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Prevalence and Risk Factors Associated with Maternal Mortality in Mizan-Aman Hospital, Bench Maji, Southwest Ethiopia

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Abstract

Background: All pregnant women are at risk of obstetric complications and most of these complications occur during labor delivery and in the immediate postpartum period that leads to maternal death. Greater proportion of all maternal deaths results from five major complications: hemorrhage, infection, unsafe abortion, hypertensive disorders of pregnancy, and obstructed labor that all accounts for more than 70%. The maternal mortality ratio in Ethiopia is estimated to be more than 676 deaths per 100,000 live births and included in African countries with higher maternal death.

Objective: This study was conducted to determine Prevalence and risk factors associated with maternal mortality in Referral Hospital.

Methods: A retrospective study was conducted in Mizan-Aman General Hospital from secondary data sources of three months back in maternal health care services. The data were collected by using well-structured questionnaire from May 15 to 25, 2014. The data were entered into EpiData 3. 1 that exported to STATA 12 and SPSS 20 statistical software windows version. Discriptive analysis to determine epidemiological characteristics and inferential statistics to assess relationship of risk factors to maternal deaths were performed. Ethical clearance was separately obtained from Mizan-Tepi University Institutional review boards, Zonal health department, and additional from Referral Hospital.

Results: A total of 384 maternal cases attended delivery ward of referral Hospital from February to April 2014. The estimation of mean age was 25 ± 4. 95 years, range at 95% CI. About 13(3.39%) of cases were died from obstetrical complications. The diagnosis for mothers death was obstructed labor in 3(0.78%), Puerperal sepsis 2(0.52%),multi-pregnancy in 1(0.26%),hypertensive disorder in 1(0.26%),hemorrhage in 1(0.26%),IUFD in 1(0.26%) and by non-frequent causes in 4(1.04%). The maternal death 9(7.76%) was highest in age group from 25 to 30 years. Our study suggested that death in cases with abortion was significantly low but increased death occurred in gynecological complications. Higher frequency 61(15.89%) was observed in C-section applications for maternal cases with underlying causes. Risk of maternal death was significantly related with occupation, ethnicity, age, and religion of them but not with marital and educational status in this study.

Conclusion: Many indicators showed there was unacceptably high risk of maternal death in the study area. It implied that the efforts applied to revert increasing trend in maternal death produced no effect. Strong interventional measures must be designed to successfully prevent death in reproductive age group.

Keywords: Prevalence; Risk factors; Maternal mortality; Ethiopia

Introduction

Maternal mortality is defined as 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. The overwhelming majority of maternal deaths occurs in developing countries and arises from the risks attributable to pregnancy and childbirth as well as from the poor performance of health services. More than 70% of all maternal deaths are due to five major complications: hemorrhage, infection, unsafe abortion, hypertensive disorders of pregnancy, and obstructed labor. The majority of maternal deaths (61%) occur in the postpartum period, and more than half of these take place within a day of delivery [1,2].

Globally, it was estimated that in 1990 alone up to 585,000 women death occurred due to obstetrical complications directly ascribed to childbirth but up to 15 million women experienced long-term disabilities [2-4]. The estimation of global maternal mortality ratio showed that one woman death per 200 live births observed in worldwide. Of these, almost all maternal mortality, 99 percent occurred in developing countries. In sub-Saharan Africa women face a 1-in-13 chance of dying in childbirth, as compared to a 1-in-4,100 chance in industrialized countries. The difference in level of maternal death measure between the developing and developed worlds is higher than any population health indicator analyzed by the World Health Organization [5].

According to EDHS 2011 in Ethiopia, the maternal mortality rate in age group of 15-49 years is 1.14 deaths per 1,000 woman-years (676 deaths per 100,000 live births). In seven years later, 15 percent reduction in death rate than that estimated in the 2005 and 32 percent reduction than in the 2000 is reported. In that survey, the highest maternal

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mortality rate is found among women 30-34 years (2.53), followed by age from 35-39 years (1.53). Also reported that in 2011maternal deaths accounted for 30 percent of all deaths in women age 15-49 years, higher compared with 21 percent in the 2005 and 25 percent in the 2000. The percentage of maternal deaths showed significant variation in age categories from 10% among women 45-49 to 37% of all deaths among women 30-39. Generally,Ethiopia reports the fifth highest maternal mortality from sub-Saharan countries [2].

