



ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH
SCIENCE SCHOOL OF PUBLIC HEALTH

ASSESSMENT OF MATERNAL DEATH AND FACTORS AFFECTING
MATERNAL DEATH SURVEILLANCE AND RESPONSE SYSTEM
IN DIRE DAWA, ETHIOPIA

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Assessment of maternal death and factors affecting maternal death surveillance and response system in Dire Dawa, Ethiopia

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ABSTRACT

Background: Reducing maternal deaths is one of the key goals of Millennium Development Goals (NDGs). Programs and policies aiming to reduce maternal deaths need reliable and valid information. Maternal Death Surveillance and Response (MDSR) system is a method of collecting information on the level and causes of maternal death in order to provide accurate information to improve quality of maternal health care.

Objective: The study aims to assess causes of maternal deaths and factors affecting MDSR system in public health facilities in Dire Dawa

Methods: A cross sectional facility based study design including quantitative and qualitative methods was conducted in nine health facilities of Dire Dawa where an MDSR system was introduced. The quantitative method assessed maternal deaths and complications for causes and avoidable factors before the introduction of MDSR from 8 June 2013 to 7 June 2014 and after the introduction of MDSR from 8 June 2014 to 9 March 2015 by reviewing patient and facility records and interviewing with health care providers. Factors which affect the implementation of MDSR assessed qualitatively through in-depth interview with 24 purposively selected health care providers working in the nine public health facilities.

Results: A total of 45 maternal deaths, 247 maternal complications and 8,857 deliveries were recorded during the two study periods. Maternal mortality ratios for the two periods were 511 and 505 per 100,000 live births in the baseline and implementation period respectively. Of the total maternal deaths 33 (73.3%) were avoidable. The direct obstetric causes were responsible for 41 (91%) of the deaths, of which hemorrhage 27%, hypertension during pregnancy 22% and obstructed labour 18% are the leading causes. MDSR is implementing in the nine public health facilities. Knowledge, attitude, support and supervision, training, staff turnover, and community participation are the main factors which affect the program implementation.

Conclusions and recommendations: The identified maternal death is very high and most of them are avoidable and caused by direct obstetric causes of maternal death. MDSR system is implementing and accepted by most of the care providers. Improving care, capacity building, support and supervision and community awareness is crucial to reduce the number of maternal death and to strengthen and sustain the program implementations.

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ACRONYMS

ANC	Antenatal Care
BEMONC	Basic Emergency Obstetric and Newborn Care
CEMONC	Comprehensive Emergency Obstetric and Newborn Care
CEO	Chief Executive Officer
CVR	Civil Registration
MDG	Millennium Development Goal
MDSR	Maternal Death Surveillance and Response
MMR	Maternal Mortality Ratio
PNC	Postnatal Care
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Globally, in the past two decades maternal mortality has decreased by 50% from 543,000 to 287,000 deaths annually (1). This reduction rate is not enough to achieve the United Nations' MDG5 that targets a reduction of maternal mortality ratio by 75% between 1990 and 2015 (2). The poor progress towards MDG5 is partly due to the inability to correctly measure levels and trends of maternal mortality which in turn contributes to lack of accountability (3).

MDSR is a component of the health information system and quality improvement processes from local to national levels, which includes routine identifications, notifications, quantification, and determination of causes and avoidability of maternal deaths, for a defined time period and geographic location, with the goal of use of this information to respond with actions that will prevent future deaths (3).

The notification of every maternal death is important to improve current maternal mortality estimates by making maternal death visible at local and national level. The information about level and causes of maternal death obtained from the system can be used by health professionals, health managers and program planners to save women's life by creating awareness in the community, improving obstetric care quality and planning and designing interventions which are important to reduce maternal death and maternal complication (3). Countries around the world establish different maternal mortality surveillance and response approaches to collect data on maternal death, for the purpose of quality control and monitoring local maternal mortality level.

In Ethiopia progress towards reduction of Maternal Mortality Ratio (MMR) has been slow and only 15% women give birth in health facilities (4). Based on estimate by World Health Organization (WHO) MMR is still high, 420/ 100,000 live births in 2013 (5) while the MDG5 target for Ethiopia is to bring the MMR level below 267/100,000 live births by 2015 (6). In order to reduce this high maternal mortality level, there have been different interventions in Ethiopia like, focused ante natal care, skilled attendants during delivery, family planning, and expansion and upgrade of comprehensive emergency obstetric care. In addition to these interventions the government of Ethiopia introduced health extension program to reach at the community level and improve maternal health problems (6, 7).

In addition to the above interventions, correct estimation of level of maternal death, identification of causes of maternal death, planning or designing of effective interventions, and monitoring and evaluation of interventions are needed.

To this effect the Government of Ethiopia launched MDSR program in May, 2013 in five regional states (Tigray, Amhara, Oromia, SNNPR and Harari) and two administrative cities (Addis Ababa and Dire Dawa). The program encompasses processes of identification, reviewing and reporting of maternal deaths that occur in the health facility as well as in the community. In Dire Dawa facility based MDSR is now implementing in full (8).

1.2. Statement of the problem

The definition of maternal death according to International Classification of Disease (ICD) is death of a woman during pregnancy or child birth or within 42 days of termination of pregnancy, irrespective of duration and site of pregnancy from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes (3).

The burden of maternal death is higher in developing countries compared to the developed ones. Sub Saharan Africa and South Asia countries alone account for 286,000 deaths out of the estimated 287,000 global annual maternal deaths (9).

Majority of maternal deaths are resulted from the five major obstetric complications: hemorrhage, infection, pregnancy induced hypertension, unsafe abortion, and obstructed labour (10).

There are so many factors that are associated with maternal death. These factors are better explained using the three delay models; delay in seeking care, delay in reaching care and delay in receiving care (11).

Almost all of the maternal deaths result from avoidable causes. Establishing a functional MDSR system enables timely review of maternal death at care delivery point to identify avoidable factors and take proper action to improve care at all levels of the health system (12).

In developing countries, few studies were conducted on MDSR system, particularly on factors that affects the establishment of a functional MDSR system. Factors that were found to affect the implementation of MDSR in one setting may not necessarily apply in another setting.

In Ethiopia, most of the previous studies focus either on assessment of trend or causes of maternal mortality. As the MDSR system was launched only in 2013 little is known about the factors that affect its implementation and effectiveness. This study aimed to explore factors affecting implementation of MDSR and come up with recommendations.

1.3. Significance of the study

Avoiding maternal death requires the right kind of information about level of maternal mortality and the contributory factors that led to the death and having such information is an important starting point to tackle the problem. This study will give a clear picture of level, causes and contributory factors of maternal death and will also provide evidence of where the main problems in reducing maternal mortality and morbidity lie, what can be done and show the key areas requiring interventions.

Exploring factors affecting implementation of MDSR will provide a comprehensive understanding of the issues surrounding implementation of the initiative and help programmers and policy makers to make evidence based decision on the program planning and scale up process ultimately helping to improve performance of the system. In addition, it will serve as a reference for further studies.

2. LITERATURE REVIEW

2.1. Measurement of maternal mortality

Providing a reliable data on the levels and causes of maternal death can be used for planning, monitoring, and evaluating programmes. Such data can also be used for priority setting and advocacy to increase awareness on safe motherhood, ensure accountability, and raise funds (3).

Civil registration systems (CVR) is a good means of obtaining information on magnitude of maternal mortality as well as the causes of the death. However, about 116 countries worldwide do not have CVR system or have incomplete CVR (13). Even in countries where routine data collection of maternal deaths is available the maternal death will be underreported due to miss classification and miss-interpretation of maternal death (10, 13). In the absence of CVR system countries estimates the MMR using different data sources: house hold survey, census, reproductive age mortality studies and verbal autopsy. These data sources have their own limitations and do not provide a routinely collected data for the estimation of maternal death (13). The other problem usually encountered during the estimation of maternal mortality and complications is that the different sources of data are neither representative nor comparable (14). These limitations challenge accurate estimation of MMR and use of the generated information for evidence-based decision-making. This is particularly challenging in developing countries where most of the countries have no or incomplete CVR system and have no other source of data on maternal death (13).

Currently several developing countries including Ethiopia are establishing MDSR system to provide routine data on maternal deaths and complications. A functional MDSR is useful to fill the evidence gap to estimate maternal mortality, identify causes of maternal mortality and prevent future maternal deaths from similar causes.

2.2. Magnitude and causes of maternal mortality

Globally, about 287,000 women die every year from maternal causes (1). The burden of maternal death is 14 times higher in developing countries (9, 12). Sub Saharan Africa alone accounts for more than half (62%) of the total deaths globally (2). According to WHO estimates high proportion of reproductive-age mortality is due to maternal causes (10).

There is a wide variation in causes of maternal mortality between developing and developed regions. In developed regions higher proportion of the maternal deaths are caused by the indirect causes unlike that of the developing regions where most of the deaths result from direct obstetric causes (12).

Among the direct causes hemorrhage, hypertensive disorder of pregnancy and sepsis are the major causes of death. Of the indirect causes anemia accounts the greater risk of maternal death followed by heart disease and HIV/AIDS. In general, indirect causes of maternal death and hemorrhage are the major causes of maternal death worldwide (10).

In Sub Saharan Africa low socioeconomic status, low literacy rate and political instability are significantly associated with highest number of maternal death (13). Besides, barriers to access to health care and poor quality of care also affect maternal mortality (14).

Ethiopia is one of the developing countries with highest number of maternal mortality. The total number of annual maternal deaths is estimated at 13,000 which yields 420/100,000 maternal deaths in 2013 (5). Similar to other developing countries maternal death in Ethiopia is mainly caused by direct causes. A review of published and unpublished researches done on maternal mortality trend in Ethiopia showed that majority of maternal deaths resulted from the five major direct causes of maternal death; hemorrhage 10-20%, unsafe abortion about 10%, obstructed labour 10%, hypertensive disorder during pregnancy 35% and sepsis less than 10% (15). Most of these deaths occur as a result of preventable causes of maternal death. A study conducted in Tigray region found that many of maternal deaths were associated with avoidable factors or substandard care originated from the health system ineffectiveness and inaccessibility (16).

2.3. Maternal Death Surveillance and Response (MDSR)

WHO defines MDSR as a form of routine surveillance system which links the health information system and quality improvement processes from local to national level. The primary goal of the system is elimination of preventable maternal mortality and using the information to guide public health actions and monitoring their impact (3).

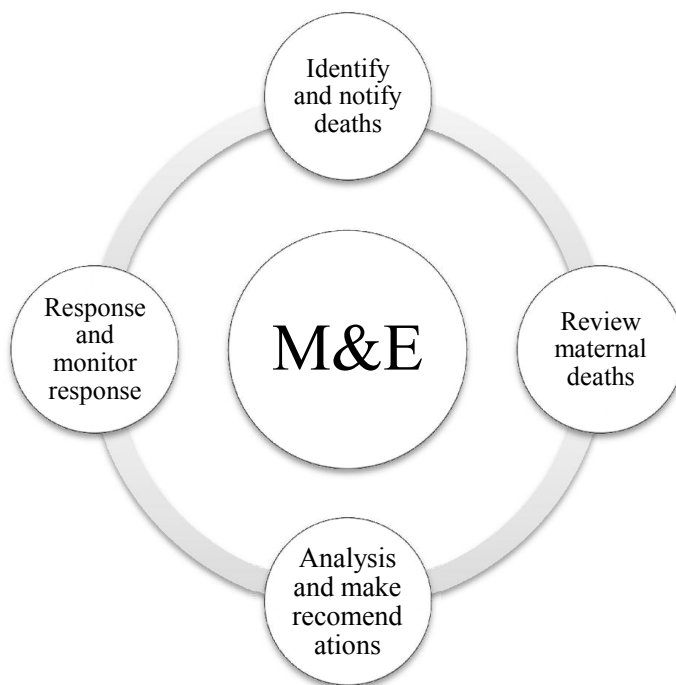


Figure 1: MDSR system: a continuous-action cycle. (Source: Beyond Numbers)

MDSR will improve accurate identification, counting, and reporting of deaths in settings with low vital registration systems coverage. Most importantly MDSR will improve current estimations of maternal mortality ratios, will provide data for action to improve quality of care and reduce maternal deaths and provide better opportunities for equity-based interventions (17). If the system is effective, it would be a major step forward in the measurement of maternal mortality and it would serve as the basis for a longer-term strengthening of the civil registration and vital statistics system (18).

