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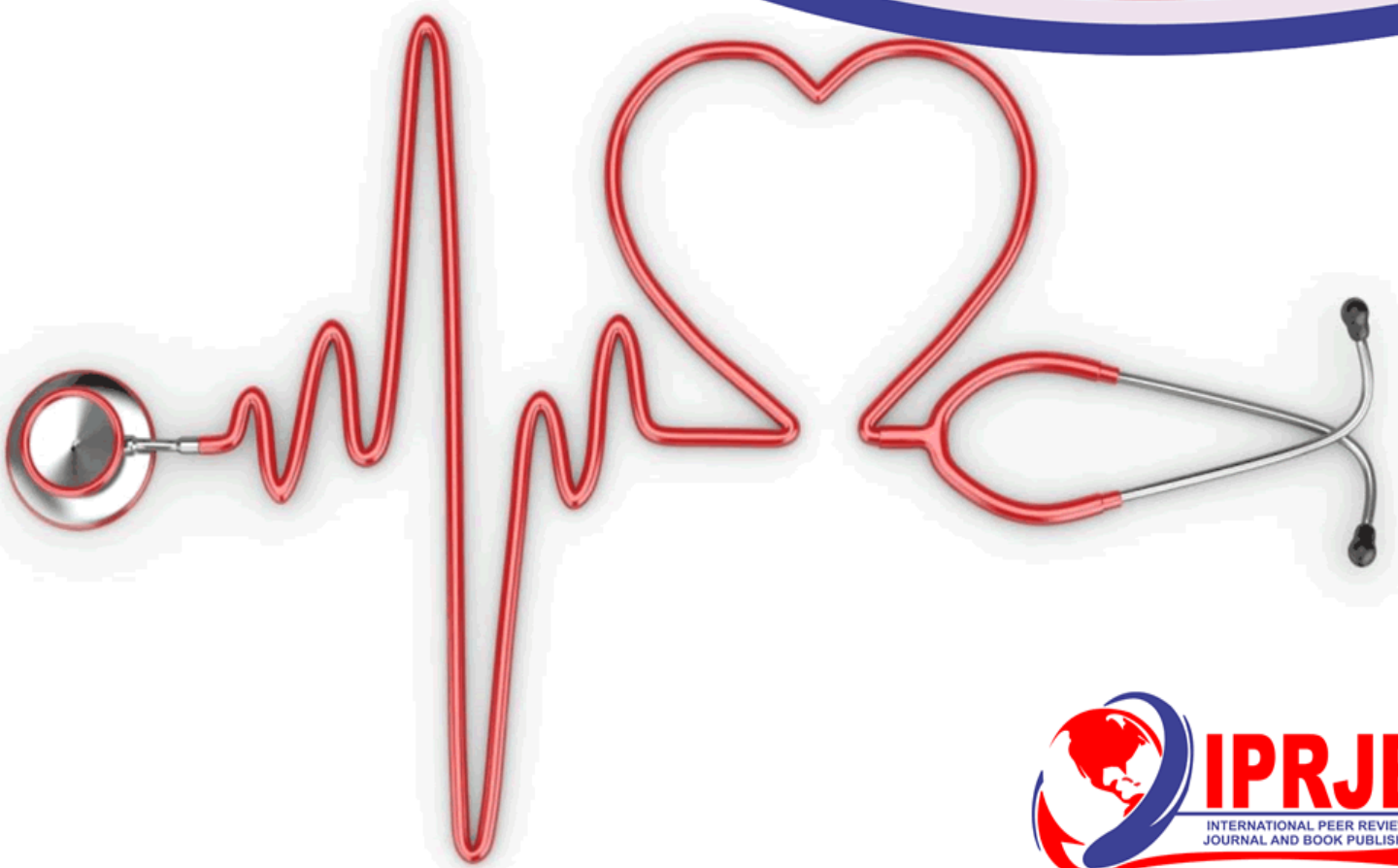

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ASCRIBING CAUSES OF MATERNAL MORTALITY IN HOMA BAY COUNTY KENYA

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Abstract

Purpose: The study sought to ascribe cause of maternal mortality in Homa Bay County Kenya.

Materials and Method: Data was collected by 40 trained community health workers who were residents of each sub county. Data for the retrospective study was collected using a standardized WHO verbal autopsy questionnaire. All maternal deaths which occurred between 2015 and 2019 in the county were identified. Data was analyzed using SPSS software version 20. Descriptive statistics, bivariate and multiple logistic regression were used in data analysis. Odds ratios with 95% confidence interval were calculated. P value of less than 0.05 was used to establish statistical significance.

Results*:* The results show that 73.6% of the deaths occurred in a health facility with 20.7% occurring at home. Majority (70.7%) of the mothers visited health facilities during the last illness preceding death. 13.6% received treatment at home while 9.3% were seen by traditional healers. Expert review of the 140 reported deaths reported the leading causes of maternal deaths as obstetric haemorrhage (31.4%), HIV/AIDS (10.7% and abortion (10%). Although the results were not statistically significant, a higher proportion of community deaths attributed to obstetric hemorrhage (31.8%) and abortion-related causes (35.7%). A higher proportion of housewives in Homa Bay died at home, though all the socio-demographic and health-related variables analyzed were not significantly correlated with community deaths.

