

PROPORTION AND ASSOCIATED FACTORS OF MATERNAL  
NEAR MISSES IN SELECTED PUBLIC HEALTH INSTITUTIONS  
OF KEFFA, BENCH-MAJI AND SHEKA ZONES OF SOUTH  
NATIONS NATIONALITIES AND PEOPLES REGIONAL STATE,  
SOUTH WEST ETHIOPIA, 2017.A CROSSECTIONAL STUDY.

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## ABSTRACT

**Background:** Maternal near-miss refers to a situation where a woman who nearly died but survived from severe life-threatening obstetric complications that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy. It has been estimated that up to 9 million women survive obstetric complications every year. According to studies done around the world most mothers suffer from Near Miss due to the factors which includes, low socioeconomic status, patient related, health provider related, and health related and health institution related issues.

**Objectives:** The objective of the study was to determine the proportion of maternal near misses and its associated factors in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional state, South West Ethiopia, 2017.

**Methodology:** Hospital based cross-sectional study design was employed and simple random sampling techniques (Lottery Method) was used to select the study institution and Systematic sampling technique was used to select 845 study participants every 5<sup>th</sup> interval. Information was collected by using pre-tested and structured interviewer administered questioner. Using SPSS version 21 software, descriptive statistics and bivariate logistic regression analysis was done and variables with p-value <0.2 were transferred to multivariate analysis and during Multivariate logistic regression analysis Variables with P-value  $\leq 0.05$  were considered as statistically significant and AOR with 95% CI were used to control for possible confounders and to interpret the result. The results were summarized by tables, graphs and charts.

**Result:** There were 5530 Live Births, 227 Sever Acute Maternal Morbidity cases of this 210 were Maternal Near-Misses cases and 17 were maternal deaths, 364 Maternal Near-Misses Events. The overall Maternal Near-Misses Proportion is 24.85%. The maternal Near-Misses outcome ratio was 41 cases/1,000 live births (LB); mortality ratio was 12.35cases/1 maternal death and 74.8/1000LB of mortality index. Parity, residence, distance of living place from hospital, ANC Follow up, duration of labor, and administrative related problems were found to have statistically significant associations.

**Conclusion:** The proportion of Maternal Near-Misses is relatively high when compared to other regional studies and efforts should be done to lower the near-misses.

**Key words:** Proportion, Near-Misses, Morbidity, Mortality, Public Health Institution.

# 1. INTRODUCTION

## 1.1. Background

A mother who faced obstetric complications during pregnancy, childbirth or within 42 days of termination of pregnancy and was on the verge of death but survived from death developing disabilities is called Near-Misses. In resource poor countries most of maternal mortality and morbidity occur as a result of pregnancy related complications this increasing rate of maternal death and disabilities seek the attention of United nations and leads them to organize and endorse the strategy which mainly focuses on the advancement of women's and children's health in September 2010, [1].

According to Studies conducted almost all of them has showed that, Magnitude of maternal near misses is very high around the world. similarly a systematic review on the prevalence of maternal near misses from 46 countries in 82 studies revealed that, prevalence rates varied between 0.6 and 14.98% for disease specific criteria, between 0.04 and 4.54% for management-based criteria and between 0.14 and 0.92% for organ dysfunction based criteria based on Mantel criteria, but based on WHO's systematic review of maternal morbidity and mortality, the prevalence of maternal near misses vary between 0.80% – 8.23% in studies that use disease-specific criteria while the range is 0.38% – 1.09% in the group that use organ-system based criteria and included unselected group of women Besides, the rates are within the range of 0.01% and 2.99% in studies using management-based criteria [2,3] wear as a systematic review of the magnitude for maternal near misses in sub-Saharan Africa between 1995 and 2010, revealed that the prevalence ranged from 1.1%-10.1%[4].

The performance of the health service or System including its quality has to be evaluated and monitored by using Near-misses guideline and near miss indicators. These indicators are outcome indicators and give us clear data or information about the health system in the prevention of adverse pregnancy outcomes [5, 6].

Even though near-misses concept is the best way to assess the quality of care provided but Now a days study of Mortality is a method mostly used for determining the quality of care aiming to improve the care provided to the client by identification of treats faced and opportunities missed through the application of the health care system but studding about those who died could only

tell about the outcome the end result but neither tells about the process nor the indicators which majorly describes about the outcome and further more if sever abnormalities are not identified during the progress or not intervened accordingly known to advance into end organ damage and finally causes deaths, then at this time high cost , advanced and more specialized care is required to treat labor and delivery related complications[7, 8].

However, as there are common characteristics between mothers who suffer from pregnancy related complications and survived by developing disabilities with those who died but there are many important differences between these mothers which can be used to improve the health care service. Studding about those who survived from conditions which might threaten her life can give us adequate information about the quality of maternal health care given.

In sub-Saharan Africa, including Ethiopia, despite the efforts of the health sector and many international and developmental health agencies, maternal deaths and disabilities remain a major public health problem and these continues to become high in its Magnitude, along with mortality rates. According to EDHS 2011vital health indicators, in Ethiopia, for every maternal death, 10% to 15% of the women develop disability from pregnancy and pregnancy related complications [9].

The evidence shows that high maternal, perinatal, neonatal and child mortality rates are associated with inadequate and poor quality health services. once country level of Maternal Near-Misses is an indirect evidence of the countries health system about its; functionality, organization, availability of equipment, the health care providers, emergency obstetric service availability, the care given and the referral system. [7,10].

## **2. METHODOLOGY**

### **2.1 Objectives**

The proportion and associated factors of maternal near misses in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia 2017.

## 2.2 Study Design

- Hospital Based Cross-sectional Study Design was Employed

## 2.3 Study Area and Period

Bench-Maji, Kefa and Sheka Zones are found in Southern Nations, Nationalities, and Peoples Regional State. South-western Ethiopia, Based on the 2007 Census conducted by the central statistics agency (CSA), 874,716 populations lives in keffa zone and out of this females constitutes about 431,778 and males constitutes about 442,938 of the population. The four largest ethnic groups reported in this and the largest ethnic group is Kafficho which constitutes around 82.72%,Bonga is the administrative center of keffa zone and the town has 3 higher institution namely Bonga Teachers college ,Bonga Agricultural college and Bonga University, and the town has also one hospital which is G/Tsadiq Shawo hospital , and the second zone which covers 19,252.00 square kilometers in the south west part of Ethiopia is Bench-Maji zone and this zone has a total population of 652,531, of these 323,348 are men and 329,183 are women. There are seven largest ethnic groups in this Zone and Bench constitutes the largest which is 45.11%.Mizan-Aman Town is the administrative center of Bench-Maji zone and the town is a location of three higher education namely Mizan-Aman Health Science College ,Mizan Agricultural College and Mizan-Tepi University and 1 teaching hospital Mizan-Tepi University Teaching Hospital , the last zone is Sheka zone which is located in the south west Ethiopia and with a total population of 199,314, of which 101,059 are men and 98,255 are women. There are seven ethnic groups in this Zone and Shakacho were the largest among others which is 32.41%, Masha town is the administrative center of Sheka Zone and it has one hospital Tepi General Hospital and also a place of one higher institution which Mizan-Tepi University ,Tepi Campus. So this study was conducted from 6<sup>th</sup> February -2017 to 6<sup>th</sup> - March -2017 in selected three Public Health Institutions of the above three zones , Namely from Keffa Zone G/tsadik Shawo Hospital, Bench-Maji Zone Mizan-Tepi University Teaching Hospital and From Sheka Zone Tepi General Hospital.

## **2.4 Target Population**

- All pregnant women who come to public Health institutions of Keffa, Bench-Maji, and Sheka Zones seeking obstetrics & gynecologic health care services, during antenatal, intra-partum or within 42 days after delivery from February -6-2017 to 6- March -2017.

