Factors associated with utilization of skilled birth attendance among women of reproductive age in North Horr Sub-County, Northern Kenya, 2021

Qabale Anna Duba[1,&], Elvis Omondi Oyugi[2], Paul Nyongesa[3], Joseph Obiero Ogutu[4]

[1]Kenya Field Epidemiology and Laboratory Training Program, Nairobi, Kenya, [2]National Malaria Program, Ministry of Health (MOH), Nairobi, Kenya, [3]Department of Reproductive Health, Moi University, Eldoret, Kenya, [4]Department of Health and Sanitation, County Government of Siaya

ABSTRACT

Introduction: One of the ways of reducing the maternal mortality ratio (MMR) is through skilled birth attendance. Kenya's Maternal Mortality Ratio (MMR) declined from 362 to 353 deaths per 100,000 live births between 2014 and 2021. However, MMR for Marsabit County has remained high, with 1,127 deaths per 100,000, and only a small proportion of births are conducted by skilled birth attendants. We identified the factors associated with the utilization of skilled birth attendant services in North Horr Sub-County, in arid Northern Kenya. **Methods:** We conducted a cross-sectional study in November–December 2021. A multistage, sampling technique was used to identify women with children aged below 5 years. We interviewed the women using structured questionnaires and performed descriptive statistics. We computed the crude odds ratios (COR) at the bivariate analysis and the adjusted odds ratios (aOR) at the multivariable analysis together with their corresponding 95% confidence intervals (CI), and p-values to identify the factors associated with utilizing skilled birth attendance. We considered factors with $p<0.05$ at the multivariable level as independently associated with the utilization of skilled birth attendants. **Results:** We interviewed 294 women. The mean age was 28.5 years (SD±5.9 years), 46% (135/294) were aged 15–27 years, and 42.2% (124/294) had delivered in a health facility. The mean age was 28.5 years (SD±5.9 years), 46% (135/294) were aged 18–27 years and 42.2% (124/294) had delivered in a health facility and 58.5% (172/294) earned less than Ksh 1,000 (USD 8) as monthly income. A total of 284 (96.6%) were married, 50.3% (148/294) were Muslims, and only 9.25% (27/294) had attended at least four Antenatal Care (ANC) visits. In the logistic regression model for determinants of skilled birth attendance services, being Muslims (aOR 3.86; 95% CI: 2.15–6.91; p=0.000), having a monthly income of more than USD 8 (aOR 2.83; 95% CI: 1.28–6.27; p < 0.05), living near a health facility (aOR 2.39; 95% CI: 1.33 – 4.28, p=0.011), attending four or more ANC visits (aOR 4.18; 95% CI: 1.03 – 17.18; p = 0.045) and being accompanied by husbands (aOR 9.45; 95% CI: 1.84 – 48.34; p =0.007) were independently associated with utilization of skilled birth attendant services. **Conclusion:** The skilled birth attendant coverage remained sub-optimal below the national coverage. Distance to facilities, religion, level of income, number of ANC visits, and being accompanied by a spouse were associated with seeking skilled birth attendant services. There is a need to address gaps in the utilization of skilled birth attendants in arid areas by establishing mobile clinics and conducting outreaches in hard-to-reach areas to cut down on travel time. Advocacy programs should also strengthen male involvement.

&CORRESPONDING AUTHOR
Qabale Anna Duba, Kenya Field Epidemiology and Laboratory Training Program, Nairobi, Kenya.

dubaqabale@gmail.com

Introduction

Nearly 830 maternal deaths occur each day globally as a result of complications associated with pregnancy and childbirth [1]. According to the World Health Organization (WHO), pregnancy-associated complications claimed the lives of almost 303,000 women of reproductive age in 2015 [1,2]. The bulk of maternal deaths–roughly 95% of all maternal deaths–occur in Sub-Saharan Africa and South Asia [3,4]. Nearly 85% of the global burden is shared between the two regions (Sub-Saharan Africa and South Asia), with Africa alone bearing more than 70% of the burden [4].

There have been significant setbacks in lowering maternal deaths in nearly all of the WHO regions, according to the report released by WHO[5]. According to a report by WHO [5], there were declines in maternal mortality between 2000 - 2015 on a national, regional, and international level. However, after 2016, more maternal deaths were reported. After 2016, improvements essentially stopped, or in some cases even reversed [5] Most maternal mortalities occur in the world's poorest regions and countries with active conflicts. Around 70% of all maternal deaths occurred in sub-Saharan Africa in 2020. In nine countries that were experiencing significant humanitarian crises, maternal mortality rates were more than double the global average[2,5].