Unique Contribution to Theory, Practice and Policy*:* The need for improving the quality of care offered in different health care facilities, the department should also create an enabling environment and ensure a fully functional referral pathway between health facilities in the county. There is therefore need of increasing age of marriage through the practice of family planning methods and avoidance of home treatment and traditional healers. Further research can be done on causes of maternal deaths with a larger sample size.

Key words*: Maternal Mortality, Hypertension, Infection and Hemorrhage*

1.1 INTRODUCTION

There is misclassification and incomplete death registration as most of the deaths occur outside health facility, (World Health Organization, 2015). Globally, in 2015 several countries had not achieved MDG 5 aimed at reducing maternal and child mortality by 75% by 2015 (United Nations, 2012). Sub-Saharan Africa and South Asia have the highest rate of child mortality, leading to 87% of maternal deaths worldwide, or 313,000 (World Health Organization, 2014). Reports of a variety of studies based on thousands of deaths have been recorded from China and parts of Africa. In India, verbal autopsies have been widely used to determine the causes of child death and have been successfully used to influence health care policy, programs, monitoring and analysis (Gajalakshmi, *et al.,* 2004). In Kenya, the maternal mortality ratio is 362 per 100,000 live births and that accounts for 15% (7300) of all deaths of women of reproductive age. Annually, Homa Bay County is ranked among the top 15 counties in Kenya reporting highest maternal deaths. Most of the causes of these maternal deaths, however, are not known, (Kenya National Bureau of Statistics, et al., December 2015)

1.2 Statement of the problem

Internationally, a woman dies every minute during pregnancy, labor and delivery, (World Health Organization, 2015). Homa Bay County ranks among the fifteen counties in Kenya with the highest number of maternal deaths. In 2015, mortality rates were 21, 2016-27 and 25 were reported in 2017 in Homa Bay County (Kenya National Bureau of Statistics, 2020). This research aimed at determining, through community measures, the direct and indirect leading cause of maternal mortality and mitigating factors to reduce the percentage of the untimely maternal deaths.

Objectives

1.2.1 Broad Objective

To determine causes of maternal deaths in Home-Bay County.

1.2.2 Specific Objectives

1. To assess the health seeking behavior of the deceased mothers in Homa Bay County.
2. To compare the cause of death in the community and health facilities in Homa Bay County.
3. To determine factors associated with maternal deaths in the community in Homa Bay County.

2.0 METHODOLOGY

Study Design: A retrospective study using a standardized verbal autopsy questionnaire containing closed and open-ended questions.

Study area: The study was carried out in Homa Bay County, which is a county in Kenya's former Nyanza Province. Homa Bay is its capital and largest town. The county has 963,794 inhabitants and an area of 3,154.7 km2 (Kenya National Bureau of Statistics, 2009). Lake Victoria is a significant source of subsistence in Homa Bay County. The county is situated along Lake Victoria in southwestern Kenya, where it borders the counties of Kisumu and Siaya to the north, the counties of Kisii and Nyamira to the east, the counties of Migori to the south and Lake Victoria and the Republic of Uganda to the west. The county is divided into two major relief areas, namely the lowlands of the lakeshore and the upland plateau with a range of rivers, most of which derive from

the counties of Kisii and Nyamira, namely Awach Kibuon, AwachTende, Maugo, Kuja, Rangwe and Riana. The road network in Homa Bay County is poor making it difficult for the residents to access the major social amenities like health facilities within the County. The study focused in the eight Sub counties; Kasipul Kabondo Sub County, Ndhiwa Sub county, Homa-Bay town SC, Kabondo Sub County, Suba Sub County, Rangwe Sub County and Mbita sub county, Rachuonyo SC and county referral hospital.

*Study Population***:** The study populations were all women who died due to pregnancy related causes of death in the community and health facility in Homa Bay County between; January 2015 to December 2019.

Sample size: No sample size. All maternal deaths of residents' occurring in Homa Bay County were covered in the study.

Sampling Technique: No sampling method was adopted in the study. Instead, all maternal deaths identified in each of the 8 sub counties and referral hospitals were captured. This included both health facility and community-based maternal deaths. Data was collected in all the 8 sub counties in Homa Bay County by the trained community health volunteers. In the study, the researcher focused in all the sub-County hospitals in Homa Bay County and community units where the deceased had died of pregnancy related conditions during the study period. Maternal death cases occurred in health facilities and communities were identified from the DHIS 2 report which also shows the location of the deceased villages and homes. Community health volunteers were assigned to collect data from the communities. KII guide was used for more clarity and information from staff working in the maternity/OPD regarding deaths they handled.

Inclusion Criteria: All the maternal deaths reported and non-reported in January 2015 to end 2019 within Homa Bay County. All women who died due to pregnancy related causes of death and were living in Homa Bay County for at least the last one year. *Exclusion Criteria:* Exclusion criteria were maternal deaths having occurred within the county but were non-residents.