## **2.5 Source Population**

- All pregnant women who come to G/Tsadiq Shawo, Mizan-Tepi University Teaching and Tepi General Hospitals seeking obstetrics & gynecologic health care services, during antenatal, intra-partum or within 42 days after delivery from February -6-2017 to 6- March -2017.

## **2.6 Study Population**

- All systematically selected Pregnant women who came to G/Tsadiq Shawo ,Mizan-Tepi University Teaching and Tepi General Hospitals seeking; obstetrics & gynecologic health care services, during antenatal, intra-partum or within 42 days after delivery

## **2.7 Study Unit**

- Individual units will be studied.

## **2.8. Inclusion and Exclusion criteria**

### **2.8.1 Inclusion Criteria**

- Women who are pregnant and
  - ✓ came to Public Health Institutions due to early complications of pregnancy including abortion ectopic pregnancy and molar pregnancy
  - ✓ Came to aforementioned selected hospitals for delivery service or within 42 days after delivery.

### **2.8.2 Exclusion Criteria**

- Complication due to accidental or incidental causes

## 2.9 Sample Size Sampling technique & Sampling Procedures

### 2.9.1 Sample Size

The required sample size for this study is determined by using single population proportion formula and considering the following basic assumptions of  $Z_{\alpha/2} = 1.96$  (value of Z at  $\alpha$  0.05 or critical value for normal distribution at 95% C.I.), 95% confidence level, 5% margin of error and proportion (P as 50%) and finally,

$$n = \frac{(Z_{\alpha/2})^2 P (1 - P)}{d^2}, \quad n_i = \frac{(1.96)^2 0.5(.5)}{(0.05)^2} = 384$$

$$d^2 \quad (0.05)^2$$

Hence, the calculated sample size becomes 384. Adding a 10% non-response rate & design effect of 2 then finally the maximum sample sizes ( $n_f$ ) becomes **844.8=845** Then K were calculated to each health institution by considering their total number of deliveries, and gynecologic admissions to G/Tsadique Shawo General Hospital = 1976 deliveries and 332 sample is needed-  $K=5.95$ , Mizan-Tepi University Teaching Hospital=1753 deliveries and 225 sample is Needed- $K=7.79$  and Tepi General Hospital=1801 deliveries and 288 sample is needed – $K=6.25$ . Then by considering the K<sup>th</sup> interval as an average and the study participants were selected every 5<sup>th</sup> interval

Assumptions;

$n_i$  = initial sample size ;**384**

$n_f$  =Final sample size=**845**

Z = confidence level which were 95%

P = proportion 50%

d = the margin of error was taken as 5%

### 2.9.2 Sampling Techniques

In this study simple Random Sampling technique was used to select the 3 study institution from five and Systematic Sampling Technique was used every 5<sup>th</sup> interval to select the study participants.

### 2.9.3. Sampling procedure

From five Public Health hospitals found in Bench-Maji, Kefa and Sheka Zones only three Hospitals were selected by simple random sampling technique (Lottery Method). Then the sample needed from each hospitals was allocated by proportional allocation and after proportional allocation of samples required the study participants who full filled the inclusion criteria were selected using Systematic Random Sampling Technique every 5<sup>th</sup> interval.

(Figure-1).

### 2.10 Data collection tool and procedure:

To identify cases and address the objectives of this study we have developed semi structured questioner which was prepared in English by adopting WHO near miss classification tool with some modification. The tool has both close ended and open ended question. The tool has a total of 6 sections and 14 Questions that address the information regarding identification, Screening questions, Maternal and perinatal information, process indicators, Underlying cause, and Associated Conditions. The time it takes to complete the questions is 15 minutes.

The data collectors were 6 trained health Professionals assigned in those three Hospitals with close supervision by the principal investigators. When the inclusion criteria were met, the trained data collector in each Hospital started to collect Primary data by interviewer administered Questioner for the Mother regarding identification, Screening questions, Maternal and perinatal information's only. Then after proportional allocation of study participants in each hospital 2ry Data were collected from the patient chart by using the same semi structured data extraction format. Data for the near-miss criterion-based clinical audit were extracted from appropriate patient records. in this part information's which was used to calculate hospital access intra hospital care indicators and process indicators. were collected. For each woman data were collected on the occurrence of selected severe pregnancy-related complications and severe maternal outcomes.



## 2.10 Data quality control:

Data quality was assured by using different techniques and in order to ensure the provision of high-quality data assurance and control methods were done before, intra and after data collection. Standardized Semi structured questioner which was adopted from WHO near miss identification tool were used and 6 BSc Health professionals were recruited as a data collector and these data collectors were trained for three days about the data collection tool and procedure and any miss understanding were clarified for the individual data collectors. We have used supervisors which are senior by the specific field to control and supervise the data collection procedure and each data collector has checked the questionnaires for completeness before they leave each and again the Questionnaire was also reviewed daily by supervisors to check for completeness and clarity and difference in data were solved as soon as identified. The entered data were checked randomly on 5% of the data by double data extraction.

## 2.11 Data Processing and Analysis

The entire returned questionnaires were checked for completeness, cleaned manually, coded and entered in to epi info version 16 and transported to SPSS version 20 statistical package to be cleaned, edited and analyzed by the principal investigators. Before bivariate analysis was done the primary outcome measures, outcome indicators, near miss indicators Hospital access indicators and lastly, intra hospital care indicators were calculated and Descriptive statistics, Frequencies and Percentage was used to summarize data. Bivariate logistic regression was used to determine association between each independent variable with dependent variable. Variables with  $P \text{ value} \leq 0.2$  in bivariate. analysis was considered to have an association with the dependent Variable and entered in to next multivariate analysis to determine relative prediction level of independent variables to the outcome variable and in multivariate logistic regression analysis Variables having  $p\text{-value} \leq 0.05$  was considered as statistically significant and AOR with 95% CI was used to control for possible confounders and to interpret the result and tables and charts were used for data presentation.

## 2.12 Dissemination of Findings

The findings of the study was presented to Mizan-Tepi University and submitted to Mizan-Tepi University College of Health Sciences Department of Midwifery to serve as reference materials for subsequent studies and teaching purposes.

The research finding was also submitted to the South Nations Nationalities and peoples regional state health bureau and the specified study institutions. Efforts will also be done further to publish in peer reviewed journals to make it accessible for all interested in the programmatic and research aspects of the proportion and associated factors of maternal Near misses. It will also be presented in scientific conferences.

## 3. RESULT

### Socio demographic Characteristics

A total of 845 mothers from three hospitals were included in the study, making a response rate of 100%. The mean age of the respondents was  $26.52 \pm 5.819$  years with Minimum and maximum age of 18 and 42 years respectively. Nearly one third 256 (30.3%) of the mothers were in the age group of 23-27 years and 239(28.3%) of the mothers were in the age group of 18-22 years. Almost all 793, (93.85%) of the study participants were married and their age at first marriage were in the range of 15-19 for 382 (45.2%), 20-24 for 432(51.1%) and 24-29 years for 31(3.7%). Out of the total mothers 470, (41%) were orthodox Christians and the majorities were protestant 269 (23.5%). Two hundred sixteen (25.56%), were housewives and one hundred ninety six (23.19%) were trader. More than half 528 (62.48%) of the study participants were from rural area where as 317(37.5%) were from Urban area, 570(67.45%) of the study participants come to the health institution traveling a distance of  $\geq 11$  kilometers the median distance they traveled was 30 km with an inter quartile range of 25 km. (Table 1).

