

# Evaluation of Maternal Death Surveillance and Response System in Dewachefa Woreda, Oromia Zone, Amhara Region, Ethiopia, 2018

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## Research article

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# Abstract

**Background:** Maternal death surveillance and response (MDSR) is the “litmus test” of the health system that provides evidence for accomplishment, links activities to results, makes maternal death visible at all levels, informs communities & health workers, increases country ownership of data, provides information in real time and allows improvement towards catching all maternal mortalities. The aim of study was to evaluate maternal death surveillance and response system in Dewachefa.

**Methods:** A cross sectional study design was conducted in two health centers, five health post, district health office and from these facilities 32 health workers were included. Data were collected through focal person, health worker and health extension worker interview by using checklist. Collected data were entered into Epi data version 3.1. These data were exported to statistical package for social science for analysis. Analyzed data were presented in the form of text, table and figures.

**Result:** The average completeness of weekly report form of the district was 77.4%. Twenty-eight (87.5%) of the health worker had not got Maternal death surveillance and response (MDSR) training. All visited health facilities and Woredas focal person were trained. The system had under notification of maternal death from the community, poor involvement of health facility staff, and discordance of data between public health emergency management, and maternal and newborn health unit report. Establish rapid response team that includes maternal and child health staff’s maternal death review committees in all health facilities.

## Background

Maternal Death Surveillance and Response (MDSR) is a system of uninterrupted investigation that connects health information to quality enrichment from grass route level to countrywide, and that measures a program's ability to answer to women's health requirements, mainly throughout and after pregnancy and birth (1-3). MDSR also provides evidence for accomplishment, links activities to results, makes maternal death visible at all levels, informs communities & health workers, increases country ownership of data, provides information in real time and allows improvement towards catching all maternal mortalities (1, 4, 5).

Routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, in addition to the practice of this evidence to respond with actions that will prevent future deaths are the function of MDSR (6, 7). In 2012, the World Health Organization (WHO) and partners introduced the Maternal Death Surveillance and Response (MDSR) approach as a new method to maternal death review (8, 9).

Maternal death is the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (1, 10, 11)

A suspected maternal death is the death of any woman while pregnant or within 42 days of the termination of pregnancy, irrespective of causes (10, 11).

Probable maternal death is death of a woman of reproductive age (between 15-49 years of age) (11).

Globally, an estimated 287 000 women die each year as a result of pregnancy and childbirth, and about 99% of them were in developing countries (8). In sub-Saharan Africa, the life time risk of maternal mortality is more than 47 times greater than for those in the developed countries (12, 13).

In Ethiopia, about 13,000 women died from pregnancy related conditions in 2013, making the country maternal death ratio 420/100,000 live births and providing approximately 4% to the total maternal deaths (7). The place of death revealed that the high percentage of deaths occurred in facilities, with 72% deaths taking place in hospitals or health centers, although this is about to be an object of better facility-based reporting. Deaths in travel accounted for 13% of deaths, while 14% of deaths were occurred at home (14).

In Oromia Zone Amhara region, about 11 maternal deaths were reported in 2017. Among the total deaths, 6(54.5%) were from Dewachefa District (15).

Even where resources were limited, almost all maternal deaths are preventable and could be eliminated but, it needs the right kind of information for decision making (16). Observed evidence is very vital in the combat alongside maternal death where exact context established interventions are important to meaningfully reduced maternal mortality (17). However, the correct burden of maternal deaths has been unidentified and unavailable, and assessment of maternal mortality needs a large countrywide survey which is unaffordable for countries (18). Refining extent is the first step to recognize where action is required (16). It is likely to establish a structure to measure the burden of maternal mortality (12).

Most countries with high maternal death have weak public registration systems (5) . Therefore, numerous maternal deaths and the explanations overdue these deaths remain unregistered and unreported, mainly when women die at home (19).

If accurate information is available, preventing maternal deaths can be achievable to provide targeted actions (1). MDSR makes each maternal death a notifiable event, and confirms that communities and facilities report and respond to end preventable maternal deaths (19). Despite the importance of MDSR in producing up to date information for decision making, evidence on the process and implementation is lacking (20).

Dewachefa district launched MDSR in 2013, but the implementation of MDSR was not evaluated yet (21). The aim of this study was to evaluate MDSR system and to design locally relevant interventions based on the study findings for government and other stakeholders in Dewachefa district.