Methods

Study design

A retrospective study for last three months in level of maternal death occurred and leading causes of childbearing women deaths was conducted. The retrospective data analysis from secondary electronic and documentary sources was thoroughly performed to suggest level of females deaths attributed to obstetrical causes and estimate indicators of maternal mortality in patients delivered over last three months in Mizan-Aman General Hospital. The study was strictly designed to focus in Obstetrical, gynecological and antenatal data of patients in specified time period that sufficiently gives new knowledge in characteristics of interest.

Study area and site

The study was carried out in Referral Hospital, Bench Maji Zone that provides tertiary Health care services for more than 2 million populations. It is geographically located at 574 Km distance from Addis Ababa, Capital City, in SNNPR, southwest Ethiopia. The hospital was established in 1985 and now it has 7 departments which are surgical, obstetrics and gynecology, pediatrics, Medical, ophthalmology, and Emergency wards. It runs multidisciplinary health care system with total of 209 staffs, of these 155 are health professionals (2 specialists,12 Medical doctors,75 Nurses, 15 Midwives, 25 Laboratory professionals, 16 Physiotherapists, 2 Environmental Health Officers, 2 Ophthalmologists, 3 X-ray Technicians,1 Health Officers and 2 Dentists) and the remaining 54 are supportive staffs.

Bench Maji Zone where this study conducted is geographically located in SNNPRS, South Western part of Ethiopia. The administrative town of the zone, Mizan-Aman, is about 561 km far away from capital city Addis Ababa, Ethiopia. The neighboring are Ilemi triangle in the south, South Sudan in the west, Gambella region in the north west, Sheka in the north, Keffa in the northeast and South Omo in the east. The area geographical features altitude varies from 700 m lowlands to 2500 m highlands. The zone has three distinct agro-ecologically areas namely, lowlands(29.1%),wet-midlands(51.6%) and highlands(19.3%). Generally, the areas average temperature varies from 15 - 27°C and receives an average rainfall of 400-2000 mm per year. The zonal census statistics in 2007 shows that approximately 652,531 total populations are living in the zone, of these, 49.6% are men and 11.53% of the populations are urban. The ethnic compositions of the population are Bench (45.11%), Me'en (21.36%), Amhara (8.23%), Kefficho (6.55%), Dezi (5.17%), Sheko (4.21%) and Suri (3.88%) and all others (5.49%).

Study variables

The characteristics under investigation in this study were distinctly categorized into independent and dependent variables in their epidemiological relationship wise. The major independent variables were socio-demographic characteristics (like Age, marital status, educational status, religion, occupation, and ethnicity), maternal death causes.

- **Direct causes** such as obstetrical and gynecological complications;
- **Indirect causes** like nutritional status, amenia, malaria, etc. ,) and remaining risk factors which contribute to maternal mortality. The dependent variables were maternal death, socio-economic consequences, and familial disorders.

Data collection, methods, and study period: The data collection activities were run from May 19 to 25, 2014 by using standard collection format. The data were collected by four principal investigators from Midwifery professionals. The secondary data in maternal care services provided over three months back period were reviewed. The study was addressed socio-demographic data, Obstetrical data, and Gynecological data of clients. The data quality was ensured through training of data collectors, pretesting of instruments, checking of missing data, data cleaning, and careful data analysis.

