



**COLLEGE OF HEALTH SCIENCE, SCHOOL OF PUBLIC HEALTH,
ETHIOPIAN FIELD EPIDEMIOLOGY TRAINING PROGRAM (EFETP)**

Compiled Body of Works in Field Epidemiology

By Mikiyas Mekonnen (BSc)

**Thesis Submitted to Addis Ababa University, School of Public Health in
Partial Fulfillment for the Degree of Master of Public Health in Field
Epidemiology**

May 2016

Addis Ababa, Ethiopia

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Approval by Examining Board

Advisor

Advisor

Examiner

Examiner

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Acronyms List

ANC	-----Antenatal Care
CBC	-----Complete Blood Count
CDC	----- Communicable Disease Prevention and Control Center (USA)
C.I	-----Confidence Interval
DHS	----- Demographic and Health Survey
DSM-IV	-----Diagnostic and Statistical Manual, Fourth Edition
EPHI	-----Ethiopian Public Health Institute
G.C	-----Gregorian calendar
ICD-10	-----International Category of Disease Ten
MDG	----- Millennium Development Goal
MDSR	----- Maternal Death Surveillance and Response
MMR	----- Maternal Mortality Ratio
MoH	----- Ministry of Health
PPH	----- Post Partum Hemorrhage
UNFPA	----- United Nations Fund for Population Activities
UNICEF	----- United Nations International Children's Emergency Fund
WHO	----- World Health Organization

Executive SUMMARY

This document contains two years Field Epidemiology Training Program outputs, to be submitted to school of public health for fulfillment of Masters Degree in Field Epidemiology. This Compiled Body of Work has eight chapters and eight annexes. Reports of diseases outbreak investigations, public health surveillance data analysis, surveillance system evaluation, narrative summary of disaster situation report, manuscript and abstracts presented in eight chapters.

Chapter One: This chapter contains findings of two outbreak investigations. The first outbreak investigation was conducted on an outbreak of psychogenic disorder in primary school of Sululta district, Oromia Regional State. The objective of the investigation was to verify the outbreak and assess the distribution and risk factors of the outbreak to implement control measures. We used a descriptive analysis of the line list followed by a sex matched case-control study; we identified 183 case of psychogenic disorder (conversion disorder) with female dominance (62%). The outbreak was controlled mainly by giving health education to students, teachers and families of cases. We recommend provision of health education to community of the locality on psychogenic disorders. On a bigger scale, we recommend primary schools in the country to have a school Psychologist to help on overall psychological problems of students including in a possible incidences of mass psychogenic disorders.

The second outbreak investigation was on Measles outbreak in Telalake district of Afar. We used a descriptive analysis of the line list followed by a sex matched case-control study; we identified 21 cases of Measles (the first five cases were lab confirmed). Eighty-one percent of the cases were not vaccinated for measles. The outbreak was controlled by providing mass vaccination and health education activities. We recommend strengthening health education and routine and catch up immunization programs activities by the district health office to prevent similar outbreaks.

Chapter Two: Presents report of surveillance data analysis conducted on maternal death. We retrospectively analyzed national surveillance report collected from October 2013 to September 2015 to describe the distribution and determinate of maternal death in Ethiopia. The summary of the findings has shown that the overall maternal mortality ratio is 28.9 per 100,000 live birth with big disparity among regions the maximum being at Dire Dawa 94 deaths per 100,00 live

birth and the minimum being at addis Ababa 2.7 deaths per 100,000 live births. The top three causes of maternal deaths found to be hemorrhage followed by sepsis and hypertensive disease of pregnancy. We recommend much focus should be given to the top three common causes of maternal deaths (hemorrhage, sepsis and hypertensive disease of pregnancy) to reduce and improve maternal outcomes. The number of reported maternal mortality is far below the local and international estimates, which needs an evaluation of the overall maternal mortality surveillance system (based on this result, we conducted evaluation of MDSR system in Tigray region which presented in the next chapter).

Chapter Three: Addresses surveillance system evaluation conducted on “Maternal Death Surveillance and Response System in Tigray Region, North Ethiopia”. This chapter aims to answer the systemic reasons of the major gaps identified from the data analysis of maternal death surveillance presented at chapter two of this document. The chapter clearly presents the purpose and objectives of maternal death surveillance its progress towards its objectives. The proposal of this study was sent to Training in Epidemiology and Public Health Intervention Network (TEPHINET)) for a mini grant and it was accepted and funded to be conducted. The surveillance attributes: simplicity, flexibility, acceptability, representativeness, timeliness, data quality, sensitivity, cost, predictive value positive and usefulness of the surveillance system were also assessed and presented in the chapter.

The findings indicated that, that the implementation process of the surveillance system at facility level is not uniform in terms of reporting system and formats utilized. The simplicity (scored 3.6 out of 5), acceptability (scored 3.2 out of 5), timeliness (scored 3.64 out of 5) and the usefulness to identify cause of death (scored 3.3 out of 5) are major attributes of the surveillance system, which identified as areas demanding improvement. The Federal Public Health Emergency Management Unit (PHEM) and Tigray Health Office, should give a clear guidance on data collection, case definition, reporting system and response process to health facilities and health extension workers.

Chapter Four: Describes assessment of Health Profile Description of Kirkose Sub city, Addis Ababa City Administration. In the chapter health and health related data of the sub city populations were evidently presented which is helpful for prioritizing high-flying problems and

implement strategies against the major public health problems of the sub city. The findings showed that lower performance was observed on overall vaccination coverage and implementation of PMTCT services. A detail action plan showing identified problems and with proposed interventions was developed and submitted to the Sub city health office (it is also annexed in this document).

Chapter Five: Presents Scientific Manuscript for Peer reviewed Journals. The manuscript was prepared according to BMC manuscript guidelines. The manuscripts are on “Outbreak of Psychogenic Disorder in Primary School Students of Central Ethiopia”, “Investigation of Measles Outbreak in Remote District of Eastern Ethiopia” and “Estimating the Magnitude and Causes of Maternal Death in Ethiopia: Using Maternal Death Surveillance Report”.

Chapter Six: Presents Abstracts on “Outbreak of Psychogenic Disorder in Primary School Students of Central Ethiopia”, “Investigation of Measles Outbreak in Remote District of Eastern Ethiopia”, “Estimating the Magnitude and Causes of Maternal Death in Ethiopia: Using Maternal Death Surveillance Report and “Evaluation of Maternal Death Surveillance and Response System in Tigray Region, North Ethiopia”.

Chapter Seven: includes the narrative disaster situation report. As part of early warning and vulnerability assessment, the government of Ethiopia has been conducting nationwide human health and nutrition emergency need assessment twice a year in collaboration with different government sectors and development partners. The assessment was conducted to identify potential problems, which need humanitarian assistance. Based on the report from the assessment humanitarian requirement document was developed and shared with potential partners for response. This chapter clearly presents pre harvest (Belege scission) human health and nutrition need assessment conducted in selected districts of Hadiya and Kembata Tembaro Zones of SNNP Region. The assessment showed that the assessed areas have a risk of seasonal malaria outbreak and both mild and severe malnutrition is increasing sharply which needs a multi-sectoral intervention.

Chapter Eight: Contain an epidemiological protocol entitled “Prevalence of Common Mental Disorders and Substance Use Among Taxi drivers of Addis Ababa and Relation with Road Traffic Incidences”. This project bases from my personal observation and it is not conducted in Ethiopian set up. This study focuses on assessing the safety of public transport specifically “Taxis” from the view point of mental health conditions of the drivers and the associated impact on road safety in Addis Ababa. Generally in low income set up specifically in Ethiopia the prevalence of mental disorders and substance uses and their impact on road traffic accident is not a well studied event. The study will use a cross sectional study design using drivers of all registered Taxis that currently giving transportation services as a study population. The findings of the study will share to all stakeholders for possible policy interventions.

Annex: In this Document, there are ten annexes containing different questionnaires and useful documents used during accomplishing the two years residency outputs.

Chapter One- Outbreak Investigation

1.1. Outbreak Investigation of Mass Psychogenic Disorder in Chancho Primary School, Chancho Town, Finfine Surrounding Zone, Oromia Region, December 2015

Abstract

Introduction

On December 2, 2015 Sululta District Health Office, central part of Ethiopia reported 180 cases of mass collapse in Chancho Primary School without any identified cause. An outbreak investigation team was formulated and deployed to the affected area to investigate the outbreak and implement control and prevention measures.

Method

We applied a descriptive analysis followed by a sex matched case-control study with a case to control ratio of 1:2.

Result

We identified 183 cases of conversion (psychogenic) disorder; all are students of grade five to eight in Chancho Primary School. Sixty two percent of the cases were females. The most affected age group (78.9%) was 11 to 15 years with an overall mean age of 14 years (+/- 2 years). The overall attack rate and admission rate were 17% and 2.2 % respectively. On bivariate analysis, factors associated with illness were seeing someone with hysterical symptoms (COR 16.64, 95% CI 2.19-141.86) and believing “Evil Spirit” as a cause of the incidence (AOR 6.4, 95% CI 1.26- 32.62).

Conclusion- We have confirmed the existence of a conversion disorder outbreak in Chancho Primary School, in similar symptoms reported in other outbreaks mostly including anxiety with associated dizziness and short-lived collapse. The outbreak was managed mainly by providing health education to students, teachers and families of student. We recommend provision of health education to community of the locality on psychogenic disorders. On a bigger scale, we recommend primary schools in the country to have a school Psychologist to help on overall psychological problems of students including in a possible incidences of mass psychogenic disorders.

Introduction

The Outbreak Report

On December 2, 2015 Sululta Woreda health office reported unknown cause of mass collapse of more than 180 Chanco Primary school students to Ethiopian Public Health Institute (EPHI). EPHI then formulate an outbreak investigation team with an aim to ascertain the existence, identify risk factors and manage the outbreak. The team started the investigation by considering all possible (Chemical, Biological and Psychological hazards) causes. Since most of the collapsed cases (180 cases) were treated at St Pauls hospital, Addis Ababa, the team discussed with the multidisciplinary team of the Hospital to aid on narrowing of the possible causes of the outbreak. After discussing with St Pauls medical practitioner, the outbreak investigation team reached on a probability of psychogenic disorders to explain the mass collapse and further field investigation was continued to confirm the outbreak and implement control and prevention measures.

Background

Mass Psychogenic (Conversion/Hysteria) Disorders

Mass hysteria is the common term used to describe a situation in which various people all suffer from similar unexplained symptoms (1). Epidemic hysteria is also known by multiple synonymous terms, including mass hysteria, mass psychogenic illness and mass sociogenic illness (2). Currently the word “Hysteria” is not used and different mental disorder diagnostic and statistical manual such as

DSM-IV and ICD-10 replaced it by the term Conversion Disorder (3).

According to the WHO- international classification of mental and behavioral disorders, the condition is classified under dissociative (conversion) disorders and defined as “a partial or complete loss of the normal integration between memories of the past, awareness of identity, immediate sensations, and control of bodily movements.” As a diagnostic measure, the manual states the following criteria

⇒ The condition needs to have a clinical pictures of a conversion disorder

-
- ⇒ There should be no evidence of a physical disorder that might explain the symptoms
 - ⇒ Evidence for psychological causation, in the form of clear association in time with stressful events (even if denied by the individual) needs to be identified (4)

In another perspective the American Psychiatric Association, diagnostic and statistical manual for mental disorder (DSM-IV) classified conversion disorder under somatoform disorders and defines it as “Conditions which involves unexplained symptoms or deficits affecting voluntary motor or sensory function that suggest a neurological or other general medical condition but, psychological factors are judged associated with the symptoms or deficits” (5)

The manual further describes the diagnostic criteria, which includes the following criteria;

- A. One or more symptoms or deficits affecting voluntary motor or sensory functions that suggest a neurological or other general medical condition
- B. Psychological factors are judged to be associated with the symptoms or deficit because the initiation or exacerbation of the symptom or deficit is preceded by conflict or other stressors
- C. The symptom or deficit is not intentionally produced or feigned (as in factitious disorder or malingering)
- D. The symptom or deficit cannot, after appropriate investigation, be fully explained by a general medical condition, or by the direct effect of a substance, or as a culturally sanctioned behavior or experience
- E. The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation
- F. The symptoms or deficit is not limited to pain or sexual dysfunction, does not occur exclusively during the course of Somatization disorder, and is not better accounted for by another mental disorder (5).

DSM-IV further classifies the disorder in to four subtypes based on the nature of the presenting symptom or deficit.

1. **With motor symptom or deficit-** This subtype includes such symptoms as impaired coordination or balance, paralysis or localized weakness, difficulty swallowing or "lump in throat," aphonia, and urinary retention.

-
2. **With sensory symptom or deficit-** This subtype includes such symptoms as loss of touch or pain sensation, double vision, blindness, deafness, and hallucinations.
 3. **With seizures or convulsions-** This subtype includes seizures or convulsions voluntary motor or sensory components.
 4. **With mixed presentation-** This subtype is used if symptoms of more than one category are evident. (5)

Course of the Disorder

The onset of Conversion Disorder is generally from late childhood to early adulthood, rarely before age 10 years or after age 35 years, but onset as late as the ninth decade of life has been reported. Typically, individual conversion symptoms are of short duration (5). Incidents sometimes follow an environmental trigger such as an odor and many outbreaks are preceded by illness in an index case (1). In individuals hospitalized with conversion symptoms, symptoms will remit within 2 weeks in most cases. Recurrence is common, occurring in from one-fifth to one-quarter of individuals within 1 year, with a single recurrence predicting future episodes (5).

Epidemiology of Conversion Disorders

Different literatures states that conversion disorders are under reported worldwide due to different barriers to estimate the prevalence and incidence of the condition. A summarizes the barriers as- The disorder has no agreed case definition and the diagnosis of the condition needs a confirmation of absence of physical infirmities (both medical and neurological disorders). The absence of a robust test for physical and psychological causes, the uncertainty inherent in excluding intentional symptom production and the inevitable diagnostic errors and variations in practice affect the estimates of the frequency of the condition (6).

The prevalence estimation of the disorder ranges from 11/100,000 to 300/100,000 in general population samples and many out breaks are reported throughout the world (1). Based on a review of published literatures conducted by Leslie P. Boss, during the period of 1973-1993, 70 outbreaks of epidemic hysteria were identified. From the identified 70 outbreaks, half of the outbreaks happened in school setup followed by factories, 29%. In 63% of the outbreaks, the case count excised above 30 and only in 10% of outbreaks the cases count was reported bellow

10 cases. Generally, the condition is common in female groups in which two-ten times affected than the male groups (5).

Common Sign and Symptoms

Common symptoms recorded during outbreaks of mass hysteria include abdominal pains, chest tightness, dizziness, fainting, headaches, hyperventilation, nausea, vomiting, palpitations; anxiety and screaming. Symptoms of Conversion Disorder typically do not conform to known anatomical pathways and physiological mechanisms. Thus, expected objective signs (e.g., reflex changes) are rarely present (5). Other symptoms like body etching, violence, screaming and spasmodic laughing are also reported (1, 2).

Reported Risk Factors

Few outbreak investigations have shown clear risk factors for mass conversion disorders. Limited data suggest that conversion symptoms are more frequent in relatives of individuals with Conversion Disorder (5). Epidemics of hysteria rely on the power of suggestion, but they are consequences of fear, sadness and anxiety (1).

The general risk factors reported includes, Low socio economical status, being a females gender, age 10 to 35 years, stereotyping cultural and religious beliefs, the social and political environment, political instability, observing the person or the photo of someone with conversion disorder and hearing or reading about conversion disorders through different medias (1,3,5).

In a factory setups risk factors such as, boredom, production pressures, physical stressors, poor communication, and labor-management relations, dissatisfaction with one's job and conflicts between demands at work and at home have also been identified (2). Some investigators report a higher rate of previous grief among those who became ill than among those who were potentially exposed but did not become ill. School based mass conversion disorder outbreaks identified religious believes such as “evil spirit” and false perception of presence of disease have also identified (7,8). In some of the outbreaks, the index case has a medically explained condition and which triggers other to start conversion symptoms (1).

Cases and Outbreak Management

No pharmacological therapy is recommended for cases unless there is co-morbidity and the main management is reassurance and psychological support (9). However, few articles like a case study conducted by Cedo D. Miljevic et.al have shown the use of Tricyclic antidepressant in a successful management of conversion disorders (10). The management of conversion disorders outbreaks is directed to the identified risk factors but, generally psychological support for cases and reassurance and health education for the affected community are mainly indicated (1,7,8).

Report of Outbreaks of Psychogenic Disorders in Ethiopia

Only two outbreaks of psychogenic disorders exist documented, both are reported after 2010.

The first case was reported in April 2010, in Which an outbreak with forty four cases of psychogenic disorder were reported from a high school of eastern Amhara region. All cases were females and majorities (75%) of them were Muslims (8). The second Outbreak was reported in January 2013 in a Primary School of Kombolcha city. Fifty cases of psychogenic disorders were identified with mean age of 13 with a range 9- 16 year. All were girls and mostly friends (75%). The overall reported attack rate of the cases were 32 per 1000 populations in all age group (8).

In both outbreaks, symptoms like anxiety, fear and crying followed by collapse or localized temporal limitation of movement were reported. We have not found any research done in Ethiopian socio cultural setting to determent the prevalence and associated risk factors of psychogenic disorders

Objective of the Outbreak Investigation

General Objectives

To verify the outbreak and determine the distribution, magnitude and associated risk factors of suspected mass psychogenic/ conversion disorder to implement control and prevention measures.

Specific Objectives

- ⇒ To confirm the existence of the suspected mass psychogenic/conversion disorder outbreak in Chanco Primary School, Chanco Town in December 2015
- ⇒ To describe the outbreak by place, person and time for cases of suspected mass psychogenic/conversion disorder in Chanco Primary School, Chanco Town in December 2015
- ⇒ To identify associated factors for the suspected mass psychogenic/conversion disorder in Chanco Primary School, Chanco Town in 2015
- ⇒ To implement control and prevention measures for suspected mass psychogenic/conversion disorder in Chanco Primary School, Chanco Town in December 2015

Methodology

Study Area and Period

Sululta Woreda is situated in Oromia region under Finfine Surrounding Special Zone with an estimated population of 156,679 (CSA, 2007 estimate). Chanco town, which is 45 K.M. from Addis Ababa, is the center of the Woreda where the Woreda administrative offices are situated. The town has one primary and one high school. Chanco primary school has 1873 students, which pursues their primary education under it. The school gives the teaching services in two shifts in which students of grade 1 to 4 (total 773 students) and 5 to 8 (total of 1079 students) are classified to learn in a four hour shift round. The reported mass collapse event happened only in grade 5 to 8 students. The study was conducted at Chanco Primary School from December 3-12, 2015.

Study Design

We applied a descriptive analysis of the collected line list of cases followed by a sex matched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak.

Sampling Method

We used the Epiinfo-7 module to estimate sample size using 95% confidence limit, 80% power, 1:2 case to control ratio and an estimated odds ratio of 3 (we used the odds ratio estimate from the recent outbreak investigation report in Kombolch City). As result, we selected 40 cases and 80 controls. Since the school was closed during the investigation period, both cases and controls were selected using a snowball technique.

Case Definition and Selection of Cases and Controls

Case Definition- Any grade five to eight student in Chanco Primary School who exhibited sudden onset of collapse (fainting) or dizziness with associated anxiety, nausea, vomiting, shortness of breath, abnormal body movement and palpitation from December 2 to 12, 2015 at school or out of school compound and the symptoms cannot be explained by any immediate physical or medical conditions.

Cases- Are individuals, which fulfils the above case definition and selected using a snow ball technique from the four-affected class rooms (from grade 5 to 8)

Controls- Any grade five to eight student in Chanco Primary School, which does not fulfill the above case definition, individually matched with the sex of cases and selected using a snow ball technique.

Data Collection Tools and Procedures - The following procedures and tools were applied to collect data during the investigation.

A. Document Review- Since there was no compiled line list from the Woreda we reviewed the outpatient medical logbooks at St Pauls Hospital and Chanco Health Center. We also reviewed the medical record and laboratory findings of cases at St Pauls Hospital.

B. Discussion with Key Informants- Using a semi structured checklist we interviewed and discussed with key informants which includes physicians and nurses which attended medical care for cases, Woreda Administrative bodies, health center head and health professionals at Chanco health center which attended medical care of the cases, Chanco Primary School director (principal), teachers and families of cases.

C. Interviewing Cases and Controls- Using a structured and semi structure questionnaire (annexed), case and controls were interviewed by three data collectors (including the principal investigator)

D. Environmental Observation- We observed the school compound starting from the place where the event started (class room-“7D”) followed by the water sources, cafeteria, playing compound and latrines of the school for possible physical hazards.

Data Quality Assurance

Before the start of data collection, a two-hour orientation was given for data collectors. Each completed questionnaire was daily reviewed by the principal investigators to monitor and improve the data quality. Before analysis, data was also cleaned for any missing and logically inconsistent values.

Data Analysis

All collected data are entered and analyzed using epiinfo-7, bivariate and multivariate (using logistic regression model) analysis are conducted using statistical software (Epiinfo-7 and SPSS) taking 95% confidence limit.

Ethical Consideration

Before filed investigation, a formal letter was written by EPHI to Sululta Woreda Health Office to get permission and facilitate the investigation process. Before data collection, an informed consent was taken from the study units and their families and any information related with personal identification was not used on the report.

Dissemination Plan

This study report was submitted to Ethiopian Public Health Institute and Addis Ababa University, School of Public Health. The manuscript of the report can be published in peer-reviewed journals to reach the scientific community.

Result

Descriptive Analysis

Using the line list, we get from St Paul's Hospital and the local health center; we identified 183 cases of suspected hysteria. All of the cases reported are students of grade five to eight in Chanco Primary School. Most of the cases were females (62.3%) and an age group of 11 to 15 is the most affected group (78.9%). Generally the mean age of the cases was found to be 14 years (+/- 2 years) and the overall attach rate and admission rate were 17% and 2.2 % respectively.

Table-1 Summary of the Personal characteristics of the students with conversion disorder in Chanco Primary School, Chanco Town, December- 2015

Personal Characteristics	Number	%
Sex		
Male	69	37.7
Female	114	62.3
Religion		
Orthodox	112	62.5
Protestant	36	20.0
Muslim	32	17.5
Age group (years)		
7 to 10	5	2.8
11 to 15	142	78.9
16 to 21	33	18.3
Mean Age		13.75
Overall Attach Rate		16.9
Overall Admission Rate		2.2

Dizziness (97.5%), fear or anxiety (92.5%), shortness of breath (92.5%) and fast hear beat or palpitation (90%) are the top five common symptoms reported by cases.

Table-2 Distribution of common symptoms among Students with conversion disorder in Chanco Primary School, Chanco Town, December- 2015

Common Sign and Symptoms	Frequency	%
Dizziness	39	97.5
Fear or Anxiety	37	92.5
Shortness of Breath	37	92.5
Fast heart beat	36	90.0
Crying	29	72.5
Fainting	28	70.0
Fatigue	27	67.5
Nausea and Vomiting	22	55.0
Unable to move limbs	21	52.5
Uncontrolled body movement	16	40.0

As shown in the figure below, in majority of cases, the symptom started in the school compound (45%) and within the class rooms (27%).

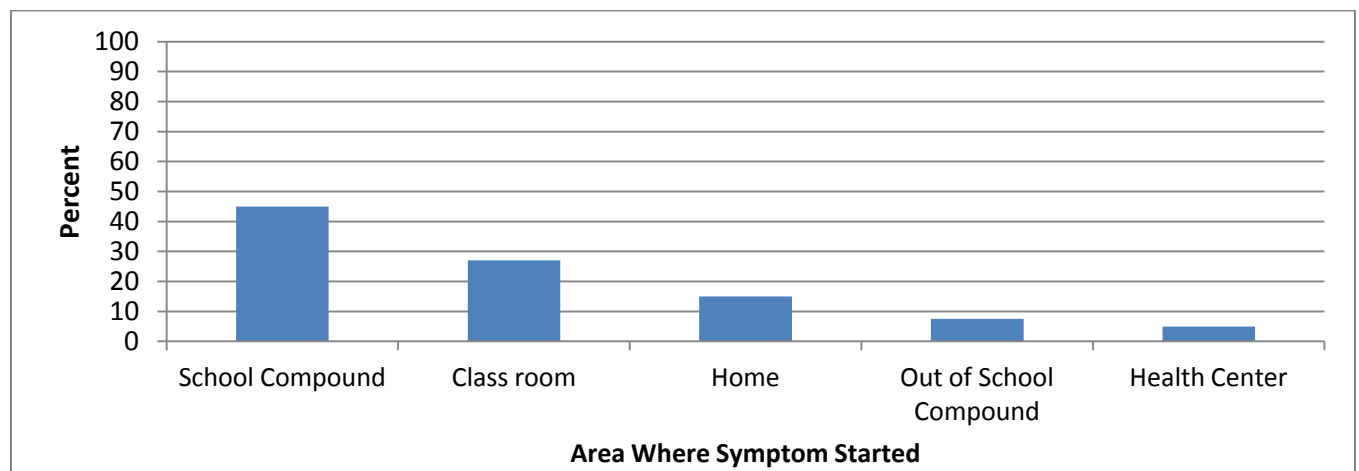


Figure-1 Distribution of places where cases started to show symptom of conversion disorder at Chanco Primary School, Chanco Town, December- 2015

The mean duration of the illness found to be 2.6 days (+/- 4.7 days). Majority of cases were reported on December 2 after which a few sporadic incidence were observed

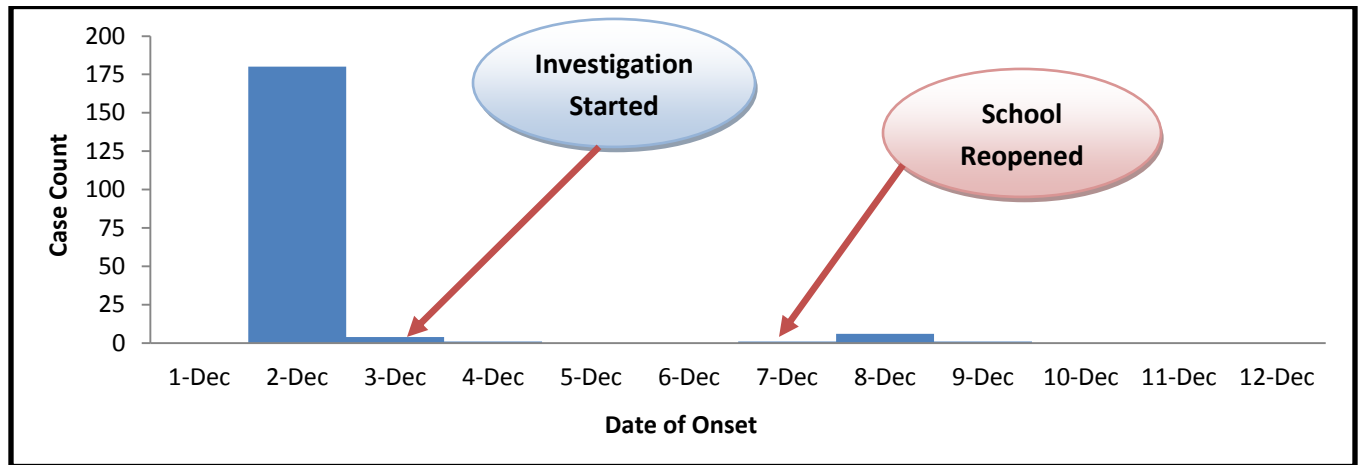


Figure-2 Epi curve of the conversion disorder incidence in Chancho Primary School, Chancho Town, December- 2015

As described in the figure bellow most of the responders (70%) do not know the cause of the outbreaks and 23% of the responders identified the cause as an evil spirit source.

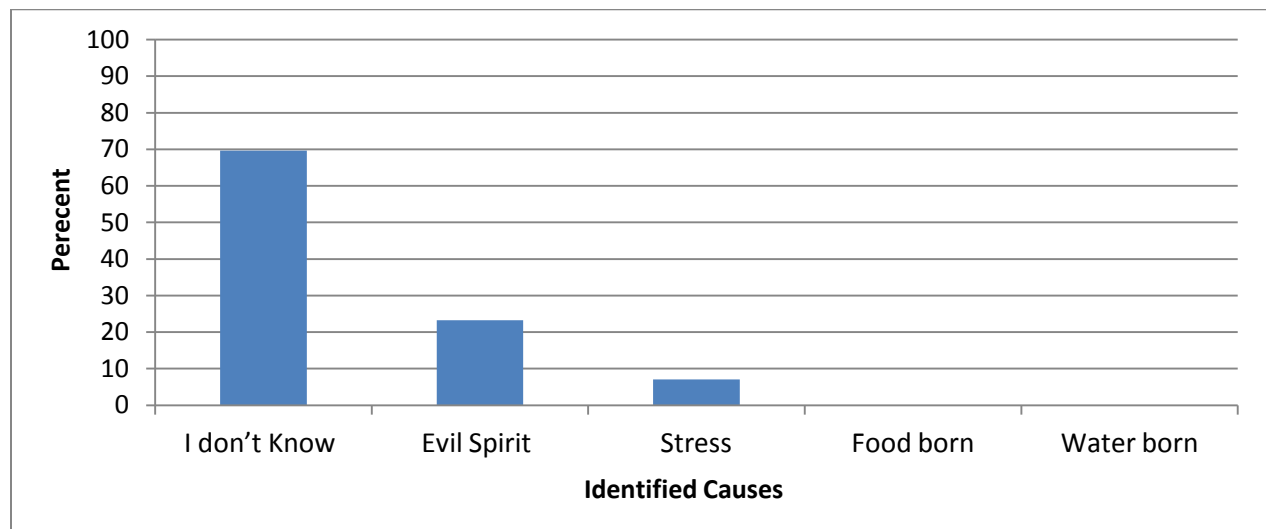


Figure-3 Distribution of identified causes of the conversion disorder outbreak at Chancho Primary School, Chancho Town, December- 2015

Analytic Analysis

We conducted a case control study selecting 40 cases and 80 controls matched for sex. Thirty-five of the cases were females and the overall mean age of the cases were 14 years (+/-3 years). The mean age of the controls was similarly 14 years (+/-2 years).

On bivariate analysis risk factor variables such as seeing someone collapsing (OR 18.75 95%CI 2.43-144.41), knowing someone with the case (OR 2.13 95%CI 1.06-15.72), evil spirit as a cause of the disorder (OR 5.2 95% CI 1.5-18.5) and not knowing the causes of the disorder (OR 2.2 95% CI 1.01- 4.84) are significantly associated with the illness. Other variables are found to be not significantly associated.

Table-3 Bivariate analysis of risk factors for a conversion outbreak in Chanco Primary School, Chanco Town, December-2015

Variables	Yes/No	Case	Controls	COR (95% CI)
Consuming food in a group at school	Yes	2	4	0.96 (0.16-5.48)
	No	38	73	
Knowing someone with a case	Yes	39	73	2.13 (1.06-15.72)
	No	1	4	
Seeing someone collapsing	Yes	39	52	18.75 (2.43-144.41)
	No	1	25	
Evil Spirit as a cause of the disorder	Yes	9	4	5.2 (1.5-18.5)
	No	31	73	
Stress and Anxiety as a cause of the disorder	Yes	4	6	3.3 (0.34-4.95)
	No	36	71	
Not Knowing the causes of the disorder	Yes	53	20	2.2 (1.01- 4.84)
	No	24	20	
Previous family history of similar illness	Yes	1	1	1.9 (0.11-32.00)
	No	39	76	
Read or listen about similar incidence	Yes	6	4	3.2(0.85-12.1)
	No	34	73	

Environmental Investigation

Starting from the classroom where the event started (7D), the overall school compound was observed. The school has four blocks, three blocks for classrooms and one block for school staffs and administrative activities. The school has no water supply and when students are at classrooms, they only consume water that they brought from home. There is one student latrine which is old and in a poor sanitation condition. Generally, from our observation from the classrooms and school compound we did not find any chemical or environmental exposure that can lead to a mass collapse incidence.



Figure 4 – Class rooms and compound of Chanco Primary School during the incidence of Conversion disorder, December 2015

Result from Qualitative Interview

After discussing with Clinicians at St Pauls Hospital (the hospital where 180 cases were first managed), local district officials and teachers at Chanco Primary School we sensitized the general course of the outbreak as follow.

Based on the information we get from the district health officials and teachers at Chanco Primary school, The mass collapse event started on Wednesday, December 2, 2015 around 8:00 local time. The event first started in the classroom called “7D”, which confined to this classroom until the break time (8:30). The event at “7D” classroom started after the sudden fall of an index case Tizeta Beteru then other students start to feel ill and collapsed. During the break time students of other classrooms get the chance to see the collapsed “7D” students, after which the event expand to other classroom students, and cases started to be transported to St Pauls hospital and nearby private facilities. On December 2 there were 180 cases that were treated at St Pauls hospital and there were also few students (for which we can’t ascertain the number) who treated at health center and private health facilities and get back to home.

Based on the information we got from St Pauls hospitals physicians and nurses at duty by the time, cases started to present at St Pauls hospital at 9:00 local time and after investigated by multi disciplinary team, no medically explained event in the cases were identified. Most of the cases were returned with reassurance and only 4 cases with sustained symptoms are observed over night and 3 was discharged and one patient was admitted. The main objective finding of the admitted case was she was having hypothermia and different lab diagnostics testes (Urine analysis, CBC, blood chemistry and arterial blood gas) were conducted at the hospital and the results showed normal values. After getting supportive care and improvement, the patient discharged on December 7, 2015. No death was reported from this incident and no case is reported from the other shift students (grade 1-4 students) of the same school.

We also interviewed the index case, a 17 years old girl and we have found that she have been treated for Anemia a month before and she was on medication (The medication is already finished we didn't get the chance to see it). She encountered similar blackout a month before with a similar symptoms at home. Based on the information we got from students and teachers, other student’s starts to fall after observing the collapse of the index case.

Interventions Conducted

Just after the team reached at Sululta Woreda, we revitalized a rapid response team to coordinate the outbreak at Woreda level. With the Woreda Health Office, we started an active surveillance of sudden collapse at the Chanco health center and Chanco primary school. Since the understanding about psychogenic disorder at local health center was poor, we developed a leaflet and gave a half day orientation for Chanco health center clinical staffs on the general concept of psychogenic disorders, how to approach and manage cases. Since Teachers were the first responders for cases, we gave an orientation for all school teachers on what the event is and what to do when the event happens. Health education about psychogenic disorders was also given for students at classrooms level. The major findings of the investigation were debriefed for Woreda health office and the Woreda Senior management.

Discussion

Hysteria is the first mental disorder attributable to women, accurately described in the second millennium BC, and until Freud considered an exclusively female disease. Over 4000 years of history, this disease was considered from two perspectives: scientific and demonological. During the 20th century, several studies postulated the decline of hysteria amongst occidental patients (both women and men) and the escalating of this disorder in non-Western countries (11).

Mass hysteria typically begins when an individual becomes ill or hysterical during a period of stress. After this initial individual shows symptoms, others begin to manifest similar symptoms. For most of the reported outbreaks index cases identified to have a history of stressful social conditions. In some of the incidences, outbreak follows an index case with a true medical condition (1,12,13). In our investigation, the index case was a 17 years old female student who have also encountered similar collapse a month before. The patient explained to us that for above symptom she visited Minilike hospital in Addis Ababa and the physician told her she has Anemia and prescribed her a drug to be taken for a month period. On our interview with the index case, we have not identified any stressful condition before the mass collapse incidence at school.

According to the key informants (Teachers and district authorities), the progression of the outbreak was so fast that within a half and a hour duration more than 180 case were identified and send to medical attention. In the period between 1973-1993, five types of conversion outbreaks based on the pattern of "contagion" of the illness were identified and includes; Explosive: symptoms appear rapidly, many people are involved. The outbreak is short-lived, and young people are often involved. The outbreak that we have investigated follows similar trend of progression with the above pattern of "contagion". Other types include; Explosive plus prodrome type (isolated first cases are detected, and there is gradual buildup to explosive Outbreak), Rebound type (a handful of cases appear rapidly, followed in a few days by a second wave of cases), Diffuse type (involves communities, rural areas, towns, usually a large number of persons, both sexes, all ages) and Cumulative type (fewer than 10 people are usually involved, and there is a slow, 2 weeks to 1 month chain reaction of transmission).

According to DSM-IV manual, Conversion Disorder has been reported to be more common in rural populations, individuals of lower socioeconomic status, and individuals less knowledgeable about medical and psychological concepts. Conversion Disorder also appears to be more frequent in women than in men, with reported ratios varying from 2:1 to 10 (5). In this investigation, it was evident that females are mostly affected by the conversion disorder (62.3%). This result is supported by many other outbreak investigation of similar disorder. For instance based on a systematic review conducted by François Sirois on Epidemic Hysteria: School Outbreaks 1973–1993 in most of the reported outbreaks in this period the ratio of female to male was 2;1 (13). Even if higher attach rate in females is reported, in many of the outbreak investigations explanation is not given on why and how such events are high in female sex. Nevertheless, there are theories such as the Lateralization of functions theories, which tries to explain the sex difference in attach rate of conversion disorder, as attributable to the difference in the size and function of the right and left hemisphere of the brain in males and females (14).

In this study, the most affected age group was 11-15 years with a mean age 13.7 years. This result is also in agreement with the twenty years systematic review conducted on Epidemic of hysteria in which in 56.2% of the reported outbreaks happened in the age groups of 11-15 years (12,14). Generally based on DSM-IV manual conversion disorders are not common before the age of 10 years and after 35 years (5).

The top five symptoms reported during the outbreak was dizziness (97.5%), fear/anxiety (92.5%), shortness of breath (92.5%), fast heart beat or palpitation (90%) and crying (72.5%). Based on the twenty years systematic review conducted by the Jon Hopkins University, nausea or vomiting, headache, and dizziness or light-headedness each were reported in more than one third of the outbreaks in period 1973-1993. Most of the above symptoms are also observed in similar outbreak in 2010, at the high school in rural eastern Ethiopia. The investigation report states that the top five symptoms are shortness of breath (97.7%), fear and crying (68.2%), anxiety(61.3%), unable to move limbs (29.5%) and fatigue (18.2%) (15).

In our Investigation, most of the responders (69.6%) do not know the cause of the outbreak. Looking in to the possible triggering factor of the outbreak knowing someone with conversion disorder, seeing someone with the symptom of conversion disorder, thinking evil spirit as a cause of the outbreak and not knowing the cause of the outbreak is associated with the outcome of being a case. Other factors such as stress in the past week of the outbreak, family history of mental disorder, listening or reading to similar outbreaks, sharing food or water at school are not significantly associated with the outcome variable. Similar finding was observed in an outbreak of conversion disorder in rural eastern Ethiopian in which, Thirteen (27.3%) and six (13.6%) of the cases reported the causes of illness were "evil-devil force" and stress, respectively. In addition, 59.1% replied they did not know the cause.

Articles such as, a review conducted by Kate Faasse, Keith J Petrie explains the use of the internet and resulting information technologies such as internet based news sites, social media websites (including Facebook and Twitter) and web-based discussion forums would result in the electronic spread of mass hysteria symptoms (16). However, in our investigation we have not identified any significant association between use of electronic and other Medias with being a case outcome. This can be due to the limited access of rural Primary students towards electronic and other Medias. As described in DSM and other articles we have not identified any significant association between previous family history of hysterical symptoms and being a case (1, 2, 4, 5).

Limitation of the Investigation

Since the school was closed during investigation of the outbreak, we used a snowball method, which can reduce the representativeness of this investigation to show the overall outbreak situation.

Conclusion

We have confirmed the existence of a conversion disorder outbreak in Chanco Primary school, Chnacho Town characterized by fear and anxiety with associated dizziness and mass collapse. The immediate triggering factor was seeing someone with the symptoms of conversion disorder and believing the causes of the outbreak as “evil spirit” source.

Recommendation

- ⇒ In future possible outbreaks of psychogenic, providing health education to all relevant stakeholders and briefly separating cases from the environment where the incidence happened, is recommended as one of the management for similar outbreaks
- ⇒ Primary schools in the country should have a school Psychologist to help on overall psychological problems of students including incidences like mass conversion disorders.
- ⇒ Health education to the community regarding conversion disorder through health extension workers is highly recommended to develop understanding about the disorder and reduce absenteeism at school.
- ⇒ Training and continuous follow-up should be conducted by zonal or regional health offices to improve surveillance system and data management at Sululta Health Office and health facilities in the Woreda.
- ⇒ We recommend further well-planned studies in order to investigate triggering and other risk factors that influence the incidence of mass conversion disorders in Ethiopian socio cultural setup.

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1.2. Investigation of Measles Outbreak in Telalake Woreda , Zone Three, Afar Region, February 2016

Abstract

Measles is an acute viral illness caused by a virus in the family paramyxovirus, genus Morbillivirus. On February 1, 2016 an outbreak of Measles was reported from Telalake district of Afar Region, East Ethiopia. Investigation team was deployed to assess the distribution and associated risk factors of the outbreak in the district, to implement control measures. We applied a descriptive analysis of the collected line list of cases followed by unmatched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak. We identified 21 cases of Measles cases from which the first five cases were laboratory confirmed, the remaining are epidemiologically linked making the overall attack rate of 0.45 per 1000 populations and no death were identified. Most of the cases (66.6%) were female. The maximum and the minimum age was 1 and 14 year respectively with a mean age of 4.7 year (+/- 3.7). Most of the caregivers (85.7%) were illiterate and housewife with an average household size of 9 person per household. Eighty-one percent of the cases were not vaccinated for measles and the average measles vaccine doses taken by the remaining vaccinated cases were one dose. The outbreak was controlled by conducting mass vaccination and health education activities. We have confirmed the incidence of measles outbreak in Telalake Woreda of Afar region, the major risk factors being accumulation of susceptible unimmunized children and contact with Measles infected person. We recommend strengthening health education and routine and catch up immunization programs activities by the district health office to prevent similar outbreaks.

Background

Measles is an acute viral illness caused by a virus in the family paramyxovirus, genus Morbillivirus. Measles is characterized by a prodrome of fever and malaise, cough, coryza, and conjunctivitis, followed by a maculopapular rash (1). Measles infection can result in serious complications such as blindness, encephalitis, or severe respiratory infections such as pneumonia (2). According to World health organization (WHO), Measles is one of the leading causes of death among young children even though a safe and cost-effective vaccine is available. In 2014, there were 114 900 measles deaths globally – about 314 deaths every day or 13 deaths every hour (3).

Prior to the availability of measles vaccine, measles infected over 90% of children before they reached 15 years of age. These infections were estimated to cause more than two million deaths and between 15 000 and 60 000 cases of blindness annually worldwide (4). Measles vaccination resulted in a 79% drop in measles deaths between 2000 and 2014 worldwide. In 2014, about 85% of the world's children received one dose of measles vaccine by their first birthday through routine health services – up from 73% in 2000. During 2000-2014, measles vaccination prevented an estimated 17.1 million deaths (3, 4, 5). Based on WHO report in Ethiopia the incidence rate of measles was 6.52 per 100,000 population in 2013 and in 2014, 14100 confirmed cases were.

Sign and Symptoms

Measles is a systemic infection. The primary site of infection is the respiratory epithelium of the nasopharynx. Measles infection presents with a two to four day prodrome of fever, malaise, cough, and runny nose (coryza) prior to rash onset. Conjunctivitis and bronchitis are commonly present. Although there is no rash at disease onset, the patient is shedding virus and is highly contagious. A harsh, non-productive cough is present throughout the febrile period, persists for one to two weeks in uncomplicated cases, and is often the last symptom to disappear. Generalized lymphadenopathy commonly occurs in young children. Older children may complain of photophobia and, occasionally, of arthralgia (2,6).

Koplik's spots may be seen on the buccal mucosa in over 80% of cases, if careful daily examinations are performed before rash onset. The lesion appears one to two days before rash onset and persists for two or three days before disappearing soon after rash onset. Rash appear

two to four days after the prodrome symptoms begin, a characteristic rash made up of large, blotchy red areas initially appears behind the ears and on the face. At the same time a high fever develops. The rash peaks in two to three days and becomes most concentrated on the trunk and upper extremities. The density of the rash can vary. The rash typically lasts from three to seven days and then fades in the same pattern as it appeared and may be followed by a fine desquamation. Whereas rash may be less evident in children with dark skin, desquamation generally is apparent. Some children develop severe exfoliation, especially if they are malnourished (2,6).

Transmission

Measles is a highly contagious virus, which spread by coughing and sneezing, close personal contact or direct contact with infected nasal or throat secretions. The Secondary attack rates among susceptible household contacts have been reported to be 75%–90%. Due to the high transmission efficiency of measles, outbreaks have been reported in populations where only 3% to 7% of the individuals were susceptible (3,6).

The virus remains active and contagious in the air or on infected surfaces for up to 2 hours. It can be transmitted by an infected person from 4 days prior to the onset of the rash to 4 days after the rash erupts, Infectivity is greatest three days before rash onset. Measles outbreaks can result in epidemics that cause many deaths, especially among young, malnourished children. In countries where measles has been largely eliminated, cases imported from other countries remain an important source of infection (2,3,6).

Risk Factors

Unvaccinated young children are at highest risk of measles and its complications, including death. Unvaccinated pregnant women are also at risk. Any non-immune person (who has not been vaccinated or was vaccinated but did not develop immunity) can become infected. The overwhelming majority (more than 95%) of measles deaths occur in countries with low per capita incomes and weak health infrastructures. Humans are the only natural hosts of measles virus. Although monkeys may become infected, transmission among them in the wild does not appear to be a mechanism by which the virus persists in nature (3).

Other risk factors for measles virus infection include: infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency due to HIV or AIDS, alkylating agents, or corticosteroid

therapy, regardless of immunization status and children who travel to areas where measles is endemic or contact with travelers to endemic areas. Malnourished and young children are at higher risk of developing complications and mortality from measles infection (6).

Laboratory Investigations

There are four recommended techniques for collecting specimens from suspected measles cases. In Ethiopia, currently blood sample (serum specimen) and nasopharyngeal swab samples are the two sample types collected. A blood sample is for measles-specific IgM detection and a nasopharyngeal swab sample is collected for virus isolation in order to identify the genotype of the measles virus in a particular outbreak. WHO recommends the IgM indirect ELISA method for rapid confirmation of measles cases. The test can be run in one day so that results can be returned in a timely manner. The laboratory result has to be sent to the users to the maximum within 7 days.

Filter paper method dried blood sample is another method used to test for the presence of measles-specific IgM; and sample of patient urine is used to do virus isolation for genotyping. This method is not currently used in Ethiopia. A small proportion of samples may give indeterminate results on IgM testing. All measles laboratories are expected to re-test measles IgM indeterminate samples, and to perform rubella IgM testing on all measles IgM indeterminate and IgM negative specimens.

Case and Outbreak Management

There is no specific antiviral treatment exists for measles virus. Severe complications from measles can be avoided through supportive care that ensures good nutrition, adequate fluid intake and treatment of dehydration with WHO-recommended oral rehydration solution. This solution replaces fluids and other essential elements that are lost through diarrhoea or vomiting. Antibiotics should be prescribed to treat eye and ear infections, and pneumonia. All children in developing countries diagnosed with measles should receive two doses of vitamin A supplements, given 24 hours apart. This treatment restores low vitamin A levels during measles that occur even in well-nourished children and can help prevent eye damage and blindness. Vitamin A supplements have been shown to reduce the number of deaths from measles by 50% (6).

Routine measles vaccinations for children, combined with mass immunization campaigns are key public health strategies to reduce measles deaths. The measles vaccine has been in use for over 50 years. It is safe, effective and inexpensive. The measles vaccine is incorporated with rubella and/or mumps vaccines in countries where these illnesses are problems. It is equally effective in the single or combined form. Adding rubella to measles vaccine increases the cost only slightly, and allows for shared delivery and administration costs (6).

In 2014, about 85% of the world's children received 1 dose of measles vaccine by their first birthday through routine health services – up from 73% in 2000. Two doses of the vaccine are recommended to ensure immunity and prevent outbreaks, as about 15% of vaccinated children fail to develop immunity from the first dose (6).

Epidemiology of Measles in Ethiopia

Case-based measles surveillance was initiated in Ethiopia in 2003. The number of reported suspected measles cases has increased through the years and this might be partly due to the increased sensitivity of the surveillance system, rather than a failure of the control efforts. Although measles is one of the weekly reportable disease in Ethiopia the number of reported cases represents only a small proportion of the expected cases. Measles case usually comes late to the health facilities and often after they have developed complication. As a result, the diagnosis given by the health workers tend to be one of the complication rather than measles itself, which is one of the reasons for under reporting of measles cases. A combination of poor quality of record keeping, failure to identify epidemics and proper filing as well as failure of mothers to bring children affected by measles to health facilities for treatment are among other contributing for under reporting (7).

In 2013, measles incidence was 7.2 cases per 100,000 populations. A total of 243 measles outbreaks were confirmed in 2013 compared to 146 in 2012 with a total of 192 affected woredas (districts) in 2013 compared to 125 in 2012. Based on the epidemiology of measles in Ethiopia and burden of disease modeling, it is estimated that more than 1.5 million cases of measles (all age) and 70,000 deaths (assuming 4% case fatality ratio) would occur in Ethiopia annually. For many years the average number of measles cases reported to the Ministry of Health by the region ranged from 500-2000 annually (7).

In Ethiopia, a seasonal pattern of occurrence of measles has been observed over the years, with increased number of measles cases during the late-early part of the year (December to February) (Figure 5). Due to the low sub national routine measles coverage and prevailing poor living and nutritional conditions, measles outbreaks continue to occur frequently in different parts of the country, most especially in Oromia and SNNPR (southern) Regions where the density of the population is relatively high . The number of confirmed measles cases steadily increased from 73 in 2003 to a peak of 3,511 in 2008, following which there was a decline to 1,944 cases in 2009. Even though measles incidence rate has showed significant increase in the country since 2010 a dramatic increase is observed from 2012 (5.2 cases per 100,000 populations) up to 2014 (11.1 cases per 100,000 populations) (3,7).

Objective of the Outbreak Investigation

General Objectives

To assess the distribution and associated risk factors of Measles outbreak in Telalake Woreda, Afar Region, so as to implement control measures.

Specific Objectives

- ⇒ To describe the distribution of cases in terms of place, person and time in Telalake Woreda, Afar Region, in February 2015
- ⇒ To identify potential risk factors for the Measles outbreak in Telalake Woreda, Afar Region, in February 2015
- ⇒ To implement control and prevention measures for Measles outbreak in Telalake Woreda, Afar Region, in February 2015

Methodology

Study Area and Period

The Investigation is conducted in Afar Region, Telalake distict, Adilala Kebele, which situated 567 K.M from the capital city Addis Ababa. Based on the information we get from the local authority, the district has 46903 populations from which 1379 and 1360 are under five and under one aged population respectively. The district has a total of 3 health centers and 11 health posts which delivery health care service to the community. According to the administrative report, the current coverage of measles immunizatio is 84%. The district is administratively classified into 11 Kebeles and Adilala Kebele is one of the eleven Kebeles in which the current outbreak of Measles happened. Adilala Kebele is situated 10 K.M from the center of the district. The Kebele have 3839 population, from which 522 and 111 are under five and under one year aged population respectively. This investigation is conducted February 2 to 9, 2016.

Study Design

We applied a descriptive analysis of the collected line list of cases followed by unmatched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak.

Sampling Method – We included all reported 21 cases and using a 1:2 case to control ratio we selected 42 controls randomly from the same village where cases are identified.

Case Definition and Selection of Cases and Controls

Case definition: The WHO adopted, national integrated disease surveillance case definition was used.

Suspected case: Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed cases: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in a epidemic.

Cases- Are individuals, which fulfils the above criteria and all reported cases were included in the study

Controls- Are individuals, who does not fulfill the above criteria and selected from similar village where cases were identified.

Data Collection Tools and Procedures

The following procedures and tools were applied to collect data during the investigation.

A. Document Review- We reviewed the outpatient medical logbooks and medical record of cases at Telalake health center. We also reviewed the laboratory findings of the first five cases at the national reference laboratory.

B. Discussion with Key Informants- Using a semi structured checklist we interviewed and discussed with key informants which includes health professionals which attended medical care of cases, Woreda health officials and families of cases.