## Methods

### Study design and period

Cross sectional study design was conducted from March 1-30/ 2018 in Dewacheffa district, North- East of Ethiopia.

### **Study setting**

Dewacheffa district is located about 325 Kilo meters from Addis Ababa (the capital city of Ethiopia) and 555 Kilo meters from Bahir Dar (the capital city of Amhara region) at an altitude of 1623 meter to 2570 meter above sea level. The district is bordered by Majetie district in the South, South Wello in the West, Dewi Harewa in the Northwest, Artuma fursi district in the Northeast and the East. The area of the district is 782.22 square kilometer with the total population 151645. The district is governmentally alienated into 26 kebeles. There are 7 health centers and 26 health posts in the district (21).

### **Source population**

The source population for this study were all governmental health facilities, and health extension workers (who are certified by government and working at community levels or health post) and health professionals who have been working in governmental health facilities in Dewacheffa district.

### **Study population**

Dewacheffa health office, Dulcha and Weldi health centers, and Teref, Tochie, Weldi, Gerbi and Kelo health posts, and health extension workers and health professions in this health facilities were study population. Maternal and youth officer and Public health emergency officers who are responsible for MDSR data collection from lower levels, compile, analyze and propose response plan, and health officers, nurses and midwives who are responsible for identification, notification, reviewing health center maternal deaths and developing action plan and health extension workers who are responsible for identification, notification and conducting verbal autopsy for community maternal deaths were included in the study. All (31 weekly reports) for 2017 were also reviewed by 3 field Epidemiology residents in all health facilities. Those health extension workers and health professionals who were not present during data collection due to annual leave, medical and social problem were excluded.

### **Sample size determination and sampling technique**

We assumed that 79.7% of health workers used the data that were generated by the surveillance system (5). We have used the single population formula to calculate the sample size.

$$n=(Z1/2)^2P(1-P)/d^2= (1.96)^2x (0.797x (1-0.797))/ (0.05)^2=249$$

Where:

n= Sample size [where population > 10,000]

Z= Normal deviation at the desired confidence interval. In this case it will be taken at 95%, Z value at 95% is 1.96

P= Proportion of the population with the desired characteristic (p=79.7%)

d= Degree of precision; will be taken to be 5%. Since the proportion of the population with the characteristic is not known, then 50% will be used

We have used Population Correction formula because the total number of study population was 35.

$$n_f = n / (1 + n/N) = 249 / (1 + 249/35) = 31$$

Where:

$n_f$  = The desired sample size for population <10,000

$n$  = the calculated sample size

$N$  = the total population ( $N = 40$ )

There was not the need of sampling for 32. So, the total sample size that was included in this study was 32.

Dewachefa district was purposively selected because the surveillance evaluation was not conducted before and more than half of Zonal maternal death was occurred in this district. Among the total health centers in this district, 2(25%) of the district health centers were included in the study. These health centers were carefully chosen by lottery method simple random sampling. From these health centers; all health posts were involved in this evaluation. Equally, all health professionals in the health centers and all health extension workers in the health posts were invited to be included in the study.

### **Data collection tools**

Standard data collection tools were prepared from US Centers for Disease Control and Prevention guidelines for surveillance system evaluation in 2013 (1) and National guideline for MDSR (9, 11). The tool consisted of two separated Questionnaires (i.e. for health extension workers and health professionals) and checklists for woreda health office, health centers and health posts.

Both questionnaires of health extension workers and health professionals consisted of sociodemographic, knowledge and attitude related questions toward MDSR.

### **Pre-testing of data collection tools**

Collection tools were checked in Artuma Fursi district, because the district provided a similar setting with the area under study. The orders of the questions in the questionnaire was changed so that the questions followed a logical sequence that made meaning to the participants.

### **Data collection techniques**

Structured self-administered technique was used to collect data from health workers and health extension workers to assess their sociodemographic, knowledge and attitude towards the surveillance attributes and operations of the MDSR system (1, 9).. A checklist, using MDSR guidelines on surveillance system evaluation was used to assess the stability of the system and completeness of the report of 31 weeks (9, 11). MDSR identification, notification and weekly and case-based report formats were reviewed to check for data quality, completeness (If all components of the report and notification form were filled then we assigned 1 point and, for incomplete variable, we gave 0 point.) and timeliness of the system. In addition to these, identification, notification, reviewing and response plan for maternal death were assessed.