Method of statistical analysis: All statistics of interest in this study were statistically analyzed by using STATA 12 and SPSS 20 for window version statistical software packages. In analysis, exclusively parametric tests involving both inferential and descriptive statistics to extrapolate generalization were neatly performed. The Gaussian distribution of the characteristics was tested by using Kolmogrov-Smyrnov test. Continuous measures were expressed in terms of mean ± standard deviation [range] to epidemiologically describe the findings. Categorical measures were exhaustively expressed into frequency distribution and the association between study variables was also investigated by Pearson calculations. In inferential statistics, mainly the relationship between variables was also performed for binary categorical variables to drive risk measures. Level of significance in statistical tests was considered at P-value less than 5% and 95% CI.

Ethical statement: Ethical clearance was obtained separately from Research Committee of College of Health Sciences, Mizan-Tepi University, and additional from Referral Hospital. Consent wasn't be made from patients as long as secondary source was reviewed. Confidentiality was completely maintained by anonymity of diagnostic data. Generally, the data were handled confidentially at all level of processing and raw data were never shared with third party.

Operational Definitions:

- **Maternal mortality** is the death of the reproductive aged mother during pregnancy before, during and after delivery till 42 days that directly related to pregnancy other than incidental or accidental causes.
- **Postpartum hemorrhage** excessive bleeding through the genital tract 500 ml blood loss following delivery. 1000 ml blood loss in cesarean section and 1500 ml blood loss in hysterectomy and 10% hemoglobin drops from antenatal level.
- **Pregnancy disorder with protein urea or without protein urea** elevated blood pressure develops in a woman after 20 not weeks of gestation and returns to normal at post-partum.
- **Unsafe abortion** the expulsion of fetus or termination of pregnancy before 28 weeks gestational age which may not support medically or surgical case.
- **Obstructed labor** is the failure of descent of the fetus in the birth canal for mechanical reasons in spit good uterine contractions.
- **Infection** invasion of the body by harmful organisms such as bacteria, fungi, Protozoa and viruses the infective agent may be transmitted by a patient.

Complications	15-20	20.0-25	25.0-30	30.0-35	35.0-40	40.0-45	Total
CPD	1(20)	1(20)	3(60)	0	0	0	5(100)
Ante-partum hem	3(18.75)	3(18.75)	6(37.5)	3(18.75)	1(6.25)	0	16(100)
Fetal distress	5(23.81)	4(19.05)	9(42.86)	2(9.52)	0	1(4.76)	21(100)
other	0	1(20)	4(80)	0	0	0	5(100)
preeclampsia	3(33.33)	1(11.11)	4(44.44)	1(11.11)	0	0	9(100)
Uterine rupture	0	1(20)	2(40)	2(40)	0	0	5(100)
No	64(19.81)	131(40.56)	88(27.24)	27(8.36)	12(3.72)	1(0.31)	323(100)
Total	76(19.79)	142(36.98)	116(30.21)	35(9.11)	13(3.39)	2(0.52)	384(100)

Table 1: Maternal death by gynecological complications.

Results

Socio-demographic differentials

A total of 384 mothers attended the delivery ward in the Mizan-Aman General Hospital, between February to April, 2014. The mean age of cases was 25 ± 4. 95 years, range at 95% CI. A greater number of maternal cases 114(36.98%) were found in age group of 20 to 25 years, followed by 116(30.2%) in age group of greater than 25 to 30 years. Almost all mothers with cases of delivery were living with their husband, 373(97%) of population but few mothers, 9(2.34%) were single, 1(0.26%) was divorced, and 1(0.26%) was widowed. The mothers ethnicity analysis showed that greater number were bench 163(42.45%), Amhara made up to 95(24.74%), 84(21.88%) keffa, 34(8.85%) Dezi and the rest were other ethnic groups, who are less in population number in the area. Orthodox 160(41. 67%) and protestant 157(40. 89%) were dominant religion in cases which followed by Muslim 61(15. 89%) and few proportion of cases 6(1.56%) were believing in other religions. Greater than half 204(53.13%) of mothers were found to work as housewife, 118(30.73%) of them were engaged in farming activities, 47(12.24%) of cases were merchant in occupation, 10(2.6%) of the cases were serving government and others were involved in variety of economic activities. The cases were educationally set apart into primary level 349(90.89%), secondary level 33(8.59%) and tertiary level 2(0.52) (Figure 1).