Hemorrhage, puerperal sepsis, and abortion complications are the most frequent causes of these deaths, whereas indirect non-obstetric causes include tuberculosis, malaria, and HIV/AIDS [6]. According to the WHO, around 80% of all maternal deaths can be avoided completely even in low-income countries [4]. If under the supervision of a skilled professional, 16-33% of maternal deaths can be avoided [7,8]. The possibility of complications turning fatal is decreased by the presence of a trained specialist. Skilled birth attendance during childbirth is known to promote better pregnancy outcomes as well as contribute to maternal and newborn survival [9,10]. At the global stage, skilled attendance during childbirth constitutes 78% of all deliveries [4]. Countries with low utilization of skilled birth attendants are associated with poor maternal health outcomes [11,12].

Despite the deliberate efforts made by the government to improve maternal health, no major drop in maternal mortality trends has been realized in the past 15 years in Kenya. Initiatives such as the Linda Mama Programme, which provides mothers with free maternity care, and Universal Health Coverage have contributed to an increase in the availability of skilled birth attendants in Kenya. Investment in high-impact initiatives to support mother and child health has also been encouraged by the First Lady's Beyond Zero program, however, the proportion of women who give birth assisted by a skilled birth attendant is still very low in the arid and semi-arid areas of the country [13] . Every year, between 6,000 and 8,000 women in Kenya lose their lives while giving birth [14]. According to the Demographic and Health Survey (KDHS) of 2022, the maternal mortality ratio (MMR) for Kenya stands at 355 deaths for every 100,000 live births [13]. Disparities exist in Kenya: 15 of the country's 47 counties account for 99% of all maternal deaths. Nearly half of all maternal deaths among these 15 counties take place in just six counties. Kenya´s Northern region is home to five of the six counties. These counties experience limited access to maternity services presenting Kenya with the biggest obstacle to lowering maternal and newborn mortality.

The introduction of free maternity services and universal health coverage (UHC) in Kenya was expected to increase the utilization of skilled birth services by pregnant women [15]. On the contrary, an estimated 54% of deliveries are not attended to by skilled health professionals [8]. Due to the low utilization of skilled birth attendants, Marsabit County records 1,127 deaths per 100,000 live births, making the MMR for Marsabit County three times that of Kenya [16]. Home deliveries are still widespread in Kenya, despite the government's efforts to promote hospital deliveries. Compared to urban areas, the prevalence is higher in rural areas. According to the Kenya National Bureau of Statistics (KNBS) & ICF Macro, Marsabit County continues to rank among Kenya's lowest three counties with the fewest skilled deliveries, with about 40.7% of all births taking place at home [14]. Among the six sub-counties in Marsabit, North Horr, and Saku Sub-Counties had the lowest (26%) and highest (95%) percentages of pregnant women who had skilled birth in 2018 respectively [17]. We conducted this study to identify the factors that were associated with the use of skilled birth attendance services among the women in North Horr Sub-County, Marsabit County.

Methods

Study design and setting

This was a community-based cross-sectional study design conducted in North Horr Sub-County from November 2021 through December 2021. North Horr Sub-County comprises five administrative wards: Turbi, Maikona, North-Horr, Illret, and Dukana. According to the 2019 population census, the North-Horr Sub-County had a population of 71,447 (41,719 male and 29,726 female) of which an estimated 7,356 are women of childbearing age (15-49) years [18]. The Sub-County has 23 health facilities including hospitals, health centers, and dispensaries. North Horr Sub-County falls under arid and semi-arid areas in the northern region of Kenya with most of the residents being nomadic pastoralists (Figure 1).

Study population

The study population was women who were aged between 18-49 years from Turbi Ward, North Horr Sub-County. Only women who had at least one birth within the previous five years and had been a resident of Turbi Ward for not less than five years before the study were included. Women who declined to provide verbal or written informed consent or who were not able to respond were excluded. The study population was only limited to the biological parent (mother) of the child upon confirmation from the community health volunteer (CHP) and by asking the mother herself.

Sample size determination

We used the Fisher et al, formula [19, 20]to estimate the sample size required for the study. Assuming skilled birth attendance coverage of 25.8% for Turbi Ward, and a 5% level of precision the minimum sample size was 294 participants.