**Table-1** Showing the socio demographic Characteristics of the study Participant in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017. (N=845)

Variable	N=845	Frequency	Percent (%)
Marital status	Single	40	4.7%
	Married	793	93.85%
	Divorced	12	1.42%
Age at first marriage	15-18	382	45.2%
	20-24	432	51.1%
	25-29	31	3.7%
Religion	Orthodox	470	41%
	Muslim	99	8.6%
	Protestant	269	23.5%
	Catholic	7	0.6%
Ethnicity	Bench	202	23.91%
	Amhara	154	18.22%
	Keffa	212	25.08%
	Sheka	205	24.26%
	Tigre	28	3.31%
	Oromo	44	5.2%
Occupational status	Farmer	216	25.56%
	Trader	192	22.72%
	House wife	173	20.47%
	Government employs	165	19.53%
	Daily laborer	55	6.51%
	other	42	4.97%
Residence	Urban	317	37.5%
	Rural	528	62.48%
Distance traveled	≤ 10 kms	275	32.54%
	>11kms	570	67.45%

## Obstetric Characteristics

From Eight Hundred forty-five study participants included in the study Half 429, (50.8%) of the participants had two and more than two children (Multi Paraous women), 296, (35%) had only one children (Primi para) and 120, (14.2%) had no children (Null Parous) previously. Furthermore, from the total participant's majority 680(80.47%) of the participants respond that

their current pregnancy was wanted and planned, ninety-six (11.36%) of the participants replied that their current pregnancy was Wanted but unplanned and 69(8.16%) of the respondents replied that their pregnancy was Unwanted and unplanned. 518(61.3%) of the mothers had Ante Natal Care more than two times whereas 327(38.69%) of the mothers had no Antenatal Care (ANC) during their pregnancy period. Out of 845 study participants who were confirmed as pregnant most 628(74.31%) of the pregnancy Gestational age from their Last Normal Menstrual Period (LNMP) were in the range of 37weeks-41 weeks(Term), 180 (21.30%) were < 37 weeks (Preterm) and 37(4.38%) were >41completed week(Post term).

Regarding duration of labor out of the study participants (N=513) diagnosed as having had a labor almost all 509(99.22%) had labor duration of <18 hours (Normal) whereas few 4(0.78%) had labor duration of > 18hours (Abnormal). From the study Participants Included 726(85.92%) comes to the health facility without referral [556(76.58%) come to the health facility for the first time and 170(23.42%) come for the second and more times], and 119(14.08%) comes to the health institution with referral, out of these mothers who were referred 99(83.19%) were from Health Center and 20(16.81%) were self-referral.

Eight hundred fourteen (96.33%) of the women's stayed 07 days or less and only Thirty one (3.67%) of the mothers stayed Eight days and more , the median duration of stay was 2 days and ranged from 1 Day to 38 days. Out of 845 Study Participants who were admitted majority 693(82.01%) of cases were treated surgically of this cases treated surgically 441(63.63%) were with Spontaneous Vertex Delivery with or without Episiotomy,163(23.52%) were with Cesarean Delivery , 62(8.95%) were with Manual Vacuum Aspiration(MVA) and 27(3.9%) whereas 152(17.99%) from the total cases diagnosed were treated Medically of this 109(71.71%) were treated with Anti-biotic, 15( 13.76%) treated with Anti convulsion drug , 20(18.35%) with Anti-Hypertensive drug and 8(7.34%) were with Anticonvulsant and anti-hypertensive drug(Table-2).

**Table-2** Showing the Obstetrics Characteristics of the study Participants in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=845)

Variable		Frequency	Percent (%)
Parity	Nully Parous	120	14.20%
	Primi	296	35.03%
	Multi	429	50.77%
Type of Current Pregnancy	Wanted and planned	680	80.47%
	Wanted but unplanned	96	11.36%
	Unwanted and unplanned	69	8.17%
ANC visits	Yes	518	61.30%
	No	327	38.69%
Gestational Age	Pre viable	132	15.62%
	Preterm	48	5.68%
	Term	628	74.82%
	Post term	37	4.38%
Duration of Labor	≤18hr	509	99.22%
	>18hr	4	0.78%
Visit Type	Referred	119	14.08%
	Not Referred	726	85.92%
Source of Referral	Health Center	99	83.19%
	Self-referral	20	16.81%
Intervention	Medical	152	17.98%
	Surgical	693	82.02%
Duration of Hospital Stay	≤7days	814	96.33%
	≥8 days	31	3.67%

## Medical Personnel Related Problems

Out of eight hundred forty five total respondents Forty two (4.97%) of the total respondents had faced medical personnel related problems of these, 16(38.09%) faced Delay in making correct diagnosis, 17(40.48%) faced Delay in getting definitive treatment after diagnosis, 6(14.29%) were Not assessed by senior doctor, and 3(7.14%) were not monitored properly. From all the study participants included 564(66.75%) were treated by Midwife, 142(16.80%) were by Integrated Emergency Surgery and Obstetrics Care (IESOC), 75(8.87%) were by Specialist which was Gynecologist and Obstetricians and 64(7.57%) were by General Practitioner

## Administrative Related problems

From Eight hundred forty five study participants one Hundred forty study participants has faced administration related problem out of this who has faced administration related problem 93(81.58%) faced Lack of life saving drugs in hospital pharmacy , 19(16.67%)faced Lack/inefficient transport and communication and 2(1.75%) faced Non-availability of required blood/blood products when needed.

## Proportion of Maternal Near Misses

There were a total of 5530 Live births , based on Disease Specific criteria there were 227 women with life threatening condition , 364 Maternal Near-Misses Events ,210 Near Misses, and 17 Maternal Deaths ,out of this 210 Near-Misses cases identified based on disease specific criteria of this 81 Near-Misses were from Bonga G/Tsadiq Shawo Hospital ,58 Near-Misses were from Mizan-Tepi University Teaching Hospital and 71 Near-Misses were From Tepi General Hospital which gives the Proportion of Maternal Near-Misses 24.4% ,25.78% ,and 24.65% Respectively. Based on disease specific criteria the total Near-Misses proportion is 24.85% (95% CI = 21.93 – 27.77), Sever Maternal Outcome ratio is 41 per 1000 live births, Maternal Near-Misses ratio of 37 per 1000 live births, maternal Near-Misses Mortality Ratio of 12.35 (for every 12 Near-Misses there is 1 death) and Mortality index of 7.48 % which shows that low index for every 7 maternal near miss there is 1 death.

Out of the 210 Maternal Near Misses Diagnosed 49(23.33%) were diagnosed from Referring institutions, 21(10%) were diagnosed at arrival, 103(49.05%) were diagnosed within 12 hours of

arrival and 37(17.62%) were diagnosed after 12 hours of arrival. Among the 210 women classified as a near Miss, 34 (16.19%) had organ dysfunctions, of these 13(38.2%) were diagnosed as having had Cardio vascular Complications, 8(23.53%) had Respiratory Complications, 10(29.41%) had Renal Complications and 3(8.82%) had Hepatic Complications. Sixty-Nine (32.86%) of near-miss were caused by Post-Partum Hemorrhage, 49 (23.33%) of near misses were caused by Sever Pre-Eclampsia, 41(19.52%) were caused by Sepsis, 33(15.71%) were caused by Uterine Rupture and 18(8.57%) were by Eclampsia. From 210 Maternal Near Misses Majority 127(60.48%) were managed by Midwives, 35(16.67%) by Integrated Emergency Surgery and Obstetric Care Professionals (IESOC), 27(12.86%) were by General Practitioner and 21(10%) were managed by gynecologists and Obstetricians

### **Factors associated with maternal near misses**

In the bivariate analysis, Parity, residence, distance from hospital, ANC Follow up, duration of labor, and administrative problems were found independently associated with Maternal near misses. Multivariate logistic regression showed that all the variables entered to bivariate analysis were found to have significant association with Maternal Near-Misses.