Obstetrical measurements

Greater number of cases 352(91.67%) generally became pregnant in their life for less five but few women 32(8.33%) experienced pregnancy for greater than five time. Multiparous 268(69.79%) was predominate in birth history of mothers in that period of time. The next higher parity was primiparous 98(25.52%) which followed by secundiparous 11(2.86%) and nulliparous 7(1.82%). About 356(92.71%) of mothers who attended delivery ward had no history of abortion previously and only 28(7. 29%) responded that they experienced abortion: 26(6.77%) had once and 2(0.52%) had twice in their past life time.

Over three months, 13(3.39%) of mothers were passed away during child birth but the rest delivered safely. The diagnosis for mothers death was obstructed labor in 3(0.78%), Puerperal sepsis 2(0.52%), multi-pregnancy in 1(0. 26%), hypertensive disorder in 1(0.26%), hemorrhage in 1(0.26%), IUFD in 1(0.26%) and by non-frequent causes in 4(1.04%). Maternal death was significantly high in age group from greater than 25 to 30 years and showed decreasing trend in lower age and higher age groups as presented in Table 1 (95% CI, P-value <0. 001). Number of pregnancy of mothers was not statistically shown relationship with death of them in all age groups but 12(92.31%) of death occurred in mother who had history of less five pregnancy (95% CI, P-value=0.932). Data from this study indicated that all maternal death occurred in multiparous women but might be possibly affected by number of women and health seeking behavior.

The bivariate analysis of maternal death and presence of complications in previous gynecological examinations summarized in detail in Table 2 . The maternal cases were receiving ante-natal care services before giving birth to child except 35(9.11%) of them. About 3(23.08%) of women with C-sections were experienced death and the parameters showed significant association in Pearson calculations (95% CI, P-value=0. 471). Of those, 144(37.5%) mothers received two times, 121(31.51%) for three times, 62(16.15%) for four times, and 20(5.21%) for one time only. Our analysis showed that ethnicity was significantly associated with death but occupation was observed to be less likely associated with death of mother in these findings. In general, socio-demographic characteristics such as marital status, educational status, and religion were statistically not associated with occurrences of death in all age groups (Table 1).

Overall, greater proportion of the mothers who attended the delivery ward received TT immunization; 16(4.17%),216(56.25%),77(20.06%),a nd 30(7.81%) cases were given for once, twice, three times and four times respectively in their age of gestation. The immunization status and number of mothers suggested to be not related with death [95%

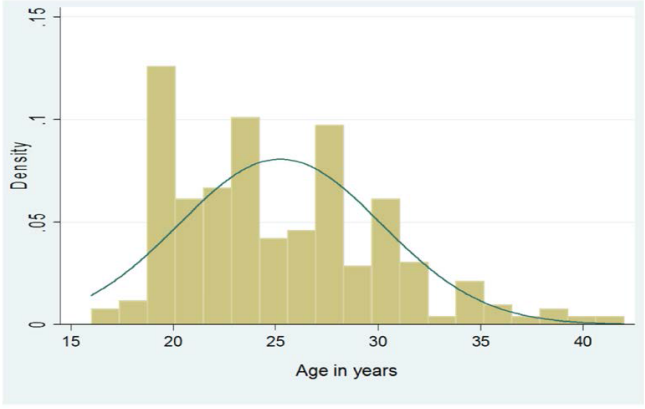

Figure 1: Age of maternal cases who attended delivery ward of Mizan-Aman Hospital, Bench zone, from February to April 2014.

Gynecological Complications	Death		
	Yes	No	Total
IUFD	2(66.6)	1(33.3)	3(100)
MDR meningitis	1(100)	0	1(100)
Abortion	1(100)	0	1(100)
Cord Prolapse	2(100)	0	2(100)
Obstructed labor	1(100)	0	1(100)
Puerpal Sepsis	4(100)	0	4(100)

Table 2: Leading causes for C-section in mothers by age category in the Referral Hospital, from February to January 2014.