Research instrument: A standard verbal autopsy tool which was already developed and reviewed by WHO was used (World Health Organization, 2007). It was simplified to allow easy understanding by CHV whom some their levels of education are primary. A broad Phraseology was further field-tested in two villages outside the study area. The results of these studies were used to make adjustments in the tool for final adoption.

Validity of the instrument: Sensitivity, precision and positive predictive value were used in evaluating the validity of the WHO instrument construct. Kappa index was used to determine the validity of the questionnaire parameters. The cause of death documented in hospital health records was the gold standard diagnosis of the cause of death for determining the validity of the VA. Monitoring everyone's work load was an important aspect of VA data management. The VA supervisor compared the VA interviewer log book to his records and to that of the key informant's mortality register to asses' completeness and discrepancies in the records.

Implementation of VA questionnaires: Forty CHVs (five per sub-county), were trained as research assistants and they were well skilled to interview caretakers of the deceased mothers

using a structured questionnaire using the local (Luo) language. They visited all homes of the mothers reported to have died due to pregnancy related issues in Homa Bay County. The respondent were relatives who had closest contact with the mother during the terminal illness, majority were husband, mother in-law or mother.

Data analysis: Descriptive statistics were used to describe sociodemographic characteristics of the study participants Chi square statistic and bivariate analysis were used to assess association between independent and dependent variables. Odds ratios with 95% confidence interval were used to test the strength of association while P value less than 0.05 was considered statistically significant. Expert review could distinguish up to three causes of death per mother, without designation of a' prime cause'. Kendall's coefficient of concordance which tests for agreement among the three clinicians was computed using SASTM for Windows version 9.2. The responses, which were the frequencies of each ascribed cause of death for each of the three clinicians, were numerically coded and on ordinal scale. proportions were calculated using total causes of death, rather than total deaths, as the denominator.

3.0 FINDINGS

3.1 Socio-Demographic Characteristics of Deceased Mothers

Table 1 illustrates the socio-demographic characteristics of deceased mothers followed up in Homa Bay County. During the study period, January 2015 to December 2019, CHVs followed up a total of 140 women. Most of the deaths occurred among women aged between 20 – 39 (68.6%) with the least proportion reported among those aged 40 years and above (7.1%). The mean age was 27.2 with a SD of 8.4 and ranged from 13 to 45 years. Over half (51.1%) were married and more than a quarter (27.3%) were single. More than half of the reported under-five child deaths were post-neonates. Majority (71.2%) had attained primary level of education while 20.1% had secondary education. The leading occupation was housewife (42.9%) followed by student (19.35) and farming (14.3%). Most of the deaths (20%) were reported in Rachuonyo North and the least in Homa Bay sub-counties (9.3%). Mfangano and Kotieno villages of Mbita and Rangwe sub-counties, respectively, led in the number of deaths with each reporting three deaths over the study period.

Table 1 Socio-Demographic Characteristics of Deceased

Variable	Categories	N	%
Age group in years	10 – 19	34	24.3
	20 – 29	47	33.6
	30 – 39	49	35.0
	≥40	10	7.1
Mean age±SD (Range) in years		27.2±8.4 (13.0 – 45.0)	
Marital status	Single	38	27.3
	Married	71	51.1
	Separated	8	5.8
	Widow	18	12.9
	Divorced	4	2.9
Level of education	None	1	0.7
	Primary	99	71.2
	Secondary	28	20.1
	Tertiary	11	7.9
Occupation	Student	27	19.3
	Housewife	60	42.9
	Farmer	20	14.3
	Teacher	10	7.1
	Business	17	12.1
	Domestic worker	6	4.3
Sub-county of residence	Homa Bay	13	9.3
	Mbita	16	11.4
	Ndhiwa	16	11.4
	Rachuonyo East	18	12.9
	Rachuonyo North	28	20.0
	Rachuonyo South	15	10.7
	Rangwe	16	11.4
	Suba	18	12.9

3.1.1 Background Information of the Respondents

Table 2 presents background information on respondents who were interviewed. Slightly more than a third (34.5%) was female relatives compared with 32.4% who were spouses of the deceased. Only 2.9% were children. Majority (82.9%) had lived with the deceased in the period leading to the reported death.

Table 2 Background Information on Respondents

Variable	Categories	n	%
Relationship of respondent to the deceased	Mother	18	12.9
	Spouse	45	32.4
	Sibling	11	7.9
	Child	4	2.9
	Female relative	48	34.5
	Male relative	13	9.3
Respondent lived with deceased in the period leading to her death	Yes	116	82.9
	No	24	17.1

3.1.2 Place and Year of Death

Table 3 shows the place and year of death. Nearly three-quarters (73.6%), of the deceased mothers died in a health facility compared, with 20.7% who died at home. Five of the deaths (3.6%) occurred on the way to health facility while three deaths were attributed to RTA, murder and terrorism. The proportion of deaths reported in 2016 (27.9%) and 2018 (27.1%) were comparable.