Regarding the parity of the mother while controlling for Null para the odds of occurrence of Maternal Near-Misses among Primi Para mother is two times higher than Nully para mother (AOR=2.194, 95% CI, 1.140, 4.223) similarly the odds of occurrence of Maternal Near-Misses among Multipara is 2.561 times higher than Nully Para (AOR= 2.561, 95%CI 1.364 ,4.809).

Controlling for Normal Duration of labor (<18hours) the odds of occurrence of Maternal Near-Misses among mother whose labor duration is long ( $\geq$ 18hours) is six times higher than those whose labor is in normal duration (AOR= 6.890, 95%CI, 4.715 ,10.066).

The Odds of Maternal Near-Misses occurrence among Mothers who were delayed to receive treatment is 1.561 times higher than those who was treated immediately (AOR=1.561,95% CI, 1.031, 2.345).

The odds of Maternal Near Misses Occurrence among mothers who has faced admission Related problem is two times Higher than those who didn't face (AOR= 2.781, 95%CI, 1.805, 4.286).

The odds of occurrence of Maternal Near Misses is 1.695 times higher among those who didn't Have Antenatal Care Follow-up than those who had Antenatal Care Follow up (AOR=1.695, 95%CI,1.127, 2.549).

Regarding Distance of the Living Place of the mother from the health facility the odd of Maternal Near-Misses is two times higher among mothers whose living place is far from the health center ( $\geq 11$ km) than those who lives near to the Health Center( $\leq 10$ km) (AOR= 2.269 ,95%CI,1.335 ,3.857).

The odds of Maternal Near Misses Occurrence among mothers who comes from Rural place is two times higher than those who is from the Urban (AOR=2.166,95%CI ,1.340, 3.500).

**Table-4** Showing Factors Associated with Maternal Near-Misses in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017. (N=845)

Variables	Categories	Near-Misses		COR with 95% CI	P-Value	AOR with 95% CI
		Yes	No			
Parity	Nully(R)	17	112	1	1	1
	Primi	73	216	2.27(1.253-3.957)	0.019	2.19(1.140-4.223)*
	Multi	120	307	2.58(1.483-4.473)	0.003	2.56(1.364-4.809)*
Duration of Labor	<18hrs(R)	48	445	1	1	1
	>18hrs	162	190	7.91(5.492-11.377)	0.000	6.89(4.715-10.066)*
Time of Diagnosis	Short(R)	141	514	1	1	1
	Long	69	121	2.08(1.466-2.948)	0.032	1.56(1.039-2.345)*
Administration Related Problem	Yes	73	88	3.31(2.305-4.759)	0.000	2.78(1.805-4.286)*
	No(R)	137	547	1	1	1
ANC follow up	Yes(R)	58	252	1	1	1
	No	152	383	1.72(1.225-2.427)	0.011	1.7(1.127-2.549)*
Distance of Living Place from Hospital	Near(R)	47	196	1	1	1
	Far	163	439	1.55(1.074-2.232)	0.002	2.27(1.335-3.857)*
Residence	Urban(R)	126	411	1	1	1
	Rural	84	224	1.22(0.888-1.685)	0.002	2.17(1.340-3.500)*

**NB:** \* P-Value  $\leq 0.05$ , **AOR:** Adjusted Odds Ratio, **COR:** Crude Odds Ratio, **CI:** Confidence Interval



## 4. DISCUSSION

The present study revealed the overall Proportion of maternal near miss in G/Tsadiq Shawo , Mizan-Tepi University Teaching Hospital and Tepi General Hospital is found to be 24.85% .The finding is almost in line with the prevalence of maternal near misses reported in Campinas, Brazil, in Tanzania , Eastern Sudan Kassala hospital, and in Referral Hospitals of Amhara region North Ethiopia which were 15.5 - 22.9%, 23.6%, 22.1% and 23.3% respectively [13,17,19 ,44].

However, it is higher than studies done in Uganda , Nigeria, Brazil, Indonesia , Nepal Katmandu and Pakistan which were 10.61% ,12% , 15.8% , 17.3% , 2.3% , and 4% Respectively [12 ,19 ,20 ,21 ,22] .The higher proportion of Near-Misses in this study area when compared to the above studies might be due the fact that these three hospitals are the only hospitals which receive referrals in each zones and terminally ill patients who are on the verge of death will be referred to this three zonal hospitals from a lot of Health Centers so due to the patient flow as a referral and as a self-referrals the hospitals becomes over flowed by the patients, and another possible explanation might be the above studies were conducted in a single hospital but this study is conducted in three different hospitals which might increase the proportion.

In contrast the study is also lower when we compared with the study done in Ghana Accra this may be due to the difference of the criteria used for the identification of the near miss cases the study conducted in Ghana used the organ system based criteria which have a significant effect on the increment of the proportion because the Near-Misses case becomes higher whenever the organ-system based criteria was used in developing country [18].

Though there is high proportion of Near misses due to Postpartum hemorrhage, Sever Pre eclampsia and Sepsis but the outcome indicators like Maternal Near miss Mortality ratio and Mortality index were 12.3 and 7.4% respectively, so as Maternal Near miss Mortality ratio becomes high and the mortality index becomes low these indicates that better care is given for the mother who is suffered from maternal near-misses. This may be due to the availability of, currently endorsed Non Pneumatic Anti shock garment for PPH, the availability of Magnesium sulphate for prevention of eclampsia and broad spectrum antibiotics for the management of Sepsis as most of the near misses were due to Postpartum Hemorrhage, Sever preeclampsia and sepsis but Blood banks, and Intensive care Unit (ICU) which might play a role in preventing lifelong complication were absent in the health institutions which makes the problem worse.

In this study the Parity of the mothers is statistically significantly associated with the occurrence of Maternal Near-Misses the odds of Maternal Near-Misses among Primi paraous (mothers who have only one child) and among multiparas (those who have two and more than two children) occurrence are two times higher than Nully paras (those who have no children). This might be due to partly explained by the fact that as the number of pregnancy, increases obstetric complications is also increased.

Regarding Duration of labor mother whose labor stayed  $\geq 18$  hours (Prolonged) are almost seven times to develop Near-Misses than those whose labor stayed  $< 18$  hours (Normal duration). This may be due to the reason that if the duration of labor becomes Prolonged ( $\geq 18$  hours) the uterus become exhausted and the uterine muscles becomes lose their integrity predisposes those mothers who are multiparous in to uterine rupture and for those who are primi to fistula.

Time gap b/n diagnosis and treatment is one of the factors which have statistically significant association with occurrence of maternal near-misses which is that mother whose time gap b/n diagnosis and treatment is longer (delay in getting treatment/delay in initiation of the treatment) is almost 1.5 times higher than those who have short gap (those who get the treatment immediately without delay). This may be due to the fact that if the intervention time for the disease or the problem is long (delay in getting treatment) after the disease is diagnosed or So that this coupled factors synergistically with no early initiation of treatment the women may continue to develop unnecessary complication even can lead to death. This finding is consistent with the study done in Uganda [20].

Admission Related problem is among the factors which have significant association with occurrence of Maternal Near-Misses than those who didn't faced admission related problem which is the odds of occurrence of maternal Near-Misses among mothers who have faced admission Related problem like; lack of life saving drugs in hospitals pharmacy and non-availability of blood or blood products for transfusion in the hospitals were 2.7 times higher when compared with those who didn't faced. This might be due to as most of the maternal near misses were due to postpartum hemmorage and if the women who lost her blood didn't replace the lost one she may develop serious complications. This result is consistent with the study done in Gambia's referral hospital and at the University of Illinois, Chicago [36, 45].