Sampling procedures

We used a multistage sampling technique to select the study participants (Figure 2). First, we ranked the wards in North Horr Sub-County and selected the ward (Turbi) which had the lowest coverage of Skilled Birth Attendance. All the 30 villages in Turbi Ward were included. We then calculated the sample size for each village based on the proportion of women of reproductive age (15-49 Years) with the lowest number of households assigned to a village being six households and the maximum being twelve households. The households were then selected using a simple random sampling technique. With the help of the Community Health Volunteers (CHVs), we determined the central point of each village during data collection. The first household to be visited and the direction of movement was determined by spinning a pen. The nearest household in the direction of the tip of the pen was used as the first household for the interview. The subsequent households were then selected using a simple random sampling technique until the desired sample size was arrived at. Where the selected household did not have an eligible study participant, or the household members were absent or declined to participate in the study, the closest neighboring household with an eligible participant was visited. However, the eldest participant was selected when a household had more than one eligible participant.

Data collection

We collected data from the study participants using a pretested structured questionnaire. The questionnaire was first created in English before being translated into the local Gabra language. We gathered information on the sociodemographic characteristics of the participants, antenatal care (ANC) attendance, the place of delivery, and the factors associated with the utilization of skilled birth attendant () services. The pre-testing of the questionnaire took place in the Shegel Location of Maikona Ward, which shared many similarities with the study area.

Data management and analysis

The collected data were entered into the Epi-info version 7.2.3 database for cleaning and analysis. Data cleaning was done by checking and correcting for duplicates and wrong entries. For the descriptive statistics, we summarized the respondents' demographic characteristics as frequencies (N) and percentages (%) for categorical data and mean and median (IQR) for continuous data. The utilization of skilled birth attendants (which was defined as giving birth assisted by a healthcare provider with midwifery skills) was the outcome of interest for the bivariate and multivariable analysis. In the bivariate analysis, we assessed the relationship between the utilization of skilled birth attendants and the sociodemographic and reproductive health characteristics of the study participants and calculated the crude odds ratios (COR). The variables that had a Chi-square test of $p < 0.05$ at the bivariate analysis were taken to the multivariable analysis where a forward stepwise selection logistic regression method was used to identify factors independently associated with the utilization of skilled birth attendant services. At the multivariable analysis, we computed the adjusted odds ratios (aOR) of utilizing skilled birth attendants among women with each variable of interest compared to the reference group and also presented the 95% confidence intervals (CI), and p-values for each. Those variables with $p < 0.05$ were retained in the final model and considered significantly associated with the utilization of skilled birth attendant services.

Ethical considerations

We obtained approval for the study from the Ethical Review Committee of Moi University/Moi Teaching and Referral Hospital (MU-MTRH IREC), approval number FAN:0003658. The participants were informed of the study's objective and methods before data collection, and their participation was gained by having them sign an informed consent form. The respondents were also guaranteed their voluntary participation and had complete freedom to quit at any time. By not giving any information gathered to a third party and removing personal identifiers during analysis, data confidentiality was carefully upheld.

Results

Socio-demographic and reproductive health characteristics

A total of 294 respondents were interviewed. The mean age of the respondents was 28.5 years (Standard Deviation±5.89 years), approximately 46.1% (135/294) were aged between 18 - 27 years, and 58.5% (172/294) earned less than Ksh 1,000 as monthly income. A total of 284 (96.6%) were married, 50.3% (148/294) were Muslims, only 9.3% (27/294) had attended at least four Antenatal Care (ANC) visits and 8.8% (26/294) had attained at least basic/primary-level education. In addition, most of the women 90.8% (267/294) had two or more children (**Table 1**).

Utilization of skilled birth attendant delivery services

In this study, 124 (42.2%) of the women gave their last birth at a health facility under the care of skilled birth attendants. However, of the 57.8% (170/294) unskilled deliveries, 88.8% were conducted by traditional birth attendants (TBAs) whereas 2.9% gave birth on their own/unassisted (**Figure 3**).

Factors associated with the utilization of skilled birth attendant services

The results in **Table 2** show the factors associated with the utilization of skilled birth attendant services in the study area. According to the findings, women who identified as Muslims were more likely than non-Muslim women (Christians) to use skilled birth attendant services (COR 3.47; 95% CI: 2.12 - 5.67; p<0.01). Similarly, women who reported having a monthly income of more than Ksh 1,000 (USD 8) had higher odds of utilizing skilled birth attendant services (COR 3.71; 95% CI: 2.01 - 6.86; p < 0.05). Other factors that were associated with the utilization of skilled birth attendant services at the bivariate level included; living less than 10 Kilometers from a health facility (COR 3.71; 95% CI: 2.26 - 6.07; p < 0.01), attending four or more ANC visits (COR 12.89; 95% CI: 3.77 - 43.87; p < 0.01) and being accompanied by husbands (COR 5.59; 95% CI: 2.32 - 13.45; p < 0.01).