MDSR has a great potential to bring change in the community, health system (health professionals and health managers) and program planners through continuous identification of adverse maternal outcomes, underlying factors, implementations and evaluations of interventions to improve obstetric care (3). It can strengthen the relationship between health sectors and the community and improve perception and knowledge of the community about maternal health care services (19). A study done in Indonesia showed maternal death audit can bring the health facility providers and the community health workers to closely work together to analyze and address the cause of maternal mortality and morbidity in their areas (20). Another study done in Senegal also showed most of the quality improvement and lifesaving programs can be addressed by active involvement of the community (21).

MDSR is also useful to identify gaps in clinical practice and recommendations are made after identification and discussion of available factors that contribute to maternal death. In United Kingdom (UK) the Confidential Enquiry into Maternal Death (CEMD) allowed improved care definitions and evaluation of factors playing a role in maternal death (22). Studies done on perinatal audit implementation in low and middle income countries showed there is a 30% perinatal mortality reduction after introduction of facility based perinatal audit (23). The study done in Senegal on maternal death review effects on maternal mortality also showed that a reduction of maternal death (21).

There are five approaches for reviewing maternal deaths and ill health: facility based maternal death review, community based or verbal autopsies, confidential enquiries on maternal death, clinical audit and survey of severe morbidity or near miss (3).

Facility Based MDSR is a qualitative, in-depth investigation of causes of death and circumstances surrounding maternal deaths occurring at health facilities. Deaths are initially identified at the facility level but such reviews are also concerned with identifying the combination of factors at facility and community levels that contributed to the death (17, 3). The method is easier to implement and can be initiated at a district and regional level or in a single institution. For this reason it is the most common approach preferred by Africa countries (24). Once a Facility Based MDSR is well established, it can be extended to include deaths occurring outside the health facilities, through community-based maternal death reviews, so that eventually all maternal deaths in a given geographic area will be captured (3).

2.4. Factors affecting implementation of MDSR

MDSR implementation will depend on the level of maternal death notification, review systems implementation and on the quality of information produced and using the information to ensure actions are taken to implement the recommendations and avoid future deaths (3).

The impact of MDSR depends on the scale of operation and sustainability of the program, which are reliant on motivating health workers, involving stakeholders at all levels and designing feasible and effective data collection system. Without effective implementation of the recommendations made during maternal death review getting the desired changes to improve maternal survival is difficult (23).

Based on studies done in different developing countries, factors affecting the implementation of MDSR can be broadly divided into individual/ health care provider factors, health facility factors and management/ leadership factors. Individual/ Health care providers' factor include knowledge and attitude of health care providers as well as MDSR committee members (25). Staff shortage, inconsistent replacement of drugs and other essential supplies, lack of on job trainings, poor record keeping, poor quality of information on medical files and lack of communication between different units in a given facility to identify maternal deaths which occur outside the maternity unit are among the barriers affecting implementation of MDSR identified by studies done in Senegal, Malawi and Tanzania (26-28). Management/leadership factors include inadequate participation of hospital and district decision makers, inadequate budget allocation, lack of involvement of head of maternity unit in the audit meeting and failure of the hospital decision makers to implement audit recommendations are factors which affect the implementation of feedbacks and recommendations given in the MDSR program implementation (27, 28).

On the other hand when appropriate information collected for the audit and local leadership is strong enough to promote non-threatening and multi-disciplinary audit meetings and high level of professionals experience on the data collection and involvement of head of the maternity unit acting as moderator during the audit meetings and high level of awareness and knowledge about MDSR facilitate its implementation and plays a great role in improving the quality of care given and ultimately helps to reduce adverse maternal outcomes.

3. OBJECTIVES

3.1. General Objective:

To assess causes of maternal deaths, complications and factors affecting implementation of maternal death surveillance and response system in public health facilities in Dire Dawa

3.2. Specific Objectives:

1. To compare number of maternal death before and after introduction of MDSR
2. To compare causes and avoidable factors of maternal death before and after introduction of MDSR
3. To compare causes of maternal complications before and after introduction of MDSR
4. To explore factors affecting implementation of facility-based MDSR

4. METHODS

4.1. Study Area

Dire Dawa is located in the eastern part of Ethiopia 515 kilometers away from Addis Ababa. It is bordered by Somali Regional State in the east, west and north, and the Oromia Regional State in the south and east. Dire Dawa has a total area of 1,558.64 square kilometers with an estimated density of 237.2 people per square kilometer. With annual population growth of rate of 2.9% the region has a total population of 395,000 in 2013 consisting of 198,092 males, 196,908 females and 94,187 childbearing age women. Total fertility rate (TFR) for the region is 3.4 child/ woman. The majority of the populations (68%) are urban dwellers.

Potential health service coverage of Dire Dawa is 100% with two public hospitals, 15 health centers and 34 health posts. Out of these health facilities, two hospitals and eight health centers are located in the urban part of the region while the rest are located in the rural area. All the 17 health facilities are implementing MDSR. According to mini EDHS 2014 report coverage of antenatal care (ANC), institutional delivery and postnatal care (PNC) in the first two days after birth for the region are 78.4%, 59.2%, and 49.3%, respectively.

The study was conducted in selected nine health facilities, two hospitals (Dil Chora Referral Hospital and Sabiyan primary Hospital) and seven health centers (Goro Health Center, Legehare Health Center, Addis Ketema Health Center, Gende Gerada Health Center, Melka Jebdu Health Center, Biyo Awale Health Center and Jello Belina Health Center).

4.2. Study design

A comparative cross sectional facility based study design with quantitative and qualitative methods was used. The quantitative method conducted retrospectively to collect causes and avoidable factors of maternal deaths that occurred in nine public health facilities in Dire Dawa from 2013 to 2015. A qualitative method was used to assess factors affecting MDSR implementation from informants working in the selected health facilities.

4.3. Source population and study population:

The source population: The source populations for the study were all maternal deaths occurred in public health facilities in Dire Dawa.

The study population: The study population include all maternal deaths occurred at the selected health facilities and on their way while referred from the health facilities that are included in the study between 8 June 2013 and 9 March 2015.

4.4. Sample size

For quantitative method: Expected number of annual maternal deaths for the review is obtained by multiplying number of deliveries during the study periods by MMR (3).

Number of deliveries identified during the study period in the selected health facilities are 8,857 and the MMR is 420/ 100,000 live births. Then the expected number of deaths is equals to 37.

For qualitative method: Purposively selected 24 key informants who are working in the selected nine health facilities were included.

4.5. Inclusion and exclusion criteria

Inclusion Criteria:

Deaths occurred in the selected health facilities and on their way while referred from the health facilities that are included in the study.

Exclusion criteria:

Women who had died on their way from their home to the health facilities and

Women who had died on their way while referred from health facilities that are not included in the study.

4.6. Health Facilities Selection Criteria

From the total 17 public health facilities, nine of them were selected based on the following three criteria; having high number of deliveries, active maternity departments for the last two years prior to the study and facilities that introduced MDSR system nine months prior to the study.

4.7. Data collection procedure

Quantitative data collection

Review of documents and maternity registers covered two periods and interviewing with individuals who were involved in caring for the deceased mother. Baseline period covered 12 months before the introduction of MDSR from 8 June 2013 and 7 June 2014. Trial period covered nine months after the introduction of MDSR from 8 June 2014 and 9 March 2015. For both periods IPD register, hospital HMIS register, OR register and Delivery register were reviewed to identify maternal deaths and complications.

The document review was done by modified WHO standard maternal death data collection tool. The tool captures key data including socio-demographic and obstetric characteristics of the deceased mother, and causes and avoidable factors of maternal deaths. To maximize the chance of getting all relevant information specifically to classify the death as maternal or non-maternal, to identify the causes of maternal death and to identify area of substandard care and to classify the death as avoidable or non-avoidable, review of different registers including patient cards and interview with one of the health care provider who participated in the care of the deceased women were conducted.

Qualitative data collection

In-depth interview was used to explore issues and factors affecting MDSR implementation in the health facilities. Purposeful sampling technique was used to recruit informants for the in-depth interview. Two criteria were used to select the informants; responsibility of informants (being MDSR committee member, working at maternity unit or being head of maternity unit) and year of experience in their respective health facility (interviewees should have at least one year of work experience).

The interviews were conducted using an interview guide that was developed in English and translated into Amharic, the language that interviewees speak. The interview guide contained open-ended questions to reduce predetermined responses and to allow informants to think aloud and to express their experiences. Questions in the interview guides were arranged in a way that facilitates dialogue. The first part contained general questions followed by more specific

questions and in the end questions merely focusing on experiences and challenges to implementation of the program.

Before conducting the interviews interviewees were informed about the study and asked for an appointment for an interview. Each interview took about thirty minutes. Notes were taken and interviews were recorded. The in-depth interviews were conducted in natural settings, where the informants wanted to have the interview. The principal investigator conducted the in-depth interviews. The interviews were started by asking interviewees to introduce themselves by telling their professional background and year of experience. The subsequent discussion focused on more general issues related to the MDSR program and the discussion continued based on the answers interviewees provide.

4.8. Operational Definitions

Avoidable maternal death: deaths that can be prevented or avoided by a change in patient behavior, provider/institutional practices, or logistic system

Critical condition of the patient: patient with unstable vital signs and/or loss of consciousness

Stable patient condition: patient with stable vital signs and conscious

Initial intervention: received at least one of the following interventions; IV fluids, CPR, drug administration, sending LAB tests

Definitive intervention: received any of the following interventions; C/S / Vacuum /forceps delivery/ hysterectomy/ manual removal of placenta/ blood transfusion/ laceration repair

Knowledge about MDSR: knowing the meaning of MDSR and at least two of process of the program

Basic services: providing all the following services: Hgb, Blood group, HIV status, U/A, BP measurement during the follow up, Fefol supplementation, TT immunization

4.9. Data Analysis procedures:

Quantitative data analysis: The quantitative data was entered and analyzed using SPSS version 21. Frequencies and percentage on obstetric characteristics, causes of maternal death, maternal complications and avoidability of deaths were calculated. Mean and range were calculated to describe age and gravidity of the deceased mother. Institutional MMR was calculated by dividing number of maternal deaths by number of deliveries for each period. Near miss ratio calculated by dividing number of maternal complications by number of deliveries of Dil Chora Hospital. Chi square test was performed to test if there is significant change in maternal death, obstetric complications, and stillbirth before and after the introduction of MDSR.

Qualitative data analysis: Data analyses started along with data collection. After each interview the recordings were transcribed and notes were searched for missing information and deficiencies to take a correction for subsequent interviews. Prior to the actual data analysis the interview data were translated into English by the principal investigator.

The initial step of the analysis was reading and rereading of the notes and transcriptions and hearing of recordings to understand the issues raised by the informants and to get an overall impression of the material. The second step was entering, coding and categorizing the data using OpenCode software. The interview guides were used to make preliminary labeling of the themes. The third step was putting relevant texts under the respective themes. The data then further analyzed by using content analysis approach.

4.10. Ethical consideration

Ethical clearance was obtained from Research and Ethical Committee of School of Public Health, Addis Ababa University. School of Public Health wrote support letter to Dire Dawa Health Bureau. Dire Dawa Health Bureau gave permission to conduct the research and wrote letter to the nine selected health facilities where the actual study was done. The CEOs and medical directors of each facility were informed about the study and asked to provide permission to conduct the study in each facility.

Upon getting permission from the CEOs and medical directors written consent was asked from each participant of the in-depth interview. The interviews were conducted individually and anonymously to ensure privacy and confidentiality. The informants' names and other personal identifications were not recorded. The interviews were conducted entirely based on participants' willingness and no payment was given to the informants.

4.11. Dissemination of results

A copy of the final study report will be submitted to School of Public Health, College of Health Sciences, Addis Ababa University, Federal Ministry of Health and Dire Dawa regional health bureau and to the participated health facilities. The finding will also be presented in different workshops, conferences and seminars and will be published in a peer reviewed journals.

5. RESULTS

5.1. Quantitative Result

There were a total of 8,857 deliveries recorded in the nine health facilities during the study periods; 4,698 of the deliveries from the baseline period and 4,159 from the trial period.

A total of 46 deaths were identified; 24 deaths during the 12 months of baseline period and 22 during the 9 months of trial period. Among these 46 deaths 42 of them occurred in the health facilities; forty one deaths at Dil Chora Referral Hospital & one death at Melka Jebdu Health Center and the remaining four died on their way to the health facility. Out of the four maternal deaths happened on their way to the health facility three of them referred from health centers that were included in this study. Thus, we counted these maternal deaths as deaths that occurred in the referring health centers. Therefore the analysis was done for 45 deaths, 24 in the baseline period and 21 in the trial period.

