities which are unable to provide comprehensive obstetric care delays further in reaching an appropriate obstetric care facility such as the district hospital.

Transportation Difficulties

Difficulties in transportation were identified in this study and were experienced, for example Case 2 took taxi from one health centre to reach the hospital. And Case 25, her mother walks an hour at noon in the heat of the sun to reach the health centre to seek care for her daughter then, the health staff told the mother to bring the patient in the centre, a car or ambulance for the evacuation was unavailable. The following cases also have experienced constraints in transportation Case 9, 10,14,17,18 and 19. The main reason for this difficulty with transport was unavailability during late at night. The woman and her family had to stay at home and wait till the morning while the women bled heavily.

Seeking Care at More Than Two Medical Facilities

Most of the women sought care from different health workers and health facilities before eventually coming to the hospital for example Case 1, 7, 8, 10,11 12,13 and 14. One of the reasons that lead the women to visit different places for health services was the comprehensive obstetrical care services were only available at the district hospital. As a result, all the cases needing these advanced obstetric care services at the peripheral health facilities were referred from one facility to another arriving at the hospital. Another reason was lack of doctors on duty causing the escorts desperate for service to move to the next facility available as Case 8. Lack of knowledge in the appropriate care available from health facilities as in Case 12 and 13. Furthermore, there were times where lack of skilled birth attendees at health facility resulted the women to be referred (Case 2, 6).

Finally, money constraints in accessing appropriate care were identified in many Cases such as Case 17 where first visit was MCH then discharged with no fees charged. The family experienced difficulty in collecting enough money to go to another health facilities to access healthcare. From the testimonies a mother narrated:

*"She felt the foetus lacked any movement for a day then she went to the local pharmacy which then suggested to her to have ultrasound, she visited the ultrasound clinic, but the clinic was closed at the time due to the daybreak at noon. She returned home and in the afternoon the labour started, TBA was called .....This was multiple pregnancy after one baby was delivered the next baby did not follow so I walked in the heat of the sun to go to MCH, but they told me to bring her to the clinic……when I was back home with a rented car she already lost lots of blood and died soon after"***.**

Delay in Actually Receiving Health Care after Reaching the Hospital (Phase 3)

Once reached the hospital some of the women did not receive prompt and adequate treatment due to many factors. For instance, refusal of care was identified as patient factors in the following cases: Case 3 was diagnosed with eclampsia at the health centre and refused to attend hospital as referred because of fear of caesarean section (CS) that may be recommended, while Case 14 had placenta praevia and refused CS as recommended by hospital and returned home. Furthermore, patient factor contributed to the frequent discharge with incomplete treatment seen in these cases of the study; Case 20 was discharged from the hospital after 10 days because of financial constraint. Likewise, Case 1 as she was advised 3 day-stay in the hospital for monitoring, but instead she returned home because of financial concerns only to be back later with increased severity of her condition and Case 7 made the same decision, but the reason was child care responsibility. However, in some cases the health staff made the decision to discharge with incomplete treatment (Case 6, 11, 17) after giving the women a medicine to take home.

Inadequate health services were another factor noticed in this study. This includes a lack of blood as in Cases 5 and 9 and incompetence of the available staff as shown in this case: Case

2 placenta was retained after delivery in the health centre; no manual removal of placenta was performed, and no timely referral was done at the health centre. As her neighbour narrated:

"After she experienced labour pain she decided to go to health centre. Her daughter and I accompanied her to the health centre two hours later when her contraction becomes more intense. A friend with a car helped us to take her in the health centre and her aunt was left home to baby sit. After the nurse examined her she told us her cervix was dilated 4 cm. so she stayed to deliver there. Finally, she delivered a baby girl but the placenta was not coming out. Immediately she told the nurse that in her previous pregnancy the placenta was also retained first then it was removed manually. This was not attempted. Consequently, she was bleeding heavily. The midwife gave her injection to stop bleeding. After two hours when the down break she was transferred to the hospital. After 20 min in the hospital the doctors told us that she was dead".

Missed diagnoses were an issue in these cases; Case 11 anaemia was unidentified while Case 16 had tumour and was only diagnosed at delivery instead of numerous times she received blood in the facility during pregnancy. Case 1 had visited four times ante-natal care (ANC) and Case 4 (2 ANC) both multiple pregnancies which were unidentified during their ANC visitations.

Mismanagement across health facilities and workers. Mismanagement of intra and postpartum haemorrhage symptoms by TBA with no timely referral done (Cases 18 & 19). Likewise mismanagement of severe anaemic symptoms (Case 9 & 11 with 5 ANC visitation each) also of preeclampsia symptoms (Cases 7) and ante-partum infection symptoms of Case 6 (3 ANC) at the health centre identified with no referral to secondary health facility. In the following, Cases 13, 14 experienced mismanagement from VHW while Case 16 experienced it from the hospital.

Delay in accessing health services may have been experienced as a result of perceived quality of care by the families: some families expressed health personnel's mistreatment towards escorts in addition to a limited privacy and lack of personal care at the delivery facility.

Lack of trained personnel Case 10 (no ANC) visited pharmacy after complication, medicine was given and no referral.

A lack of monitoring and attentiveness for instance, Case 11 (5ANC) queued seven consecutive days at the health centre because of delay in receiving a registration for vouchers.

DISCUSSION

In this study majority of deaths were direct obstetric death accounting for more than 93%. Haemorrhage was the most prominent cause of direct obstetric death accounting for more than half (64.3%) of the deaths either as main cause or underlining cause of death. The findings of this study is consistent with findings of other studies such as WHO estimates (WHO 2001, WHO systematic analysis 2006, Pacegnella et al. 2014 and Say, L. 2014). All but two (intrapartum) of these haemorrhage occurred during postpartum period. Moreover, their place of delivery was home for most of them. In some of the cases haemorrhage was caused by obstetric labour, while there were others where anaemia was the underlining cause of death. In Somalia, the women are responsible for child care duties and all of the domestic chores. In addition, many of them often have poorly paid job or sell mergendises in the market throughout the year to support the family financially, even during pregnancy. Almost half of the women in the study worked for income. Of these thirteen women who worked for income their jobs almost all were in informal/labour sector. This hard work and responsibilities coupled with financial constraints during pregnancy might have been the possible reasons for overlooking the severe anaemia. Furthermore, a reason for not utilizing obstetric services for instance, for not having ultrasound during pregnancy. Eclampsia was the second most prominent cause of direct obstetric death accounting for nearly one-third of the cases as main cause of death. More cases had hypertensive disorder as the underlining cause of death. Similarly, hypertensive disorders were the second leading cause of maternal deaths globally (WHO systematic analysis 2014). Lack of recognition on the severity of the hypertensive disorder was prominent. For the majority, some of the symptoms of hypertension such as swelling and head ache were

present and ignored. However, the decision to seek care was often made after the symptoms of preeclampsia/eclampsia such as fits were developed.

Traditional birth attendees (TBA) played a major role in this study as a health service provider. In this study there were six cases out of 30 whom three sepsis presented as the main cause of death including additional three where sepsis presented as the underlining cause of death, all six cases delivered at home assisted by TBAs. However, one of the Cases, sepsis was cause of death after an operation to remove tumour at the hospital following the home delivery. In general TBAs were known to the family, some even were family members claiming to be the TBAs that provide this service to all of their family as one grandmother expressed it "I assist all my seven daughters with delivering their babies". A number of TBAs were not wearing gloves during delivery according to the family members interviewed hence, sepsis could be a result of unhygienic home delivery. Since there may not be a systematic sterilisation of delivery environment and available safe delivery kit. Furthermore, lack of skilled birth attendees to assist with safe and hygienic delivery could account for the deaths from intra and postpartum sepsis. This study similarly confirms that sepsis usually follows haemorrhage in the order of occurrence in cause of death for maternal deaths (WHO 1996)

The average number of pregnancies was 7.1 (range=1–17, SD=4.3). This is higher than national fertility rate of 6.6. Elsewhere, high fertility rate is considered as a contributing factor to maternal mortality. The average age of gestation was 8.4 (range = 6-9, SD =1.0) (Table 4).

Verbal autopsy was performed in 30 cases of death. Applying the Three Delay Model in the analysis of the data generated from the key informants indicated a delayed decision to seek medical care in 25 (83.3%) of the cases. Twenty-two (73.3%) of the women had delay in reaching an appropriate obstetric care facility once the decision to seek care was made. However, even after reaching an appropriate obstetric care facility, 24 (80.0%) out of the 30 cases had not received the obstetric care services they needed. Looking at the phases of delay cases, 12 of the 30 (40.0%) cases had all three delays; 21 in 30 (70.0%) experienced two phases of delays and two cases experienced only one type of delay. All three types of delay were

shown to be very frequent in the cases studied first delay 83.3%, second delay 73.3 % and third delay 80.0%.

Obstetric emergency occurred mostly during the intrapartum and immediately postpartum. Moreover, they are unpredictable. In this study 73.1% of the women delivered at home increasing the risk of maternal mortality from delays while studies showed facility based delivery would have reduced the risk of maternal mortality (Say, L. 2014). Any delay in accessing emergency obstetric deaths increases the severity of the complications. This is shown in a study of maternal near miss cases in Brazil (Pacagnella, et al. 2014).

A combination of factors contributed to the first delay in deciding to seek care were found to be most frequent in this setting 83% when compared with the second and third. First delay was identified to be lack of knowledge about the danger signs, symptoms and severity of the problem. This caused the women and their relatives to not see the warnings therefore, not seek prompt treatment from health facility. Other factors in the first delay included delay in getting to see professional health staff and a facility with capacity to manage pregnancy related complications. Some mothers did nothing about the danger some sought treatment from TBAs and VHWs, and others purchased medicine from the pharmacy. Some for instance, sought spiritual means of treatment.

Contributing factors reaching an appropriate obstetric care were lack of available transport and visiting many different health facilities which are unable to manage complications and provide comprehensive obstetric care. The main reason for this difficulty with transport was transport unavailability late at night. The woman and her family had to stay at home and wait till the morning while the women bled heavily. Another source of delay in transportation is an inadequate labour and delivery management of referral process which is caused by lack of functioning ambulance in the district. The fact is many women sought care from different health workers and health facilities before eventually coming to the hospital. Other factors played key role in the second delay for instance, money constraints in accessing appropriate

care and lack of doctors on duty causing the escorts desperate for service to move from one facility to the next facility.

Likewise once reached the hospital some of the women did not receive prompt and adequate treatment due to many factors. For instance, refusal of hospital recommendation was identified as patient factors reasons for avoiding caesarean section (CS). Furthermore, patient factor was source of delay in the frequent discharge with incomplete treatment seen in the study. However, in some cases the health staff made the decision to discharge the patient with incomplete treatment after giving the women a medicine to take home.