		Age (yr.)						
		15-20	20.0-25	25.0-30	30.0-35	35.0-40	40.0-45	Total
Abortion	Yes	2(7.14)	6(21.43)	17(60.71)	3(10.71)	0	0	28(100)
	No	74(20.79)	136(38.2)	99(27.81)	32(8.99)	13(3.65)	2(0.56)	356(100)
	Total	76(19.79)	142(36.98)	116(30.21)	35(9.11)	13(3.39)	2(0.52)	384(100)
Death	Yes	0	2(15.38)	9(69.23)	0	0	2(15.38)	13(100)
	No	76(20.49)	140(37.74)	107(28.84)	35(9.43)	13(3.5)	0	371(100)
	Total	76(19.79)	142(36.98)	116(3.21)	35(.11)	13(3.39)	2(0.52)	384(100)

Table 3: Abortion and death in maternal cases by age categories in referral Hospital, Maji zone, SNNPR, from February to April 2014.

CI, P-value=0. 769, P-value=0. 676]. In this finding, the immunization status was not significantly affected by religion of maternal cases in this area. Of 339 women with delivery case, 131(38.64%) from 20 to 25 years and 98(28.91%) from 30 to 35 years were in larger number immunized. The educational level of mothers was completely biased to report because greater number of subjects was at primary level that significantly affects our findings. There was no difference in number of immunization status among study participants (Table 3).

Gynecological information

About 61(15. 89%) of mothers were delivered with C-section procedure and the common causes for cesarean section delivery were CPD in 5(1. 3%), ante-partum hemorrhage in 16(4. 17%), fetal distress in 21(5. 47%), preeclampsia in 9(2. 34%), uterine rupture in 5 (1. 5%) and by others in 5(1. 3%). Higher number of young adult from 25 to 30 years were borne child with C-section procedure than rest age categories. Across age groups, fetal distress was very common causes of C-section with varying frequency. Ante-partum hemorrhage was also common in mothers who delivered during the period in all age. Generally, C-section delivery was frequently observed in less than 30 years of age than above it as summarized in Table 1 [95% CI,P-value=0. 189]. It was detected in higher number from farmers 37(60. 65%) and housewife 14(22. 95%) in occupation distribution analysis. Fetal distress was predominantly found in housewife 14(66. 67%) compared to all other occupation in the study area [95% CI, P-value=839). About 3 women with previous C-section experienced death and there was significant correlation between the death and C-section in this study [95% CI, P-value=0. 242].

The maternal cases also evaluated with gynecological complications throughout their age of gestation. Majority showed no problem of gynecology in their previous visits but 12(3.13%) reported to have complications. The diagnosis suggested that IUFD in 3(0.78%),MDR bacterial meningitis in 1(0.26%),abortion in 1(0.26%),cord prolapse in 2(0.52%),sepsis in 4(1. 04%), and obstructed labor in 1(0.26%) were responsible for complications observed in the mothers. Most of them 4(1.04%) were suffered from sepsis that followed by IUFD 3(0.78%). About 9(7.83%) of complications were diagnosed from 25 to 30 years only [95% CI, P-value<0. 001). As presented in Table 3, 11(84.61%) of maternal cases with different gynecological complications experienced death. The analysis showed frequency of complications in gynecology was higher in farmer than housewife and highly low in rest of occupations (Table 2).

Discussion

In this study, the analysis showed that there was significantly high maternal death over three months period. It is consistent with many previous studies from different parts of Ethiopia and global reports which showed Ethiopia is among top five countries with the highest maternal death globally [6]. All maternal death in this study resulted due to leading causes like Sepsis, Ante-partum hemorrhage (APH), IUFD, Multi-pregnancy, hypertensive disorder, and ruptured uterus. The contribution of these causative factors were considerably vary from previous reports in which unsafe abortion and sepsis were the predominant causes of death of mothers [1] but obstructed labor and bacterial sepsis were found to be the leading contributors of death in this referral Hospital. Our results were consistently similar to reports from Jimma Hospital where obstructed labor increasingly contributed to maternal death over 10 years [7].