The institutional MMR calculated for the two periods were 511 and 505 per 100,000 live births during baseline and trial periods, respectively.

Table 1: Distribution of deliveries and deaths occurred in each health facilities by period in Dire Dawa, 2013- 2015

Facilities	Deliveries			Deaths		
	Baseline	Trial	Total	Baseline	Trial	Total
Dil Chora Hospital	2,474	2,088	4,562	23	18	41
Sabiyen Hospital	522	453	975	0	1	1
Goro HC	235	235	470	0	1	1
Legehare HC	562	511	1,073	1	0	1
Gende Gerada HC	270	190	460	0	0	0
Addis Ketema HC	122	128	250	0	1	1
Melka Jebdu HC	267	311	578	0	0	0
Biyo Awale HC	127	130	257	0	0	0
Jelo Belina HC	119	113	232	0	0	0
Total	4,698	4,159	8,857	24	21	45

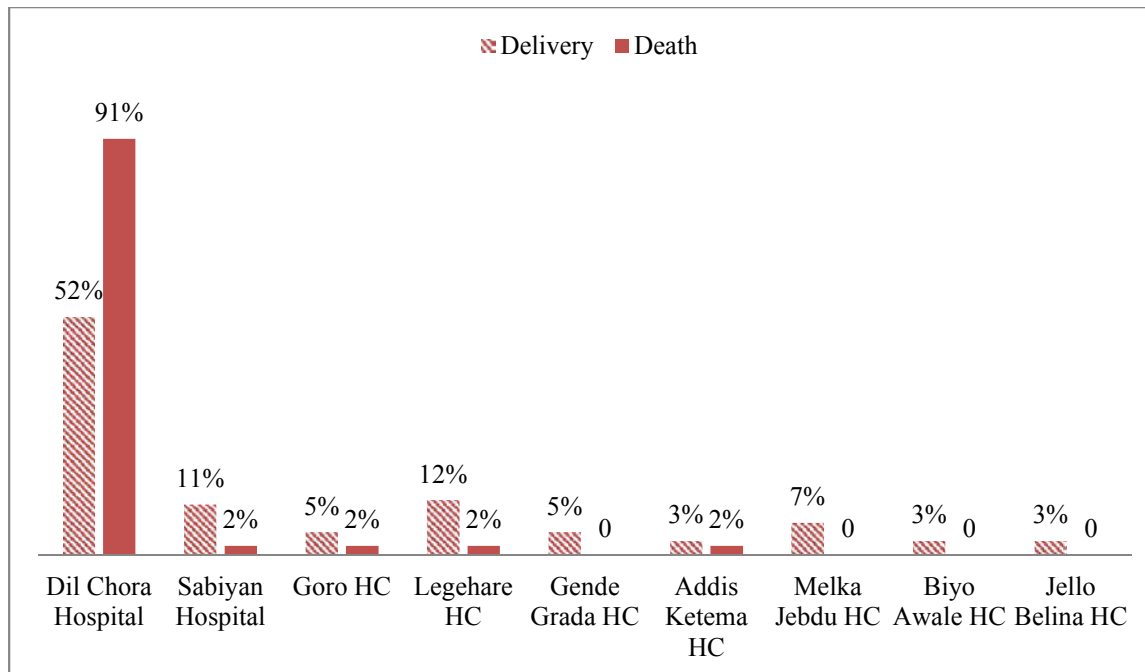


Fig 2: Proportion of deliveries and deaths in the selected health facilities in Dire Dawa, 2013-2015

Socio-demographic characteristics of the deceased mothers

Baseline period: The analysis of 12 months data obtained from the Medical Record Extraction Form revealed that there were a total of 24 deaths. Twenty-three of the deaths occurred at Dil Chora Hospital whereas the remaining one death occurred on the way to the health facility.

The mean age of the deceased mothers at the time of death was 26 ± 6 . More than half of the deceased mothers 13 (54.2%) were 20-29 years old. Eleven (45.8%) of the deceased were living in Dire Dawa while the remaining 13 (54.2%) came from outside Dire Dawa. The mean number of pregnancies the deceased mothers had was 3.17 ± 2 . Half of the deceased mothers had five or more pregnancies.

Trial period: Twenty-one deaths happened during this period. Eighteen of them died at Dil Chora Hospital, one at Melka Jebdu Health Center, and two on their way to health facility.

The mean age of the deceased mothers at the time of death was 26.7 ± 6.14 . Fourteen (66.7%) of the deceased mothers were 20-29 years old when they died. More than half 12 (57.1%) were living in Dire Dawa while the remaining 9 (42.9%) came from outside Dire Dawa.

The mean number of pregnancies was 3.1 ± 1.7 . Thirty eight percent of the deceased had five or more pregnancies.

In both periods most of the deceased mothers were referral cases 31 (70%); 18 (75%) at the baseline and 13 (61%) in the trial period. Of the referred cases 19 (61.3%) were referred from health centers, 11 (35.4%) from hospitals and 1 (3.2%) from private clinic.

Table 2: Socio-demographic characteristics of deceased mothers in Dire Dawa, 2013-2015

Characteristics	Total number of deaths		p-value
	Baseline n= 24	Trial Phase n= 21	
Residence			
Dire Dawa	11 (45.8%)	12 (57.1%)	0.647
Outside Dire Dawa	13 (54.2%)	9 (42.9%)	
Age in years			
<20 years	3 (12.5%)	1 (4.8%)	0.611
20-29 years	13 (54.2%)	14 (66.7%)	0.583
30-39 years	8 (33.3%)	5 (23.8%)	0.709
≥ 40 years	0 (0.0%)	1 (4.8%)	0.467
Mean (SD)	26 (6)	26.7 (6)	0.694
Range	17-35	19-40	
Gravidity			
I	6 (25%)	4 (19%)	0.729
II –IV	6 (25%)	9 (42%)	0.342
$\geq V$	12 (50%)	8 (38.1%)	0.616
Referral			
Yes	18 (75%)	13(61.9%)	0.533
No	6 (25%)	8 (38.1%)	
Place of death			
Health Facility	23 (98.5%)	19 (90.5%)	0.592
Way to health facility	1 (4.2%)	2 (9.5%)	

Obstetric characteristics and status of the deceased women at the time of admission and death

As shown in table 3, for mothers who died during the baseline period, 4 (17%) had at least one ANC follow up, 5 (21%) had no ANC and 15 (62.5%) unknown ANC follow up. Labour occurred at 16 (66.7%) of mothers, among these 12 (75%) were delivered at the health facility whereas 4 (25%) were home delivery. Twelve (75%) of the mothers who gave birth had one of the following complications during postpartum period; 31% PPH, 25% sepsis, 12.5% eclampsia and 6% ruptured uterus.

Out of the 24 deceased mothers 14 (58.3%) mothers were critically ill, 9 (37.5%) were stable and the remaining 1 (4.2%) dead at the time of admission. Majority of the deaths 18 (75%) occurred within the first week of postpartum period and the remaining six deaths were occurred during antepartum period and abortion.

And mothers who died during the nine months of trial period, 7 (33.3%) had at least one ANC follow up, 3 (14.3%) had no ANC and 11 (52.4%) unknown ANC follow up. Labour occurred in 16 (76%) of mothers among these, 11 (69%) was delivered and 5 (31%) were not delivered. Six (54.5%) were delivered at the health facility while 5 (45.5%) were home delivery. Of the delivered mothers 7 (63.6%) had one of the following complications during postpartum period; 36% PPH, 27% ruptured uterus and 9% had sudden shock.

Out of the 21 deceased mothers 13 (62%) mothers were critically ill on admission, 6 (28.6%) were stable and the remaining 2 (9.5%) were dead on admission. Majority of the deaths 12 (57%) of the deaths were occurred within the first week of postpartum period, 5 (23.8%) intrapartum period, 3 (14.3%) antepartum period and 1 (4.8%) abortion.

Majority of the cases during the two periods received at least initial intervention, 19 (79%) during baseline period and 16 (76%) during the trial period.

Table 3: Obstetric characteristics and status of the deceased women at the time of admission and death in Dire Dawa, 2013 - 2015

Characteristics	Total number of		P-value
	Baseline n= 24	Trial phase n= 21	
deaths			
ANC visit			
Yes	4 (16.7%)	7 (33.3%)	0.694
No	5 (20.8%)	3 (14.3%)	
Not known	15 (62.5%)	11 (52.4%)	
Labour occurred			
Yes	16 (66.7%)	16 (76.2%)	0.709
No	8 (33.3%)	5 (23.8%)	
Not known	0	0	
Place of delivery			
Health facility	12 (75%)	6 (54.5%)	0.411
Home	4 (25%)	5 (45.5%)	
Admission condition			
Stable	9 (37.5%)	6 (28.6%)	0.677
Critically ill	14 (58.3%)	13 (61.9%)	
Brought dead	1 (4.2%)	2 (9.5%)	
State of pregnancy at the time of death			
Antepartum	3 (12.5%)	3 (14.3%)	1.000
Intrapartum	0	5 (23.8%)	
Postpartum	18 (75%)	12 (57%)	0.342
Abortion	3 (12.5%)	1(4.8%)	0.611

Causes of maternal death and avoidable factors

Baseline period: Direct obstetric causes of maternal death were responsible for 22 (91.6%) of maternal deaths. Of the direct causes, hemorrhage and puerperal sepsis contribute 7 (29.2%) and 5 (20.8%) of the deaths respectively followed by pregnancy induced hypertension 4 (16.7%), obstructed labour 3 (12.5%) and abortion 3 (12.5%). Among the indirect underlying causes of maternal death, anemia was the only prominent cause.

In establishing avoidability of maternal deaths, it was observed that 16 (66.7%) maternal deaths were avoidable, 2 (8.3%) unavoidable and 6 (25%) deaths were not known either avoidable or otherwise. Among the contributory factors 12 of the deaths had Personal/ family/ woman factors, 6 deaths had logistic system factors, 2 deaths had health service factors and 2 of the deaths had health personnel factors. Delay of women seeking help, refusal of treatment and parental refusal to give blood are the most common factors from Personal/ family/ woman factor, lack of transport between health facilities fall under logistic system factor, staff misguided action under health personnel factors and lack of consumables and equipment, delay in referring from the 1st health facilities and health service communication breakdown under health service factor. Among the avoidable deaths, 11 (68.7%) of the deceased mothers had one contributory factors and for 5 (31.3%) cases more than one contributory factors applied.

Trial period: Direct obstetric causes of maternal death were responsible for 19 (90.4%) of maternal deaths. Among these direct causes of maternal death, pregnancy induced hypertension and obstructed labour causes 11 (52.3%) of deaths and hemorrhage 5 (23.8%), puerperal sepsis 2 (9.5%) and abortion 1 (4.8%). Among the indirect causes of maternal death, anemia and cardiac problem were caused the remaining 2 (9.5%) maternal deaths.

In establishing avoidability of maternal deaths, it was observed that 17 (81%) of all the maternal deaths were avoidable and 4 (19%) deaths were unavoidable. Among the contributory factors 15 of the deaths had Personal/ family/ woman factors, 4 deaths had logistic system factors, 2 deaths had health service factor. Delay of women seeking help, refusal of treatment and lack of partner support, lack of transport from home to facility and between facilities, and lack of blood were the most prominent factors.

Of the contributory factors 13 (76.4%) of the deceased mothers had only one contributory factors and for the remaining 4 (23.6%) more than one factors applied.

Anemia was the commonest contributory cause of maternal deaths for the two periods of death among the deceased mothers 16 (35.5%).

Table 4: Causes of maternal death and avoidable factors of deaths in Dire Dawa, 2013-2015

Characteristics	Total number of deaths		
	Baseline	Trial	p-value
Deaths	24	21	1.000
Direct causes of death			
Hemorrhage	7 (29.2%)	5 (23.8%)	0.946
PIH	4 (16.7%)	6 (28.6%)	0.476
Obstructed labor	3 (12.5%)	5 (23.8%)	0.443
Puerperal sepsis	5 (20.8%)	2 (9.5%)	0.422
Abortion	3 (12.5%)	1 (4.8%)	0.611
Indirect causes of death	2 (8.3%)	2 (9.5%)	1.000
Avoidable			
Yes	16 (66.7%)	17 (81%)	
No	2 (8.3%)	4 (19%)	0.739
Not known	6 (25%)	0	
Contributory Factors			
Personal/family/woman factor	12 (75%)	15 (88.2%)	0.407
Logistical systems	6 (37.5%)	4 (23.5%)	0.721
Health service factor	2 (12.5%)	2 (11.7%)	1.000
Health personnel factor	2 (12.5%)	0	0.488

Causes of maternal death in the two study periods were, Hemorrhage 27%, Hypertensive disorder during pregnancy 22%, obstructed labour, 18% sepsis 15%, abortion 9% and the remaining 9% of deaths accounts for indirect causes.