Inadequate health services were another factor noticed in this study. Elsewhere, studies show women are at risk of dying even if they arrive in the health facility without any complications (Knight H. 2013). This includes a lack of monitoring attentiveness. Delay in accessing health services may have been experienced as a result of perceived quality of care by the families: some families expressed health personnel's mistreatment towards escorts. Moreover, they mentioned a limited privacy and lack of personal care at the delivery facility. Furthermore, a lack of blood for transfusion and unqualified staff with critically limited ability to handle cases with complications. Consequently, missed diagnoses and incorrect treatment were an issue in the women with anaemia, tumour and multiple pregnancies at the time of ANC visitations.

United nation has guidelines that recommend a minimum of 5% caesarean section to be performed for all the expected births in the population. However, the percentage in this study was much lower than 5%, which is indicative of the inadequacy and unmet need for emergency care for women in the district. Similar studies carried out in Afria such as in Morocco found such lows (Bailey P. 2003).

An observation made was that family members or people in the community feel more comfortable to talk if the interviewer accompanied by someone whom they knew. For that reason during interviews at family or community level, the investigator was accompanied by a health staff (nurse or midwife) from the MCH nearby, or by the TBA or VHW. The health staff who then after doing the necessary introduction moves away from the interview to avoid the influence their presence can exert.

Tracing and retrieving of health facility kept records was a challenge. In the situations where records exist, most of the time they are chaotically stored. Furthermore, incomplete health data, missing records or lack of clarity in such records were major issue.

During the verbal autopsy, the relatives were asked to produce a healthcare card or records, for the mother such as antenatal card, or other cards. However, in less than five cases cards were available, the rest the cards were unavailable due to the removal of the children from the diseased mother's home and moved to the home of the care taker who usually are extended family.

A limitation of this study is that it involved interviewing the family/relative about maternal mortality, which could make them feel distressed talking about some of the topics. So to manage this emotion considerable time was required to pause the interview and then continue later. Moreover, there is the tendency of the people to tell stories that may be formed by a wish to blame someone, or at least someone else.

In this study verbal autopsy technique was used as a method to investigate maternal mortality. A limitation to the method in this study is the absence of information on survival which may have given more clarity to the contributing factors of maternal mortality. The agreement among the three reviews in classifying all cases as maternal deaths were 100% and a highly satisfactory level was recorded in the subsequent classifying of all cases as maternal deaths. Moreover, qualitative and quantitative approaches were used to collect data from two different levels. In addition, many sources were also used at each level. This is an evidence that verbal autopsy technique is worth using in countries such as Somalia, where there is no system of vital

registration and the practice of the medical certification of death is non-existent. The use of the two approaches will consequently add to the validity and comprehensiveness of the data generated. Verbal autopsy provides a valuable opportunity to obtain information from those whom the access to emergency obstetric care is inadequate or none.

Assessing extend of what was intended to be measured was actually measured; the piloting of the VAQ has illuminated any issues that effort to improve the validity and made the continually sensitive to them. As the VAQ was in English language and the principal investigator who conducted all of the interviews spoke both English and Somali fluently, there were no concerns in regards to translation between the languages and in the cases of an English word not having words for it in Somali the most similar word is used as a compromise. Furthermore, in the interview process the same question was asked to repeat but differently just to check for validity.

Assessing the extent to which the measurement yields the same answer each time it is repeated, the pre-testing carried out has put into surface issues that effort to improve both validity as well as reliability. One main interviewer was used at all times to fasten consistency thus improves reliability. This present study used two different approaches which are cambined with multiple source of information to contribute to the reliability. The recall period between one to 30 weeks was used, this is within the approved range of not more than five years (WHO VA workshop, 1995). The quality of recall may not even decline over period since a maternal death is an unforgettable event.

GENERAL CONCLUSION, RECOMMENDATIONS AND DISSEMINATION

CONCLUSION

Haemorrhage, eclampsia, sepsis and obstructed labour were the cause of direct obstetric deaths. Anaemia accounted for the indirect obstetric deaths. Studies conducted in the global network sites found similar trend (Pasha, O. et al. 2016). Patient factors such as delaying the decision to seek care as obstetric complications arise, socioeconomic and health service factors were

clear and significant contributors to maternal deaths in this study. Health education and intervention designed to remove barriers to accessing adequate facility based delivery could reduce maternal mortality in Somalia.

RECOMMENDATIONS

1. There should be national policies or protocols put in place to track and to review all maternal deaths. Furthermore, statewide and regional maternal death review committees should be set up that meets regularly to review and audit cases of maternal mortality. An annual report of maternal deaths to disseminate findings and recommendations should be also rewritten and issued.
2. It happened maternal death occurred due to unskilled healthcare worker at the referral hospital thus it is crucial to strengthen healthcare providers' knowledge and skills to recognize and manage complications and provide emergency obstetric care.
3. Institutional delivery is the key to reduce high maternal mortality (Campbell OMR 2006), mother needs to access adequate facility based delivery. Therefore, the contact with the skilled birth attendance and an access to emergency obstetric care is made as soon as labour starts.
4. Maternal death occurred while seeking healthcare in multiple sources. Therefore it is important to have a referral linkages such as stablishing a telephone communication mechanisms that ensures a fully functional referral pathway between healthcare facilities. This recommendation is found in other maternal mortality studies (Castro 2000). Furthermore, health education programs for the community to change people's health seeking behaviour need to be conducted.
5. Quality of care should improve, ones the mother arrives, at the health facility, she needs to receive urgent and adequate obstetric care.
6. Utilisation of the services need to be increased to reduce the maternal mortality. This include adding postpartum care since the majority of deaths occurred during postpartum period, the mother needs to visit a health facility within two days of delivering at home.
7. Training traditional birth attendees (TBAs) and upgrading them with adequate knowledge, skills and behaviour to enable them to properly assist deliveries in communities and provide safe and hygienic services including recognizing and timely referral of the high risk pregnancies. Elsewhere, in Pakistan, training TBAs and

integrating them into an improved health care system has been shown that it is achievable and effective in reducing maternal mortality (Jokio, AH. 2005).

8. All the required medicines such as for reducing haemorrhage (oxytocin) needs to be prepared with and available in birth kit to be used by the birth attendees.
9. Emergency laboratories to test immediately the blood type of the mother, common blood (CBC) and blood coagulation need to exist as many cases blood was donated at the time in need of blood.
10. The blood transfusion services could be made available at the MCHs that provide obstetric care to minimize the transport difficulty experienced during referral.

RESEARCH DISSEMINATION

The findings from this study will be disseminated through a multi-faceted approach including: to health authorities for policy decision makers, health institutions, feed back to the study sites, The research study will be published in scientific journals. Also the results will be made accessible format by creating graphic and translated; posters, pamphlets, and website while, paying attention to language and literacy needs of the Somali community. Actionable messages and good practice recommendations will be produced from the findings of this research to disseminate proactively to the community through giving workshops public presentations for passing result findings with Q/A sessions on major media campaign including Radio and Television audience.

ACKNOWLEDGEMENTS

I extend my gratitude to all those who in one way or the other contributed or supported this study.

Special regards to the team of Somali-Swedish Collaboration in Research for Health for offering me this program. It is a dream comes true.

I would also like to recognize the support given to me from East Africa university management, the Chancellor, Dr **Aadam Shekhdoon Ali,** the Vice Chancellors, **Mr Mahamed Mohamud Isse** and **Dr Abdi Salam Issa-Salwe,** the Dean of the Faculty of Medicine and Health Sciences **Dr Abshir Abdi Ali.**

My special thanks and appreciation goes to my mentors **Professor Per-Olof Ostergren and Professor Hinda Jama Ahmed.**

To the three independent reviewers, to maintain your anonymity, I extend my appreciation and gratefulness for a job well done.

I would do the grossest disservice without extending my gratefulness and appreciation to the following:

Dr. Abdullahi Aw-Muse	Director of Bosaso Regional Hospital
Kadijo Ahmed	Head of Beldage MCH
Nimco Mahamud	Head of Isnino MCH
Fadumo Jama	Head of Torebore MCH
Habibo Omar	Traditional Birth Attendee

To my family I express my gratefulness for your patience during my period of absence.

REFERENCES:

AbouZahr C. (2003). Safe Motherhood: a brief history of the global movement. 1947–2002. British Medical Bulletin, 67(1):13-25.

AbouZahr, C. (2000). Measuring maternal mortality. What do we know? In. Berer M, Ravindran TKS, eds. Safe motherhood initiatives. Critical issues. London. Blackwell Science-Reproductive.

Bailey, P. (2003). Program note. Using UN process indicators to assess needs in emergency obstetric services. Morocco, Nicaragua and Sri Lanka. International Journal of Gynaecology and Obstetrics 80: 222-30.

Barnes-Josiah, D., Myntti, C., Augustin, A. (1998). The "Three Delays" as a framework for examining maternal mortality in Haiti. Soc Sci Med; 46(8): 981-93.

Campbell OMR, Graham W. (2006). Strategies for reducing maternal mortalities. Getting on with what works. The Lancet Maternal Survival. Sep. 25-37.

Castro, R., Campero, M., Hernandez, B., Langer, A., (2000). A study on maternal mortality in Mexico through a Qualitative Approach. Journal of Women's Health & Gender-Based Medicine 9(6): 679-90.

Failed States Index, http://www.foreignpolicy.com/failedstates.

Final Report, (2014). Northeast Zone, Somalia Multiple Indicator Cluster Survey 2011 March

Graham, W., Brass, W., Snow, W. (1989). Estimating maternal mortality: the sisterhood method. Stud Fam Plann. 20(3):125-35.

Knight H, Self, A., Kennedy, S. (2013). Why are women dying when they reach hospital on time? A systematic review of the "third delay". PloS One 8:51.

Mohamud, Khalif Bile (2011). The Puntland State of Somalia Ministry of Health the Health Policy Framework 2012 – 2007 "Report on the Consultation Process Coordinated, the Ministry Of Health",

[WWW Document http://www.mohpuntland.com/wp-content/uploads/2016/03/4-Puntland-HPF-Process-and-Consultations-Report.pdf, [26/04/2018].

Pacagnella, et al., (2014). Delays in receiving obstetric care and poor maternal outcomes. Results from a national multicentre cross-sectional study. BMC Pregnancy and Childbirth. 14,159

Pasha, O, et al. (2016). A Prospective Cause of Death classification system for maternal death in low and middle –income countries. Results from the global network maternal newborns.

Paxton, A., Maine, D., Freedman, L., Fry, D., Lobis S (1986). The evidence for emergency obstetric care. Br Med J (Clin Res Ed) 293:606-608.

Ronsmans, C., Etard, F., Walraven, G., (2004). Verbal Autopsies. Learning from Reviewing Deaths in the Community. In: WHO, Beyond the Numbers. Reviewing maternal deaths and complications to make pregnancy safer. Geneva: World Health Organization.

Say, L., Chou, D., Gemmill, A. Tunçalp, Ö. Moller, A., Daniels, J., Gülmezoglu, A., Temmerman, M., Alkem, L... (2014). Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health; 2: 323–33.