In the logistic regression model for factors associated with utilization of skilled birth attendance services, being Muslims (aOR 3.86; 95% CI: 2.15-6.91; p<0.01), having a monthly income of more than USD 8 (aOR 2.83; 95% CI: 1.28-6.27; p < 0.05), living less than 10 km from a health facility (aOR 2.39; 95% CI: 1.33 - 4.28, p < 0.01), attending four or more ANC visits (aOR 4.18; 95% CI: 1.03 - 17.18; p < 0.05) and being accompanied by husbands during clinic visits (aOR 9.45; 95% CI: 1.84 - 48.34; p < 0.05) were independently associated with accessing skilled birth attendant services (**Table 2**).

Discussion

We found that the coverage of skilled birth attendance was 42.2%. Having a monthly income of above Ksh 1000, having attended more than four ANC visits, and living less than 10 kilometers from a health facility were associated with the utilization of skilled birth attendance among women. The utilization of skilled birth attendant services during delivery in the study area has significantly improved from 26% in 2018 [**21**] to 42.2% in 2022 as observed in the current study. The observed improvement over time could be attributed to the efforts and interventions initiated by the Ministry of Health, the county government, and other development partners towards the implementation of free delivery policy and in achieving universal health coverage (UHC) of which maternal and child health is among the six key programmatic areas [**22**].

There was an association between living less than 10 kilometers from a medical facility and a higher chance of using skilled birth attendant services. According to this study, women who lived less than 10 kilometers from a hospital had a twice as high likelihood of using skilled birth attendant services during childbirth than women who resided more than 10 kilometers away. This may be because one of the well-known obstacles to accessing healthcare, particularly in developing countries, is the distance to a medical facility. Living away from a health facility comes with both direct and indirect costs, including time and transportation expenses. The results are consistent with comparable earlier studies showing that a mother's decision to use a trained birth attendant at delivery is greatly influenced by the distance to a medical facility [**8**,**23-25**]. Distance to the nearest health facility is still a problem in the study area albeit this. To access skilled birth attendant services, over 80% of the respondents had to travel more than the recommended 5-kilometer radius to seek skilled birth attendant services.

According to this study, having more than four ANC visits was linked to higher-skilled birth attendant use during delivery. Compared to women who had attended fewer ANC visits, those who had attended four or more were 4 times as likely to use skilled birth attendant services during delivery. Studies carried out in Ethiopia, Kenya, Tanzania, and Sierra Leone showed similar findings [**8**,**11**,**23**,**25**]. This finding bolsters the idea that ANC is a crucial foundation for safe motherhood since it provides access to professional care and a host of other vital services that promote the mother's and baby's health. The latest WHO recommendations require women from developing countries to have a minimum of eight (8) ANC visits [**26**].

We noted a strong association between religion and the utilization of skilled birth attendant services. Compared to Christian women, Muslim women were more likely to use skilled birth attendant services at delivery. Due to their strong predisposition towards adhering to traditional beliefs, customs, and practices, studies have shown that women who are traditionalists are less likely to use skilled birth services [27-30]. However, to explore the causes of the religious differences in skilled birth attendant utilization, we advise conducting additional research utilizing a qualitative research approach since this is still a grey area.

The study revealed that women with monthly household incomes exceeding Ksh 1000 (USD 8) were more likely to utilize skilled birth attendant services than those with lower incomes. There could be several reasons for this, including financial difficulties stemming from the need to pay for extra supplies required during the delivery process and transport the mother to a health facility, or a lack of support for receiving skilled birth attendants because the poorest have other household or family responsibilities. In public health institutions in Kenya, skilled birth delivery services are provided without charge [31]; however, mothers may be required to purchase supplies that are not on hand at the moment of delivery. Sometimes these expenses surpass the direct cost of the service, which results in low utilization.

A key indicator that is substantially and strongly associated with women's use of skilled birth attendant services during childbirth is husbands' attendance at their wives' ANC visits. Our analysis confirms the results of earlier research [32-33] by demonstrating that women who had their husbands accompany them to the ANC clinic and during delivery had nine times higher odds of using skilled birth attendant services at birth than women who did not have their husbands with them. One possible explanation for this could be that men who accompany their to the ANC are more likely than men who do not to debate and decide together with their wives on the birth plan. The use of SBAs during childbirth may be aided by the concern of male partners and the presence of open communication between partners. This underscores the notion that a woman's social cycle, particularly her partner influences her decision to use the skilled birth attendant services.

Limitations of the study

This study was not without limitations. There was a possibility of recall and reporting bias. Social desirability may have occurred through the use of research assistants who were well-known to the community in the data collection process. Although this is acknowledged, we believe that the utilization of community members fostered a trusting environment among respondents, which enabled genuine responses.