Ante Natal Care follow up is also statistically significantly associated with maternal near-Misses the odds of occurrence of Maternal Near-Misses among Mothers who didn't have Antenatal Care Follow up during her pregnancy is 1.7 times Higher than those who have had Antenatal Care Follow up. This might be the fact that Antenatal care follow up is a time where the women can get a chance to contact the health professional and to know the status of the pregnancy and at this time of contact the women also have a chance of getting information about birth preparedness and complication readiness especially when the pregnancy advances to third trimester so if the women misses this chance of knowing about what to prepare for birth, where to deliver and other things she may not contact the health professional or may not seek the health care and prefer to stay in home. This finding is consistent with the study done in Ayder comprehensive teaching hospital, Tigray Ethiopia, Nigeria, Pakistan, and rural Bangladesh and Bolivia [26, 29, 42, 43, and 48].

Distance of the living place from the health facility (Delay in Reaching Health Facility) is also one of the variable which showed to have statistically significant association with Maternal Near-Misses in which the odds of occurrence of maternal near-misses among mothers whose living place were far from the Health center ( $\geq 11\text{km}$ ) is 2.27 times higher than those mothers who lives in nearby ( $\leq 10\text{km}$ ). This may be due to the distance of her living place from the health facility is far she may arrive lately (delay in reaching the Health Facility) which makes her prone to develop complication. Furthermore in spite of the distance Lack of available transport, particularly during night hours, and nature of roads distance of the living place with other coupled factor like the nature of the road lack of transport make the travel time long and can all delay the mother in reaching to the health facility, these give the complication adequate time to advance it to sever. This finding is consistent with the study done in Arsi zone south east Ethiopia, Tigray region northern Ethiopian and Nigeria [18, 22, 46].

Regarding Residence, the odds of developing Maternal Near-Misses among mothers who lives in rural area is two times higher than those who lives in Urban. This might be due to the decreased performance of the health extension worker which used as a bridge between the health service and the society so if there performance decreased women from rural areas might lack access to health education, promotion and services. This finding is consistent with the study done in Referral Hospitals of Amhara Regional State, in Arsi zone south east Ethiopia [44, 46, 47].

## 5. CONCLUSION

The study revealed that the proportion of maternal near miss is Relatively high in G/Tsadiq Shawo , Mizan-Tepi University Teaching Hospital and Tepi General Hospital, but the outcome indicators and outcome measures show as that quality care has been delivered or given to mother who were suffered from life threatening condition and this has reduced the maternal mortality ,the most important factors which showed to have statistically significant association with maternal near misses were diverse in nature. Being Primi Para, Multi parity, long Labor duration, Long time b/n diagnosis and treatment (Delay in receiving of initiating treatment), lack of ANC follow up, presence of administrative related problems, being in Rural Residence, and living Far from the Health Institution.

## LIST OF ABBREVTION

SPSS-Statistical Solution and System Package

CI-Confidence Interval

AOR-Adjusted Odds Ratio

COR-Crude Odds Ratio

LB-Live Birth

ANC-Ante Natal Care

WHO-World Health Organization

EDHS-Ethiopian Demographic Health Survey

WLTC-Women with Life Threatening Conditions

MNM-Maternal Near Misses

MD-Maternal Death

SAMM-Sever Acute Maternal Morbidity

HEELP-Hemolysis Elevated Enzyme Low Platelet

SMOR-Sever Maternal Out Come Ratio

MI-Mortality Index

PPH-Post Partum Hemorrhage

ICU-Intensive Care Unit

LNMP-Last Normal Menstrual Period

MVA-Manual Vacuum Aspiration

IESOC-Integrated Emergency Surgery and Obstetric Care

## **Declaration**

### **Ethical Approval and Consent to Participate**

After approval of the document by Mizan-Tepi university college of health sciences then the formal letter was obtained from Mizan-Tepi University College of Health Sciences Department of Midwifery to communicate with the study institution then after the letter was submitted to the study institution permission letter was obtained from this study institution and the study was conducted as per the schedule There was no personal identifier attached during data retrieval. There was no intention to collect additional information from the institution and there are no risks that follow with participation in this research. During the study the Participant was informed that he/she had full right to withhold information, skip questions or to withdraw from the study at any time. Nobody needed to explain the reason for withdrawal. It was also explained that there would be no effect at all in the benefit or other effect that the Participant would get from her refusal to participate.

### **Consent for Publication**

This is Not Applicable

### **Availability of Data and Material**

The datasets supporting the conclusions of this article are included within the article and its additional files.

### **Competing interests**

Both of the authors declare that there is no competing interest

## **Funding**

The funding for this study was covered by Mizan-Tepi University

## **Authors' contributions**

YYA, FTT conceived and designed the study. Both authors equally conducted the literature search. Involved in the analysis and interpretation of data. YYA drafted the manuscript. The study was supervised by YYA, and FTT. All authors read and approved the final manuscript.

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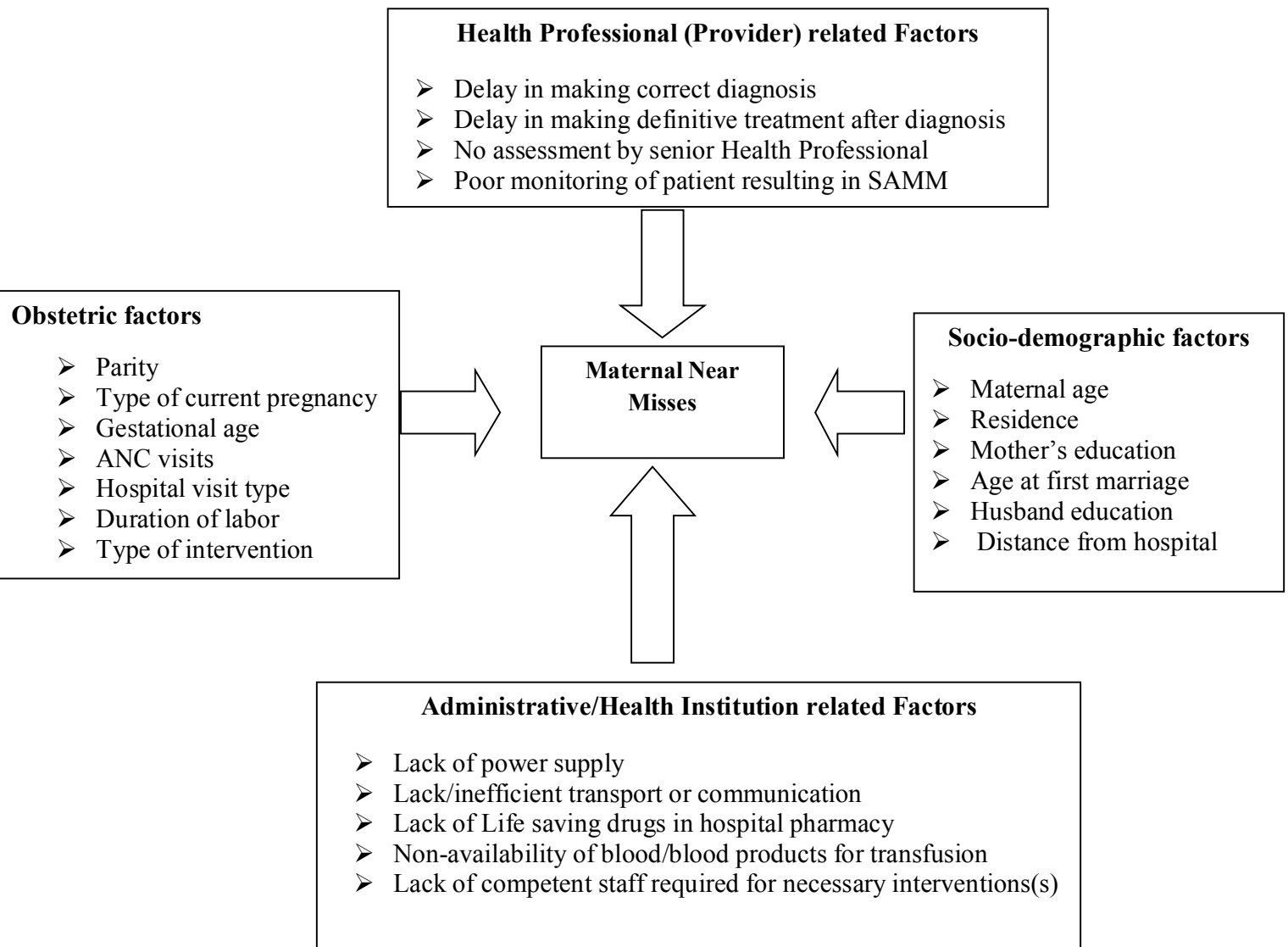