Shah, I.H., Say, L., (2007). Maternal Mortality and Maternity Care from 1990-2005. Uneven but Important Gains Reproductive Health Matters, Vol.15, No.30 Maternal Mortality and Morbidity: Is Pregnancy Getting Safer for Women? pp.17-2.

Thaddeus, S., Maine, D. (1994). Too far to walk: maternal mortality in context. Soc. Sci. Med 38(8): 1091-110.

The World Factbook. (2017). Langley, Virginia: Central Intelligence Agency.

Combs Thorsen, V., Sundby, J., Malata A. (2012). Piecing Together the Maternal Death Puzzle through Narratives: The Three Delays Model Revisited. PloS One, 7, Malata.

United Nations Children's Fund, (2016). Situational Analysis of Children in Somalia.

United Nations Children's Fund, (2014). Final Report *Multiple Indicator Cluster Survey 2011* Monitoring the situation of children and women Northeast Zone, Somalia

United Nations Children's Fund, (2006). Final Report *Multiple Indicator Cluster Survey (MICS).* Monitoring the situation of children and women, Somalia.

United Nations, (2000). The Millennium Declaration, Resolution A/RES/55/2. New York: United Nations.

USAID, (2014). Environmental and Natural Resource Management Assessment, USAID, Nairobi, April, p. 16.

World Health Organization (1995). Verbal autopsies for maternal deaths. Report of a WHO workshop London, 10 - 13 January 1994. Geneva: World Health Organization.

World Health Organization, (1994). International Classification of Diseases and Related Health Problems. 10th Revision. Geneva: WHO.

World Health Organization, (1997). The Sisterhood method for estimating maternal mortality: Guidance notes for potential users. Geneva: World Health Organization;

World Health Organization, (2012). The WHO application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-MM. WHO: Geneva [Cross reference].

World Health Organization. (1996). Safe Motherhood Needs Assessment: Maternal Death Review Guidelines. Geneva: World Health Organization;

World Health Organization. (1996). Revised 1990 estimates of maternal mortality. Geneva: World Health Organization;

World Health Organization. (2001).Maternal mortality in 1995: Estimates developed by WHO, UNICEF and UNFPA. Geneva: World Health Organization;

World Population Prospects (2017): The 2017 Revision. ESA.UN.org (custom data acquired via website). United Nations Department of Economic and Social Affairs, Population Division. Retrieved 10 September.

WHO, UNICEF, UNFPA, Word Bank Group, and United Nations Population Division, (2015). Trends in Maternal Mortality. 1990 to 2015 Geneva: World Health organization. http://apps.who.int/iris/bitstream/10665/194254/1/9789241565141-eng.pdf?ua=1.

APPENDICES

Appendix 1a: Characteristics of the maternal deaths identified 1b: Sociocultural and Economic Characteristics.

Identity					**Death**				**Pregnancy**	
Case #	*Age (yrs.) estimated*	*Parity*	ANC Clinic visits	*Place of delivery*	*Medical Cause*	*Timing of the death*	*Time*	*Place* of Death	*Outcome*	*Period*
1 (SM)	20	2	4	Home	Haemorrhage and Sepsis	Postpartum	21 days postpartum	Hospital	LB & FSB	9
2 (AS)	35	10	3	MCH	Haemorrhage and Retained placenta	Postpartum	One day postpartum	Hospital	LB	9
3 (NH)	18	1	2	Hospital	Eclampsia	Postpartum	5 hrs. postpartum	Hospital	LB	7
4 (FH)	30	7	2	Home	Eclampsia and Haemorrhage	Postpartum	3 hrs. postpartum	Hospital	LB & LB	9
5 (KF)	32	8	0	Home	Haemorrhage and Obstructed labour	Postpartum	4 hrs. postpartum	Hospital	LB & FSB	9
6 (DQ)	31	8	3	Home	Haemorrhage	Postpartum	One day postpartum	Home	FSB	9
7 (MR)	40	17	3	Private hospital	Eclampsia	Postpartum	One day postpartum	Private hospital	FSB	8
8 (HA)	21	4	5	Home	Eclampsia	Postpartum	6 days postpartum	Home	FSB	7
9 (AA)	34	9	5	Hospital	Haemorrhage and Obstructed labour	Postpartum	4 hrs. postpartum	Hospital	FSB	9
10 (HA)	20	4	0	Home	Eclampsia and Haemorrhage	Postpartum	One hr. postpartum	Home	FSB	7
11 (RA)	28	5	5	NA	Anaemia	Ante-partum	Before labour began	Home	NA	8
12 (BA)	40	6	0	Home	Eclampsia	Postpartum	10 days postpartum	Home	FSB	9
13 (FA)	27	4	2	Home	Haemorrhage, HTN, Sepsis	Postpartum	9 days postpartum	Home	FSB	9
14 (AM)	30	5	3	NA	Haemorrhage, Anaemia	Intra-partum	During labour	Home	NA	9
15 (SM)	30	7	5	Home	Haemorrhage, Anaemia	Postpartum	2 hrs. postpartum	Hospital	FSB	6
16 (DA)	32	5	5	Home	Haemorrhage and Sepsis	Postpartum	21 days postpartum	During transport	LB	6
17 (JA)	50	10	5	Home	Sepsis	Postpartum	10 days postpartum	Home	LB	9
18 (SO)	40	11	3	NA	Haemorrhage and Obstructed labour	Intra-partum	During labour	MCH	NA	9
19 (HM)	36	9	0	NA	Obstructed labour	Intra-partum	During labour	Home	NA	9
20 (GO)	27	5	0	Home	Haemorrhage, HTN	Postpartum	5 hrs. postpartum	Home	LB	9
21 (FF)	31	5	0	NA	Haemorrhage, Obstructed labour	Postpartum	During labour	Hospital	SB	9

22 (QS)	26	9	4	Hospital	Eclampsia	Postpartum	½ hrs. postpartum	Home	FSB	7
23 (BD)	40	14	2	Home	Haemorrhage	Postpartum	6 hrs. postpartum	Home		9
24 (HA)	15	1	3	Hospital	Obstructed labour, HTN	Postpartum	18 hrs. postpartum	Hospital	FSB	9
25 (AA)	18	3	0	Home	Obstructed labour, Haemorrhage	Postpartum	2 hrs. postpartum	Home	LB	9
26 (KC)	32	2	3	Home	Anaemia, HTN	Postpartum	31 days postpartum	Home	FSB	9
27 (UI)	40	14	0	Home	Obstructed labour, Haemorrhage	Postpartum	2 hrs. postpartum	Home	FSB	9
28 (AI)	45	15	3	Home	Eclampsia, Obstructed labour	Postpartum	10 min postpartum	Home	SB	8
29 (SI)	34	10	0	Home	Sepsis, Haemorrhage	Postpartum	2 hrs. postpartum	Home	FSB	9
30 (S)	30	2		Home	Sepsis	Postpartum	2 hrs. postpartum	Home	LB	9

Case No.	Mother Education	Husband Education	Mother Occupation.	Husband Occupation	Total cost of health in $	Who paid it	No. of wives husband	Rank of the Mother	1st facility contacted	2nd facility contacted	3rd facility contacted
1	Madarasah	Madarasah	Stay home mom	Taxi driver	150	Mother in law	1	1	TBA	Spiritual healer	TB Clinic and hospital
2	Madrasah	Primary	Vegetable shop owner	Fisherman	0	0	2	2	MCH	Hospital	No contact
3	Madrasah	Madrasah	Laundry worker	Forklift operator	35	Husband	1	1	MCH	Hospital	No contact
4	Madrasah	Secondary	Stay home mom	Restaurant owner	0	0	2	1	TBA	MCH	Hospital
5	Madrasah	Primary	Stay home mom	qur'anic teacher at madrasah	350	$50 Husband, and loan $300	1	1	Pharmacy referred ultrasound	TBA	MCH referred hospital
6	Madrasah	Secondary	family shop	owns and works in store	90	Husband	1	1	TBA	Hospital	P. hospital
7	Madrasah	Madrasah	Cleaner	Truck Driver	358	Husband and brother in law	2	1	MCH	Hospital	P. hospital
8	Primary	Secondary	Stay home mom	Teacher	60	Husband	2	1	TBA	MCH	Hospital
9	Madrasah	Technical School	Vegetable shop owner	Furniture maker	40	Husband	1	1	MCH	Hospital	No contact
10	Madrasah	Madrasah	Tailor	Farmer	35	Husband	1	1	Pharmacy	CHW	No contact
11	Madrasah	Primary	Stay home mom	Plumber	20	Husband	1	1	MCH	P. Hospital	No contact
12	Madrasah	Secondary	Restaurant owner	Community Chief	100	Husband	1	1	Pharmacy	VHW	No contact
13	Primary	Secondary	Stay home mom	Soldier	20	Husband	1	1	Pharmacy	TBA	Visiting Health team
14	Madrasah	Secondary	Stay home mom	Store Manager	40	Sister	1	1	TBA	MCH	VHW
15	Secondary	Secondary	NGO worker	Mechanic	70	Husband	1	1	TBA	Hospital	No contact
16	Madrasah	Primary	Stay home mom	Works at port	260		1	1	TBA	Hospital	Private hospital
17	No Formal Education	Madrasah	Stay home mom	Labourer at a cement store	20	relatives	1	1	MCH	No Contact	No contact
18	No Formal Education	Madrasah	Stay home mom	Builder	10	herself	1	1	TBA	MCH	No contact
19	Madrasah	Secondary	Stay home mom	Soldier	0	N/A	1	1	TBA	No Contact	No contact

20	No Formal Education	Madrasah	Stay home mom	Mechanic	60	Husband	1	1	TBA	Hospital	No contact
21	No Formal Education	Primary	Stay home mom	Worked in vegetable market	280	relatives	1	1	TBA	Hospital	No contact
22	Madrasah	Primary	Stay home mom	Works at port	150	sister in law	1	1	Pharmacy	MCH	Hospital
23	Secondary	Secondary	Supermarket	Butcher	20	N/A	1	1	CHW at the Pharmacy	No contact	No contact
24	Primary	Secondary	Stay home mom	Builder	80	father in law	1	1	CHW	TBA	MCH ref. Hospital
25	Secondary	Secondary	moved back from Saudi Arabia	Plumber	20	mother	1	1	TBA	MCH	No contact
26	Madrasah	Secondary	Stay home mom	Soldier	140	husband took loan	1	1	TBA	Hospital	No contact
27	Primary	Secondary	Tailor	Teacher	30	mother	2	1	TBA	MCH	No contact
28	No Formal Education	Technical School	Stay home mom	Antenna technician	50	N/A	1	1	MCH	Hospital	VHW at pharmacy
29	No Formal Education	Technical School	tradition antique maker and trader	Tile builder	80	Husband	4	1	TBA	pharmacy	Hospital
30	Madrasah	Primary	Farm worker	Driver	20	Husband & loan	3	1	TBA	Hospital	P. hospital