Conclusion

Even though skilled birth attendance is free at government health facilities, the proportion of women using it is still very low. One of the main barriers preventing women from getting skilled birth attendant services during childbirth is the distance to health facilities. To provide pregnant women with access to skilled delivery, the stakeholders should consider the construction of additional health facilities and outreach programs, particularly in the vast region of the North Horr sub-county. Due consideration should also be made to educating the public about husbands' participation in ANC visits as there is a substantial association between their involvement and women's use of skilled birth attendants s during childbirth. This can be through the media, religious authorities, and community leaders.

What is known about this topic

The utilization of skilled birth attendance services is still very low in many developing countries

- Distance to the health facility, family income, number of ANC visits made, and level of education are some of the determinants of utilization of skilled birth attendant services.

What this study adds

- According to this study, women who had their spouses with them both at the ANC clinic and during childbirth were more likely to use skilled birth attendant services than women who did not have their husbands with them. Public education regarding spouses' engagement in ANC visits should be a priority for all programs that promote reproductive health and well-being.
- This study also noted an association between religion and the utilization of skilled birth attendant services. Muslim women were more likely to use skilled birth attendant services at delivery compared to those who were Christians.

Competing interests

The authors declare no competing interests.

Authors´ contributions

Conceptualization and design: QAD, EOO, PN and JOO. Data Collection: QAD, JOO and EOO. Analysis,

and Interpretation: QAD, JOO, PN, and EOO. Drafting and Review of Manuscript: QAD, JOO, EOO, and PN. All the authors reviewed and approved the final manuscript.

Acknowledgements

Table and figures

Table 1: Socio-demographic and reproductive health characteristics of the study participants, North Horr Sub-County Northern Kenya, 2021
Table 2: Factors associated with the utilization skilled birth attendance services among women of reproductive age, North Horr Sub-County, Northern Kenya, 2021
Figure 1: Map showing the study area and distribution of health facilities, Marsabit County, Kenya, 2021
Figure 2: Schematic presentation of the sampling procedure
Figure 3: Place of delivery and nature of assistance received during delivery

References

1. WHO Regional Office for Africa. Maternal Health [Internet]. Brazzaville (Congo): WHO Regional Office for Africa; c2024 [cited 2024 Sep 9].

2. United Nations Children's Fund. Maternal mortality [Internet]. New York (NY): United Nations Children´s Fund; c2024 [cited 2024 Sep 9].

3. Samuel O, Zewotir T, North D. Decomposing the urban-rural inequalities in the utilisation of maternal health care services: evidence from 27 selected countries in Sub-Saharan Africa . Reprod Health [Internet]. 2021 Oct 30 [cited 2024 Sep 9];18(1):216. https://doi.org/10.1186/s12978-021-01268-8 PubMed | Google Scholar

4. World Health Organization. Maternal mortality [Internet]. Geneva (Switzerland): World Health Organization; 2024 Apr 26 [cited 2024 Sep 9].

5. World Health Organization. Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division[Internet]. Geneva (Switzerland): World Health Organization; 2023 Feb 22 [cited 2024 Sep 9]. 86 p.

6. Musarandega R, Nyakura M, Machekano R, Pattinson R, Munjanja SP. Causes of maternal mortality in Sub-Saharan Africa: A systematic review of studies published from 2015 to 2020 . J Glob Health [Internet]. 2021 Oct 9 [cited 2024 Sep 9]; 11:04048. https://doi.org/10.7189/jogh.11.04048 PubMed | Google Scholar

7. Callister LC. Global maternal mortality: contributing factors and strategies for change . MCN Am J Matern Child Nurs [Internet]. 2005 May [cited 2024 Sep 9];30(3):184-92. https://doi.org/10.1097/00005721-200505000-00006 Purchase or subscription required to access full text. Google Scholar

8. Nyongesa C, Xu X, Hall JJ, Macharia WM, Yego F, Hall B. Factors influencing choice of skilled birth attendance at ANC: evidence from the Kenya demographic health survey . BMC Pregnancy Childbirth [Internet]. 2018 Apr 10 [cited 2024 Sep 9];18(1):88. https://doi.org/10.1186/s12884-018-1727-z PubMed | Google Scholar

9. Gülmezoglu AM, Lawrie TA, Hezelgrave N, Oladapo OT, Souza JP, Gielen M, Lawn JE, Bahl R, Althabe F, Colaci D, Hofmeyr GJ. Interventions to Reduce Maternal and Newborn Morbidity and Mortality . In: Black RE, Laxminarayan R, Temmerman M, Walker N, editors. Disease control priorities: Reproductive, maternal, newborn, and child health [Internet]. 3rd ed. Washington (DC): World Bank; 2016 Apr 6 [cited 2024 Sep 24]. 397 p. (Disease Control Priorities; vol. 2). https://doi.org/10.1596/978-1-4648-0348-2_ch7 Download pdf to view full text.