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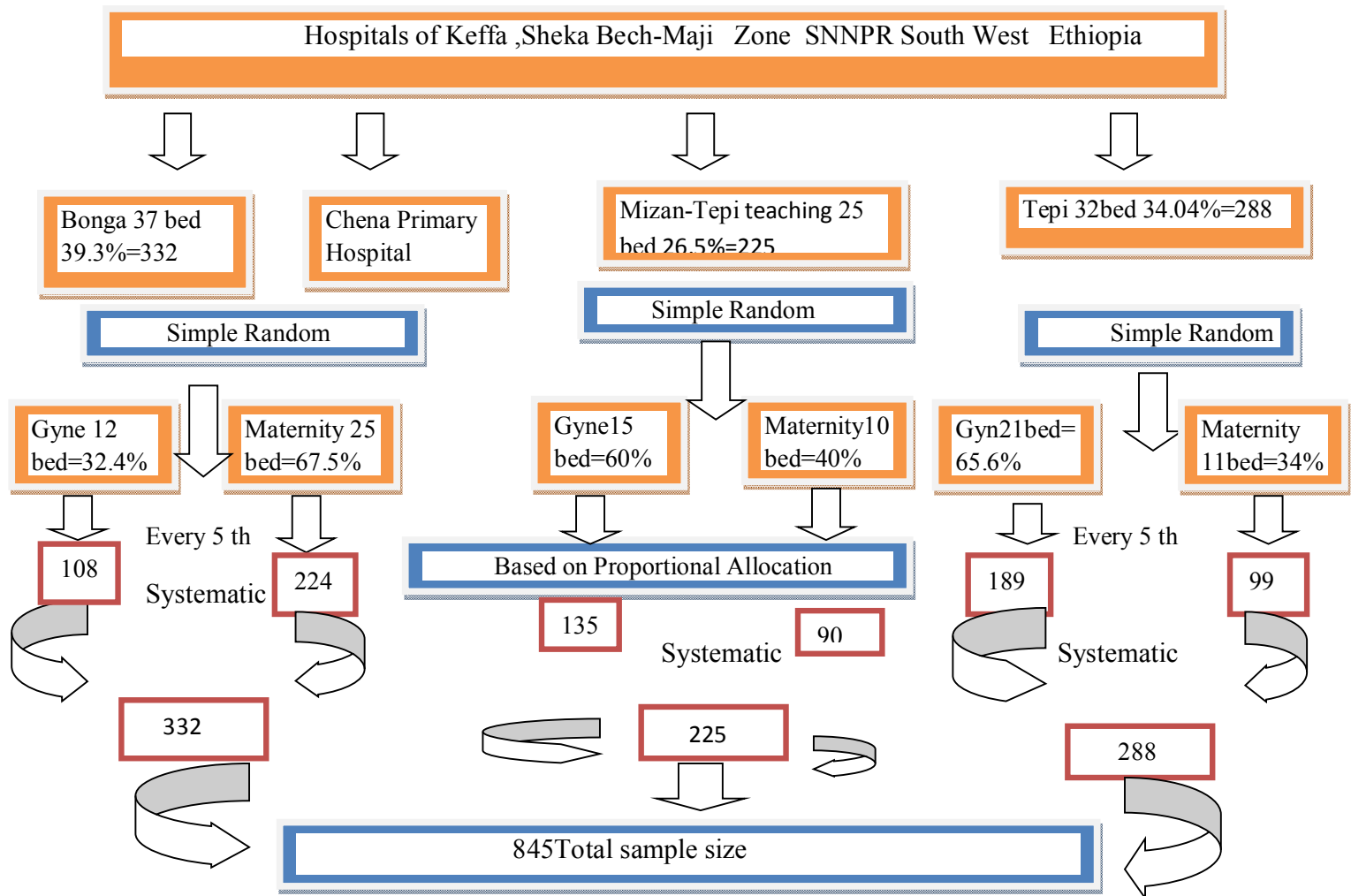
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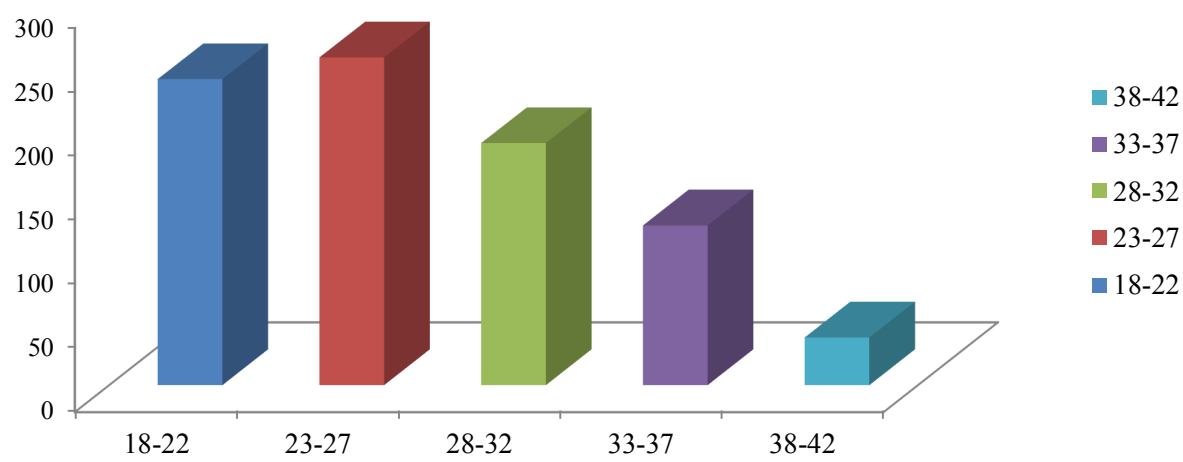
### 3. CONCEPTUAL FRAME WORK