Appendix 1c: Statistics

Statistic	N	Mean	St.Dev.	Min	Max
Case	**30**	**15.5**	**8.8**	**1**	**30**
Age (yrs.) estimated	**30**	**31.1**	**8.4**	**15**	**50**
Parity	**30**	**7.1**	**4.3**	**1**	**17**
ANC Clinic visits	**30**	**2.2**	**2.0**	**0**	**5**
Total cost of health	**30**	**79.6**	**93.5**	**0**	**358**
No of wives husband has `	**30**	**1.3**	**0.7**	**1**	**4**
Rank of the Mother	**30**	**1.0**	**0.2**	**1**	**2**
Duration of pregnancy	**30**	**8.4**	**1.0**	**6**	**9**

Appendix 2: ***ANC Visitation of all MCHs in Bosaso City***

Antanatal Care Visitations of all MCHs in Bosaso City

	2016											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ANC 1st visit	1468	1397	1663	1798	1874	1565	1673	1814	1597	1809	1821	1909
ANC 2nd visit	1073	1216	1240	1422	1181	1112	1124	1260	1184	1376	1404	1508
ANC 3rd + visit	912	1093	1086	1178	1057	1082	1078	1144	1221	1478	1304	1661
	2017											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ANC 1st visit	2109	2664	2328	2522	2277	1825	2537	2640	2629	2675	2197	2221
ANC 2nd visit	1531	1817	1859	1961	1923	1673	1924	2251	2213	2217	2000	2047
ANC 3rd + visit	1568	1764	1907	1949	1731	1582	1928	2056	2195	2064	2263	2196

Appendix 4: ***Delays experienced among the 30 cases autopsied.***

Case #	Cause	Reported symptoms	Delays experienced		
			Delay 1 (25)	*Delay 2 (22)*	*Delay 3 (24)*
1	Haemorrhage and Sepsis	Bleeding Shortness of breath and offensive vaginal discharge.	Delivered at TBA. Decided to seek medical help 6 days after recognition of the complication. Difficulty for the husband in paying $150 family helped	Seeking care from different places including spiritual visited TB clinic twice and referred 2nd time to hospital	Needed blood, not available, so relatives donated, mother in law paid for the testing and bags.
2	Haemorrhage and Retained placenta	Labour pains.	-	After 1.5-2 hours of bleeding she was transferred to the hospital by taxy.	Placenta was retained for 1.5-2 hours before transferred to the hospital,
3	Eclampsia	Generalized oedema.	Returned home and the husband made the decision to seek care again after 6 hours	Went MCH referred to hospital went instead home and finally went to hospital.	-
4	Eclampsia and Haemorrhage	Fits Generalized oedema.	Delivered at TBA Decided to seek medical care after fitting.	Went to MCH first referred to hospital. Transportation difficulties experienced	-
5	Haemorrhage and Obstructed labour	Foetus not moving	Transport not available at night. Was available in the morning 5 hrs. later	Went to local pharmacy referred to an ultrasound centre but was closed b/c of mid-day break she came back home then returned back to hospital.	Blood (1000mL) needed but was not readily available. Relatives and public member donated for the blood.
6	Haemorrhage	Bleeding. And Infection	Deliver at TBA	-	Seen at the hospital received medicines and discharged then

			Kept at home for over 2 hours before deciding to seek medical care.		went home then went to another health facility received medicines and sent home. She died after returning home
7	Eclampsia	Fits Generalized oedema	Hospital stay was planned but Escorts retuned her home	Seeking care from three different places	
8	Eclampsia	Fits Generalized oedema.	Decided to seek medical care after fitting.	Transported from home to MCH where she was transferred to the hospital. Then transferred to private hospital. These health facility had no doctors thus after returning home she died	The hospital was closed and the escorts took her to another health facility which was also closed
9	Haemorrhage and Obstructed labour	Labour pains Bleeding.	Decided to seek medical care after in labour and discharging blood more than 12 hours	Transportation difficulties experienced due to the time in the night	Blood (1000mL) needed but was not available. Relatives and public members had no match.
10	Eclampsia and Haemorrhage	Generalized oedema.	Decided to seek medical care after she was too week to move.	Seeking care from local pharmacy three different times	VHW in the local pharmacy could not help
11	Anaemia	Tired and weak	Decided to seek care when too weak to move	Seeking care from two different health centres in separate times	No active management at the MCH and the private hospital. Seen at the outpatients given tablets and sent home.
12	Eclampsia	General oedema, Blurred fission	Seek medical care after her eyesight blurred	-	No active management at the pharmacy and no referral to obstetric care provider.
13	Haemorrhage, HTN, Sepsis	Bleeding	Delivered at TBA Stayed at home for 10 days before receiving medical care	Seeking care from traditional remedies Difficulty in finding money for medicines experienced	The health care providers such as the village health worker and others did not refer her to MCH or the hospital.
`14	Haemorrhage, Anaemia	Prolonged labour, Bleeding	Seek medical care after bleeding for an hour and seeing baby was not positioned properly.	Seek care from MCH referred to hospital returned home and called village health worker. After deciding to seek care again transport was not available	No active management by the VHW and no referral to obstetric care provider.
15	Haemorrhage, Anaemia	.Bleeding	Delivered at TBA She decided to seek care because of bleeding after birth. Bleeding that started with labour	-	-
16	Haemorrhage and Sepsis	Offensive vaginal discharge, fever	-	-	No active management

17	Sepsis	Abdomen pain, Fever and shivering		Money and transport difficulty experienced by the relatives to take her to hospital	Medicines was given at the MCH then sent home
18	Haemorrhage and Obstructed labour	Bleeding	Called TBA when lost large amount of blood	Transport difficulty experienced for two hours	Detained at the MCH for 3 hours
19	Obstructed labour	Prolonged labour	No decision made to seek care for 10 hours in labour	Transport difficulty experienced due to the time in the night	No active management by the TBA and no referral to obstetric care provider.
20	Haemorrhage, HTN	Bleeding	Seek medical care after she turned pale	-	Detained 10 days in hospital she died when returned home
21	Haemorrhage, Obstructed labour	Prolonged labour, Bleeding	Seek medical care after many hours of bleeding		Needed blood. Had to pay $60 and the escort had no money so they searched blood donors but could not find a donor with a match
22	Eclampsia	Generalized oedema,	-	-	Died 30 min after giving birth and returning home from hospital where she stayed the previous 10 days.
23	Haemorrhage	Bleeding, followed by headache and fever.		The family seeks care from the community health worker.	No active management at the community health worker and no referral to obstetric care provider.
24	Obstructed labour, HTN	Blood pressure Obstructed labour	Fist delay was made by HA's mother to decide to seek care after sixteen hours	Delay was due to going many health centres such as (CHW)	
25	Obstructed labour, Haemorrhage	Prolonged labour and haemorrhage	AA's family Decided to Seek care after thirty six hours	Long distance which takes more than 1hour to walk and limited transportation available	Ambulance was not available for the MCH during that time.
26	Anaemia, HTN	Hypertension anaemia, blood loss, poor appetite and weight loss	KC's family took thirty days to seek medical care		Blood (500mL) needed but was not readily available. Relatives and public member are donated for the blood Due to limited financial support available, the women was discharged from the hospital
27	Obstructed labour, Haemorrhage	Fever, vomiting , prolonged labour and haemorrhage	There was no fist delay she took write decision and seek care but she decided to return home after weak labour		VHW who injection to induce labour which resulted bleeding, the decision to refer her to hospital after bleeding was not made.

28	Eclampsia, Obstructed labour	High blood pressure,	Al's elder son and daughter refused to follow doctor's advice to proceed caesarean section	Went to MCH then MCH referred to hospital which then she returned home after refusal of DRs suggestion to pursue caesarean section and then called TBA which is seeking care in wrong place	
29	Sepsis, Haemorrhage	Fever and bleeding	It took one week to seek medical care with bleeding	Seeking support from multiple health facilities e.g. private hospital and then referred to referral hospital	She admitted to hospital, received blood and then she returned back to home due financial limitation and limited family support.
30	Sepsis	Bleeding, developed rash after blood transfusion	After seven days of bleeding she decided to seek medical care	SH's seek care from hospital Then returned back home and later seek medical care again	Patient feels sick and skin rash after blood transfusion (blood transfusion reaction).

Appendix 5: Case Studies

Case No. 1

SM was 20 years old and the only wife of the husband. This was her second pregnancy. It was a multiple pregnancy. She made four routine antenatal care visits. After **SM** delivering at home with TBA to twins (one life birth and one stillbirth), she lost lots of blood. She became ill, felt weak and she complained blurred vision and headache. She was breathing heavily and had offensive vaginal discharge. The family seeks help from spiritual healer before taking her to private hospital the sixth day of giving birth, where she received blood 500 ml, paid $ 60 she was recommended to stay at the health facility for three more days but escort had no money and returned home. **SM** continued to be ill with symptoms mentioned above and started to have fits. After family seeking care for her from different places including spiritual and TB clinic for tests they went to hospital where she received more blood that was donated by relatives. $30 was paid for the service. Total of $150 were spend. Finally, she died in the hospital.

Cause of Death: Haemorrhage and Sepsis

(Respondents: Husband, Mother in law, TBA, and Father in law, and one health care provider from one health facility)

Case No. 2

AA was 35 years old and had one co-wife. She had nine previous pregnancies with six live births. During this pregnancy she made four routine antenatal care visits. **AA** experienced labour pain. Therefore, she decided to go to the MCH two hours later when her contraction becomes more intense. At her arrival **AA**'s cervix was dilated 4 cm after examination, she stayed to deliver there. Around 5am in the morning she delivered a baby girl. Unfortunately, the placenta was not delivered and retained in the uterus. **AA** claimed to the health staff that in her previous pregnancy the placenta was retained first then it was removed manually. This was not attempted. Consequently, she was bleeding heavily. The midwife gave her oxytocin to stop bleeding. After 1.5-2 hours she was transferred to the hospital. The hospital admitted her to the examination room. After 20 minutes the doctors announced to the family that she was dead.

Cause of Death: Haemorrhage and Retained placenta

(Respondents: Aunt, Daughter, Neighbour and two health care provider from one health facility)

Case No. 3

NH was 18 years old married lady. This was her first pregnancy and she made two routine antenatal care visits. At seven months pregnant **NH** was swollen all over her body. She complained about headache, pain in her chest, vomiting and fainting. The family took her to MCH, after examining and checking her, they found her blood pressure to be very high and her cervix was dilated 1 cm. As a result she was referred to the hospital at 8pm in the evening but she returned to home and was experiencing weak labour pain. At around 2am in the morning she was taken to hospital. The doctor found her blood pressure to still be high and only 1 cm dilated cervical. She was induced and delivered premature baby at 8am next morning the baby was kept in the incubator and at noon the mother was dead.

