

## Original Research Article

# Factors associated with maternal mortality among women of reproductive age seeking care at Wajir County Referral Hospital, Wajir County, Kenya

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## ABSTRACT

**Background:** The rate of maternal death is too high. In 2020, 287,000 women lost their lives both during and after becoming pregnant and giving birth. In 2020, low- and lower-middle-income countries accounted for nearly 95% of all maternal deaths, the majority of which could have been avoided. The study aimed to determine factors associated with maternal mortality among women of reproductive age seeking care in Wajir County, Kenya.

**Methods:** The study employed a retrospective analytical cross-sectional study design where a systematic random sampling approach was utilized to recruit respondents into the study. The Yamane formula of sample size calculation was used to recruit 359 study partakers for this study.

**Results:** The prevalence of maternal mortality in Wajir County was 4.2%. Not utilizing emergency obstetric and newborn care services (OR=2.4,95%CI=0.19-0.89), unavailability of skilled birth attendants (OR=2.4,95%CI=0.19-0.87), poor uptake of antenatal care services (OR=3.1,95%CI=0.15-0.67), and study partakers aged 18-23 years (OR=3.7,95%CI=0.06-3.89), earning 1-10000 Ksh (OR=5.3,95%CI=0.04-0.89) increased the odds of maternal mortality rate. While taking 31-60 minutes to reach the nearest health facility (OR=3.9,95%CI=1.67-9.23) and being married (OR=3.9,95%CI=1.47-10.54) reduced the odds of maternal mortality.

**Conclusions:** The prevalence of maternal mortality in Wajir County was 4.2%. From this study, not utilizing emergency obstetric and newborn care services, unavailability of skilled birth attendants, and study partakers aged 18-23 years increased the odds of maternal mortality rate. While taking 31-60 minutes to reach the nearest health facility and being married reduced the odds of maternal mortality.

**Keywords:** Antenatal care services, Emergency obstetric care, Maternal mortality rate and obstetric complication

## INTRODUCTION

Deaths resulting from adverse effects during the pregnancy or delivery process are referred to as maternal mortality. In accordance with United Nations inter-agency estimates, the worldwide rate of maternal mortality (MMR) decreased by 34% between 2000 and 2020, from a total of 342 deaths to 223 fatalities per 100,000 babies born alive.<sup>1</sup> This corresponds to a 2.1 percent annual average rate of reduction. This is roughly one-third of the 6.4 percentage point annual rate required

by, to meet the Sustainable Development Goal (SDG), which is the target of seventy maternal fatalities per 100,000 births that are healthy by 2030, despite being a significant number.<sup>2,3</sup> According to UN inter-agency estimates, the global mother-to-child mortality ratio (MMR) decreased by 34% between 2000 and 2020, from 339 passing away to 223 passing away per 100,000 babies born alive.<sup>4</sup> This corresponds to a 2.1 percent annual average rate of decrease

In Africa, maternal mortality is still a major problem for fertile women. Mortality rates among mothers (MMRs) are still a catastrophe in the African continent even though they declined globally to 34.2% between 2000 and the year 2020.<sup>5</sup> This is an opportunity for WHO and other significant stakeholders to concentrate efforts on ways of decreasing MMR to 70 maternal mortality per 100,000 births that are healthy by 2030, as over two-thirds (69%) of mother deaths happen in the African Region.<sup>6</sup> The African Region's rate of maternal mortality was projected to be 531 deaths per 100,000 births that occurred in 2020. South Sudan, with 1223 deaths, Chad, with 1063 deaths, as well as Nigeria, with 1047 passing away per hundred thousand live births, are the three nations with the highest rates of mortality among mothers.<sup>5</sup>

The average number of women in Kenya who die from causes associated with pregnancy is 355 per hundred thousand births. This indicates that, given the present high number of births, almost 5,000 women and girls lose their lives each year as a result of difficulties caused by pregnancy as well as childbirth.<sup>7</sup> Over the past seven years, access to professional birth participation has increased from 62% to roughly 70%; however, inadequate care is still blamed for more than eighty percent of deaths among mothers.<sup>8</sup> Kenya has a neonatal mortality rate of 21 per one thousand live births. The mortality rate per 1,000 people worldwide is 18. Mortality among mothers in Kenya rose by 55% between 2017 and 2020.<sup>9</sup>