C. Interviewing Cases and Controls- Using a structured and semi structure questionnaire (annexed), case and controls were interviewed by three data collectors (including the principal investigator)

Data Quality Assurance

Before the start of data collection, a half-day orientation was given for data collectors. Each completed questionnaire was daily reviewed by the principal investigators to monitor the data quality. Before analysis, data was also cleaned for any missing and logically inconsistent values.

Data Analysis

All collected data are entered and analyzed using statistical softwars (using epinfo-7 and SPSS), bivariate and multivariate (using logistic regression model) analysis are conducted using Epinfo-7 and SPSS taking 95% confidence limit.

Ethical Consideration

Before filed investigation a formal letter was written by Ethiopian Public Health Institute (EPHI) to Telalake Woreda health office to get permission and facilitate the investigation process. Before data collection, an informed consent was taken from mothers or caregivers of cases and any information related with personal identification was not used on the report. Cases were also referred to the nearby health facilities for medical care.

Dissemination Plan

This study report was submitted to Ethiopian Public Health Institute and Addis Ababa University, School of Public Health. The manuscript of the report can be published in peer-reviewed journals to reach the scientific community

Result

Descriptive Analysis - We identified 21 cases of Measles from which the first five cases were laboratory confirmed using the conventional PCR. All of the cases reported were from Adalil Kebele of Telalake Woreda and no death was identified. Most of the cases (66.6%) were female and the maximum and the minimum age was 1 and 14 year respectively with a mean age of 5 years (+/-3 years). All of the responders (mothers or caregivers) were Muslim in religion, 90.5% were married and 85.7% of them were illiterate and housewife with an average house hold size of 9 person per household.

Table-5 Summary of the Personal characteristics of cases with Measles in Afar Telalake Woreda, February- 2016

Personal Characteristics	Number	%
Sex		
Male	7	33.3
Female	14	66.6
Religion		
Muslim	21	100
Occupation		
House Wife	18	85.7%
Govnt	2	9.5%
Student	1	4.8%
Educational Status		
Illiterate	18	85.7%
Read and Wirte	2	9.5%
Primary Education	1	4.8%
Marital Status		
Married	19	90.5%
Widowed	2	9.5%
Mean Age		4.7 (+/-3.7)
Under Five Attach Rate		2.9%

The responders were asked for the common sign and symptoms and Fever (100%), Rash (100%), Coryza (100%) and Cough (81%) were the top identified symptoms.

Table-6 Distribution of common symptoms cases with Measles in Afar, Telalake Woreda, February- 2016

Symptoms	Number	%
Fever	21	100.0%
Rash	21	100.0%
Cough	17	81.0%
Corayza	21	100.0%
Conjunctivitis	16	76.2%
Diarrhea	15	71.4%
Ear Discharge	5	23.8%
Blindness	0	0.0%
Vomiting	10	47.6%

The mean duration of cases to sick medical care were 6 days. Majority of cases were reported on 28 January

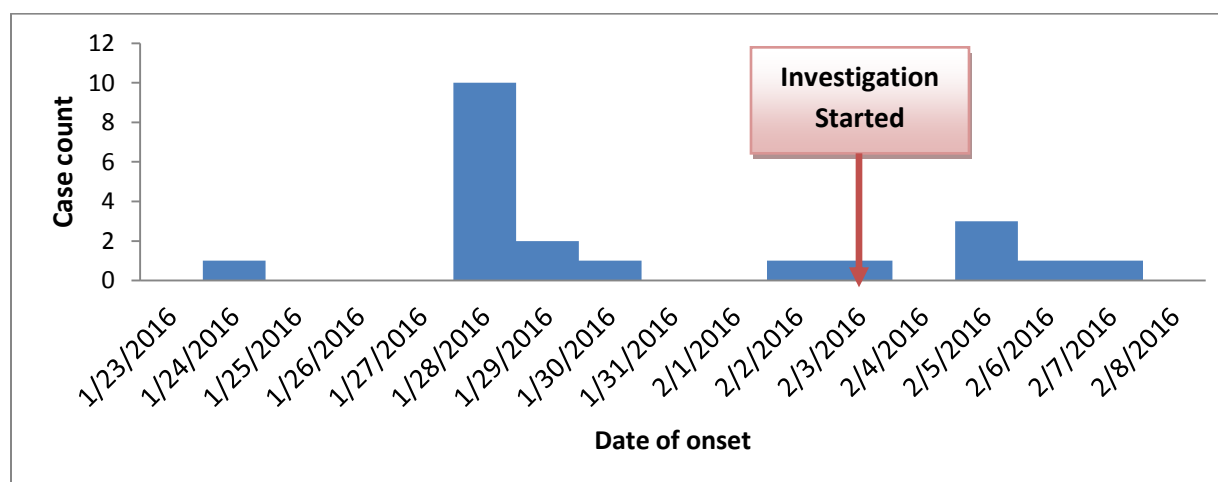


Figure-5 Epi curve of the Measles cases in Afar, Telalake Woreda, February- 2016

Most of the cases (66.7%) were seen at health facility, 14.3% of cases were not provided with Vitamin A at health facility.

Table-7 Distribution of treatment type taken by cases with Measles in Afar, Telalake Woreda, February- 2016

Treated at Health Facility	Number	%
Yes	14	66.7%
No	7	33.3%
Type of Treatment given at Health Facility (n14)		
ORS	3	21.4%
Antibiotics	4	28.6%
Vitamin A	12	85.7%

From the total cases 17 (81%) of them were not vaccinated for measles, from the vaccinated 4 cases, the 3 of the vaccination status was identified by vaccination card and the reaming one was from vaccination memory. The average does taken by the vaccinated cases were one does, and the mean duration of last vaccination was identified as 14 month.

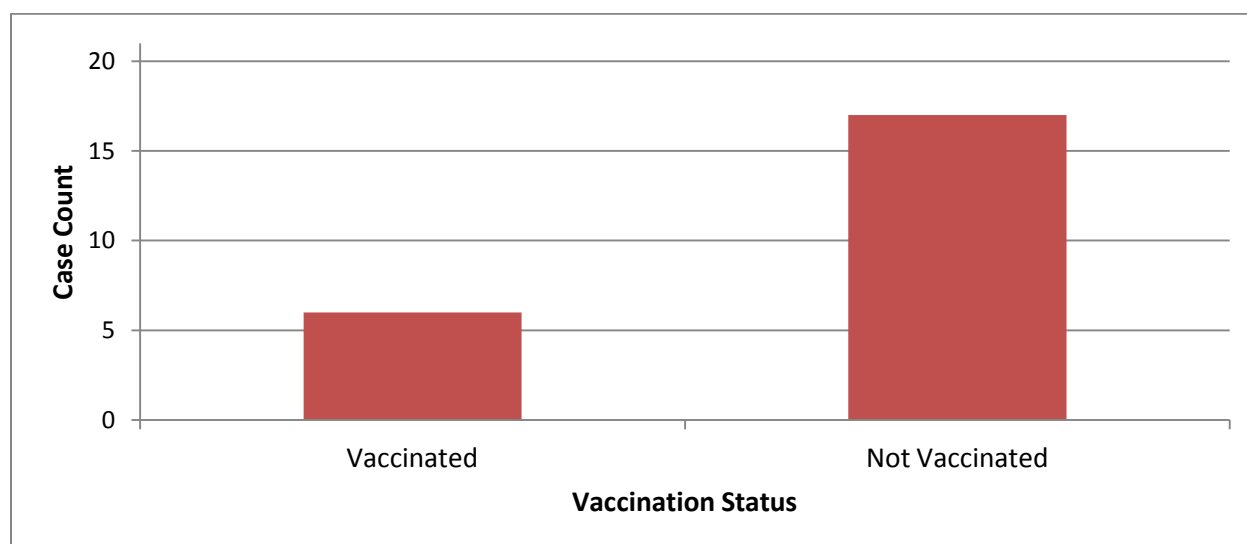


Figure-6 Distribution of vaccination status of case with Measles in Afar region, Telalake Woreda, February-201

To assess the nutritional status of study subjects the middle upper arm circumference was measured and from the total 21 cases, two of the cases had moderate mal nutrition.

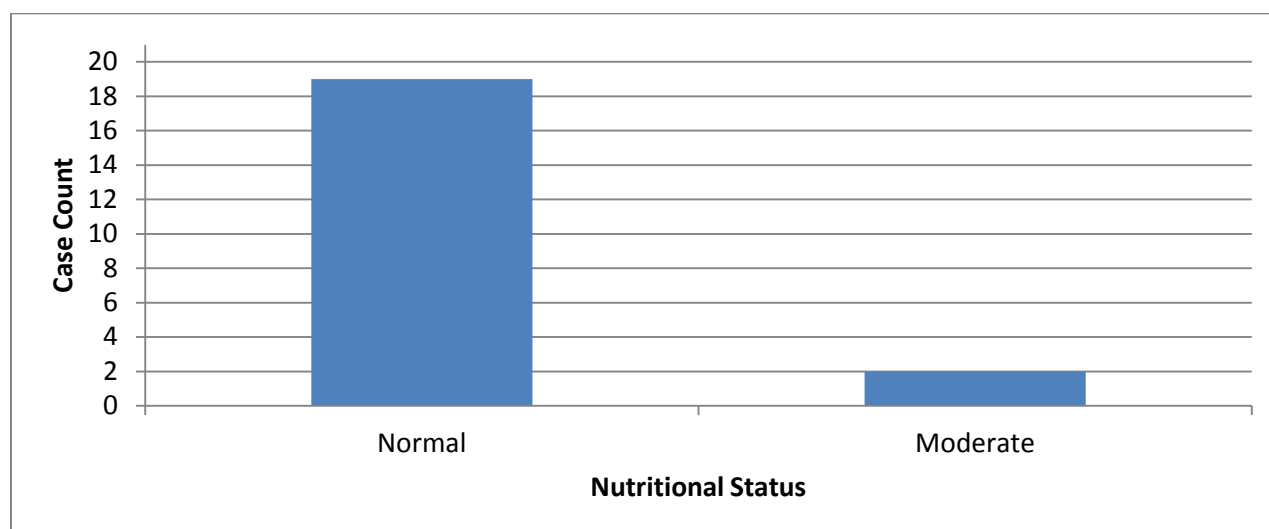


Figure-7 Distribution of nutritional status of case with Measles in Afar region, Telalake Woreda, February-2016

The mothers or the caregivers of cases were asked a list of question to measure their knowledge on the measles disease and the summary of the result is displayed in the table below.

Table-8 Distribution of knowledge status of Mothers or Caregivers of cases about Measles disease in Afar, Telalake Woreda, February- 2016

Knowledge Questions	Count	%
Do you Know Mode of transmission		
Yes	5	23.8%
No	16	76.2%
Preferred Place of Treatment when Measles Happen		
Health facility	15	71.4%
Home	6	28.6%
Preferred Treatment Mechanism		
Moder Medicen	2	9.5%
Tradtional Medicen	6	28.6%

Both (Moder and Traditional Medicen)	13	61.9%
Knowledge about the Cause of Measles		
Know	3	14.3%
Don't Know	18	85.7%
Is Measles Vaccine Preventable		
Yes	3	14.3%
No	18	85.7%

Analytic Analysis- In order to assess the possible risk factors of the outbreak we applied bivariate analysis using 95% confidence level. On bivariate analysis nutritional status of case OR2.9 (1.02-16.8), vaccination status of the responders OR 0.16 (0.05-0.51), Travel history of responders OR2.5. (1.05-10.5), contact history with a rash patient OR32.5. (7.1-146.8) and Knowing the causes of the disease OR0.5 (0.09- 0.81) were statically associated with probability of acquiring the disease.

Table 9 Bivariate analysis of risk factors for a Measles outbreak in Afar, Telalake Woreda, February- 2016

Variables	Yes/No	Case	Controls	COR (95% CI)
Sex of the Case	Male	7	21	0.5 (0.16-1.6)
	Female	14	21	
Nutritional Status	Moderate malnutrition	2	2	2.9(1.02-16.8)
	Normal	19	40	
Vaccination status	Vaccinated	6	30	0.16 (0.05-0.51)
	Not Vaccinated	15	12	
Travel History	Yes	7	7	2.5. (1.05-10.5)
	No	14	35	
Contact history	Yes	15	3	32.5 (7.1-146.8)
	No	6	39	
Knowing the causes of the disease	Yes	2	7	0.5 (0.09- 0.81)
	No	19	35	

Knowing Measles is vaccine preventable	Yes	3	12	0.8 (0.07-2.2)
	No	18	30	

Result from Qualitative

We also made a discussion with key informants including the local health officials (district and Kebele health extension workers) and families of the cases. Based on the key informants the outbreak started after the index case (4 years old girl) return to home after staying in neighboring district for 2 months to visit the families of her mother. The mother of the index case reported that, the girl acquired a fever and rash while she was at the neighboring district. After she come back to home her two sister and one brother started to show the same symptom. The index case was not vaccinated for measles before and the mother thinks the disease happens because of bad water and she didn't take her children for medical intervention. After few days the disease started to expand in the village and a health extension woker reported the condtion to woreda health officials.

Intervention conducted

After the team reached at Telalake Woreda, we revitalized a rapid response team to coordinate the outbreak at Woreda level. With the Woreda Health Office, we started an active surveillance of Measles. Mass vaccination was immediately started by the Afar regional health office. With the local health extension, the team gave a health education on the cause and mode of transmission measles disease. During our interview with the local community their knowledge and attitude on the usefulness of vaccine to prevent measles was very poor, hence the team gave a feedback to local administration to give a health education and advocacy activities on the usefulness of Measles vaccine to prevent similar incidences.

Discussion

Ethiopia is one of the countries with high measles incidence rate with a total of 14.61 cases per 100,000 population per year (8).

Like any infectious diseases, the burden is much pronounced in rural and illiterate community. The current outbreak occurred in children of one of a rural village of Afar region, in which 85.7% of the mothers or caregivers of the cases were illiterate. The maximum educational status achieved by the respondents was primary education. Educational status of a mother is one of the factors that have a great impact on prevention of communicable diseases, including measles. This is further shown by the study conducted by Tikelaye Kidane et.al, to study the Factors that influencing child immunization coverage in a rural District of Ethiopia. In this study it was evident that children's of illiterate mothers have an odds Of 9.0 not to be vaccinated form measles as compared to the children's of literate mothers. The study further explains that maternal education is decisive to immunization status of the child. As not knowing subsequent dose was the most common reason given for defaulting and since the immunization, knowledge was related to education of the mother, coverage was low among illiterate mothers (9).

To further observe the mothers or caregivers knowledge and attitude regarding the measles disease and its prevention methods we asked a list of question and the result showed that 85.7% of the responders reported they don't know what cause the disease and 76.2% of the responders they don't know how the disease transmitted from person to person. Regarding the preventability of the disease much of the responders (85.7%) reported they have no knowledge about the vaccine against measles. This result is in agreement with a study conducted in the rural districts of Ethiopia, to assess the factors influencing childhood immunization, which showed most of mothers have a low knowledge about the importance and the schedule of vaccination (9).

The above finding is further strengthen by a study done in rural Nigeria to assess mothers concept on measles and prevention methods. The study states that, from a total of 200 study units, 54 believed implicitly in the efficacy of the vaccine, 112 did not believe in the vaccine as a preventive measure, and the remaining 34 had no knowledge of the vaccine. The non-believers in the measles vaccine were asked to explain their attitudes. How had they evaluated the efficacy of

the vaccine? Some of their responses were based on the experiences of their children with the vaccine, while other responses were motivated by what they had heard from friends, relatives, and neighbors about the vaccine. Eighty-one believed that the vaccine is not preventive because they claimed that some of their children who had been immunized still contracted measles in later years. Generally the low knowledge and perception of measles and its prevention method in our study area can be due to the lower education status of mothers or caregivers and the poor health care system which is unable to deliver effective health education to community (10).

Based on the information we get from the local health officials a year before a follow up measles vaccination campaign was conducted for children in age group between 6 month and 5 years. The administrative report of the district health office shows that measles vaccination coverage is 84% in the district. The current outbreak was happened in Adilal kebele which very near to the center of the Woreda, which may show possibility of a severe outbreaks in the pocket Kebeles of the district. Based on the Ethiopian Public Health Institute Measles surveillance and outbreak control guideline, efforts should be made to have measles coverage of 90% in the age group between 9 and 11 month (6).

According to WHO fact sheets on Measles, Unvaccinated young children are at highest risk of measles and its complications, including death. Unvaccinated malnourished Children are at a higher risk of death and complications (3). In our investigation the mean age was found to be 4.7 year, two moderately malnourished children were identified, and during the investigation period both were being treated for acute Otitis media. Based on our investigation from the total 63 study units (including both the cases and controls) only 37 (58.7%) was at least once vaccinated for measles. Using both the administrative and the investigation data it is possible to explain the current outbreak as a result of the accumulation of high number of susceptible children which was not vaccinated for Measles.

Conclusion

We have confirmed the incidence of an imported measles outbreak in Adilala Kebele of Telalake Woreda of Afar region, the major risk factors being accumulation of susceptible unimmunized children and contact with infected person. We have seen that the overall knowledge and perception about Measles and its prevention methods is poor.

Recommendations

1. Health education and advocacy activities should be performed by the district health office on Measles causes, transmission methods, importance of vaccination
2. The district health office needs to work with religious leaders and other important community stakeholders to change the perception of the community about measles immunization
3. The regional and district health offices should strengthen the routine and catch up immunization programs against measles
4. The regional and district health offices should strengthen the surveillance activities to detect possible similar outbreaks at earliest period.
5. The regional and district health offices should provide a training on case management of measles disease for clinicians and health extension workers at health centers and health posts level

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Chapter Two – Surveillance Data Analysis

2.1. Surveillance Data Analysis of Maternal Death in Ethiopia in the Period Between 2013 to 2015 G.C

Abstract

Ethiopia is one of the top eleven countries of high maternal mortalities with an estimate of 420 deaths per 100,000 live births a year. As the country have no vital registration system it is difficult to ascertain the current maternal mortality rate. In addition different estimation conducted by different organization has resulted in significantly different magnitudes. So far there is no comprehensive and updated study on maternal death and the associated risk factors in Ethiopia. Thus we conducted a surveillance data analysis collected from October 2013 to January 2015 to estimate the magnitude and potential factors associated with maternal death in the country.

We conducted a retrospective data analysis of maternal death surveillance reports collected from October 2013 to January 2015 from six regions in the country. The summary of the findings has shown that the overall maternal mortality ratio is 28.9 per 100,000 live birth with big disparity among regions the maximum being at Dire Dawa 94 deaths per 100,00 live birth and the minimum being at addis Ababa 2.7 deaths per 100,000 live births. The study also showed that almost two in 100,000 women of reproductive age group have the probability of dying due to maternal causes. In this study the top three causes of maternal deaths are found to be hemorrhage followed by sepsis and hypertensive disease of pregnancy. Much focus should be given to the top three common causes of maternal deaths (hemorrhage, sepsis and hypertensive disease of pregnancy) to reduce and improve maternal outcome and very significant amount of maternal deaths were not reported from regions which needs higher official engagement to promote the importance of MDSR system so as to improve the commitment towards the system.

Introduction

Background

Pregnancy is a normal health state in which every woman aspires to at one point of her life. Even if it's a normal and basic biological process it also carries a risk of morbidity and mortality. (1) The death of a mother has an immense impact on the health and wellbeing of her child, family and the society as a whole (1, 2).

An estimated 287000 women worldwide died from pregnancy and its complications in 2010, 99%, of them in developing countries (4). Reported maternal mortality underestimates the true magnitude by up to 30% worldwide and by 70% in some countries (5). Inadequate measurement contributes to a lack of accountability and in turn to a lack of progress (2). By investigating a woman's death, MDSR inherently places value on her life which creates an important form of accountability for families and communities (2).

“Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels. It includes the routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths” *WHO, MDSR Technical Guidance* (2). Maternal death surveillance and response is a relatively new system which aims at providing information that effectively shows the true magnitude of maternal mortality and guides actions to eliminate preventable maternal mortality at health facilities and in the community(2). WHO and other partners are on the process of implementing this new approach towards maternal death specifically on 75 high-burden countries that account for 95% of maternal deaths (6).

Ethiopia is one of the countries with a higher number of maternal death (3). There has been effort in the country to improve access of essential health service to the population with specific focus on mothers and children (1). Progress have been also made as shown by the maternal mortality trend study which describes a 600 death/100,000 live birth improvement between the period of 1900 to 2010 (4). In contrary DHS, 2011 reported relatively elevated estimate (676/100,000) which shows the challenges in both reduction and estimation of maternal death (1, 7).

With a rational of getting effective information on maternal mortality causes, contributors and other pertinent parameter which can guide on improving and monitoring of interventions against maternal mortality, the Ethiopian Ministry of Health launched the program on May, 2013 G.C (1).

Therefore the aim of this project is to analyses the data obtained from the maternal death surveillance so as to point out the major lessons we can learn from this short MDSR experience.

Problem Statement

The magnitude of death of a mother is one of the indicators that shows the quality of life in a given country and it is also one of the major focus area of the MDG for which countries committed to reduce by two third (1).

Ethiopia is one of the eleven countries which contribute to the 65% of world maternal mortality (3). As the country have no vital registration system it is difficult to ascertain the current maternal mortality rate. In addition different estimation conducted by different organization has resulted in significantly different magnitudes (1).

In addition to the difficulty of estimating maternal mortality rate, most of the studies conducted in the nation regarding magnitude and cause of maternal mortality are restricted to small geographical area or only to single or few selected health facilities and there is no recent compressive national study.

Having a compressive national study regarding magnitude and associated causes of maternal death assists the countries effort towards reduction of preventable maternal deaths by providing evidences for development of effective programs and strategies.

Therefore this study will assess the burden and distribution of maternal death, related contributing factors and causes identified by the MDSR system in order to provide a feasible and applicable recommendation to appropriate stakeholders.

Literature Review

What is Maternal Death?

“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” ICD-10 (10). It is a product of a death of a pregnant women and number of life births in a community (11).

ICD-10 also classifies the maternal deaths as direct obstetric death and indirect obstetrics death. Direct obstetric deaths are those deaths which resulted from obstetric complication of pregnant state (pregnancy, labour and puerperium) from intervention, omission and incorrect treatment or from chain of events resulting from any of the above. In another hand the indirect obstetric deaths are the result of pre existing diseases or disease that develop during pregnancy and which was not due to direct obstetric cause, but which was aggravated by the physiologic effect of pregnancy (10).

Medical Causes of Maternal Death

WHO estimates show that the leading causes of maternal deaths in the world are hemorrhage and hypertension, which together account for more than half of maternal deaths. Indirect causes, which include deaths due to conditions such as malaria, HIV/AIDS and cardiac diseases, account for about one fifth of maternal deaths (12).

In developing countries hemorrhage and hypertension are among the top three causes of deaths in both South Asia and Sub-Saharan Africa (12). The majority of maternal deaths in developing countries are due to five major direct obstetric complications: hemorrhage, infection, unsafe abortion, hypertensive disorders of pregnancy, and obstructed labour (13). This evidence was also supported by other individual studies conducted in developing countries specifically in sub Saharan countries. For instance a study done in Gambia to identify causes and contributing factors to maternal death in a community using verbal autopsy shows that from the total of 18 maternal deaths recorded within the five years 9 of them were classified as having direct obstetric cause, hemorrhage was the largest cause of death which accounts for 6 of the 18 deaths.

Other obstetrics causes of deaths observed in this study includes unspecified early pregnancy death and prolonged labour. The other nine portions of the deaths were caused by indirect causes which includes anemia, hepatitis and unknown causes (14).

Like any other developing countries, Ethiopia is also affected by the above causes of maternal mortality. A systemic review conducted by Yifru Berhan and Asres Berhan on eight facility based maternal death studies conducted from 1980 to 2012 indicates that the top four causes of maternal mortality in the year 1980-1999 were abortion related complications (31%), obstructed labor/uterine rupture (29%), sepsis/infection (21%) and hemorrhage (12%). In the last decade, however, the top four causes of maternal mortality were obstructed labor/uterine rupture (36%), hemorrhage (22%), hypertensive disorders of pregnancy (19%) and sepsis/infection (13%) (15).

Contributing Factors for Maternal Death

Maternal death is a very complex event to understand the contribution and the association among risk factors (12). These complex contributing factors can be categorized in the following broad groups.

1. Socio Economic Factors

Women's vulnerability to maternal death and capacity to access services is mediated by their degree of physical and sexual, economic, social and political autonomy. For example, women's vulnerability to maternal death may be increased by poor health or physical violence and abuse, which are manifestations of their lack of physical and economic autonomy. Their capacity to seek care may be limited by restrictions on mobility for both economic e.g. lack of independent resources to access transport) and social (norms which limit women's freedom of movement) reasons (16).

High fertility is associated with high levels of maternal mortality, both because more pregnancies mean more chances of pregnancy related deaths, and because the risks of pregnancy and childbirth increase after the third child. And yet in many developing countries there is still a strong pressure on women to bear many children despite the risks. Women also may not have the educational preparation to limit their pregnancy and to decide the right place of delivery while they are pregnant. Women's autonomy in deciding to seek care can be hampered by their

economic dependence and the prohibitive costs of emergency intervention. Some women may have no or limited cash available in times of emergency unless they are given it by their husbands (16).

Generally poverty is clearly a high risk factor. It is also known that poor women are less likely to have formal education than wealthy women, and are less likely to be in good health and to seek or receive medical care. Which of these factors are causes and which are effects, and how this vicious circle can be broken is a complex question. The socioeconomic status of women has a special importance in maternal deaths. In almost all societies in the past, and many societies in the present, women are a socially disadvantaged group (16).

2. Medical Factors

There are a number of medical factors which have a direct or indirect contribution on maternal death.

Age: The age of a pregnant woman affects her chances of dying a maternal death. This is due to a range of biological and social factors. For instance, young women may be at increased risk of obstructed labour, if their pelvis is not mature. Older women may have accumulated health problems like hypertension and diabetes which cause obstetric problems. Young unmarried pregnant women may be likely to resort to illegal abortion due to social factors (13, 16).

Pregnancy order (parity): Women having their first pregnancy are more likely to die a maternal death than women having their second or third. With the fourth child the risk rises again (13, 16).

Birth spacing: No studies exist to show that the spacing of a woman's births affects her chances of dying a maternal death. Evidence does show that birth spacing may affect infant survival and it is often assumed that this must include maternal survival too. But this must be recognized as just that, an assumption (13, 16).

Wantedness of pregnancy: Women with unwanted pregnancies may be more likely to seek illicit abortion, or less likely to seek health care, thereby increasing their risk of a maternal death (13, 16).

The health status of a woman may affect the likelihood that she will develop complications during pregnancy and also her ability to survive these complications. Health status is itself affected by a range of factors, both distant and intermediate. Anemia is a health status factor which is influenced by other factors, for example it may be the result of a lack of money to buy food, or its persistence may be the result of a lack of access to health services which can correct anemia (16).

HIV/AIDS is another health status factor which may be increasingly important in influencing the incidence of maternal mortality. Pregnant women with HIV are more prone to the complications of pregnancy (9). Women whose immune systems are already under attack through full blown AIDS may be less likely to survive the complications of pregnancy (16). Some drugs for the treatment of AIDS may be inappropriate for pregnant women. A five years data analysis conducted by UNFPA showed that there was a 1.4% of incidence rate in Ethiopian mothers who comes for ANC visits (17).

3. Health System and Health Facilities

Access and quality of health services is a complicated concept covering many different issues, including both whether adequate facilities exist (e.g. adequate supplies and personnel, good quality of care), and also if people can reach the services given (e.g. cost, distance, information) (16).

To show the problems in our setup, based on a study done in Tigray Region, Ethiopia which assessed a one year data of hospitals in the region showed that, the median interval between the onset of signs and symptoms of obstetric emergencies and arrival at the facility is measured to be eight hours ranging from 0 to 125 hours (18).

Another study conducted on five hospitals of Tigray, Ethiopia point out that some of the women were attended by skilled attendants but, they were not properly handled to avoid death; since for approximately 87.5% of the deaths medical service-related factors were identified (19). These include lack of blood for transfusion, institutional delay in treatment, inappropriate treatment and misguided action by staff. This could be associated with the quality of training of the attendants, lack of experience and lack of equipment. Proper attention needs to be given to proper training

and to availing services at the right time to reduce the tragic death of mothers during pregnancy and labour (19).

Timely referral of women with due consideration to transportation problems also needs to be given attention. As shown in this study, the majority of the women did not receive definitive care at the hospitals, indicating that referral or care seeking was delayed and many lives were lost during the resuscitation process on arrival at the hospitals (19).

Methods to Measure Maternal Death

There are different methods to capture the death of a pregnant women and the common one are listed here

- ⇒ Vital Records - Vital records often serve as the initial source for determining the magnitude of maternal mortality in a given population. However, cause of death is routinely reported in only 78 countries or areas covering a total population of 1.8 billion, or 35% of the world's population (20). Even among countries where every death is registered, maternal mortality is often still underreported due to improper recording or coding of cause of death. Identifying maternal deaths is made easier if every death is registered and each has an accurate cause of death recorded (20).
- ⇒ Hospital Records - Hospital records often contain information useful in ascertaining the factors that contributed to the death (20). Some hospitals may have a computerized system that records admissions and deaths along with information on diagnoses that can be used as an initial screening method to capture maternal deaths. One of the main problems with using hospital records is that only the deaths occurring in the hospital are identified by hospital record review. Depending on the type of hospital, the rate of maternal mortality may vary significantly. If the hospital is fee-for-service, or serves patients with a certain type of insurance, it may attract economically advantaged women. These hospitals may have a lower maternal mortality rate than that of the rest of the community (20).
- ⇒ Community Identification of Death - Although hospital-based studies can be valuable sources of cause-of death information, maternal deaths that occur outside the hospital are

much more difficult to identify (20). It is important to identify and investigate deaths occurring outside the health system because these women may die of different causes than do women who die in hospitals. Community identification of deaths occurs when persons sometimes referred to as key informants report information from the community to the health sector (16). Key informants may be traditional birth attendants, village health workers, village leaders, or simply well-connected individuals in the community (20).

⇒ Formal Surveillance (MDSR) - In certain areas, the death of a woman of reproductive age or a death due to pregnancy or its complications is on the list of notifiable diseases in the government-run surveillance system. In this system, surveillance for maternal deaths is usually conducted by the epidemiology or surveillance division of the Ministry of Health instead of the local family or maternal and child health (MCH) unit (20). This type of surveillance system, if well-designed and functioning, can reduce many of the pitfalls associated with other methods of identifying maternal deaths (20).

What is MDSR?

“Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels. It includes the routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths.” *WHO, MDSR Technical Guide (2)*.

MDSR responds to Millennium Development Goal 5, which aims to reduce the maternal mortality ratio by three quarters. This MDG is far from being achieved and MDSR is aimed at collecting accurate information regarding magnitude, contributors and causes of maternal death which support in the elimination of preventable maternal deaths (2).

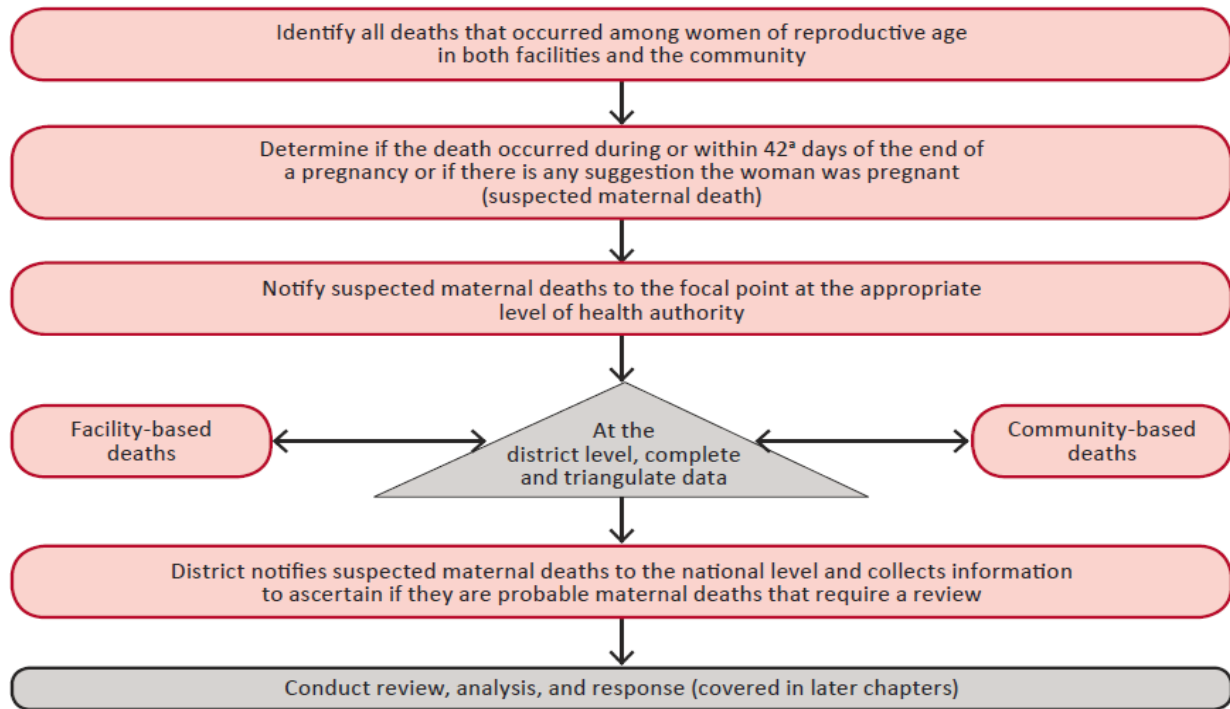
MDSR Process

Based on WHO technical guide for MDSR there are four basic process in the implementation of MDSR.

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1. **Identification and notification on an ongoing basis:** Identification of suspected maternal deaths in facilities (maternity and other wards) and communities, followed by immediate notification (within 24 and 48 hours, respectively) to the appropriate authorities (2).
 2. **Review of maternal deaths by local maternal death review committees:** Examination of medical and nonmedical contributing factors that led to the death, assessment of avoidability and development of recommendations for preventing future deaths, and immediate implementation of pertinent recommendations (2).
 3. **Analysis and interpretation of aggregated findings from reviews:** Reviews are made at the district level and reported to the national level; priority recommendations for national action are made based on the aggregated data (2).
 4. **Respond and monitor response:** Implement recommendations made by the review committee and those based on aggregated data analyses. Actions can address problems at the community, facility, or multi-sectoral level. Monitor and ensure that recommended actions are being adequately implemented (2).

Identification and Notification of Maternal Death

Identify and notify all suspected maternal deaths



Source- WHO, MDSR Technical Guideline

MDSR Implementation in Ethiopia

MDSR system in Ethiopia has a one year history in which Ministry of health and partners launched the program on May 2013. MDSR National Guidelines were launched in, in both Amharic and English. They describe the structure of the overall MDSR system in Ethiopia and includes details of responsibilities and accountability emphasising the need for a ‘no blame’ culture. They distributed to hospitals and health centre facilities across the country, accompanied by supportive training (21). Currently the reporting system is on the early implementation state at four regions of the country (Oromia, Amahar, Tigray and SNNPR)

Objectives of the Study

General Objective

The General Objective of this study is to assess the magnitude, major causes and contributors of maternal death in Ethiopia from 2013 to 2015.

Specific Objectives

- ⇒ To describe the magnitude and the distribution of maternal mortality identified by the MDSR system in Ethiopia in the period from 2013 to 2015.
- ⇒ To describe the distribution of major causes and contributors of maternal mortality identified by the MDSR system in Ethiopia in the period from 2013 to 2015.

Methods

Study Area and Period

This study is conducted in the Six (Amahra, Tigray, Oromia, Addis Ababa, Dire Dawa and Harara) MDSR reporting regions of Ethiopia. Based 2014 Ethiopian central statistical agency estimate in the above six regions there is a total of 61,642,985 population in which 50.1% of them are females. 86% of the total population and 87% of the total female population of the country resides in the aforementioned six regions of the country.

Sampling Method

All data collected by MDSR system from the start of the system (October 2013) to January 2015 was used to meet the objective of the study

Study Design

This study applied a retrospective data analysis of the data collected on pre defined period.

Definition of Terms

- ❖ **Maternal Mortality** – “The death of a woman while pregnant or within 42 days of 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.” (ICD-10)
- ❖ **A Suspected Maternal Death** – “The death of any woman while pregnant or within 42 days of the termination of pregnancy” (WHO, MDSR Technical Guide)
- ❖ **A Probable Maternal Death** – “Deaths among women of reproductive age, not clearly due to incidental or accidental causes.” (WHO, MDSR Technical Guide)
- ❖ **Direct Obstetric Deaths** – “Those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.” (ICD-10)
- ❖ **Indirect Obstetric Deaths** – “Those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy” (ICD-10)

-
- ❖ **Pregnancy Related Death** – “The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (and) is intended for countries that wish to identify deaths occurring in pregnancy, childbirth and up to 6 weeks after the end of pregnancy but where the cause of death cannot be identified precisely.” (ICD-10)
 - ❖ **Maternal Mortality Ratio** – “The maternal mortality ratio (MMR or MMRatio) is the number of maternal deaths per 100,000 live births.” (CDC, Maternal Health Epidemiology)
 - ❖ **Late Maternal Death** - is defined as a maternal death due to pregnancy (direct or indirect obstetric causes) which occurred more than 42 days but less than one year after the end of pregnancy (ICD-10)
 - ❖ **Health Facilities** – In this study health facility refers all types of hospitals and health centers.

Data Quality and Management

The MDSR collected data was entered and analyzed using Epiinfo-7 and the results will be displayed using tables and different figures and charts. While case definitions for the reporting form were clear and had been the subject of training, diagnosis is done by many of staff members at community, health centers and hospitals and its accuracy therefore cannot be assessed here.

Ethical Consideration

A formal letter was submitted to the data manager at EPHI and Ministry of Health MCH directorate in order to access the data. As this study use secondary data consent and other ethical measures were not applicable.

Dissemination of the Results

The study result will be disseminated to stakeholders using a report and can also be presented in different review meetings.

Result

A total of 226 deaths were reported in the period between Oct, 2013 to Jan 2015. Looking to the national MDSR database 94 of fatality case were reported using case based reporting format and 132 were reported in aggregated form. The data bellow shows the socio economic status of mothers who died in the reporting period.

Socio Demography

As described in the table bellow most of the deaths (45%) occurred in the age group between 30 to 39, 87% of mothers were married and 66% of mothers were illiterate.

Table -11. Socio economic status of mothers who died in the period between Oct, 2013 to Jan 2015

Variable	Category	Frequency	Percentage
Age	<19 Yrs	13	6
	20-29 yrs	84	37
	30-39 Yrs	102	45
	>40 Yrs	16	7
Marital Status	Single	11	5
	Married	197	87
	Widowed	1	0.04
	Divorced	1	0.04
Level of Education	Illiterate	59	66
	Can Read and Write	7	8
	Primary School	8	9
	Secondary School	6	7
	University/Collge	3	3
	Don't Know	7	8

Distribution of Maternal Death by Place, Person and Time

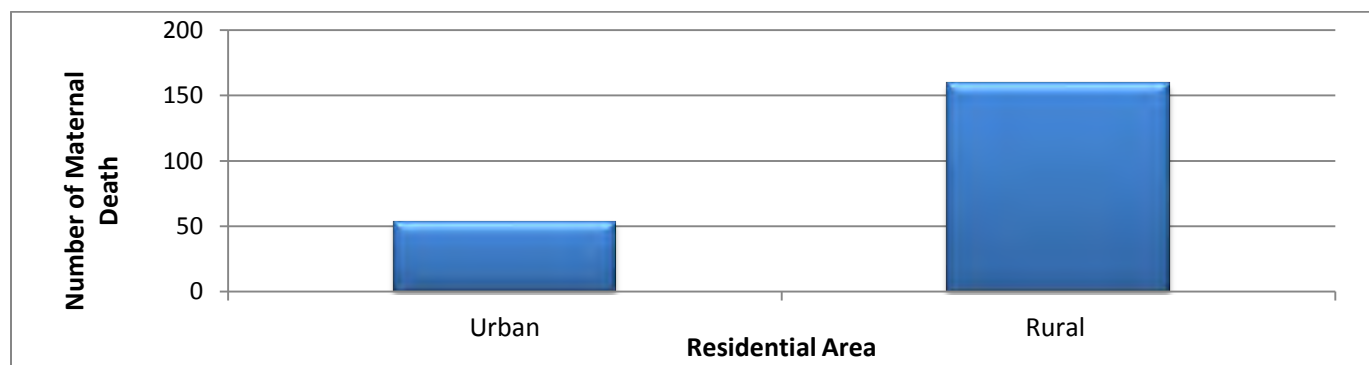
Distribution of Maternal Death by Place

As described on the table bellow most of the deaths are reported from Tigray region followed by Amhara and Oromia. The overall maternal mortality ratio is 10.9 per 100,000 live birth with big disparity among regions the maximum being at Dire Dawa 94 deaths per 100,00 live birth and the minimum being at addis Ababa 2.7 deaths per 100,000 live births

Table-12 Distribution of maternal death by reporting Region in the period between Oct, 2013 to Jan 2015

Reporting Regions	Total Reported Maternal Death	Expected Live Birth	MMR (in 100,000 Live Births)
Amhara	45	171371	26.3
Oromia	35	347238	10.1
Dire Dawa	13	13749	94.6
Harari	1	7006	14.3
Addis Ababa	2	74490	2.7
Tigray	130	168640	77.1
National	226	782493	28.9

As shown on table three only one quarter of the death is occurred in the urban setup and three fourth of the death occurred in rural place of the country.



Figutre-8 Distribution of maternal death by residential place from Oct, 2013 to Jan 2015.

As shown on the figure bellow 34 and 33 percent of death are happened at hospital and home and the list (12%) of death occurs at health center level.

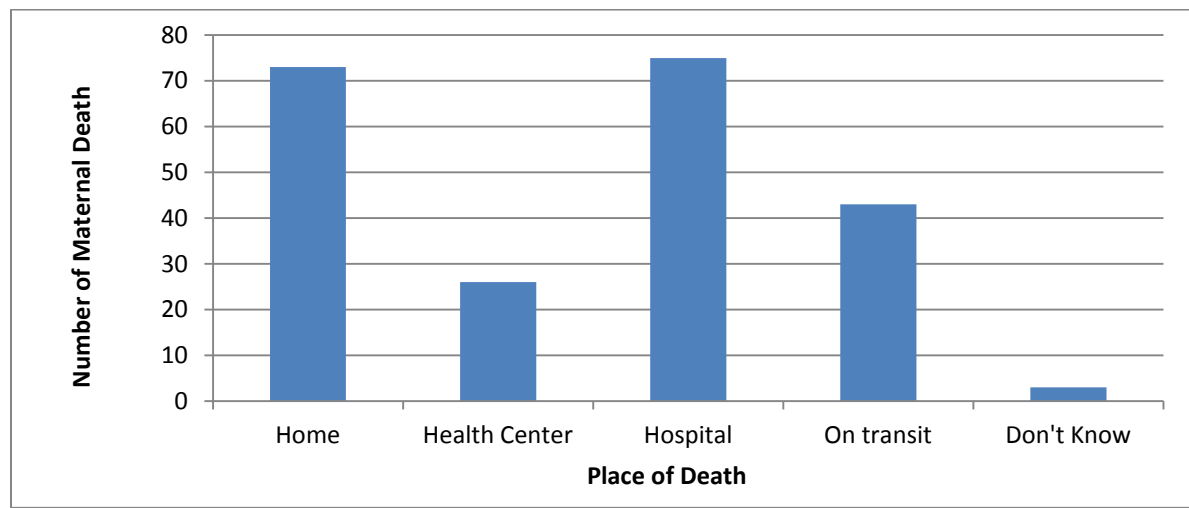


Figure-9 Frequency distribution of maternal death by place of death from Oct, 2013 to Jan, 2015

Distribution of Maternal Death by Person

As demonstrated in the socio demographic part of this study most of the deaths (45%) occurred in the age group between 30 to 39 (with a mean age of 30.2 years), 87% of mothers was married and 66% of mothers were illiterate. The figure bellow demonstrate the age distribution of maternal death

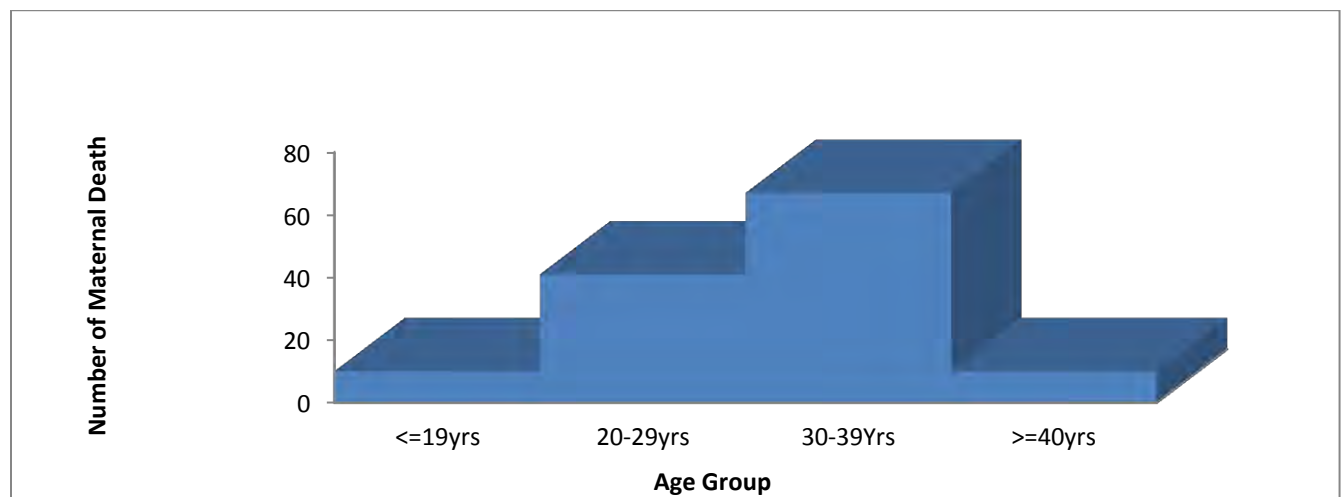


Figure-10 Frequency distribution of maternal death by age from Oct, 2013 to Jan, 2015

As shown in the figure bellow the number of death increases as parity increases, more than half of the reported deaths have a party of five and above.

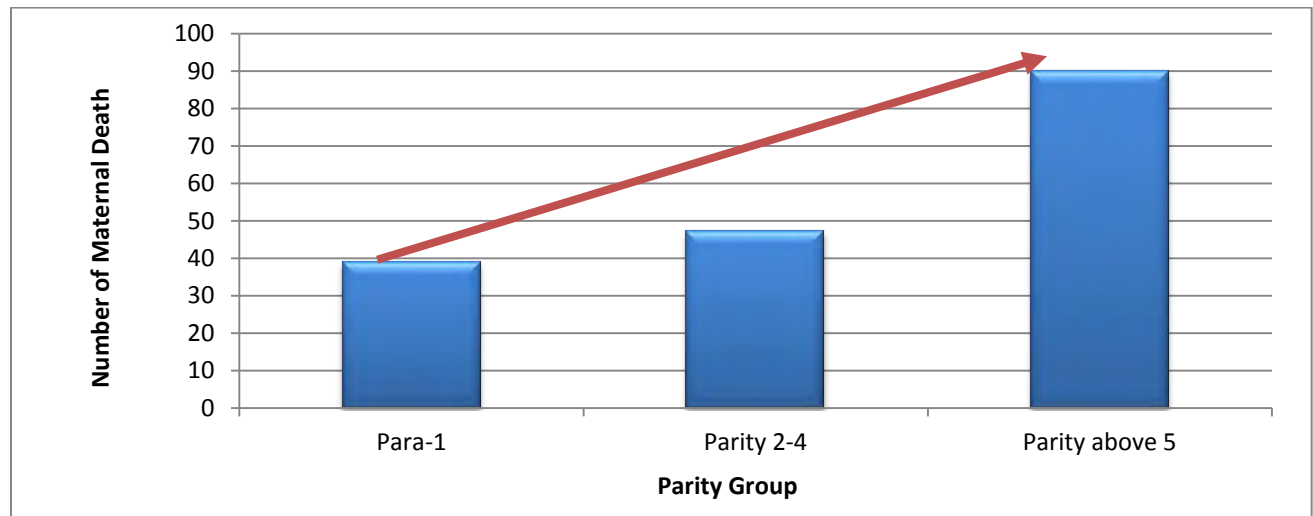


Figure-11 Frequency distribution of maternal death by Parity from Oct, 2013 to Jan, 2015

2.3. Distribution of Maternal Death by Time

As depicted by the figure bellow, from the 94 data that have been collected by case based report, relatively high number of death is reported in April and August, 2014 and maternal death is unevenly distributed within the time period.

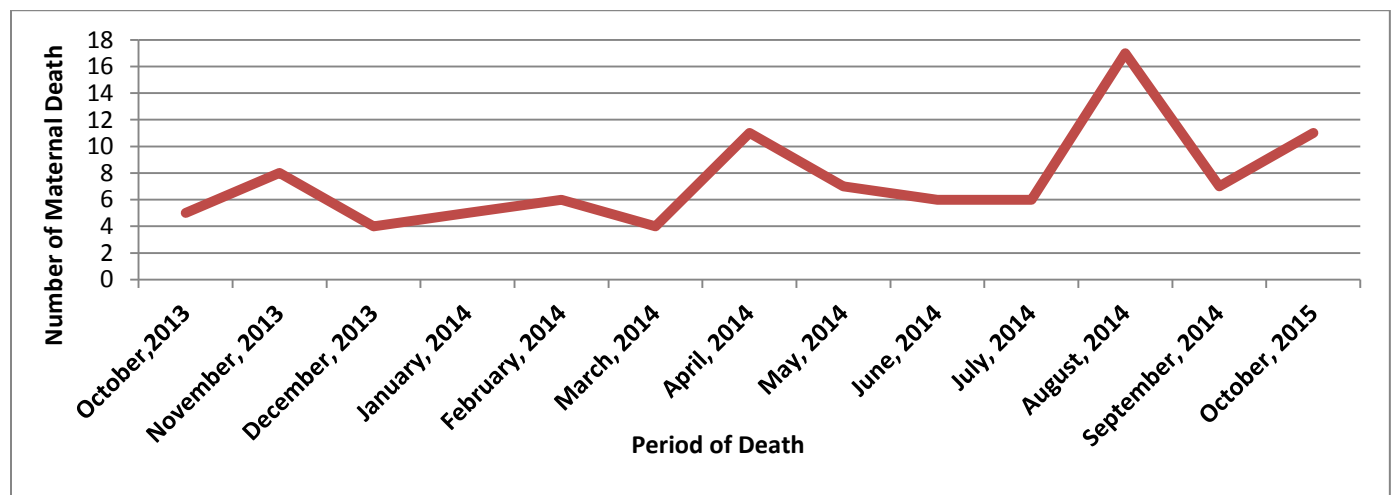


Figure-12 Frequency distribution of maternal death by period of death from Oct, 2013 to Jan, 2015

As shown in the figure bellow most of the death occurred in the time period were at the post partum period

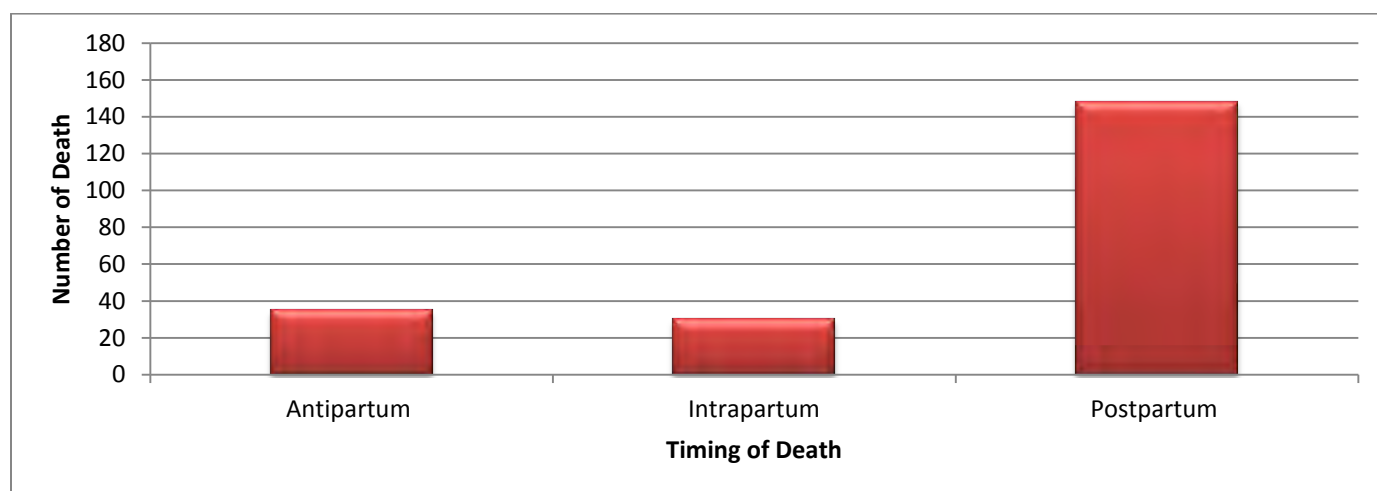


Figure-13 Frequency distribution of maternal death by timing of pregnancy from Oct, 2013 to Jan, 2015

3. Cause and Contributors to Maternal Death

From the total 226 deaths reported in the period 210 deaths have full report of identified causes. Causes of maternal death are reported as direct obstetric and indirect obstetric causes. The figure bellow shows the distribution of causes of maternal death in study period.