## **Data analysis**

Epidata versions 3.1 was used to enter collected data. Entered data were exported into statistical package for social science (SPSS) version 20 for data clearness and analysis. The knowledge related questions were coded on a true/false basis. A correct answer was assigned 1 point and an incorrect/unknown answer was assigned 0 point. The total knowledge was computed in SPSS. The median of knowledge was determined. Then variable was categorized as knowledgeable and non-knowledgeable based on the median. Frequency mean, median and proportion were computed. The findings of this evaluation were stated in the form of text and tables.

## **Attributes of the surveillance system**

**Simplicity** is an easiness of a surveillance system as both its structure and implementation while quiet meeting their aims. This attribute was evaluated by assessing the training status of the implementers and determining the experience of the implementers of ever filling MDSR form.

**Acceptability** is the preparedness of persons and organizations to take part in a surveillance system. Health care workers were asked whether they were ready to remain participating in the MDSR. As well as completeness and timeliness were also be assessed as a substitution of acceptability.

**Usefulness** is ability to use maternal mortality data to implement changes that leads to maternal care and mortality reduction

**Sensitivity**; The sensitivity of a surveillance system can be evaluated by the percentage of cases identified by the surveillance system. This attribute was considered by asking main respondents the number of maternal deaths that were picked by the MDSR system, through verifying whether maternal deaths were correctly classified

**Flexibility** is the ease with which system can integrate another disease or event with little or no additional resources

**Stability** is the consistency and availability of the system. Consistency is the capability to collect, manage and provide data properly without failure. Availability is the capacity of a surveillance system to be

functional when it is required. Stability of the MDSR was evaluated by examining for consistency in reporting, availability of communication apparatus and other material resources needed for the surveillance system.

**Data quality** The quality of data is prejudiced by the clearness of surveillance forms, the quality of training and the observation of persons who complete the maternal death notification forms and the amount of care that is practiced in handling the surveillance data. A review of these structures of a surveillance system provided an unintended measure of the quality of data. MDNF were revised to check for completeness of the notification forms.

**Timeliness** states as the speed at which data is communicated between different levels in the surveillance system. It was measured by checking whether MDNF are completed within seven days of a maternal death and are then sent to the district health office within 14 days of the maternal days as restricted.

### **Operational definitions**

**Satisfactory Knowledge:** Those respondents who score median or above median score of MDSR related knowledge questions

**Positive attitude:** Those respondents who score above median score of attitude assessing questions toward MDSR.

## **Result**

### **Socio demographic characteristic of Health professions and Health extension workers**

Twenty-two health professionals and 10 health extension workers were participating in this evaluation. More than three-fourth, 17 (77.3.1%) of health professionals were male whereas all health extension workers were female. The median age of health professionals was 28.5 years [Interquartile range (IQR)=26.25-32 years]. The median age of health extension workers was 24.6 year [IQR=21.5-26.4 years]. Regarding to professional background of health workers, 12 (54.5%) of them were nurses. The mean year of experience of health professionals and health extension workers was 8 and 7.3 years respectively (Table 1).

**Table 1: Sociodemographic characteristics of health professional who have been working at governmental health centers in Dewachefa district, Northeast Ethiopia, 2018 (N=22).**

Variables	Frequency	Percentage
Sex		
Male	17	77.3
Female	5	22.7
Profession		
Health officer	4	18.2
Midewifery	6	27.3
Nurses	12	54.5
Educational level		
First degree	4	18.2
Diploma	18	81.8

### Knowledge of health professionals on MDSR

Majority, 18 (81.8%) of the health professionals had not got MDSR training. Nearly three-fourth, 16(72.7%) of health professionals, did not define the case definition of maternal death. Fourteen (63.6%) of health professionals had unsatisfactory knowledge on MDSR (Table 2).

**Table 2: knowledge of health professionals toward MDSR in Dewachefa, Northeast, Ethiopia, 2018**

Variables	Frequency	Percentage
Trained on MDSR		
Yes	4	18.2
No	18	81.8
Know maternal death definition		
Yes	6	27.3
No	16	72.7
Know Correct time frame to report maternal death to the next level		
Yes	10	45.5
No	12	54.5
Advantage of MDSR		
to know the cause of maternal death	9	40.9
to prevent maternal death	10	45.5
to know the number of maternal deaths	13	59.1
Duplicate copies of MDRF		
5	7	31.8
4	11	50
3	2	9.1
2	2	9.1
Knowledge		
Satisfactory	8	36.4
Unsatisfactory	14	63.6

Three-fifth, 6(60%) of the health extension workers did not define the probable case definition of maternal death. Regarding to the overall knowledge of MDSR, 6(60%) of health extension workers had unsatisfactory knowledge (Table 3).