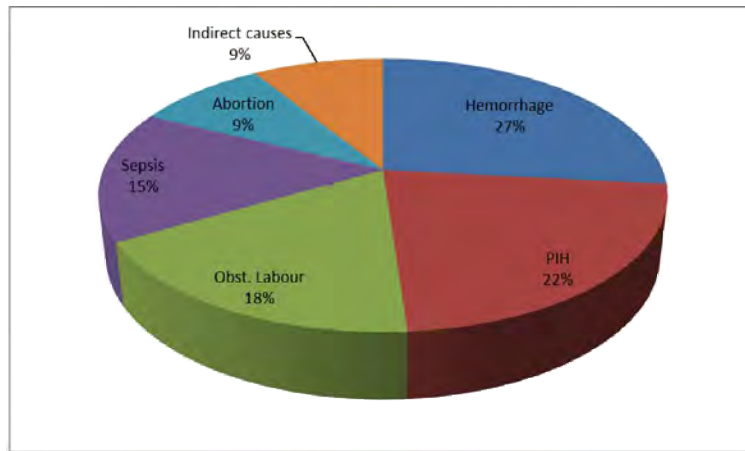


Fig. 3: Causes of maternal death in Dire Dawa, 2013-2015

As shown in figure 4, distribution of maternal deaths throughout the study periods by quarter; 4/1000 from June-August 2013, 3/1000 from September-November 2013, 6/1000 in the months between December-February 2013/14 and 7/1000 in the months between March-May 2014, and for the remaining three quarters from June 2014 - 2015 February the distribution of maternal death was constant, 5/1000 live births.

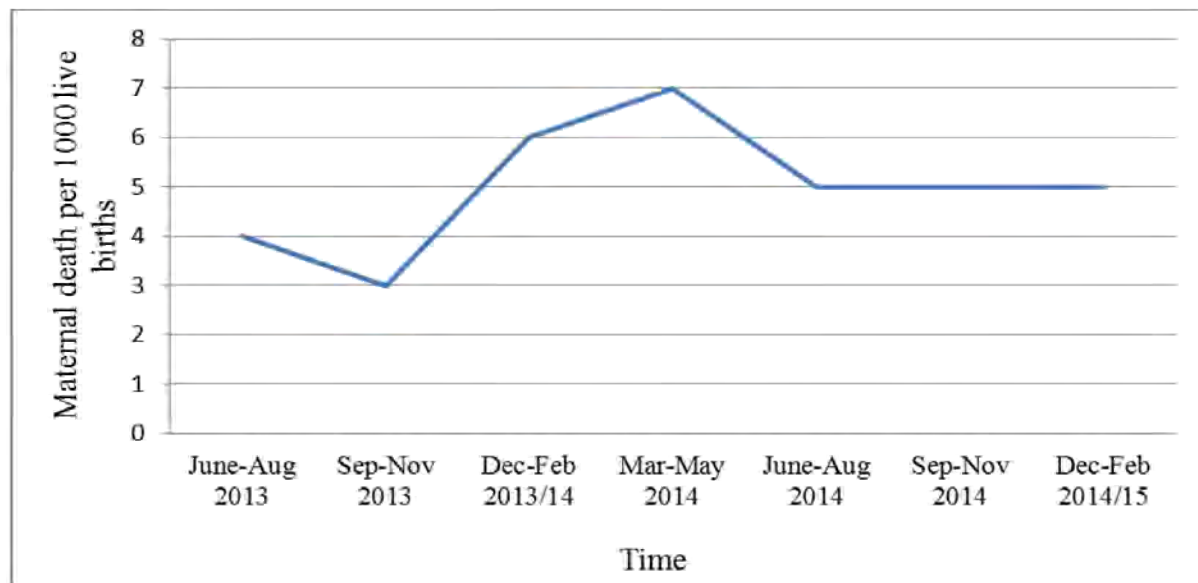


Fig. 4: Distribution of maternal death per 1000 live births in Dire Dawa, 2013-2015

Among the 45 maternal deaths recorded between 8 June 2013 and 9 March 2015, 33 (71.4%) were associated with avoidable factors. For each study period the percentage was 16 (66.7%) for the baseline period and 17 (81%) for the trial period. This proportion did not change significantly across the two study periods at the value of $P = 0.739$ (Fisher's Exact Test, $N = 51$).

In addition, there is no significant difference between the two maternal deaths obtained from the two periods at the value of ($X^2 = 0.000$, $p = 1.000$).

Identification of maternal complications was also done during the two study periods at Dil Chora Referral Hospital. Identification of the cases were based on disease specific criteria; hypertensive disorders in pregnancy, obstetric hemorrhage (includes APH, PPH, ectopic pregnancy and hemorrhage due to abortion), sepsis, ruptured uterus, and severe anemia which needs blood transfusion.

A total of 247 maternal complications were identified; 144 for the baseline period and 103 during trial period, which yielding maternal complication ratio of 5820/100,000 live births during baseline and 4933/100,000 live births during trial periods.

The same as that of maternal deaths majority 239 (97%) of maternal complications are caused by direct obstetric causes of morbidity and mortality and the remaining 3% of maternal complications are attributed to anemia. During the baseline period majority of the maternal complications were due to sepsis (36.8%) and hemorrhage (26.4%) then followed by eclampsia (21.5%) whereas the top three causes of maternal complications during the trial period changed to ruptured uterus (34%), eclampsia (27%) and sepsis (18%).

There is no significant change in maternal complication between the two periods whereas morbidity due to sepsis and obstructed labour changed significantly in the two periods at the value of $X^2 = 8.93$, $P = 0.003$ and $X^2 = 16.45$, $P = 0.000$ respectively.

Table 5: Causes of maternal complications between the two periods in Dire Dawa, 2013-2015


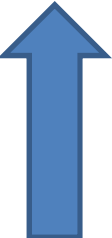

Cause of complication	Baseline		Trial		p-value
	N	%	N	%	
Hemorrhage	38	26	18	17	0.135
PIH	31	22	28	27	0.381
Ruptured uterus	17	12	35	34	0.000
Sepsis	53	37	19	18	0.003
Anemia	5	3	3	3	1.000
Total	144	100	103	100	0.210

Table 6: Distribution of maternal mortality, morbidity and still birth during the two periods in Dire Dawa, 2013-2015

	Baseline	Trial	p-value
Maternal death	24	21	1.000
Maternal complications	144	103	0.210
Still births	83	61	0.303

5.2. Qualitative Result

Table 7: Theme, Categories and codes identified and used during the qualitative data analysis

<p>Theme</p> 	<p>Factors affecting the implementation of MDSR,</p>			
<p>Categories</p> 	<p>Individual factor</p>	<p>Health service factor</p>	<p>Management factor</p>	<p>Family factor</p>
<p>Codes</p> 	<p>Knowledgeable, oriented, trained, experienced, participated, blame, accepted, positive changes, importance, attention, position/responsibility, personal development, overload, affect routine activities, opinion</p>	<p>Involvement of all units, meetings, delay, replacements effectiveness, committee existence, turnover, information sharing, trainings</p>	<p>Support, supervision, decision, implementation of recommendations, NGO support, heads support, participation, solving problems</p>	<p>Awareness, family cooperation, involvement of extension workers, refusal, litigation, sensitive, emotional</p>

1. Characteristics of informants

A total of 27 respondents, 3 from each health facility, were approached for in-depth interview. Since 3 of the respondents had little or no information we excluded them from the interview. The remaining 24 respondents were included in the interview; 14 females and 10 males. All of the participants were health professionals: 16 midwives, 4 health officers, 3 nurses and 1 emergency surgery graduate. Among the 24 participants 12 received training on MDSR and 12 were oriented about the program. Most of the informants have two or more years of work experience in their respective facilities (ranging from a minimum of one year to a maximum of 10 years).

Table 8: characteristics of informants, Dire Dawa Ethiopia, 2015

Characteristics	Total number of deaths			
	Committee n= 9	Heads n= 9	Providers n= 6	Total n= 24
Sex				
Male	7	2	1	10
Female	2	7	5	14
Profession				
Midwife	4	7	5	16
Nurse	1	2	0	3
Health officer	4	0	0	4
Others	0	0	1	1
Mean year of experience	4.1	3.1	3.3	3.5
Training on MDSR	7	4	1	12
Orientation on MDSR	2	5	5	12

2. Structure and responsibility of the MDSR committees

The nine health facilities included in the study have MDSR committees. The committees were established immediately after the MDSR training was given in May 2014. Members of the committees in Dil Chora and Sabiyan hospitals include CEO, medical director, pharmacist, and senior midwife. In Dil Chora hospital the committee includes a gynecologist and laboratory technician while representative from outpatient department involved in the committees at Sabiyan Hospital. In the health centers the members in the committees include the health center head, representative from maternity unit, pharmacy unit, outpatient department, health extension worker and one person from health development army involved.

The senior midwife and gynecologist at Dil Chora Hospital reviewed the identified maternal deaths while death at Melka Jebdu Health Center was reviewed by head of maternity unit and health officer. The committees met on monthly basis in the seven health facilities except for that of Gende Gerada and Biyo Awale health centers where regular meetings did not happen.

The main responsibilities of the committee are identification of maternal deaths that happen in the health facility and in the catchment community, determining the causes of the deaths, developing action plan to address the causes (making recommendations), implementing the recommendations, monitoring implementation of the plan, and as reporting to the higher level.

3. Improvements after the implementation of MDSR

About half (13) of the respondents agreed that the program brought improvements in the way the facilities provide care for mothers. Giving special attention to mothers, tracking data on number and causes of maternal death and conducting meetings to review causes of maternal deaths are some of the improvements that came about after the introduction of MDSR. In addition, participants reported that, using the MDSR platform some of the health facilities started to audit and review near misses to take action to improve quality of maternal health care services.

By using the MDSR committee they addressed problems with ambulance and telephone services. In addition, after the introduction of the MDSR program the referring health centers started to communicate with the referral hospital before sending the mother and, in some cases, health workers from health centers started to accompany the mother to the referral hospital. The other improvement mentioned by the participants that resulted from the MDSR initiative was strong

team spirit and shared responsibility created among the health workers in the facilities. One of the respondents mentioned the changes as follows:

“We are not only focusing on maternal deaths; we also use the program to identify near misses. Primarily we share responsibility for the committee members and every unit is made to render emphasis to mothers like I told you, pharmacy and Laboratory units too. The committee members participate in educating the community about MDSR and other maternal health care services. Thus, make the workers in MCH unit to give more emphasis on identification of near misses.”

Study participants reported changes seen in the community after the start of the MDSR. The communities have now better awareness on maternal deaths, they started to promptly report when there is maternal death and question the causes of the death if the mother died in the health facility. When there is a mother who has complication related to pregnancy or delivery they started to immediately bring her to health facilities.

“Currently big emphasis is given to maternal death. Moreover, every mother has the awareness. They promptly come to health institutes upon bleeding and other complications. And there is also change in our facility, for example, previously ambulances did not render service except for transportation; however, it is currently made to partake in maternal care”. As a midwife from health center narrated

“----- The community is awake nowadays, they used to blame the Lord for everything before; but now, they question why and how deaths happen” a committee member from hospital

Some of the study participants reported that it is difficult to know the improvements the MDSR initiative brought because they either don't have baseline data to compare the implementation period with, or they didn't have maternal death cases in their health facilities in either period. Some feel that it is too early to expect change from the program but they believe that the program can bring change if the program strengthened and sustained. A midwife from health center stated as follows

“It is too early to say the program brought an improvement because we only had two maternal deaths in our catchment even these deaths did not occur in our health facility. The program is not that strong to bring change. We have to compare changes with the situation before the start of the program but we don’t know the pre-existing situations.”

4. Factors limiting implementation of MDSR

Factors which affect the implementation of MDSR are divided in to four broad categories; individual/ health care providers’ factors, health facility factors, management/ leadership factors and family/ community factors.

a. Individual/ health care provider factors

Knowledge about the program and attitude towards the program

Lack of knowledge is the main problem that affects the effectiveness of the program. Study participants observed that health care providers who have no good knowledge of the program think that the program is introduced to blame or punish the provider. This fear of blame and punishment in return affects the identification of the true causes of maternal death. Two informants explained what they faced as follows.