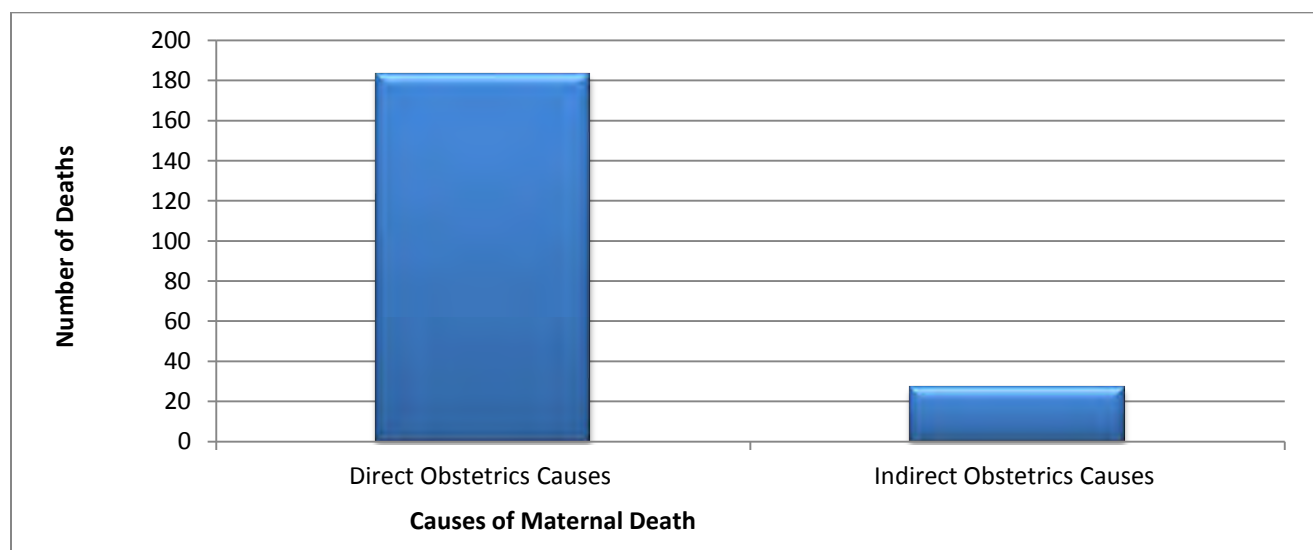


Figure-14 Frequency distribution of causes of maternal death from Oct, 2013 to Jan, 2015

As described in the chart bellow more than half of the maternal deaths that are categorized as direct obstetric causes are identified to be caused by hemorrhage

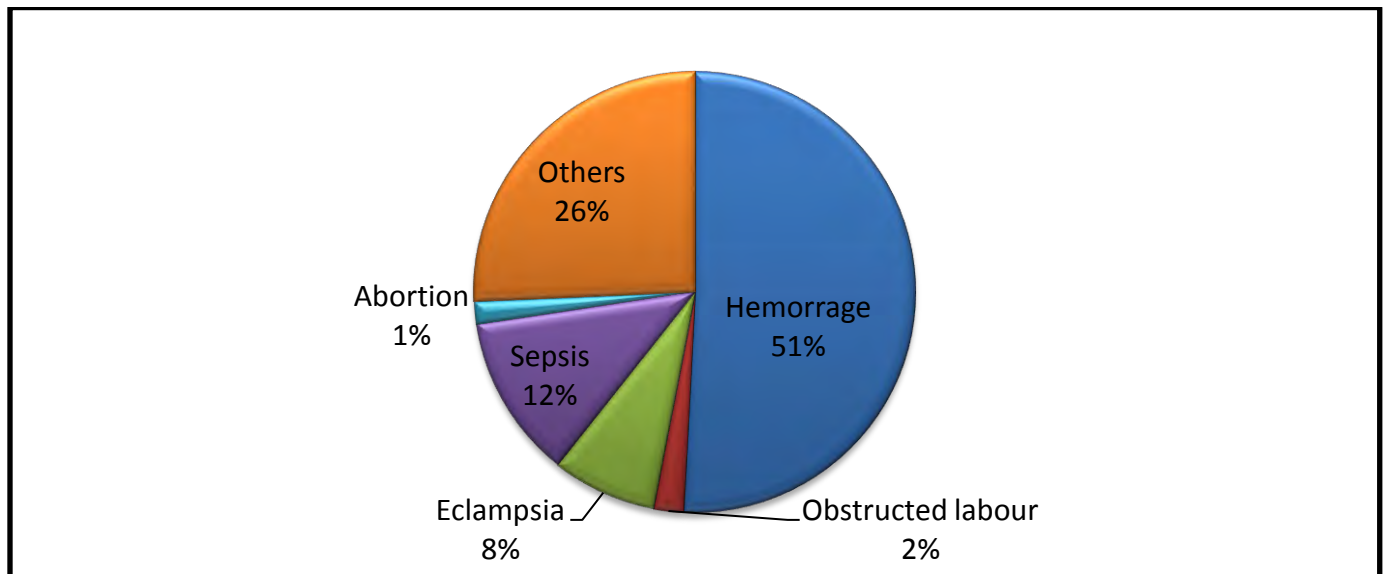


Figure-15 Frequency distribution of direct obstetrics causes of maternal death from Oct, 2013 to Jan, 2015

As described in the chart bellow many of (63%) the maternal deaths that are categorized as indirect obstetric causes are identified to be caused by conditions that are categorized as “others”

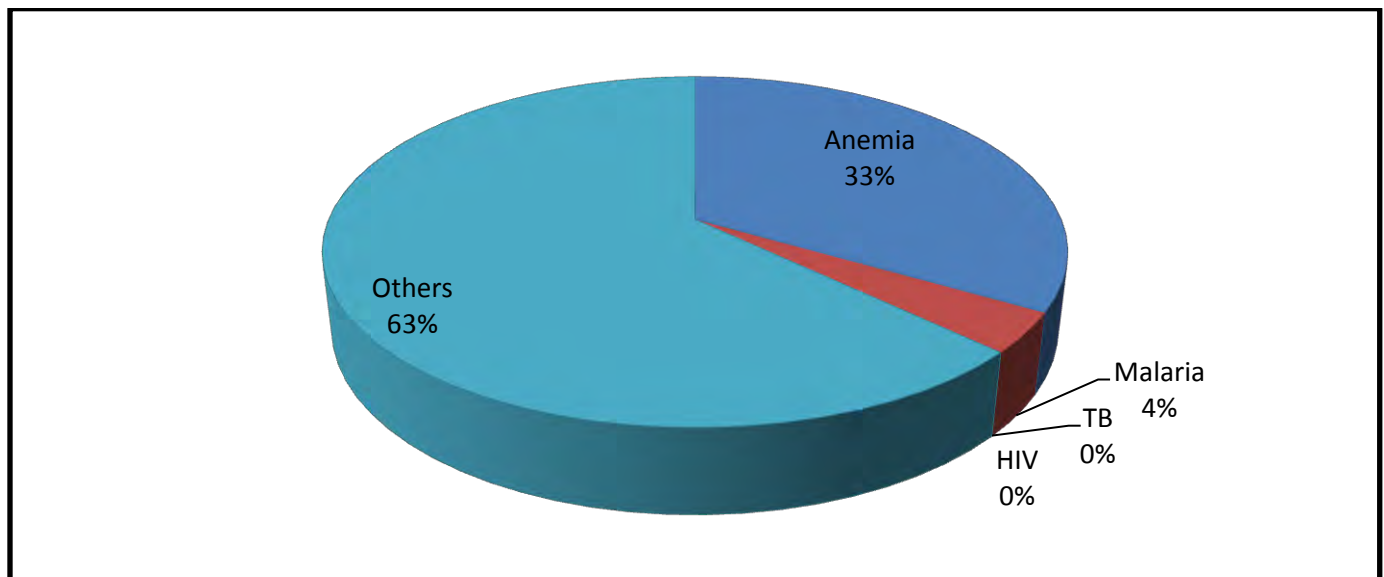


Figure-16 Frequency distribution of indirect obstetrics causes of maternal death from Oct, 2013 to Jan, 2015

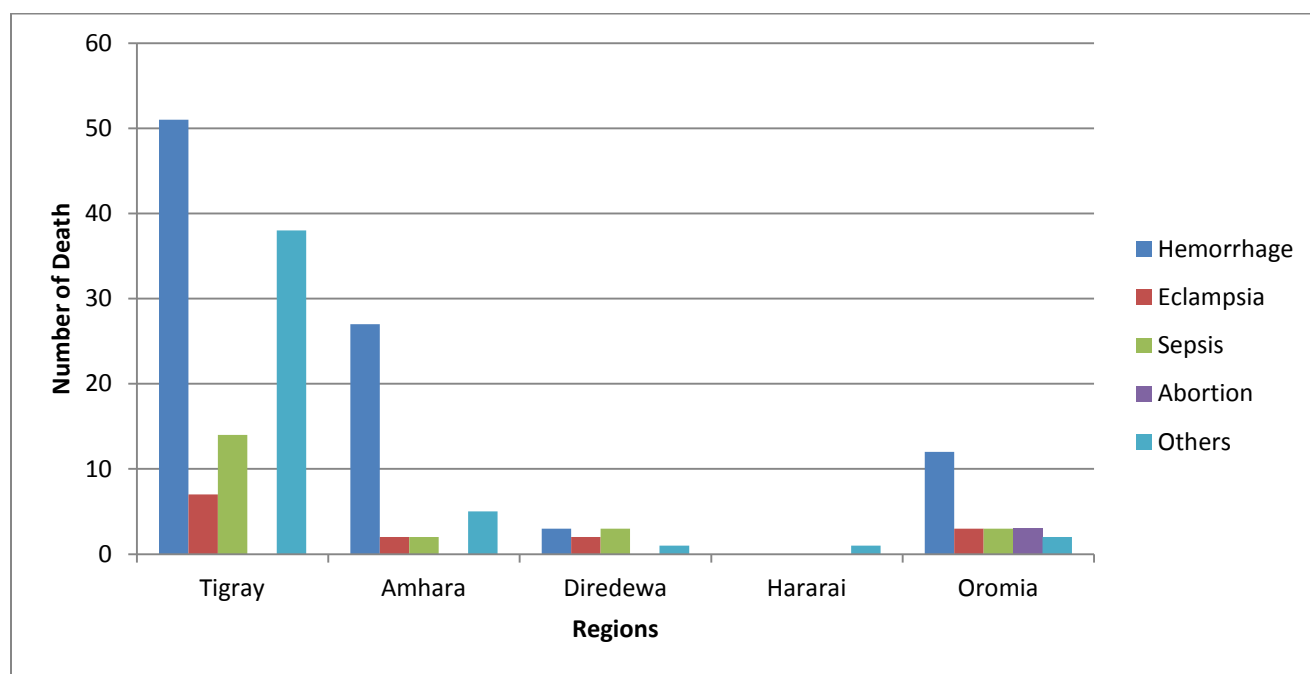


Figure-17 Frequency distribution of causes of maternal death by region from Oct, 2013 to Jan, 2015

As described in the figure bellow first delay (delay before reaching health facilities) contributes to almost half of the reported maternal death.

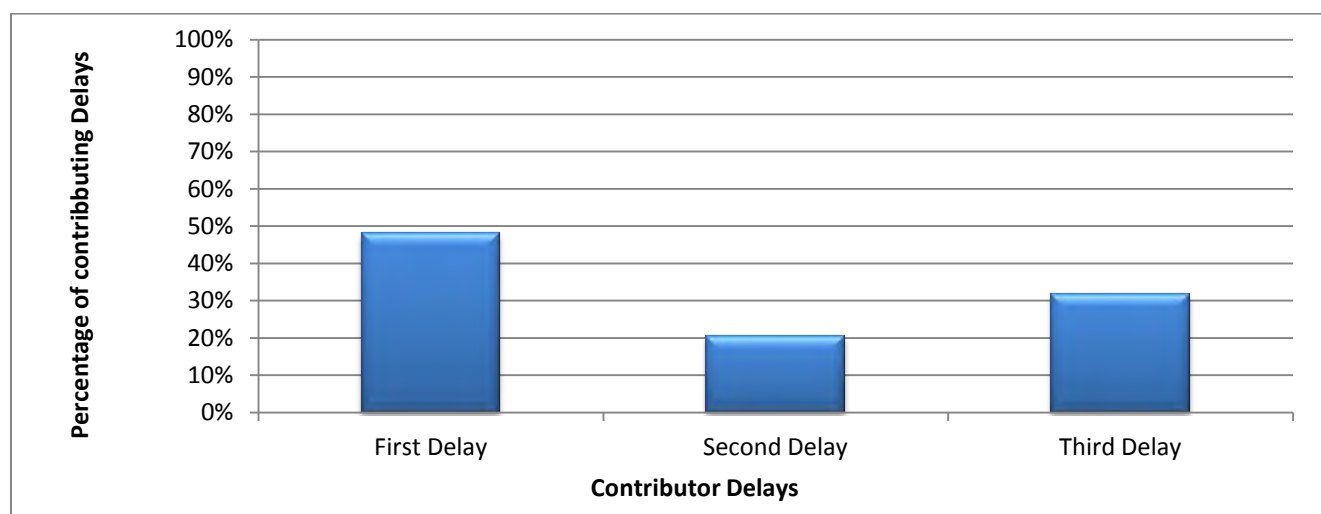


Figure-18 Frequency distribution of Identified contributing delays of maternal death from Oct, 2013 to Jan, 2015

The figures bellow shows the major reasons for the first and third delays encountered by the mothers before death, collected from the 94 data that have been gathered by case based report.

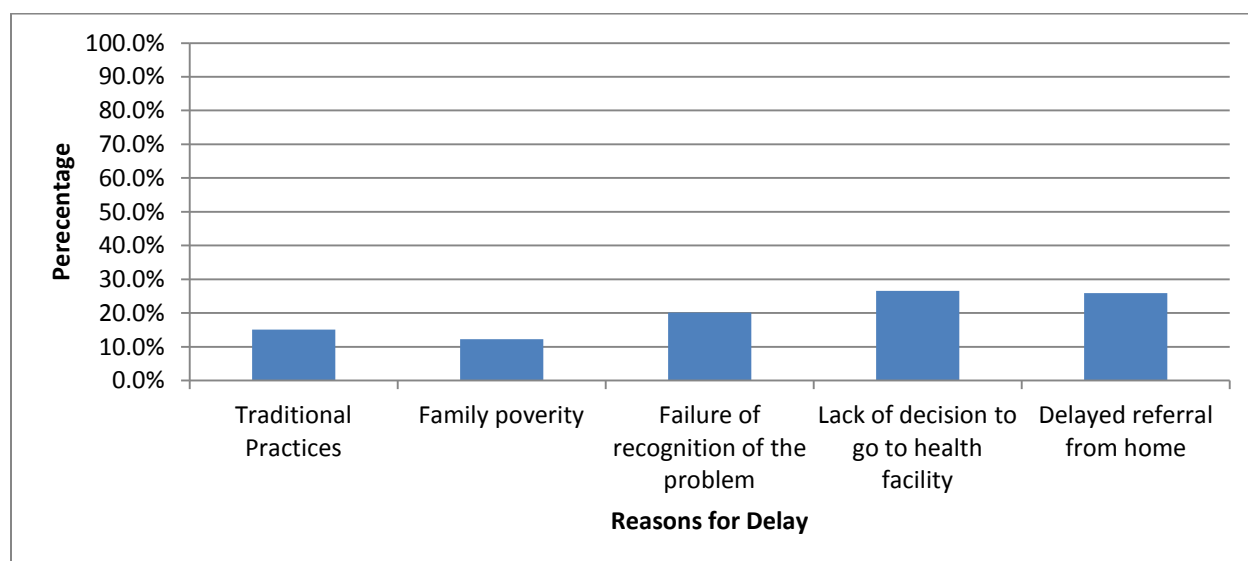


Figure-19 Frequency distribution of major reasons of first delay encountered by mothers before death in the period from Oct, 2013 to Jan, 2015

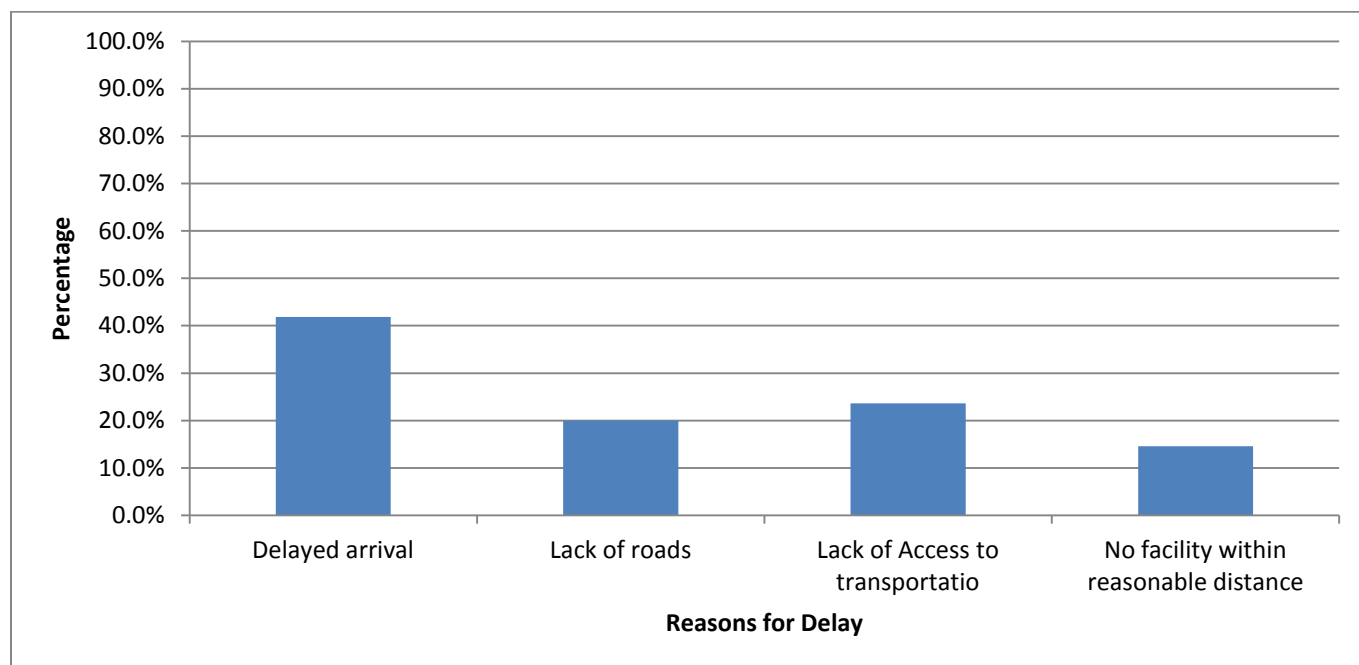


Figure-16 Frequency distribution of major reasons for secondary delay encountered by mothers before death in the period from Oct, 2013 to Jan, 2015

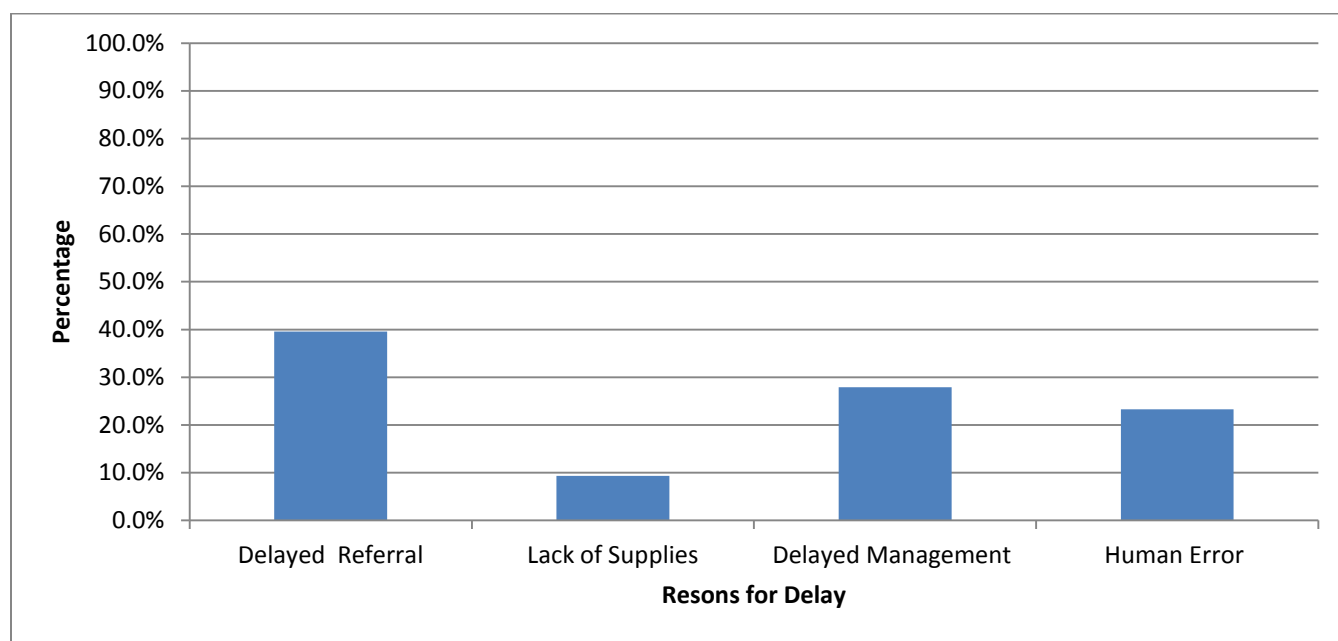


Figure-20 Frequency distribution of major reasons for third delay encountered by mothers before death in the period from Oct, 2013 to Jan, 2015

Form 226 deaths reported 177 deaths have an identified judgment regarding preventability of the maternal death and as described in the figure bellow almost all (96%) of the deaths were reported as preventable.

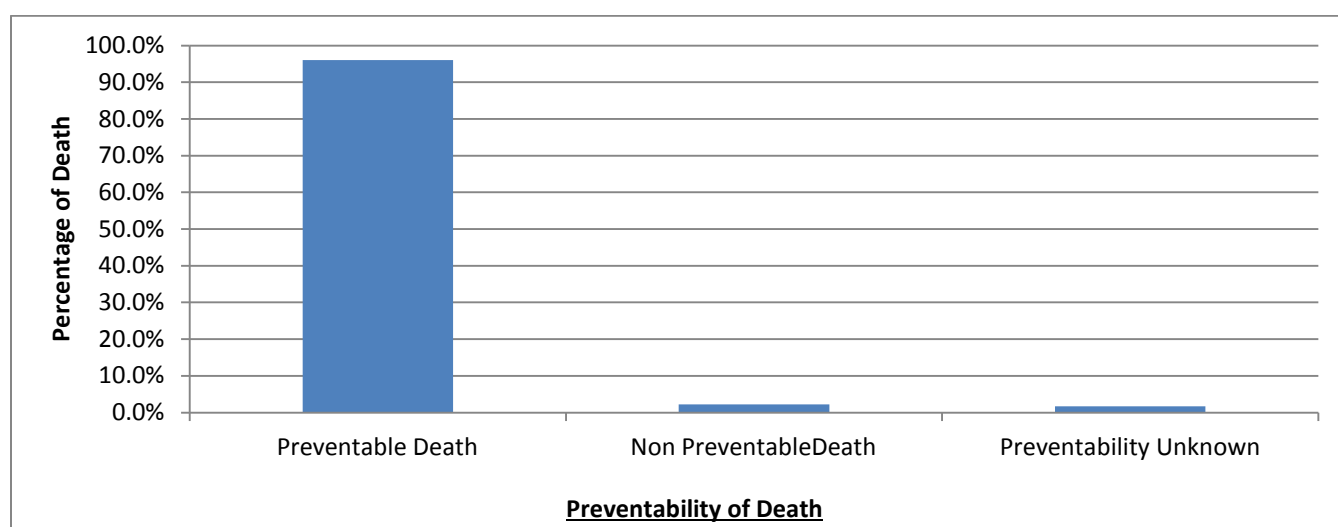


Figure-21 Frequency distribution of Preventability Status of Maternal death from Oct, 2013 to Jan, 2015

Discussion

Different literatures show that the age of a pregnant woman affects her chances of dying from maternal cause. Based on this study most of the deaths (45%) happened on the upper age groups (30-39) with an overall mean age of 30.3 years (+/- 1.4 years) . Age is one of the biological factors that have an influence on the occurrence of maternal death. This is due to a range of biological and social factors. For instance, young women may be at increased risk of obstructed labour, if their pelves are not mature. Older women may have accumulated health problems like hypertension and diabetes which cause obstetric problems (15). This finding is supported by a study done in Nigeria to assess factors contributing to maternal death, which states the greatest risk of maternal death was among early teenagers and older women (22).

Most of the deaths reported in the study periods were in mothers with lower literacy level, with higher parity and those who reside in the rural part of the country. This is also observed in a maternal death surveillance data analysis conducted in Morocco in which, 53.6% of mothers who died of pregnancy related causes were residents of rural setups of the country (23). A relatively higher number of deaths at rural setup can be explained by the combined effect of literacy status, lack of information and the physical difficulty of accessing health facilities. Literacy status or Education is a distant factor which offers the possibility of affecting the magnitude of maternal mortality in a number of different ways. One is the well known effect of education in lowering fertility. If women get pregnant less and bear fewer children, they are less at risk of maternal death. Women's social status, self image and decision making powers may all be increased through education, which may be key in reducing their risk of maternal death, resulting from early marriage and pregnancy or lack of information about health services (15).

From the total of 11 regions and city administration in the country 6 of them reported maternal death through the MDSR system. More than half of the maternal deaths (58%) were reported from Tigray region alone and followed by Amhara (20%) and Oromia (15%) regions. The high number of maternal death report from Tigry region can be due to a relatively good maternal death tracing mechanism at community and health facility level. The lower death report from

regions with a bigger population size like Oromia and Amhara obligate us to consider a sever under reporting of maternal death in the country, specifically on the afro mentioned regions.

This study also shows that the overall maternal mortality ratio in this sex region is found to be 28.9 per 100,000 live birth the maximum being at Dire Dawa (94.6 per 100,000 live birth) and the minimum at Addis Ababa (2.7 per 100,000 live birth). It is also observed that almost two in 100,000 women in reproductive age group has the chance of dying from maternal causes the maximum being at Tigray (13.1 per 100,000 women in reproductive age group) and the minimum at Addis Ababa (0.2 per 100,000 women in reproductive age group).

Generally the overall maternal mortality ratio observed in this study is far below the WHO estimation (420 per 100,000 live birth) and a recent researches such as a study done in south west Ethiopia to estimate maternal and neonatal mortality(2014 e.c) which reports a maternal mortality ratio of 425 per 100,000 live births (95% CI:318–556) (31). The big disparity of maternal mortality may show as much of the maternal deaths are not reported under the MDSR system and the huge variation among regions may indicate the difference in strength of the system and the focus given to maternal death surveillance.

Based on the Mini DHS, 2014 report only 15% of mothers delivery at health facilities (24). In contrast to the place of delivery on this study it is observed that the number of maternal death encountered at home and hospital is almost equal (33% and 34% respectively). The higher number of maternal death at hospital level is also observed in a maternal death surveillance data analysis conducted in Morocco. In this study the majority of maternal deaths (217/303; 71.6%) occurred in public hospitals, one death occurred in a basic health service (which can be equivalent to our health centers) and 12 (4.0%) during the transfer between health facilities. Only 72 deaths (23.8%) occurred at home or during transit from home to health facility. The relatively high level of maternal death at hospital level can be due to the complexity of the maternal condition presenting at hospital level and it is also difficult to rule out the role of quality of maternal care provided by hospitals.

A good referral system composes of an organized communication system between referring and receiving facilities have the necessary infrastructure such as vehicles and guided by policies and procedures to ensure mothers receive the best possible care closest to home (25). In this study the

other major proportion of mother also died during transfer or referral between two health facilities. In addition to the weak linkage and poor on referral care there are also factors that de motivates mothers to accept and to comply with referral advices. A study done in rural Tanzania to assess the effectiveness of maternal referral shows that the major factors that de motivate not to attend to referral advise includes financial difficulties, in accessibility of transportation, absence of accompany and poor knowledge regarding the importance of referral (26).

The Ethiopian DHS, 2011 finding also shows that more than six women in ten (61 percent) stated that a health facility delivery was not necessary, and three in every ten (30 percent) stated that it was not customary. Fourteen percent of women said that the health facility was either too far or that they did not have transportation (6).

WHO estimates show that the leading causes of maternal deaths are hemorrhage and hypertension, which together account for more than half of maternal deaths. Indirect causes, which include deaths due to conditions such as malaria, HIV/AIDS and cardiac diseases, account for about one fifth of maternal deaths. Regional estimates show that hemorrhage and hypertension are among the top three causes of deaths in both South Asia and Sub-Saharan Africa, where the majority of maternal deaths occur. In this study it is shown that 87% of the deaths caused by direct obstetric cause and from which more than half of the death are caused by hemorrhage and 20% of the deaths are caused by sepsis and hypertensive disease of pregnancy.

It is also possible to see that hemorrhage is a single major factor which accounts for 44.3% of the total death. This finding is also supported by the MDSR data analysis conducted in Morocco which shows that Haemorrhage is the first direct obstetric cause (33% of all deaths). The second leading cause was pre-eclampsia/eclampsia (18%) followed by infections (8%). Ethiopian based researches such as the analysis of risk factors for maternal death and delivery complications' in West Shoa zone, Oromia Region, Ethiopia, 2014 and Health facility-based maternal death audit in Tigray, Ethiopia, 2010 also showed that hemorrhage and infection are among the top three cause of death in their study areas (18,27).

Postpartum Haemorrhage (PPH) is commonly defined as a blood loss of 500 ml or more within 24 hours after birth, while severe PPH is defined as a blood loss of 1000 ml or more within the same timeframe. PPH affects approximately 2% of all women who give birth: it is associated not only with nearly one quarter of all maternal deaths globally but is also the leading cause of maternal mortality in most low-income countries. World Health Organization (WHO) recommends all women giving birth should be offered uterotonics during the third stage of labour to prevent PPH and IM/IV oxytocin (10 IU) is recommended as the uterotonic drug of choice. Other injectable uterotonics (i.e. ergometrine/methylergometrine, or the fixed drug combination of oxytocin and ergometrine) and misoprostol are recommended as alternatives for the prevention of PPH in settings where oxytocin is unavailable. Continuous uterine massage is not recommended as an intervention to prevent PPH for women who have received prophylactic oxytocin, because the massage may cause maternal discomfort, requires a dedicated health professional, and may not lead to a reduction of blood loss. However, surveillance of the uterine tonus through abdominal palpation is recommended for all women for the early identification of postpartum uterine atony (28).

Among the independent obstetric causes Anemia and malaria are found to be the most significant know causes of maternal death and there is no any maternal death report that is associated with TB and HIV this can be explained by the prevalence and incidence reduction of this disease in the general community.

From total 226 maternal death reports, it was possible to get the detail data regarding the associated delays and their reasons only from 95 of the death report. The analysis of this data demonstrates that almost half (48%) of mothers encounter first delay (delay to seek care) before death. From those mothers who encountered first delay before death, the top three reasons reported were Lack of decision to go to health facility (26.6%), Delayed referral from home (25.9%), Failure of recognition of the problem (20%).

The first delay, failure to seek treatment by the pregnant women or her partner/family/relatives, is largely affected by local health beliefs (cultural, religious, bad experience in health facilities, good outcome in previous pregnancies without health care, gender inequality, unaffordable medical service cost and low education) (29). All these are significant limitations particularly among people with limited education and limited exposure to a modern medical care system. In Ethiopia, where the cultural barriers, religious influence, male dominance in household decision

making and bad experiences in available health facilities are quite common-pregnant women usually come to health facilities with obstetric complications (29). As a result of the big delay at home, pregnant women encountered the common life threatening obstetric complications: hemorrhagic, shock, severe anemia, sepsis, generalized peritonitis, obstructed labor, uterine rupture, eclampsia, aspiration pneumonia, coma, severe fetal asphyxia or fetal death. Once a woman develops any of these clinical conditions, the chance of deteriorating to tertiary level complications (multiple organs failure and death) is very high (29).

The other most common delay reported is the third delay which is the delay in receiving medical care (32%). From those mothers who encountered third delay before death, the top three reasons reported were, delayed referral from lower facilities (39.5%), delayed management (27.9%) and human errors (23.3%). Generally the reasons for 60% of the third delays are arises from the internal problem of the reporting facilities. Health facilities internal problems specially problems related with human error and negligence was also observed in a maternal death review conducted in Tigray hospitals which strongly recommend action be taken to improve training of medical staff; develop and maintain standards of care for emergency obstetric care; and improve health information systems to reduce maternal deaths significantly (18).

The England Statistic office defines preventable and avoidable deaths as follow; Preventable mortality: A death is preventable if, in the light of understanding of the determinants of health at time of death, all or most deaths from that cause (subject to age limits if appropriate) could be avoided by public health interventions in the broadest sense. Avoidable mortality: Avoidable deaths are all those defined as preventable, amenable or both, where each death is counted only once. Where a cause of death is both preventable and amenable, all deaths from that cause are counted in both categories when they are presented separately (30).

Based on Ethiopian MDSR technical guide preventability of a maternal death is judged by an “investigation committee” by reviewing and analyzing the information obtained from family and delivey attendant for those deaths occurred at community. For deaths occurred in health facilities information from ANC, delivery is used to classify preventability status of the death. In addition the guide also recommends to consider intersectoral factors like transportation while assessing the likelihood of preventability of the death (1).The surveillance data analysis report shows that almost all deaths (96%) are reported as preventable death. This relatively high figure comparing

with the maternal death review conducted in Tigray region which states only 35% of the maternal deaths were avoidable (18).

Generally looking into the data completeness of the reports, much is need to be done to improve the completeness and the quality. On this study it was possible to see that almost 11 data elements regarding ANC care of died mothers were missing from all reporting region. Most of the data elements specially data elements of parity, causes of death and preventability status of the deaths are missing on significant number of the reported death.

Limitation of the Study

Since MDSR system in Ethiopia is in its infancy stage, there can be a lot of unreported maternal death from those regions implementing MDSR and the data used in this study can be considered as the tip of the iceberg. It may not be also representative of the whole situation of maternal death in the country as most of the emerging regions of the country are not included in this study.

Conclusion

From this study it is possible to conclude the following;

- ⇒ Almost half of the maternal death was reported from mothers with the upper age group.
- ⇒ Majority of the maternal death is reported from mothers residing in rural parts of the country and with illiterate educational status.
- ⇒ Most of the maternal deaths are reported in the post partum period and most of the mothers were grand parous with an overall mean parity of 4.8 births.
- ⇒ The overall maternal mortality ratio obtained in this data analysis is by far below the result of other studies and international estimations.
- ⇒ Hospital and home are the most reported place on which maternal death occurred, accounting for 67% of the total death
- ⇒ 87% of deaths are reported to be caused by direct obstetric causes and from which hemorrhage alone causes almost half of the total maternal deaths.
- ⇒ First delay (which includes lack of decision to seek care, lack of knowledge to identify problems and delayed home referral) was identified by most reports as a major factor in which most mothers faced before death.
- ⇒ Almost all of the death (96%) were reported as preventable maternal deaths
- ⇒ Data completeness was poor as demonstrated by 11 data elements were missing on case based report and have a great variation among regions.

Recommendation

Based on the result observed in this study it is possible to recommend the following major points to appropriate stakeholders at all levels of the health sector.

- ⇒ Health education on danger signs of pregnancy and on the need for institutional delivery should be strongly provided specially focusing on highly burdened rural and illiterate community.
- ⇒ As most of the deaths are occurring in the post partum period, teaching institutes and health authorities at all level should provided capacity building activities and follow up focusing on active third stage management of labour and postnatal care.
- ⇒ To reduce maternal mortality and improve maternal health focus should be given to top three killers (hemorrhage, sepsis and hypertensive disease of pregnancy) specially to hemorrhage which accounts almost half of the total death.
- ⇒ To reduce deaths caused by first delays health extension workers should strongly work on awareness creation activities which consider the local culture of the community to promote institutional delivery and birth preparedness.
- ⇒ The health regulatory bodies and health facilities management should strongly work on ethical medical practice and create a mechanism to review maternal deaths and near misses so as to identify and improve professional errors and delayed management of mothers with obstetric condition.
- ⇒ In order to reduce maternal mortality and sustainably improve maternal health in the country ministry of health and other stakeholders are recommended to use a multi sectorial approach as most of illiterate and rural women with lower information and poor infrastructure are at high risk of maternal mortality.
- ⇒ A general Surveillance evaluation is recommended to identify major reasons that cause poor data completeness and variability in data quality among regions.

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Chapter Three- Evaluation of Surveillance System

3.1. Evaluation of Maternal Death Surveillance and Response (MDSR) System in Tigray Region, North Ethiopia

Abstract

In 2013 an estimated 289,000 women worldwide died from pregnancy and its complications, 99% of them in developing countries. Estimates conducted by different organizations regarding magnitude of maternal death significantly vary among each other, the DHS estimate (676 deaths in 100,000 live births) and the WHO estimate (420 deaths in 100,000 live births) can be an example. One of the challenges in eliminating preventable maternal death in the nation is absence of information that effectively shows the true magnitude of maternal mortality to guide intervention. As an intervention, Ministry of Health started to implement maternal death surveillance and response (MDSR) system as a weekly reportable event since October 2013. Since then, no study was conducted to assess the efficiency and effectiveness of the system. The objective of this project is to assess the efficiency and effectiveness of the current MDSR system in Tigray Region. We used descriptive data analysis of the MDSR report in the region followed by a cross sectional study on selected health facilities and key informants. We have identified that the implementation process of the surveillance system at facility level is not uniform in terms of reporting system and formats utilized. The simplicity (scored 3.6/5), acceptability (scored 3.2/5), timeliness (scored 3.64/5) and the usefulness to identify cause of death (scored 3.3/5) are attributes of the system, which identified as areas demanding improvement. There is a big disparity between estimated number of maternal deaths and deaths reported through the surveillance system, which reduce the representativeness (calculated representativeness of 16%) of the system. The Federal Public Health Emergency Management Unit (PHEM) and Tigray Health Office should give focus to attributes that identified as areas' demanding improvement, guidance and follow up is recommended to improve the representativeness of the system.

Introduction

Background

Maternal death is the death of a woman while pregnant or within 42 days of 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)

An estimated 289000 women worldwide died from pregnancy and its complications in 2013, 99%, of them in developing countries making the global MMR in 2013 to be 210 maternal deaths per 100 000 live births, (2). Reported maternal mortality underestimates the true magnitude by up to 30% worldwide and by 70% in some countries (3).

Generally according to WHO report, every day, approximately 800 women die from preventable causes related to pregnancy and childbirth and 99% of all maternal deaths occur in developing countries. Maternal mortality is higher in women living in rural areas and among poorer communities. Young adolescents face a higher risk of complications and death as a result of pregnancy than older women. (4)

Based on the WHO report on trend of maternal death from 1990- 2013, the sub-Saharan Africa region alone accounted for 62% (179000) of global deaths followed by Southern Asia at 24%. (5) The MMR in developing regions (230) was 14 times higher than in developed regions. Sub-Saharan Africa has the highest MMR (510) than the remaining MDG developing regions (5). The report also have identified 40 globally high burden countries, Sierra Leone being the most burdened country with MMR of 1100 maternal deaths per 100,000 live births (5).

Ethiopia is one of the eleven countries which contribute to the 65% of world maternal mortality (5). The recent demographic and health survey (DHS) estimated that maternal mortality of Ethiopia to be 676 per 100,000 live births. Based on the WHO report on trend of maternal death from 1990- 2013 the Ethiopian maternal mortality ratio is estimated to be 420 per 100,000 live births with 5% C.I (5.4-4.6) annual average reduction. However it is to be noted that the

reduction is lower than the needed level of annual reduction (5.5%) to reach the MDG goal of reducing MMR by 75% between 1990 and 2015 (6).

Maternal death is affected by the biological, social and cultural factors. Common biological factors include age of the mother, level of parity, birth spacing, wantedness of the pregnancy and presence of other medical problems in the mother. There are also complex socio cultural and health system factors that lead to maternal death which grossly includes poverty, distance for health care, lack of information, inadequate services and cultural practices (8).

In addition to epidemiological burden and the socio political interest on maternal death, it also has a great impact on the economy of a family. Based on a study done in western rural Kenya regarding the economic burden of maternal death on households, the health service utilization costs associated with maternal deaths were significantly higher, due to more frequent service utilization as well as due to the higher cost of each visit suggesting more involved treatments and interventions were sought with these women. The already high costs incurred by cases during pregnancy were further increased during delivery and postpartum mainly a result of higher facility-based fees and expenses. Households who experienced a maternal death spent about one-third of their annual per capita consumption expenditure on healthcare access and use as opposed to at most 12% among households who had a health pregnancy and delivery. Funeral costs were often higher than the healthcare costs and altogether forced households to dis-save, liquidate assets and borrow money. What is more, the surviving members of the households had significant redistribution of labor and responsibilities to make up for the lost contributions of the deceased women (7).

Even if maternal death poses a huge socio economical burden both in the globe and Ethiopia, Most maternal deaths are preventable, as the health-care solutions to prevent or manage complications are well known. Critical interventions include, all women need access to antenatal care in pregnancy, skilled care during childbirth, and care and support in the weeks after childbirth. It is particularly important that all births are attended by skilled health professionals, as timely management and treatment can make the difference between life and death (4). The majority of maternal deaths in developing countries are due to five major direct obstetric complications: hemorrhage, infection, unsafe abortion, hypertensive disorders of

pregnancy, and obstructed labour (7). For instance the common causes of maternal death in the glob are preventable by applying the following proven preventive measures;

Severe bleeding after birth can kill a healthy woman within hours if she is unattended. Injecting oxytocin immediately after childbirth effectively reduces the risk of bleeding. Infection after childbirth can be eliminated if good hygiene is practiced and if early signs of infection are recognized and treated in a timely manner. Pre-eclampsia should be detected and appropriately managed before the onset of convulsions (eclampsia) and other life-threatening complications. Administering drugs such as magnesium sulfate for pre-eclampsia can lower a woman's risk of developing eclampsia. To avoid maternal deaths, it is also vital to prevent unwanted and too-early pregnancies. All women, including adolescents, need access to contraception, safe abortion services to the full extent of the law, and quality post-abortion care (4).

System Description of Maternal Death Surveillance and Response (MDSR) in Ethiopia

The MDSR system in Ethiopia was started in October 2013 and based on ministry of health MDSR technical guideline the system has two major purposes;

- ⇒ MDSR provides information about avoidable factors that contributed to a maternal death and guides actions that need to be taken at the community level, within the formal health care system, and at the intersectoral level (i.e. in other governmental and social sectors) to prevent similar deaths in the future (6).
- ⇒ MDSR establishes the framework for an accurate assessment of magnitude of women's deaths related to pregnancy. By having an accurate assessment of maternal mortality, policy and decision makers may be more compelled to give the problem the attention it deserves. In addition, evaluators will more accurately assess the effectiveness of interventions to decrease mortality rates (6).

Based on the MDSR guideline there are two major sources of maternal death report (community and health facility maternal death report) and the overall surveillance and response process follows the same pattern as the sources.

A. Community Based Maternal Death Surveillance

For deaths happening outside of the facility, the health extension workers will establish a link with all possible sources of information for identifying deceased women of reproductive age. For In the community, the sources for the information include:

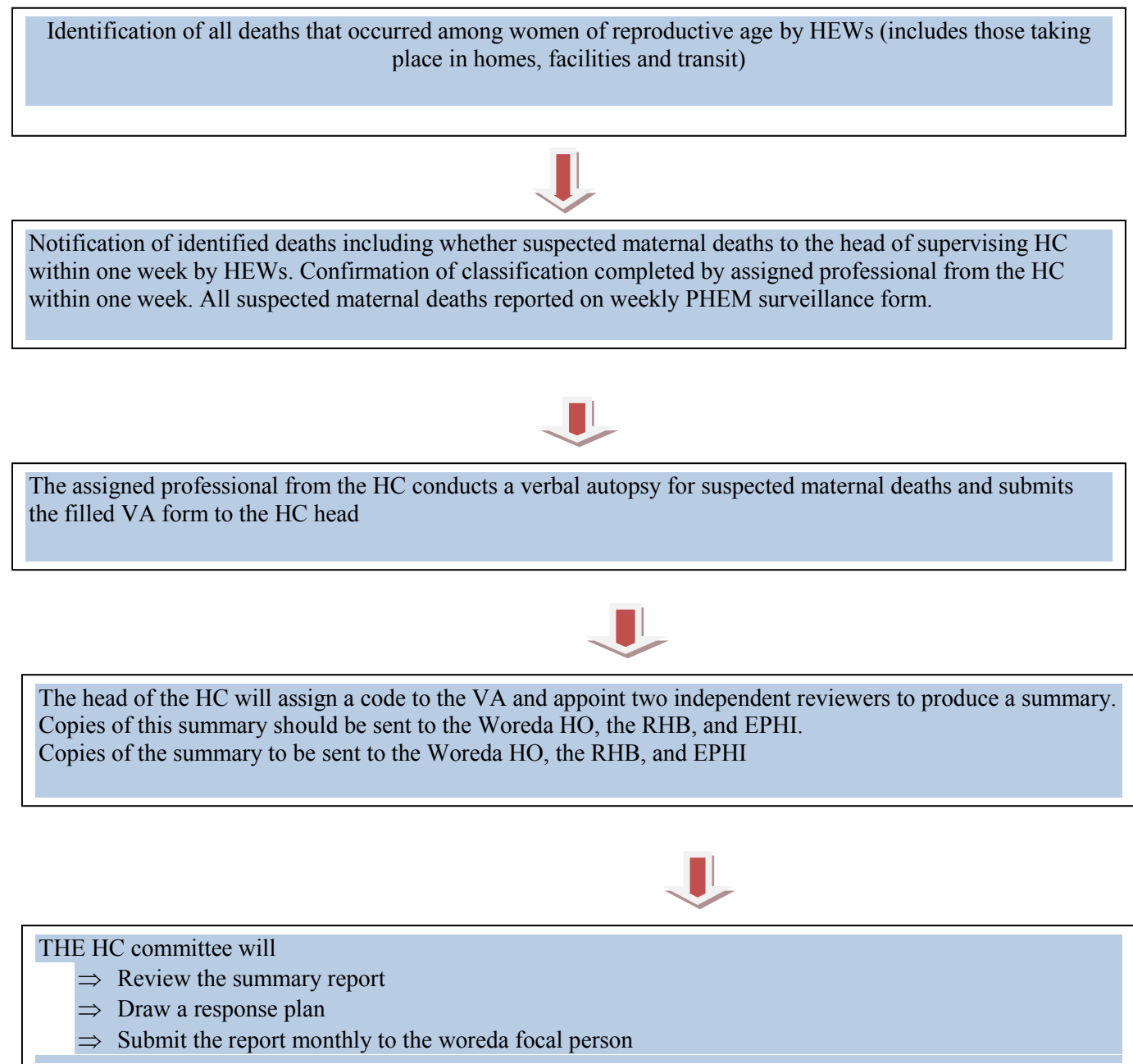
- Health Development Army members
- Religious leaders/institutes
- Community leaders
- Administrative leaders
- The HEW
- Community members (6)

Any of these individuals can identify a death to women of reproductive age (15-49), and should notify the local HEW. The HEW should pass on the Information to the Health Centre Head, who will arrange the Verbal Autopsy (VA). Family and other community members assist in completing the VA, which relies on the following sources of information:

- Persons who primarily attended the women during illness
- Persons who attended the women in labour and delivery (if at home)
- Persons who were present at the side of the woman at the time of death Husband (who is likely to have additional details on the woman's experiences during pregnancy) (6)

The details of the procedures are described in the following flow chart.

Maternal Death Review at Community Level (Source - Ethiopian MDSR technical Guideline)



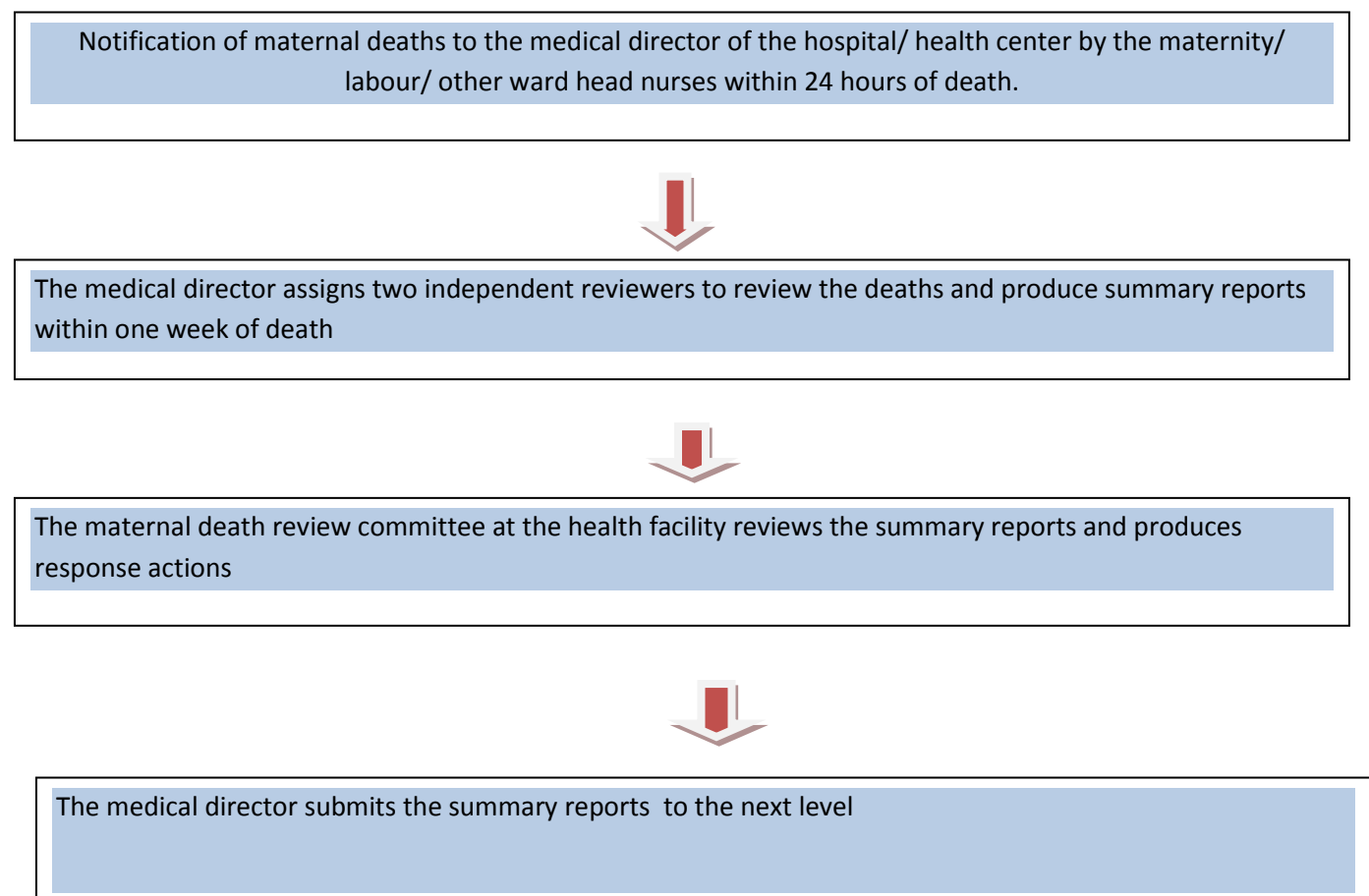
B. Health Facility Based Maternal Death Surveillance

The head of the any ward where a suspected maternal death occurs is responsible for notifying these to the head of the health facility/the medical director. The sources of the information for facility deaths reviews include:

- ⇒ Referral sheets
- ⇒ Medical records
- ⇒ Log books (OR, maternity, OPD, anaesthesia)
- ⇒ Attending health workers (OPD, maternity, OR)
- ⇒ Others (6)

The details of the procedures are described in the following flow chart.