Table 3: Place and Year of Death

Variable	Categories	n	%
Place of death	Hospital	103	73.6
	Home	29	20.7
	On the way to hospital	5	3.6
	RTA/Murder/Terrorism	3	2.1
Year of death	2015	34	24.3
	2016	39	27.9
	2017	29	20.7
	2018	38	27.1

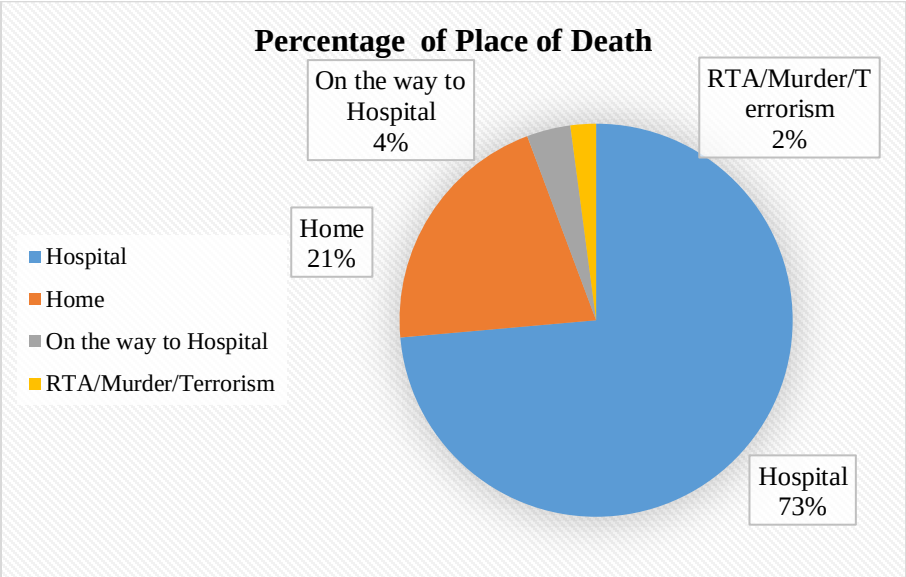

Figure 1: Percentage of Place of Death.

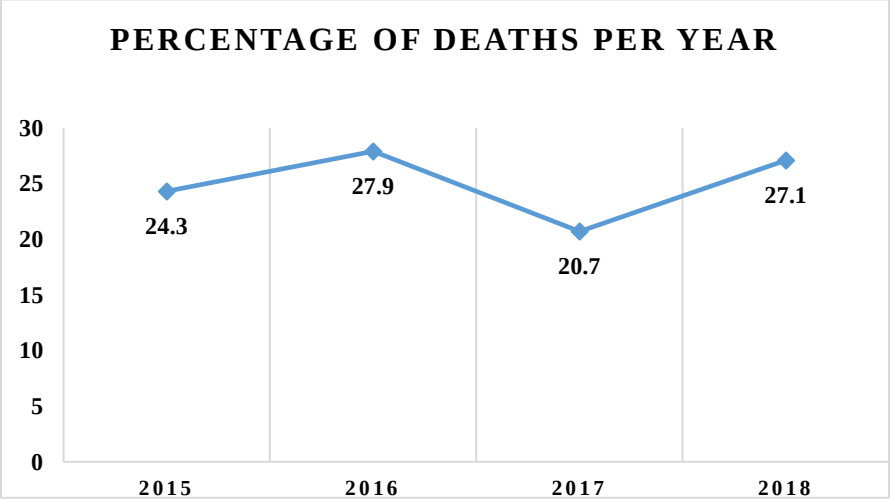

Figure 2: Percentage of Death per Year

3.1.3 History of Chronic Illness

Respondents were asked some questions concerning chronic illnesses that the deceased had suffered and results reported in Table 4 HIV/AIDS was the most common chronic illness (20%) seconded by high blood pressure (10%). Although four cases of cancer were reported, only three cases, one with breast and two with cervical cancers were identified.

Table 4: History of Chronic Illness

Variable	Categories	n	%
High blood pressure	Yes	14	**10.0**
	No	107	76.4
	Don't know	19	13.6
Diabetes mellitus	Yes	2	1.4
	No	117	83.6
	Don't know	21	15.0
Asthma	Yes	6	**4.3**
	No	119	85.0
	Don't know	15	10.7
Epilepsy	Yes	2	1.4
	No	122	87.1
	Don't know	16	11.4
Malnutrition	Yes	6	**4.3**
	No	124	88.6
	Don't know	10	7.1
Cancer	Yes	4	***2.9***
	No	123	87.9
	Don't know	13	9.3
Type of cancer	Breast	1	33.3
	Cervical	2	66.7
Tuberculosis	Yes	3	***2.1***
	No	120	85.7
	Don't know	17	12.1
HIV/AIDS	Yes	28	20.0
	No	90	64.3
	Don't know	22	15.7

3.2 Health Seeking Behavior of the Deceased Mothers in Homa Bay County

Table 5 presents health seeking behavior of the deceased mothers. Majority (70.7%) visited health facilities (public or private) during the last illness that led to death. Whereas 13.6% received treatment at home 9.3% were seen by traditional healers. Out of the 72 who had visited a health facility, 30.6% had been to the facilities at least twice and a maximum of 28 times. Slightly more than half (52.5%) received treatment for the illness that led to death. Of the 68 whom respondent to question on type of treatment received, 77.9% were put on IV fluids. On the other hand, among the 48 who responded to question on blood transfusion, 52.1% confirmed having been transfused. Surgical intervention was performed on 14.7% of the 116 mothers.