Kenya had a mortality rate for mothers ratio of 530 fatalities per 100,000 babies born alive in 2020.<sup>10</sup> Despite significant fluctuations in recent years, Kenya's rate of maternal mortality tended to decline from 2001 to 2020, reaching 530 passing away every 100,000 births that were healthy in 2020 thus indicating the need to pinpoint gaps associated with a maternal mortality rate.<sup>8</sup> The maternal mortality rate in the subject's research area, Wajir County, is 1683 deaths per 100,000 live births; which is the result of measures to eliminate and lessen the threat, which has become an issue of public health in this area.<sup>8</sup> Consequently, the purpose of this research was to identify the specific factors linked to maternal mortality among women of reproductive age who are receiving care at the Wajir County Referral Hospital in Wajir County, Kenya.

## METHODS

### Study design

Since gathering data from patient files required going back in time, the research design for the current investigation employed a retrospective analytical cross-sectional approach. Because the study's primary objective was to find a causal relationship between the independent and dependent variables, an analytical cross-sectional study technique was employed. A thorough understanding of the factors influencing the maternal

mortality rate was obtained by triangulating quantitative and qualitative data.

### Study area

The Wajir County Referral Hospital, located in the upper region of Kenya, was the site of the investigation. Indicators of maternal health in the County are not very good in Kenya.<sup>11</sup> It is anticipated that 1,683 women pass away in the County each year, compared to every 100,000 live births that take place there.<sup>12</sup> According to, Obstruction of labor, severe instances of female genital mutilation (mostly type III), and cephalopelvic disproportion as a result of early marriages are the primary causes of these fatalities.<sup>13</sup>

### Sampling technique

Since Wajir County and Referral Hospital is the biggest and the only referral facility in Wajir County that provides services for antenatal and postnatal care, it was purposively chosen to conduct the investigation. In the present investigation, systematic sampling was used to choose women of reproductive age to participate. The total number of individuals who sought ANC and postnatal care who were enrolled in this medical center for maternal care were counted and divided by the overall number of samples to determine the sampling interval. A random selection of the initial patient's file was used to establish the starting point. Purposive sampling was used to choose key informant participants.

### Sample size determination

The hospital reproductive health unit had a total of 4651 registered women of reproductive age from the year 2017-2023 who sought maternal care. Since the population size was known the study employed the Yamane formula of sample size calculation.<sup>14</sup> As a result, 366 participants took part in this study and their data was taken from the hospital records.

### Data collection

Data on patient-related factors was gathered in Section A of the data collection instrument; data on ANC uptake was gathered in Section B; and data on factors associated with health facilities and the death rate of mothers was gathered in Section C. The death of mothers was the outcome of interest in this study, and data on maternal outcomes was collected in section D using a data extraction tool. For the intent of gathering qualitative data, an interview with key informants was carried out with specifically chosen nurses, physicians, and community health volunteers.

### Data analysis

The SPSS version 27 was employed to perform these analyses. in descriptive statistics frequencies and

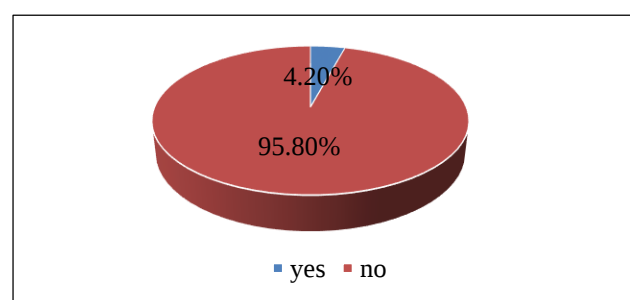
percentages were employed. Inferential statistics' chi-square test for independence and binary logistic regression were used to determine the extent of associations.  $p \leq 0.05$  was the cutoff point for statistical significance. The significant variables from the bivariate analysis were brought into binary logistic regression for further analysis. The qualitative data was subjected to thematic analysis.