Maternal Death Review at Health Facility Level (Source - Ethiopian MDSR technical Guideline)



C. Cased Definitions Used in the Surveillance System

- ❖ **Maternal Mortality** – “The death of a woman while pregnant or within 42 days of 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.” (6)
- ❖ **A Suspected Maternal Death** – “The death of any woman while pregnant or within 42 days of the termination of pregnancy” (6)
- ❖ **A Probable Maternal Death** – “Deaths among women of reproductive age, not clearly due to incidental or accidental causes.” (6)
- ❖ **Direct Obstetric Deaths** – “Those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.” (6)
- ❖ **Indirect Obstetric Deaths** – “Those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy” (6)
- ❖ **Pregnancy Related Death** – “The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (and) is intended for countries that wish to identify deaths occurring in pregnancy, childbirth and up to 6 weeks after the end of pregnancy but where the cause of death cannot be identified precisely.” (6)

D. Data Analysis

The collected maternal death information will be analyzed at a multiple levels. At hospital and Health Centers level every death is reviewed based on a set of standardized formats and they are expected to generate response plan based on the identified problems. A descriptive analysis is performed at Woreda, Zonal and Federal level. The descriptive analysis is mainly consists of information related to socio demography of the deceased mothers, cause of death, contributory factors, and maternal mortality ration. (6)

E. Legal and Ethical Framework

Based on the MDSR guideline the consent, informed decision of the participants and confidentiality should be maintained and the following methods are recommended to be practiced

- ⇒ Family and friends of the deceased should be well informed about the review process. Their voluntary participation should be sought for and the interview can be interrupted at their request. This particularly applies for verbal autopsy. Their consent should be sought.
- ⇒ Families and health care workers directly and indirectly involved in the review process have to be reassured of their privacy.
- ⇒ The identities of the deceased, family and health care providers involved in the management should be kept confidential and known only to those who are doing the actual review.
- ⇒ Anonymizing staff member may be done for example by labeling them as Midwife A, Midwife B, Doctor X etc.
- ⇒ All persons having access to identifiable information will sign a confidentiality agreement stating that they will not disclose any identifiable information.
- ⇒ Data collection forms, case summaries, review meeting minutes and reports or dissemination results will not contain any personal identifiers. (6)

F. Dissemination of findings

The information needs to be disseminated using a variety of channels to enable a wide range of people to access it, to ensure that the information gets to the right audience, namely those 29

who can act on the recommendations. If specific causes of deaths are identified as particularly problematic, conferences or seminars can be held to educate health staff. The guideline recommends using different dissemination methods of starting from presentation on meetings to scientific publications and audio visual reports. (6)

G. Resources Used for Maternal Death Surveillance

In order to implement this system there are resource needed to be invested. This resource includes;

- ⇒ Transportation costs for professionals doing community verbal autopsy
- ⇒ Additional time spent by the health extension workers to collect and send maternal death reports
- ⇒ Additional time spent by facility based maternal review committee members
- ⇒ Additional time spent by Zonal, regional and federal public health emergency personnel and task force members
- ⇒ Printing and distribution cost for the following routinely used formats
 - Notification form
 - Verbal autopsy tool
 - Verbal autopsy consent form
 - Facility based abstraction form
 - Maternal death reporting form (summarizing the VA)
 - Action plan template
 - Near miss review forms

According to the FMOH, MDSR guideline the regional health bureaus and Woreda health offices are responsible to cover all Printing and distribution costs. The guideline doesn't implicate any source of budget for other needed resources and the current practices shows that the activities are integrated in to the routine surveillance tasks and also using the routine sources of budget's of health facilities. (6)

3.1.2. Rationales of the Evaluation

Ethiopia is one of the countries with high burden of maternal death. As the country have no vital registration or other supporting system it is difficult to estimate maternal mortality rate on regular and routine bases which makes implementation of MDSR system to have a paramount value. MDSR system in Ethiopia has two years history in which Ministry of health and development partners launched the program on May 2013 and started implementation on

October, 2013. Since then the ministry of health is using it as one of the methods to measure maternal death in the nation.

However there is no evaluation studies conducted in the nation regarding the current practiced MDSR system. Therefore this study will help to identify the early challenges of MDSR in Tigray region which can give crucial information about the national status of MDSR system in general.

In addition to showing the overall status of maternal death surveillance system in the country the study also assists to identify major challenges in overall attributes of the surveillance, which in turn assists in improving the overall MDSR system of the country.

Objectives of the Evaluation Study

General Objective

To assess the efficiency and effectiveness of the current practices including the attributes and limitations of maternal death surveillance and response system in Tigray region in 2015 G.C, so as to recommend areas for further improvement.

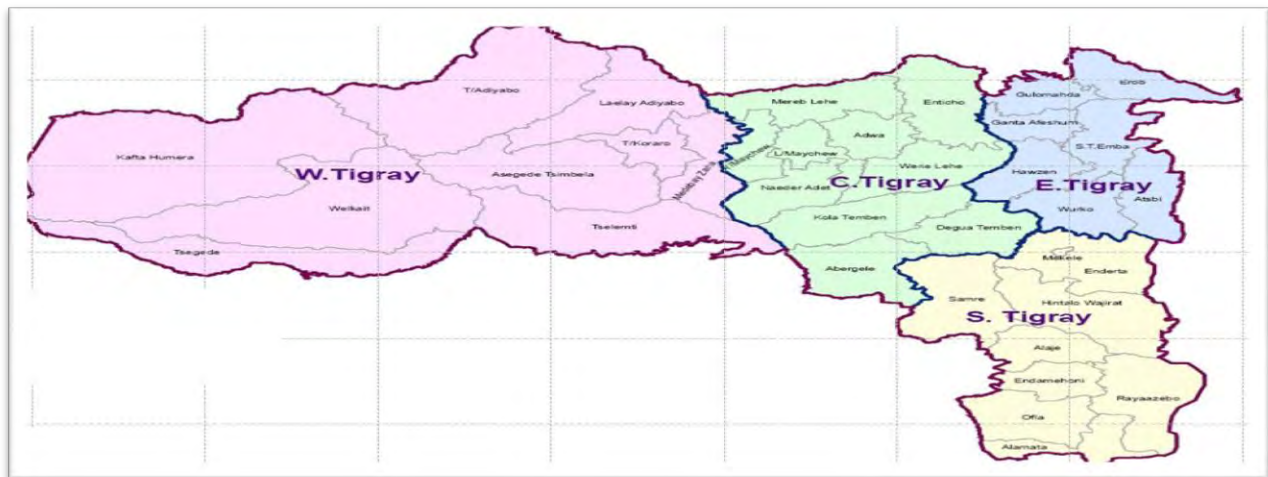
Specific Objectives

- ⇒ To describe the overall current practices of the surveillance system (starting from death notification to feedback provision) maternal death surveillance and response system in Tigray region in 2015
- ⇒ To describe and measure the attributes and major areas of improvement for maternal death surveillance and response system in Tigray region in 2015

Methods of the Evaluation

Study Area and Period

The evaluation study was conducted in Tigray region which situated in the northern part of Ethiopian 700 km from the capital city Addis Ababa. Based on the federal ministry of health (MoH), health and health related indicators report in the region there are a total estimate of 994976 women in reproductive age group (15-49) and there are also 167,390 expected pregnancies and 168, 640 live births in the year 2006 E.C. Therefore, the populations covered under the MDSR surveillance are all expected pregnancies in the region. The detail of the administration classification of the region is demonstrated in the map below. The study was conducted from Feb 4 to 11, 2016 G.C.



Map of Tigray Region, North Ethiopia.

Study Design

A descriptive review of MDSR data followed by a cross sectional survey on selected informants was applied.

Sampling Methods

A purposive sampling method was applied to select four hospitals, eight health centers and eight health posts in Tigray region in order to show the overall status of MDSR implementation in the region.

Data Sources

The following were data source used in this study

1. Review of documents which includes;

- ⇒ National MDSR database
- ⇒ Tigray regional MDSR data base
- ⇒ Health facilities labor and delivery log books
- ⇒ Health facilities maternal death review documents and response plans
- ⇒ Verbal autopsy report at health centers
- ⇒ Health post notification forms and log books

2. Survey (face-to-face interview)

- ⇒ Interview with the labour and delivery head, medical director, CEO (not applicable at health centers) and randomly selected health professionals working in labour and delivery units of the selected health facilities.
- ⇒ Interview with the health extension workers in the selected health posts.
- ⇒ Interview with key informants (MDSR focal units at EPHI, Tigray regional health bureau and WHO focal unit at Tigray)

Data Collection Method and Instruments

The review of the documents was done using a checklist (annexed -2) and the interviews was conducted using a separate questionnaire for health facilities, health posts and key informants (annex 3 and 4). The face to face interview was conducted by the investigator and by one additional FETP resident at Mekele field base.

Data Management

The collected data was entered, cleaned and analyzed using excel -2007 and EPInfo-7

Definition of Terms

All case definition listed in the system description part of this document was applied and other definitions are listed below

- ❖ **Consistent reporting** – When a health facility or health post reports MDSR report for 9 months of a year.
- ❖ **Contributing Factors** - “The social, economic environment, physical environment, and the person’s individual characteristics and behaviors which contributes to the death.”
WHO, Health Impact Assessment
- ❖ **Health Facilities** – In this study health facility refers all types of hospitals and health centers.

Surveillance Attributes and their Measurements to be used

The table below describes the list of attribute and their measurements

Table-13 List of Attributes and their measurement Method for MDSR system Evaluation in Tigray Region

S.No	List of Attributes	Measurement Method
1	Simplicity	Perceived(Facility interviewees) simplicity of information need to establish diagnosis listed on MDSR
		Quantities and complexity of reporting sources
		Perceived simplicity of data analysis by different levels of health offices
		Time spent to maintain the system
		Level of integration with other systems
		Number of report receivers
		Staff training requirement to implement MDSR at different levels
		Simplicity of distribution or reports
2	Flexibility	Presence of any demand for improvement or change from users
		The response given by MDSR system toward users demand

3	Acceptability	Health facility participation rate in MDSR system in the region
		Woreda and Zone participation rate in MDSR system in the region
		Completion rate of death reviews at health facility level
		Verbal autopsy completion rate
4	Sensitivity	Proportion of maternal deaths reported from total expected maternal deaths (expected prevalence)
		Number of events in which the system is able to identify increments in maternal death at specific area
5	Predictive Value Positive	Number of reported maternal deaths which are actually true maternal deaths at health facility level
		Number of reported maternal deaths which are actually true maternal deaths at community level
6	Data Quality	Proportion of blank or unknown values in regional report
		Consistency of maternal death between facility log books and report
7	Representativeness	Level of representativeness of maternal death report at Facility
		Level of representativeness of maternal death report at Woreda
		Level of representativeness of maternal death report at Region
8	Timelines	Proportion of reports sent as per set timeline
		Availability of death reports during regional and Woreda level planning
9	Cost and Benefits	Cost of personnel salary working specifically for MDSR
		Travel costs
		Training costs
		Supply costs (formats . . .)
		Equipment costs
		Cost fo transmission of report from level to level
		Benfits- estimated maternal deaths averted from using MDSR system

Measures of Level of Usefulness of Surveillance System

The level of usefulness of a surveillance system was evaluated based on the objectives of the system and the following measures was applied to measure the usefulness of the system

- ⇒ Perceived (from interview) and observed (from databases) ability of the system to detect maternal deaths in the community and health facilities
- ⇒ Ability of the system to estimate maternal deaths (both community maternal mortality ratio and facility based maternal mortality rate)
- ⇒ Ability of the system to show trend of maternal death both in the community and health facility
- ⇒ Ability of the system to show the progress and effect of preventive and control methods applied against maternal death
- ⇒ The ability of the system to lead health facilities to improve clinical and ethical practices.

Data Analysis

The principal investigator supervised the data collection procedure and when necessary edits interviews onsite which found to have problems. Every data tabulation was done using excel-2007 and Epiinfo7. During data entry the choices for surveillance attributes was coded (Strongly agree -5, Agree-4, Neutral-3, Disagree-2 and strongly disagree- 1) and the average scores was tabulated under each components of the surveillance attributes. Before analysis the data was clean for any missing, illegal and logical inconsistent values using excel-2007 and Epiinfo7. After cleaning the collected data a descriptive analysis was performed and the frequency distributions of the variables was presented using tables and graphs.

Limitations of the Study

Since the number of purposively selected health facilities are limited due to resource constraints, the identified practices may not show the overall picture of MDSR implementation in Tigray region. To make the limitation minimum the selection of health facilities was performed by considering distribution of maternal death burden and geographical location of Woredas. The current status (strength or weakness) of MDSR implementation in the health facilities was not used to select the study units.

Ethical Considerations

After getting an ethical approval from EPHI, IRB, a formal letter was written to the Tigray health offices and all selected health facilities in order to get permission to access data and personnel working on MDSR system. Any information related with personal identification (both the deceased mother and professionals attending the care of the mother) was not collected.

Risk and Mitigation

Following the above ethical considerations, this study has no significant risk on both the study units and selected health facilities. When discrepancies or conflict of interest arise with the study result an objective based measures will be applied prior to release of the study result.

Dissemination Plan

The result of this evaluation can be disseminated as a written report for Tigray regional health bureau. The report can also be presented on different scientific and performance review meetings and can also be published on scientific journals.

Result

Summary of the Descriptive Review

We reviewed the Tigray MDSR data at national MDSR database and the region have sent an aggregate data starting from October 2013 to January 2015. From Feb 2015 to Feb 2015, the region is using the standard reporting format to send the MDSR data. Up to Feb 2016, the region totally reported 200 maternal deaths through the MDSR system. In this region, 36 Woredas out of the total 46 woredas (78.3%) reported maternal death in the past one year (from Feb 2015-Feb 2016). To help on visualizing the system and it's output we have described the few summary analysis of the system products.

As shown in the table bellow Central Tigray and South Tigray reported the highest number of maternal death in the past one year. When we used the CSA projection of expected live births and calculate maternal mortality ration, we found that Western Tigray have the highs MMR in the region (92 per 100,000 live births)

Table 14 – Distribution of Maternal Death in Zones of Tigray region, from Feb 15 to Feb 2016

Reported Zones	Reported Death	Expected live Birth	MMR in 100,000 live birth
Central Tigray	18	48451	37.2
Eastern Tigray	10	29831	33.5
Mekele Especial Zone	4	10,571	37.8
North Western Tigray	7	28691	24.4
South Tigray	18	38953	46.2
Western Tigray	13	14127	92.0
Regional Total	70	170,624	41.0

As described in the bellow figure the estimated maternal mortality in all zones of the region is far below the 2015 WHO national maternal mortality ratio estimation (353 per 100,000 live births)

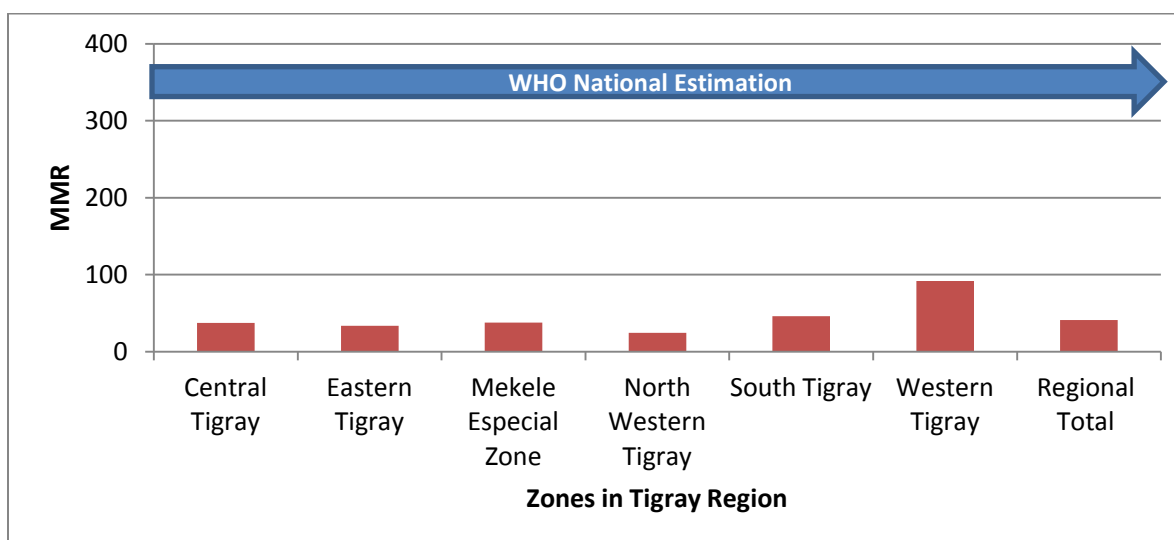


Figure 22-Distribution of Maternal Death in Zones of Tigray region, from Feb 15 to Feb 2016 , Comparing with WHO National Estimation

The bellow figure show that most of the maternal death in the region happens in the age between 30 to 39

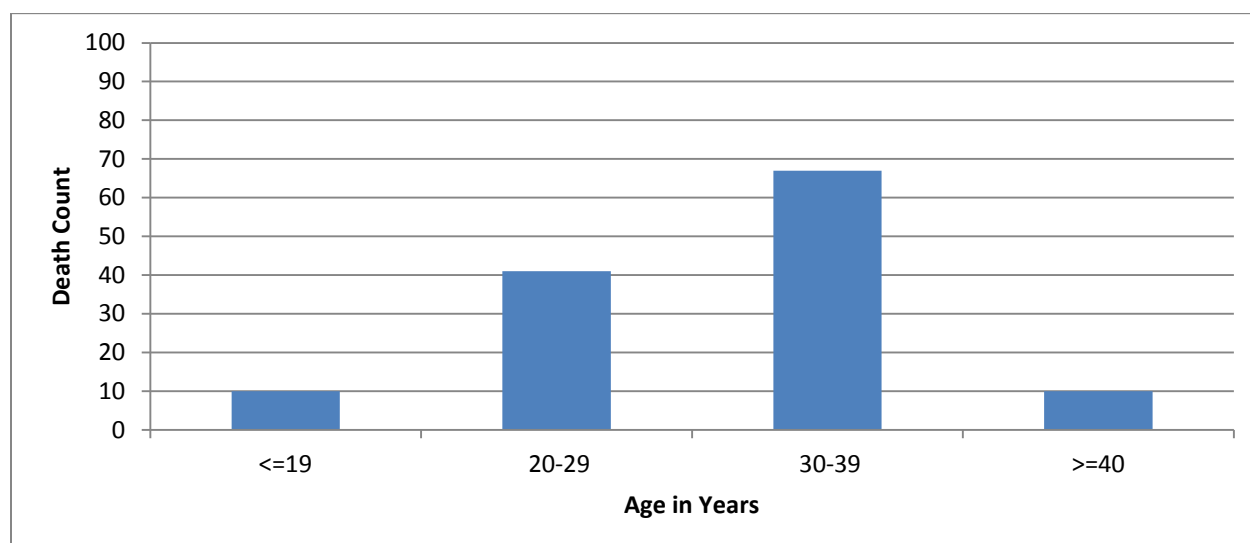


Figure 23 - Distribution of Maternal Death by Age in Tigray region, From October 2013 to January 2015

As described in the table below home (51%) and hospitals (43%) are the common places where maternal death happens in the region

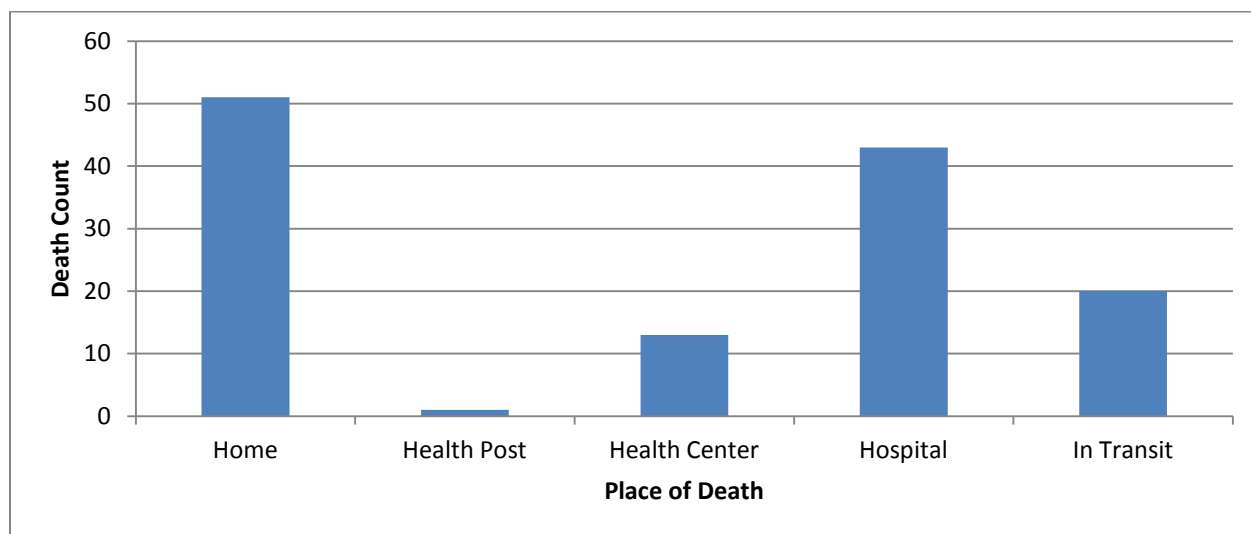


Figure 24- Distribution of Maternal Death by Place of death in Tigray region, From October 2013 to January 2015

Looking into the timing of death most of maternal death happens during the postpartum period of pregnancy.

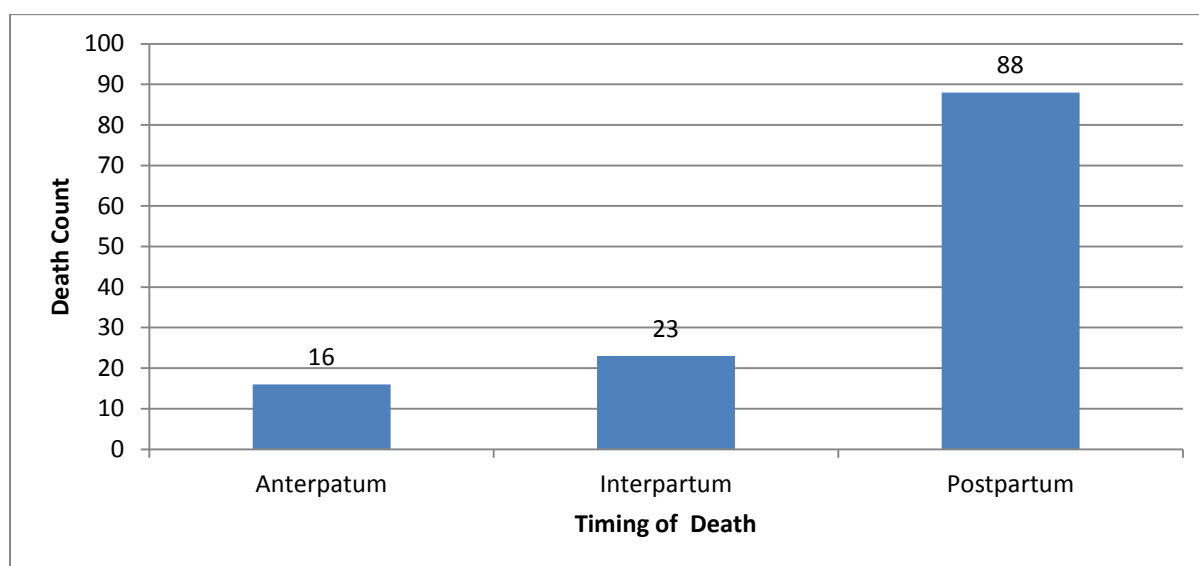


Figure 25- Distribution of Maternal Death by Period of Pregnancy in Tigray region, From October 2013 to January 2015

General Implementation of the System

In order to understand the current implementation and to measure the major attributes of the surveillance system we interviewed 48 managers and professionals from selected 4 hospitals, 8 health center and 8 health posts using a semi structured questionnaire. The result is sensitized as follow.

Most of the responders identified that any professional working at labour and delivery ward can report the death of the mother to the next level. CEO at hospital (87.5%) and Medical directors (82.6%) at health center level are identified as a unit for the immediate report of maternal death incidence.

Table-15 The summary of the Reporting System reported by The Responders in Selected Health Facilities of Tigray Region, Feb 2016

Quires	Identified Professionals	Hospital Responders		Health Center Responders		Health Post Responders	
		n	%	n	%	N	%
Who is responsible to report the incidence of maternal death	Any professional in Labour and delivery department	14	87.5	20	89	-	-
	The Head of Labour and delivery department	2	12.5	3	13.1	-	-
	Health Extension Workers	-	-	-	-	9	100
	Others	0	0	0	0	0	0
	Total	16	100	23	100	9	100
Who collect and report the immediate report of maternal death to the next level health authorities	Surveillance officer	0	0	4	17.4	-	-
	CEO	14	87.5	-	-	9	100
	Medical Director	2	12.5	19	82.6	-	-
	Health Extension Workers	-	-	-	-	-	-
	Others	0	0	0	0	0	0
	Total	16	100	23	100	9	100

Who collect and report the weekly report of maternal death to the next health authorities	Surveillance officer	12	76.5	7	30.4	-	-
	HMIS officer	4	23.5	16	69.6	-	-
	Health Extension Workers	-	-	-	-	9	100
	Total	16	100	23	100	9	100

All interviewed health facilities have a committee to review, approve and respond to maternal case incidence. At hospital level, the committee has a name of “Maternal death review committee” and at health centers, level it is called “MDSR Steering Committee”. The following is the list of composition of the committed at hospital and health center level.

Table 16- The reported Composition of Maternal death Review Committees in the Selected Health Facilities of Tigray Region, Feb 2016

Committee Composition at Hospital Level	Committee Composition at Health Center Level
Medical Director (chair)	Medical Director (Chair)
Head, Labor and delivery (Secretary)	Head, Labor and delivery or MCH (Secretary)
CEO	Head, Pharmacy representative
Head, Pharmacy representative	Surveillance officer
Gynecologist (when available)	OPD representative
Integrated Emergency Surgical Officers	Health extension worker
OPD representative	Head of Woreda MCH department (member only in four of studied health centers)
Matron	
Surveillance officer	

65% of the responders reported that they have got a feedback from the respective health authorities. When feedbacks are sent, responders reported that the frequency is not regular (72%). We have identified that there is no mechanism for dissemination of the result to all stakeholders.

Table 17- The Reported Feedback system and Frequency of MDSR Surveillance in the Selected Health Facilities of Tigray Region, Feb 2016

Did you get feedback for your MDSR reports (n48)				How frequent do you get feedback (n32)					
No		Yes		Not regular		Every Month		Every Quarter	
N	%	n	%	n	%	n	%	n	%
16	34.7	32	65.31%	23	71.9	6	18.7	3	9.4

Attributes of the Surveillance System

We interviewed study units at the health facilities to measure the major attributes of the surveillance system. The responses to each question items were categorized into five groups. The Groups includes; Strongly agree – coded as 5, Agree- coded as 4, Neutral- coded as 3, Disagree coded as -2 and strongly disagree coded as – 1 then the average score was calculated for each question item and attribute.

1. Simplicity

To measure the simplicity of the surveillance system we used eight question items and the respond towards each individual questions and the summary results, disaggregated to facility type are shown in the below figure and table.

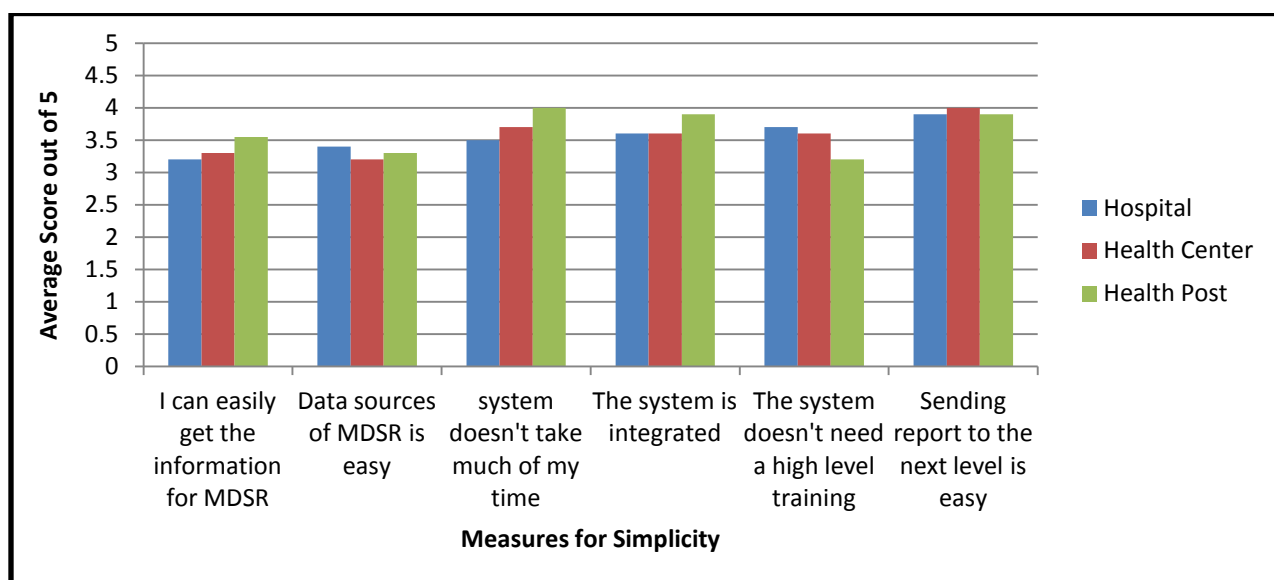


Figure 26- The Average score given to measures of acceptability for MDSR Surveillance System in selected health facilities of Tigray, Feb 2016.

Table 18- Summary result of the score given to the simplicity of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The System is Simple to Use	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	0	3.6	4.4	3.6	4.2	3.6	3.	3.6
Agree (4)	72.1		60.9		62.5		65.5	
Neutral (3)	22.1		26.6		26.4		24.5	
Disagree (2)	5.9		7.6		7		6.8	
Strongly Disagree (1)	0		0		0		0	

2. Flexibility

As shown in the tables bellow most of the responders (66%) reported that the system is flexible for the users demand making the overall average score of 3.7 out of 5.

Table 19- Summary result of the score given to the flexibility of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The Surveillance System Adopts to the Users Improvement demands	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	0%	3.4	21.7	3.9	0.	4	10	3.7
Agree (4)	47%		47.8		100		56	
Neutral (3)	47%		30.4		0.		32	
Disagree (2)	6%		0.0		0.		2	
Strongly Disagree (1)	0		0		0		0	

3. Acceptability

To measure the acceptability of the surveillance system we used three question items and the respond towards each individual questions and the summary results, disaggregated to facility type are shown in the below figure and table.

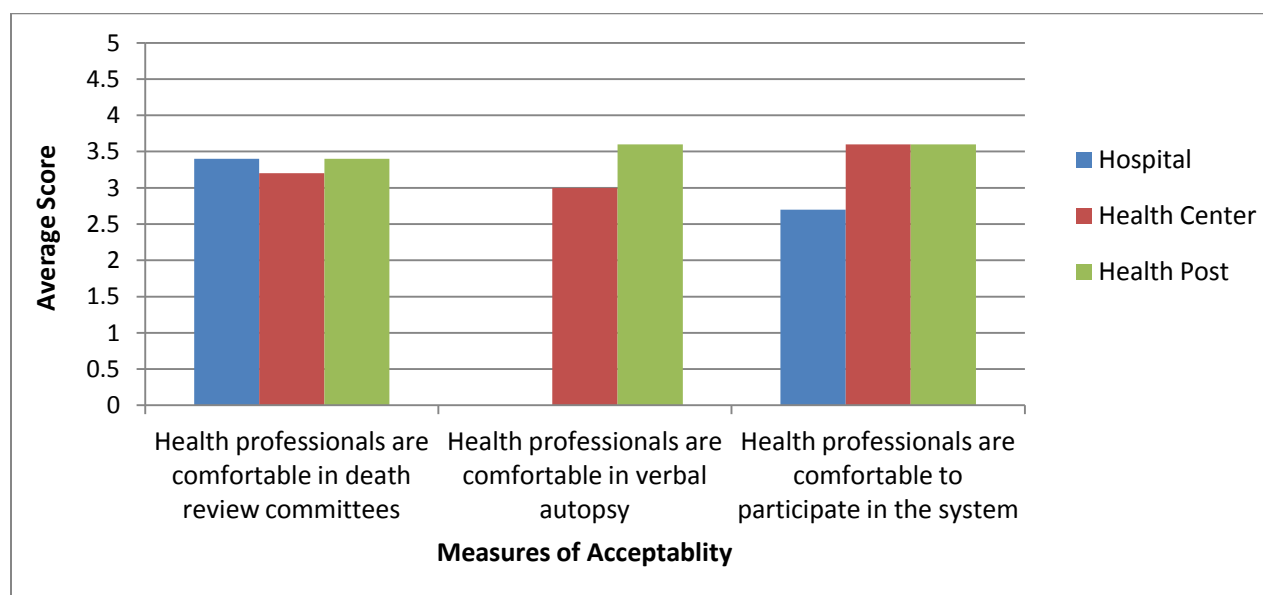


Figure 27- The Average score given to measures of acceptability for MDSR Surveillance System in selected health facilities of Tigray, Feb 2016.

As shown in the tables bellow most of the hospital responders are neutral or disagree about the acceptance of the system and almost half of the responders (41%) are neutral or disagree about the acceptance of the system by the health professionals.

Table 20- Summary result of the score given to the Acceptability of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The Surveillance System Adopts to the Users Improvement demands	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	0%	2.9	0	3.7	0	3.1	0.	3.2
Agree (4)	37.3		46.4		62.9		45.3	
Neutral (3)	31.4		37.6		11.1		30.0	
Disagree (2)	7.8		14.5		11.1		11.3	
Strongly Disagree (1)	0		0		0		0	

4. Sensitivity

As described in the bellow table all of the responders strongly agree or agree that the MDSR system picks or address most of incidences of maternal deaths in their facility or community.

Table 21- Summary result of the score given to the Sensitivity of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The System Picks Most of the Maternal Deaths in the Facility or Community	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	47.1	4.5	43.5	4.4	11.1	4.1	40	4.4
Agree (4)	42.9		56.5		88.9		60	
Neutral (3)	0		0		0		0	
Disagree (2)	0		0		0		0	
Strongly Disagree (1)	0		0		0		0	

5. Predictive Value Positive

As described in the bellow table all of the responders strongly agree or agree that the deaths reported in MDSR system are actually maternal deaths.

Table 22- Summary result of the score given to the Predictive value Positive of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

Deaths reported in this system are actually maternal deaths	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	53	4.5	43.5	4.4	12.5	4.1	42	4.4
Agree (4)	47.5		56.5		87.5		56	
Neutral (3)	0		0		0		0	
Disagree (2)	0		0		0		0	
Strongly Disagree (1)	0		0		0		0	

6. Representativeness

As described in the bellow table all of the responders strongly agree or agree that the deaths reported in MDSR system represents the real situation in the facility or community

Table 23- Summary result of the score given to the representativeness of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The reported maternal death represents the situation in the facility or community	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	53	4.5	43.5	4.4	11.1	4.1	48	4.5
Agree (4)	47.5		56.5		88.9		52	
Neutral (3)	0		0		0		0	
Disagree (2)	0		0		0		0	
Strongly Disagree (1)	0		0		0		0	

7. Timelines

To measure the timeliness of the surveillance system we used three question items and the respond towards each individual questions and the summary results, disaggregated to facility type are shown in the below figure and table

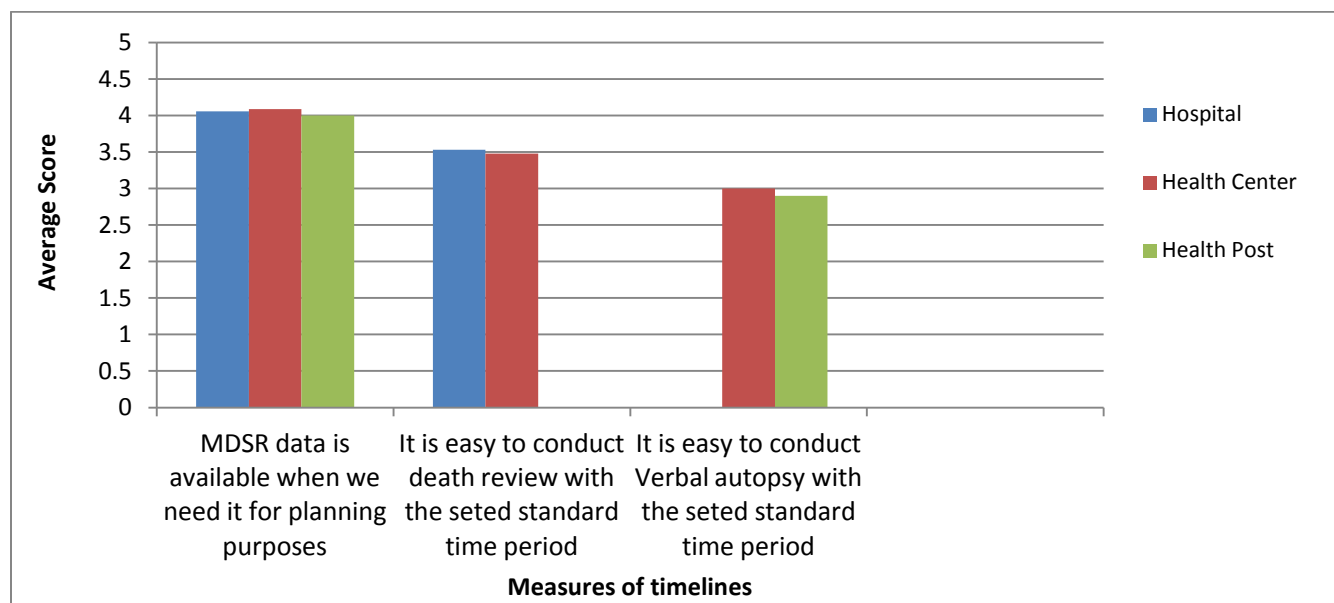


Figure2 8- The Average score given to measures of Timelines for MDSR Surveillance System in selected health facilities of Tigray, Feb 2016.

As shown in the table bellow almost half (48%) of the health center responders are neutral or disagree that MDSR Data can be collected and Used based on the seated standard timeline

Table 24- Summary result of the score given to Timelines of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

Data can be collected and Used based on the seated standard timeline	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	3.9	3.7	4.4	3.5	0.0	3.35	3.33	3.6
Agree (4)	45.1		46.4		37.0		45.3	
Neutral (3)	21.6		46.4		25.9		33.3	

Disagree (2)	0.0		2.9		11.1		3.3	
Strongly Disagree (1)	0		0					

8. Cost

Most of the responder (94%) strongly agree or agree that the system is not costly as compared to the current benefits their facility or community gain from it

Table 25- Summary result of the score given to Cost and Benefit of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The system is not costly as compared to the current benefits we gain from it	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	35.3	4.2	4.3	3.9	0.0	4	14	4.1
Agree (4)	58.8		87		100.0		80	
Neutral (3)	5.9		4.4		0.0		4	
Disagree (2)	0.0		4.4		0.0		2	
Strongly Disagree (1)	0.0		0.0		0.0		0.0	

Usefulness of the Surveillance System

To measure the Usefulness of the surveillance system we used five question items and the respond towards each individual questions and the summary results, disaggregated to facility type are shown in the below figure and table

As shown in the figure bellow all facilities reported that they are neutral or disagree that the current system is helpful to identify the cause of maternal death at facilities level.

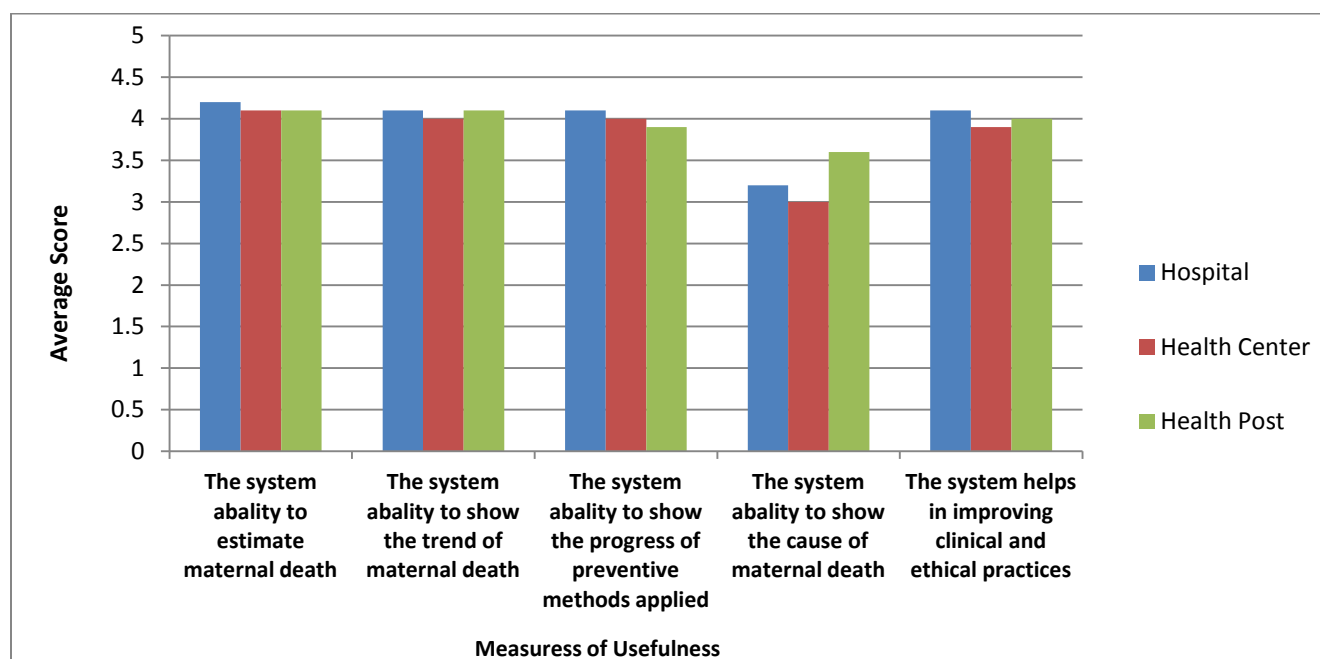


Figure 29- The Average score given to measures of Usefulness for MDSR Surveillance System in selected health facilities of Tigray, Feb 2016.

Ninety five percent of the responder reported that the system is useful to generate evidences that can support the effort against preventable maternal deaths.

Table 26- Summary result of the score given to usefulness of the MDSR surveillance system by selected health facilities of Tigray Region, Feb 2016

The system generate useful information	Hospitals (n16)		Health Centers (n24)		Health Posts (n8)		Overall Average Score given (n48)	
	%	Average Score Given	%	Average Score Given	%	Average Score Given	%	Average Score Given
Strongly agree (5)	10.6	3.9	4.4	3.8	4.4	3.9	7.6	3.9
Agree (4)	75.3		78.4		84.4		77.2	
Neutral (3)	11.8		12.2		8.9		11.2	
Disagree (2)	2.4		5.22		0.0		3.6	
Strongly Disagree (1)	0.0		0.0		0.0		7.6	

Summarizing the overall finding of the surveillance attributes, Acceptability, Simplicity and Timelines are the three attributes of the system which the responders give the least score.

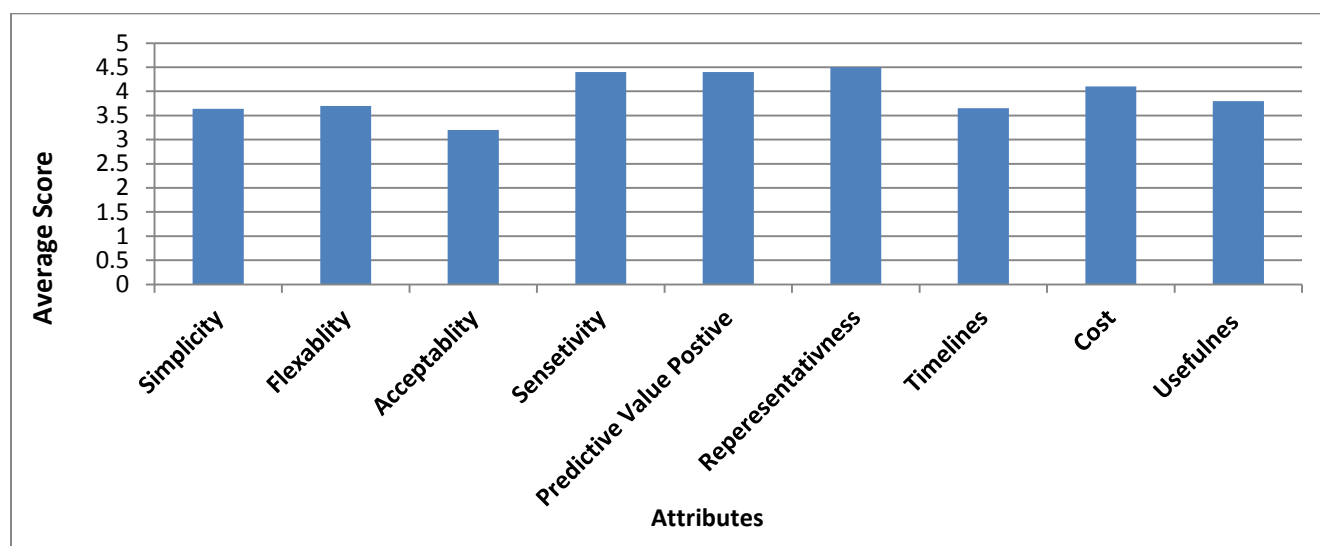


Figure 30 – summary of the average scores give for each attributes of the MDSR system in selected health facilities of Tigray Region, Feb 2016

We have also interviewed Key informants at Tigray Regional Health Bureau and respective Woredas where studied health facilities are selected. Like the health facilities, the key informants at health authorities also give a relative least score for simplicity and acceptability attributes of the system.

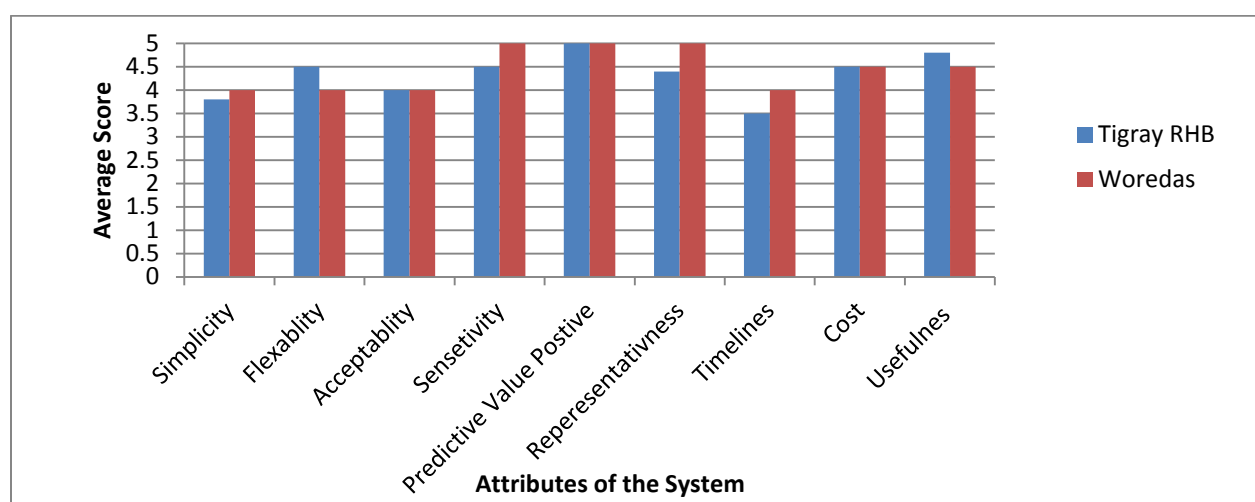


Figure 31 –Average scores give for each attributes of the MDSR system by Key Informants at Tigray Regional Health Bureau and selected Woredas of Tigray Region, Feb 2016

To further calculate some of the attributes of the system we used the regional, selected Woredas and selected health facilities (from labour and delivery logbooks) data. The Summary of the result is described below.

Table 27- Summary of the calculated attributes of the MDSR system in Tigray Region, Feb 2016

Attributes	Data elements	Number	Calculated Attribute
Representativeness of the System	Reported Death in a year	70	16.8%
	Estimated annual maternal death (using 2015, WHO MMR estimation and CSA estimated live birth)	417	
Predictive Value Positive of the System (from only reported deaths)	Total Notified maternal deaths in the selected Health facilities	10	100%
	Total Verified Maternal deaths (by death review in hospitals and health centers and by Verbal autopsy in Community)	10	
Data Completeness	Total data elements that should be reported to the national database (for a total of reported 70 deaths)	3920	62.3%
	Total reported data elements in a year (from the 70 reported deaths)	2442	
Participation Rate	Total Woredas in the region	46	78.3%
	Woredas which reported at least one maternal death	36	

Discussion

Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels. It includes the routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths. Elimination of preventable maternal mortality is the goal of MDSR (20). The MDSR system, in Ethiopia and specifically in Tigray region started in October 2013 with an aim to measure the magnitude and contributing factors of maternal death to aid in the evidence based implementation of interventions against preventable maternal death (6).

Before we started the evaluation of the MDSR system in Tigray region, we descriptively reviewed the overall outcome of the system. From our review of the MDSR database, we have identified that the maternal mortality ration of the region to be 41 in 100,000 live births, with significant disparity among Zones in the region, the maximum being at West Tigray report (92 in 100,000 live births) and the minimum at north west Tigray (24.4 in 100,000 live birth). This result is far beyond the 2015 WHO maternal death estimation for Ethiopia, which is 353 (C.I, 247-567) (21). This obligates us to consider a sever underreporting of maternal death in the region.

It was also observed that the majority of the maternal death is reported in the postpartum period (69%) and in mothers with an age group of 30 to 39 (52%), mothers delivered at home (39%) and hospitals (34%). This result is in agreement with both African and local studies. For instance a surveillance data analysis conducted in Moroco showed that, 50% of the reported maternal death happened in an age group of 25 to 30 and 71.6% of maternal death happened at hospital level (22). This also supported by local studies such as a death audit conducted in five hospitals of Tigray region by Samuel Hailu et.al. It showed most of the hospital death happened in age group of 19 to 34 (73.5%) and Home (47%) and hospital (32.3%) are the common places for incidence of maternal death (11). The relatively high level of maternal death at hospital level can be due to the complexity of the maternal condition presenting at hospital level and it is also difficult to rule out the role of quality of maternal care provided by hospitals.