Maternal mortality review from Jimma Hospital showed that higher number of deaths occurred in high risk group, primiparous and grand multiparous but less risk of death in 2-4 parity. Data from our retrospective study found out different trends in relation of maternal mortality and parity level where in ours death occurred in multipara only [7]. Studies have clearly suggested that many numbers of pregnancies significantly increase risk of maternal death [8]. In contrast; relational analysis in this study indicated no risk of death in women with the highest number of pregnancy. Our study might be liable to confounding factors that negatively affect the strong relationships of risk of death and pregnancy level.

In this study, maternal deaths in age distribution also showed significant variation from previous studies in Jimma, southwestern, Ethiopia and other reports in Institutional based studies, Addis Ababa. In this retrospective data analysis, risk of death was increasingly predominant in 25 to 30 years age groups which was slightly different in range from many studies [9]. However, consistence in data distribution in this study was generally assumed to introduce biases as higher number of women were in between 25 to 30 years.

The Caesarean section delivery in this study was considered significantly higher with basis of WHO guideline [8]. Higher estimate of C-section was reported previously from Addis Ababa and was found less in 11 regions of Ethiopia due to level of standards in obstetrical care services [8]. Our findings in relation with C-section services was strongly consistent with standard of obstetrical care services in few areas of Ethiopia and completely different from majority of reports from 11 regions of Ethiopia in EDHS 2011. A small proportion of C-section delivery in the present study resulted in maternal death. The maternal cases in this study subjected to C-section primarily due to fetal distress, ante-partum hemorrhage and preeclampsia.

In most studies, the combined effects of direct and indirect causes for maternal deaths were significantly risen trend in level of risk in different regions [10]. In this case, indirect causes of death in maternity remained unknown due to shortcomings of our data sources. However, direct causes of maternal death were well diagnosed in every cases and frequency in occurrence of them greatly varied from previous studies. The direct causes for maternal death in our study contributed largely to consequences of complications associated with pregnancy. Such findings considerably agree with many reports from elsewhere in regions of Ethiopia and sub-Saharan Africa.

Surprisingly more than 92.3% of maternal cases with gynecological complications were died during giving birth to child in this study. It shows sufficiently the direct relationship of previous gynecological conditions to death consequences of women at giving birth. Previous studies also significantly agree with our findings in which gynecological complications mostly resulted in death of mothers.

Conclusion and Recommendations

In conclusion, maternal mortality rate in this area was unacceptably higher than reported in EDHS 2011. It shows the impact of efforts to reduce maternal mortality rate in all regions of Ethiopia according to MDG program. The level of effectiveness in implementation of the measures designed to significantly reduce obstetric death in all part of Ethiopia was presumably below standard. In our findings, among dominant causes of maternal death in this area, obstructed labor and puerperal sepsis were significantly higher in level of estimates compared with others. In general, the maternal death indicator and predictors of death in these study populations showed significantly increasing trend in contrast to reported estimates at national level in EDHS and UNPA. Our analysis indicated that gynecological complications suggested to contribute significantly in maternal death but less significant relationship of C-section and occurrence of death observed.

Improvements in maternal health care services are required to meet MDG of 47% reduction in obstetric death by 2015. Strenthening the current efforts to control maternal death measure possibly reverts the upward trend in level of occurrence. Many interventional measures that target standard of maternal care services, better accessibility of services, increase in use of three maternal services, and preventing those causes of death ensure risk of maternal death reduction and effectively safeguards life of women. Progress in previous years to reduce complications during pregnancy or childbirth should continue and barely changes negative consequences in childbirth events.

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Author's Contributions

All authors carried out the research from conception to the write up of the final draft of the article. All authors read and approved the final manuscript.

Competing Interests

The authors declare that they have no competing interests.

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