“The health care providers even the physicians think that the program is here to blame and punish them.....”

“We had one case and it was very difficult to know the exact cause of the death because the health care providers thought that if they tell the cause of the death they will be punished or blamed.”

Attitude towards the program is highly related to the position (being committee members, head or care provider) and having trainings or orientations.

Almost all of the committee members and most of maternity unit heads have a positive attitude towards the program. They agreed on the importance of the program and they believed that the program brought some positive changes to their health facility and to the community and they think taking part in such program as a privilege to make a difference on maternal health. They want the program to strengthen and sustain.

“I am happy because I am a part of such an important initiative. Primarily it is important to save mothers who are dying as a result of preventable problems especially negligence from the providers’ side.....” as a nurse from health center narrated

“I voluntarily participate in the program because it is the right program to know the cause of maternal death and to act on it and prevent deaths happening from the same reason” a midwife from hospital

Whereas some of health care providers from the maternity unit, especially the non-trained one believed that the program is burden to the providers and take their time and disrupt their routine activities in the health facility. And they also believed it was only the responsibility of the committee members.

“It is an extra burden to the health care provider. You have to do works here (in the health facility) and if there is a case you have to go out and work there too. It is very tiresome and affects our routine works in the facility” A midwife from health center

“We took the orientation for the matter of knowing about the program but participating in the program is the responsibility of the committee members” a midwife from hospital

b. Health facility factors

Under the health facility factors three main problems were raised. These are delay in information sharing on maternal death between health facilities, high staff turnover, and irregular or no MDSR committee meetings.

Regarding data exchange between health institutes; inability to promptly respond for inquiries upon lodging of requests from one health institute to the other is stated by the respondents as a limitation for the implementation of the program. It in turn impeding the process of the maternal audit work and this makes the effort of identifying the causes of death even harder.

“....We do not get the information (on maternal death) timely and the hospital does not inform us on time. (For a mother who died in the hospital) the health extension worker found out the case and we tried to get information from the hospital about the cause of the death but we had to wait for about two to three days. This affects the audit process and

makes the identification of causes of maternal death very difficult.” As a health officer from the health center narrated

High trained staff turnover rate is the second issue raised under the health facility factors which affects the implementation of the program. Workers who have taken trainings resigned from their works and the replacements get only the orientation and this makes the situation difficult as they cannot perform efficiently as the formerly trained workers. One of the respondents explained the condition as follows

“We have high staff turnover as I told you before we tried to replace them by other health workers who received orientation on the program but they do not easily implement the program as effective as that of the trained care providers.”

Irregularly or even worse being total absence of committee meetings is the last issue mentioned as a factor which limits the implementation of MDSR under this category. The main causes of this problem are work overload, difficulties in finding all committee members at the same time and some of the respondents mention the absence of the case or maternal death as a reason. Thus, they mentioned that such irregular hosting of meetings, created big challenge to discuss and settle matters that need to be resolved.

“Most of the time the committee members meet if there is a problem or if there is a case. According to the guideline the committee should meet every month and should discuss on the agenda even if there is zero death report. But the meeting is not regular and sometimes it may not happen at all. The reason for this is partly because it is difficult to bring all committee members together due to trainings and duty programs.” A nurse from health center

Beside the above limitations, the idea mentioned as best interest to the program implementation in this category is the presence of more than one trained experts and, it was mentioned that having more than one trained personnel complemented the program implementation process when a formerly trained expert resigns from duty or is absent thereof.

“There are three trained providers and if either of become absent, the other takes over, thus the program could be implemented without interruption. And, the presence of many trained experts is advantageous.” A health officer from health center

c. Management/ Leadership factors

Under this category absence of CEOs and medical directors during committee meetings and lack of regular supervision and support from the higher-level were mentioned as the main problems that affect the implementation of the program.

“We have a huge problem of getting all members together for the regular meeting particularly CEO and medical director. The CEOs and medical directors must be in the meetings because the recommendations implemented only if they attend the meetings and agree on the decisions.” a midwife from hospital

“The supervisions are not regular. If it becomes regular, I meant the meetings, the matters which are mentioned as problems herein should not be left on paper as we just discussed, and rather these should be effected through the bureaus” a midwife from one of the health center

On the other hand receiving support and supervision from experts who work for NGO and working closely with the facility heads was mentioned to be helpful in the discussion and resolution of challenges, and also help in the implementation of some recommendations thereby aiding the proper implementation of the program.

“The head of the facility follows the program regularly not just only him also experts from the NGO which in turn helps to us to alleviate the problems and aid the prompt implementation of recommendations.” A midwife from hospital

d. Family/ community factors :

The other factors that affect the implementation of MDSR program in the study area are family or community level factors. In this category lack of cooperation from the family members of the deceased women during verbal autopsy and attempt to use the audit report for litigation are identified as barriers to effective implementation of MDSR program. One of the respondents from the health center said the following

“...When we try to talk to the families of the deceased sometime after the death they are too sensitive and usually refuse to give information. They blame the health care providers for the death of the mother and sometimes they want to use the situation to file charges against the health care provider (who attended the deceased)”.

On the other hand some of the informants mentioned including a health extension worker in the committee as a best opportunity to track deaths which are happening in the community and to facilitate the verbal autopsy. Some of the health facilities use the health extension workers to convince the families of the deceased mother to cooperate for the verbal autopsy.

“What we are doing now is initially we try to communicate and convince family of the deceased mother via the health extension worker to get the needed information as the extension workers are more accepted by the community and then we go further -----”

5. Overall opinions and Suggestions to improve the program implementation

Almost all respondents admit the importance of MDSR program to avoid preventable maternal deaths through identification of causes of deaths and underlying factors, and improving the care provided by the health care providers. Study participants also appreciate the importance of filling information gap on maternal death. In addition, respondents think that the effective implementation of the program will facilitate women empowerment. The respondents feel that to get these results training on MDSR should be given to all health care providers; the committees in the health facilities should work closely with relevant stakeholders including the regional health bureau, blood bank and other health facilities; and health facilities need to integrate the program with other existing programs to ensure it receives regular supervision and support needed.

“... MDSR have a potential to reduce maternal mortality. It will play a great role in empowering women and can help to reduce negligence in medical care from the health care providers’ side” said one of the respondents from health center

6. DISCUSSION

A total of 45 deaths were identified during the two study periods; 24 during the baseline period and 21 during the period. Maternal death ratios obtained for the two periods were 511 and 505 per 100,000 live births during baseline and trial periods, respectively.

The mean age at the time of death during the two periods were 26 (6) and 26.7 (6) for the baseline and trial period respectively. Majority of the deaths occurred in the age group of 20-29 and occurred in grand multigravida mothers.

Of the total maternal deaths occurred in the two periods 11 (24.4%) had at least one ANC follow up and significant number 26 (57.7%) of mothers ANC follow up were not known. Majority of the deaths 30 (66.7%) occurred after delivery within the first week of postpartum period. From the 27 deliveries 18 (66.7 %) of deliveries were occurred at the health facility while 9 (33.3%) of the deceased women delivered at home.

Direct obstetric causes of death were responsible for 91% (41 out of 45) of maternal deaths. Of the causes, hemorrhage 12 (27%), hypertension during pregnancy 10 (22%), obstructed labour 8 (18%), puerperal sepsis 7 (15%) and abortion 4 (9%). Most of the deaths, 33 (73%) were due to avoidable factors.

One of the objectives of this study is to provide an overview of the maternal mortality status in Dire Dawa. The MMR which is obtained from this study, 508/100,000 live births is lower than the MMR obtained from the study done in Ambo Hospital, 1852/ 100,000 live births (29).

Whereas it is comparable with MMR obtained from the studies done in ten public health hospitals located in four regions of Ethiopia, which was 728/100,000 live births (ranges from 337/100,000 live births in Addis Ababa to 1192/100,000 live births in SNNPR) (30).

The actual numbers of maternal deaths identified in this research were 45 whereas HMIS report showed that there were only 29 deaths during the respective periods. So here we should ask why such discrepancies between the research finding and HMIS report exist. It could be as a result of difference in sources of data and/ or knowledge of the data collectors; specifically on maternal death classification (are the data clerks know what maternal death is?)

Number of deaths identified during baseline period believed probably fewer than the actual number of deaths. Because of missing of patient records specifically patient cards and the absence of established maternal death review system. In the absence of standardized maternal death review system or CVR it is difficult to know the exact magnitude of the death (10, 13).

Most of maternal deaths in both periods were (54% for the baseline and 66.7% for the trial period) occurred in 20-29 years age group. Study from India also showed that 62% of deceased mothers were in the age group of 20-30 (31). And other study conducted in Ambo Hospital on maternal mortality trend also showed that over half of the deaths are occurred in this age group (29). This age group considered as low risk groups for poor maternal outcomes but in this specific study as age and gravidity analysis showed that, about 40% of the mothers in the age group had at least five pregnancies in their life time. Having at least five pregnancies (being grand multigravida) is one of the conditions that most of maternal deaths occurred and the risk of dying from obstetric cause increases (29).

This study showed that 66.7% of the deceased mothers delivered in the health facilities and 33.3% of the deceased mothers delivered at home. A study done in Nigeria showed that, delivery assisted by health professionals was the main factor for reduction of maternal mortality (32). On the other hand only availing and utilizing the delivery service does not guarantee an effect on maternal mortality reduction (33).

Majority (68.8%) of the mothers died within the first week of postpartum period. During the postpartum period physical, social and mental problems emerged (33). In addition the post natal care coverage in Ethiopia is very low only 13% of mothers utilize the service within the first two days after delivery (4) even when the problem occurred most of mothers remain at their home.

Majority 31 (69%) of maternal deaths were among mothers who referred from other health facilities. Other studies done in India (31) and in Tigray Hospitals (16) showed that most of the maternal deaths are from referral cases. Referred clients are most of the time in critical conditions as a result of delay in care seeking of the mother, delay in decision making and delay in transit, thus saving their lives would be a great challenge for the health care providers (34).

Direct causes of maternal death were responsible for 41 (91%) of the deaths. The responsible direct obstetric causes of maternal death in this study are the five commonly known direct causes of maternal death; hemorrhage 27%, sepsis 15%, hypertensive disorders of pregnancy 22%, obstructed labour 18% and abortion 9%. The result is almost similar with other studies conducted in Ethiopia (16, 29, 30).

Determination of avoidability of maternal death during the baseline period was through interview with at least one of the health care provider who participated in the care of the deceased mother. Even though, the interview provided useful information that helped to classify deaths as maternal and non-maternal, to identify causes and avoidable factors of the death it was very difficult to get those health care providers who were participated in the care of the deceased women because of high staff turnover and the time lapse between the death and the data collection and even for those who were available for the interview, it was difficult to remember the cases and to classify it as avoidable or not. The recommended time for the interviews to be conducted is as soon as possible and recalls more than one year should be interpreted with caution (35). Whereas during the trial period it was relatively easy to determine avoidability of the death as a result of the already established maternal death review system and getting the health care providers for interview was easy and the recall bias was minor.

Most of the deaths, 73.3 % (66.7% and 81% for the baseline and trial periods respectively) were due to avoidable factors. Among the avoidable factors personal/family/women factor contributed for 27, Logistic system factor 10, health service factors 4 and health personnel factors 2. Other studies also showed that higher proportion (35-60%) of maternal deaths were avoidable (16, 31).

There are no changes in proportion of maternal deaths and proportion of avoidable maternal death in the two periods. We can compare this study with the research done in Senegal on facility based maternal death review (one year baseline and three years implementation periods maternal death review) result showed, there was no changes in the overall maternal death in the first two years and there was no changes in proportion of avoidable maternal death for the three years of implementation period (21). Absence of changes in MMR and proportion of avoidable maternal death in the two periods doesn't mean that the program is not successful. In projects aimed at improving maternal health, expecting such changes in short period of time is meaningless it needs at least five and more years (36).

A total of 247 maternal complications were identified; 144 for the baseline period and 103 during the trial period, which yielding the overall maternal complication ratio of 5376.5/ 100,000 live births. This result is comparable with the study done in ten selected hospitals in Ethiopia, which was 5016/100,000 live births from Bishoftu Hospital and 6315/ 100,000 live births from Yekatit 12 Hospital (30).