**Table 3: knowledge of health extension workers on MDSR in Dewachefa district, Northeast Ethiopia, 2018 (n=10)**

Variables	Frequency	Percentage
A probable maternal death case definition		
Yes	4	40
No	6	60
Correct time of Verbal autopsy was done for suspected maternal death		
Within 1 week	3	30
After 2 week	4	40
I don't know	3	30
Verbal autopsy form contains section		
3	5	50
4	2	20
5	2	20
I don't know	1	10
The formal suspected maternal notification time frame		
Within 24 hours	3	30
After 24 hours	7	70
Knowledge		
Satisfactory	4	40
Unsatisfactory	6	60

### Surveillance attributes

#### Simplicity

Fourteen (63.6%) of health professionals had negative attitude toward simplicity of the surveillance system whereas 6(60%) of health extension workers had positive attitude towards simplicity of the surveillance system. All health centers surveillance focal person and woreda PHEM focal person agree the simplicity of the system (Table 4).

#### Flexibility

Thirteen (59.1%) and 5(50%) of health professionals and health extension workers believe that system adopts to the user improvement demands respectively (Table 4).

#### Acceptability

Thirteen (59.1%) of health professionals had positive attitude toward the acceptability of the system. Four health posts (80%) of the total visited health posts were not reported suspected maternal deaths. Verbal autopsy was not done by all visited health posts. All visited health centers focal persons accepted the system. All visited Health facility and woreda health office sent weekly report to the next level by hard copy. Reported data were not analyzed at woreda and visited health facilities. Rapid response team was not functional at woreda and visited health facilities. Action for response was not developed in all visited health facilities and woreda health office (Table 4).

### **Predictive positive value**

Sixteen (72.7%) of health professionals and 4(40%) and 4(40%) health extension workers believe that death reported in this system are actually maternal deaths respectively. Positive predictive value was not calculated because 12 suspected maternal death were not identified and notified by health centers (Table 4).

### **Sensitivity**

Half, 11 (50%) of health professionals and 7(70%) health extension workers had positive attitude toward the sensitivity of the system. In 2017, three maternal deaths were identified and notified to Woreda PHEM unit whereas 5 maternal deaths were reported through health management information system. The sensitivity of this surveillance was 3/5(60%) (Table 4).

### **Representativeness**

More than half, 12 (54.5%) of health professionals and 7(70%) health extension workers perceived that maternal death report represents the situation in the facility/community. Twelve suspected maternal death were not notified from the community in 2017. The representativeness of the system in MNCH unit was 5/17(29.4%). In PHEM unit its representativeness was 3/17 17.6% (Table 4).

### **Data quality**

#### **Timeliness**

More than half,13 (54.5%) of the health professionals agree with MDSR data is always ready when we need it for planning purposes whereas 7(70%) of health extension workers did not agree for the timeliness of MDSR data. In 2017, all maternal deaths were notified after 8 day of death. The case-based report forms of 4 maternal deaths were sent to the woreda after 1 month of death. One case-based report format was reported from health facility to woreda after 3months (Table 4).

#### **Completeness**

The revised weekly reports were 31 for all visited health facilities and woreda health office. Among the total revised weekly report form, the report forms left black were 7(22.6%). The report completeness of the woreda was 24/31(77.4%) (Table 4).

## **Cost**

Twelve (54.5%) of health agree with the system is not costly as compared to the current benefits we gain from it. The mean annual financial cost of the system could be 55859 Ethiopian birrs in each health facilities and woreda health office (Table 4).

## **Usefulness**

Twelve (54.5%) of health professionals said current system have an ability to estimate maternal death in the facility/community, show the trend of maternal death in the facility/community, the progress and effect of preventive and control methods applied against maternal death and indicate major causes of maternal deaths in the health facility/community (Table 4).