Coming to the evaluation findings, In this study we have identified that in the past one year (from Feb 2015 to Feb 2016) 70 maternal deaths were reported from 36 Districts (Woredas) of the region. At regional health bureau level the whole process of surveillance is carried out by three departments which are, HMIS department (collects the data), public health emergency management unit (analyze the data) and the MCH department (report and act on the findings). We cannot identify a lead person or department for the system and processes are disintegrated in which coordinated management of the system is difficult.

The Ethiopian Public Health Implementation manual for implementation of MDSR indicates that, the surveillance officer of the health facility should report a case based maternal death report to the next health authority with 48 hours. The facilities surveillance officer should also report the weekly report (which includes suspected and confirmed maternal deaths) every Monday morning (23). In our study we have identified that most of the immediate maternal deaths are reported by CEOs (at hospital level) or Medical directors (at health centers level) and the involvement of surveillance officer is very minimal. This can be the absence of clear guidance and training at facilities level on how to coordinate the system.

As shown in the figure below, we have identified that the reporting formats utilized in different health facilities is not similar which some have no the needed variables.

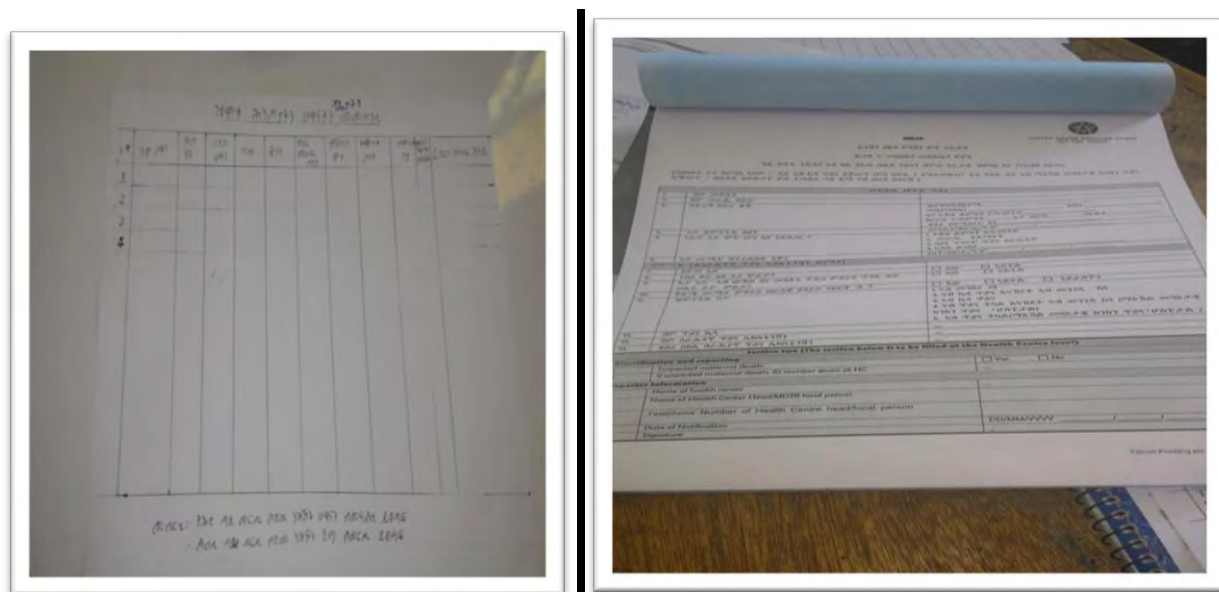


Figure 32-Non Uniformity of Formats Used to Report Maternal Death at Facility Level, in Selected Health Facilities of Tigray Region, Feb, 2016

The Implementation manual recommends that at health center there should be rapid response team (RRT) that has the responsibility to investigate any suspected maternal death in the catchment. Nevertheless the manual doesn't describe how the composition of the RRT should be (23). Based on our findings all studied hospitals have a committee to review any suspected maternal death composed of senior management members and labour and delivery professionals. Similarly, all studied health centers have RRT composed of health center management and one health extension worker. Health centers in Central Tigray include Woreda MCH heads as part of the RRT team, whereas RRTs in health centers of Mekele Zone are composed only of the health centers staff. The WHO MDSR technical guideline emphasizes that one of the preliminary activities before the start of the MDSR system is to design a reporting and feedback mechanism. The PHEM manual also describes that feedback should be given for any maternal death report by the health authorities (Woreda Health Office and regional Health Bureaus).

In our study we have found that for 35% of reported maternal deaths feedback was not given. This can reduce the interest and acceptability towards the system and compromise the continuous learning platform that can be developed by this system. We have also observed that, at regional health Bureau level findings are disseminated through the weekly epidemiological bulletins to appropriate stakeholders whereas at facility level there is no system to disseminate findings to external stakeholders.

Looking into the attributes of the surveillance system simplicity (3.6/5), acceptability (3.2/5) and timelines (3.64/5) of the system are among the attributes, which score the lowest. This result is in agreement with the theoretical bases of the CDC, updated guideline on public health surveillance system, which indicates the close relationship between the above three attributes. The simplicity of a public health surveillance system refers to both its structure and ease of operation. Surveillance systems should be as simple as possible while still meeting their objectives (19). To measure the simplicity of the system responders were asked to score eight questions and from this question "Data sources for MDSR are simple and easily available" scores the lowest (3.3 – most of the responders are neutral or disagree about this statement). This score is further lower at health posts and health centers level, which can be due to the relative complexity and hardship of gathering verbal autopsy data from deaths happening at the community level.

Acceptability of a surveillance system reflects the willingness of persons and organizations to participate in the surveillance system. In our study, this attribute scored the lowest in all types of health facilities. Participates were asked why they give lower score for acceptability and we have been able to identify the major reasons. At the community level (health post and health centers) the hardship to investigate death reports (which include verbal autopsy and communicating all health facilities that the mother pass through) which includes, absence of transportation and mechanisms to cover costs of the investigators reduce their interest to participate in the system. At hospital level, the major worries of responders were fear of using the data for punitive action. The effect of this worry is more reflected in the lower confidence of the participants on the ability of the system identifies to identify the right cause of death. Even if the confidentiality of information collected in this system, anonymity and a “no blame” principles are described in the ministry of health MDSR guideline, the idea is not well understood at the implementing facilities level.

The Public health emergency management MDSR implementation manual states that death investigation of a maternal death at facilities level should be completed in 48 hours and a case based report should be sent to the next level health authorities. For deaths happening at the community level, a verbal autopsy and review should be completed within a week period of notification and should be reported to the next level health authorities. At the community level (health post and health centers) most of responders does not agree that a week period is enough to perform verbal autopsy and review for which they give an average score of 2.9/5. The major reason identified was the difficulty of gathering data during the grieving periods of family's of the deceased mother.

In this study sensitivity, predictive value positive and representativeness are attributes of the system which get the highest scores, in which responders strongly agree or agree that these attributes are the strong side of the system.

According to the CDC update guideline representativeness of a surveillance system refers that accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person (19). Even if most of the responders agree that deaths happening at both facility level and community level are detected by this system, the annual maternal death reported in Tigray region through MDSR report is much below the expected or the estimated

level, making the calculated sensitivity to be only 16%. This obligated us to consider a severe underreporting of maternal death in the region.

A public health surveillance system is useful if it contributes to the prevention and control of adverse health-related events, including an improved understanding of the public health implications of such events (19). In this study most of the responders agree on the overall usefulness of the system. However, most of the responders are neutral about the usefulness of the system to indicate the actual cause of maternal death. Responders were also asked for their reason for the lower scores on the ability of the system to identify causes of maternal death. Reason given includes, since private facilities are not included in the system it is difficult to identify causes of a mother's deaths happening or passed through private facilities. Some of the responders at hospitals reported that fear of punitive action and poor medical recording reduce the ability of the system to identify the right causes of death. When deaths happen at higher facilities like hospitals, there is no regional death review committee that oversees and approves the possible cause of a death, which makes the investigation to be dependent and influenced by a single attending senior physician at the hospital level.

The federal public health emergency management guideline for implementation of maternal death recommends that for every maternal death, there should be a lesson to be learnt and an official action plan should be developed. In this study, in all the studied facilities we have not observed a response action plan for death happening at facilities and community level.

Conclusion

Generally, from this study we can conclude that the implementation process of the surveillance system at facility level is not uniform. The simplicity, acceptability, timeliness and the usefulness to identify cause of death are major attributes of the surveillance system, which identified as areas demanding improvement. The Sensitivity and predictive value positive are the two major attributes, which identified as the strength of the surveillance system. We have also identified that in Tigray region there is a big disparity between estimated numbers of maternal death and death reported through the surveillance system, which reduce the representativeness of the system.

Recommendations

Based on the study findings the following major recommendations are forwarded for the appropriate stakeholders.

1. At Tigray regional health bearea level, we recommend a clear demarcation and division of responsibility of MDSR system among the MCH and surveillance units.
2. The Federal Public Health Emergency management unit and Tigray regional Health Bureau should provide a clear guidance on the overall death investigation process, reporting system and standard formats to make a uniform implementation of the system at health facilities and community level.
3. We recommend the revision of the current MDSR implementation manual by The Federal Public Health Emergency Management Unit, which does not include the details for compositions, and tasks of different committees in the system and implementation of response activates.
4. Tigray regional health bureau should strengthen the supervision and the feedback system in order to improve the current low data completeness, acceptance of the system and a formal plan and implementation of response activities.
5. To improve acceptability of the system by health professionals, Tigray regional ealth bureau needs to avail resources including vehicles or should devise a reimbursement mechanisms for fees incurred during field investigation of maternal death (verbal autopsy)

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6. Clear guidance should be given to professionals, specially for staffs working at hospitals by Federal Public Health Emergency management unit and Tigray regional health bureau about the legal framework of MDSR implementation in Ethiopia to reduce the fear of liability and punitive measures
 7. To make the system complete private facilities should be part of the system and the needed training and legal framework should be developed and implemented by the regional government.
 8. Establishment of a well qualified and separate regional death review committee is recommended to confidentially investigate deaths happening at hospital level
 9. To further understand the magnitude and factors related with low representativeness of the system we recommend a well-designed community based study.

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Chapter Four- Health Profile Assessment

4.1. Health Profile Description of Kirokose Sub City, Addis Ababa City Administration, 2014

Introduction

Addis Ababa lies 9°1'48"N latitude and 38°44'24"E longitude. The city is located at the heart of the country, at an altitude ranging from 2,100 meters at Akaki in the south to 3,000(9,800 ft) meters at Entoto Hill in the North. This makes Addis Ababa the third highest city in the world, Addis Ababa has a Sub-tropical highland climate. The city has a complex mix of highland climate zones, with average temperature differences of up to 12.2°C, depending on elevation and prevailing wind patterns.(1)

Addis Ababa is the largest as well as the dominant political, economic, cultural and historical city of the country established in 1887 by emperor Menilik II. It has the status of both a city and a state. It is the capital of federal government and a chartered city. Based on CSA population projection the total population in Addis Ababa is estimated as 3,194,999 by 2013 from which 52.6% of the population is females.(1)

Administratively the city is divided in to ten sub-cities which are the second administrative units next to city administration. In terms of area coverage Bole is the largest sub-city followed by Akaki- Kality and Yeka. Addis ketema is the smallest and followed by Lideta and Arada Sub-cities. The sub-cities are also divided in to 116 weredas, which are the smallest administrative unit in the city. (1)

Kirkose is one of the ten sub cities in Addis Ababa covering a total of 14.62 sq. km. Based on CSA population projection the estimated population of the sub city is 235,035 from which 58.7% of the population are females. (2)

Administratively the sub city is divided in to 11 wordas. Generally the Subcity is a home to 31 historical heritages, 29 Federal offices, 18 Addis Ababa city governmental offices, 11 offices of Oromia National and Nationalities government, 10 governmental development agencies, Palace, UN main office, Economy commission of Africa (ECA). Meanwhile, there are 15 embassies, 2 parks, 15 hotels which has stars and 12 normal hotels, 4 Orthodox, 5 Muslim, 16 Protestant, and 2 Catholic institutions. The overall aim of this paper is to describe the health profile of the sub city so as to identify and recommend on areas that needs improvement. (2)

Objectives of the Health Profile

General Objective

The General objective of this study is to assess the Health and health related profile of Kirkose sub city so as to identify and recommend on areas that needs improvement.

Specific Objectives

- ⇒ To describe the demographic characteristics of the population in Kirkose sub city in 2006 E.C
- ⇒ To describe health delivery infrastructures and health delivery status in Kirkose sub city in 2006 E.C
- ⇒ To describe the health status of the population in Kirkose sub city in 2006 E.C, using health and health related indicators.

Methodology

Study Area and Period

The Study area is Kirkose Sub city which is one of the ten sub cities in Addis Ababa, Ethiopia. To develop this profile a one year data (from May 31, 2012 up to June 1, 2013 (2006 E.C)) is used.

Study design

A retrospective review of data is applied to develop this profile description

Data Source

To develop this profile data was collected and reviewed from the following sources

- ⇒ The federal Ministry of Health, Plan and Policy Directorate, Monitoring and Evaluation Team
- ⇒ Kirkose Sub City Health Office, Plan and Program Core Process
- ⇒ Kirkose Sub City Education office
- ⇒ Kirkose Sub City Bureau of Finance and Economic Development (BoFED)
- ⇒ Review of related Literatures conducted in Addis Ababa and Kirkose Sub City

Data Management

Health and Health related data collected from the above organizations were entered and analyzed using Excel 2007 and the result is presented using tables and different figures and charts.

Ethical Consideration

A formal letter was submitted to the data manager at each source organizations in order to get access to the data. As this study use secondary data consent and other ethical measures are not applicable.

Dissemination of the Results

The study result will be disseminated to stakeholders using a report and can also be presented in different review meetings.

Result

Socio Demographic Overview of the Sub City

Sub City Overview

Kirkos sub-city is one of the ten sub-cities of Addis Ababa, Ethiopia. As shown in Figure below, Kirkos sub-city is located at the centre of Addis Ababa. National sport and cultural facilities such as Addis Ababa stadium and Meskel square are located in the sub-city. The sub-city hosts international offices such as the office for Organization for African Union (OAU) and the United Nations Economic Commission for Africa (ECA). (3)

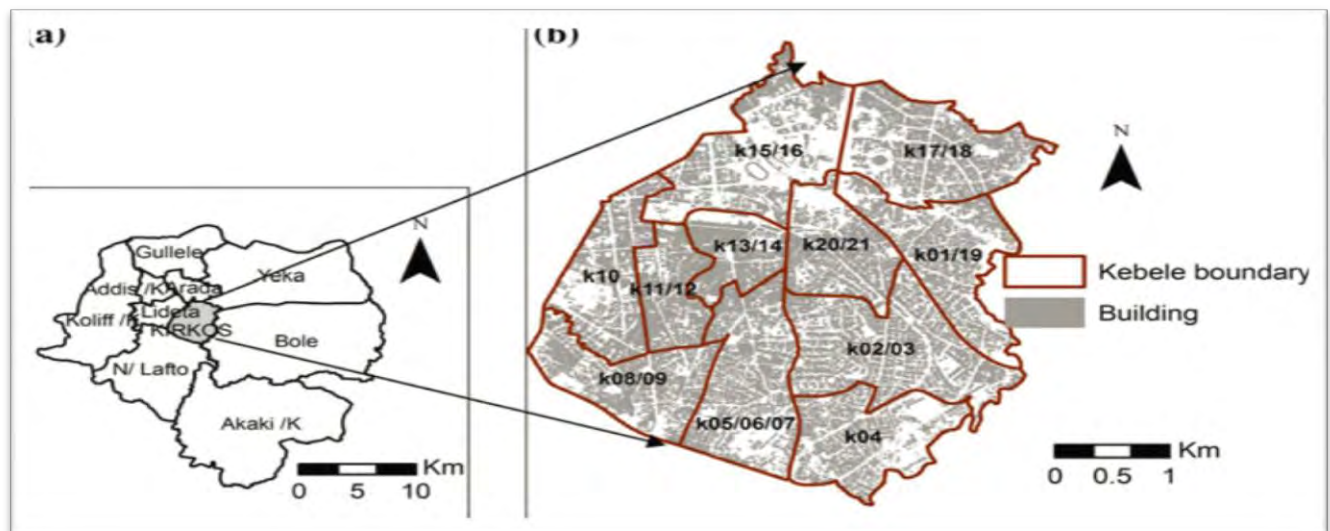


Fig. 33 A. Addis Ababa sub-city boundaries, B. building and road network in Kirkos sub city

Kirkos sub-city covers a surface area of 1,462 ha and has a population size of about 220,991 (Central statistical agency of Ethiopia 2007). The sub-city is one of the densely populated sub-cities in Addis Ababa with a population density of 150 persons per hectare. Kirkos sub-city is characterised by a combination of modern buildings and old residential settlements. Also as shown in Fig. 1 the sub-city is characterized by dense built-up areas. Superficial observations of Kirkos's residential areas suggest that it is inhabited by residents with high difference in income. The sub-city has 11 Kebeles, which constitute the smallest administrative levels in Ethiopia (2, 3).

Economic Status

Even if there is no detail data we get from the sub city regarding the economic status of the population, Studies like 2012 survey study result on Ethiopian progress Towards Eradicating Poverty an Interim Report, 28.1% of the residents of Addis Ababa were under general poverty. On the other hand, 26.1% of the residents were under food poverty. When we compare poverty in terms of sex, females were more affected by poverty than males. (4)

Regarding unemployment status there is temporal variation in unemployment condition, in the past three years from 2002-2004 E.C. Even though, unemployment existed in the city the total number of unemployed persons increased every year. With regard to sex, females were more vulnerable than males. (1)

Educational Status

According to the 2012 DHS, about 77.5 percent of the population of Addis Ababa was literate. The literacy rate by sex also reveals that there is a significant difference between males and females. Thus about 91.3 percent of male were literate while the proportion of literate among female populations were accounted for 79.9 percent. (5)

Figure reveals the literacy status of the city in 2004 E.C. Based on Urban Employment Unemployment survey study, there is an improvement in literacy rate in Addis Ababa. The literacy rate by sex in 2012 indicated us a similar trend with that of the previous years. Hence, 94.3 percent of male was literate while the proportion of literate among female populations was accounted for 80.0 percent. Thus, the average literacy rate of the city is estimated to be 86.4% which was above the average literacy rate of the country. The illiteracy rate in the city had been declined to from 13.9 in 2003 E.C to 13.5 % in the year under discussion. (6)

Coming to the sub city, generally in the Sub city the following educational infrastructure are reported by the educational office of the sub city

Table-28 List of all Formal Schools in Kirkose Sub City, Addis Ababa in 2006 E.C

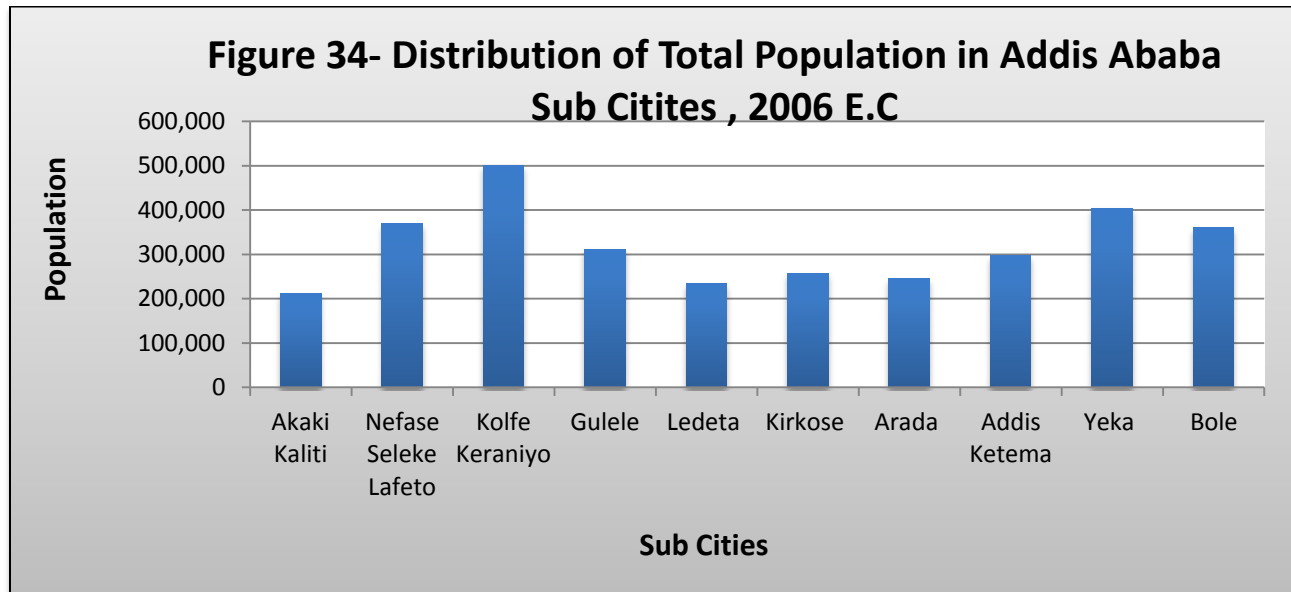
Owner	KG	Primary School	Secondary School	Preparatory	TVET	College	University
Governmental	4	9	4	---	1	---	---
Private	38	32	5	---	57	15	---
NGO	5	5	3	---	3	1	---
Public	14	16	2	---	---	---	---

Demography

Based on the CSA population and the Sub city health office report, the table below shows the summary of the major demographic parameters in Kirkose sub city.

Table -29 Summaries of Major Demographic Parameters in Kirkose Sub City

Demographic Parameters	Number	Proportion from Total Population
Total Population	235,035	
Total Male Population	120,120	46.55%
Total Female Population	137,915	53.45%
Total Female of Reproductive Age Group	81,382	31.54%
Total Under Five Children	16935	6.56%
Total Infants	5175	2.01%
Total New Life Births in the Year	1416	0.55%



Health Profile of Kirkose Sub City

Health Resource and Service Utilization

Bases on the 2006 E.C HMIS performance report of Kirkose sub city the summary of major health resource and utilization indicators are presented as follow.

Table-30 List of health service delivering institutions in Kirkose sub city in 2006 E.C

Owner	Health Center	Special Higher Clinic	Higher Clinic	Diagnostic Laboratory	Special Medium clinic	Medium Clinic	Lower Clinic	Hospital
Governmental	3	---	---	---	---	---	---	2
Private	---	18	28	3	3	18	36	4
NGO	---	---	---	---	---	7	22	---
Public	---	---	---	---	---	---	---	---

Table-3 Distribution of Practitioners Working in Kirkose Sub City Health Facilities at each Quarters of 2006 E.C

Quarter one		Quarter Two		Quarter Three		Quarter Four	
Number of Practitioners	Practitioner :Population	Number of Practitioners	Practitioner :Population	Number of Practitioners	Practitioner :Population	Number of Practitioners	Practitioner :Population
35	1:6715	37	1:6352	33	1:7122	48	1:4897

Figure 35 - Distribution of Average Stock out Days for Each Tracer Drugs in Kirkose Sub City, 2006 E.C

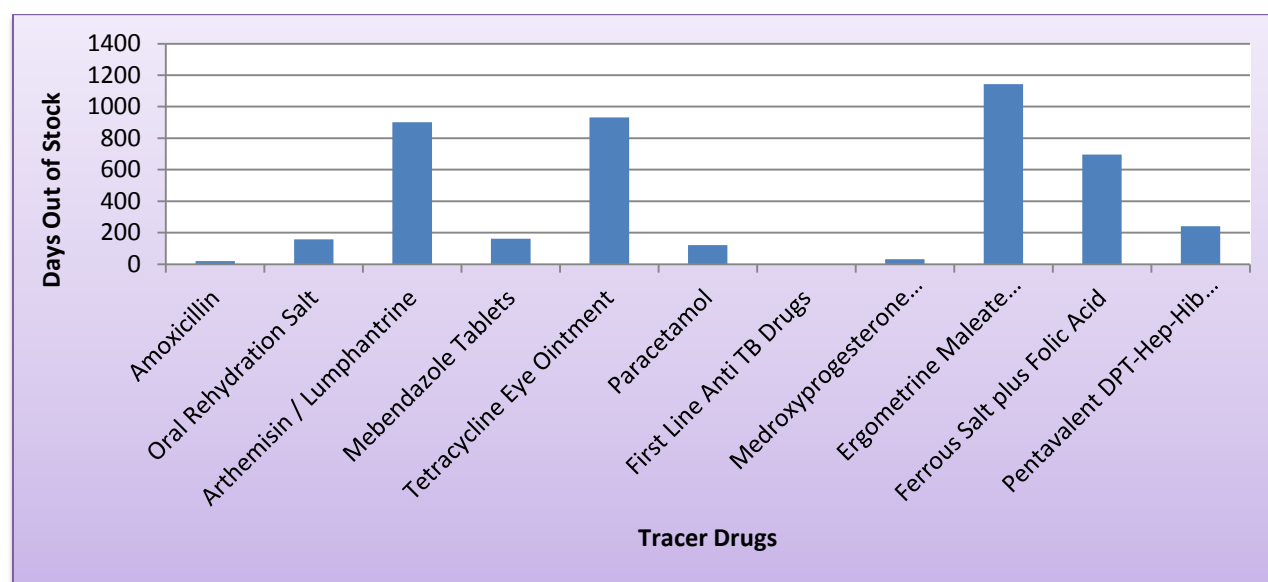


Figure 36 – Trend on Average Stock out Days of Tracer Drugs in Kirkose Sub City, at Each Quarters of 2006 E.C

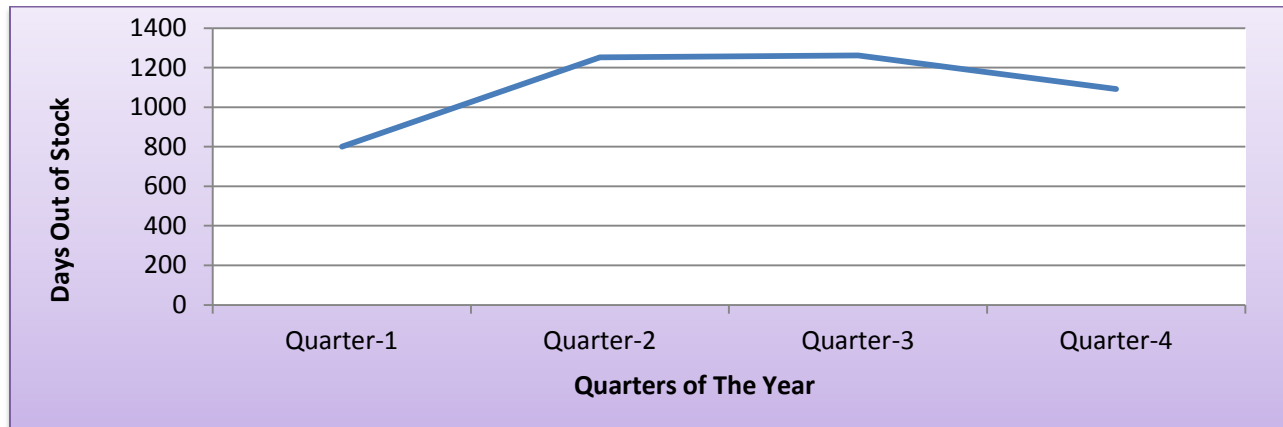


Figure 37 – Distribution of Total Outpatient Visit in Kirkose Sub City at Each Quarters of 2006 E.C

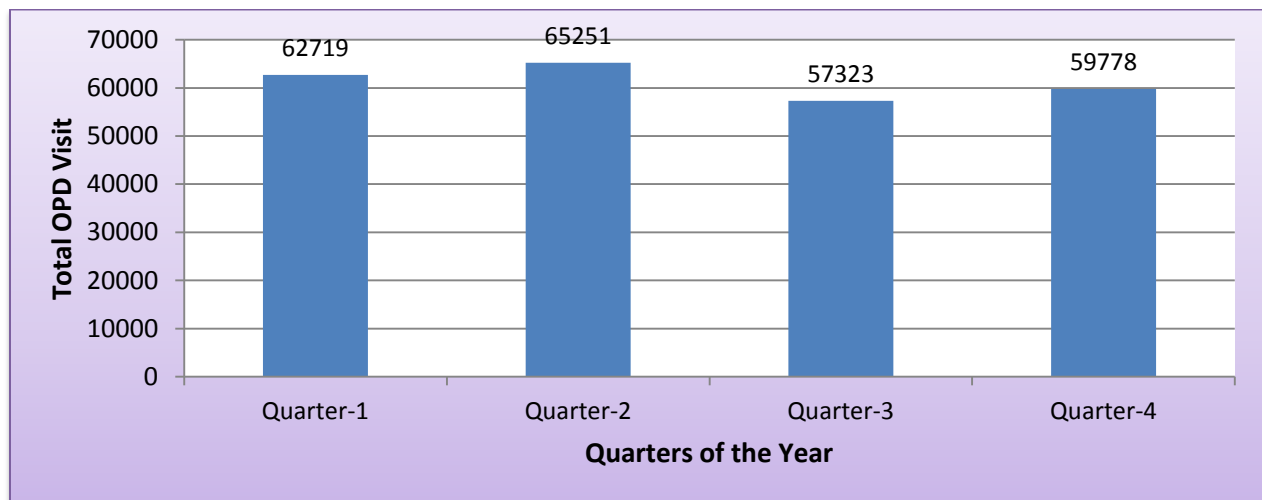
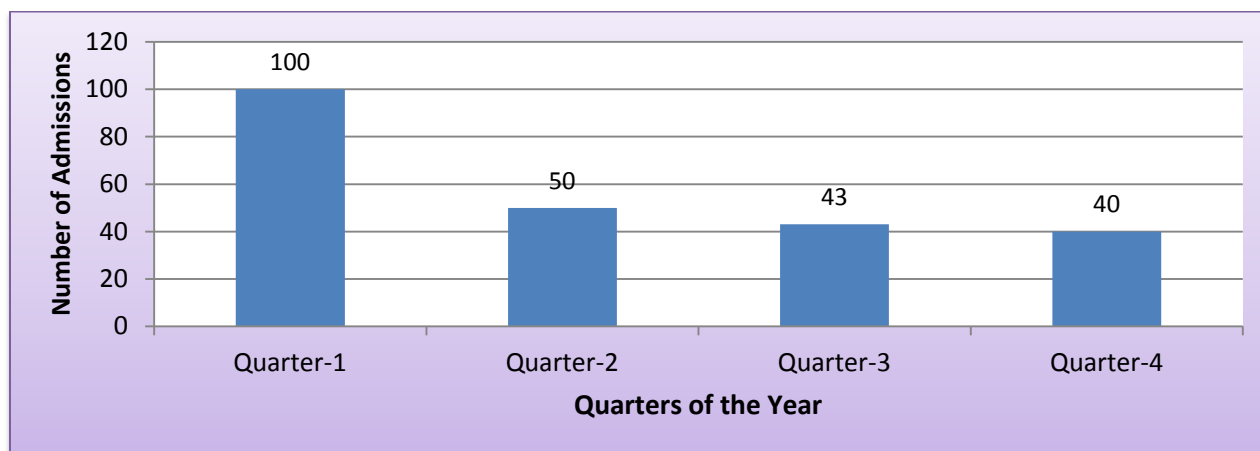
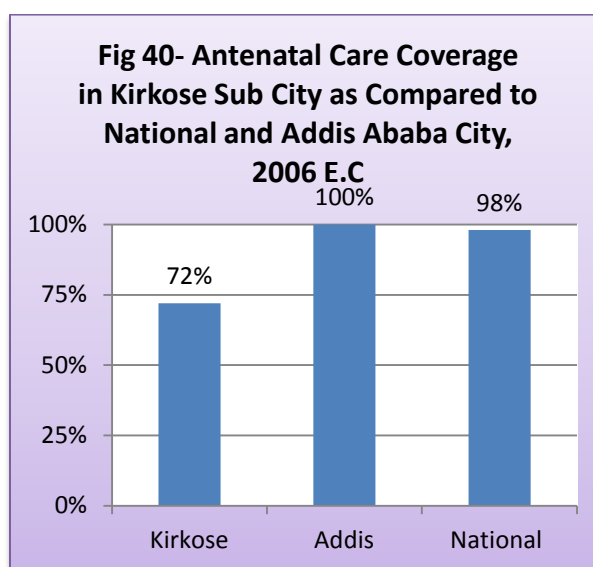
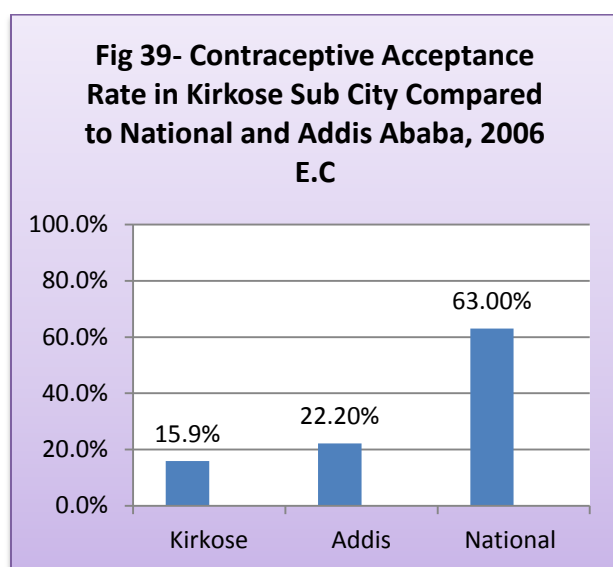


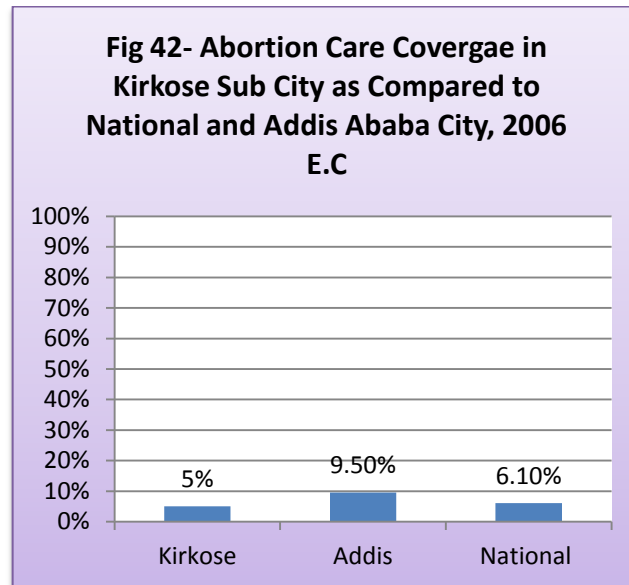
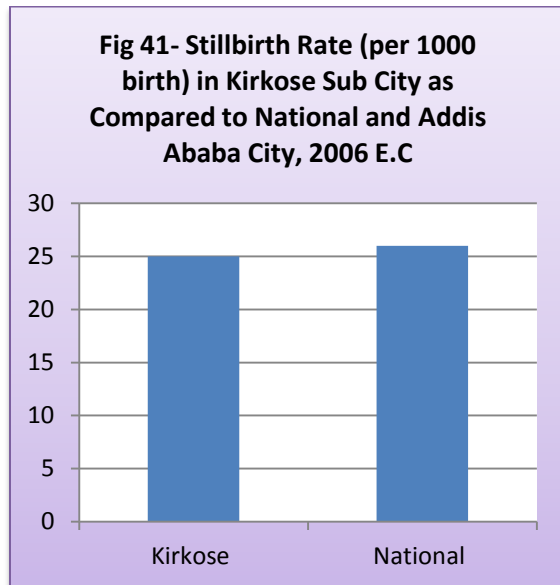
Figure 38 – Distribution of Total Inpatient Admissions in Kirkose Sub City at Each Quarters of 2006 E.C



Maternal and Reproductive Health

Bases on the 2006 E.C HMIS performance report of Kirkose sub city Major indicators for maternal and reproductive health are presented as follow. Since there is no a community based vital statistic system we only used the data generated from the health facilities in the sub city.

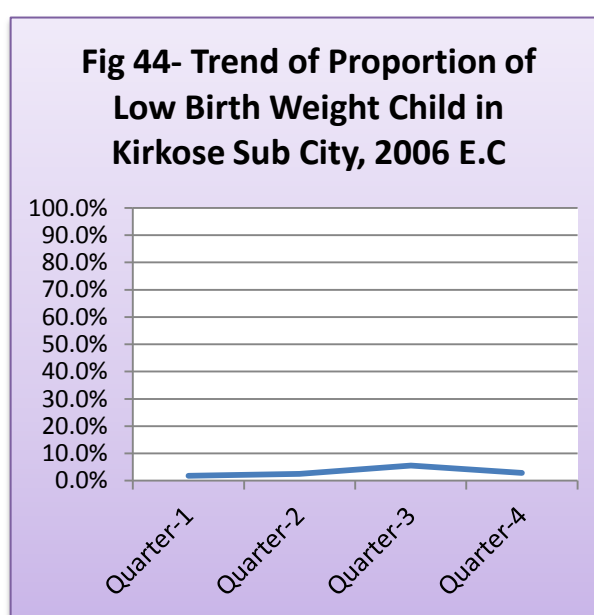
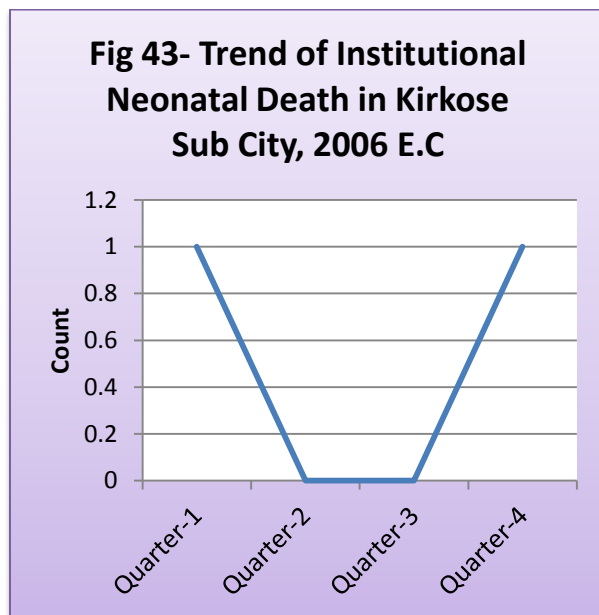


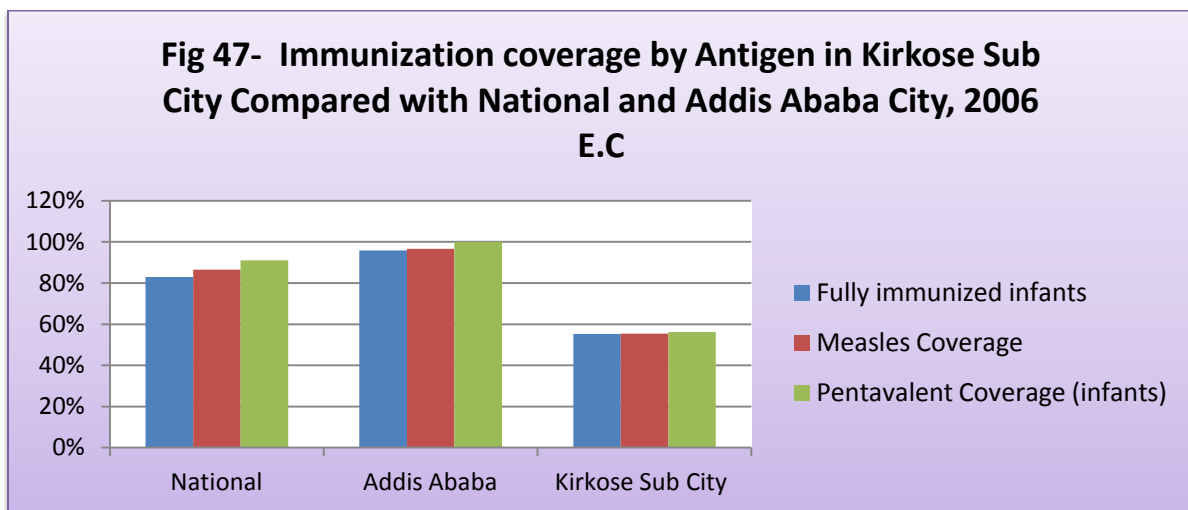
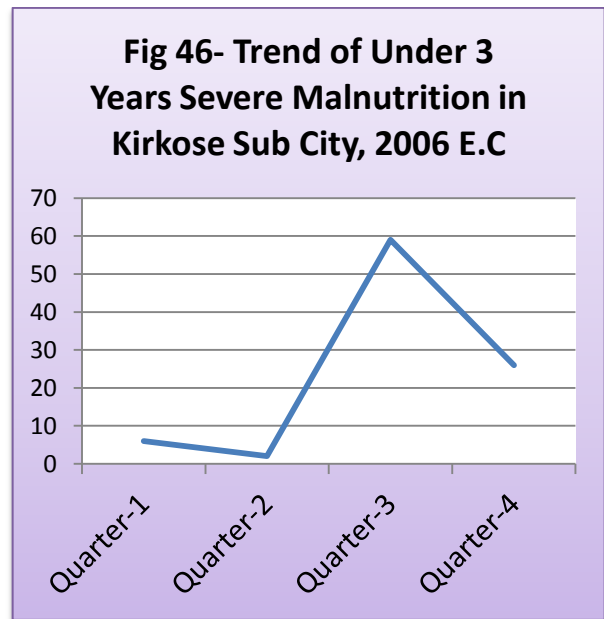
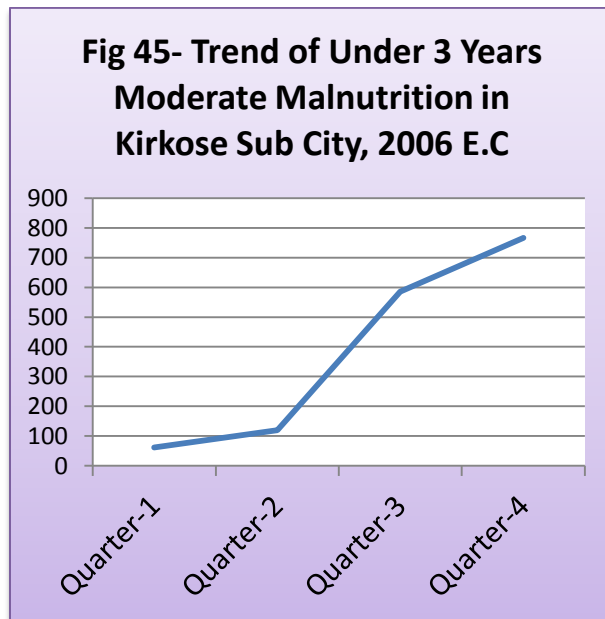


⇒ Data regarding community based maternal death and skilled birth attendance is not available. The sub city reported that there was no institutional maternal death in 2006 E.C

Child Health

Bases on the 2006 E.C HMIS performance report of Kirkose sub city Major indicators for child health and reproductive health are presented as follow. Since there is no a community based vital statistic system we only used the data generated from the health facilities in the sub city.





⇒ Data regarding community based Infant and Child death is not available.

General Disease Burden

Table 32 -Top 10 Causes of Morbidity in Under Five Children in Kirkose Sub City ,2006

E.C

Kirkose Sub City			National	
Diagnosis	Number	%	Diagnosis	%
Acute upper respiratory infections	2935	30.3%	Pneumonia	18.30%
Diarrhea (non-bloody)	1393	14.4%	Diarrhea (non-bloody)	18.30%
Pneumonia	733	7.6%	Acute upper respiratory infections	16.90%
Other or unspecified diseases of the eye and adnexa	630	6.5%	Acute Febrile Illness (AFI)	7.20%
Infections of the skin and subcutaneous tissue	485	5.0%	Malaria (confirmed with P. falciparum)	4.00%
Other Unspecified infections and Parasites	296	3.1%	Infections of the skin and subcutaneous tissue	3.80%
Other Unspecified Diseases of skin and subcutaneous tissue	271	2.8%	Helminthiasis	3.50%
Other Unspecified Respiratory Diseases	265	2.7%	Diarrhea with dehydration	2.90%
Other Unspecified Gastro Intestinal Diseases	254	2.6%	Malaria (confirmed with species other than P. falciparum)	2.80%
Acute Febrile Illness (AFI)	196	2.0%	Other or unspecified diseases of the eye and adnexa	2.30%
Total Leading Causes	7458	76.9%	Total of leading cause	80.00%
Total all Causes	9694	100.0%	Total all causes	100.00%

Table 34- Top 10 Causes of Morbidity (all ages) in Kirkose Sub City, 2006 E.C

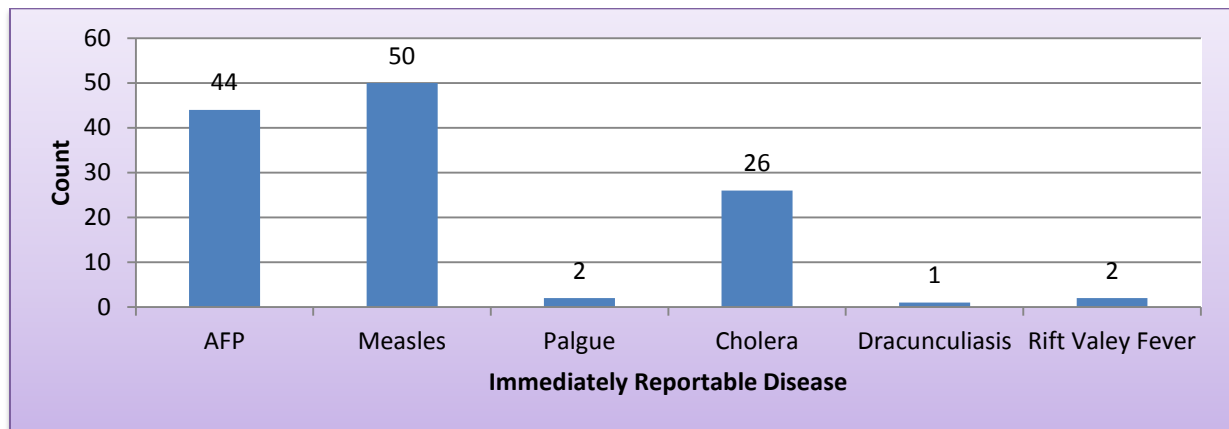
Kirkose			National	
Diagnosis	Number	%	Diagnosis	%
Acute upper respiratory infections	20972	17.0%	Acute upper respiratory infections	9.40%
Disease of Musculoskeletal	7434	6.0%	Acute Febrile Illness (AFI)	9.10%
UTI	7159	5.8%	Pneumonia	8.20%
Diarrhea (non-bloody)	7073	5.7%	Diarrhea (non-bloody)	6.20%
Dyspepsia	6973	5.6%	Malaria (confirmed with P. falciparum)	5.30%
Acute Febrile Illness	6347	5.1%	Trauma (injury, fracture etc.)	4.60%
Disease of Skin and Mucosa	5847	4.7%	Helminthiasis	4.40%
Other Unspecified infections and Parasites	4351	3.5%	Urinary tract infection	3.90%
Dental and Gum Diseases	4311	3.5%	Infections of the skin and subcutaneous tissue	3.30%
Trauma	4096	3.3%	Dyspepsia	3.30%
Total of leading cause	74563	60.4%	Total of leading cause	57.80%
Total all causes	123542	100.0%	Total all causes	100.00%

Table 35- Top 10 Causes of Inpatient Admission (all ages) in Kirkose Sub City, 2006 E.C

National		Kirkose Sub City	
Diagnosis	%	Diagnosis	%
Normal delivery	23.4	Unspecified Diseases of The Circulatory System	25
Pneumonia	8.2	Diarrhea with dehydration	25
Trauma (injury, fracture etc.)	4.5	Upper Respiratory Tract Infections	9.6
Malaria (confirmed with P. falciparum)	2.4	Dyspepsia	9.6
Typhoid fever	2.2	Unspecified Diseases of Blood	7.7
Dyspepsia	2	Pneumonia	7.7
Diarrhea with dehydration	1.9	Normal delivery	5.8
Cataract	1.8	Typhoid fever	3.8
Severe acute malnutrition	1.7	TB	3.8
Other abortion (spontaneous, with complication etc. exclude safe abortion)	1.7	Disease of the Ear and Mastoid	1.9

⇒ Regarding the mortality report, only 9 deaths were reported which includes 6 deaths from diarrheal with dehydration, 1 from Typhoid Fever, 1 from Tuberculosis and 1 from other gastrointestinal diseases.