The most common type of near misses events in the two periods were caused by sepsis 29%, hemorrhage 23%, hypertension during pregnancy 24%, and ruptured uterus 21%. A study done in ten public hospitals in Ethiopia revealed that obstructed labour (29.7%), hypertension during pregnancy (27.5%) and hemorrhage (14.8%) are the most common causes of maternal morbidity while maternal morbidity due to sepsis accounts only 2% (30). During the trial period the three common causes of the complications were obstructed labour 34%, hypertension during pregnancy 27% and sepsis 18%. There was a reduction of complication events from sepsis at p-value of 0.003 and increment of complications due to obstructed labour at p-value of 0.000 was revealed between the two periods. However, the study design doesn't allow concluding a causative relationship between audit practice and some changes in causes of maternal complications still the change may be attributed to the introduction of MDSR. The change could be explained by improvement in obstetric care quality (increased partograph utilization during labour and delivery) and/ or improvement in accurate identification of causes of complications which follow the introduction of MDSR system.

Researches done in Ethiopia as well as in other developing countries showed that most of maternal deaths are avoidable and these maternal deaths mainly caused by direct obstetric cause of death like hemorrhage, eclampsia and puerperal sepsis and anemia considered as the major contributory of maternal death. These deaths can be prevented by improving quality of care through early detection and prompt treatment of the problems and in places where presence of maternal death audit system led to improved quality of obstetric care (3) and MDSR is a system which helps to identify area of substandard care and improve quality of care and eliminate avoidable maternal deaths (21).

A total of 24 health care providers were participated in the qualitative interview. Almost all of the study participants had knowledge about the program. Presence of knowledge plays a great role in acceptability, readiness and willingness towards the program implementation and a potential factor for efficient audit system (25).

Most of the committees found in the facilities are applying all the process of the program properly. MDSR committee which is formed based on the MDSR guideline existed in all the selected nine health facilities and responsible for the audit of maternal deaths. In addition to using the program for maternal death identification they are using it to identify near misses and to improve maternal health service performances. The existence of such committee and working on maternal death notification, review system implementation and producing quality information and using the produced information to avoid death is the major step towards the implementation of the MDSR program (3).

The program brought some positive changes and improvements to the health care providers, to the health facility, as well as to the community, including improving in patient care, improving in knowledge and behavioral change in patient care, improving in team spirit between health care providers, having data on maternal deaths and near misses and improving in community awareness towards maternal mortality. The study done in in Rural Tanzania also showed that audit has a great potential to bring change by continuous identification of adverse maternal outcome, underlying factors, implementation and evaluation of interventions for the purpose of improving care (26).

The main challenges encountered during the program implementations include: lack of knowledge which is linked to fear of blame, negative attitude towards MDSR program, high staff turnover which linked to reduce effective implementation of the programs by those who replace the trained staffs, delay in information sharing and irregular/ total absence of committee meetings which are lead to inability to identify problems and maternal deaths on time. Failure of managers and decision makers' involvement in meetings and decision making process and irregular support and supervision from the higher level are the major problems which denied the proper implementation of recommendations and solving problems which are encountered during the program implementation process.

The study done on perinatal death audit showed that lack of involvement among decision makers and poor supervision are the leading factors for health services poor performances, poor implementation of recommendations and rather it will ultimately destroy the committee (25). The success of audit system attributed to strong leadership and accountability of both health providers and key decision makers (20, 21).

Lack of family cooperation during verbal autopsy and need to use the situation for litigation purpose are other factors that limit proper implementation of MDSR. The study from Senegal also showed that performing the interview with the family of the deceased woman was difficult (27). Family of the deceased mother is likely to provide the most reliable and accurate information about the woman condition but the interview should be done after any culturally prescribed mourning period has passed (35).

On the other hand having trained personnel, support and supervision from NGO, closely work with managers of the facility and including health extension workers in the program are facilitating factors. Generally participation of managers in the audit session is most essential to build teamwork, to facilitate the review of maternal death in a constructive way and to plan appropriate and realistic actions to prevent other maternal deaths and to implement recommendations.

In general the study showed that the program is accepted by the health care providers as an important initiative to prevent maternal deaths. They perceived that the program is very important to bring changes in the community, health facility as well as to the health care providers and ultimately it can reduce preventable maternal deaths. Other study on maternal death review system also showed that the program was well accepted by health professionals and service administrators which are important to adhere to the program (26).

Results of this study suggest that the implementation of MDSR strongly influenced by knowledge, attitude, regular committee meetings, implementation of recommendations, system integration with other existing programs, strong follow up and support from the higher level and community participation.

To get the desired change from the audit system the audit process must be well structured, conducted as per the principles and there must be commitment to the process from care providers, health managers and policy makers, and needs contribution from community (27). The audit system is not just “gathers dust on shelves” rather it has a purpose of learning and acting on the results and improves maternal health outcomes (3).

7. STRENGTH AND LIMITATIONS

Strength

Application of both qualitative and quantitative methods, conducted in many facilities and being first of its kind are strengths of the study

Limitations

There are a number of limitations: since the quantitative data collected retrospectively and through document review getting all the information was difficult. There was high recall bias for those interviewed health care providers to fill the missing data. The study only included deaths occurred at health facility and the audit didn't supplement with information from family and community members of the cases, it doesn't give the exact picture of the problem.

8. CONCLUSION

As far as maternal death concerned the problem is still in its worst. Relatively young females are dying due to pregnancy and pregnancy related problems and among these young mothers about half of them have five and above number of pregnancy.

Giving birth at the health facilities alone doesn't change/ reduce the risk of dying of mothers from pregnancy and pregnancy related causes. The first week of postpartum period was the most risk time for maternal mortality.

Delay in care seeking is still the most prominent delay which contributes for the majority of maternal deaths.

There is no change in magnitude of maternal mortality as well as maternal morbidity during the two periods.

Having maternal death audit system is the major step forward to reduce maternal mortality and improve service quality. The primary thing for the implementation of MDSR is having well-structured committees which involve members from different units and who take responsibility on the program. The system which is introduced in Dire Dawa health institutions is relatively properly establishing in structure, process and in bringing some changes on maternal health care services. But still there are challenges which encountered during the program implementation.

9. RECOMMENDATIONS

One of the aims of this study is providing information on magnitude and causes of maternal complication, death and factors affecting the implementation of MDSR and come up with recommendations. With respect to the findings of the study the following recommendations have been made.

Government level

To reduce the level of maternal mortality should tend to improve service quality and service utilization. Strengthen and sustain the implementation of MDSR program through capacity building, continuous and regular assessment, integration with other existing programs and raising public awareness.

Health facility level

Improvement in postpartum care services and other maternal health care services is needed. Should work on improving health care workers attitude and knowledge on MDSR program and encourage all care providers to take part in the program implementation. Working on family planning program should be also considered.

Community level

Since reduction of maternal mortality needs involvement from the community, community awareness and community involvement in each program is fundamental. Communities should be able to utilize the maternal health care services and support the implementation of MDSR program.

Researchers

Studies on quality of maternal health care services also need to be done

10. REFERENCES

1. Kalid S. Khan, Daniel Wojdyla, Lale Say, Amertin Gulmezoglu and Paul Van Look: WHO analysis of maternal death: A systemic review. <http://www.thelancet.com>
2. UN: The Millennium Development Goals Report 2014: <http://www.un.org/millenniumgoals/2014%20MDG%20report/MDG%202014%20English>
3. Gwyneth Lewis: Beyond the numbers: reviewing maternal deaths and complications to make pregnancy safer. British medical bulletin www.ossyr.org.ar/pdf/bibliografia/2.4.
4. CSA & MOH: Mini Ethiopia Demographic and Health Survey 2014. www.unicef.org/ethiopia/Mini_DHS_2014_Final_Report.pdf
5. UNICEF/WHO/The World Bank/UN Pop Div.: Levels and Trends in Child Mortality. Report 2013. <http://www.futuresgroup.com>
6. Federal Democratic Republic of Ethiopia Ministry of Health: Health Sector Development Program IV 2010/11 – 2014/15 FINAL DRAFT. October 2010: page 48
7. Ndola Prata, Paige Passano, Amita Sreenivas & Caitlin Elisabeth Gerdts: Women's Health: Maternal mortality in developing countries: challenges in scaling-up priority interventions. www.futuremedicine.com
8. WHO: Country Accountability Framework: Progress Summary, August 2014. www.who.int/woman_child_accountability
9. Carine Ronsmans, and Wendy J Graham: Maternal mortality: who, when, where, and why. <http://download.thelancet.com/pdfs/journals/lancet/PIIS014067360669380X.pdf?id=a>
10. Say et al.: Global causes of maternal death: A WHO systemic analysis. <http://download.thelancet.com/pdfs/journals/langlo/PIIS2214109X1470227X.pdf?id=h>
11. Pacagnella et al.: Delays in receiving obstetric care and poor maternal outcomes: A result from a national multicenter cross sectional study, Brazilian Region between 2009 & 2010. <http://www.biomecentral.com/1471-2393/14/159>
12. Eugene J Kongnyuy: Maternal Death Surveillance and Response: Eliminating Preventable Maternal Mortality by 2030. <http://omicsonline.com/open-access/maternal-death-surveillance-and-response-eliminating-pre...>

13. UNICEF/WHO/The World Bank/UN Pop Div.: Trends in maternal mortality 1990-2013.
<http://www.who.int/reproductivehealth>
14. Carla Abouzahr: Global burden of maternal death and disability.
<http://bmb.oxfordjournals.org/content/67/1/1.full.pdf#page=1>
15. Ahmed Abdella: Maternal mortality trend in Ethiopia. *Eth. Jour. of Health Dev.*2010; 24 (special issue 1): 115-122
16. Samuel Hailu, Fikre Enqueselassie and Yemane Berhane: Health facility based maternal death audit in Tigray, Ethiopia. *Eth. Jour. of Health Dev.*2009; 23 (2): 115-119
17. Hounton et al.: Towards elimination of maternal deaths: maternal deaths surveillance and response. <http://www.reproductive-health-journal.com/content/10/1/1>
18. Isabella Danel, Wendy J Graham & Ties Boerma: Maternal death surveillance and response. <http://www.who.int/bulletin/volumes/89/11/11-09722>
19. Animesh Biswas, Fazlur Rahman, Abdul Halim, Charli Eriksson & Koustuv Dalaa: A useful approach to identifying appropriate and effective maternal and neonatal health initiatives in Bangladesh. <http://www.scirp.org/journal/health>
20. Endang Achadi, Carine Rosmans, Gunawan Supratikto, Margareth E. Wirth: A district based audit in to the causes and circumstances of maternal deaths in South Kalimantan, Indonesia. http://pdf.usaid.gov/pdf_docs/pnack511.pdf
21. Dumont et al.: Facility based maternal death reviews: Effects on maternal mortality in a district hospital in Senegal.
http://www.scielosp.org/scielo.php%3Fscript%3Dsci_arttext%26pid%3DS0042-96862006000300017
22. Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–8: a review. <http://bj.a.oxfordjournals.org/content/107/2/119.full.pdf>
23. Pattinson et al.: Perinatal mortality audit: counting, accountability and overcoming challenges in low and middle income countries. <http://www.figo.org>
24. Luwei Pearson, Luc deBernis, Rumishael Shoo: Maternal death review in Africa.
<http://www.elsevier.com/locate/ijgo>
25. Angelo S. Nyamtema, David P. Urassa, Andrea P. Pembe, Felix Kisanga & Jos Van Roosmalen: Factors for change in maternal and perinatal audit systems in Dare Salaam, Tanzania. <http://biomedcentral.com/1471-2393/10/29>

26. Angelo S. Nyamtema, Alise Bartsch Dejong, David P. Urassa & Jos Van Roosmalen: Using audit to enhance quality of maternity care in resource limited countries: Lesson learnt from Rural Tanzania. <http://biomedcentral.com/1471-2393/11/94>
27. Alexandre Dumont, Caroline Tourigny & Pierro Fournier: Improving obstetric care in low resource settings: Implementation of facility based maternal death reviews in five pilot hospitals in Senegal. <http://www.human-resource.com/content/7/1/61>
28. Eugene J. Kongnyuy and Nynce Van Den Broek: The difficulties of conducting maternal death review in Malawi. <http://www.biomedcentral.com/1471-2393/8/42>
29. Herpassa Garomssa and A.D.Dwivedi, Maternal mortality in Ambo Hospital: a five year retrospective view. Ethiopian Journal of Reproductive Health. 2008 May; 2(1);
30. Gebrehiwot Y, Tewolde BT, Improving maternity care in Ethiopia through facility based review of maternal deaths and near misses. <http://dx.doi.org/10.1016/j.ijgo.2014.08.003>
31. Biswajit Paul, Mousumi Sen, Krishna Kar and Bijayeeni Mohapatra, Facility Based Maternal Death Review: Learning from Maternal Deaths in a Teaching Hospital of Eastern India. www.ssjournals.com
32. Dr. Joseph Nnamdi Mojekwu and Mr. Uche Ibekwe: Maternal Mortality in Nigeria: Examination of Intervention Methods Department of Actuarial Science and Insurance Faculty of Business Administration University of Lagos Akoka, Lagos, Nigeria. www.ijhssnet.com
33. Oona M R Campbell and Wendy J Graham on behalf of The Lancet Maternal Survival Series steering group: Maternal Survival 2, Strategies for reducing maternal mortality: getting on with what works. www.thelancet.com
34. Prata, N., Graff, M., Graves, A. and Potts, M. 'Avoidable maternal deaths: Three ways to help now', Global Public Health, (2009). <https://openknowledge.worldbank.org/bitstream/handle/10986/18701/870760>
35. WHO, HMNR & In-depth Network: Verbal autopsy standards: the 2012 WHO verbal autopsy instrument. http://www.who.int/healthinfo/statistics/WHO_VA_2012_RC1_Instrument.pdf
36. World Bank: Guidelines for monitoring and evaluating World Bank projects aimed at improving reproductive health outcomes. <http://siteresources.worldbank.org/INTPRH/Resources/376374->