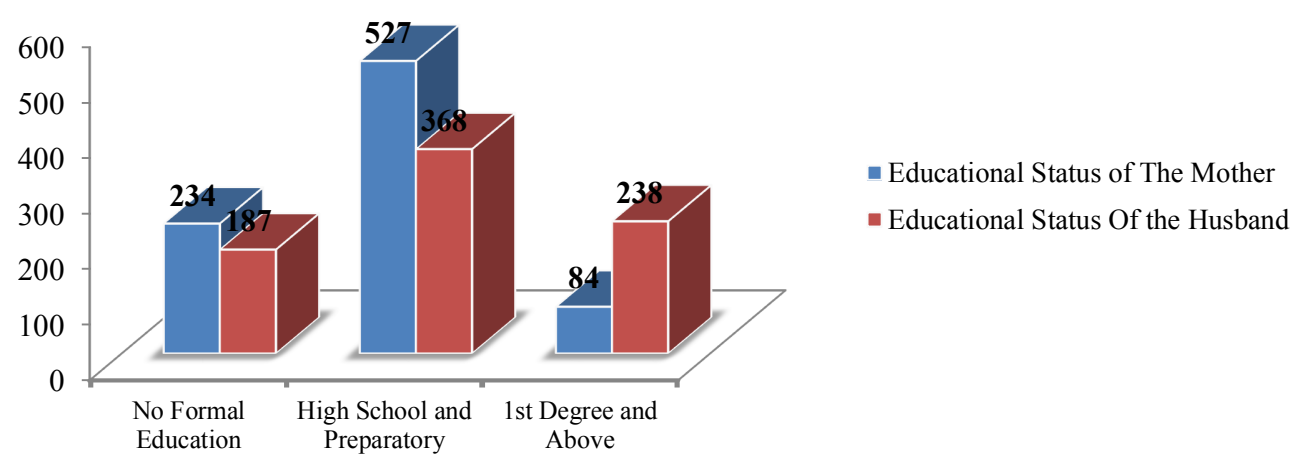
**Figure -1:-** Conceptual frame work showing factors associated with maternal near misses in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.



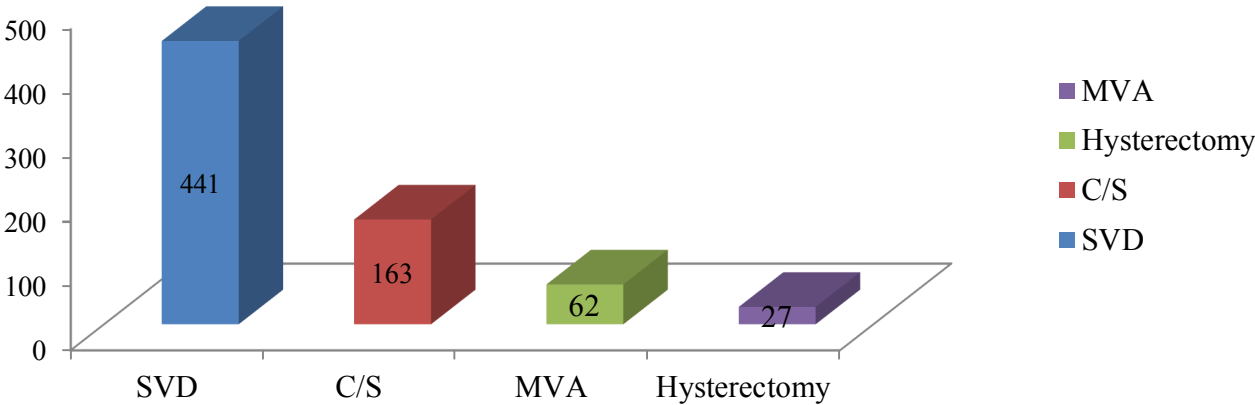
**Figure -2** A schematic presentation of sampling procedure proportion and Associated Factors of Maternal Near-Misses in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia 2017.



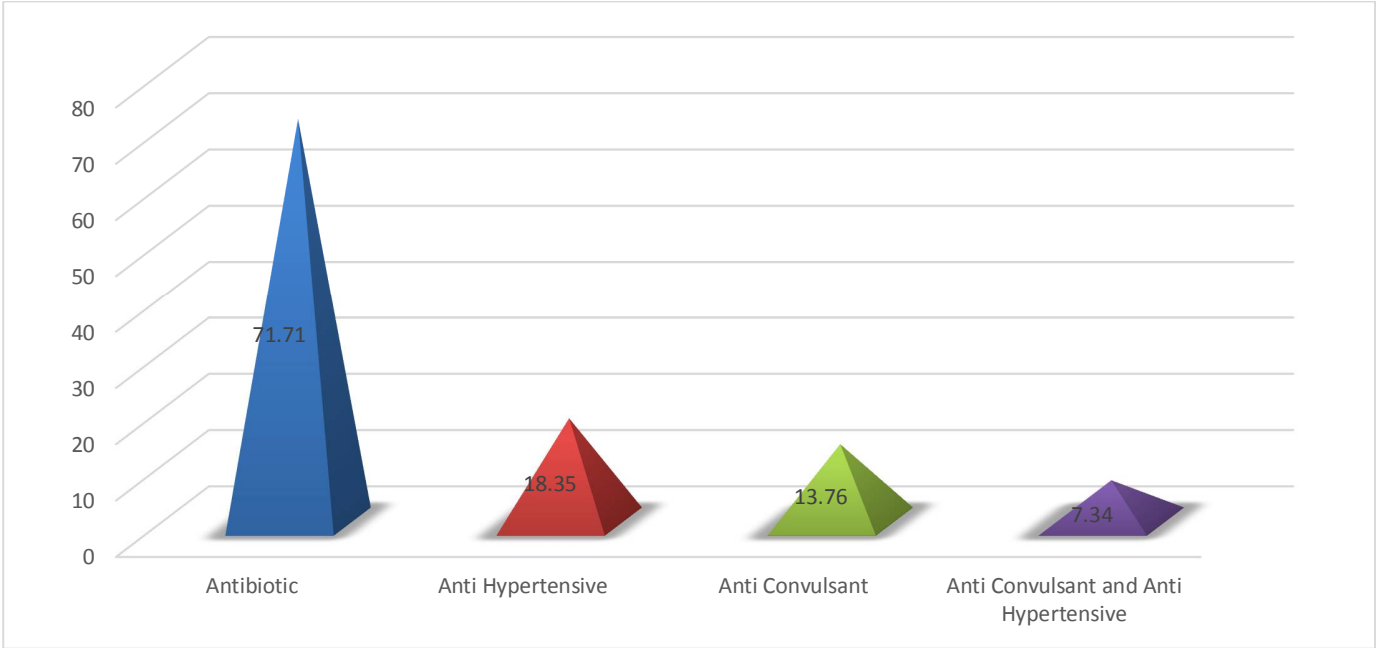
**Figure 1** Showing Age of the respondents at Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017..(N=845)



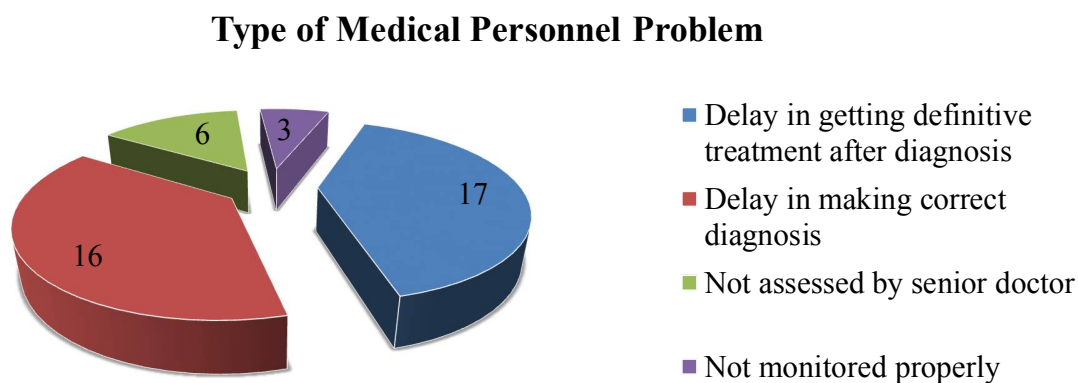
**Figure- 2** Showing Educational Status of the Mother and Her Husband who comes to Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=845)