For approval or permission to conduct the investigation, the Mount Kenya University ethics review committee was consulted, and NACOSTI was consulted for permission to carry out an investigation in the designated research area. Further authorization to conduct research in the study area was requested from the county commissioner, the county department of health, and other designated county offices. The Wajir County Referral Hospital ethics and review committee was also asked for additional ethical clearance. Before starting the data collection phase, the researcher obtained consent forms from the study participants (Key informants). Participation in the investigation was optional. The confidentiality and anonymity of study participants were strictly maintained. Patient information to be gathered from hospital records was password-protected and shared only with the hospital's permission.

## RESULTS

### Prevalence of maternal mortality from abstracted data

As indicated in Figure 1 below, the prevalence of maternal mortality in Wajir County was 4.2% or a maternal mortality ratio of 4178/100,000 live births from data abstraction tools.



**Figure 1: Prevalence of maternal mortality.**

### Demographic characteristics

Table 1 below provides descriptive statistics on the social demographic characteristics of the study respondents. Concerning age, 235 (65.5%) of the study respondents were aged between 18-23 years. Regarding education status, 125 (34.8%) of the study respondents had attained a primary level of education. Concerning marital status 270 (75.2%) of the study participants were married. Concerning religion, 323 (90%) of the study partakers were Muslims which could be attributed to this region

being a Muslim-dominated region while only a few (10%) were Christians. Concerning respondent's history of smoking, 31 (8.6%) were smokers. Concerning respondents' history of alcohol consumption, 26 (7.2%) were reported taking alcohol. Concerning the frequency of alcohol consumption among alcohol, 22 (84.6%) were taking alcohol 1-2 times a week.

**Table 1: Social demographic characteristics of the study respondents.**

| Independent variables   | Categories          | Frequencies | Valid percentage |
|-------------------------|---------------------|-------------|------------------|
| Age in years            | 18-23               | 235         | 65.5             |
|                         | 24-29               | 79          | 22               |
|                         | 30-35               | 20          | 5.6              |
|                         | 36-40               | 25          | 7                |
| Education level         | No formal education | 137         | 38.2             |
|                         | Primary             | 125         | 34.8             |
|                         | Secondary           | 86          | 24               |
|                         | Tertiary            | 11          | 3.1              |
| Marital status          | Married             | 270         | 75.2             |
|                         | Separated           | 37          | 10.3             |
|                         | Single              | 52          | 14.5             |
| income                  | 1-10000             | 181         | 50.4             |
|                         | 10001-20000         | 130         | 36.2             |
|                         | 20001-30000         | 48          | 13.4             |
| Alcohol consumption     | Yes                 | 26          | 7.2              |
|                         | No                  | 333         | 92.8             |
| Frequency of alcoholism | 1-2 times a week    | 22          | 84.6             |
|                         | 3-4 times a week    | 4           | 15.4             |
| religion                | Christian           | 36          | 10               |
|                         | Muslims             | 323         | 90               |
| smoking                 | Yes                 | 31          | 8.6              |
|                         | No                  | 328         | 91.4             |
| Frequency of smoking    | Once a week         | 4           | 12.9             |
|                         | 1-2 times a week    | 20          | 64.5             |
|                         | 3-4 times a week    | 7           | 22.6             |

### Social demographic factors associated with maternal mortality

In the social demographic factor, the following variables were found to be significantly associated with maternal mortality; maternal age ( $\chi^2=16.522$ ,  $df=3$ ,  $p^*=0.001$ ), education level ( $\chi^2=11.652$ ,  $df=3$ ,  $p=0.009$ ), income level ( $\chi^2=11.088$ ,  $df=2$ ,  $p^*=0.004$ ) and marital status ( $\chi^2=12.219$ ,  $df=2$ ,  $p=0.002$ ) hence they were imported for multivariate analysis. Maternal mortality was not statistically associated with the study respondents religion ( $\chi^2=0.084$ ,  $df=1$ ,  $p=0.772$ ), smoking ( $\chi^2=0.00$ ,  $df=1$ ,

p=0.989) and alcohol consumption ( $\chi^2=1.11, df=1, p=0.292$ ).