11. ANNEXES

Annex 11.1. Distribution of health professionals and available services in participating hospitals and health centers, Dire Dawa, 2015

Facilities	Heath professionals covering maternity unit					Available services		
	Gynecolo gist	Midwife	Nurse	Other	Total	Basic	BEmONC	CEmONC
Dil Chora Hospital	3	16	0	0	19	✓	✓	✓
Sabiyen Hospital	0	9	3	1	13	✓	✓	
Goro HC	0	3	0	0	3	✓	✓	
Legehare HC	0	4	2	0	6	✓	✓	
Gende Gerada HC	0	2	3	0	5	✓	✓	
Addis Ketema HC	0	4	2	0	6	✓	✓	
Melka Jebdu HC	0	1	2	0	3	✓	✓	
Biyo Awale HC	0	3	0	0	3	✓	✓	
Jelo Belina HC	0	2	1	0	3	✓	✓	
Total	3	44	13	1	61	9	9	1

Annex 11.2. Data Abstraction tools

SECTION 1: HEALTH FACILITY CHARACTERISTICS:

1.1 Facility name

1.2 Type of facility (✓):

1. Referral hospital	2. General hospital	3. Health centre

1.3 No. of personnel covered maternity ward (write number)

1. Doctors covering maternity	2. Midwives	3. Others

1.4 Availability of services (✓)

1. Basic services	2. BEMONC/ CEMONC	3. CS	4. Blood transfusion

1.5 Total deliveries and maternal deaths (write number)

1. Number of deliveries	2. Total maternal death	3. Maternal death ratio	4. Maternal mortality rate

1.6 Maternal complication

Periods	Causes of complications				
	Haemorrhage	Sepsis	Pre/eclampsia	Obs. labour	Other
Baseline					
Implementation					
Total					

SECTION 2: CHARACTERISTICS OF DECEASED WOMEN

Data collection period: (✓)

1. Baseline period 2. Implementation period

2.1. Socio demographic characteristics of deceased women				
Residence				
Age (in years)				
Gravida Para Gestation (weeks)				
2.2. Obstetric Conditions and interventions of the Deceased Women				
ANC visit(s)	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not known <input type="checkbox"/>	
Number of ANC visit	One <input type="checkbox"/>	More than one <input type="checkbox"/>	Not known <input type="checkbox"/>	
Place of ANC visit	Hospital <input type="checkbox"/>	Health Center <input type="checkbox"/>	Health Post <input type="checkbox"/>	Other (specify)
Antenatal risk factors (✓)	Hypertension <input type="checkbox"/>		Bleeding <input type="checkbox"/>	Previous C/S <input type="checkbox"/>
	Multiple gestation <input type="checkbox"/>		Abnormal lie <input type="checkbox"/>	Anemia <input type="checkbox"/>
	Glycosuria <input type="checkbox"/>		Proteinuria <input type="checkbox"/>	Other (Specify) <input type="checkbox"/>
Did labour occur? (✓)	Yes <input type="checkbox"/>		No <input type="checkbox"/>	Not known <input type="checkbox"/>
Was a partograph used (✓)	Yes <input type="checkbox"/>		No <input type="checkbox"/>	
If “yes”, was a partograph correctly filled? (✓)	Yes <input type="checkbox"/>		No <input type="checkbox"/>	
Duration of labour (✓)	< 12 Hrs. <input type="checkbox"/>	12-24 Hrs. <input type="checkbox"/>	>24 Hrs. <input type="checkbox"/>	Not known <input type="checkbox"/>
Mode of delivery (✓)	SVD <input type="checkbox"/>		Instrumental <input type="checkbox"/>	C/S <input type="checkbox"/>
	Destructive operations <input type="checkbox"/>			Not delivered <input type="checkbox"/>
Place of delivery (✓)	Hospital <input type="checkbox"/>	Health Center <input type="checkbox"/>	Health Post	Other (specify)
Main Assistant at delivery	Doctor <input type="checkbox"/>		Midwife <input type="checkbox"/>	Health extension <input type="checkbox"/>
	TBA <input type="checkbox"/>		Family	Self- <input type="checkbox"/>
Puerperal conditions (✓)	PPH <input type="checkbox"/>		Sepsis <input type="checkbox"/>	Ruptured uterus <input type="checkbox"/>
	Eclampsia <input type="checkbox"/>		Shock/sudden <input type="checkbox"/>	Other (specify)
Interventions (✓)	Yes <input type="checkbox"/>		No <input type="checkbox"/>	Not known <input type="checkbox"/>
If “yes”, intervention (✓)	Supportive <input type="checkbox"/>			Definitive <input type="checkbox"/>

2.3. Timing and Cause of death

Date of admission	(DD/MM/YYYY)		
Day of admission (✓)	Working days <input type="checkbox"/>	Weekends <input type="checkbox"/>	Holidays <input type="checkbox"/>
Time of admission (✓)	Working hours <input type="checkbox"/>		Nonworking hours <input type="checkbox"/>
Referred (✓)	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not known <input type="checkbox"/>
If “yes”, referred from (✓)	TBA <input type="checkbox"/>	Health post <input type="checkbox"/>	Health center <input type="checkbox"/>
	Hospital <input type="checkbox"/>	Other (specify)	
Admission with complication	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not known <input type="checkbox"/>
Reason for admission			
Diagnosis on admission			
Condition on admission (✓)	Stable <input type="checkbox"/>	Critically ill <input type="checkbox"/>	Brought dead <input type="checkbox"/>
State of pregnancy at the time of admission (✓)	Abortion <input type="checkbox"/>	Ectopic pregnancy <input type="checkbox"/>	Antepartum <input type="checkbox"/>
	Intrapartum <input type="checkbox"/>	Postpartum <input type="checkbox"/>	
State of pregnancy at the time of death (✓)	Abortion <input type="checkbox"/>	Ectopic pregnancy <input type="checkbox"/>	Antepartum <input type="checkbox"/>
	Intrapartum <input type="checkbox"/>	Postpartum <input type="checkbox"/>	
Time interval between admission and death (✓)	Within 24 Hrs. of arrival <input type="checkbox"/>	After 24 Hrs. <input type="checkbox"/>	Not known <input type="checkbox"/>
Main attendant at admission			
Place of death			
If the event was antepartum or intrapartum, GA at the time of death			
If the event was postpartum or post abortion, after how many days has the event occurred?			
Direct causes of death	Hemorrhage <input type="checkbox"/>	Preeclampsia/ eclampsia <input type="checkbox"/>	Obstructed labor <input type="checkbox"/>
	Infection <input type="checkbox"/>	Unsafe abortion <input type="checkbox"/>	
Indirect causes of death	Hypertension <input type="checkbox"/>	Cardiac problem <input type="checkbox"/>	Anemia <input type="checkbox"/>
	Malaria <input type="checkbox"/>	HIV/AIDS <input type="checkbox"/>	Other (specify)

2.4. Avoidable factors/ Missed opportunities/ Substandard Care

Personal/ family/ woman factor	Delay of the woman seeking help	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Lack of partner support	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Refusal of treatment or admission	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Herbal medication	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Refused transfer to higher facility	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Others, specify:			
Logistical systems	Lack of transport from home to health facilities	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Lack of transport between health facilities	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Other, specify:			
Health service factors	Health service communication breakdown	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Lack of facilities, equipment or consumables	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Other, specify:			
Health personnel factors	Absence of critical human resource	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Inadequate numbers of staff	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Staff misguided action	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Staff over-sight	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Staff non-action	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Staff lack of expertise, training or education	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Absence of critical human resource	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown
	Other, specify:			

Information Sheet and Consent Forms for the In-depth Interview:

My name is Tseyon Tesfaye a graduate student from Addis Ababa University School of Public Health. I am doing a research on maternal death surveillance and response system implementation and its progress here in Dire Dawa and I am interested to hear your experience and opinion about the program.

The purpose of the study is to assess maternal death surveillance and response program progress, the challenges and facilitators encountered as well as your perception about its implementation so as to contribute to generate information necessary for the planning to strengthen, improve, redesign and scale up the programs. You are selected to participate in this study because you are directly related to the program implementation and I thought you are the best person in the issues for generating productive ideas.

There is no risk in participating in this study and the interview will be conducted in private and it will take about 30 minutes. The result of the study will benefit the society, programme planners and decision makers as well as your facility by providing a comprehensive understanding of the issues surrounding implementation of the initiative and by improving maternal health.

I want to emphasize that your participation in the study is upon voluntary basis. There will not be a payment for participating in this study. If you feel uncomfortable with some of the question you have the right not to answer. During the interview period, if you feel inconvenient, you can interrupt and clarify inconvenience, appoint to other time or even you can decide not to continue the interview at some point. If you are agreeing to participate in the interview, you will be asked some short questions about the program and your answers will be recorded. I will not record your name and any other personal identifications and all the data obtained will be kept strictly confidential by using only code numbers assigned to it and will be stored in locked file cabinets, to be accessed only by the principal investigator and my research advisors, and after the study is finalized all the information will be destroyed.

You have full right to refuse to participate and/or withdraw from the study at any time. However, because the information you will be providing us is very useful for the study we encourage of you to participate and provide us with the information we need.

Person to contact: If you want to know more about the study you can contact the principal investigator of the study Tseyon Tesfaye through mobile phone numbers +251-911-676523, IRB of AAU by Tel: 251-115538734, e-mail: aaumfirb@yahoo.com

Do you have any question that you want to ask us about the study?

Consent Form

Interviewer: Please provide a paper copy of the Consent Form to the respondent and explain it.

With due understanding of the aforementioned information, I am willing to participate in the study?

(Yes) Check box: => Proceed

(No) Check box: => Stop

Name of the interviewer: _____ Signature _____ Date __/__/____

Name of the supervisors: _____ Signature _____ Date __/__/____

Identifiers	
Q1. Facility name _____	Q2. Facility code [__ __]
Q3. Observer name _____	Q4: Today's date (day/month/year) _____
Q5. Respondent Code [__ __ __]	Time started: HH/Min [__ __] Time completed: HH/Min [__ __]

Annex: 11.3. Interview guide for In-depth interview

With health care providers and heads from maternity unit

I. Background Information

Code ----- Sex -----

Professional background ----- Year of experience -----

Trainings on MDSR -----

II. Questions about MDSR implementation

Topics	Main questions	Follow up questions
Knowledge	-Have you ever heard about MDSR?	-What have you heard from others? -Can you tell me what you know about MDSR?
Source of information	-Where did you hear about MDSR?	-How did you happen to be discussing it? -Who else is talking about MDSR today? Are these things are true?
Experience	-Do you know anyone who participates in in the process of MDSR? And are you?	-Why did you decide to participate?
Opinion	-What do you think are the advantage and disadvantage of MDSR?	-How could MDSR help or harm the health care system, an individual/ health care provider and the community? -Would you think MDSR program should be continued and implemented in other areas? Why or why not? -Do you think other colleague of yours want the program to continue? -What things are improved after the implementation of MDSR?