Fig 48 – Number and Type of Immediately Reportable Disease Reported in Kirkose Sub City in 2006 E.C



TB and HIV

Fig 49 - Distribution of New TB Cases (all forms) in Kirkose Sub City in Quarters of 2006 E.C

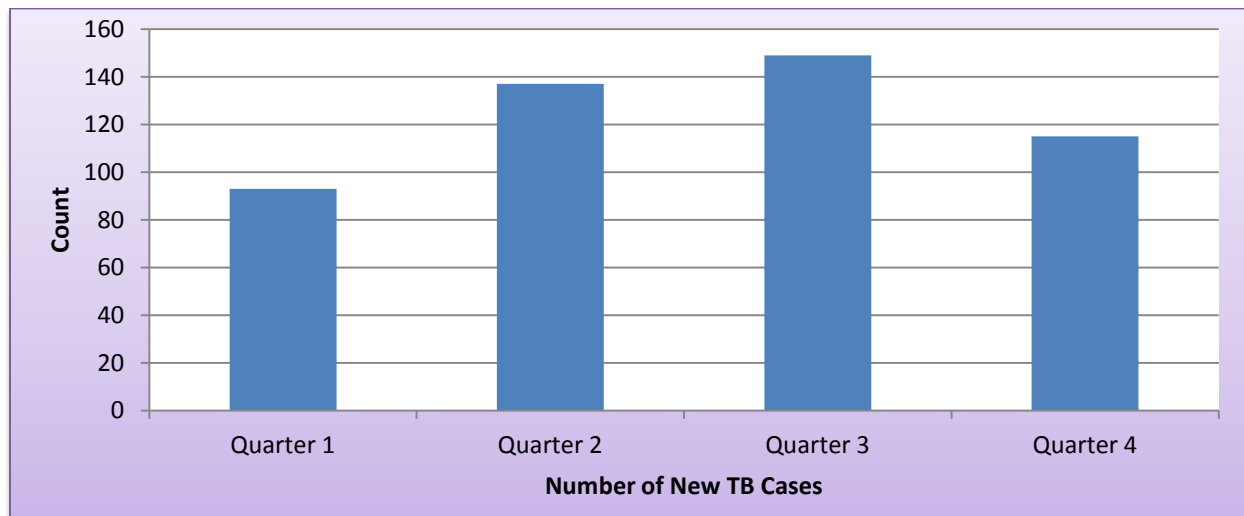


Fig 50- Distribution of Pulmonary TB Treatment Outcome in Kirkose Sub City Enrolled in and Complete Treatment Cohort in 2006 E.C

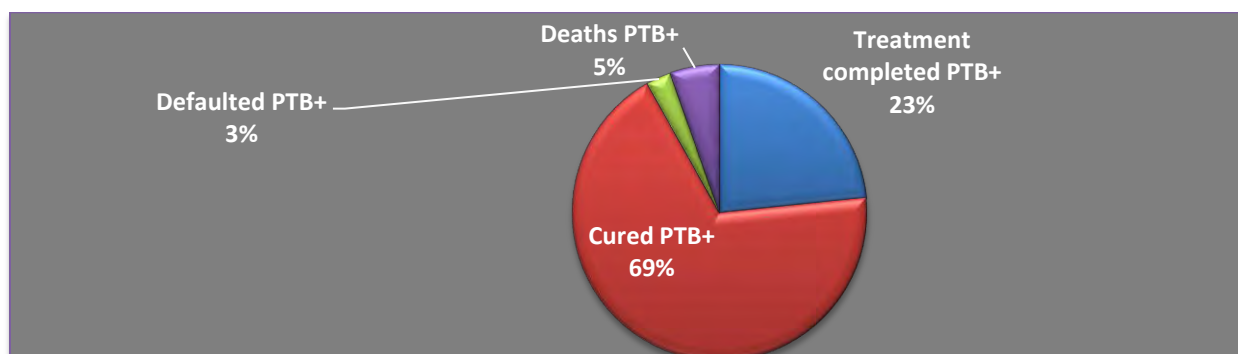


Fig 51 – Number of Clients who received VCT Service in Kirkose Sub City in 2006 E.C

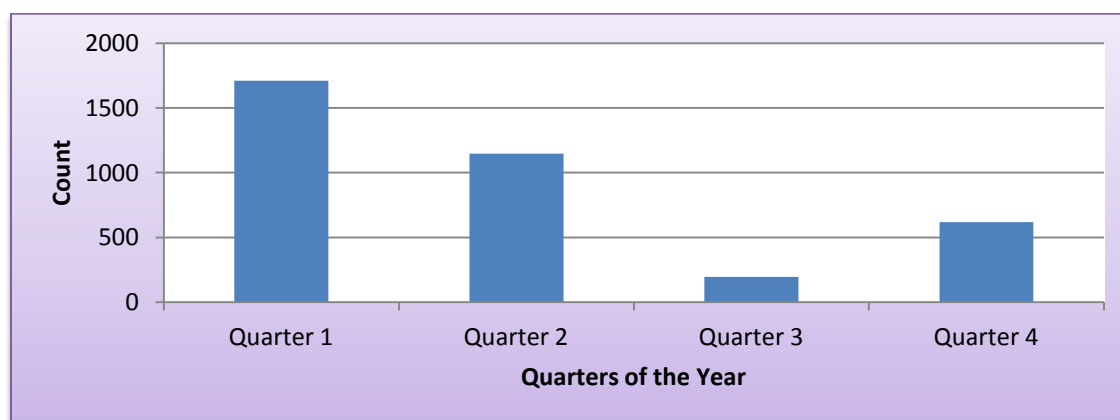


Fig 52 – Proportion of ANC Clients who received HIV Testing in Kirkose Sub City in 2006 E.C

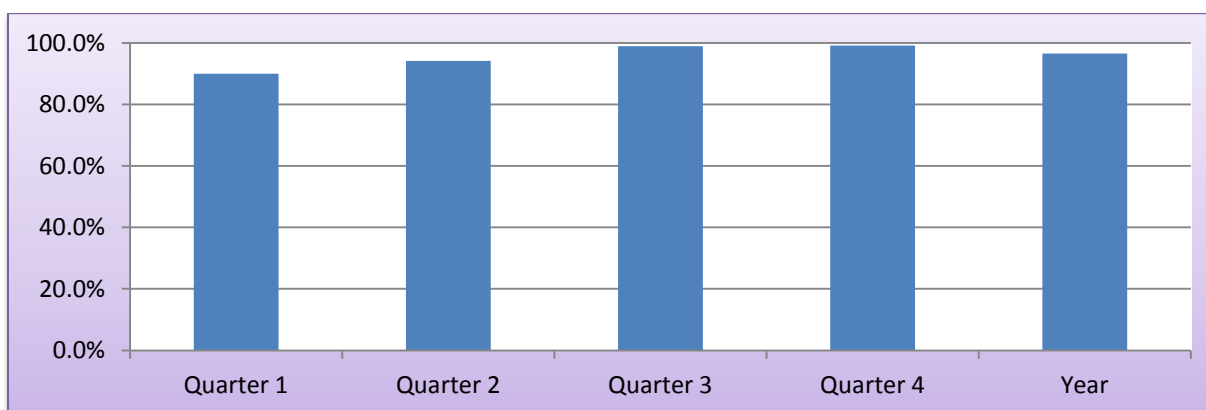


Fig 53 – Number of ANC Clients who received HIV Testing Service and Clients Testing Positive for HIV in Kirkose Sub City in 2006 E.C

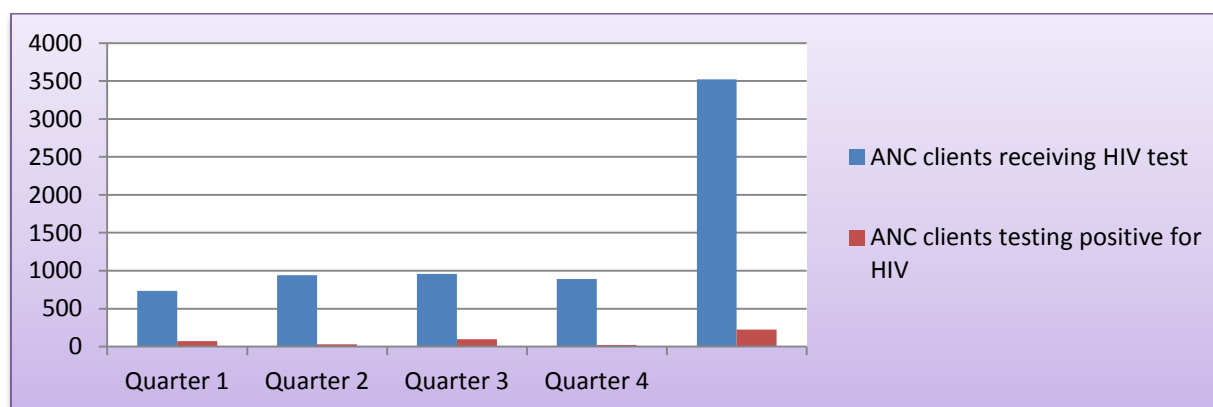
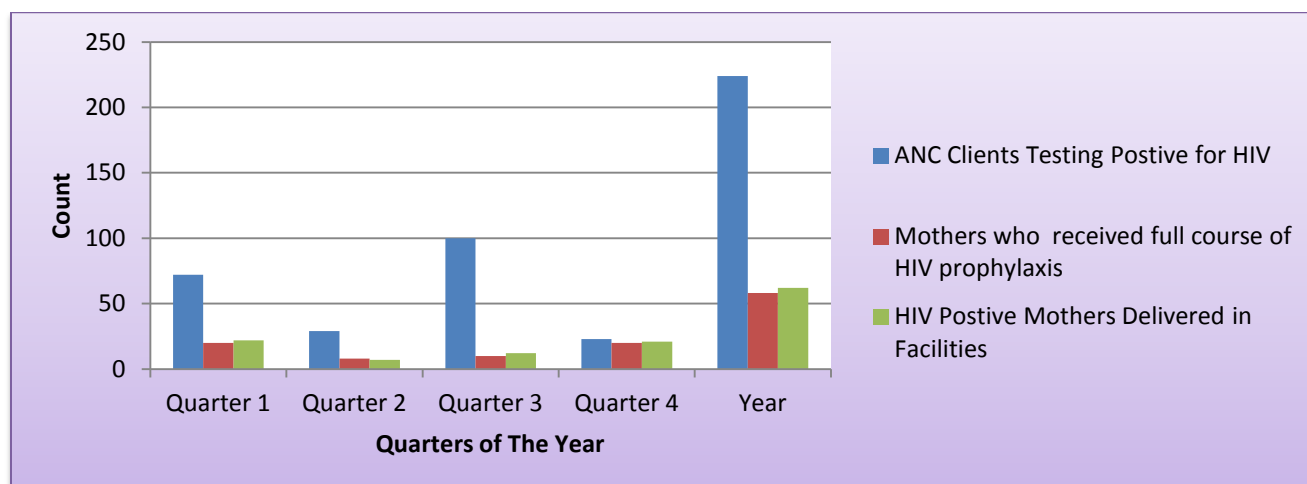


Fig 54 – Number of ANC Clients who tested Positive for HIV Compared with HIV Positive Mothers Delivered at Facility and received full dose of HIV prophylaxis in Delivering Organization in Kirkose Sub City in 2006 E.C



Discussion

Kirkose Sub City is one of the densely populated Sub Cities with an average 150 residents per hectare. Regarding the health service coverage of the Sub City, there are 3 and 2 government health centers and hospitals respectively. Based on the above data one health center is expected to serve 78,345 populations and a single hospital is also expected to serve 117,518 population. The health center coverage is far below the national urban coverage standard, which states a health center to give service for 40,000 populations. (7) In contrary the hospital coverage is higher than the national planned standard, which is (1:500,000). Similarity is also observed with overall Addis Ababa health service coverage in which a health center gives service for 43,795 and a single hospital for 228,357.

Looking in to the human power distribution, in health facilities of Kirkose a single medical practitioner gives a service for 4897 clients. This is by far better than the overall Addis Ababa population to general practitioner ratio (1:22342), this can be due to the presence of residents medical practitioner in the two hospitals residing in Kirkose Sub City (8). It is also observed that there is a significant log stock out days of tracer drugs specially on ferrous sulphate, ORS and Tetracycline. One of the indicators used to measure the health service utilization rate is inpatient admission rate in 1000 population. In kirkose sub city the inpatient admission rate is 1 in 1000 population which is far below the overall admission rate of Addis Ababa which is 11 in 1000 population. This may be due to the hospitals capacity in the sub city, which can increase referral of patients to other facilities due to absence of bed and services.

Contraceptive acceptance rate (CAR): proportion of women of reproductive age (15-49 years) who are not pregnant who are accepting a modern contraceptive method (new and repeat acceptors). The contraceptive acceptance rate in Kirkose sub city (15.9) is below Addis Ababa contraceptive acceptance rate which is 22. The national target for contraceptive acceptance rate by the end of HSDP IV is 79% and based on 2006 E.C health and health related indicators report of FMoH the current national performance on contraceptive acceptance rate is 63%. Peoples in urban setup are believed to have a higher level of CAR as they can access information related to family planning. In contrary based on the above data both Addis Ababa and Kirkose sub city CAR is far below the national performance which can be due to poor data collection method and

absence of health information management system at private facilities which may serves much of the clients in the city.

The above findings are also observed in antenatal care coverage and abortion coverage, which is by far below the national performance. The ANC coverage at Kirkose Sub City is 72% which in better performance than the 2011, EDHS finding (57.1) but by far below than the national HMIS performance 98%. Stillbirth Rate is proportion of stillbirths from total births attended by skilled health attendants. In Kirkose Sub city the stillbirth rate is 25 in 1000 live birth which is also similar to the national performance (25.6%) (5, 8) .

This Profile paper also summarized the child health status of the sub city. Based on the data collected from the sub city it was observed 2.9% of all live birth are low birth weight (below 2500 gm) and an early institutional death of 1 in 1000 live births were reported. Observing the nutritional status of under 3 children, both the mild and severe malnutrition trend is increasing throughout the year which end up with 766 and 24 under 3 children with moderate and severe malnutrition respectively. Similar finding is also observed in immunization status of the Children in which for two selected antibodies (Measles and Pentavalent) and the overall full immunization status is below the city and national coverage.

Acute upper respiratory tract infection was the leading causes of morbidity both in under five and general population. Diarrheal disease and Pneumonia were also found to be an important cause of morbidity in under five children. Diarrhea, Urinary tract infection and Dyspepsia were common causes of morbidity in general population. This finding is similar to the national top causes of morbidity. Unlike the national data in Kirkose sub city Trauma is one of the top ten causes of morbidity in the sub city which can be explained by the urban nature of the city which makes it vulnerable with road traffic accidents and construction related traumas. There were a total of 125 report of immediately reportable diseases the commonest being Measles, AFP and AWD. The details of the reporting period and the action taken by the administrative bodies are not well documented. Only from the list of the reports it shows a higher number of detected outbreaks in the community as a single presence of the above disease initiate an emergency response.

TB and HIV are two selected priority diseases used in this profile. Based on the data gathered from the sub city health office there were 494 new cases of TB in the region making a period incidence of 0.2%. 69% of TB patients who completed a treatment cohort in 2006 have reported to be cured which is also similar with the national performance of the same year which is 69.1% but, far below the HSDP target of 83%. A total 3669 clients have received a VCT service in 2006 E.C. A total of 4869 clients are receiving ART services from facilities residing in Kirkose Sub city (which alone makes a total prevalence of 2.1%). There is a relatively good performance of providing HIV test for ANC clients in which almost all mothers coming for ANC service have got HIV testing services (with PMTCT testing rate of 95%). This performance is much better than the one got by 2011 DHS report who states, only 55.2% of Clients on ANC gets HIV test services. (5)

In contrary, a very poor performance was observed on PMTCT services. In 2006 from all clients coming for ANC services 224 were tested positive for HIV which give an 6% prevalence of HIV in ANC clients which is a significantly higher prevalence as compared to the ANC based HIV sentinel surveillance studies report (the maximum site reporting 5.1% prevalence). From the above 224 mothers only 62 (27.6%) of mothers delivered their babies at health facilities and 58 (25.8%) of mothers completed a full dose of HIV prophylaxis (PMTCT Delivery Coverage). This shows almost 75% of mothers in the sub city have not accessed HIV prophylaxis before delivery which in turn will have a great impact on the health of the newborn

Regarding the data quality and completeness the sub city has reported a data completeness of 85%. However still much of the data elements in the report are not full and difficult to summarize the overall health status of the sub city based HMIS report as private health facilities may serve a significant amount of the population and they are not included in HMIS system.

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Conclusion

Based on the data collected the following can be conclude regarding the socioeconomic status specifically the health status in Kirkose Sub City;

- ⇒ Most of the socio economical aspect of the sub city is (in terms of educational, safe water and Economical status) in similar with other sub cities and it is the reflection of the current the city status.
- ⇒ Comparing with the national targets the sub city has optima hospital service coverage with optimal level of practitioner to population ratio however; there was low health center service coverage.
- ⇒ All tracer drugs in health facilities residing in Kirkose Sub City were missing at least for one day in 2006 E.C
- ⇒ All selected maternal and reproductive health indicators in the sub city (CAR, ANC coverage and Abortion care) are below both the national and City performance and target.
- ⇒ All selected vaccines coverage are below both the national and City performance and target and the trend of under 3 years moderate and severe malnutrition are increasing throughout the year
- ⇒ Upper Respiratory Tract Infection, Diarrheal Diseases and Pneumonia are there three disease with a high public health importance both for under five and general population.
- ⇒ There is a relatively good performance of health facilities in the sub city on TB treatment and HIV testing services for ANC Clients.
- ⇒ There is a very low rate of health facility delivery by HIV positive mothers which reduces the delivery PMTCT coverage which in turn have a great impact on health of the newborns
- ⇒ The overall data management (from data collection up to documenting) needs much improvement in all sector offices of the sub city and the health management information system (HMIS) implementation should be started at private facilities in sub city.

Recommendation

Based on the above result the following are recommended regarding the health status in Kirkose Sub City;

- ⇒ Observing a low coverage of health center services and a relatively high outpatient load construction of new health centers by government or in partnership with the private sectors is recommended
- ⇒ The sub city and the facilities in the sub city need to plan pharmaceuticals earlier and Pharmaceutical Fund and Supply Agency (PFSA) should avail at least tracer drugs in uninterrupted manner.
- ⇒ The sub city should study the reasons for a lower maternal and child health indicators so as to device a way for improvement
- ⇒ Since the three common diseases in the sub City are Upper Respiratory Tract Infection, Diarrheal Diseases and Pneumonia, Health education on prevention and control of respiratory disease, hygiene and sanitation practices should be provided to the community in Kirkose Sub City through health facilities and health extension professionals.
- ⇒ health professional working in health facilities residing in Kirkose Sub City should provide a continuous follow up, Tracing mechanism and encouragement to HIV positive mothers identified at ANC services to deliver their babies at health facilities so as to prevent mother to child transmission of HIV
- ⇒ Addis Ababa city administration health office, HMIS department should give a continuous mentorship and supervision to improve data quality at each sub cities and also should start implementation of HMIS in private health facilities of Addis Ababa, since a significant part of the population receives services from this facility.
- ✚ The details of the action plan is presented on the annex part of this document

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CHAPTER FIVE- Scientific Manuscript

5.1-Outbreak of Mass Psychogenic Disorder in a Primary School of Central Ethiopia, December 2015

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Abstract

On December 2, 2015 Sululta District Health Office, a semi rural area in the central part of Ethiopia reported 180 cases of mass collapse in Chanco Primary School without any identified cause. An outbreak investigation team was formulated and deployed to the affected area to investigate the cause of the outbreak and implement control and prevention measures. We applied a descriptive analysis followed by a sex matched case control study of 1:2 case to control ratio.

We identified 183 cases of conversion disorder; all are students of grade five to eight in Chanco Primary School. Sixty two percent of the cases were females (age 11 to 15 years). The most affected group (78.9%) with an overall mean age of 14 years (+/- 2 years). The overall attack rate and admission rate were 17% and 2.2 % respectively and on the bivariate and multivariate analysis, the factors associated with illness were seeing someone with hysterical symptoms (OR17.64, 95% CI, 2.19-141.86) and believing “Evil Spirit” (OR6.4, 95% CI, 1.26- 32.62).. We have confirmed the existence of a conversion disorder outbreak at Chanco Primary school, in similar symptoms, reported in other outbreaks mostly including fear and anxiety with associated dizziness and mass collapse. The outbreak was managed mainly by giving health education to students, teachers and health professionals in the locality. We recommend provision of health education to community of the locality on psychogenic disorders. On a bigger scale, we recommend primary schools in the country to have a school Psychologist to help on overall psychological problems of students especially during incidence of mass conversion disorders.

Key Words: Mass Psychogenic Disorder, Chanco, Primary School, Ethiopia

Word Count: 262

Introduction

Mass hysteria/Psychogenic disorder is a common term used to describe a situation in which various people all suffer from similar unexplained symptoms (1). Epidemic hysteria is also known as mass hysteria, mass psychogenic illness and mass sociogenic illness (2). Currently the word “Hysteria” is not utilized by different mental disorder diagnostic and statistical manual such as DSM-IV and ICD-10, replaced by the term conversion Disorder (3).

Generally, the prevalence estimation of the disorder ranges from 11/100,000 to 300/100,000 in general population samples and outbreaks are common throughout the world (1). Based on a review of published literatures conducted by Leslie P. Boss, during the period of 1973-1993, 70 outbreaks of epidemic hysteria were reported from different parts of the world. From the identified 70 outbreaks, half of the outbreaks happened in school setup followed by factories, 29%. Thirty and more cases were reported in 63% of the outbreaks. Psychogenic disorders are common among peoples with low socio economical status, females, age 10 to 35 years, stereotyping cultural and religious beliefs, unstable social and political environment (1,3,4).

In Ethiopia, there were two documented reports of “Mass Hysteria” outbreaks. The first was reported in April 2010 at a high school of the northern part of the country, in which fourty four cases of psychogenic disorders with female dominance was identified. The second outbreak of “Mass Hysteria” was reported in 2013, similarly in schoolgirls of northern Ethiopia in which, 50 cases with hysterical symptoms were identified (5).

The current outbreak was reported on December 2, 2015 in which a district health bureau at the central part of Ethiopia reported unknown cause of mass collapse of more than 180 primary school students to Ethiopian Public Health Institute (EPHI). EPHI then formulated an outbreak investigation team with an aim to ascertain the existence, identify risk factors and manage the outbreak. The team started the investigation considering all possible (Chemical, Biological and Psychological hazards) causes.

Methods and Materials

Study Area and Period

The mass collapse of unknown cause was reported from Sululta District which is situated in Oromia region under Finfine Surrounding Special Zone, Central Ethiopia with an estimated population of 156,679 (CSA, 2007 estimate). Chanco town which is the seat for the district administration is found 45 kilometers from Addis Ababa. The town has one primary and one high school. Chanco primary school where the event occurred has had 1873 students pursuing their education. The school gives the teaching services in two shifts in which students of grade 1 to 4 (total 773 students) and 5 to 8 (total of 1079 students) are classified to learn in a four hour shift round. The reported mass collapse event happened only in grade 5 to 8 students. The study was conducted from December 3-12, 2015.

Study Design

We applied a descriptive analysis followed by a sex matched case control study of 1:2 case to control ratio.

Sampling Method

We used the Epiinfo-7 mode to estimate sample size using 95% confidence limit, 80% power, 1:2 case to control ratio and an estimated odds ratio of 3 (we used the odds ratio estimate from the recent outbreak investigation report in Kombolch City). As result, we selected 40 cases and 80 controls.

Case Definition- Any student in Chanco Primary school who exhibited sudden onset of collapse (fainting) or dizziness with associated nausea, vomiting, anxiety, shortness of breath, abnormal body movement and palpitation from December 2 to 12, 2015 at school or out of school compound and the symptoms cannot be explained by any immediate physical or medical conditions.

Data Collection Tools and Procedures

To get the overall picture of the outbreak, we collected data from different sources including review of outpatient medical logbooks at health facilities where cases were treated, interview

and discussed with key informants (Physicians and nurses who attended the medical care of cases, district officials, the primary school director (principal), teachers and families of cases). Then, using a structured and semi structure questionnaire, cases and controls were interviewed by three trained data collectors. Environmental observation was also conducted, starting from the classroom where the event initiated (class room-7D) followed by the water and sanitation facilities, cafeteria and playing compound of the school for possible chemical or biological hazards.

Data Management and Quality Assurance- Before the start of data collection, a one-hour orientation was given for data collectors. Each completed questionnaire was daily reviewed by the principal investigators to monitor and improve the data quality. Before analysis, data was also cleaned for any missing and logically inconsistent values. After data collection, data entry and analysis were performed using epinfo-7, bivariate and multivariate (using logistic regression model) analysis were conducted using Epinfo-7 taking 95% confidence level.

Ethical Consideration- Before field investigation, a formal letter was written by EPHI to Sululta district health office to facilitate the investigation process. Before interview, an informed consent was taken from the study units and any information related with personal identification was not used on the report.

Result

We identified 183 cases of psychogenic disorder. All cases reported are students of grade five to eight in Chanco Primary School. Most of the cases were female (62.3%) and an age group of 11 to 15 is the most affected group (78.9%). Generally the mean age of the cases was found to be 14 years (+/- 2 years) and the overall attach rate and admission rate were found to be 17% and 2.2 % respectively.

The most common symptoms presented by the patients were dizziness (97.5%), fear or anxiety (92.5%), shortness of breath (92.5%) and fast hear beat or palpitation (90%).See table 36 **Table-36 Distribution of common symptoms among Students with psychogenic disorder in Chanco Primary School, Chanco Town, December- 2015**

Common Sign and Symptoms	Frequency	%
Dizziness	39	97.5
Fear or Anxiety	37	92.5
Shortness of Breath	37	92.5
Fast heart beat	36	90.0
Crying	29	72.5
Fainting	28	70.0
Fatigue	27	67.5
Nausea and Vomiting	22	55.0
Unable to move limbs	21	52.5
Uncontrolled body movement	16	40.0

The mean duration of the illness found to be 2.6 days (+/- 4.7 days). Majority of cases were reported on December 2 after which a few sporadic incidences were observed.

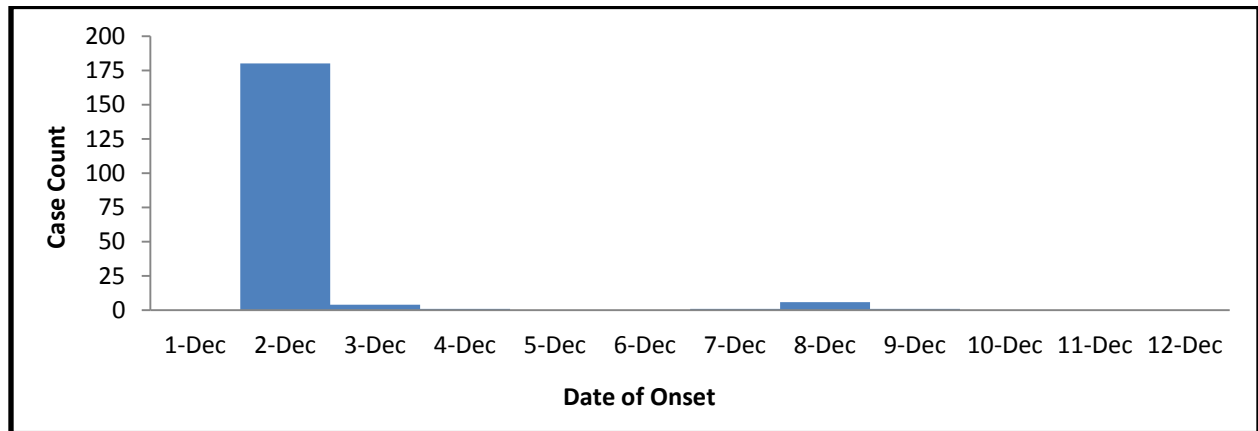


Figure-55 Epi curve of the psychogenic disorder incidence in Chanco Primary School, Chanco Town, December- 2015

During the Bivarite analysis risk factor variables such as seeing someone collapsing (OR 18.75 95%CI 2.43-144.41), knowing someone with the case (OR 2.13 95%CI 1.06-15.72), Evil spirit as a cause of the disorder (OR 5.2 95% CI 1.5-18.5) and not knowing the causes of the disorder (OR 2.2 95% CI 1.01- 4.84) are significantly associated with the outcome variable. However, on multivariate analysis, using a logistic regression model, only two variables, seeing someone collapsing[OR: (-)] and Evil spirit[OR:-- (-)] have statically significant association with the outcome variable.

Table 37 Multivariate analysis of risk factors for a psychogenic disorder outbreak in Chanco Primary School, Chanco Town, Decmber-2015

Variables	AOR (95% CI)
Knowing someone with a case (Yes/No)	1.87 (0.15-22.64)
Seeing someone collapsing (Yes/No)	17.64 (2.19-141.86)
Evil Sprit as a cause of the disorder (Yes/No)	6.4 (1.26- 32.62)
Not Knowing the causes of the disorder (Yes/No)	1.31 (0.50- 3.43)
Religion (Muslim/Orthodox)	1.42 (0.47- 4.27)
Religion (Protestant/Orthodox)	0.71 (0.18- 2.67)

Environmental Investigation- Starting from the classroom where the event starts (7D), the overall school compound was observed. The school has four blocks, three blocks for classrooms and one block for school staffs and administrative activities. The school has no water supply and when students are at school, they only consume water that they brought from home. Generally, from our observation from the classrooms and school compound we did not find any chemical or environmental exposure that can lead to a mass collapse incidence

Interventions Conducted - With the district health office, we started an active surveillance of sudden collapse at the Chanco health center and Chanco primary school. Since the understanding about psychogenic disorder at local health center was poor, we developed a leaflet and gave a half day orientation for Chanco health center clinical staffs on the general concept of psychogenic disorders, how to approach and manage cases. Since Teachers were the first responders for cases, we gave an orientation for schoolteachers on what the event is and what to do when the event happens. Health education about psychogenic disorders was also given for students at classrooms level.

Discussion and Conclusion

Mass hysteria typically begins when an individual becomes ill or hysterical during a period of stress. After this initial individual shows symptoms, others begin to manifest similar symptoms. For most of the reported outbreaks index cases identified to have a history of stressful social conditions. In some of the incidences, outbreak follows an index case with a true medical condition (1, 6,7). In our investigation, the index case was a 17 years old female student who have also encountered similar collapse a month before. The patient explained to us that for above symptom she visited Minilike hospital in Addis Ababa and the physician told her she has Anemia and prescribed her a drug to be taken for a month period. On our interview with the index case, we have not identified any stressful condition before the incidence of the mass collapse.

Based on the information we got from St Pauls hospitals' Physicians and nurses where most of the cases were treated, cases started to present at the hospital at 3:00 in the afternoon. Most of the cases were returned with reassurance and only 4 cases with sustained symptoms are observed over night and 3 was discharged and one patient was admitted. The main objective finding of the

admitted case was having hypothermia and different lab diagnostics testes (Urine analysis, CBC, blood chemistry and arterial blood gas) and the results showed normal values. After getting supportive care and improvement, the patient discharged on December 7, 2015.

According to DSM-IV manual, Psychogenic Disorder has been reported to be more common in rural populations, individuals of lower socioeconomic status, and individuals less knowledgeable about medical and psychological concepts. Psychogenic Disorder also appears to be more frequent in women than in men, with reported ratios varying from 2:1 to 10 (4). In this investigation, it was evident that females and age between 11-15 are the most affected groups. This result is supported by many other outbreak investigation of similar disorder. For instance based on a systematic review conducted by François Sirois on Epidemic Hysteria: School Outbreaks 1973–1993 in most of the reported outbreaks in this period the ratio of female to male was 2;1 and 56.2% of the reported outbreaks happened in the age groups of 11-15 years (7). Even if higher attack rate in females is reported, in many of investigations explanation is not given on why and how such events are high in female sex.

The top five symptoms reported during the outbreak was dizziness (97.5%), fear/anxiety (92.5%), shortness of breath (92.5%), fast heart beat or palpitation (90%) and crying (72.5%). Based on the twenty years systematic review conducted by the Jon Hopkins University, nausea or vomiting, headache, and dizziness or light-headedness each were reported in more than one third of the outbreaks in period 1973-1993 (8). Most of the above symptoms are also observed in similar outbreak in 2010, at the high school in rural eastern Ethiopia. The investigation report states that the top five symptoms are shortness of breath (97.7%), fear and crying (68.2%), anxiety(61.3%), unable to move limbs (29.5%) and fatigue (18.2%) (5).

In our Investigation, most of the responders (69.6%) do not know the cause of the outbreak. Looking in to the possible triggering factor of the outbreak knowing someone with psychogenic disorder, seeing someone with the symptom of psychogenic disorder, thinking evil spirit as a cause of the outbreak and not knowing the cause of the outbreak is associated with the illness. Similar finding was observed in an outbreak of psychogenic disorder in rural eastern Ethiopian in which, Thirteen (27.3%) and six (13.6%) of the cases reported the causes of illness were "evil-devil force" and stress, respectively. In addition, 59.1% replied they did not know the cause of the outbreak (5).

In spite of the above results, this study has limitations. Since the school was closed during the investigation of the outbreak, we obligated to use a snowball method to identify cases, which can reduce the randomization of the sample and the representativeness of the whole outbreak situation. In conclusion, we have confirmed the existence of a psychogenic disorder outbreak at Chanco Primary school, characterized by fear and anxiety with associated dizziness and mass collapse. The immediate triggering factor was seeing someone with the symptoms of psychogenic disorder and believing the causes of the outbreak as “evil spirit” source. We recommend provision of health education to local community on psychogenic disorders. On a bigger scale, we recommend Primary schools in the country to have a school Psychologist to help on overall psychological problems of students including in the incidence of events like mass psychogenic disorders.

Acknowledgment

We would like to acknowledge the district health officials, administrators and study participants for their full cooperation during the fieldwork.

Conflict of Interest

We declare that there is no conflict of interest in this research.

Contribution of Authors

Mekonnen .M: Wrote the first proposal, as well as draft manuscript. Addessei.A and Taame. H reviewed and finalized them. Boulanger. L and Megersa. E supported on the development of data collection instruments, and review of the final draft.

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5.2. Estimating Magnitude and Causes of Maternal Death in Ethiopia: Using National Maternal Death Surveillance and Response (MDSR) Report

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Abstract

Ethiopia is one of the eleven countries which contribute to the 65% of world maternal mortality. Estimations conducted by different organizations regarding magnitude of maternal death significantly varies among each other and the recently implemented MDSR system is believed to have a great role in estimating the magnitude and causes of maternal death in Ethiopia. However there is no study conducted to assess the role and outputs of MDSR system regarding estimation of the magnitude and causes of maternal death in Ethiopia. Thus we conducted a surveillance data analysis collected from October 2013 to January 2015 to estimate the magnitude and potential risk factors for maternal death in the country. We applied a retrospective descriptive data analysis of maternal death surveillance reports collected from October 2013 to January 2015 from the six regions of the country reporting maternal death under MDSR system. The result shows that the national maternal mortality ratio is 28.9 per 100,000 live birth with big disparity among regions, the maximum being at Dire Dawa City Administration (94 deaths per 100,00 live birth) and the minimum being at Addis Ababa City Administration (2.7 deaths per 100,000 live births). In this study the top three causes of maternal death are found to be post partum hemorrhage followed by sepsis and hypertensive disease of pregnancy. Much focus should be given to the top three common causes of maternal deaths (hemorrhage, sepsis and hypertensive disease of pregnancy) to reduce maternal death and very significant amount of maternal deaths were not reported from regions which need an evaluation of the national maternal death surveillance and response system.

Key Word: MDSR, Maternal Death, Surveillance Data Analysis

Word Count: 266 Word

Introduction

An estimated 287000 women worldwide died from pregnancy and its complications in 2010, 99%, of them in developing countries (1). Reported maternal mortality underestimates the true magnitude by up to 30% worldwide and by 70% in some countries (2). Inadequate measurement contributes to a lack of accountability and in turn to a lack of progress (3). By investigating a woman's death, MDSR inherently places value on her life which creates an important form of accountability for families and communities (3).

“Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels. It includes the routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths” *WHO, MDSR Technical Guidance* (3). Maternal death surveillance and response is a relatively new system which aims at providing information that effectively shows the true magnitude of maternal mortality and guides actions to eliminate preventable maternal mortality at health facilities and in the community(3). WHO and other partners are on the process of implementing this new approach towards maternal death specifically on 75 high-burden countries that account for 95% of maternal deaths (4).

Ethiopia is one of the countries with a higher number of maternal deaths (5). There has been effort in the country to improve access of essential health service to the population with specific focus on mothers and children (1). Progress have been also made as shown by the maternal mortality trend study which describes a 600 death/100,000 live birth improvement between the period of 1900 to 2010 (6). In contrary DHS, 2011 reported relatively elevated estimate (676/100,000) which shows the challenges in both reduction and estimation of maternal death (7, 8).

As the country have no vital registration system it is difficult to ascertain magnitude of maternal mortality in the community. In addition estimations conducted by different organizations regarding magnitude and causes of maternal death significantly varies among each other and the recently implemented MDSR system is believed to have a great role in estimating the magnitude and causes of maternal death in Ethiopia. However there is no study conducted to

assess the role and outputs of MDSR system regarding estimation of the magnitude and causes of maternal death in Ethiopia. Therefore this study will assess the burden and distribution of maternal death, related contributing factors and causes identified by the MDSR system in order to provide a feasible and applicable recommendation to appropriate stakeholders

Methods

This study applied a retrospective data analysis of MDSR reports collected the start of the implementation of the system (October 2013) to January 2015 defined period.

This study is conducted in the Six (Amahra, Tigray, Oromia, Addis Ababa, Dire Dawa and Harara) MDSR reporting regions of Ethiopian. Based 2014 Ethiopian central statistical agency estimate in the above six regions there was a total of 61,642,985 population in which 50.1% of them are females. 86% of the total population and 87% of the total female population of the country resides in the afro mentioned six regions of the country.

All case definitions used by Ethiopian maternal death surveillance and report (MDSR) technical guideline was applied on the study as a standard case definition.

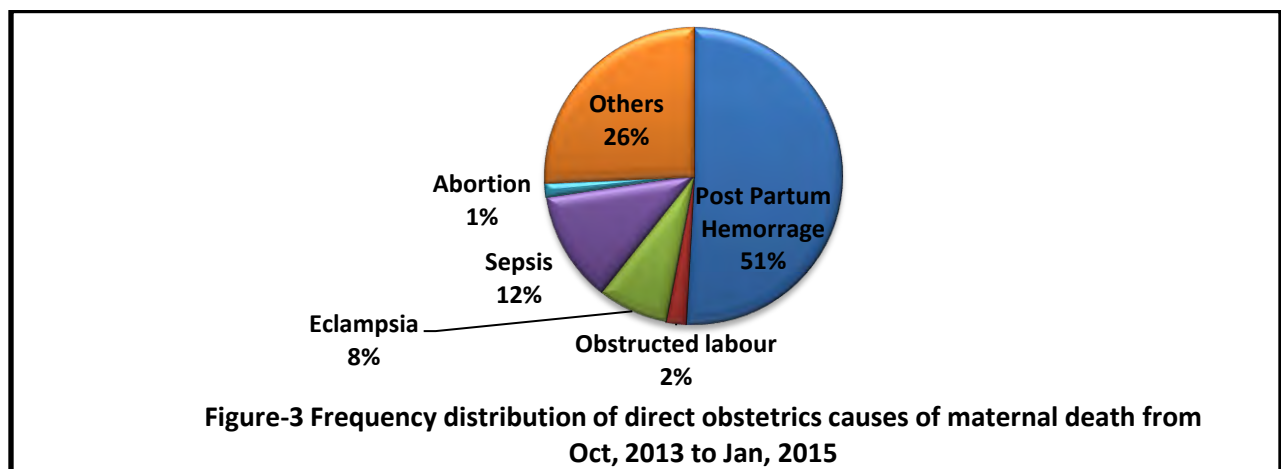
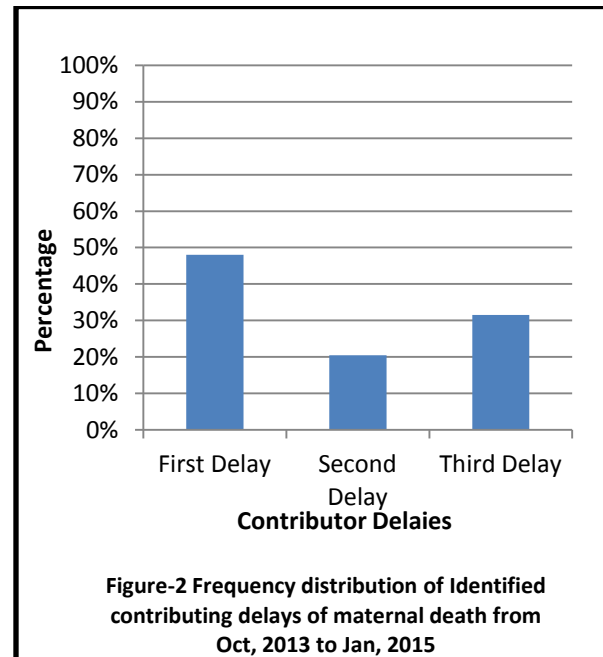
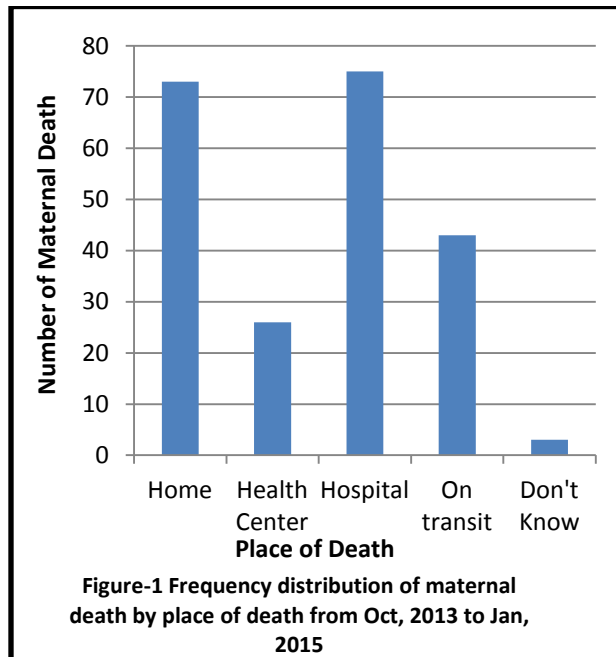
Result

A total of 226 deaths were reported from Oct, 2013 to Jan 2015. Looking to the national MDSR database 94 of fatality case were reported using case based reporting format and 132 were reported in aggregated form. Most of the deaths (45%) occurred in the age group between 30 to 39 years with a mean age of 30.3 year (+/- 1.4 years), 87% of mothers were married and more than half of the reported deaths have a party of five and above.

Most of the death happened in illiterate mothers (66%) and mothers who reside in rural part of the country (75%). Majority of the deaths happened during postpartum period (69.4%) followed by antepartum (16.4%) and intrapartum (14.2%) and 87% of deaths are reported to be caused by direct obstetric causes.

Table-1 Distribution of Maternal Death by Reporting Region from Oct, 2013 to Jan 2015

Reporting Regions	Total Reported Maternal Death	Expected Live Births	MMR (in 100,000 Live Births)
Amhara	45	171371	26.3
Oromia	35	347238	10.1
Dire Dawa	13	13749	94.6
Harari	1	7006	14.3
Addis Ababa	2	74490	2.7
Tigray	130	168640	77.1
National	226	782493	28.9



Discussion and Conclusion

From the total of 11 regions and city administration in the country 6 of them reported maternal death through the MDSR system. More than half of the maternal deaths (58%) were reported from Tigray region alone and followed by Amhara (20%) and Oromia (15%) regions. The high number of maternal death report from Tigray region can be due to a relatively good maternal death tracing mechanism at community and health facility level. The lower death report from regions with a bigger population size like Oromia and Amhara obligate us to consider a severe under reporting of maternal death in the country, specifically on the afro mentioned regions. This study also shows that the overall maternal mortality ratio in this sex region is found to be 28.9 per 100,000 live birth the maximum being at Dire Dawa (94.6 per 100,000 live birth) and the minimum at Addis Ababa (2.7 per 100,000 live birth).

Generally the overall maternal mortality ratio observed in this study is far below the WHO estimation (420 per 100,000 live birth) and a recent researches such as a study done in south west Ethiopia to estimate maternal and neonatal mortality(2014 e.c) which reports a maternal mortality ratio of 425 per 100,000 live births (95% CI:318–556) (9). The big disparity of maternal mortality may show as much of the maternal deaths are not reported under the MDSR system and the huge variation among regions may indicate the difference in strength of the system and the focus given to maternal death surveillance system.

WHO estimates show that the leading causes of maternal deaths are hemorrhage and hypertension, which together account for more than half of maternal deaths. Indirect causes, which include deaths due to conditions such as malaria, HIV/AIDS and cardiac diseases, account for about one fifth of maternal deaths. Regional estimates show that hemorrhage and hypertension are among the top three causes of deaths in both South Asia and Sub-Saharan Africa, where the majority of the world maternal deaths occur. In this study it is shown that 87% of the deaths were caused by direct obstetric cause and from which more than half of the death are caused by hemorrhage and 20% of the deaths are caused by sepsis and hypertensive disease of pregnancy.

It is also possible to see that hemorrhage is a single major factor which accounts for 44.3% of the total death. This finding is also supported by the MDSR data analysis conducted in Morocco which shows that Haemorrhage is the first direct obstetric cause (33% of all deaths). The second leading cause was pre-eclampsia/eclampsia (18%) followed by infections (8%). Ethiopian based

researches such as the analysis of risk factors for maternal death and delivery complications' in West Shewa zone, Oromia Region, Ethiopia, 2014 and Health facility-based maternal death audit in Tigray, Ethiopia, 2010 also showed that hemorrhage and infection are among the top three cause of death in their respective study areas (9, 10,11).

From total 226 maternal death reports, it was possible to get the detail data regarding the associated delays and their reasons only from 95 of the death report. The analysis of this data demonstrates that almost half (48%) of mothers encounter first delay (delay to seek care) before death. From those mothers who encountered first delay before death, the top three reasons reported were Lack of decision to go to health facility (26.6%), Delayed referral from home (25.9%), Failure of recognition of the problem (20%).

The first delay, failure to seek treatment by the pregnant women or her partner/family/relatives, is largely affected by local health beliefs (cultural, religious, bad experience in health facilities, good outcome in previous pregnancies without health care, gender inequality, unaffordable medical service cost and low education) (12). All these are significant limitations particularly among people with limited education and limited exposure to a modern medical care system. In Ethiopia, where the cultural barriers, religious influence, male dominance in household decision making and bad experiences in available health facilities are quite common-pregnant women usually come to health facilities with obstetric complications (12).

The surveillance data analysis report shows that almost all deaths (96%) are reported as preventable death. This relatively high figure comparing with the hospital based maternal death review conducted in Tigray region which states only 35% of the maternal deaths were avoidable (10). Generally looking into the data completeness of the reports, much is need to be done to improve the completeness and the quality. On this study it was possible to see that 11 data elements regarding ANC care of died mothers were missing from all reporting region. Most of the data elements specially data elements of parity, causes of death and preventability status of the deaths are missing on significant number of the reported death.

From this study it is observed that much focus needs to be given to the top three common causes of maternal deaths (hemorrhage, sepsis and hypertensive disease of pregnancy) to improve maternal outcomes in Ethiopia. Very significant amount of maternal deaths were not reported from regions which reduce the current usefulness of the system to estimate the magnitude of

maternal death in the country and we recommend a detailed evaluation of the national maternal death surveillance and response system.

Acknowledgment

We would like to acknowledge Ethiopian Public Health Institute (EPHI) for the support provided during the process of conducting this study.

Conflict of Interest

We declare that there is no conflict of interest in this research.

Contribution of Authors

Mikiyas .M: raised the research idea, wrote the first proposal, as well as manuscript drafts. Adamu A and Hafetom T. reviewed and finalized them. Ftalew G. Supported the statistical analysis.

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5.3. Investigation of Measles Outbreak in Telalake Woreda , Zone Three, Afar Region, February 2016

Authors- Mekonnen.M (1), Adissie. A (2), Taame.H (2), , Muse. A (3)

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Abstract

Measles is an acute viral illness caused by a virus in the family paramyxovirus, genus Morbillivirus. On February 1, 2016 an outbreak of Measles was reported from Telalake district of Afar Region, East Ethiopia. Investigation team was deployed to assess the distribution and associated risk factors of the outbreak in the district, to implement control measures. We applied a descriptive analysis of the collected line list of cases followed by unmatched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak. We identified 21 cases of Measles cases from which the first five cases were laboratory confirmed, the remaining are epidemiologically linked making the overall attack rate of 0.45 per 1000 populations and no death were identified. Most of the cases (66.6%) were female. The maximum and the minimum age was 1 and 14 year respectively with a mean age of 4.7 year (+/- 3.7). Most of the caregivers (85.7%) were illiterate and housewife with an average household size of 9 person per household. Eighty-one percent of the cases were not vaccinated for measles and the average measles vaccine doses taken by the remaining vaccinated cases were one dose. On multivariate analysis using the logistic regression model vaccination status of case (AOR 0.16, CI 0.02-0.96) and contact history with person with similar symptoms (AOR 46.2, CI 6.6- 532.2) were statically associated with probability of acquiring the illness. The outbreak was controlled by conducting mass vaccination and health education activities. We have confirmed the incidence of measles outbreak in Telalake Woreda of Afar region, the major risk factors being accumulation of susceptible unimmunized children and contact with Measles infected person. We recommend strengthening health education and routine and catch up immunization programs activities by the district health office to prevent similar outbreaks.

Key Word: Measles Outbreak, Afar, Ethiopia

Word Count: 299

Introduction

Measles is an acute viral illness caused by a virus in the family paramyxovirus, genus Morbillivirus. Measles is characterized by a prodrome of fever and malaise, cough, coryza, and conjunctivitis, followed by a maculopapular rash (1). Measles infection can result in serious complications such as blindness, encephalitis, or severe respiratory infections such as pneumonia (2). According to World health organization (WHO), Measles is one of the leading causes of death among young children even though a safe and cost-effective vaccine is available. In 2014, there were 114 900 measles deaths globally – about 314 deaths every day or 13 deaths every hour (3).

Prior to the availability of measles vaccine, measles infected over 90% of children before they reached 15 years of age. These infections were estimated to cause more than two million deaths and between 15 000 and 60 000 cases of blindness annually worldwide (4). Measles vaccination resulted in a 79% drop in measles deaths between 2000 and 2014 worldwide. In 2014, about 85% of the world's children received one dose of measles vaccine by their first birthday through routine health services – up from 73% in 2000. During 2000-2014, measles vaccination prevented an estimated 17.1 million deaths (3, 4, 5). Based on WHO report in Ethiopia the incidence rate of measles was 6.52 per 100,000 population in 2013 and in 2014, 14100 confirmed cases were.

Measles is a highly contagious virus, which spread by coughing and sneezing, close personal contact or direct contact with infected nasal or throat secretions. The Secondary attack rates among susceptible household contacts have been reported to be 75%–90%. Due to the high transmission efficiency of measles, outbreaks have been reported in populations where only 3% to 7% of the individuals were susceptible (3,6).

In Ethiopia, a seasonal pattern of occurrence of measles has been observed over the years, with increased number of measles cases during the late-early part of the year (December to February) (Figure 5). Due to the low sub national routine measles coverage and prevailing poor living and nutritional conditions, measles outbreaks continue to occur frequently in different parts of the country, most especially in Oromia and SNNPR (southern) Regions where the density of the population is relatively high . The number of confirmed measles cases steadily increased from 73 in 2003 to a peak of 3,511 in 2008, following which there was a decline to 1,944 cases in 2009. Even though measles incidence rate has showed significant increase in the country since 2010 a

dramatic increase is observed from 2012 (5.2 cases per 100,000 populations) up to 2014 (11.1 cases per 100,000 populations) (3,7). The Major objective of this investigation was to assess the distribution and associated risk factors of Measles outbreak in Telalake Woreda, Afar Region, so as to implement control measures.

Method

Study Area and Period

The Investigation is conducted in Afar Region, Telalake district, Adilala Kebele, which situated 567 K.M from the capital city Addis Ababa. Based on the information we get from the local authority, the district has 46903 populations from which 1379 and 1360 are under five and under one aged population respectively. The district has a total of 3 health centers and 11 health posts which delivery health care service to the community. The district is administratively classified into 11 Kebeles and Adilala Kebele is one of the eleven Kebeles in which the current outbreak of Measles happened. Adilala Kebele is situated 10 K.M from the center of the district. The Kebele have 3839 population, from which 522 and 111 are under five and under one year aged population respectively. This investigation is conducted February 2 to 9, 2016.

Study Design- We applied a descriptive analysis of the collected line list of cases followed by unmatched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak.

Case Definition and Selection of Cases and Controls

Case definition: The WHO adopted, national integrated disease surveillance case definition was used.

Suspected case: Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed cases: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in a epidemic.

Data Collection Tools and Procedures – Review of medical records of cases and discussion with key informants was conducted. Interview of Cases and Controls by three trained data collectors (including the principal investigator) was also conducted.

Data Management and Quality Assurance- Before the start of data collection, a half-day orientation was given for data collectors. Each completed questionnaire was daily reviewed by the principal investigators to monitor the data quality. Before analysis, data was also cleaned for any missing and logically inconsistent values. All collected data are entered and analyzed using statistical softwares (using epiinfo-7 and SPSS), bivariate and multivariate (using logistic regression model) analysis are conducted using Epiinfo-7 and SPSS taking 95% confidence limit.

Ethical Consideration- Before filed investigation a formal letter was written by Ethiopian Public Health Institute (EPHI) to Telalake Woreda health office to get permission and facilitate the investigation process. Before data collection, an informed consent was taken from mothers or caregivers of cases and any information related with personal identification was not used on the report.

Result

We identified 21 cases of Measles from which the first five cases were laboratory confirmed using the conventional PCR. All of the cases reported were from Adalil Kebele of Telalake Woreda and no death was identified. Most of the cases (66.6%) were female and the maximum and the minimum age was 1 and 14 year respectively with a mean age of 5 years (+/-3 years). All of the responders (mothers or caregivers) were Muslim in religion, 90.5% were married and 85.7% of them were illiterate and housewife with an average house hold size of 9 person per household.