10. Talon PY, Saizonou J, Kpozèhouen A, Zannou RF, Ouendo EM. Trends in the utilisation of skilled birth attendance among pregnant women in Benin, from 2001 to 2017-2018, and projections to 2030 . BMC Public Health [Internet]. 2023 May 12 [cited 2024 Sep 9];23(1):874. https://doi.org/1186/s12889-023-15460-x PubMed | Google Scholar

11. Ameyaw EK, Dickson KS. Skilled birth attendance in Sierra Leone, Niger, and Mali: analysis of demographic and health surveys . BMC Public Health [Internet]. 2020 Feb 3 [cited 2024 Sep 9];20(1):164. https://doi.org/10.1186/s12889-020-8258-z PubMed | Google Scholar

12. World Health Organization. Trends in maternal mortality: 1990 to 2015: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division [Internet]. Geneva (Switzerland): World Health Organization; 2015 Nov 12[cited 2024 Sep 9]. 80 p. Download pdf to view full text.

13. Kenya National Bureau of Statistics, ICF. Kenya Demographic and Health Survey 2022: Key Indicators Report [Internet]. Nairobi (Kenya): Kenya National Bureau of Statistics; 2023[cited 2024 Sep 9]. 95 p. Download PR143.pdf.

14. United Nations Population Fund. Kenya needs greater investments in midwifery for life-saving maternity care [Internet]. New York (NY): United Nations Population Fund; 2021 May 7 [cited 2024 Sep 10].

15. Njuguna J, Kamau N, Muruka C. **Impact of free delivery policy on utilization of maternal health services in county referral hospitals in Kenya** . BMC Health Serv Res [Internet]. 2017 Jun 21 [cited 2024 Sep 9];17(1):429. **https://doi.org/10.1186/s12913-017-2376-z PubMed** | **Google Scholar**

16. United Nations Development Programme. **Addressing maternal health challenges through community-led human rights approaches** [Internet]. New York (NY): United Nations Development Programme; 2019 Jul 11 [cited 2024 Sep 9].

17. Ministry of Health (Kenya). **KHIS Aggregate** [Internet]. Nairobi (Kenya): Ministry of Health; 2019 [cited 2024 Sep 10]. Credentials required to access site.

18. Kenya National Bureau of Statistics. **2019 Kenya Population and Housing Census Volume I: Population by County and Sub-County** [Internet]. Nairobi (Kenya): Kenya National Bureau of Statistics; 2019 [cited 2024 Sep 10]. 38 p. Download pdf to view full text.

19. Charan J, Biswas T. **How to calculate sample size for different study designs in medical research?** How to calculate sample size for different study designs in medical research? Indian J Psychol Med [Internet]. 2021 Nov 15 [cited 2024 Sep 11];35(2):121-6. **https://doi.org/10.4103/0253-7176.116232 PubMed** | **Google Scholar**

20. Althubaiti A. **Sample size determination: A practical guide for health researchers** . J Gen Fam Med [Internet]. 2022 Dec 14 [cited 2024 Sep 11];24(2):72-8. **https://doi.org/10.1002/jgf2.600 PubMed** | **Google Scholar**

21. **County Governments At The Centre of Achieving Universal Health Care** [Internet]. Nairobi (Kenya): Vision 2030 (KE); 2018 Sep 12 [cited 2024 Sep 9]. **Google Scholar**

22. Ayalew HG, Assefa KT, Desalegn SY, Mesele TT, Anteneh TA, Tibebu NS, Liyew AM. **Individual and community-level determinants of skilled birth attendant delivery in Ethiopia; multilevel analysis** . Shallo SA, editor. PLoS One [Internet]. 2023 Aug 1 [cited 2024 Sep 9];18(8):e0289145. **https://doi.org/10.1371/journal.pone.0289145 PubMed** | **Google Scholar**

23. Taye BT, Zerihun MS, Kitaw TM, Demisse TL, Worku SA, Fitie GW, Ambaw YL, Amare NS, Behulu GK, Ferede AA, Kebede AA. **Women´s traditional birth attendant utilization at birth and its associated factors in Angolella Tara, Ethiopia**. PLoS One[Internet]. 2022 Nov 11 [cited 2024 Sep 9];17(11):e0277504. **https://doi.org/10.1371/journal.pone.0277504 PubMed** | **Google Scholar**

24. Damian DJ, Tibelerwa JY, John B, Philemon R, Mahande MJ, Msuya SE. **Factors influencing utilization of skilled birth attendant during childbirth in the Southern highlands, Tanzania: a multilevel analysis** . BMC Pregnancy Childbirth [Internet]. 2020 Jul 25 [cited 2024 Sep 9];20(1):420. **https://doi.org/10.1186/s12884-020-03110-8 PubMed** | **Google Scholar**

25. World Health Organization. **New guidelines on antenatal care for a positive pregnancy experience** [Internet]. Geneva (Switzerland): World Health Organization; 2016 Nov 7 [cited 2024 Sep 9].