**Table 4: Attitude of participated health workers toward the attribute of surveillance system in Dewachefa, Oromia zone, Amhara Region, Ethiopia, 2018**

Variable		Health professionals		Health extension workers	
		Frequency	Percentage	Frequency	Percentage
Simplicity	Positive	8	36.4	6	60
	Negative	14	63.6	4	40
Flexibility	Positive	13	59.1	5	50
	Negative	9	40.9	5	50
Acceptability	Positive	13	59.1	6	60
	Negative	9	59.1	4	40
Sensitivity	Positive	11	50	7	70
	Negative	11	50	3	30
Predictive value positive	Positive	6	27.3	4	40
	Negative	16	72.7	6	60
Representativeness	Positive	12	54.5	7	70
	Negative	10	45.5	3	30
Timeliness	Positive	13	54.5	3	30
	Negative	9	40.9	7	70
Cost	Positive	12	54.5	2	20
	Negative	10	45.5	8	80
Usefulness	Positive	12	54.5	4	40
	Negative	10	45.5	6	60

## Stability

Woreda health office PHEM, MNCH units, and health center PHEM and MNCH focal had trained focal person (Table 2).

All visited health posts were not using revised PHEM tools for maternal death surveillance and response whereas all visited health centers and woreda health office were using revised PHEM tools.

## Discussion

The overall knowledge of health professionals and health extension workers on MDSR were 63.6% and 60% respectively. This is larger than the study conducted in Zimbabwe 50% (5). This difference might be due to time elapsed so that much training could be given to health care providers of the participants of

this study. Another justification might be due to internet access increment. Now, this internet access might increase reading habit which may impose to increase knowledge of health professionals and health extension workers on MDSR.

The average completeness of weekly report form of the woreda was 77.4%. This is consistent with the study conducted Zimbabwe 79% (22) and in Mutare district, Zimbabwe 76% (5).

The timeliness of this surveillance system was poor because all reports of maternal deaths were sent after 8 days of maternal death from health facility to woreda office. In all Health facilities, the case based form of maternal death was reported after 2 months which is greatly discrepancy with the standard FMOH report which is scheduled with 48 hours and another study conducted in Ethiopia (23).

The management looks at it from a negative point of view, that they will be held responsible for the maternal deaths (4, 23).

Maternal death surveillance and response system was not representative because 12 suspected maternal death were not reported from health post/ community. This is greatly contradicted with the FMOH and the study conducted in Cambodia (24). MDSR which recommends all suspected maternal death report from community/health post (9). This might be due to unavailability of notification form in health posts, and weak supervision and feedback system.

The sensitivity of this surveillance system was 17.6%. This is discrepancy with the study conducted in Cameron 42.9% (2). This might be due to unavailability of maternal identification and notification form at the health posts, absence of feedback and supervision system.

This system is unstable because all visited health posts were not using revised PHEM tools for maternal death surveillance and response, and there was not established feedback and regular supervision system. This is contradicted with the FMOH target which recommends all facilities have revised PHEM tools (9) and the study conducted in Zimbabwe (5). This might due to weak coordination between woreda PHEM and MNCH units.

Woreda health office PHEM and MNCH unit had delegated officers. The visited health centers had PHEM and MNCH focal persons. This is consistent with the target of FMOH 100% (9)]. The proportion of woreda PHEM and MNCH unit officer, health center focal person training was 100%. This is consistent with the target of FMOH 100% (9).

## Conclusion

The overall knowledge of Health professionals and health extension workers on MDSR was fair. The surveillance system is not sensitive, timeliness and representative. The System is not sustainable/ not standardized.

More work should be needed to improve the sensitivity, representativeness, timeliness and sustainability of the surveillance system.

### **Limitation**

This study cannot show factors associated with surveillance evaluation of MDSR because it is descriptive data analysis.

## **List Of Abbreviations**

CDC: Center of disease control, FMOH: Federal ministry of health, MDR: Maternal death report, MDRF: Maternal death report form, MDSR: Maternal death surveillance and response, MNCH: Maternal, newborn and child health, PHEM: Public health emergency management, RRT: Rapid response team, VA: Verbal autopsy, WHO World health organization

## **Declarations**

- **Ethics approval and consent to participate**

Ethical clearance was obtained from Oromia Zone Health Department Ethical review committee. Written permission was obtained from district, Health centers and Health posts administrative bodies.

- Consent for publications: Not applicable
- Availability of data and material: The data sets generated during the current study are available from corresponding author on reasonable request.
- Competing interest: The authors declare that they have no competing interests
- Funding: Not applicable

### **Authors' contributions**

MK wrote study design, data entry, analyzed the data, and drafted paper.

SW involved in data entry

SA and AH approved the design

All Authors read and approved the final manuscript

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