As indicated in Table 2 below, study partakers aged 18-23 years were 3.7 more times likely to experience maternal mortality as compared to their counterparts. In addition, study participants who were earning between 1-10000 Ksh were 5.3 times more likely to experience maternal mortality as compared to those earning between 20001-30000 Ksh. Study respondents who were married were 3.9 less likely to experience maternal mortality as compared to those who were single.

These findings were in harmony with the qualitative data where one of the key informants narrated that:

*“Married women may have better access to healthcare services, including prenatal care, skilled birth attendants, and emergency obstetric care, compared to unmarried women. This can be attributed to factors such as shared health insurance coverage, spousal support in navigating the healthcare system, and assistance with transportation to healthcare facilities, all of which contribute to lower maternal mortality rates among married women.....”*(KII 1, community health volunteer).

**Table 2: Multivariate analysis on social demographic factors associated with maternal mortality.**

| Variables in the equation |                       | B      | S.E.     | Wald   | df | Sig.  | Exp(B)  | 95% C.I. for EXP(B) |        |
|---------------------------|-----------------------|--------|----------|--------|----|-------|---------|---------------------|--------|
|                           |                       |        |          |        |    |       |         | Lower               | Upper  |
| Step 1                    | Study respondents age |        |          | 13.210 | 3  | 0.004 |         |                     |        |
|                           | 18-23                 | -0.749 | 1.074    | 0.486  | 1  | 0.023 | 3.7     | 0.058               | 3.881  |
|                           | 24-29                 | -0.246 | 1.159    | 0.045  | 1  | 0.832 | 0.782   | 0.081               | 7.580  |
|                           | 30-35                 | -2.708 | 1.189    | 5.189  | 1  | 0.486 | 0.473   | 0.006               | 0.685  |
|                           | Income level          |        |          | 11.924 | 2  | 0.003 |         |                     |        |
|                           | 1-10000               | -1.675 | 0.796    | 4.427  | 1  | 0.035 | 5.3     | 0.039               | 0.892  |
|                           | 10001-20000           | -0.115 | 0.877    | 0.017  | 1  | 0.896 | 0.892   | 0.160               | 4.978  |
|                           | Education level       |        |          | 10.339 | 3  | 0.116 |         |                     |        |
|                           | Noformal education    | -1.253 | 0.261    | 7.762  | 1  | 0.145 | 3.6     | 0.112               | 0.453  |
|                           | Primary               | -1.254 | 0.340    | 6.877  | 1  | 0.343 | 0.289   | 0.214               | 0.531  |
|                           | Secondary             | -0.565 | 0.432    | 2.118  | 1  | 0.142 | 0.455   | 0.152               | 1.436  |
|                           | Marital status        |        |          | 16.055 | 2  | 0.03  |         |                     |        |
|                           | Married               | 1.371  | 0.502    | 7.458  | 1  | 0.006 | 3.939   | 1.473               | 10.537 |
|                           | Separated             | -0.618 | 0.618    | 0.998  | 1  | 0.318 | 0.539   | 0.160               | 1.812  |
|                           | Constant              | 22.339 | 1125.858 | 0.000  | 1  | 0.998 | 503.598 |                     |        |

**Table 3: Multivariate analysis on the association between uptake of antenatal care services and maternal mortality.**

| Variables in the equation |            | B     | S.E.  | Wald   | df | Sig.  | Exp(B) | 95% C.I. for EXP(B) |       |
|---------------------------|------------|-------|-------|--------|----|-------|--------|---------------------|-------|
|                           |            |       |       |        |    |       |        | Lower               | Upper |
| Step 1 <sup>a</sup>       | ANC uptake | -1.14 | 0.374 | 9.316  | 1  | 0.002 | 3.1    | 0.153               | 0.665 |
|                           |            |       |       |        |    |       | ref    |                     |       |
|                           | Constant   | 3.960 | 0.636 | 38.737 | 1  | 0.000 | 52.463 |                     |       |