26. Yaya S, Zegeye B, Ahinkorah BO, Seidu AA, Ameyaw EK, Adjei NK, Shibre G. **Predictors of skilled birth attendance among married women in Cameroon: further analysis of 2018 Cameroon Demographic and Health Survey** . Reprod Health [Internet]. 2021 Mar 25 [cited 2024 Sep 9];18(1):70. **https://doi.org/10.1186/s12978-021-01124-9 PubMed** | **Google Scholar**

27. Aziato L, Odai PNA, Omenyo CN. **Religious beliefs and practices in pregnancy and labour: an inductive qualitative study among post-partum women in Ghana** . BMC Pregnancy Childbirth [Internet]. 2016 Jun 6 [cited 2024 Sep 9];16(1):138. **https://doi.org/10.1186/s12884-016-0920-1 PubMed** | **Google Scholar**

28. Ayele GS, Melku AT, Belda SS. **Utilization of skilled birth attendant at birth and associated factors among women who gave birth in the last 24 months preceding the survey in Gura Dhamole Woreda, Bale zone, southeast Ethiopia** . BMC Public Health [Internet]. 2019 Nov 11 [cited 2024 Sep 9];19(1):1501. **https://doi.org/10.1186/s12889-019-7818-6 PubMed** | **Google Scholar**

29. Tarekegn W, Tsegaye S, Berhane Y. **Skilled birth attendant utilization trends, determinant and inequality gaps in Ethiopia** . BMC Women´s Health [Internet]. 2022 Nov 22 [cited 2024 Sep 9];22(1):466. **https://doi.org/10.1186/s12905-022-01995-5 PubMed** | **Google Scholar**

30. Oyugi B, Nizalova O, Kendall S, Peckham S. **Does a free maternity policy in Kenya work? Impact and cost-benefit consideration based on demographic health survey data** . Eur J Health Econ [Internet]. 2023 Feb 13[cited 2024 Sep 9];25(1):77-89. **https://doi.org/10.1007/s10198-023-01575-w PubMed** | **Google Scholar**

31. Odeny B, McGrath CJ, Langat A, Pintye J, Singa B, Kinuthia J, Katana A, Ng´ang´a L, John-Stewart G. **Male partner antenatal clinic attendance is associated with increased uptake of maternal health services and infant BCG immunization: a national survey in Kenya** . BMC Pregnancy Childbirth [Internet]. 2019 Aug 8[cited 2024 Sep 9];19(1):284. **https://doi.org/10.1186/s12884-019-2438-9 PubMed** | **Google Scholar**

32. Teklesilasie W, Deressa W. **Husbands´ involvement in antenatal care and its association with women´s utilization of skilled birth attendants in Sidama zone, Ethiopia: a prospective cohort study** . BMC Pregnancy Childbirth [Internet]. 2018 Aug 3 [cited 2024 Sep 9];18(1):315. **https://doi.org/10.1186/s12884-018-1954-3 PubMed** | **Google Scholar**

33. Mohammed BH, Johnston JM, Vackova D, Hassen SM, Yi H. The role of male partner in utilization of maternal health care services in Ethiopia: a community-based couple study . BMC Pregnancy Childbirth [Internet]. 2019 Jan 14 [cited 2024 Sep 9];19(1):28. https://doi.org/10.1186/s12884-019-2176-z PubMed | Google Scholar