From the total cases 17 (81%) of them were not vaccinated for measles, from the vaccinated 4 cases, the 3 of the vaccination status was identified by vaccination card and the remaining one was from vaccination memory. The average does taken by the vaccinated cases were one does, and the mean duration of last vaccination was identified as 14 month. The responders were asked for the common sign and symptoms and Fever (100%), Rash (100%), Coryza (100%) and Cough (81%) were the top identified symptoms. The mean duration of cases to sick medical care were 6 days. Majority of cases were reported on 28 January

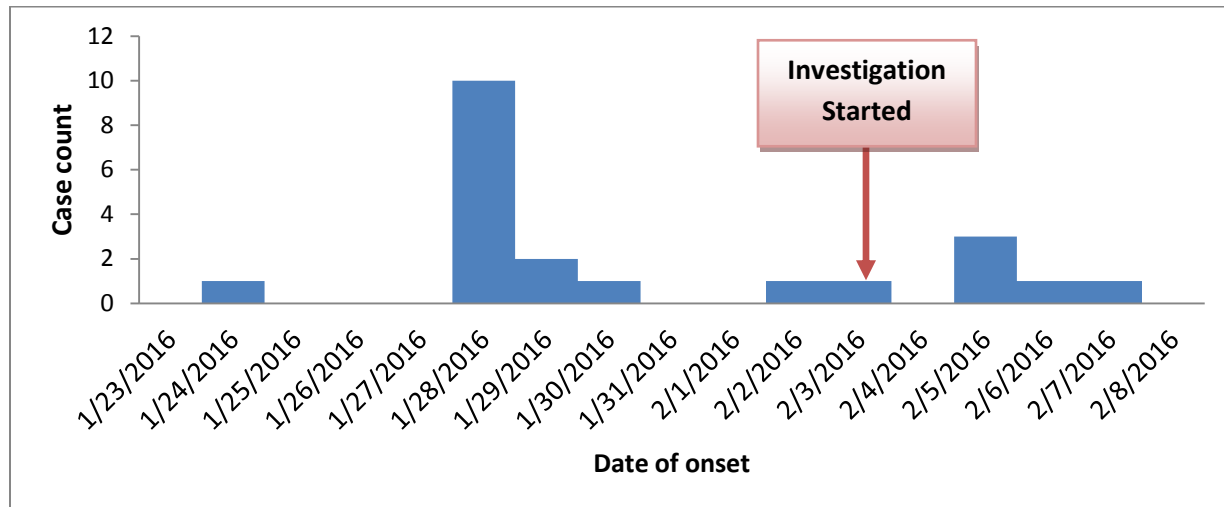


Figure-5 Epi curve of the Measles cases in Afar, Telalake Woreda, February- 2016

In order to assess the possible risk factors of the outbreak we applied bivirate analysis using 95% confidence level. On bivirtae analysis nutritional status of case OR2.9 (1.02-16.8), vaccination status of the responders OR 0.16 (0.05-0.51), Travel history of responders OR2.5. (1.05-10.5), contact history with a rash patient OR2.5. (1.05-10.5) and Knowing the causes of the disease OR0.5 (0.09- 0.81) were statically associated with probability of acquiring the disease.

During Multivariate analysis using the logistic regression model only Vaccination status of case AOR0.16 (0.02-0.96) and contact history AOR 46.2 (6.6- 532.2) were statically associated with probability of acquiring the disease.

Table 10 Multivariate analysis of risk factors for a Measles outbreak in Afar, Telalake Woreda, February- 2016

Variables	AOR (95% CI)
Nutritional Status of case	2.7 (0.05-22.64)
Vaccination status of case	0.16 (0.02-0.96)
Travel History	7.6 (1.9- 62.62)
Contact history	46.2 (6.6- 532.2)

Result from Qualitative Discussion- We also made a discussion with key informants including the local health officials (district and Kebele health extension workers) and families of the cases. Based on the key informants the outbreak started after the index case (4 years old girl) return to home after staying in neighboring district for 2 months to visit the families of her mother. The mother of the index case reported that, the girl acquired a fever and rash while she was at the neighboring district. After she come back to home her two sister and one brother started to show the same symptom. The index case was not vaccinated for measles before and the mother thinks the disease happens because of bad water and she didn't take her children for medical intervention. After few days the disease started to expand in the village and a health extension woker reported the condtion to woreda health officials.

Intervention conducted- After the team reached at Telalake Woreda, we revitalized a rapid response team to coordinate the outbreak at Woreda level. With the Woreda Health Office, we started an active surveillance of Measles. Mass vaccination was immediately started by the Afar regional health office. With the local health extension, the team gave a health education on the cause and mode of transmission measles disease. During our interview with the local community their knowledge and attitude on the usefulness of vaccine to prevent measles was very poor, hence the team gave a feedback to local administration to give a health education and advocacy activities on the usefulness of Measles vaccine to prevent similar incidences.

Discussion and Conclusion

Ethiopia is one of the countries with high measles incidence rate with a total of 14.61 cases per 100,000 population per year (7).

Like any infectious diseases, the burden is much pronounced in rural and illiterate community. The current outbreak occurred in children of one of a rural village of Afar region, in which 85.7% of the mothers or caregivers of the cases were illiterate. The maximum educational status achieved by the respondents was primary education. Educational status of a mother is one of the factors that have a great impact on prevention of communicable diseases, including measles. This is further shown by the study conducted by Tikelaye Kidane et.al, to study the Factors that influencing child immunization coverage in a rural District of Ethiopia. In this study it was

evident that children's of illiterate mothers have an odds of 9.0 not to be vaccinated from measles as compared to the children's of literate mothers. The study further explains that maternal education is decisive to immunization status of the child. As not knowing subsequent dose was the most common reason given for defaulting and since the immunization, knowledge was related to education of the mother, coverage was low among illiterate mothers (8).

To further observe the mothers or caregivers knowledge and attitude regarding the measles disease and its prevention methods we asked a list of question and the result showed that 85.7% of the responders reported they don't know what cause the disease and 76.2% of the responders they don't know how the disease transmitted from person to person. Regarding the preventability of the disease much of the responders (85.7%) reported they have no knowledge about the vaccine against measles. This result is in agreement with a study conducted in the rural districts of Ethiopia, to assess the factors influencing childhood immunization, which showed most of mothers have a low knowledge about the importance and the schedule of vaccination (8).

Based on the information we get from the local health officials a year before a follow up measles vaccination campaign was conducted for children in age group between 6 month and 5 years. The administrative report of the district health office shows that measles vaccination coverage is 84% in the district. In our investigation from the total 63 study units (including both the cases and controls) only 37 (58.7%) was at least once vaccinated for measles. The current outbreak was happened in Adilal kebele which very near to the center of the Woreda, which may show possibility of a severe outbreaks in the pocket Kebeles of the district. Based on the Ethiopian Public Health Institute Measles surveillance and outbreak control guideline, efforts should be made to have measles coverage of 90% in the age group between 9 and 11 month (6).

Using both the administrative and the investigation data it is possible to explain the current outbreak as a result of the accumulation of high number of susceptible children which was not vaccinated for Measles. On multivariate analysis the major risk factors identified were vaccination status of case AOR 0.16 (0.02-0.96) and contact history with person with similar symptoms AOR 46.2 (6.6- 532.2). This finding is observed in different outbreak investigation of measles, which shows the above factors are key for prevention of similar outbreaks in the nation (3, 10, 11).

In conclusion, we have confirmed the incidence of an imported measles outbreak in Adilala Kebele of Telalake Woreda of Afar region, the major risk factors being accumulation of susceptible unimmunized children and contact with infected person. We have seen that the overall knowledge and perception about Measles and its prevention methods is poor. We recommend strengthening health education and routine and catch up immunization programs activities by the district health office to prevent similar outbreaks.

Acknowledgment

We would like to acknowledge the district health officials, administrators and study participants for their full cooperation during the fieldwork.

Conflict of Interest

We declare that there is no conflict of interest in this research.

Contribution of Authors

Mekonnen .M: Wrote the first proposal, as well as draft manuscript. Addessei.A and Taame. H reviewed and finalized them. Muse.A, supported on the development of data collection instruments, and review of the final draft.

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CHAPTER SIX- Scientific Abstract

6.1. Outbreak of Mass Psychogenic Disorder in a Primary School of Central Ethiopia, December 2015

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Abstract

On December 2, 2015 Sululta District Health Office, a semi rural area in the central part of Ethiopia reported 180 cases of mass collapse in Chanco Primary School without any identified cause. An outbreak investigation team was formulated and deployed to the affected area to investigate the cause of the outbreak and implement control and prevention measures. We applied a descriptive analysis followed by a sex matched case control study of 1:2 case to control ratio.

We identified 183 cases of conversion disorder; all are students of grade five to eight in Chanco Primary School. Sixty two percent of the cases were females (age 11 to 15 years). The most affected group (78.9%) with an overall mean age of 14 years (+/- 2 years). The overall attack rate and admission rate were 17% and 2.2 % respectively and on the bivariate and multivariate analysis, the factors associated with illness were seeing someone with hysterical symptoms (OR17.64, 95% CI, 2.19-141.86) and believing “Evil Spirit” (OR6.4, 95% CI, 1.26- 32.62).. We have confirmed the existence of a conversion disorder outbreak at Chanco Primary school, in similar symptoms, reported in other outbreaks mostly including fear and anxiety with associated dizziness and mass collapse. The outbreak was managed mainly by giving health education to students, teachers and health professionals in the locality. We recommend provision of health education to community of the locality on psychogenic disorders. On a bigger scale, we recommend primary schools in the country to have a school Psychologist to help on overall psychological problems of students especially during incidence of mass conversion disorders.

Key Words: Mass Psychogenic Disorder, Chanco, Primary School, Ethiopia

Word Count: 262

6.2. Investigation of Measles Outbreak in Remote District of Eastern Ethiopia

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Abstract

Measles is an acute viral illness caused by a virus in the family paramyxovirus, genus Morbillivirus. On February 1, 2016 an outbreak of Measles was reported from Telalake district of Afar Region, East Ethiopia. Investigation team was deployed to assess the distribution and associated risk factors of the outbreak in the district, to implement control measures. We applied a descriptive analysis of the collected line list of cases followed by unmatched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak. We identified 21 cases of Measles cases from which the first five cases were laboratory confirmed, the remaining are epidemiologically linked making the overall attack rate of 0.45 per 1000 populations and no death were identified. Most of the cases (66.6%) were female. The maximum and the minimum age was 1 and 14 year respectively with a mean age of 4.7 year (+/- 3.7). Most of the caregivers (85.7%) were illiterate and housewife with an average household size of 9 person per household. Eighty-one percent of the cases were not vaccinated for measles and the average measles vaccine doses taken by the remaining vaccinated cases were one dose. On multivariate analysis using the logistic regression model vaccination status of case (AOR 0.16, CI 0.02-0.96) and contact history with person with similar symptoms (AOR 46.2, CI 6.6- 532.2) were statically associated with probability of acquiring the illness. The outbreak was controlled by conducting mass vaccination and health education activities. We have confirmed the incidence of measles outbreak in Telalake Woreda of Afar region, the major risk factors being accumulation of susceptible unimmunized children and contact with Measles infected person. We recommend strengthening health education and routine and catch up immunization programs activities by the district health office to prevent similar outbreaks.

Key Word: Measles Outbreak, Afar, Ethiopia

Word Count: 299

6.3. Estimate Magnitude and Causes of Maternal Death in Ethiopia: Using National Maternal Death Surveillance and Response (MDSR) Report

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Abstract

Ethiopia is one of the eleven countries which contribute to the 65% of world maternal mortality. Estimations conducted by different organizations regarding magnitude of maternal death significantly varies among each other and the recently implemented MDSR system is believed to have a great role in estimating the magnitude and causes of maternal death in Ethiopia. However there is no study conducted to assess the role and outputs of MDSR system regarding estimation of the magnitude and causes of maternal death in Ethiopia. Thus we conducted a surveillance data analysis collected from October 2013 to January 2015 to estimate the magnitude and potential risk factors for maternal death in the country. We applied a retrospective descriptive data analysis of maternal death surveillance reports collected from October 2013 to January 2015 from the six regions of the country reporting maternal death under MDSR system. The result shows that the national maternal mortality ratio is 28.9 per 100,000 live birth with big disparity among regions, the maximum being at Dire Dawa City Administration (94 deaths per 100,00 live birth) and the minimum being at Addis Ababa City Administration (2.7 deaths per 100,000 live births). In this study the top three causes of maternal death are found to be post partum hemorrhage followed by sepsis and hypertensive disease of pregnancy. Much focus should be given to the top three common causes of maternal deaths (hemorrhage, sepsis and hypertensive disease of pregnancy) to reduce maternal death and very significant amount of maternal deaths were not reported from regions which need an evaluation of the national maternal death surveillance and response system.

Key Word: MDSR, Maternal Death, Surveillance Data Analysis

Word Count: 266 Word

6.4. Evaluation of Maternal Death Surveillance and Response (MDSR) System in Tigray Region, North Ethiopia

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Abstract

In 2013 an estimated 289,000 women worldwide died from pregnancy and its complications, 99% of them in developing countries. Estimates conducted by different organizations regarding magnitude of maternal death significantly vary among each other, the DHS estimate (676 deaths in 100,000 live births) and the WHO estimate (420 deaths in 100,000 live births) can be an example. One of the challenges in eliminating preventable maternal death in the nation is absence of information that effectively shows the true magnitude of maternal mortality to guide intervention. As an intervention, Ministry of Health started to implement maternal death surveillance and response (MDSR) system as a weekly reportable event since October 2013. Since then, no study was conducted to assess the efficiency and effectiveness of the system. The objective of this project is to assess the efficiency and effectiveness of the current MDSR system in Tigray Region. We used descriptive data analysis of the MDSR report in the region followed by a cross sectional study on selected health facilities and key informants. We have identified that the implementation process of the surveillance system at facility level is not uniform in terms of reporting system and formats utilized. The simplicity (scored 3.6/5), acceptability (scored 3.2/5), timeliness (scored 3.64/5) and the usefulness to identify cause of death (scored 3.3/5) are attributes of the system, which identified as areas demanding improvement. There is a big disparity between estimated number of maternal deaths and deaths reported through the surveillance system, which reduce the representativeness (calculated representativeness of 16%) of the system. The Federal Public Health Emergency Management Unit (PHEM) and Tigray Health Office should give focus to attributes that identified as areas' demanding improvement, guidance and follow up is recommended to improve the representativeness of the system.

Word Count- 290

Key Word: MDSR, Surveillance Evaluation, Ethiopia

CHAPTER SEVEN- Narrative Description of Disaster Situation

7.1. Pre Harvest Public Health and Nutritional Risk Assessment in Hadiya and Kembata Tembaro Zones of SNNP Region

Introduction

Hadiya zone is located in the southern part of Ethiopia 430 kilometers from the capital city, Addis Ababa. Administratively the Zone is under SNNPR region and it has 11 Woredas including the main Hosana town. The population of the zone is estimated to be 1.6 million for which there are a total of 2 hospitals, 61 health centers and 305 health posts. There are also 483 primary schools and 65 secondary schools in the zone. The health governance structure is composed of zonal health department which manage the overall public health activities and there are health office in each Woredas, further more health extension workers are assigned in each Kebeles. Most of the populations in the Zone are farmers and 40% of their total agricultural products are from the Belege session. It was also reported that few part of the population is a pastoralist community in which their livelihood is dependent of Animal products.

The other assessed area is Kebata Tembaro Zone which is located 400 km from the capital city Addis Ababa. The both the administrative and health governance structure of the Zone is similar with Hadiya Zone, which consists of 8 administrative Woredas including the main city Durame. The population of the Zone is estimated to be 864,453 for which there are a total of 1 hospital, 34 health centers and 134 health posts. Majority parts of the population are farmers and 30% of their total agricultural products are from the Beleg session.

Methods of the Assessment

Assessment Team

The assessment team is composed of multiple sectors which include EPHI, Regional DRMFSS, Regional Education Office, WFP and World Vision, Ethiopia. The team is sub grouped as a food need assessment group which mainly focuses to identify the food gap of the community and non food need assessment group whose main objective is to identify the health, nutritional, water and education current and anticipated gaps in the community.

Assessment Area and Period

The assessment is conducted at the Zonal offices and at two Woredas from each Zones, which are selected by the senior management of the Zone, using criteria of areas that are expected to have a major need gaps both in food and non food prospect. The information of selected Woredas are described below.

Hadiya Zone

A. Soro Woreda- Located 40 km from the Zonal city Hosaena, which has a total population of 239059 (49.9% are females) from which 33324 are under five children. There are a total of 8 governmental health centers, 1 NGO health center and 46 health posts. Administratively the Woreda is structured in two 49 kebeles in which one health extension worker is assigned for each kebele.

B. East Badwacho Woreda - Located 80 km from the Zonal city Hosaena, which has a total population of 216714 (50.3% are females) from which 33829 are under five children. There are a total of 8 governmental health centers and 41 health posts. Administratively the Woreda is structured in two 39 kebeles in which one health extension worker is assigned for each kebele.

Kebata Tembaro Zone

A. Tembaro Zone - Located 90 km from the zonal city Durame, which has a total of 4 governmental health centers and 20 health posts. Administratively the Woreda is structured in to 21 kebeles in which one health extension worker is assigned for each kebele.

B. Hadero Tuneto - Located 70 km from the Zonal city Hosaena, which has a total population of 127590 (50.5% are females) from which 19904 are under five children. There are a total of 4 governmental health centers and 20 health posts. Administratively the Woreda is structured in two 16 kebeles in which one health extension worker is assigned for each kebele.

⇒ The assessment is conducted in a period between June 24 to July 2

Assessment Techniques and Procedures

After briefing the objectives of the assessment by the team leader the Zonal Senior management teams selected two Woredas (considering the time and logistic limitation) that are considered to have a major gap in food security and other non food needs of the community. The woreda also selected a Kebele to be visited using similar criteria with Zonal part.

To assess the public health need of the community we used a pre designed structured questionnaire to interview health officials at Zonal and Woreda level. Environmental and household observation is also applied to further support evidences got from interview.

Assessment Findings

Public Health Emergency Coordination

Both of the assessed Zones and all the four Woreda health offices reported that there is a multi sectorial PHEM coordination forum majorly composed of respective PHEM office, water authority, agriculture office and women affairs. The Zonal officials also reported that the meeting frequency is regular at Zone level but, at all assessed Wordas the forum is functional only during public health emergencies. Both at Zone and Woreda level there is PHE preparedness plan but the plan has no demarcated budget source.

Cause of Morbidity

Hadiya Zone

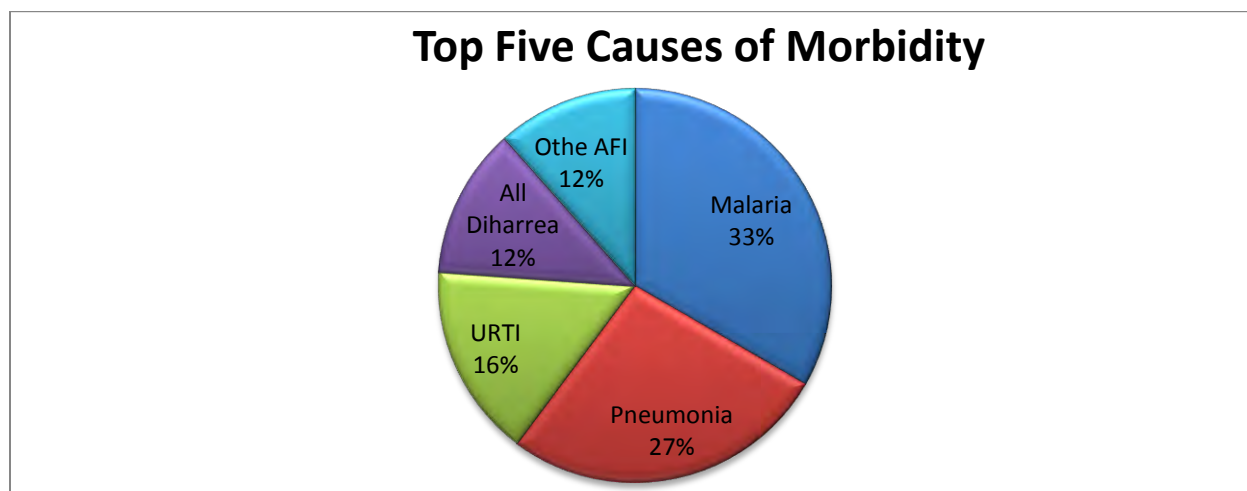


Figure 56. Top Five Causes of Morbidity in Under 5 Children in Soro Woreda, Hadiya Zone 2007 E.C

⇒ As shown in the figure malaria the first cause of morbidity in under 5 children followed by Pneumonia and URTI respectively.

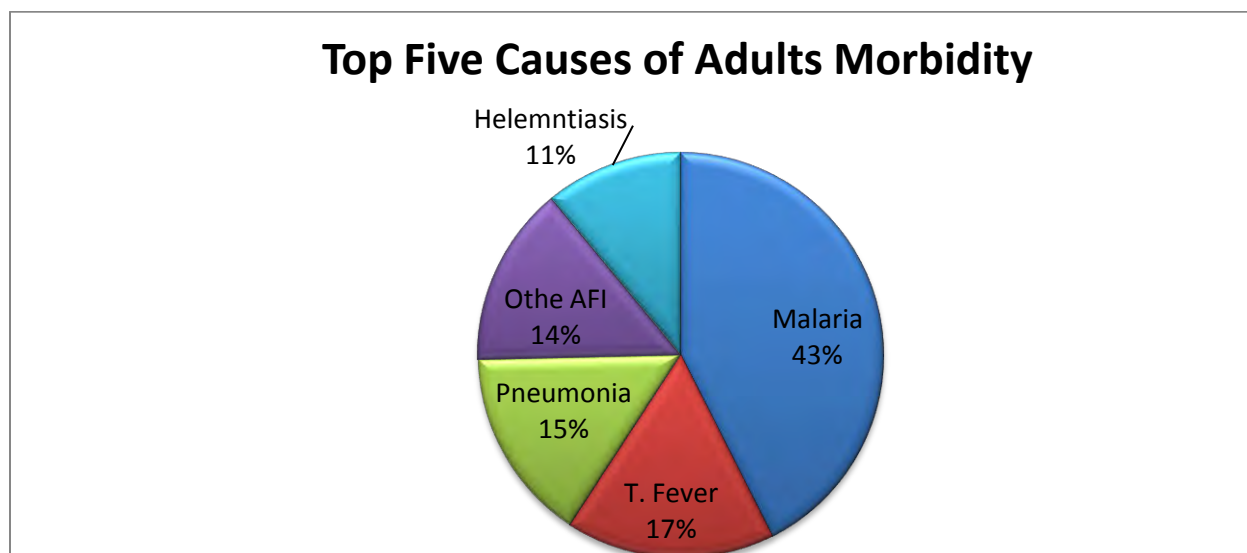


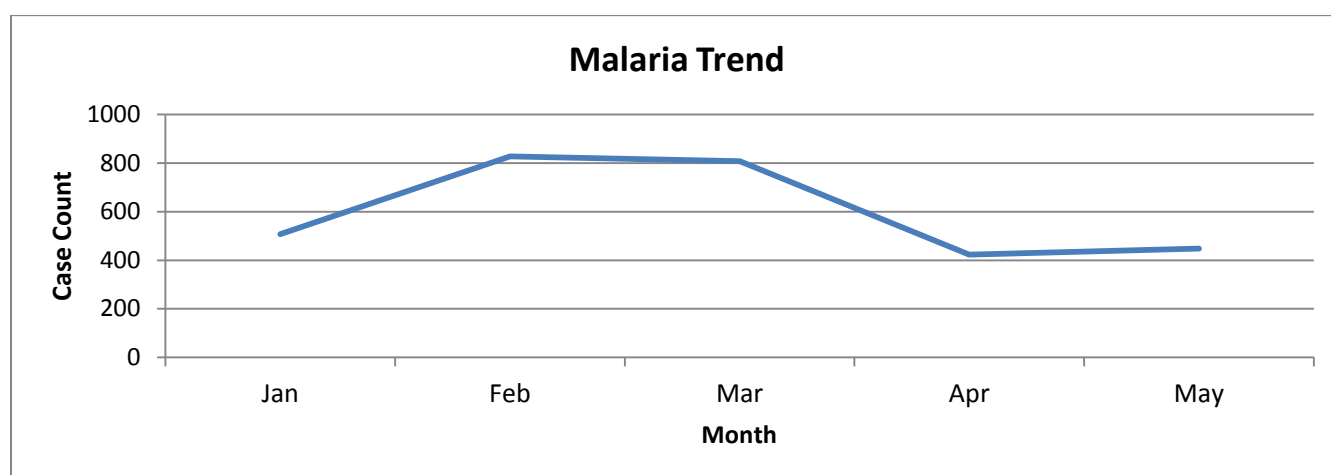
Figure 57. Top Five Causes of Morbidity in Adults in Soro Woreda, 2007 E.C

⇒ As shown in the figure malaria the first cause of morbidity in adults followed by T. Fever and Pneumonia respectively.

Table 38. Top Five Causes of Morbidity in Under 5 and Adults in E.Badewacho Woreda, 2007 E.

S.No	Morbidity Below Five Years	Morbidity above Five Years
1	Malnutrition	Malaria
2	Pneumonia	T. Fever
3	Malaria	Pneumonia
4	Other AFI	Other AFI
5	Non dysentery Diarrhea	Helemtiasis

Figure 58. Trend of Malaria Cases in E.Badewacho Wored from Jan-May, 2007



Both Woredas reported that there was no death caused by four selected epidemic prone disease (AWD, Malaria, Measles and Meningitis) in year 2007.

Incidence of Outbreak

In Hadiya Zone, the Zonal health department reported that from January to May there was only measles outbreak in two Woredas of the Zone (Shashego and E.Badewacho) with overall 398 cases and no mortality. Looking in to the assessed Woredas, there was no outbreak report in Soro Woreda in the past 3 month (Belege Session) but, in E.Badewacho Woreda there was a Measles outbreak from February to March, 2007 with a total cases of 329 and no fatality.

In other perspective in Kembata Tembaro Zone, the Zonal health department reported that there was no outbreak in the Zone in the past three month. Looking in to assessed Woredas, there was no outbreak report in Hadero Tumto Woreda in the past 3 month but, in Tembaro Woreda in contrary to the zonal report, the woreda stated that, there was a Measles outbreak from January to February, 2007 with a total cases of 55 and no fatality.

Drug and Supply Preparedness

Table 39. Drug and Supply preparedness in Hadiya and Kebata Tembaro Zone in 2007

E.C

Drug and Supplies	Hadiya Zone			Kembata Tembaro Zone		
	Total Required	Available	Gap	Total Required	Available	Gap
Coartem	2000 strip	12000 strip	800 strip	233 PK	14440 PK	
Oily CAF	-	-	-	9486 vial	0	9486 vial
Doxycycline	1000 capsule	0	1000 capsule	1164 strip	0	1164 strip
Ringer lactate	605 box	0	605 box	62832 bag	0	62832 bag
ORS	3257 packs	3257 packs	0	12,605 pacs	0	12,605 packs
Amoxaciline Suspension	3000 bottle	800 bottle	2200 bottle	141 bottle	900 bottle	No gap
Cotrimoxazole Suspension	3000 bottle	1000 bottle	2000 bottle	19393 bottle	384 bottle	19009 bottle
TTC ointment	2000	0	2000	-	-	-

	ampoules		ampoules			
Vitamin A	500 strip	7000 strip	No gap	388 tin	0	388 tin
RDT (Malaria)	2000 kit	200 kit	1800 kit	Not quantified	561	Not known
LP set	100 set	0	100 set	Not quantified	0	Not known
TI bottle	200 bottle	0	200 bottle	Not quantified	0	Not known
Gloves	200 box	2 box	198 box	Not quantified	134	Not known
Syringes	200 box	0	200 box	Not quantified	0	Not known

Soro health office reported that there shortage of ringer lactate, Amoxaciline syrup, Coartem, RDT (Malaria), CTC kit Syringe and Gloves. Even if the zonal health department reported there is enough Vitamin A strips Soro Woreda stated no Vitamin A stock in the Woreda. The other assessed Woreda, E.Badewacho Woreda reported that there is only Malaria RDT kit shortage. In Kebata Tembaro Zone, Hadero Tumto Woreda reported that there is only CTC shortage for possible AWD outbreak.

Risk Factors for Selected Diseases

Table 40. Analysis of Risk Factors in Selected Four Woredas of Hadiya and Kebata Tembaro Zone in 2007 E.C

Disease	Risk Factors	Soro Woreda		E. Badewacho Woreda		Hadero Woreda		Tembaro Woreda	
		Yes	NO	Yes	No	Yes	NO	Yes	No
Malaria	Malaria endemic area	✓		✓		✓			
	Presence of Malaria breeding area	✓		✓		✓			
	Interrupted or potentially interrupted river	✓			✓	✓			
	Unprotected irrigation area	✓			✓		✓		
	LLINs coverage below 80		✓		✓		✓		
	IRS coverage	73%		46%					
	Depleted prevention		✓		✓				
	Total population in maltrious area	158838		216714		108,137			
Meningitis	Presence of epidemic in the past 3 years		✓		✓		✓		
	Vaccination conducted in the past 3 years	✓		✓		✓			
AWD	AWD epidemics in the last 3 years		✓		✓		✓		
	Latrine coverage	86%		80%		98%			
	Latrine utilization	75%		78%		78%			
	Safe water coverage	60%		34.7		77%			
Measles	Presence ongoing Measles outbreak		✓		✓	✓			
	Measles vaccination coverage	97%		100%		96%			
	SIA conducted in 2006 E.C	✓			✓	✓			

Nutritional Status

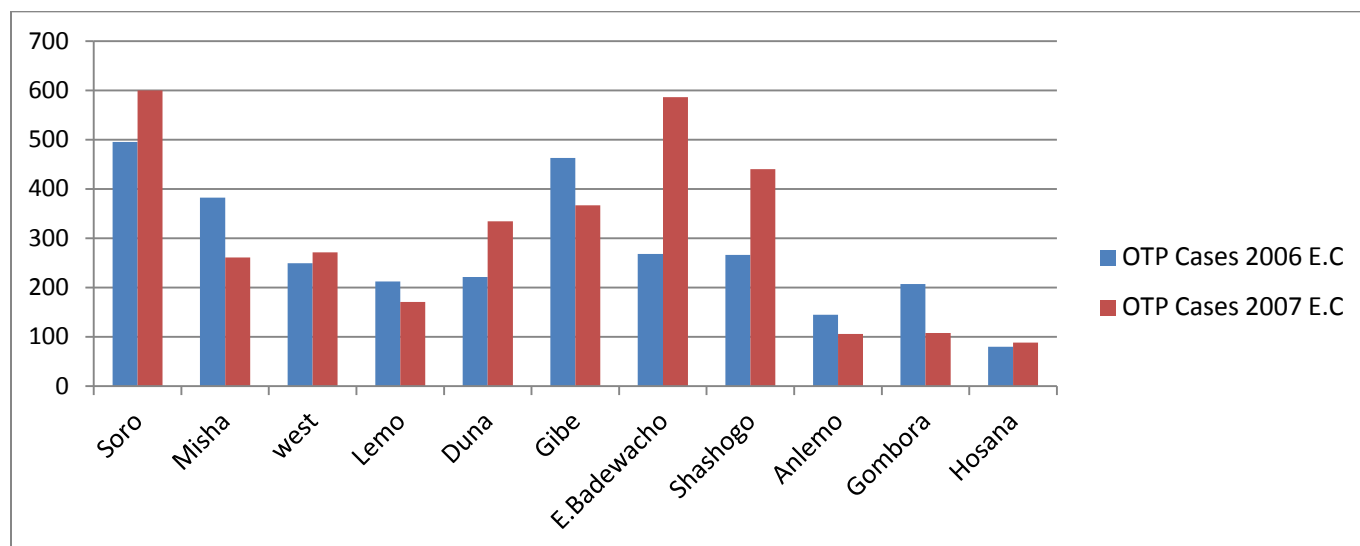


Figure 58. Distribution of OTP Cases in Hadiya Woredas in 2006 and 2007 E.C

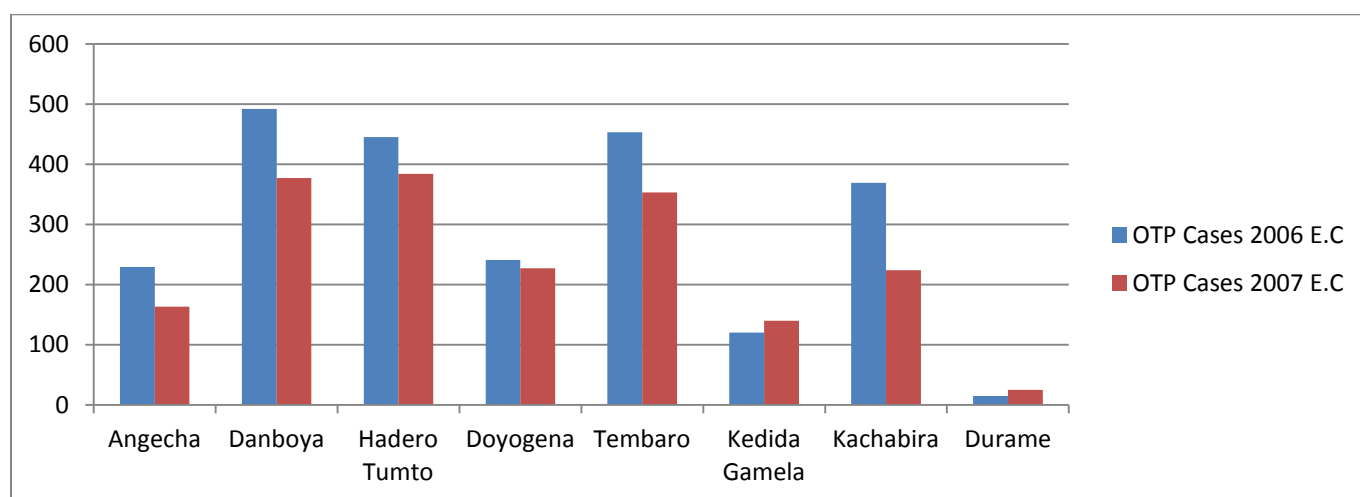


Figure 59. Distribution of OTP Cases in Kebata Tembaro Woredas in 2006 and 2007 E.C

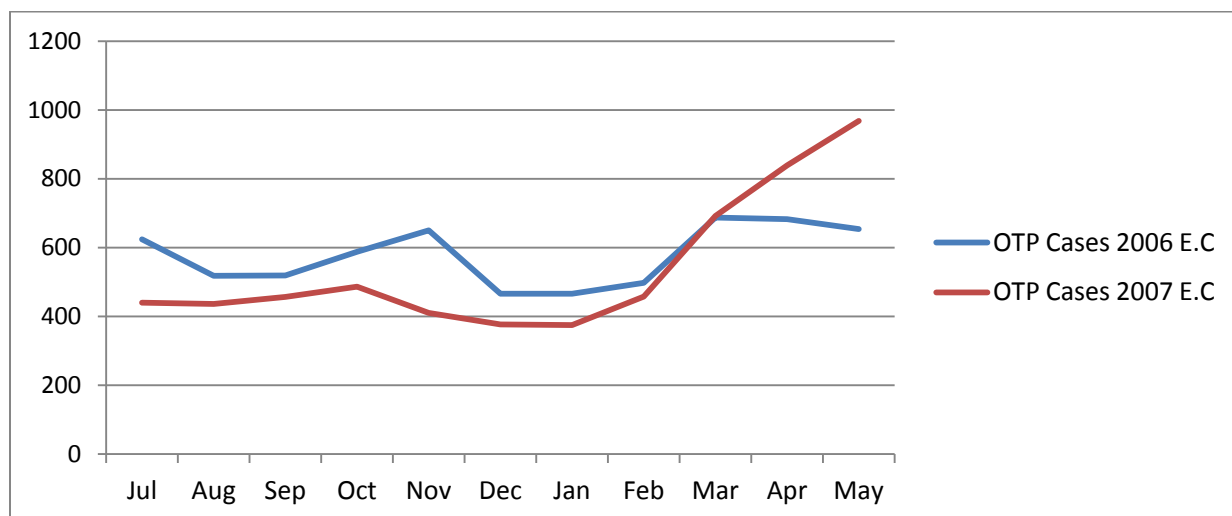


Figure 60. Trend of Overall OTP Cases in Hadiya Zone in 2006 and 2007 E.C

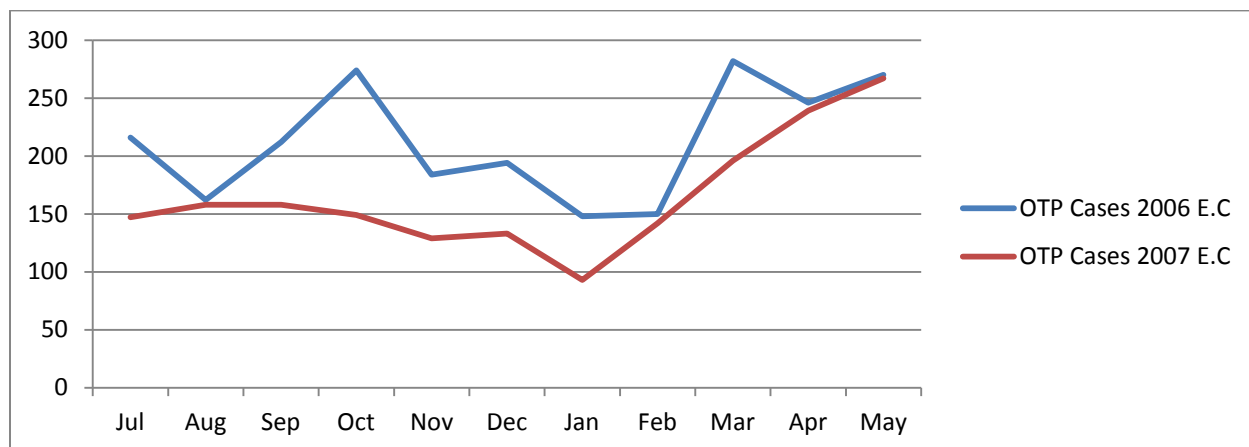


Figure 61. Trend of Overall OTP Cases in Kebata Tebaro Zone in 2006 and 2007 E.C

Figure 62. Trend of Overall OTP Cases in Soro and E.Badewacho Woreda in Months from January to May of 2006 and 2007 E.C

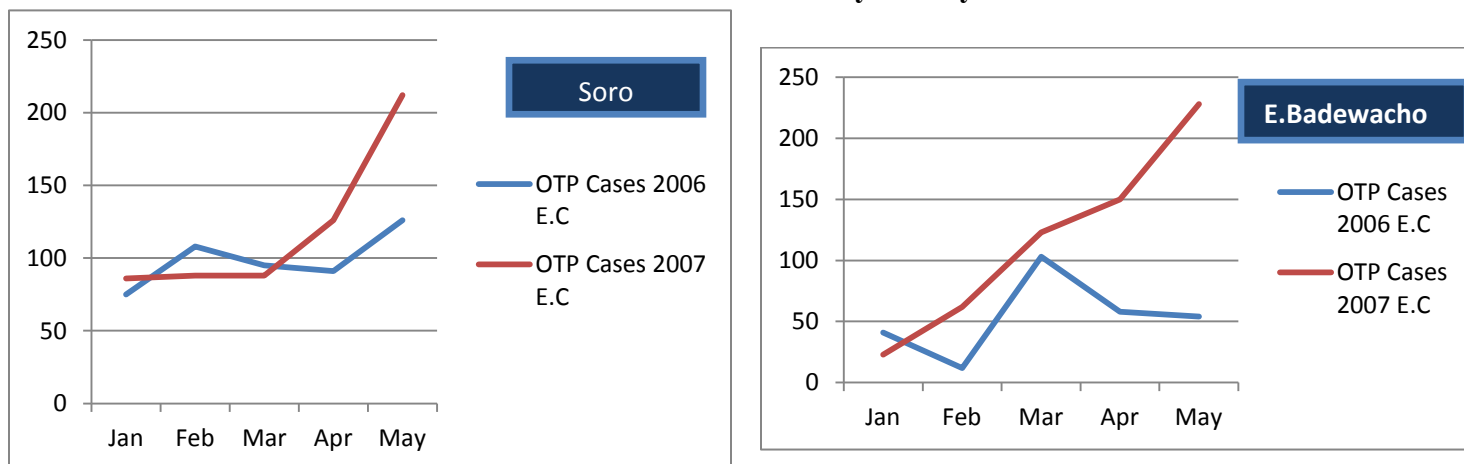


Figure 63. Trend of Overall OTP Cases in Temabro and Hadero Tumto Woreda in Months from January to May of 2006 and 2007 E.C

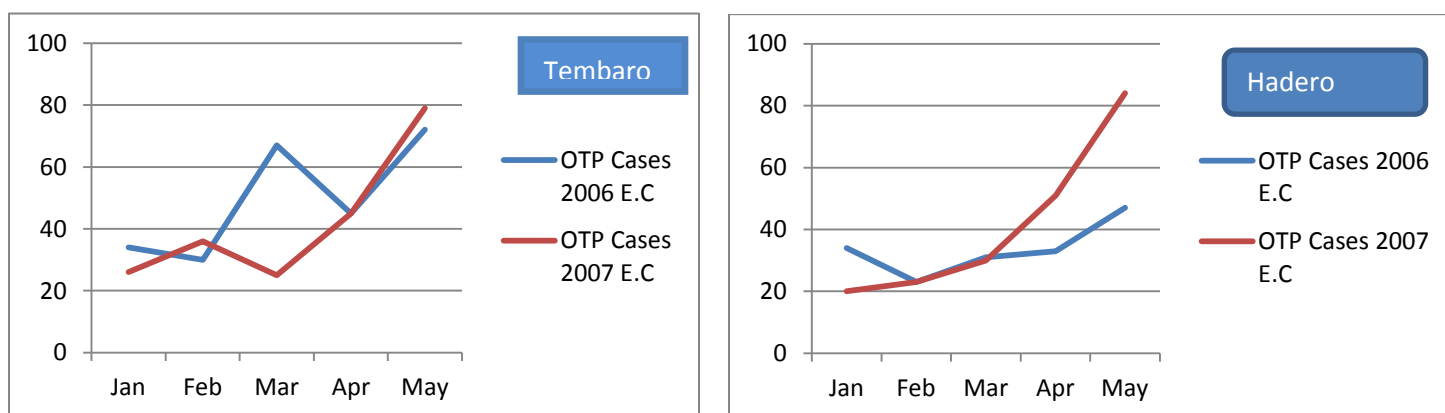
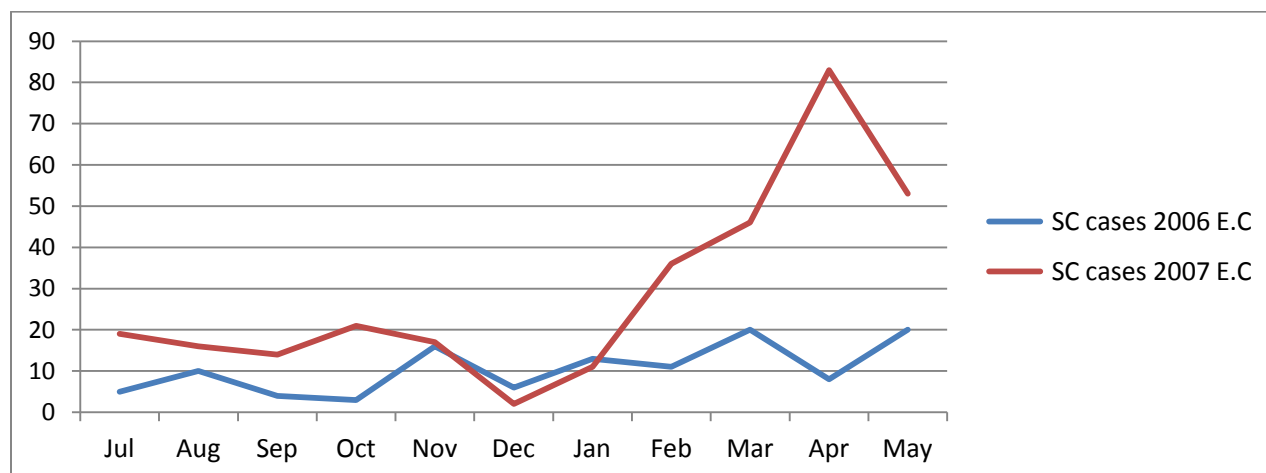


Figure 64. Trend of Overall SC Cases in Hadiya Zone in 2006 and 2007 E.C



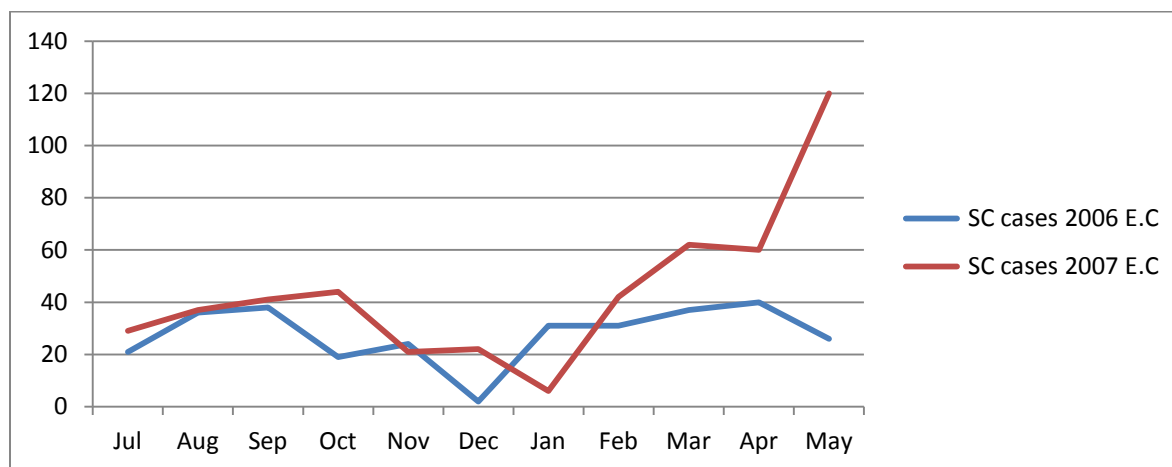


Figure 65. Trend of Overall SC Cases in Kebata Tebaro Zone in 2006 and 2007 E.C

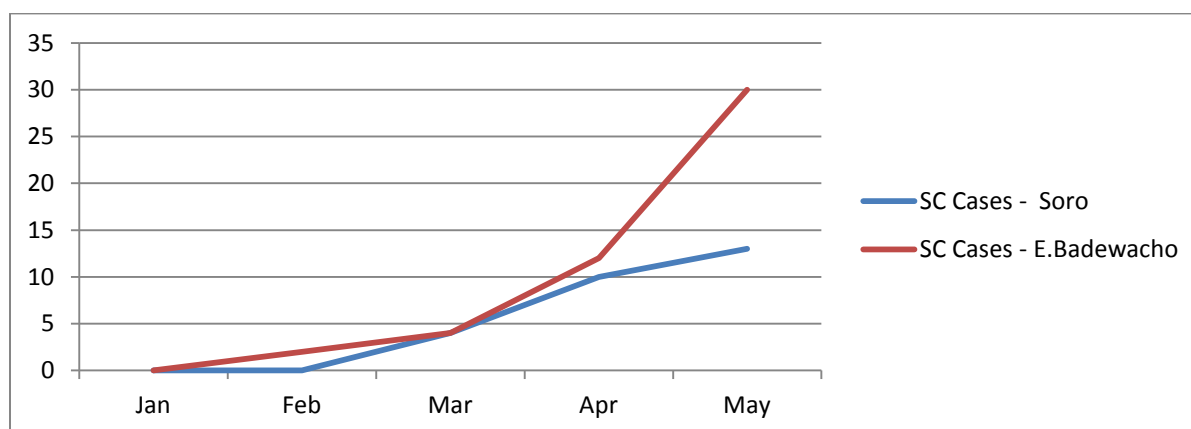


Figure 66. Trend of Overall OTP Cases in Soro and E. Badewacho Woreda in Months from January to May of 2006 and 2007 E.C

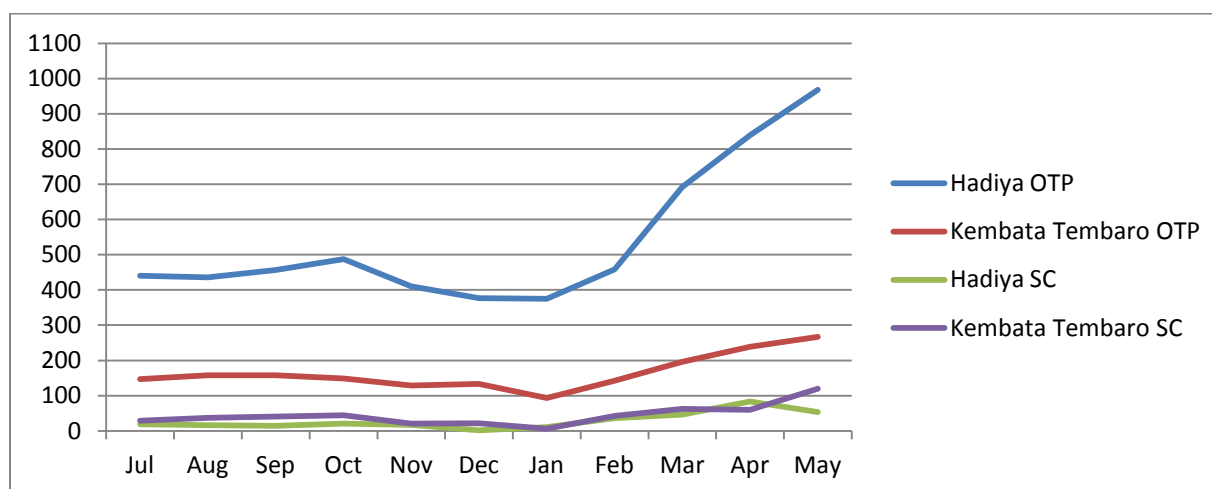


Figure 67 Overall Trends of OTP and SC Cases in Hadiya and Kembata Tembaro Zone in 2006 and 2007 E.C

Generally all assessed Woredas reported that there is no shortage of TFP supplies including RUTF, F100 and F75.

Public Health Emergency Risks

Table 41. Distribution of Expected Outbreak Risk in Hadiya and Kembata Tembaro Zone in the coming six months

Zone	Woreda at Risk	Type of Risk	At Risk Population
Hadiya	Shashego	Malaria	131,097
	E. Badewacho	Malaria	216,714
	Gombora	Malaria	104,121
	W. Badewacho	Malaria	103,347
	Soro	Malaria	198,000
	Gibe	Malaria	94,403
Kembata Tembaro	Durame	AWD	1739
	Kedida Gemila		
	Kachabira		
	Hadero		
	Doyogena		
	Tembaro		
	Angecha		
	Domboya		
	Tembaro	Malaria	33,727
	Kedida Gemila		
	Kachabira		
	Domboya		
	Kedida Gemila		
	Kachabira		
	Hadero		

	Tembaro	Meningitis	590,213
	Domboya		
	Angecha		
	Doyogena		
	Hadero	Measles	403,621
	Kedida Gemila		
	Kachabira		
	Doyogena		
	Angecha		

Conclusions

- ⇒ Even if there is a PHE coordinating forum both at zonal and Woreda level, they are mainly functional during emergency conditions and their plan is not budgeted
- ⇒ Malaria is the leading cause of Morbidity both at zonal and Woreda Level
- ⇒ Measles is the only reported outbreak in the Zone
- ⇒ Most of emergency supplies needed in the Zone are not enough to control future possible outbreaks
- ⇒ Both Soro and E.Badewacho Woredas have identified major high risk area for malaria and have started intervention activities
- ⇒ Both mild and server malnutrition is sharply increasing in the community

Recommendations

- ⇒ Both the Zonal and Woreda PHE coordinating forum should be strengthen both in technical capacity and budget and follow up should be strengthen by regional health office
- ⇒ Since the coming session is suitable for Malaria control programs such as incising LLINs coverage, utilization and indoor residual spray should be strengthen.
- ⇒ Even if Woredas reported measles vaccination coverage above 95%, there are still outbreaks, we recommend a supplementary immunization specially in hard to reach Kebele of E.Badewacho
- ⇒ The federal ministry of health, SNNPR regional health office and partners should avail necessary emergency drug and supplies based on the indicated gap
- ⇒ Both mild and server malnutrition is sharply increasing in the community which needs an urgent agricultural support and strengthen of OTP and SC sites
- ⇒ Data handling, quality and communication between Zones and Woredas need much improvement
- ⇒ Capacity building activities is needed for PHEM offices both at Zone and Woreda level on overall public health emergency preparedness

CHAPTER EIGHT- Epidemiological Project Proposal

8.1. Prevalence of Common Mental Disorders and Harmful Substances Use among Taxi Drivers of Addis Ababa and Relation with Road Safety

Proposal Summary

About 450 million people suffer from mental and behavioral disorders worldwide. One person in four will develop one or more of these disorders during their lifetime. In Ethiopia, mental illness is the leading non-communicable disorder in terms of burden. Studies conducted in developed countries showed that the risk of accidental death significantly associated with alcohol use disorder and with other common mental disorders. When jointly considered, it was greatest when these two types of disorders co-existed, followed by common mental disorders alone. Countries like New Zealand utilizes such evidences and before issuing a driving license in addition to physical evaluation mental evaluation particularly factors like psychomotor functioning, behavior, mood (including suicidal ideation) medication and insight are mandatory to assess. In Ethiopia road-traffic accident is one of the top ten leading causes of death and specifically in Addis Ababa where most of RTA occurs. In Addis Ababa 35.8% of the RTAs are caused by public transport including “Taxis” registered under Addis Ababa Road and Transport office. Therefore, the major aim of this study is to determine the prevalence of common mental disorders and substance use among Taxi drivers in Addis Ababa and relation with road traffic incidents in the city to recommend possible interventions to appropriate stakeholders.