Cause of Death: Eclampsia

(Respondents: Mother and Aunt)

Case No. 4

FH was 30 years old had one co- wife of the husband. She had six previous pregnancies. This pregnancy was a multiple pregnancy but **FH** did not know. She made two routine antenatal care visits. At ninth month of pregnancy she suffered hypertension. She was swollen all over the body from the seventh month of pregnancy. She took no medicines for the hypertension but took Panadol when she had headache. When the labour pain started she called TBA and two of her female friends. Her husband worked long hours. She delivered twin boys that died after three months of birth. She started bleeding heavily. Furthermore, she developed fits chewing her tongues. She complained extreme pain in the left side of her chest and shortness of breath. She had headache and vomiting. She was taken to the MCH where she was found to have high blood pressure. As a result she was referred to the hospital. After examination the hospital administered medicines to lower the blood pressure. This was to no avail. Consequently she was dead in few hours.

Cause of Death: Eclampsia and Haemorrhage

(Respondents: 2 Neighbours who are also her friends)

Case No. 5

KF was 32 years old and was the only wife of the husband. She had seven previous pregnancies but three were live births. **KF** last pregnancy was multiple but was not known and she had no ANC visits and no ultrasound done. At the ninth month of her pregnancy suspected that the foetus was not moving. Therefore, she visited the local pharmacy with the local village health worker who advised her to have ultrasound; unfortunately the ultrasound clinic was closed when she visited. Shortly after she returned home the labour pain started followed by the delivery of the first of twins. The second baby was obstructed and retained in the uterus. The time was after midnight where there was difficulty in finding a vehicle to transport her to a health facility. Meanwhile, she continuously bled heavily. She was taken to the local MCH in the morning around 6am Monday. MCH referred her to hospital. After reaching the hospital, she was examined and was found that she requires minimum of 1000ml of blood. In addition, the placenta has ruptured. Furthermore, she needed caesarean section to remove the retained twin. Followed by blood transfusion of 500ml of blood from a relative and 500 ml from a member of the public, she had caesarean section at 5pm and she finally was dead at 4am Tuesday morning.

Cause of Death: Haemorrhage and Obstructed labour

(Respondents: Mother and Sister)

Case No. 6

DQ was 39 years the only wife of the husband. She had seven previous pregnancies with five live births. During pregnancy **DQ** battled with infection continuously discharging fluid. She went to MCH a number of times where she received antibiotics. When she experienced labour pain she called for TBA then she delivered at home a live baby, who died at home later in the day. She's delivering placenta at 5pm is followed by haemorrhaging for two hours. As a result, she was taken to the hospital. The hospital administrated medicines for infection and for stopping the bleeding the husband paid $30 for the medicines. She returned home hoping to get better as her condition worsened the family took her to private hospital where she had medicines for infection through IV and this cost $40. At 2pm next morning she suffered hypotension and eventually died. The family unsure of the death returned her body to hospital. There were no doctors available so they were referred to private hospital and her death was confirmed.

Cause of Death: Haemorrhage

(Respondents: Husband, Two Sisters, community health worker and two health care providers from two different health facilities)

Case No. 7

MR was 40 years old and was first wife of her husband and had one co- wife. She had sixteen previous pregnancies with eight live births. MR developed preeclampsia symptoms in first trimester. At eight months of pregnancy her symptoms intensified, followed by headache, swelling of the body and blurred vision. At the same time she was in contact with MCH and had three antenatal care visits used antihypertensive medicines. The family took her to the hospital after referral from the MCH. The hospital gave her an injection and asked her to stay in the hospital for check-up but the family thought she improved with the medication and returned her home. However, she started to have fits, ripping off her clothes, pulling her hair and in great pain without rest. As a result, the family took back her to a private hospital. She was given medicines to stabilize her. These medications lead to her unconsciousness. After days in coma and only responding to a call of her name with faint "hnnn" sound, she was in labour. She had assisted delivery where instruments used, and gave birth to still birth she then died the following day.

Cause of Death: Eclampsia

(Respondents: Husband, Sister and two health care providers from same health facility)

Case No. 8

HA was 21 years old and is second wife of her husband. She had hypertension with all three previous pregnancies and last pregnancy resulting only one live birth. At the seventh month of pregnancy she began to have pre-eclampsia symptoms such as a swelling over the body. In addition, she suffered minor injury suspected of resulting from animal bite to the leg. The leg became inflammated. Eventually labour pain started and she gave birth to stillbirth baby at home with her mother assisting her who is also the TBA. She begun to have fits and started chewing her lips, she also complained of having a headache. The family transferred her from home with ambulance to MCH were she was referred to the hospital at noon. Unfortunately, there were no doctors available at lunch time. Therefore they went to private hospital where there were no doctors available either for the same reason. As a result, the family returned home and few hours later she died.

Cause of Death: Eclampsia

(Respondents: Mother, Husband and Sister)

Case No. 9

AA was 30 years old. She had eight previous pregnancies with five live births. During her last pregnancy **AA** made five routine prenatal care visits. She had anaemia thus received iron tablets and was advised to take balanced diet including vegetables. At nine months of pregnancy she began to experience labour pain in the morning in the same time she also started to bleed. That evening she was too weak to walk. As the husband decided to take her to a health facility there were no transport available in late hours of the night. Therefore around 7am in the morning the women went to the MCH. After examining her blood pressure was found to be very low and she needed blood transfusion thus MCH referred her to hospital. The hospital also added the point that the blood needs to be given to her before she has a delivery. Unfortunately blood with the same blood type of her were not available at the hospital. Furthermore, the relatives and the people around them who were willing to donate blood had no match. Meanwhile, she gave birth to still birth baby around 1pm. Finally 5pm before any blood was not found yet she died.

Cause of Death: Haemorrhage and Obstructed labour

(Respondents: Husband, Mother and VHW and one health care providers from a health facility)

Case No. 10

HA was 20 years old married lady and the only wife of the husband. She had three previous pregnancies with three live births. **HA** at the 7th month pregnancy, started to have general oedema especially the legs. Two weeks through the 7th month swelling increased she felt weak. So she went to the local pharmacy/doctor were she was tested and found to have high blood pressure. She bought medicines for the hypertension three times. Her swelling became extreme, she felt too weak to go to the pharmacy/ doctor. Eventually the foetus died and within those three days of labour starting around 6pm evening, she delivered 6am in the morning. She was bleeding heavily and died in an hour of giving birth.

Cause of Death: Eclampsia and Haemorrhage

(Respondents: Husband's brother, TBA, co-wife,)

Case No. 11

RA was 28 years old and the only wife of the husband. She had four previous pregnancies with three live births. **RA** at eight months was pregnant and anaemic. Her illness started when she went to MCH to get registration for food vouchers given by local NGO. This involved many pregnant women in the community queuing in the heat of the sun from early morning till evening until the person gets a respond. She had to return to MCH for seven consecutive days before she was very ill to return. Consequently, her blood pressure was very low. She received medicines for anaemia and infection from the MCH. Shortly after, her condition became worse. The family took her to the private hospital to have medical tests. Her blood pressure was found to be very low. They administered IV for nutrient and medicines for typhoid. She returned home and died still pregnant in few days later. The aunt cares for the children now.

Cause of Death: Anaemia

(Respondents: Husband and Aunt)

Case No. 12

BM was 40 years old. She had hypertension, diabetes and asthma. During this pregnancy **BM** her illness began early. Her symptoms included headache, swelling of the body and heart pain. She used medicines to lower her blood pressure from the village pharmacy and she was in contact with the village health worker at the pharmacy. Furthermore, she suffered gestational hypertension in her previous three pregnancies. However her blood pressure back to normal each time after delivery. Unfortunately, this last pregnancy her blood pressure continued to be high after delivering still birth, swelling and headache increased, her eyesight blurred. The family seek more medication that cost the her husband up to $100 to treat her illness from the pharmacy and VHW this involved IV for nutrient as she was anaemic according to the VHW however, the medicines resulted no improvement in her condition. Finally, she went in to coma and died.

Cause of Death: Eclampsia

(Respondents: Husband, TBA, Mother in-law, Aunt and one health provider at health facility)

Case No. 13

FA was 27 years old and the only wife of the husband. She made two ANC. She had three previous pregnancies but only one was a live birth. During pregnancy **FA** suffered breathlessness at the eighth month of pregnancy, her body was swollen. Therefore she had a test for blood pressure from local pharmacy. The village health worker at the pharmacy and was shown to be high. She had no medication for the hypertension due to difficulty in finding money for the medicines. Eventually, she delivered stillbirth at home. In addition, after delivery she lost large quantity of blood in a period of days bleeding commenced slowly then increased in the following six days. Symptoms she suffered included fever, headache, swelling of the body increased. The family applied traditional remedies to treat her illness. Eventually the bleeding ceased however, she was still ill and became weaker. Health providers visiting the village examined her then prescribed and supplied antibiotics. They recommended to seek care from hospital but the family had no money so the sister went to market to sell her earrings and as she come back with $50 she died at home. This was ninth day after delivering.

Cause of Death: Haemorrhage, HTN, Sepsis

(Respondents: Husband, Sister and one health provider)

Case No. 14

AM was 30 years old and the only wife of the husband. **AM** was anaemic at her ninth month of pregnancy as labour started and commenced well and could see the foetus head, she started bleeding and the following hours the bleeding continued and the baby was not delivered and was obstructed. Consequently, she was taken to the MCH. As it was clear to midwives at the MCH that she needed blood and they stated that the placenta has ruptured, thus the MCH referred her to the hospital. The mother of **AM** decided to not attend the hospital due to the fear of caesarean section possibly she would need to have. Therefore, woman was returned home. VHW at the local pharmacy was called he administered medicines to stop bleeding and was paid $30, then left. Bleeding continued. The family decided to eventually take her to hospital then, unfortunately as it was late hours of the night there were no transport available. When it became morning she became too weak and soon died around 6am.

Cause of Death: Haemorrhage, Obstructed labour, Anaemia

(Respondents: Husband, Two Sisters and two health providers from two different health facilities)

Case No. 15

SS was 30 years old. She had six previous pregnancies with last two pregnancy resulting still births. **SS** was anaemic and received blood during this pregnancy. In addition, she had near miss situation in her previous pregnancy where she delivered a stillbirth then followed by haemorrhage. Fortunately, she delivered at hospital hence, had blood transfusion and recovered. At six months of pregnancy she felt heaviness and noticed that the foetus lacked any movement for a number of days. Bleeding started with the labour pain, and continued as labour commenced till birth. She gave birth to still birth baby. The following hours, bleeding continued while the relatives were busy the infant's burial. Coming back from burial, she was taken to the hospital. The hospital, after examining, arranged blood transfusion for her. Unfortunately while in process of receiving the first blood bag that the husband bought with $30 she died.