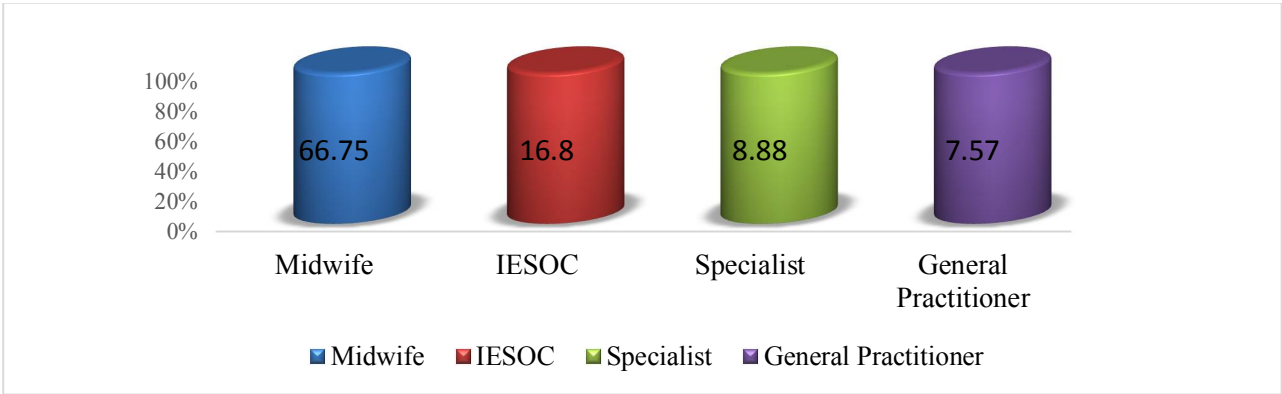
**Figure- 3** Showing the type of Intervention done in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=693)



**Figure- 4** Showing the Type of Medical Management Given for the Respondents in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=152)

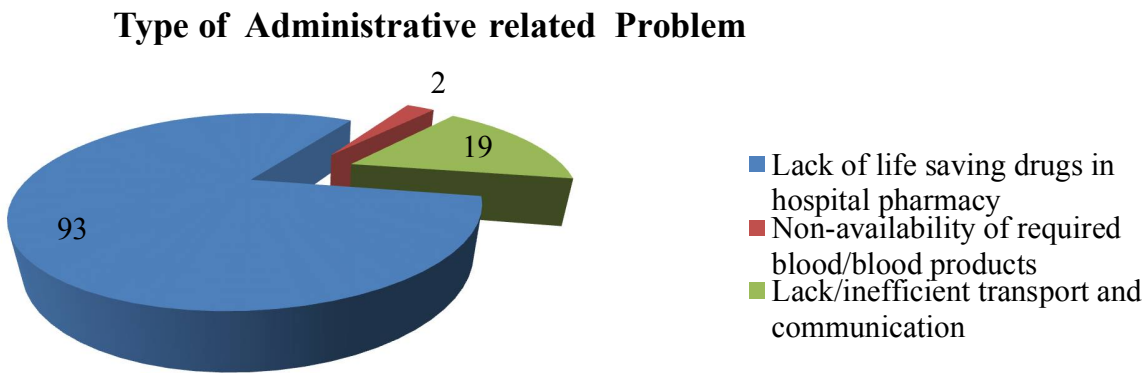


**Figure- 5** Showing Type of Health Professional Problem the mother faced in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017. (N=42)

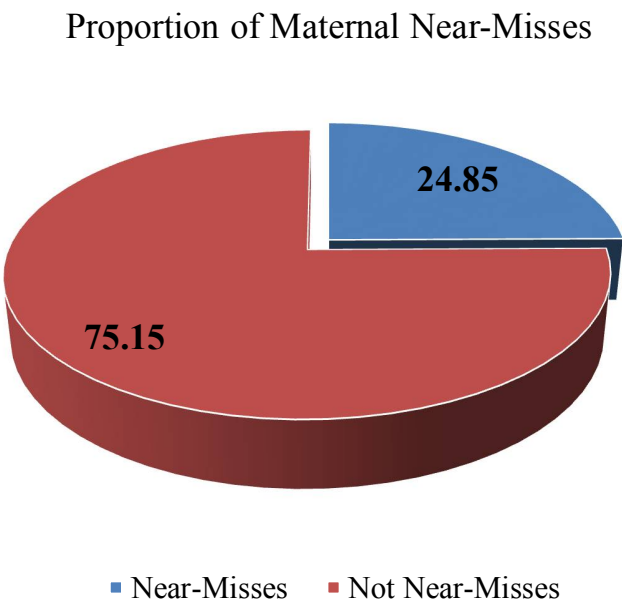


**Figure -6** Showing the type of Health Professional who treated the mother in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=845)

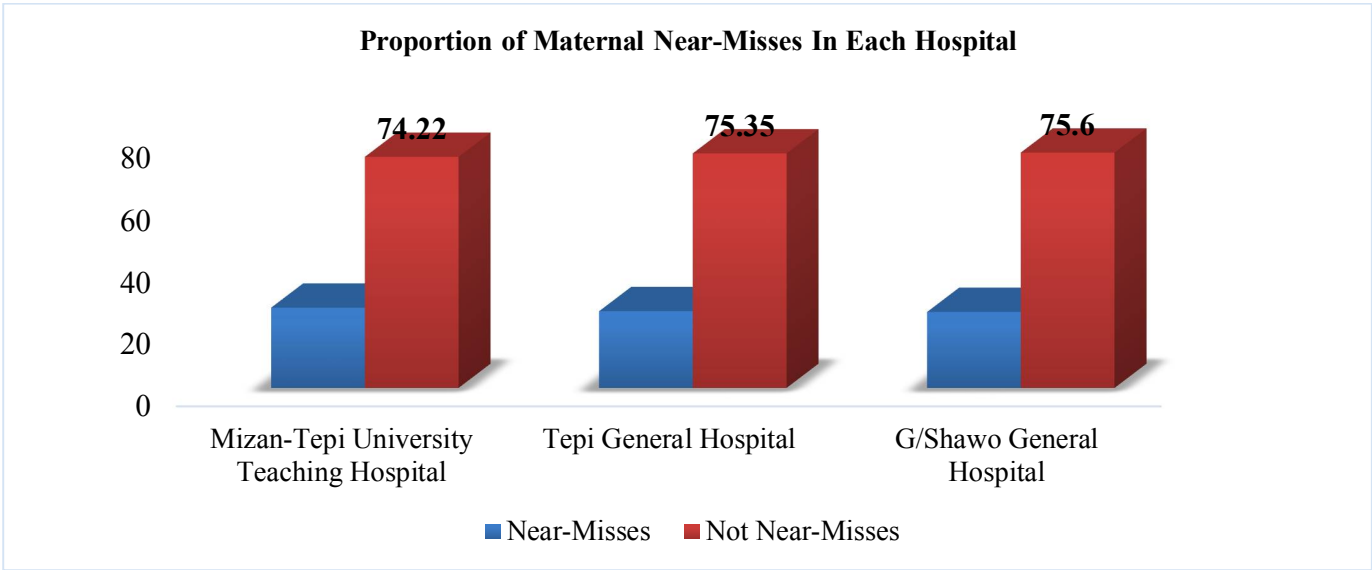




**Figure -7** Showing Administrated Related Problem the Mother Faced in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=114)



**Figure 8** Showing the Overall proportion of Maternal Near-Misses in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=845)



**Figure- 9** Showing the Proportion of Maternal Near-Misses in Selected Public Health Institutions of Keffa, Bench-Maji and Sheka Zones of South Nations Nationalities and Peoples Regional State, South West Ethiopia, 2017.(N=845)