Table 5: Health Seeking Behavior of the Deceased Mothers in Homa-Bay County

Variable	Categories	n	%
Where received treatment during the last illness that led to death	Home	19	13.6
	Traditional healer	13	9.3
	Government facility	8	5.7
	Public hospital	58	41.4
	Private clinic	13	9.3
	Private hospital	20	14.3
	Pharmacy	1	0.7
	Don't know	8	5.7
	Total	**138**	**100.0**
Number of times deceased made contacts with formal health services	1	16	22.2
	2 – 28	22	30.6
	Don't know	34	47.2
	Total	72	100.0
Duration of illness	0 – 1 day	71	53.0
	2 – 7 days	36	26.9
	8 – 15 days	1	0.7
	1 – 24 months	26	19.4
	Total	**134**	**100.0**
Received treatment for the illness that led to death	Yes	73	52.5
	No	63	45.3
	I don't know	3	2.2
	Total	**139**	**100.0**
Received IV fluids	Yes	53	77.9
	No	6	8.9
	I don't know	9	13.2
	Total	**68**	**100.0**
Transfused	Yes	25	52.1
	No	16	33.3
	I don't know	7	14.6
	Total	**48**	**100.0**
Was operated on	Yes	17	14.7
	No	99	85.3
	Total	**116**	**100.0**

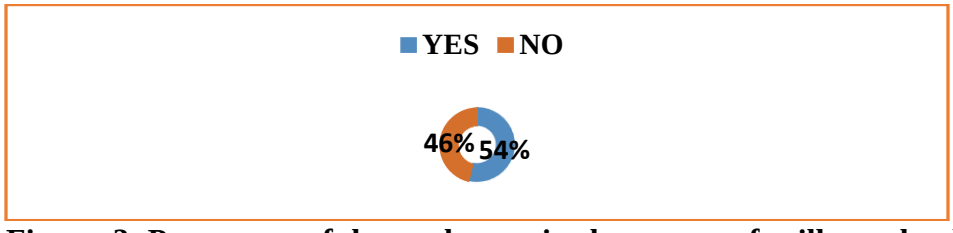

Figure 3: Percentage of those who received treatment for illness that led to death

3.2.1 Presenting Signs during the Last 3 Months of Pregnancy

Table 6 shows the type of illness the deceased suffered during the last 3 months of pregnancy. The five leading types of illness in descending order of prevalence were severe abdominal pain - not related to labor – (24.3%), headache (22.1%), pallor/shortness of breath or both (13.6%), blurred vision (10%) and puffy face (8.6%). Convulsions were the least common presenting sign (5%).

Table 6 Presenting Signs during the Last 3 Months of Pregnancy

Presenting signs	Response	n	%
Vaginal bleeding	Yes	9	6.4
	No	63	45.0
	Don't know	68	48.6
Smelly vaginal discharge	Yes	8	5.7
	No	59	42.1
	Don't know	73	52.1
Puffy face	Yes	12	**8.6**
	No	58	41.4
	Don't know	70	50.0
Headache	Yes	31	**22.1**
	No	52	37.1
	Don't know	57	40.7
Blurred vision	Yes	14	**10.0**
	No	62	44.3
	Don't know	64	45.7
Convulsions	Yes	7	5.0
	No	74	52.9
	Don't know	59	42.1
Febrile illness	Yes	11	7.9
	No	63	45.0
	Don't know	66	47.1
Severe abdominal pain (not labor pain)	Yes	34	**24.3**
	No	52	37.1
	Don't know	54	38.6
Pallor/shortness of breath (both)	Yes	19	**13.6**
	No	58	41.4
	Don't know	63	45.0

3.3 Ascribed Causes of Death Defined Through Verbal Autopsy in Homa-Bay

Ascribed causes of death are presented in Table 7. Expert review was completed for 140 mothers. There was agreement among all the three clinicians on probable cause of death for 97 (69.3%) cases while at least two clinicians agreed on 59 cases (42.1%). There was only one case whose cause of death was unknown. The history given was that the mother delivered well at home but then suddenly collapsed and died on the mat where she was delivered.