With MDSR committee members

I. Background Information

Code ----- Sex -----

Professional background ----- Year of experience -----

Trainings on MDSR -----

II. Questions about MDSR implementation

Topics	Main questions	Follow up questions
MDSR implementation process	Is the committee organized according to the guideline?	Who are the members of the committee?
		What will happen if the responsible person for the MDSR process leaves?
		What framework do you have to evaluate the effectiveness of the program?
Factors affecting the implementation of MDSR	Facilitating Factors	During identification of maternal death?
		During the data collection
	Challenges	During MDSR meeting
		During the application of recommendations
Opinion	What do you think are the advantage and disadvantage of MDSR?	How could MDSR help or harm the health care system, an individual/ health care provider and the community?
		Would you think MDSR program should be implemented in the other areas? Why? Or why not?
		Do you think other colleague of yours want the program to continue?
		What things are improved after the implementation of MDSR?
		What should be done to improve the program?

የመረጃ ገለጻ እና የፈቃደኝነት መጠየቂያ ቅፅ

ጽዮን ተስፋዬ እባላለሁ በአበአዲስ አበባ ዩኒቨርሲቲ በህብረተሰብ ጤና ሳይንስ የትምህርት ክፍል የሁለተኛ አመት የህብረተሰብ ጤና የድህረ ምረቃ ተማሪ ነኝ። በዚህ በድሬዳዋ ከተማ በሚገኙ የተመረጡ ጤና ተቋማት ላይ በእናቶች ሞት አሰሳ እና ምላሽ የመስጠት ፕሮግራም ዙሪያ የመመረቂያ ጥናቱን እየሰራሁ እገኛለሁ።

የዚህ ጥናት አላማ በእናቶች ሞት አሰሳ እና ምላሽ የመስጠት ፕሮግራም አፈፃፀም እና ሂደት ወቅት ያጋጠሙ ተግዳሮቶችን እና አጋዥ ሁኔታዎችን መለየትና እንዲሁም ስለፕሮግራሙ ያሎትን ምልክታ መዳሰስ ሲሆን፤ እርሱም የሚሰጡን ማንኛውም መረጃ ፕሮግራሙን ለማሻሻል እና ለማስፋፋት የላቀ አስተዋፅኦ ይኖረዋል። እርሶ ከሌሎቹ የስራ ባልደረቦች በተለየ ለዚህ ጥናት የተመረጡበት ዋነኛ ምክንያት ፕሮግራሙን በተመለከተ የተሻለ እውቀት እንዲሁም ለፕሮግራሙ ቅርበት አሎት ተብሎ በመታሰብ ነው። በዚህ ጥናት ላይ በመሳተፍዎ የሚገጥሞት ምንም ዓይነት ችግር ወይም ጉዳት የሌለ ሲሆን ቃለ መጠይቁን የማረጋገጥም ማንም በማይኖርበት እና ነፃነትዎን በማይነካ ቦታ ነው። ቃለ መጠይቃችንም የሚቆየው ለሰላሳ ደቂቃዎች ያህል ብቻ ይሆናል። የጥናቱ ውጤት ምንም እንኳን እርሶን በቀጥታ የሚጠቅም ባይሆንም፤ ለህብረተሰቡ፣ ፕሮግራሙ ላይ ለሚሰሩ አካላት፣ ለውሳኔ ሰጪዎች እንዲሁም ለሚሰሩበት የጤና ተቋም ስለፕሮግራሙ መረጃ በመስጠት እና ያላቸውን ግንዛቤ በማሳደግ ፕሮግራሙን ብሎም የእናቶችን ጤና ያሻሽሉ ዘንድ ይረዳቸዋል።

በዚህ ጥናት ላይ የሚሳተፉት በእርሶ መልካም ፈቃደኝነት ብቻ ነው። ቃለ መጠይቁን ፈቅደው ስላደረጉ የሚያገኙት ምንም አይነት ክፍያ የለም። በቃለ መጠይቁ ወቅት መመለስ የማይፈልጓቸው ጥቂዎች ካሉ አለመመለስ ይችላሉ። ያልገባዎት ወይም የሚስቸግሮት ነገር ካለ በመሃል በማቋረጥ ያልገባዎትን ነገር መጠየቅ፣ ለሌላ ግዜ ቀጠሮ መውሰድ ብሎም ቃለ ምልልሱን ለማቋረጥ ከፈለጉ ማቋረጥ ይችላሉ። ቃለ ምልልሱን ለማድረግ ፍቃደኛ ከሆኑ ስለፕሮግራሙ ለምጠይቆች ጥያቄዎች የሚሰጡትን ምላሽ ልመዘግብ እንዲሁም በመቅረፅ ድምፅ ልይዝ እችላለሁ ነገር ግን ስምዎትንም ሆነ የእርሶን ማንነት የሚገልፅ ምንም አይነት መረጃ አልመዘግብም። ከእርሶ የማገኘውን መረጃ በጥብቅ እና ሚስጥራዊነቱ በተጠበቀ፣ እኔ እና የጥናቱ አማካሪዎቼ ብቻ ልንደርስበት በምንችልበት ቦታ ተቆልፎበት የሚቀመጥ ሲሆን ጥናቱም ካለቀ በኋላ የመዘገብናቸው መረጃዎች በሙሉ እንዲወገዱ ይደረጋል። ጥናቱን የማቋረጥም ሆነ እምቢ የማለት ሙሉ መብት ያሎት ቢሆንም ነገር ግን ከእርሶ የምናገኘው መረጃ ጠቃሚ መሆኑን አውቀው በጥናቱ ላይ እዲሳተፉ በአክበሮት እጠይቆታለሁ።

ጥናቱን በተመለከተ ጥያቄ ወይም ቅሬታ ካሎት በሚከተለው አድራሻ መጠቀም ይችላሉ። ጽዮን ተስፋዬ፣ ስልክ ቁጥር +251-911-676523፣ ኢሜል: tsitesfa@yahoo.com ፣ አዲስ አበባ ዩኒቨርሲቲ፣ ስልክ ቁጥር251-115538734፣ ኢሜል: aaumfirb@yahoo.com ጥናቱን በተመለከተ ግልፅ እንዲሆንሎት የሚፈልጉት ነገር አለ?

ቃለ መጠይቁን ለማካሄድ ፈቃደኛ ናት?

አዎን --- ቃለ መጠይቁን ይቀጥሉ

አይደለሁም ----- ያቁሙ

ቃለ መጠይቁን የሚያደርገው ሰው ስም ----- ፊርማ ----- ቀን ----/-----/-----

ቃለ መጠይቁ የሚቆጣጠረው ሰው ስም ----- ፊርማ ----- ቀን ----/-----/-----

Identifiers	
1. የተቋሙ ስም _____	2. የተቋሙ ኮድ [____ ____]
3. የተካሄደበት ቀን-----/ወር-----/ዓ.ም----- _____	4: የመላሽ ኮድ [____ ____ ____]
<p>ቃለ መጠይቁ የተጀመረበት ሰአት: ሰአት/ደቂቃ [____ ____]</p> <p>ቃለ መጠይቁ የተጠናቀቀበት ሰአት: ሰአት/ደቂቃ [____ ____]</p>	

በእናቶች ጤና መስጫ ክፍል ውስጥ ለሚሰሩ የጤና ባለሙያዎች እና ለእናቶች ሞት አሰሳ እና ምላሽ መስጠት ኮሚቴ አባላት በአማርኛ የተዘጋጀ የቃለ መጠይቅ መምሪያ

1. በእናቶች ጤና መስጫ ክፍል ውስጥ ለሚሰሩ የጤና ባለሙያዎች የተዘጋጀ መጠይቅ

1.1. አጠቃላይ መረጃ

ኮድ ----- ይታ -----

ሞያ ----- የስራ ልምድ -----

የእናቶች ሞት አሰሳ እና ምላሽ መስጠት ስልጠና -----

1.2. የእናቶች ሞት አሰሳ እና ምላሽ መስጠት በተመለከተ

ርእስ	ዋና ጥያቄ	ተጨማሪ ጥያቄዎች
እውቀትን በተመለከተ	-የእናቶች ሞት አሰሳ እና ምላሽ መስጠት ስለሚባለው ፕሮግራም ስምተው ያውቃሉ?	-ስለ ፕሮግራሙ የሚያውቁትን ሊነግሩኝ ይችላሉ? -ሌሎች ስለ ፕሮግራሙ የሚያውቁ ሰዎች አሉ? ካሉስ በእርሶ አስተያየት ስለፕሮግራሙ ያላቸው እውቀት ምን ያክል ነው?
የመረጃ ምንጭ	-ስለ የእናቶች ሞት አሰሳ እና ምላሽ መስጠት ፕሮግራም የሰሙት ከየት ነው?	-ስለ ፕሮግራሙ ሊሰሙ የቻሉት እንዴት ነው? -ስለ ፕሮግራሙ ከሌሎች የሰሟቸው ነገሮች አሉ ካሉስ የሚሰጡት አስተያየቶች ምን ያክል እውነት ናቸው ብለው ያስባሉ?
ተሳትፎ/ ልምድ	-በፕሮግራሙ ላይ እየተሳተፈ ያለ ሰው ያውቃሉ? እርሶስ ተሳትፈው የውቃሉ?	-ከተሳተፉስ ከመቼ ጀምረው ነው መሳተፍ የጀመሩት? ለምንስ ለመሳተፍ ፈለጉ?
አስተያየት/ አመለካከት	-የእናቶች ሞት አሰሳ እና ምላሽ መስጠት ፕሮግራም ጥቅም አለው ወይም የለውም ብለው ያስባሉ? ጥቅሞቹ ወይም ጉዳዮቹ ምንድናቸው?	-ይህ ፕሮግራም በምን መልኩ ነው የጤና ስርአቱን፣ ግለሰብን ወይም የጤና ባለሙያውን ብሎም ህብረተሰቡን ሊጎዳ ወይም ሊጠቅም የሚችለው? -ፕሮግራሙ ሊቀጥልና በሌሎች አካባቢዎችም ሊስፋፋ ይገባል ወይም አይገባም ብለው ያስባሉ? ለምን? -ሌሎች የስራ ባልደረቦችዎ ትሮግራሙ እንዲቀጥል ፍላጎት አላቸው -ከፕሮግራሙ መጀመር በኋላ ምን የተሻሻሉ ነገሮች አሉ?

2. ለእናቶች ሞት አሰሳ እና ምላሽ መስጠት ኮሚቴ አባላት የተዘጋጀ መጠይቅ

2.1. አጠቃላይ መረጃ

ኮድ ----- ያታ -----
 ሞያ ----- የስራ ልምድ -----
 የእናቶች ሞት አሰሳ እና ምላሽ መስጠት ስልጠና -----
 2.2. የእናቶች ሞት አሰሳ እና ምላሽ መስጠት በተመለከተ

ርእስ	ዋና ጥያቄ	ተጨማሪ ጥያቄዎች
የእናቶች ሞት አሰሳ እና ምላሽ መስጠት አካሄድና ትግበራ	የኮሚቴው አወቃቀር በመመሪያው መሰረት ነው ?	ኮሚቴው እነማንን ነው ያካተተው?
		ፕሮግራሙ ላይ ሃላፊነት የተሰጠው አንድ ሰው ቢሄድ ምንድነው የሚፈጠረው?
		የፕሮግራሙን አፈፃፀም ለመከታተልና ለመገምገም ምን አይነት ዘዴ ነው የምትጠቀሙት?
የፕሮግራሙ አፈፃፀም ላይ ተፅእኖ የሚያሳድሩ ሁኔታዎች	አጋዥ ሁኔታዎች	የእናቶችን ሞት በመለየት ወቅት በመረጃ አሰባሰብ ወቅት
	ተግዳሮቶች	በስብሰባ ወቅት የማሻሻያ ውሳኔዎችን በመተግበር ወቅት
አስተያየት/ አመለካከት	-የእናቶች ሞት አሰሳ እና ምላሽ መስጠት ፕሮግራም ጥቅም አለው ወይም የለውም ብለው ያስባሉ? ጥቅሞቹ ወይም ጉዳዮቹ ምንድናቸው?	ይህ ፕሮግራም በምን መልኩ ነው የጤና ስርአቱን፣ ግለሰብን ወይም የጤና ባለሞያውን ብሎም ህብረተሰቡን ሊጎዳ ወይም ሊጠቅም የሚችለው? ፕሮግራሙ ሊቀጥልና በሌሎች አካባቢዎችም ሊስፋፋ ይገባል ወይም አይገባም ብለው ያስባሉ? ለምን? ሌሎች የስራ ባልደረቦችዎ ትሮግራሙ እንዲቀጥል ፍላጎት አላቸው? -ከፕሮግራሙ መጀመር በኋላ ምን የተሻሻሉ ነገሮች አሉ? ፕሮግራሙን ለማሻሻል ወይም ባለበት እንዲቀጥል ለማድረግ ምን መደረግ አለበት?