Cause of Death: Haemorrhage, Anaemia

(Respondents: Husband, Sister and one health providers from health facilities)

Case No. 16

DM was 32 years old. All four previous pregnancies were normal with outcome of live births. **DM** started bleeding at the beginning of her last pregnancy. This bleeding made her anaemic which further made her very weak and tired, thus needing blood transfusion. She went to hospital a number of times where she then received blood each time. Eventually she delivered still birth at 6th month of pregnancy. As the bleeding continues after birth, the hospital examined then diagnosed her and found tumour in the uterus. They advised her to have hysterectomy. However, the family refused this decision and requested to have an operation to remove the tumour alone from the uterus. Two weeks after the operation took place, she started to discharge fluid which smelled, she developed symptoms such as fever, and feeling pain over the body and was tired. She was taken to the hospital and died on the way to the hospital.

Cause of Death: Haemorrhage and Sepsis

(Respondents: Husband, Two Sisters and VHW)

Case No. 17

JA was 50 years old and the only wife of the husband. She had nine previous pregnancies with seven live births. **JA** had normal delivery with no apparent complications. However, after a week she developed acute pain in the abdomen, fever and shivering. Furthermore, she began to have diarrhoea. As a consequence she was taken to the MCH. At the MCH, she received antibiotic and ORS then sent home. There was no improvement in her condition in the following few hours. As the family then planned to take her to the hospital and transportation and money difficulty were experienced. Within few hours from MCH and at home she was dead, that was less than 24 hours of being ill.

Cause of Death: Sepsis

(Respondents: Husband, Two Daughter and a Neighbour who is also family Friend)

Case No. 18

SO was 40 years old married lady with ten previous pregnancies and had ten children. **SO** As she delivered her previous pregnancies at home, she decided her last pregnancy to give birth at home, when the labour started she noticed bleeding. Because of the absence of her husband and no relatives nearby she sent her children to call the TBA. After the arrival of the TBA she has lost a large amount of blood. Therefore, the TBA advised her to go to the MCH. After the decision to go to MCH was made it took another two hours to find transportation. Eventually, around 1am in the morning they reached the MCH. At the MCH, she was very tired and the midwife suggested that it was too cold at night to receive IV with sugar. She was dead by 4am in the MCH.

Cause of Death: Haemorrhage and Obstructed labour

(Respondents: A Neighbour and two health providers from two health facility)

Case No. 19

HM was 37 years old and the only wife of the husband. She had eight previous pregnancies with six live births HM delivered all her previous pregnancies at home. This woman had three children whom all had disability resulted from a prolonged labour during child birth thus due to suffocation. This last pregnancy, the labour time was long, labour started in the morning and continued to the night. She had with her the TBA and the husband who is solder was away from town. Around 12 am, she was fully dilated however, there were no delivery. She became weak, had no energy and found difficult to talk. As a result the sister in-low decided to take her to the hospital but because it was 1 am in the morning, a time that is very difficult to find a transport. A relative who owned a private car underestimated the situation and thought that this could wait till morning. Unfortunately, around 4 am in the morning she died still pregnant.

Cause of Death: Obstructed labour

(Respondents: Friend who is also Sister In-low and TBA)

Case No. 20

GO was 27 years old. She had four successful previous pregnancies. During this pregnancy **GO** suffered diabetes and hypertension (HTN). In addition, she was anaemic and had poor appetite which increased her anaemia. Last months of pregnancy, she was very weak and tired. As labour started with bleeding which continued until she gave birth to live baby. The family applied ice on her abdomen for remedy. While she was anaemic she lost large amount of blood. This resulted her skin to turn pale and her placenta was white in colour. She was taken to hospital and stayed for 10 days. After examination **GO**'s blood pressure was very high. The hospital gave her medicines, for the HTN, then IV of sugar and blood transfusion. The doctor requested an x-ray. The escort paid $50 for the x-ray $200 for the 10 day stay. She died shortly after returning home concerned of funding the care. Meanwhile the newborn suffers diabetes and cared by her sister.

Cause of Death: Haemorrhage, HTN

(Respondents: Sister, TBA and one health provider)

Case No. 21

FF was 30 years. She had four previous pregnancies with live birth. During this pregnancy she made no prenatal care clinic visit. As labour began she experienced a discharge of blood, the discharge commenced as drops then later continued in to intensive haemorrhaging. **FF** was accompanied by her husband at the start of her pain. The husband contacted his sister in low and the TBA whom were present with her for extra three hours waiting for her to give birth.

Finally the family decided to take her to the hospital. After examining, the hospital said the placenta was detached and she need blood transfusion before giving birth. The blood available from hospital cost sixty US dollars which the family could not pay. Therefore they searched blood donors from friends and relatives and could not find. Meanwhile, she gave stillbirth and died before receiving blood.

Cause of Death: Haemorrhage, Obstructed labour

(Respondents: Two Sisters and TBA)

Case No. 22

QSh was 26 years old. She was the only wife of the husband and had eight previous pregnancies with six live births. During her last pregnancy she made four antenatal care visits. **QSh** suffered hyper tension in her early pregnancy she received medication from local MCH and pharmacy. She contacted regularly the village health worker in the local pharmacy. The symptoms such as swelling of the body, headache, and pain in the chest/heart with beating hard sensation intensified later months of the pregnancy. The family took her to the local pharmacy and MCH numerous times. Eventually, MCH referred her to the hospital because of pre-eclampsia symptoms such as trying to chewing her lips and having fits etc. In the hospital, she stayed in the hospital for ten days. While in the hospital, she delivered live baby who was a live for one day. The mother, was discharged immediately by family after delivering then died as she returned home from hospital within 30 minutes of coming home, and the family thought she will recover from symptoms of gestational hypertension after giving birth, but instead she developed further symptoms for example fever. That eventually claimed her life.

Cause of Death: Eclampsia

(Respondents: Husband, TBA, Sister In-low)

Case No. 23

BD was 40 years old and the only wife of the husband. She had 14 previous pregnancies, which three were still birth and three were miscarriages. She made two antenatal care visits in her last pregnancy. **BD** illness started after giving birth. It was in the evening when she complained a headache in an hour of delivering a stillbirth baby. She had fever and became restless. Local village worker was called, he administered medicines in IV to stop the bleeding and gave her some vitamins then left. After the medications finished her condition became worse, she had fits and at 1:00 am in the morning she was dead.

Cause of Death: Haemorrhage

(Respondents: Husband, TBA and Daughter)

Case No. 24

HA was 15 years old married lady pregnant for the first time. She made three routine antenatal care visits during her pregnancy. **HA** at seven months pregnancy had oedema when she contacted CHW, her blood pressure was checked and was found to be high. They advised her to reduce her salt intake. At nine months of pregnancy labour commenced slowly in the evening and contraction continued till morning. Eventually, the foetus head appeared however not delivered. Four hours later at 12pm the village health worker was called to induce the labour and strengthen the contractions thus, VHW gave injection to do this. This intervention resulted no delivery for the next few hours. As a consequence, the family decided to take her to the MCH. After examination, she was induced again by giving injection. With strong contractions the foetus head was stagnated at the cervix. **HA** went into a coma and was referred to the hospital immediately. The hospital examined her and said that the foetus was dead, and her blood pressure was high. Therefore, the foetus was removed with instruments. **HA** became conscious for 15 minutes then went back to coma and was declared dead eighteen hours later.

Cause of Death: Obstructed labour, HTN

(Respondents: Mother, Father In-low and TBA)

Case No. 25

AA was 18 years old and the only wife of the husband. This was her third pregnancy with two live births. She made no antenatal care visit in her last pregnancy. **AA** had experienced no symptoms during pregnancy. She did not made antenatal visitation this period. She planned home birth. In addition, the nearest MCH was more than one hour away walking. Finally, labour pain started one morning. The family called TBA to assist her with birth. She experienced labour pain for the next 36 hours. Unfortunately this result no delivery. The mother decided to seek health care for her daughter in labour. This involved walking in the heat long distance to the MCH. Once the mother reached the MCH the midwives informed her to bring the patient to the MCH. Meanwhile, she finally gave live birth. However, the placenta was detached

which lead to haemorrhaging. The mother found a rent car and returned home. Shortly as the **AA**'s mother arrived with a transport, she lost her life with a pool of blood.

Cause of Death: Obstructed labour, Haemorrhage

(Respondents: Mother, Father Sister and one health care provider)

Case No. 26

KC was 32 years old. She had only one previous pregnancy with the outcome of live birth. She made three antenatal care visits in this pregnancy. During this pregnancy, **KC** suffered high blood pressure. She disliked the taste of the medicines, therefore, did not take them. After delivery at home she lost large amount of blood and became sick. In addition, she lost weight and had poor appetite for food. Consequently the new borne died of malnutrition a week later. **KC** continued to be sick until the family decided to take her to the hospital 30 days after giving birth. In the hospital she needed blood. She received blood (500 ml) donated by a member of the public. Furthermore, she received medicines for the hypertension. After three days in the hospital she was taken back home. She lost her life after two days at home.

Cause of Death: Anaemia, HTN

(Respondents: Sister)

Case No. 27

UI was 40 years old had one co- wife of the husband. She had thirteen previous pregnancies with six live births. During this pregnancy she made no antenatal care visit. **UI** suffered infection and discharged fluid in late pregnancy. Her symptoms include fever and vomiting, she felt better in morning and at night she was sick again. When labour started she went to MCH, She was 8 cm dilated but contractions were irregular and weak. Therefore, after hours she decided to return home. At home, fully dilated but no progress in delivering. As a result, VHW was called and he administered medicines to strengthen contractions and soon after there was delivery of stillbirth. However, the forceful birth lead to an injury to the birth channel thus haemorrhaging for two hours before she died. Meanwhile, the family seek help from the VHW at the local pharmacy, unfortunately, she died before help reached her.

Cause of Death: Obstructed labour, Haemorrhage

(Respondents: Husband and Daughter)

Case No. 28

AI was 45 years old. She had fourteen previous pregnancies with eight live births. She made three antenatal care visits in her last pregnancy. **AI** was feeling ill. She had symptoms like swelling of the body and headache then labour pain started. **AI** went to the MCH, after examination the health workers told her she had high blood pressure and experienced short of breath (asthma attack). As a result, the MCH referred her to the hospital. After examination, the hospital recommended caesarean section, then the family herself and children (the adult daughter and son) refused this recommendation and returned to home. TBA assisted the birth of still birth. Finally she died 10 minutes after delivery the rest of children are currently looked after by the adult children. The husband was away when she was sick but arrived the same day she died.

Cause of Death: Eclampsia, Obstructed labour

(Respondents: Husband, Daughter and Son)

Case No. 29

SI was 34 years old and the only wife of the husband. She had nine previous pregnancies with five live births. She made no antenatal care visit in her last pregnancy. Before giving birth, at the eighth month of pregnancy **SI** was very weak, tired and kept lying down most of the time. She was discharging blood until labour started. At ninth month of pregnancy she lost large amount of blood after delivering. This continued for a week. Consequently, she went to the hospital after examining her, she received blood and stayed in the hospital for one day. Four days after coming home she was dead. She felt heat in her skin and was agitated constantly.