This study will be conducted in Addis Ababa, the capital city of Ethiopia. Using systematic random sampling, we will select 384 taxi drivers and will be interviewed by trained psychiatry nurse using standardized structured questionnaires. The study will be conducted from April 20-30, 2017 and an estimated cost of 118,000 Ethiopian birr is needed.

Introduction

Background

About 450 million people suffer from mental and behavioral disorders worldwide. One person in four will develop one or more of these disorders during their lifetime. Neuropsychiatric conditions account for 13% of the total Disability Adjusted Life Years (DALYs) lost due to all diseases and injuries in the world and are estimated to increase to 15% by the year 2020. Five of the ten leading causes of disability and premature death worldwide are psychiatric conditions. (1)

In developing countries depression by itself accounts for 3.2% of the total disease burden which is nearly similar with that of malaria, which accounts for 4% of the total disease burden. (2) In African country specific studies like, national survey of prevalence of mental disorders in Egypt and prevalence of common mental disorders in a rural district of Kenya, identified that the overall prevalence of mental disorders in the population is more than 10% (16.93% and 10.8% respectively) and the top three common mental disorders being Anxiety, depression and multiple disorders. (3, 4)

In Ethiopia, mental illness is the leading non-communicable disorder in terms of burden. Indeed, in a predominantly rural area of Ethiopia, mental illness comprised 11% of the total burden of disease, with schizophrenia and depression included in the top ten most burdensome conditions, out-ranking HIV/AIDS. (5) Even if there is no national wide survey regarding mental disorders, few localized studies conducted at Jimma and Kombolcha town using WHO self reporting questionnaire (SRQ) showed that the overall prevalence is above 20% (22.7% and 32.4% respectively). (6, 7)

There are only few studies conducted to assess the prevalence of mental disorders including substance abuse among drivers and the effect on the incidence of road traffic accidents. A recent study done to assess the association between psychiatric disorders and work-related problems among subway drivers in Korea showed that PTSD and panic disorder were more prevalent among subway drivers than in the general population (8). In addition a case control study done in Taiwan regarding mental illness and accidental death showed that the risk of accidental death

was significantly associated with alcohol use disorder and with other common mental disorders. When jointly considered, it was greatest when these two types of disorders co-existed, followed by common mental disorders alone. (9) Even if the effect of mental disorders on RTAs differs among different studies conducted in different set ups, some countries like New Zealand utilizes such evidences and before issuing a driving license in addition to physical evaluation mental evaluation particularly factors like psychomotor functioning, behavior, mood (including suicidal ideation) medication and insight are mandatory to assess.

In Ethiopia road traffic accident is one of the top ten leading causes of death and specifically in Addis Ababa where most of RTA occurs. In Addis Ababa 35.8% of the RTAs are caused by public transport including “Taxis” registered under Addis Ababa Road and Transport office. Therefore, the major aim of this study is to determine the prevalence of common mental disorders and substance use among Taxi drivers in Addis Ababa and associated effect on road traffic accident in the city so as to recommend possible interventions to appropriate stakeholders.

Literature Review

Epidemiology and Burden of Mental Disorders

According to CDC mental illness is defined as “collectively all diagnosable mental disorder or health conditions that are characterized by alterations in thinking, mood, or behavior (or some combination thereof) associated with distress and/or impaired functioning.” (10) And the concept of mental health includes Concepts of mental health include subjective well-being, perceived self-efficacy, autonomy, competence, intergenerational dependence and recognition of the ability to realize one’s intellectual and emotional potential. (11)

Currently mental health disorders are one of the complex challenges of not only the health sector but the general global economically development. Every individual in the community is at risk of having mental disorders but those with poor economical status, homeless, the unemployed, persons with low education, victims of violence, migrants and refugees, indigenous populations, children and adolescents, abused women and the neglected elderly are at a greater risk. (11)

According to the WHO global burden of disease four of the six leading causes of years lived with disability are due to neuropsychiatric disorders (depression, alcohol-use disorders, schizophrenia and bipolar disorder). (11) More than 150 million persons suffer from depression at any point in time and nearly 1 million commit suicide every year. About 25 million peoples suffer from schizophreni and more than 90 million suffer from an alcohol- or drug-use disorder. The number of individuals with disorders is likely to increase further in view of the ageing of the population, worsening social problems and civil unrest. (11)

The disability associated with mental illness in Ethiopia is high, where people are already struggling for survival, the catastrophic impact of a chronic and disabling illness on the person and their family can be well-appreciated. The lack of mental health services or any kind of financial support for families with a mentally ill member is the biggest factors causing caregiver burden in Ethiopia. (5) Generally the overall prevalence of common mental disorders in Ethiopia is summarized under the bellow table.

Mental Illness	Prevalence/ Incidence (%)
Schizophrenia	0.5
Bipolar Disorders	0.5
Depression	5.0
Alcohol-Problem drinking	2.2-3.7
Alcohol Dependency	1.5
Cannabises Abuse	1.5
Childhood Mental Illness	12-25
Epilepsy	1.0

Source- FMOH, NATIONAL MENTAL HEALTH STRATEGY 2012/13 - 2015/16

Regarding Substance use and Substance dependency, the 2010 global disease burden study analysis showed that Illicit drug dependence directly accounted for 20·0 million DALYs (95% UI 15·3–25·4 million) in 2010, accounting for 0·8% (0·6–1·0) of global all-cause DALYs. Worldwide, more people were dependent on Opioids and amphetamines than other drugs. Opioid

dependence was the largest contributor to the direct burden of DALYs (9·2 million, 95% UI 7·1–11·4). The proportion of all-cause DALYs attributed to drug dependence was 20 times in some regions than others, with an increased proportion of burden in countries with the highest incomes. (12) Substance abuse is a highly prevalent problem in Ethiopia, particularly among the young population. Alcohol, khat and cannabis are the main substances used within Ethiopia (5).

Mental Disorders in Drivers and Impact on Road Traffic Accidents

The workplace is one of the key environments that affect our mental wellbeing and health. There is an acknowledgement and growing awareness of the role of work in promoting or hindering mental wellness and its corollary – mental illness. Although it is difficult to quantify the impact of work alone on personal identity, self-esteem and social recognition, most mental health professionals agree that the workplace environment can have a significant impact on an individual's mental well-being. (8)

Employment provides five categories of psychological experience that promote mental well-being:

- Time structure (an absence of time structure can be a major psychological burden);
- Social contact;
- Collective effort and purpose (employment offers a social context outside the family);
- Social identity (employment is an important element in defining oneself);
- Regular activity (organizing one's daily life). (8)

Driving is a complicated psychomotor performance that depends on the driver's ability to maintain effective and reliable control of his or her vehicle; respond to the road, traffic, and other external clues; and follow the "rules of the road". Psychiatric disorders may interfere with any of the aforementioned driving skills to a significant degree, resulting in impaired driving ability. (14) A Meta analysis conducted by Jessica Williams, Stephen Tregear suggested that, current evidence concerning crash risk among drivers with psychotic, mood, anxiety or personality disorders is inconclusive, although some evidence suggests that individuals with mood disorders are at increased risk for crash. The evidence also suggests an association between certain traits of

patients with personality disorders (including aggression, hostility, impulsivity, disregard for law, and various psychological symptoms) and increased crash risk. (14)

Few studies have also indicated that some types of mental disorders are highly prevalent among drivers. For instance a study done in Korea to assess mental disorders among subway drivers showed that PTSD and panic disorder were more prevalent among subway drivers than in the general population. In this study having frequent conflict with passengers, a near accident and a breakdown while driving were identified as risk factors for psychiatric disorders among subway drivers.(8) In the contrary a study conducted in Britain regarding occupations and Psychiatric morbidity showed that Drivers demonstrated one of the lowest Psychiatric morbidity when compared to other occupation (the average prevalence among all occupations were 13% and that of drivers were 9%). (15) From these studies it is clear that those few studies conducted on prevalence of mental disorder among drivers have shown different results which can be attributed to the cultural and other socio-economical differences of the respective study areas.

A road traffic crash results from a combination of factors related to the components of the system comprising roads, the environment, vehicles and road users, and the way they interact. Some factors contribute to the occurrence of a collision and are therefore part of crash causation. Other factors aggravate the effects of the collision and thus contribute to trauma severity. Some factors may not appear to be directly related to road traffic injuries. Among the major risk factors influencing crash involvement, presence of alcohol, medicinal or recreational drugs have a clear well-constructed evidence (16). In addition to substance use, few studies like the one conducted by Wright University to assess reckless driving, Borderline personality disorder and impact on motor vehicle accident showed that there were statistically significant correlations between both measures of BPD and the number of moving violations. Number of non-moving violations, driving while intoxicated, and ever having had driving privileges suspended which increases the risk of having RTAs (17). This evidence is further supported by a case control study, which uses Psychological autopsy method, which states that, the risk of accidental death was significantly associated with alcohol use disorder and with other common mental disorders. When jointly considered, it was greatest when these two types of disorders co-existed, followed by common

mental disorders alone. The risk of accidental death increased with the number of co morbid conditions. (9)

In Ethiopia there is almost no evidence regarding the prevalence of mental disorders among drivers and the impact on RTA which is one of a big public health concern of the country. Regarding substance use among drivers a study conducted by Mohammed Abdul-kadir to study the perspective of the community regarding driving under Khat influence showed that almost half of the responders (passengers) feel safe traveling with a driver who was chewing khat. (18) Generally as described in the above reviewed literatures there is still a knowledge gap on the general prevalence of mental disorders and their impact on road accidents specially in resource limited set ups. Therefore, the major aim of this study is to assess the overall prevalence of mental disorders, substance use and their impact on driver's occupational activities and road traffic accidents so as to generate evidences that can assist in the development of interventions by appropriate stakeholders.

Statement of the Problem

Based on 2013 WHO road safety report, in Africa 24 in 100,000 population and in Ethiopia more than seventeen (17.6) in 100,000 population dies from causes attributed to road traffic accident and 6% (using only two referral hospitals report) of survivors in Ethiopia permanently disabled due to road traffic accidents. (18)

WHO recommends a safer public transport system as one of the major strategies to reduce road traffic accident related morbidity and mortality. (18) In Addis Ababa, the capital city of Ethiopia with more than three million population "Taxis" are a major transportation system in which most of the community utilizes which makes the assurance of the safety of the system from different perspective to have a paramount public health importance.

This study focuses on assessing the safety of public transport specifically "Taxis" from the view point of mental health conditions of the drivers and the associated impact on road safety in Addis Ababa. Generally in low income set up specifically in Ethiopia the prevalence of mental disorders and substance uses and their impact on road traffic accident is not a well studied event.

Therefore this study has the aim of narrowing the knowledge gap regarding the impact of mental disorders and substance use on road safety specifically in resource limited set ups. The study also has multiple importances such as, to estimate mental disorders among drivers as an occupational related health problem, for police consideration of mental disorders and substance use on the national road safety polices and driving licensing system so as to improve the overall safety of transportation system specifically public transportation system.

Objectives of the Study

General Objective

The General objectives of this study to assess the prevalence of mental disorder and substance use among taxi drivers of Addis Ababa and the relation with road safety and road traffic incidents.

Specific Objectives

- ⇒ To measure the general prevalence of mental disorders and substance use among Taxi drivers of Addis Ababa
- ⇒ To measure the prevalence of poor driving practice as per the operational definition among Taxi drivers of Addis Ababa
- ⇒ To identify the relation of mental disorders with road traffic accidents and poor driving practices.

Methods

Study Area and Period

This study will be conducted in Addis Ababa, the capital city of Ethiopia. Addis Ababa is founded by Emperor Menelik II as the capital city of Ethiopia in 1889. The city lies 9°1'48"N latitude and 38°44'24"E longitude which is located at the heart of the country, at an altitude ranging from 2,100 meters at Akaki in the south to 3,000(9,800 ft) meters at Entoto Hill in the North. This makes Addis Ababa the third highest city in the world, after La Paz and Quito in Latin America. Addis Ababa is the largest as well as the dominant political, economic, cultural and historical city of the country with an estimated total population of 3,195,000 within 10 sub cities and 116 Woreda administrative structures. The city has a total of 11 governmental and 36 nongovernmental hospitals and 56 health centers. The city has a total of 3,800 kilometres roads and according to the 2005 transport study the Addis Ababa mobility rate or average trip/day/person is 1.08 km. In this respect the average length of mobility covered by vehicle is 3.3 km. and that of 1.5 by foot. (19, 20). This study will be conducted from April 20-30, 2017.

Sampling Method

Study Population- All Taxi drivers in Addis Ababa

Sampling Frame- List of plate numbers of Taxis registered under Addis Ababa road and transport office.

Study Units- Taxi drivers randomly selected from the study population

Study Design - This study will apply a cross sectional survey method

Sample Size and Sampling Procedure

Using single population sample size estimation formula; $n = (Z_{1-\alpha/2})^2 * p * (1-P)/d$

Using 95% confidence level and prevalence of 0.5(as the mental disorder prevalence is not studied in driver's population) and degree of uncertainty to be 0.05, the sample size would be as follow;

$$n = (1.96)^2 * 0.5 * (0.5) / 0.05$$

n= 384

This study uses a systematic sampling method in which, using the plate numbers as a sampling frame every Taxi drivers at $K(n/N)$ interval will be interviewed once the first sampling units is selected using lottery methods (within the range between 1-K)

Data Collection Tool and Method

The SRQ (self reporting questionnaire) developed by WHO, designed to screen psychiatric disturbances in primary care setting, especially in developing countries will be utilized. (16) The SRQ has previously been translated into Amharic and validated in Ethiopia, and it has been used for community surveys (6). Based on the experience of previous studies conducted in Ethiopia, we will use a cut-off point of 8 and 6 out of 20 items to estimate prevalence and clinical attendance respectively. Other items for socio demographic, drug uses and history of aggressive driving and road traffic accidents will be added to the questionnaire.

Data will be collected by psychiatry nurses after getting orientation on the objectives and data collection instruments of the study. A progressive monitoring on quality of data collection will be undertaken by Epidemiologist supervisors.

Definition of Terms

1. Mental Disorder- Based on this study anyone with an SRQ score of 8 and below will be considered as a person with possible mental disorder

2. Significant Mental Disorder- Based on this study anyone with an SRQ score of six and below will be considered as a person with significant mental disorder and will be referred to psychiatric clinic for further evaluation.

3. Taxi-Based on this study Taxis are Minibus vehicles registered under Addis Ababa road and traffic office to provide transportation service to the Public.

4. Harmful Drug Use- A pattern of psychoactive substance use that causes damage to health. The damage may be physical (e.g. in the cases of hepatitis from the self-administration of injected psychoactive substances) or mental.

5. Drug Intoxication- A transient condition following the administration of alcohol or other psychoactive substance, resulting in disturbances in level of consciousness, cognition, perception, affect or behaviour, or other psychophysiological functions and responses

6. Aggressive Driving-is defined as when individuals commit a combination of moving traffic offenses to endanger other persons or property. This can be explained by some examples of aggressive driving include exceeding the speed limit, following another vehicle too closely, changing lanes in an erratic or unsafe manner, excessive horn honking, improper signaling of lane changes, and failing to obey traffic control devices (i.e., stop signs, yield signs, traffic signals, railroad grade cross signals), running red lights and in severe forms driver may attempt to intimidate, threaten, or injure another driver, pedestrian, or passenger or to damage their vehicle in a traffic incident. (NHTSA).

Data Management

Data will be entered using Epiinfo7 and SPSS will be utilized for data analysis. The result of the study will be presented using different tables and charts with necessary statistical details. To see association between the outcome variables (mental disorder and substance use) and exposure variables we will conduct a bivariate and multivariate analysis (using logistic regression model), using 95% confidence limit.

Ethical Considerations

To conduct this study a formal letter will be sent to Addis Ababa Road and Transport office and every study unit will be briefed on the objectives, importance and risks of the study. Data will only be collected if study units are agreed to participate in the study. The data collection process will be conducted on a place which can provide the maximum possible confidentiality for the study units and after data collection data will be stored and used confidentially only for study purposes. Those drivers that need clinical follow up (as defined above) will be referred to psychiatric centers (using a referral slip designed for this study) and the psychiatric centers will be formally communicated prior to the start of the data collection process.

Work Plan

Activity List	Time Frame								Responsibility
	April, 2017				May, 2017				
	Wk-1	Wk-2	Wk-3	Wk-4	Wk-1	Wk-2	Wk-3	Wk-4	
Proposal Development									
Review of the proposal									
Prepare and submit formal letter and proposal to EPHI IRB for ethical review									
Secure budget to conduct the study									
Finalize data collection									
Data entry and analysis									
Develop final report									
Review the final report with mentors									
Submit Final report									

Cost of the Study

Item	Needed Amount	Cost per Item
Papers	Four Packet	1600 birr
Printing cost	One paper per 1 birr	1536 birr
Pens	One Packet	150 birr
Pencils	One Packet	100 birr
CDs	One packet CDs	120 birr
Flash Discs	3 Flash CDs	400 birr
Transportation Fee	2 rental cars for 10 days	30,000 birr
Fee to cover time spent on interview (for taxi drivers)	100 birr per interviewee	38,400
Data collectors fee	500 birr per day (4 interviewer will be deployed)	20,000 birr
Supervisors fee	Two supervisors 1000 birr per day	20,000 birr
Total cost with 5% contingency		117,921.3 Birr

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Annexes

Annex-1. Questionnaire to Investigate Suspected Hysteria Outbreak Checklist, Chanco Primary School, Chanco Town, Oromia Region, December 2015

A. Identification and Demographic Information

1. Name of the respondent _____
2. Respondent Status A. Case B. Control
3. Age of the responder (in years) _____
4. Sex of the responder A. Male B. Female
5. Number of family size _____
6. Occupation of the responder _____
7. Educational status (Grade) _____ Section _____
8. Residential zone _____ District _____ Kebele _____
9. Religion
 A. Protestant B. Orthodox C. Muslim D. Catholic D. Other _____
10. Ethnicity
 A. Oromo B. Amhara C. Tigray D. Others _____
11. Where were you when the mass collapse occurred? _____
12. Phone Number of the responders (If available) _____

B. Clinical Picture/ Illness Information

13. Date and time of onset of the symptom _____ / _____ / _____
14. Duration of the illness _____
15. Symptom of the Disease

Sign and Symptoms	Yes	No
Dizziness		
Fainting/Collapse		
Unable to move limbs		
Fear or Anxiety		
Crying		

26. Did you know someone collapsed in the past two days?

A. Yes

B. No

27. Did you read or listen in any electronic or other Medias about the mass collapse?

A. Yes

B. No

28. Is there any familial history of mental disorder or similar incidence in your family

A. Yes

B. No

29. What do you think the cause of the current incidence of mass collapse in your school?

A. evil spirit

B. The food I consumed

C. Water source

D. Stress

E. I do not know

F. Others _____

D. Environmental Inspection

Please observe the classrooms, water source, cafeterias, science laboratories and the overall school compound and describe your overall findings

Annex-2. Questionnaires for Case - control study on Measles outbreak in Telalake Woreda, Zone 3, Afar Region

Case status Case _____ Control _____

Patient Name/Id No _____ Date of Data collection _____

Region _____ Zone _____ Woreda _____ Kebele _____ Got _____ Phone _____

Location: Longitude: _____ Latitude: _____

I. Socio-demographic Characteristics

S. No	Questions	Alternatives
1.1	Sex	1.Male 2.Female
1.2	Age	years _____ Months _____
1.3	Occupation	☐ Farmer ☐ House wife ☐ Student ☐ Unemployed ☐ Daily laborer ☐ Merchant ☐ Gov't ☐ Other (specify) _____
1.4	Educational level	☐ Illiterate ☐ Read and write ☐ Elementary ☐ Secondary ☐ Above secondary
1.5	Marital status	☐ Single ☐ Married ☐ Divorced ☐ Widowed ☐ Separated
1.6	Family size	_____

1.7	Is there any sick person with rash, fever, running nose/conductivities (illness)?	1. Yes 2. No
1.8	If yes, number of sick person	_____

II. Clinical History of Diseases:

2.1	What was the symptom?	1.fever 2.Rash 3.cough, 4.coryza (runny nose), 5. conjunctivitis (red eyes) 6.Diarrhea 7.Ear discharge 8. pneumonia 9.Blidness 10. Laringo tracheal infection 11.Vomitting Others _____
2.2	Date of rash on set	___ / ___ / ___
2.3	Date seen at health facility	___ / ___ / ___
2.4	Did you (he/she) take treatment?	1.Yes 2.No
2.5	If yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4.Supplementary food 5. TTC ointment 6.Anti pyretics 7.Others given _____
2.6	Did you recovered after the treatment?	1.cure 2. partially 3. deteriorated/disabled 4.death

III. Risk factor

3.1	Did you ever vaccinated for measles?	1.Yes 2.No 3.Unknow 4.Not applicable
3.2	If yes last vaccination date Number of vaccine doses received	1.patient recall _____ dd/mm/yy 2. vaccination card _____ dd/mm/yy 1.one dose 2. two dose 3.three and above
3.3	Did you have any travel history 7-18 days to areas with active measles cases before onset of symptoms?	1.Yes 2.No If Yes where _____
3.4	Do you have any travel history four days before and after rash onset	1.Yes 2. No If yes where _____
3.5	Do you have any contact history with someone else four days before and after rash onset	1.yes 2.No If yes with whom _____
3.6	If Yes to question 3.5 place of travel	1.School 2.Neighbor 3.Market 4.Other _____
3.7	Do you know modes of transmission for measles?	1.Yes 2.No 3. If yes specify _____
3.8	Did you ever have measles infection?	1.Yes 2. No 3. Don't know
3.9	Nutritional status of the cases	1.Normal 2.Moderate 3.Severely malnourished
3.10	How many people are living together in one house with you:	_____

3.11	What is the estimated area of the house?	_____
3.12	Where did you go first when you get ill?	☐ Health Facility ☐ Traditional Healers ☐ Holy Water ☐ Stayed at home ☐ Other :(Specify)_____
3.13	How do you think people get measles?	☐ Contact with a virus from ill person ☐ From God ☐ Bad attitude of other people ☐ Other(Specify)_____
3.14	Do you Know measles is vaccine preventable?	☐ Yes ☐ No ☐ Don't Know
3.15	Who do you think can be affected by measles?	☐ Children of aged less than 5 years ☐ Children of aged less than 18 years ☐ Women of any ages ☐ Any age groups of both male and women ☐ Other (specify):_____
3.16	How do you think measles can be cured?	☐ Using modern medicine ☐ Using traditional Medicine ☐ Holy water ☐ By feeding nutritious foods ☐ Keeping the sick person indoor ☐ Other(Specify)_____

Annex-3. MDSR Document Review Checklist at Regional and Health Facility Level

Look at the two years (2013-2015) all MDSR reports sent to the region and EPHI and collect data for the following items;

Name of the Region/Health Facility/Health Post Visited _____ Date
____/____/____

Form Completed by _____

Total reports send to the region (disaggregated in each year) -----

Total community maternal death report-----

Total facility based maternal death report-----

Number of health facilities which report consistently (9 months in annum) -----

Number of Woredas which report consistently (9 months in annum) -----

Number of Zones which report consistently (9 months in annum) -----

Number of regional reports submitted based on the national agreed time period in the year-----

Number of reports submitted based on the regional agreed time period in the year-----

Number of blank or unknown data elements at each reporting month-----

Specify common data elements which are reported blank or unknown -----

Total number of deaths in labour and delivery log book (only for health facilities) -----

Total reported maternal death at each selected health facilities and health posts -----

Total maternal deaths for which death review is conducted at health facility level-----

Total Number of true maternal deaths after verified by death review team -----

Total notification reported to the health centers (at health post level) -----

Total verbal autopsy conducted (at health center level) -----

Number of true maternal deaths (among all notifications) after verified by verbal autopsy

Number of response plans developed at all selected facilities -----

Annex-4. MDSR Survey Questionnaires for Health Facilities and Health Posts

Part one – General Information

- 1.1 Interview date _____ 1.2. Name of the health facility/Health Post _____
- 1.3. Date of start of implementing MDSR ____/____/____
- 1.4. Position of the interviewee in the health facility _____

Part Two – Framework of MDSR implementation

2.1. Who is responsible to report maternal deaths happening in the facility?

- A. Labour and delivery head ☐ B. Any professional in the labour and delivery unit ☐
- C. Other, specify _____

2.2. Is there an assigned focal unit to collect analyze and submit MDSR report? (If “No” pass to question 2.4)

- A. Yes ☐ B. No ☐

2.3. If “yes” to question 2.2 please describe the assigned unit/units _____

2.4. Is there a functional maternal death review committee in the facility? (If “No” pass to question 2.5)

- A. Yes ☐ B. No ☐

2.5. If “yes” to question 2.4, please list members of maternal death review committee

2.6. How do you disseminate the results of maternal death surveillance to staffs and other stakeholders?

- A. we haven't yet share to staffs or Stakeholders ☐ Workshops ☐
- C. Printed reports ☐ D. Other specify _____

2.7. Do you regularly receive feedbacks from Tigray Regional Health Bureau? (If “No” pass to the next part)

- A. Yes ☐ B. No ☐

2.8. If “yes” to question 2.7, in what duration do you get the feedbacks?

A. Not regular ☐ Every Month ☐ Every Quarter ☐

D. Others (specify) _____

Part Three – Attributes and Usefulness of the Surveillance

S.No	List of Attributes measures	Scale of Measurement				
		Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
	1. Simplicity					
1.1	I can easily get the information needed to establish MDSR diagnosis					
1.2	The data sources of MDSR is easy and manageable					
1.3	Data analysis at facility level is easy and manageable					
1.4	MDSR system doesn't take much of my time or have no influence on my other activities					
1.5	The system is integrated with other surveillance systems					
1.6	To work in the system it doesn't need a high level training (it can work just by orientations only)					
1.7	Sending report to the next level is easy					
1.8	Distributing the surveillance result report is easy and manageable					
	2. Flexibility					
2.1	The surveillance system adopts to the users improvement demands					
2.2	If you agree please give an example that the system adopts users comment or suggestion for improvement					

	3. Acceptability					
3.1	Health professionals are comfortable to participate in the system					
3.2	Health professionals are comfortable when they assigned in death review committees					
3.3	Health professionals are comfortable when assigned to participate in verbal autopsy teams					
	4. Sensitivity					
4.1	The system picks most of the maternal deaths in the facility /Community					
4.2	If you don't agree why do you think the reasons for not picking most of the deaths					
	5. Predictive Value Positive					
5.1	I believe Deaths reported in this system are actually maternal deaths					
5.2	If you don't agree give examples or explanations					
	6. Representativeness					
6.1	I believe the monthly maternal death report represents the situation in the facility/community					
	7. Timelines					
7.1	MDSR data is always ready when we need it for planning purposes					
	8. Cost					
8.1	The system is not costly as compared to the current benefits we gain from it					
8.2	Estimate of the cost of the system (include					



	all personnel, transportation and material costs)					
	9. Usefulness					
9.1	The current system have an ability to estimate maternal death in the facility/community					
9.2	The current system have an ability to show the trend of maternal death in the facility/community					
9.3	The current system have an ability to show the progress and effect of preventive and control methods applied against maternal death					
9.4	The current system have an ability to indicate major causes of maternal deaths in the health facility/community					
9.5	The current system have an ability to help the health facilities to improve clinical and ethical practices.					



Annex-5. MDSR Survey Questionnaire for Key Informants

Part one – General Information

1.1 Interview date _____ 1.2. Name of Woreda/Zone/NGO _____

1.3. Date of start of implementing/participating in MDSR ____/____/____

1.4. Position of the interviewee in the organization _____

Part two - Implementation Status

2.1. How many health posts and health facilities are participating in MDSR system in your Zone/Woreda ?

2.2. How many of them are participating consistently (9 months in annum) -----

2.3. Is there a function MDSR task force at regional/Zonal/Woreda level? (If “No” pass to question 2.5)

Yes ☐ No ☐

2.4. If “Yes” to question 2.3, please list members of maternal death review committee

2.5. How do you disseminate the results of maternal death surveillance findings to stakeholders?

A. we haven't yet share any result yet ☐ Workshops ☐

C. Printed reports/bulletins ☐ Other specify _____

2.6. Do you regularly give feedbacks to the next lower level? (If “No” pass to the next part)

A. Yes ☐ B. No ☐

2.7. If “Yes” to question 2.6, in what duration do you give the feedbacks?

A. Not regular ☐ B. Every Month ☐ C. Every Quarter ☐

D. Others (specify) _____

Part Three – Attributes and Usefulness of the Surveillance

S.No	List of Attributes measures	Scale of Measurements				
		Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
	1. Simplicity					
1.1	The data sources of MDSR is easy and manageable					
1.2	MDSR system doesn't take much of my time or have no influence on my other activities					
1.3	Data analysis at Woreda level is easy and manageable					
1.4	the system is integrated with other surveillance systems					
1.5	To work in the system it doesn't need a high level training (can work just by orientations only)					
1.6	Sending report to the next level is easy and manageable					
1.7	Distributing the surveillance report is easy manageable					
	2. Flexibility					
2.1	The surveillance system adopts to the users improvement demands					
2.2	If you agree please give an example that the system adopts users comment or suggestion for improvement					
	3. Acceptability					
3.1	Proportions of Woredas regularly and consistently participating in the system					
3.2	Proportion of health facilities consistently participating in the system					
	4. Sensitivity					

4.1	The system picks most of the maternal deaths in the facility /Community					
4.2	If you don't agree why do you think the reasons for not picking most of the deaths					
	5. Predictive Value Positive					
5.1	Deaths reported in this system are actually maternal deaths					
5.2	If you don't agree give examples or explanations					
	6. Representativeness					
6.1	The monthly maternal death report represents the situation in the facility/community					
	7. Timelines					
7.1	MDSR data is always ready when we need it for planning purposes					
	8. Cost					
8.1	The system is not costly as compared to the current benefits we gain from it					
8.2	Estimate of the cost of the system (include all personnel, transportation and material costs)					
	9. Usefulness					
9.1	The current system have an ability to estimate maternal death in the facility/community					
9.2	The current system have an ability to show the trend of maternal death in the facility/community					

9.3	The current system have an ability to show the progress and effect of preventive and control methods applied against maternal death					
9.4	The current system have an ability to indicate major causes of maternal deaths in the health facility/community					

Annex 6. Checklist for Health Profile Assessment of Kirkose Sub City in 2006

E.C

Sub City Kirkose

Date of report _____

1. Demography and Vital Statistics

- 1.1. Total Population in the Sub City _____
- 1.2. Total Male Population _____
- 1.3. Total Female Population _____
- 1.4. Total Under Five Children in the Sub City _____
- 1.5. Total Women of reproductive age group _____
- 1.6. Average house hold size _____
- 1.7. Total new life birth in the year _____
- 1.8 Total mortalities in the year _____

2. Health Resource, Infrastructure and Utilization

2.1 Health professional ratio to population

	Number	Ratio per total population
Health Professionals		
General Practitioner		
Specialist		
Health Officer		
Pharmacist		
Pharmacy Technician		
Nurse (B.Sc)		

Nurse (Diploma)		
Midwives (Diploma+BSC)		
All Other Nurses		
Lab. Technologist		
Lab Technician		
Radiographer		
X-Ray Technician		
Environmental Health (Diploma+BSC)		

2.2 Total number of health centers _____

2.3 Total number of public General Hospital _____

2.4 Total number of public referral Hospitals _____

2.5. Total number of private clinics _____

2.6. Total number of private hospitals _____

2.7. Total number of Ambulances _____

2.8. Total number of Primary schools _____

2.9. Total number of Secondary schools _____

2.10. Outpatient attendance per capital _____

2.11. Rate of referral _____

2.12. Bed occupancy rates of hospitals in the sub city _____

2.13. Total budget of the sub city

2.14. Total budget of the health office

3. Maternal Health

- 3.1. Total number of expected pregnancies in the year _____
- 3.2. Contraceptive prevalence rate _____
- 3.3. Contraceptive acceptance rate _____
- 3.4. General fertility rate _____
- 3.5. Antenatal care coverage (4 rounds) _____
- 3.6. Proportion of deliveries attended by skilled professional _____
- 3.7. Caesarian section rate _____
- 3.8. Institutional maternal mortality rate _____
- 3.9. Total maternal mortality rate _____
- 3.10 Still birth rate _____
- 3.11. Postnatal care coverage _____
- 3.12. Top three causes of maternal death in the sub city (if available)

4. Child Health

4.1. Proportion of low birth weight _____

4.2. Proportion of moderate/severe malnutrition children _____

4.3. Pentavalent first dose (DPT1-HepB1-Hib1) immunization coverage _____

4.4. Pentavalent third dose (DPT3-HepB3-Hib3) immunization coverage _____

4.5. Measles immunization coverage _____

4.6. Full immunization coverage _____

4.7. Primary school coverage _____

4.8. Primary school completion rate _____

4.9. Top 10 causes of under five morbidity and mortality _____

S.No	Top 10 causes of under five morbidity	Top 10 causes of under five mortality
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4.10. Neonatal Mortality rate _____

4.11. Infant mortality rate _____

4.12. Child mortality rate _____

5. General Diseases Burden and Distribution

5.1. Top 10 causes of morbidity

S.No	Top 10 causes of morbidity in the general population	Top 10 causes of morbidity in female population
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

5.2. Top 10 causes of mortality

S.No	Top 10 causes of mortality in the general population	Top 10 causes of mortality in female population
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

5.3. Top 3 Weekly IDSR reported diseases in the year

S.No	Reported IDSR disease	Total Number
1		
2		
3		

5.4. Number and cases of any report of immediately reportable diseases in the year

5.5 TB and HIV

5.5.1. Number of new TB cases (all forms) _____

5.5.2. TB Case detection rate _____

5.5.3. Health Facilities Providing VCT Services _____

5.5.4. Health Facilities Providing PMTCT Services _____

5.5.5. PMTCT testing rate _____

5.5.6. Health Facilities Providing ART Service _____

5.5.7. Cumulative ART care enrollment rate _____

5.5.8. Number of new HIV cases _____

6. Hygiene and Sanitation

6.1. Proportion of households with access of any kind of latrine _____

6.2. Proportion of households using an improved water source _____

6.3. Proportion of open defecation free Kebeles/Woredas _____

7. Major challenges of the sub city regarding delivery and quality of health services

Annex-7. Action Plan Developed Based on Major Problems Identified on Health
Profile Assessment of Kirkose Sub city

Identified Problems	Ordered Possible Solutions	Responsible Body	Time Frame
1. Health Resource and Services Utilization			
Low Health Center Service Coverage	Study the distribution and coverage of health facilities in Addis Ababa	Addis Ababa and Kirkose Sub city health office	Spet 15
	Construction of health centers guided by the above study result	Addis Ababa and Kirkose Sub city health office	
High Stock out of tracer drugs	Early need assessment and planning of Pharmaceutical in the sub city	Kirkose Sub city health office	Aug 30
	Purchase of tracer drugs	PFSA	Oct 20
2. Reproductive and Maternal Health			
Low Contraceptive acceptance rate	Integrated assessment on reasons for lower maternal health coverage	Addis Ababa and Kirkose Sub city health office	Oct 15
	Supportive supervision on health facilities that provide family planning services	Addis Ababa and Kirkose Sub city health office	Routine
	Health promotion activities on family planning and options of contraceptives	Kirkose Sub city health office	Ongoing
Low ANC Coverage	Integrated assessment on reasons for lower maternal health coverage	Kirkose Sub city health office	Oct 15
	Start the HMIS system in private health facilities (since many mothers can receive ANC from private facilities which reduce coverage)	Addis Ababa and Kirkose Sub city health office	Jan 15,2016

	Health education and promotion activities on antenatal care	Kirkose Sub city health office	Routine
Low Abortion care Coverage	Integrated assessment on reasons for lower maternal health coverage	Kirkose Sub city health office	Oct 15
	Start the HMIS system in private health facilities (since many mothers can receive abortion care from private facilities which reduce coverage)	Addis Ababa and Kirkose Sub city health office	Jan 15,2016
3. Child Health			
Increasing trend in malnutrition	Assess the community prevalence of malnutrition in the sub city	Kirkose Sub city health office	Sept 30
	Work with agricultural offices to monitor food security	Kirkose Sub city health office and agricultural office	Routine
	Strengthen (in terms of technical capacity and logistics) OTP and SC site in the sub city	Addis Ababa and Kirkose Sub city health office	Nov 15
Low Immunization coverage	assessment on reasons for Immunization coverage	Kirkose Sub city health office	
	Health education and promotion activities on importance of immunization	Kirkose Sub city health office	Routine
4. General Disease Burden			
High burden of upper respiratory infections and diarrheal disease both in under 5 and general population	Health education on prevention and control of respiratory disease, hygiene and sanitation practices	Kirkose Sub city health office	Routine
	Expand personal and community latrines in the sub city	Kirkose Sub city health office and Addis Ababa City administration municipal	

A high report of immediately reportable diseases	Give orientation for clinicians on case definitions of immediately reportable diseases	EPHI and Addis Ababa health office	Dec 15
	Train surveillance officers at sub city health office on immediately reportable diseases surveillance	EPHI and Addis Ababa health office	Dec 30
5. TB and HIV			
Low HIV positive mothers facility delivery and low delivery PMTCT coverage	Develop Tracing mechanism for HIV positive mothers identified on ANC and eligible for PMTCT	All health facilities in the sub city and Kirkose sub city health office	Spet 12
	Encouragement to HIV positive to deliver their babies at health facilities through peer discussion (coffee discussion) and health education	All health facilities in the sub city	Routine
6. Data Management			
Poor Data quality and absence of private health facilities in the sub cities HMIS	Give training on data management and documentation for all HMIS officers at facility and sub city level	Addis Ababa health office	Nov 10
	Continuous mentorship supervision on data management at facility and sub city level	Addis Ababa and Kirkose Sub city health office	Routine
	Start implementation of HMIS in private health facilities of the sub city	Addis Ababa and Kirkose Sub city health office	Jan 15,2016

Annex-8. List and Definitions of Indicators Used in the Health Profile

1. **Contraceptive acceptance rate (CAR):** proportion of women of reproductive age (15-49 years) who are not pregnant who are accepting a modern contraceptive method (new and repeat acceptors).
2. **Antenatal care (ANC) coverage:** proportion of pregnant women attended, at least once during the current pregnancy, by a health professional, for reasons related to pregnancy.
3. **Abortion care:** number of safe abortion services provided as far as the law permits as a proportion of expected pregnancies.
4. **Stillbirth Rate:** proportion of stillbirths from total births attended by skilled health attendants.
5. **Institutional Early Neonatal Death Rate:** proportion of deaths within the first week of life from total births attended by skilled health attendants in the facility.
6. **Proportion of low birth weight (LBW):** percentage of live born babies who weigh less than 2500g.
7. **Proportion of moderate/severe malnutrition:** percentage of weights reflecting moderate/severe malnutrition amongst weights-for-age recorded for children under 3 years of age.
8. **Pentavalent third dose (DPT3-HepB3-Hib3) immunization coverage:** proportion of surviving infants who receive a third dose of pentavalent vaccine before their first birth day.
9. **Measles immunization coverage:** proportion of surviving infants who receive a dose of measles vaccine before their first birthday.
10. **Full immunization coverage:** proportion of surviving infants who receive all doses of infant antigens before their first birthday.
11. **TB treatment success rate:** percentage of a cohort of new smear positive TB cases registered in a specified period that successfully completed treatment. Successful completion entails clinical success with or without bacteriological evidence of cure.
12. **TB cure rate:** percentage of a cohort of new smear-positive TB cases registered in a specified period that was cured as demonstrated by bacteriologic evidence (a negative sputum smear result recorded during the last month of treatment and on at least on one previous occasion during treatment).

-
13. **PMTCT antenatal coverage:** proportion of pregnant women who attend a facility that provides PMTCT services for at least one ANC visit.
 14. **PMTCT testing rate:** proportion of pregnant women who receive ANC at PMTCT site who receive testing for HIV.
 15. **PMTCT delivery coverage:** proportion of deliveries of HIV+ women that receive a full course of ARV prophylaxis (“full course” means that both mother and newborn receive prophylaxis).
 16. **Admission rate:** number inpatient admissions per 1000 population

Annex- 9. Questionnaire to Assess the Prevalence of Mental Disorders and Substance Use among Taxi Drivers of Addis Ababa and the Relation on Road Safety

My name is _____ am studying the prevalence of mental disorders and substance use among Taxi drivers in Addis Ababa and impact on road traffic accident. The whole objectives of the study are to assess the magnitude and of mental disorders in taxi drivers and their association with road traffic accidents. The information you provide on this study will only be used for academic purposes and all information will be kept confidentially. This questionnaire may take around 35 minutes and at any time you have the right to stop or pass or to ask explanation for any of questions items listed in the questionnaire. If you agree to participate in this study please approve by putting your signature below.

Signature -----

Part One – Socio Demographic Factors

1.1. Sex of responder Male ☐ Female ☐

1.2 Age of the responder (in years) -----

1.3. The maximum educational level achieved by the responder.

Illiterate ☐ Primary education (up to 8th grade) ☐ Secondary education (9-12) ☐
College or University ☐

1.4. Marital status of the responders. Married ☐ Single ☐ Divorced ☐ Widowed ☐

1.5. Experience as a Taxi Driver (in years) -----

Part Two – Mental Disorder (SRQ+)

2.1. Have you ever been to psychiatrist or psychiatric clinic to get care for your psychiatric complaint?

Yes ☐ NO ☐

2.2 Do you have immediate (mother, father or siblings) family history of mental disorder?

Yes ☐ NO ☐

WHO- Self Reporting Questionnaire (SRQ - 20)

The following questions are related to certain pains and problems that may have been bothered you for the past 30 days. If you think the question applies to you and you had the described problem in the past 30 days select "Yes". In the other hand if the question doesn't applies for you or if you didn't have the described problem please select "NO"

1. Do you often have headaches? Yes ☐ No ☐
2. Is your appetite poor? Yes ☐ No ☐
3. Do you sleep badly? Yes ☐ No ☐
4. Are you easily frightened? Yes ☐ No ☐
5. Do your hands shake? Yes ☐ No ☐
6. Do you feel nervous? Yes ☐ No ☐
7. Is your digestion poor? Yes ☐ No ☐
8. Do you have trouble thinking clearly? Yes ☐ No ☐
9. Do you feel unhappy? Yes ☐ No ☐
10. Do you cry more than usual? Yes ☐ No ☐
11. Do you find it difficult to enjoy your daily activities? Yes ☐ No ☐
12. Do you find it difficult to make decisions? Yes ☐ No ☐
13. Is your daily work suffering? Yes ☐ No ☐
14. Are you unable to play a useful part in life? Yes ☐ No ☐
15. Have you lost interest in things? Yes ☐ No ☐
16. Do you feel that you are a worthless person? Yes ☐ No ☐
17. Has the thought of ending your life been on your mind? Yes ☐ No ☐

-
18. Do you feel tired all the time? Yes ☐ No ☐
19. Do you have uncomfortable feelings in the stomach? Yes ☐ No ☐
20. Are you easily tired? Yes ☐ No ☐

Part Three- Substance Use Problems

- 3.1. Have you used drugs other than those required for medical reasons in the past month?..Yes ☐ No ☐
- 3.2. What Kind of drugs have you used in the past month?
- Khat ☐ Cigarette ☐ Alchols ☐ Marijuana ☐ Cocaine ☐ Heroin ☐ others ☐
- 3.3. Do you abuse more than one drug at a time (including Khat, **Cigarette** or Alchol)?.....Yes ☐ No ☐
- 3.4. Can you get through the day without using drugs? Yes ☐ No ☐
- 3.5. Can you get through the week without using drugs? Yes ☐ No ☐
- 3.6. Are you always able to stop using drugs when you want to?..... Yes ☐ No ☐
- 3.7. Do you ever feel bad or guilty about your drug use? Yes ☐ No ☐
- 3.8. Has drug abuse created problems between you and your spouse or your parents?
..... Yes ☐ No ☐
- 3.9. Have you been in trouble at work because of drug abuse? Yes ☐ No ☐
- 3.10. Have you gotten into fights when under the influence of drugs?Yes ☐ No ☐
- 3.11. Have you ever experienced withdrawal symptoms (felt sick) when you stopped taking drugs? -
..... Yes ☐ No ☐
- 3.12. Have you gone to anyone for help for a drug problem? Yes ☐ No ☐

Part Four- Road Safety

- 4.1. Have ever been formally charged by traffic police with any of the following traffic violation in the past 30 days?

-
- | | | |
|--|------------------------------|-----------------------------|
| 4.1.1. Speeding above the limit | Yes ☐ | NO ☐ |
| 4.1.2. Careless Driving | Yes ☐ | No ☐ |
| 4.1.3. Going through a stop sign | Yes ☐ | No ☐ |
| 4.1.4. Driving in restricted traffic lane | Yes ☐ | NO ☐ |
| 4.1.5. Running a traffic light | Yes ☐ | No ☐ |
| 4.1.6. Following too closely | Yes ☐ | No ☐ |
| 4.1.7. Failure to move over | Yes ☐ | No ☐ |
| 4.1.8. Expired registration | Yes ☐ | No ☐ |
| 4.1.9. Unlawful use of license plate | Yes ☐ | No ☐ |
| 4.1.10. Lack of insurance proof | Yes ☐ | No ☐ |
| 4.1.11. Driving unregistered vehicle | Yes ☐ | No ☐ |
| 4.1.12. Absence of lights required on vehicles | Yes ☐ | No ☐ |

4.2. Have ever encountered the following problems in the past 30 days

- | | | |
|---|------------------------------|-----------------------------|
| 4.2.1 Any kind of Traffic accident | Yes ☐ | No ☐ |
| 4.2.2. Vehicular manslaughter | Yes ☐ | No ☐ |
| 4.2.3. Leaving the scene of an accident (pass if 4.4.1 is “No”) | Yes ☐ | No ☐ |
| 4.2.4. Suspension of driving privilege | Yes ☐ | No ☐ |

Annex 10- Rapid Belge Assessment - Health Sector: Woreda level Questionnaire 2015 GC.
Serial No.

Interviewer name _____				Institution: _____					
Interview Date: (dd) ____/(mm)____/2015____				Region: _____ Zone: _____ Woreda _____					
Main contact at this location:		Name: _____		Position: _____		Tel: _____			
SECTION I: SOCIO- DEMOGRAPHIC PROFILE									
Woreda total population:		M: _____ F: _____		Under 5 _____		Total: _____			
Special Population (if any):		Pastorals _____	Refugees _____	IDPs _____	Migrant Workers _____				
SECTION II: HEALTH PROFILE									
2.1. Coordination									
Is there a multi sectoral PHEM coordination forum?							Yes ☐ No ☐		
Is there a PHE preparedness and response plan?							Yes ☐ No ☐		
Is there accessible emergency response fund							Yes ☐ No ☐		
2.2. Morbidity (List top 5 causes of Morbidity) in the year 2007 EC (2014-2015 GC)									
Morbidity below 5				Morbidity above 5					
1.				1.					
2.				2.					
3.				3.					
4.				4.					
5.				5.					
2.3. List number of cases/deaths from Tir 2007 EC to Ginbot 2007 EC (June–Oct 2014)									
Month	AWD		Malaria		Measles		Meningitis		Other (specify)
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Death	
Jan 2015									

Feb 2015									
Mar 2015									
Apr 2015									
May 2015									
2.4. Outbreak?									
Was there any outbreak in the last 3 months? YES_____ NO_____									
If yes, specify the type of disease									
Type of outbreak _____ Number of cases _____ Deaths _____ (specify the time period)_____									
Is there any ongoing outbreak of any disease? YES_____ NO_____									
Type of outbreak _____ Number of cases _____ Deaths _____ (specify the time period)_____									
Type of outbreak _____ Number of cases _____ Deaths _____ (specify the time period)_____									
Type of outbreak _____ Number of cases _____ Deaths _____ (specify the time period)_____									
2.5. Preparedness: Is there emergency drugs and supplies enough for 1 month? Or easily accessible on need?									
Ringer Lactate (to treat AWD cases)						Yes ☐ No ☐			
ORS (to treat AWD cases):						Yes ☐ No ☐			
Doxycycline (to treat AWD cases):						Yes ☐ No ☐			
Consumables : Syringes, Gloves (for AWD management):						Yes ☐ No ☐			
Amoxil susp (measles)						Yes ☐ No ☐			
Tetracycline ointment (measles)						Yes ☐ No ☐			
Vit A (measles)						Yes ☐ No ☐			
Coartem for Malaria						Yes ☐ No ☐			
Lab supply: RDT for Malaria						Yes ☐ No ☐			

Lab supply: RDT (pastorex) for M eningitis		Yes ☐	No ☐
LP set		Yes ☐	No ☐
Number of CTC kit available: (for AWD)		Yes ☐	No ☐
Main shortage (if any): Specify			
Is budget allocated for emergency Rapid response by the woreda?			
SECTION III: RISK FACTORS			
Diseases	Risk factors for epidemics to occur	Yes	No
Malaria	Malaria endemic area		
	Presence of malaria breeding site		
	Interrupted or potentially interrupting rivers		
	Unprotected irrigation in the area		
	LLINs coverage <80%		
	Indicate the coverage of IRS 2006		
	Depleted prevention and control activities		
	Number of malarious kebeles and total population in these Kebeles	Keb _____ pop _____	
Meningitis	Was there Meningitis epidemic in the last 3 years (If yes specify date)		
	Has vaccination been conducted in the past 3 years		
	If yes : Indicate the date and number of people vaccinated	date	No
AWD	Was there AWD epidemic in the last three years (If yes specify date)		
	Latrine coverage		
	Latrine utilization		
	Safe water coverage		
Measles	Is there ongoing measles outbreak		
	What is the measles vaccination coverage of 2006 EC, less than one year		

	Has SIA been conducted in 2006 EFY		
	If yes, Indicate the month and number of children vaccinated including the age group	Month _____	
		No. Vaccinated	
		Age group	

Any other observations you made or any risks of epidemics?

What were the major challenges in your Epidemic response experience?

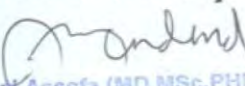
Section IV: Nutrition - TFP admissions at woreda level Jan to May 2015

Month	Total SAM Cases	Total Number of TFP (OTP/SC) in the woreda	Number of SC.	Number of OTP.	Total Number of OTP/SC reported.	Therapeutic Supplies enough Y/N (for the next 1 mo)			Children Discharged from TFP referred to SFP Y/N
						RUT F	F100	F75	
Jan									
Feb									

Month	Total SAM Cases	Total Number of TFP (OTP/SC) in the woreda	Number of SC.	Number of OTP.	Total Number of OTP/SC reported.	Therapeutic Supplies enough Y/N (for the next 1 mo)			Children Discharged from TFP referred to SFP Y/N
						RUT F	F100	F75	
Mar									
Apr									
May									

Any comment

Annex 11- Letter of Ethical Approval for the Study Project on “Evaluation of Maternal Death Surveillance and Response (MDSR) System in Tigray Region North Ethiopia”

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Ref. No. EPHI/6.13/107 Date 10 FEB 2016	
Mr. Mikiyas Mekonnen Principal Investigator FMOH Addis Ababa, Ethiopia	
Subject:-<u>Approval of project proposal</u>	
I would like to congratulate you and group that your Research proposal entitled "Evaluation of Maternal Death Surveillance and Response (MDSR) System in Tigray Region, North Ethiopia" has been examined and approved for its scientific and ethical merits by our scientific and Ethical Review Committee.	
Looking forward to seeing the best outcome of this work as a contribution to solving the health problem of our country. I wish you a successful implementation.	
Sincerely yours ,  Yibeltar Assefa (MD, MSc, PhD) Deputy Director General	
CC:- General Director Office SERO <u>EPHI</u>	