Of the 140 mothers with ascribed cause of death the leading causes of death was obstetric

hemorrhage (31.4%) followed by HIV/AIDS (10.7%), abortion (10%) and pregnancy induced hypertension (7.1%). There were four cases of assault and two cases of intentional self-harm. For the latter two cases one had a history a history of having delivered and threw the baby in a well. The deceased was later found unconscious and died after being taken to hospital. The second victim inserted sticks in her to remove the baby which led to her death. Of the 29 deaths that occurred at home, 37.9% were attributed to obstetric hemorrhage while 13.8% were abortion related deaths and two cases due to ruptured uterus. Notably, eight (23.5%) out of the 34 deaths that occurred either on the way to hospital or at home were deliveries conducted by TBAs. In the same category, five (14.7%) deaths were attributed to abortion.

Table 7: Evaluation of Ascribed Cause of Death by Verbal Autopsy

Probable cause of death	**First cause of death**		**Second cause of death**	
	n	%	n	%
Obstetric hemorrhage	44	31.4	3	5.1
HIV/AIDS related deaths	15	10.7	5	8.5
Abortion related death	14	10.0	1	1.7
Pregnancy induced hypertension	10	7.1	3	5.1
Malaria	8	5.7	2	3.4
Acute respiratory infection, including pneumonia	5	3.6	2	3.4
Pregnancy related sepsis	5	3.6	14	23.7
Assault	4	2.9		
Obstructed labor	4	2.9	5	8.5
Female reproductive system neoplasms	4	2.9	1	1.7
Pulmonary Tuberculosis	3	2.1	1	1.7
Sepsis	3	2.1	1	1.7
Severe anemia	3	2.1	2	3.4
Anemia of pregnancy	2	1.4	2	3.4
Asthma	2	1.4	2	3.4
Diarrhea diseases	2	1.4	2	3.4
Meningitis and encephalitis	2	1.4	1	1.7
Ruptured uterus	2	1.4		
Breast neoplasms	1	0.7		
Severe malnutrition			2	3.4
Ectopic pregnancy	1	0.7		
Epilepsy	1	0.7		
Exposure to force of nature	1	0.7		
Intentional self-harm	1	0.7	1	1.7
Accidental drowning and submersion	1	0.7		
Other and unspecified maternal causes	1	0.7	3	5.1
Diabetes mellitus			1	1.7
Ruptured uterus			3	5.1
Cause of death unknown	1	0.7		
Total	140	100.0	59	100.0

3.3.1 Ascribed Cause of Death by Verbal Autopsy per Sub-County

Table 8 Illustrates ascribed cause of death by sub-county of residence. Ndhiwa Sub-County had the highest proportion of deaths (62.5%) due to obstetric hemorrhage. This was followed by Rachuonyo South (40%) and Homa Bay (38.5%). Rangwe had the lowest proportion of deaths (18.7%). HIV/AIDS – related deaths were commonly reported in Homa Bay (30.8%) and Rachuonyo East (27.8%) with no case reported in Ndhiwa and Suba. Deaths attributed to abortion were mostly reported in Mbita (25%) and Suba (16.7%) while the highest proportion of malaria attributed deaths (16.7%) were from Suba.

Table 8: Ascribed Cause of Death by Verbal Autopsy per Sub-County

.	Homa Bay %	Mbita %	Ndhiwa %	Rachuonyo East %	Rachuonyo North %	Rachuonyo South %	Rangwe %	Suba %	Total n
Obstetric hemorrhage	38.5	31.2	62.5	22.2	21.4	40.0	18.7	27.8	**44**
HIV/AIDS related deaths	30.8	6.2	0.0	27.8	7.1	13.3	6.2	0.0	**15**
Abortion related death	0.0	25.0	0.0	5.6	7.1	13.3	12.5	16.7	**14**
Pregnancy induced hypertension	7.7	6.2	0.0	5.6	7.1	6.7	18.7	5.6	**10**
Malaria	7.7	0.0	6.2	0.0	7.1	0.0	6.2	16.7	**8**
Acute respiratory infection, including pneumonia	0.0	0.0	12.5	5.6	3.6	0.0	6.2	0.0	**5**
Pregnancy related sepsis	0.0	0.0	0.0	5.6	14.3	0.0	0.0	0.0	**5**
Assault	7.7	0.0	0.0	0.0	3.6	6.7	6.2	0.0	**4**
Female reproductive system neoplasms	0.0	0.0	6.2	0.0	3.6	6.7	0.0	5.6	**4**
Obstructed labor	0.0	0.0	0.0	5.6	0.0	6.7	6.2	5.6	**4**
Pulmonary Tuberculosis	0.0	0.0	0.0	5.6	3.6	6.7	0.0	0.0	**3**
Sepsis	0.0	0.0	12.5	0.0	0.0	0.0	0.0	5.6	**3**
Severe anemia	0.0	6.2	0.0	5.6	0.0	0.0	6.2	0.0	**3**
Anemia of pregnancy	7.7	0.0	0.0	0.0	3.6	0.0	0.0	0.0	**2**
Asthma	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	**2**
Diarrhea diseases	0.0	0.0	0.0	5.6	0.0	0.0	6.2	0.0	**2**
Meningitis and encephalitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	**2**
Ruptured uterus	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	**2**
Other causes	0.0	12.5	0.0	5.6	10.8	0.0	6.2	0.0	**8**
Total	**13**	**16**	**16**	**18**	**28**	**15**	**16**	**18**	**140**