Cause of Death: Sepsis, Haemorrhage

(Respondents: Husband, Sister, TBA and co-wife)

Case No. 30

SH was 30 years old and had 2 co-wives. She had six previous pregnancies with five live births. During this pregnancy she made no antenatal care visits. **SH** had normal delivery at home. At the beginning the bleeding was not unusual. However, she continued bleeding for the next seven days with increased intensity. The family took her to the hospital. After examining, the hospital told the family that she needs a blood. The blood was donated by two men in the community 500 ml each then she returned home. **SH** condition deteriorated,

She started scratching herself feeling a rush all over the body. In addition, she had general oedema and appeared pale in the face. **SH** was taken back to the hospital. The hospital administered fluid and gave her medication. When she returned home, there was no improvement in her condition. Consequently, she was dead two days later.

Cause of Death: Sepsis

(Respondents: Husband, Sister and Brother)

Appendix 6: Verbal autopsy and contributing factors questionnaire of Maternal Deaths

Case Review Number: |__|__|

Name

EXPLAIN STUDY

Part A: interview details

No	**Questions and filters**	**Coding Categories**
QA01	**Interviewers initial**	**|_J_|_A_|** **|___|___|**
QA02	**Date of interview**	**_____/-_____/_____**

Part B: Selection of people to be interviewed

No.	**Questions and filters**	**Coding Categories**	**Skip to**
QB01	**Who was looking after/caring for the woman before her death?** ***More than one answer is possible*** **If Other, please specify_____**	**Husband 1** **TBA 2** **Mother 3** **Mother-in-law 4** **Father-in-law 5** **Sister 6** **Brother 7** **Brother-in-law 8** **Son 10** **Daughter 11** **Neighbour 12** **Other 13**	

QB02	**Who was around at the time of the woman's death?** **If Other, please specify_____**	**Husband 1** **TBA 2** **Mother 3** **Mother-in-law 4** **Father 5** **Sister 6** **Brother 7** **Brother-in-law 8** **Son 10** **Daughter 11** **Co-wife 12** **Granny 13** **Other 14**	
QB03	**If woman was married and husband hasn't been mentioned:** **Ask: Was her husband around (i.e. in the village) just before she died?**	**Yes 1** **No 2** **Not married 3** **Dead 4**	

Part C: Listing of people who participated in the interview:

Name	**Relationship to woman**	**Present when the woman died** **Yes 1**	**No 2**	**When they joined/left the interview**

Section 1: Background

No	**Questions and filters**	**Coding Categories**	**Skip to**
	I'd like to begin by getting some background information about the woman		
Q101	**How long ago did the woman die?** ***(write down what is said and code in months)***	**Months |____|____|**	
Q102	**How old was the woman when she died?**	**Years |____|____|** ***(99=unknown)***	
Q103	**Where did the death occur?** **If at health facility, specify_____**	**Home 1** **Health facility 2** **During transport 3** **Unknown 4**	
Q104	**Was the death due to an accident?**	**Yes 1**	

		No 2 **Don't know 9**	
Q105	**Do you know the cause of death?** **If Yes, specify_____**	**Yes 1** **No 2**	
Q106	**Do you know if the woman, before she died, had any long term medical problems during her pregnancy? (I.e. hypertension, diabetes, epilepsy……..) If yes, specify:_____**	**Yes 1** **No 2** **Don' know 9**	 **→Q108** **→Q108**
Q107	**Was she on treatment for this illness?** **If yes, specify_____**	**Yes 1** **No 2** **Don' know 9**	
Q108	**What was her marital status?** **If married specify for husband** **Name_____**	**Married 1** **Divorced 2** **Single 3** **Widowed 4**	 **→Q111** **→Q111** **→Q111**
Q109	**How many co-wives did she have in the marriage?**	**|___|**	
Q110	**What was her rank**	**Wife number: |___|**	
Q111	**Has she ever been to school (koranic or other)** **If yes: What was the highest level she attended** **For madrassa: How many years |____|____|** ***(Unknown = 99)***	 **No formal education 1** **Madrassa 2** **Primary 3** **Secondary 4** **Technical 5** **University 6** **Don't know 9**	
Q112	**What was her occupation?** **Specify**		
Q113	***Pre-amble: if married, answer the following questions for her husband, otherwise for the head of the compound or household:*** **What was the highest level of school he attended** **For madrassa: How many years |__|__|** ***(Unknown = 99***	**No formal education 1** **Madrassa 2** **Primary 3** **Secondary 4** **Technical 5** **University 6** **Don't know 9**	
Q114	**What is his occupation?** **Specify**		
Q116	**Was she pregnant when she died?**	**Yes 1** **No 2** **Don't know 9**	 **→Q118** **→Q118**
Q117	**How long had she been pregnant for?**	**Months |___|**	
Q118	**What was the outcome of her last pregnancy?**	**Live birth 1** **Stillbirth 2** **Abortion/miscarriage 3** **Mother and child died after labour began 4**	 **→Q120**

		Mother died during pregnancy but before labour began 5	**→Q120**
Q119	**How long after the end of this last pregnancy did she die?**	**days |___|___|**	

Section 2: Family or community's account of events around the woman's death and illness

Give an introduction explaining that we would like them to tell us what happened:

1. Around the woman's death (final hours)

2. From the time the woman started to become ill to her death

3. Tell me about what happened at the start of her illness? b) How her illness progressed close to the time of death.

Try and create a time line based on what they say if the story is complicated (attached at back of survey).

Section 3: Symptoms

Fill in based on history but if the material has not been covered ask the following questions:

(Note with an asterix * those responses already given in Section 2)

Q301	**How long had the woman been ill before she died? (*Your best guess from what the reporters have said!!)***	
Q302	**What symptoms did the woman have when she died or just before she died?** ***(What did she say and what did you observe?):***	

Q303	**What symptoms did the woman have when her illness started?** ***(What did she say and what did you observe?):***	

For deaths during pregnancy and prior to the onset of labour go to Section 4

For deaths during pregnancy but after onset of labour go to Section 5

For alldeaths go to Section 6

Section 4: Deaths during pregnancy, prior to onset of labour: symptoms

No	Questions and filters	Coding categories	Skip to
Filter	***Only ask the questions in this section when the woman died while pregnant, and prior to the onset of labour***		
	I'd like to ask you some questions about the woman's health during her pregnancy		
	During pregnancy did she		
Q401	**Have swelling of the legs?**	**Yes 1 No 2 Don't know 9**	
Q402	**Have swelling of the face?**	**Yes 1 No 2 Don't know 9**	
Q403	**Complain of blurred vision?**	**Yes 1 No 2 Don't know 9**	
Q404	**Have any fits?**	**Yes 1 No 2 Don't know 9**	
Q405	**Was she pale?**	**Yes 1 No 2 Don't know 9**	
Q406	**Was she short of breath when she carried out regular household activities?**	**Yes 1 No 2 Don't know 9**	
Q407	**Lose weight?**	**Yes 1 No 2 Don't know 9**	
Q408	**During pregnancy did she have her blood pressure taken**	**Yes 1** **No 2** **Don't know 9**	 **→Q410** **→Q410**
Q409	**Did she tell you what the blood pressure results were?** **If told…..what was the result?**	**High 1** **Normal 2** **Weren't told 3** **Don't know 9**	
	Questions about her final illness/death		
Q410	**During her final illness, was she bleeding from the vagina?**	**Yes 1** **No 2** **Don't know 9**	 **→Q414** **→Q414**
Q411	**Did the bleeding wet her clothes, the bed or the floor?**	**Yes 1** **No 2** **Don't know 9**	
Q412	**Was anything done to stop the bleeding?** **If Yes, specify_____**	**Yes 1** **No 2** **Don't know 9**	
Q413	**Was she in pain while bleeding?**	**Yes 1** **No 2** **Don't know 9**	
Q414	**Did she have any other episodes of bleeding during her pregnancy?**	**Yes 1** **No 2** **Don't know 9**	 **→Q416** **→Q416**
Q415	**Were they painful?**	**Yes 1** **No 2** **Don't know 9**	
Q416	**Did she have high fever during her final illness?**	**Yes 1** **No 2** **Don't know 9**	
Q417	**Was she yellow at the time of her death?**	**Yes 1** **No 2** **Don't know 9**	

Q418	**Was she short of breath at the time of death?**	**Yes 1** **No 2** **Don't know 9**	

Now go to section 6

Section 5: Deaths during labour, delivery or within 6 weeks after delivery: symptoms

No	Questions and filters	Coding categories	Skip to
Filter	***Only ask the questions in this section when the woman died during labour/delivery or within 6 weeks after delivery***		
	I would now like to ask you some questions about the woman's last delivery (.make clear that the relatives should talk about the one that is related to the death)		
Q501	**Where did the delivery take place?**	**Home 1** **On the way to the health facility 2** **Health facility 3** **During referral 4** **Died undelivered 5** **Don't know 9**	
Q502	**Who assisted at her delivery?**	**No one 1** **Relative (no health worker) 2** **TBA 3** **Nurse/midwife 4** **Doctor 5** **Don't know 9**	
Q503	**What sort of delivery was it?**	**Normal 1** **Instruments used 2** **Caesarean Section 3** **Don't know 9**	
Q504	**How many months pregnant was the woman when labour began?**	**Months |___|___|** **(*99= don't know)***	
Q505	**Was she in good health when labour began?**	**Yes 1** **No 2** **Don't know 9**	
Q506	**How long was she in labour for?**	**Hours |___|___|** **(*99= don't know)***	
Q507	**Did the woman die before the baby was born?**	**Yes 1** **No 2** **Don't know 9**	**→Q510**
Q508	**Was the placenta delivered?**	**Yes 1** **No 2** **Don't know 9**	 **→Q510** **→Q510**
Q509	**How long after birth of the child was the placenta delivered?**	**Hours |___|___|** **(*99= don't know)***	
Q510	**Did she have any fits before she died?**	**Yes 1** **No 2** **Don't know 9**	**→Q511**
Q511	**Did the fits stop after the baby was born?**	**Yes 1** **No 2** **Don't know 9**	
	Questions about the woman's health during her last pregnancy:		
	During the pregnancy did she:		
Q512	**Have swelling of the legs?**	**Yes 1 No 2 Don't know 9**	