#### **Association between uptake of antenatal care services and maternal mortality**

There was a statistical association between the uptake of antenatal care services and maternal mortality when the chi-square test for independence was done ( $\chi^2=10.08, df=1, p=0.001$ ). As indicated in Table 3, Study respondents who never sought antenatal care services were 3.1 times more likely to experience maternal mortality. These findings were in harmony with the qualitative data where one of the key informants noted that:

*“Antenatal care services often include guidance on birth planning and preparation for delivery. Women who attend antenatal care are more likely to deliver with skilled birth attendants in a healthcare facility, where emergency obstetric care is available if complications arise during labor and delivery. This significantly reduces the risk of maternal mortality compared to delivering without skilled assistance.....”*(KII 2, Nurse).

#### **Health facility factors associated with maternal mortality**

In the health facility factor, the following variables were found to be significantly associated with maternal

mortality; utilization of emergency obstetric care ( $\chi^2=5.251, df=1, p=0.02$ ), distance to the health facility ( $\chi^2=11.383, df=2, p=0.003$ ), presence of a referral system and transport services ( $\chi^2=4.74, df=1, p=0.02$ ), the availability of skilled birth attendants

( $\chi^2=6.924, df=1, p=0.009$ ) hence they were imported for multivariate analysis. Maternal mortality was not statistically associated with maternal health education ( $\chi^2=0.678, df=1, p=0.42$ ) and seeking post-partum care ( $\chi^2=0.067, df=1, p=0.79$ ).

**Table 4: Multivariate analysis on health facility factors.**

| Variables in the equation |                                          | B     | S.E.  | Wald   | df | Sig. | Exp(B)  | 95% C.I. for EXP(B) |        |
|---------------------------|------------------------------------------|-------|-------|--------|----|------|---------|---------------------|--------|
|                           |                                          |       |       |        |    |      |         | Lower               | Upper  |
| Step 1 <sup>a</sup>       | Distance to the health facility          |       |       | 11.609 | 2  | .003 |         |                     |        |
|                           | 1-30 mins                                | 1.741 | 1.052 | 2.736  | 1  | .098 | 5.701   | .725                | 44.841 |
|                           | 31-60 mins                               | 1.369 | .435  | 9.883  | 1  | .002 | 3.930   | 1.674               | 9.227  |
|                           |                                          |       |       |        |    |      | ref     |                     |        |
|                           | Referral systems and transport services  | -.904 | .512  | 3.117  | 1  | .077 | .405    | .149                | 1.105  |
|                           |                                          |       |       |        |    |      | ref     |                     |        |
|                           | Presence of skilled health care provider | -.885 | .378  | 5.471  | 1  | .019 | 2.4     | .196                | .866   |
|                           |                                          |       |       |        |    |      | ref     |                     |        |
|                           | Provision of Enmoc                       | -.869 | .383  | 5.161  | 1  | .023 | 2.4     | .198                | .888   |
|                           |                                          |       |       |        |    |      | ref     |                     |        |
|                           | Constant                                 | 5.886 | 1.223 | 23.176 | 1  | .000 | 359.805 |                     |        |

As indicated in Table 4, study respondents who never utilized emergency obstetric and newborn care services were 2.4 times more likely to experience maternal mortality. In addition, study respondents who reported taking 31-60 minutes to reach the nearest health facility were 3.9 times less likely to experience maternal mortality as compared to those who took more than one hour. Furthermore, the unavailability of skilled birth attendants increased the odds of maternal mortality by 2.4.

These findings were in harmony with the qualitative data where one of the key informants narrated that:

*“Skilled birth attendants provide continuity of care throughout the childbirth process, from antenatal care to postnatal care. They monitor the progress of labor, provide emotional support to women in labor, and ensure that appropriate care is provided during the postpartum period, reducing the likelihood of maternal deaths due to untreated complications or inadequate postnatal care.....”*(KII5, Medical doctor).