* Accidental drowning and submersion, Breast neoplasms, Ectopic pregnancy, Epilepsy Exposure to force of nature, Intentional self-harm, Other and unspecified maternal cause, Unknown Cause of death cause each = 1 case

3.3.2 Bivariate analysis on the relationship between causes of death and place of delivery

Table 9 shows the results on bivariate analysis on the relationship between selected causes of death and place of delivery. Four causes of death that were selected based on the higher frequency of deaths. Although none of the ascribed causes of maternal deaths had statistically significant association with place of death, the results are still informative. Based on the 95%CI upper limit, mothers whose deaths were attributed to obstetric hemorrhage were up to three times more likely to have died at home (31.8%) and not in a health facility (24%). Likewise, mothers with provisional diagnosis of abortion related deaths were up to five-fold more likely to have died at home (35.7%) than in a health facility (25.4%).

On the other hand, cases of HIV/AIDS were 80% less likely to have died at home just as cases of pregnancy induced hypertension that were 30% less likely to have occurred at home. Probably, failure to have had significant results could be ascribed to smaller number of cases of death that were followed up during the three-year period.

Table 9 Bivariate Analysis on the Relationship between Causes of Death and Place of Delivery

First ascribed cause of death	Categories	N	Place of delivery		OR	95%CI	p value
			Home (%)	Hospital (%)			
Obstetric hemorrhage	Yes	44	31.8	68.2	1.5	0.7 – 3.2	0.3
	No	96	24.0	76.0			
HIV/AIDS	Yes	15	6.7	93.3	0.2	0.02 – 1.40	0.1
	No	125	28.8	71.2			
Abortion related deaths	Yes	14	35.7	64.3	1.6	0.5 – 5.2	0.5
	No	126	25.4	74.6			
Pregnancy induced hypertension	Yes	10	20.0	80.0	0.7	0.1 – 3.4	0.98
	No	130	26.9	73.1			

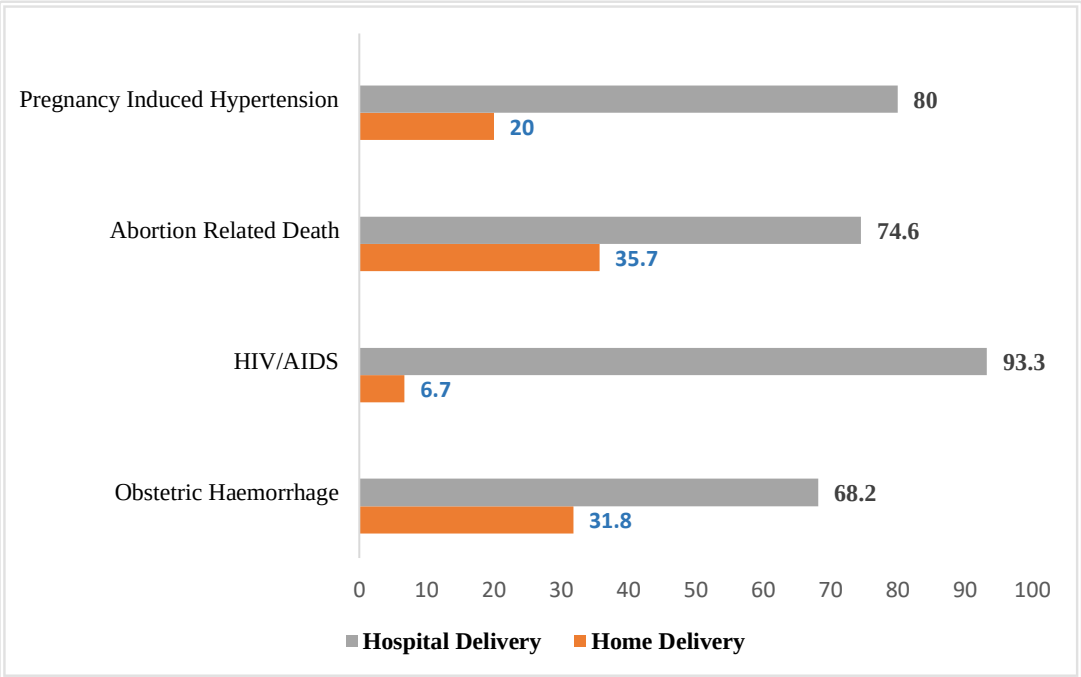

Figure 4: First Ascribed cause of death

3.4 Factors Associated with Maternal Deaths in the Community in H/B County

Table 10 presents factors associated with maternal deaths in the community in the study area. The following factors were examined as independent variables against place of delivery which was the dependent variable: socio-demographic variables, past medical history and type of illness the deceased experienced during the illness leading to death. None of the factors examined were significantly associated with community deaths. However, further analysis reveals that mothers who were less than 29 years of age were up to 3.8 times more likely to have died at home (30.9%) compared with the older age

group (20.3%). The odds of dying at home being a housewife (30%) were three times higher than those who were of the other occupations (23.7%). On the contrary, those with history of chronic illness, vaginal bleeding or severe abdominal pain were up to 70% and 40%, respectively, less likely to have died at home.