Q513	**Have swelling of the face?**	**Yes 1 No 2 Don't know 9**	
Q514	**Complain of blurred vision?**	**Yes 1 No 2 Don't know 9**	
Q515	**Have any fits?**	**Yes 1 No 2 Don't know 9**	
Q516	**Was she pale?**	**Yes 1 No 2 Don't know 9**	
Q517	**Was she short of breath when she carried out regular household activities?**	**Yes 1 No 2 Don't know 9**	
Q518	**Lose weight?**	**Yes 1 No 2 Don't know 9**	
Q519	**During her pregnancy did she have her blood pressure taken?**	**Yes 1** **No 2** **Don't know 9**	**→520**
Q520	**Did she tell you what the blood pressure results were?** **If told…..what was the result?**	**High 1** **Normal 2** **Weren't told 3** **Don't know 9**	
Q521	**During her final illness, was she bleeding from the vagina?**	**Yes 1** **No 2** **Don't know 9**	 **→Q526** **→Q526**
Q522	**Did the bleeding wet her clothes, the bed or the floor?**	**Yes 1** **No 2** **Don't know 9**	
Q523	**Was anything done to stop the bleeding?** **If Yes, specify_____**	**Yes 1** **No 2** **Don't know 9**	
Q524	**Was she in pain while bleeding?**	**Yes 1** **No 2** **Don't know 9**	 **→Q526** **→Q526**
Q525	**Did the pains start before the labour pains?**	**Yes 1** **No 2** **Don't know 9**	
Q526	**Did she have a vaginal examination during her illness?**	**Yes 1** **No 2** **Don't know 9**	 **→Q528** **→Q528**
Q527	**Did the vaginal examination increase/cause bleeding?**	**Yes 1** **No 2** **Don't know 9**	
Q528	**Did she have any other episodes of bleeding during her pregnancy?**	**Yes 1** **No 2** **Don't know 9**	 **→Q530** **→Q530**
Q529	**Were they painful?**	**Yes 1** **No 2** **Don't know 9**	
Q530	**Did she have high fever during her final illness?**	**Yes 1** **No 2** **Don't know 9**	
Q531	**Did she have foul smelling discharge during her final illness?**	**Yes 1** **No 2** **Don't know 9**	

Q532	**Was she yellow at the time of her death?**	**Yes 1** **No 2** **Don't know 9**	
Q533	**Was she short of breath at the time of death?**	**Yes 1** **No 2** **Don't know 9**	

Now go to section 6

Section 6: Health seeking behaviour/contributing factors

Q601	**Between the woman falling ill and dying did she seek or did you take her to see anyone for treatment?**	**Yes 1** **No 2** **Don't know 9**	**→603**
	Where did she go? Fill in table Q602- unprompted column		**→602**
	Did she go to see anyone else? *Fill in table Q602- unprompted column*		**→602**
	For all those not mentioned: ask whether they went to see: ***Fill in table Q602- prompted column***		**→602**

Q602. Fill in table

	Unprompted	**Prompted**
VHW		
TBA		
Maternal Health Centre		
Hospital		
Private Doctor		
Pharmacist		
Spiritual healer		
Herbalist		
Other, specify _____		

I would like to ask you some more questions about events around the final illness and death of the woman

Q603	**Why did she not seek or you take her for treatment?** **_____** ***Prompt:* Did you take the woman to see any traditional healers? *If yes: continue***	**Yes 1** **No 2** **Don't know 9**	 **→Q613** **→Q613**
Q604	**Who did you go to see?** ***Prompt:* Did you go to see anyone else?**		

Q605	**Who was involved in making the initial decision that the woman should go for treatment?**		
Q606	**What prompted you to send the woman for treatment?** ***(e.g. what symptoms)***		
Q607	**Once the decision was made to take the woman for treatment did the woman go straight away?**	**Yes 1** **No 2** **Don't know 9**	**→610**
Q608	**Why not?**		
Q609	**How long was the delay?**		
Q610	**Was it difficult to find the funds to send the woman for treatment?**	**Yes 1** **No 2** **Don't know 9**	
Q611	**Where did the funds come from for the woman to go for her treatment? (*I.e. who paid?)***		

Q612. Once the decision was made to seek care

	Centre 1	**Centre 2**	**Centre 3**
a. How did the woman get there?			
b. How long did it take to get there?			
c. If by car/bus: **Did you have to pay for transport?** **If YES: who paid & and how much?**			
d. When you got to ……..how long did you have to wait before the woman was seen?			
e. Who did she see?			
f. What did they do?			
g. What did they tell you?			
h. How much did you have to pay?			
i. Did they ask you to go and buy anything? **If YES:** **How much was spent? Where did the money come from?**			
j. Did they refer the woman?			

k. If YES: Where to? **Did you go? If YES: next column** **If NO: why not?**			
l. What did you do next?			

All maternal deaths

	I'd like to ask some general questions about health seeking behaviour during the woman's pregnancy		
Q613	**Did she ever go for antenatal care during her pregnancy?**	**Yes 1** **No 2** **Don't know 9**	 **→618** **→618**
Q614	**How many times did she go for antenatal care?**	**|___|___|** ***(99= unknown)***	
Q615	**Is the antenatal or other health card still available?** ***If yes, ask permission for photocopying***	**Yes 1** **No 2** **Don't know 9**	
Q616	**Do you know where she was asked to deliver?**	**Yes 1** **No 2** **Don't know 9**	 **→618** **→618**
Q617	**Where?**		
Q618	**Apart from ANC visits did she ever go for health care during the last pregnancy?**	**Yes 1** **No 2** **Don't know 9**	 **→621** **→621**
Q619	**Who did she go to see?** **Specify: *(more than one answer possible)***	**TBA 1** **Nurse/midwife 2** **Doctor 3** **Pharmacies 4** **Drug seller 5** **Traditional healer 6** **Spiritual healer 7** **Don't know 8**	
Q620	**Why did she go there?**		

<u>Only for women who died after delivery</u>

Q621	**Did she ever go for postnatal care?**	**Yes 1** **No 2** **Don't know 9**	 **→625** **→625**
Q622	**Who did she go to see?** **Specify: *(more than one answer possible)***	**TBA 1** **Nurse/midwife 2** **Doctor 3** **Pharmacies 4**	

		Drug seller 5 **Traditional healer 6** **Spiritual healer 7** **Don't know 8**	
Q623	**Did she go for a routine visit or for a specific problem?**	**Specific 1** **Routine 2** **Don't know 9**	 **→625** **→625**
Q624	**What was the problem?**		

All deaths

Q625	**Does the family give permission to examine any health records pertaining the woman?**	**Yes 1** **No 2** **Don't know 9**	

Section 7: All suspected maternal deaths:

Questions about pregnancy history

Q701	**Has the woman ever been pregnant, including pregnancies that ended early or where the baby did not survive?**	**Yes 1** **No 2** **Don't know 9**	 **→Q120** **→Q120**
Q702	**How many live births did she have?**	|___|___| ***(99= unknown***	
Q703	**How many stillbirths did she have?**	|___|___| ***(99= unknown***	
Q704	**How many abortions/stillbirths did she have?**	|___|___| ***(99= unknown***	
Q705	**What was the woman's age at first pregnancy?**	**Years** |___|___|	

	Reliability of interview	**Good 1** **Indifferent 2** **Bad 3**	

End of questionnaire (for time line see next page)

TIME LINE FOR SYMPTOMS/TREATMENT FROM THEIR START UP TO DEATH Symptoms/Complaints

Start of Illness----------Death (Time interval)

Treatment Sought

Any additional notes or comments not included in the survey

Appendix 7: Classification form Verbal Autopsy –Maternal Deaths

A. Cause of death

Initials of reviewer |__|__|

Survey number. |__|__|__|

Name of deceased _____

Date review |__|__|/|__|__|__|/|__|__|__|__|

Suspected maternal death within 42 days post-partum (ICD 9): Yes/No

Suspected maternal death within 1 year post-partum (ICD 10): Yes/No

	Categories	Underlying cause(s)
Suspected maternal death	Direct cause	Level 1……..
		Level 2……..
	Indirect cause	Hepatitis
		Malaria
		TB
		Anaemia
		Heart disease
		AIDS
		Injuries
		Other_____
		Unknown
Suspected non maternal death		
	21 Chronic liver disease	
	22 Chronic renal disease	
	23 Diabetes	
	24 Malignancy	
	25 Maternal	

	26 Stroke 27 Under-nutrition 28Other_____ 29 Unknown	

Additional

Comments……
……
……
……

B. Checklist contributing factors

Initials of reviewer |__|__|

Survey number. |__|__|__|

Name of deceased _____

Date review |__|__|/|__|__|__|/|__|__|__|__|

Summary contributing factors **More than one answer possible**		Importance of factor	
Level 1	Level 2	Probably would have avoided death	Possibly would have avoided death
Perception of illness in the community	Other perception of the disease		
	Not recognizing severity of the problem		
	Lack of knowledge of treatment-possibilities		
Decision making	Delay in decision-making process		
	Essential people in decision-making process not available		
	Disagreement in decision-making		
Resource constraints	Lack of transport		
	Lack of money		
Access to care	Delay in reaching health facility		
	Delay in getting to see professional health staff		
	Obstructions in getting care		
Quality of care	Substandard primary care		
	Substandard obstetric referral care		

Additional

Comments……
……
……
……

Appendix 8 8Interview guide for conducting interviews with health staff

1. What was the arrival time of the deceased to this facility?

2. In your opinion what contributed to the death?

3. If the death was preventable how it could have been?

4. What do you think "should have been done but not done?

5. What have happened but should not have happened?

Appendix 9 Cover Area population for Bosaso Health Facilities in 2016 and 2017

Number of Facility	Facility Name	Facility Type	Total Population (2016)	Total Population (2017)	Annual Live Births (4%)	Annual Pregnant Women (5%)	Annual WCBA not Pregnant (17%)	Annual Post-partum Women (4%)	Annual PLW (9%)	Implementing Partner
Facility1	**Bosaso Regional Hospital**	**Hospital**								MoH
Facility2	Beldaje HC	HC	**67,885**	69,922	2,797	3,601	12,243	2,881	6,482	MDM Bari
Facility3	Boqolka Bush HC	HC	**41,754**	43,007	1,720	2,215	7,530	1,772	3,987	MDM Bari
Facility4	Bulo-elay HC	HC	**57,334**	59,054	2,362	3,041	10,340	2,433	5,474	MDM Bari
Facility5	Central HC-Bosaso	HC	**66,398**	68,390	2,736	3,522	11,975	2,818	6,340	MDM Bari
Facility6	Horsed HC	HC	**46,313**	47,702	1,908	2,457	8,353	1,965	4,422	MDM Bari
Facility7	Isnino HC	HC	**46,169**	47,554	1,902	2,449	8,327	1,959	4,408	MDM Bari
Facility8	Shabelle HC	HC	**65,379**	67,340	2,694	3,468	11,791	2,774	6,242	MDM Bari
Facility9	Tur-jalle HC	HC	**43,728**	45,040	1,802	2,320	7,886	1,856	4,175	MDM Bari
Facility10	Yalho PHU	PHU								MDM Bari
Facility11	Kalabayr PHU	PHU								MDM Bari
Facility12	Laag PHU	PHU								MDM Bari
Facility13	Karin PHU	PHU								MDM Bari
Facility14	Qaw PHU	PHU								MDM Bari
Facility15	Bosaso TB Centre	TB Centre								MoH
			434,960	***448,009***	***17,920***	***23,073***	***78,445***	***18,458***	***41,530***	