## DISCUSSION

The prevalence of maternal mortality in Wajir County was 4.2% or a maternal mortality ratio of 4178/100,000 live births from data abstraction tools which is way high compared to the WHO target which calls for a zero maternal mortality rate among pregnant mothers. These findings were contrary to a study carried out in Kenya

where the maternal mortality ratio was low (414/100,000 live births).<sup>15</sup> Study partakers aged 18-23 years were 3.7 more times likely to experience maternal mortality as compared to their counterparts. Adolescents may not seek or have access to adequate prenatal care, which can lead to undetected or untreated medical conditions that increase the risk of complications during pregnancy and childbirth. The results from this study were in agreement with those of a study done in Zambia.<sup>16</sup> Study participants who were earning between 1-10000 Ksh were 5.3 times more likely to experience maternal mortality as compared to those earning between 20001-30000 Ksh. Women with higher incomes may have access to higher-quality healthcare services, including facilities with better infrastructure, medical equipment, and trained healthcare providers. Quality of care is essential for preventing and managing pregnancy complications effectively, ultimately reducing maternal mortality rates. This was contrary to an investigation carried out in Nigeria where income was not associated with maternal mortality.<sup>17</sup>

In addition, study respondents who were married were 3.9 less likely to experience maternal mortality as compared to those who were single. Marriage is often associated with greater economic stability due to shared resources, financial support from a spouse, and access to health insurance coverage. The study findings were in agreement with those of a study done in Ghana.<sup>18</sup> However, another study conducted in Zimbabwe was contrary to these outcomes.<sup>19</sup> Study respondents who never sought antenatal care services were 3.1 times more

likely to experience maternal mortality. Antenatal care visits provide an opportunity for healthcare providers to educate pregnant women about healthy behaviors, proper nutrition, and warning signs of potential complications. This education empowers women to make informed decisions about their health and seek appropriate care when needed, ultimately reducing the risk of maternal mortality. This was contrary to a study done in Namibia which found no association between antenatal care services uptake and maternal mortality.<sup>20</sup> Study respondents who never utilized emergency obstetric and newborn care services were 2.4 times more likely to experience maternal mortality. The utilization of EMONC services is influenced by the availability, accessibility, and quality of care provided at health facilities. Factors such as skilled staffing, availability of essential supplies and equipment, and adherence to evidence-based clinical guidelines can impact the effectiveness of EMONC services in preventing maternal deaths. These findings were in agreement with another study done in Nepal.<sup>21</sup>

Study respondents who reported taking 30-60 minutes to reach the nearest health facility were 3.9 times less likely to experience maternal mortality as compared to those who took more than one hour. Women who live far away from health facilities may face challenges in accessing timely maternal healthcare services, including antenatal care, skilled birth attendance, and emergency obstetric care. Long distances, lack of transportation, and poor road infrastructure can delay or deter women from seeking care when complications arise during pregnancy or childbirth. The study findings were in agreement with a study done in Chad where distance to the health facility was associated with maternal mortality.<sup>22</sup> This was contrary to a study done in Burkina Faso.<sup>23</sup> The unavailability of skilled birth attendants increased the odds of maternal mortality by 2.4. The presence of skilled birth attendants (SBAs) is strongly associated with reduced maternal mortality rates. Skilled birth attendants are trained healthcare professionals, such as midwives, nurses, or doctors, who have the knowledge and skills to manage normal deliveries and identify and manage obstetric complications. The study findings were in agreement with a study done in Lesotho.<sup>24</sup> This was contrary to a study done in Ethiopia.<sup>25</sup>

## CONCLUSION

The prevalence of maternal mortality in Wajir County was 4.2%. Concerning the association between uptake of ANC and maternal mortality, poor uptake of antenatal care services increased the odds of maternal mortality rate. With respect to, social demographic factors associated with maternal mortality; study partakers aged 18-23 years, earning 1-10000 Ksh, increased the odds of maternal mortality while being married reduced the odds of maternal mortality. Lastly, on health facility factors associated with maternal mortality, not utilizing emergency obstetric and newborn care services, and unavailability of skilled birth attendants increased the

odds of maternal mortality while taking 30-60 minutes to reach the nearest health facility reduced the odds.

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