Table 10: Bivariate Analysis on Factors Associated with Maternal Deaths in The Community

Independent variables	Categories	n	Place of delivery		OR	95%CI	p value
			Home (%)	Hospital (%)			
Age group in years	<30	81	30.9	69.1	1.7	0.8 – 3.8	0.2
	≥30	59	20.3	79.7			
Marital status	Married	71	26.8	73.2	1.0	0.4 – 2.1	0.9
	Others	69	26.1	73.9			
Level of education	None or primary	100	26.0	74.0	0.9	0.4 – 2.1	0.8
	Secondary or tertiary	40	27.5	72.5			
Occupation	Housewife	60	30.0	70.0	1.4	0.6 – 2.9	0.4
	Others	80	23.7	76.3			
Sub-county of residence	Rachuonyo North	28	14.3	85.7	0.4	0.1 – 1.2	0.1
	Others	112	29.5	70.5			
Medical history	Chronic illness	48	20.8	79.2	0.6	0.3 – 1.4	0.3
	None	92	29.3	70.7			
Presenting signs	Vaginal bleeding	31	19.3	80.7	0.6	0.2 – 1.6	0.3
	Others	109	28.4	71.6			
	Severe abdominal pain	34	23.5	76.5	0.8	0.3 – 2.0	0.6
	Others	106	27.4	72.6			

4.0 DISCUSSION, CONCLUSSION AND RECOMMENDATION

From the study findings, majority of deceased mothers visited a health facility during the last illness that led to death. The study findings were supported by the results from Nairobi which showed that maternal deaths which was caused by poor health seeking behavior as well as inadequate skilled health care staff (Francis *et al.,* 2020)

Almost all maternal deaths and morbidities are closely associated with factors such as delays which prevent an expectant mother from getting the required healthcare and treatment services (Lassi, *et al.,* 2019). Delays are connected to services, facilities, logistics and conditions. More women die at home in rural areas such as Homa Bay County, with probably less affordability and restricted access to treatment, which is comparable to similar studies carried out in India (Shah *et al.,* 2014).

These findings are also comparable to those presented in a study in Ghana (Alabi *et al.,* 2015) and in Tanzania's Rufiji District (Rishworth *et al.,* 2016) and backed by WHO (2016), which recorded postpartum hemorrhage (PPH) as the world's leading contributor to maternal mortality, causing about 24percent of all maternal death

The odds of dying at home being a housewife was up to three times higher than the odds of the other occupations. In a related study conducted by Jharkhand India, where most of the dead were

housewives with deaths due to poverty and lack of education, similar findings were published (Khan & Pradhan, 2013).

On the contrary, there fewer community deaths due to vaginal bleeding than facility deaths with the same cause. The results do not concur with findings in a study conducted in Bangladesh where more community maternal deaths (43%) than health facility deaths (32.6%) were of a similar cause (Halim, *et al.,* 2014).

In Homa-Bay County, the majority of peripheral health facilities such as Ndhiwa Sub-County Hospital still lack misoprostol, safe blood transfusion, fully equipped operating theatre and sufficient aseptic techniques to treat the key causes of obstetric complications in the area (Health, Population & Nutrition Office & International Business & Technical Consultants, In, 2018). This research confirms the results of a study conducted in western Kenya (Meghan, *et al.*, 2013) showing that only 14% of EmONC services are offered by facilities.

Conclusion

Homa-bay county department of Health should improve quality of care offered in all sub-county hospitals through strengthening of access to EmONC services. Ensure capacity building of healthcare providers for early identification and treatment of obstetric emergencies to help save lives. Create enabling environment and ensure a fully functional referral pathway between health facilities and community level for effectiveness. Put in place strategies and directives on health promotion through health messaging on dangers signs of pregnancy, benefits of ANC services and childbirth at all level of care. Adopted VA tool is an additional source of data for identification of burden of maternal mortality to aid timely decision making and resource mobilization to strengthen healthcare.

Recommendation

The study recommends that the VA method should be used to capture the assigned causes of maternal deaths and may serve as a good additional source of knowledge to recognize the burden of maternal mortality caused by certain factors in the community. Through the practice of family planning techniques and avoidance of home care and conventional healers, there is also a need to raise the age of marriage. Communication on risk signs of pregnancy and childbirth should also be improved by midwives and community health volunteers in the county. The Department of Health to ensure that healthcare providers focus on skills for them to identify and manage various health care complications as well as offer emergency services in regards to obstetric care respectively. The department should also create an enabling environment and ensure a fully functional referral pathway between health facilities in the county. Further research can be done on causes of maternal deaths with a larger sample size. This would require multi-site (multi-county) approach as maternal deaths seem to be fewer than expected for a single county study. It would also help reduce the recall period to less than two years which would help improve on reliability of the VA tool.

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