Characteristic (Variable)	Frequency (n=294)	Percent (%)
Table 1: Socio-demographic and reproductive health characteristics of the study participants, North Horr Sub-County Northern Kenya, 2021		
Age (Years)		
18 – 27	135	45.92
28 – 37	132	44.90
38 – 49	27	9.18
Marital Status		
Married	284	96.6
Widowed	7	2.38
Divorced	1	0.34
Single	1	0.34
Separated	1	0.34
Parity		
One	27	9.18
Two	88	29.93
Three	79	26.87
More than three	100	34.01
Religion		
Muslim	148	50.34
Christian	142	48.3
Others	4	1.34
Maternal Level of Education		
No Formal Education	263	89.46
Primary Level	26	8.84
Secondary Level	3	1.02
Tertiary Level	2	0.68
Maternal Occupation		
Housewife	272	92.52
Business	19	6.46
Teacher	2	0.68
Police Officer	1	0.34
Monthly Income		
Less than Ksh 1,000	172	58.5
Ksh 1,000-5,000	45	15.31
Above Ksh 5,000	15	5.1
No income	62	21.09
Number of ANC Visits Made		
1	205	70.21
3	48	16.44
≥ 4	27	9.25
Missing	12	4.11
Distance to the nearest health facility		
Above 10KM	141	47.96
5KM-10KM	95	32.31
1KM-5KM	46	15.65
Less than 1 KM	12	4.08

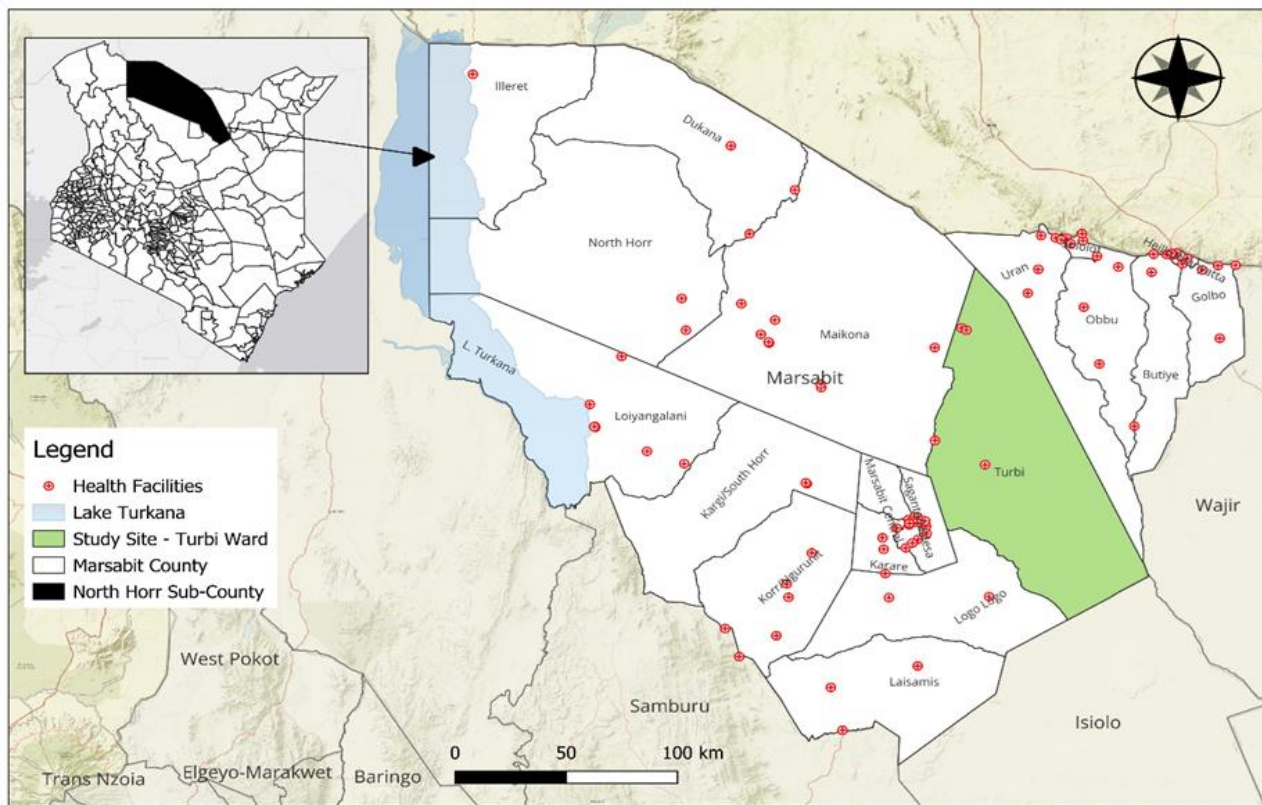| Characteristic/Variable	Skilled Birth		Bivariate Analysis		Multivariable Analysis	
Table 2: Factors associated with the utilization of skilled birth attendance services among women of reproductive age, North Horr Sub-County, Northern Kenya, 2021						
	Yes	No	Crude OR (95% C.I)	P-Value	Adjusted OR (95%C. I)	P-Value
Age (Years)						
≥30	44	61	1.03(0.63 – 1.67)	0.914		
< 30	80	108	Ref			
Marital Status						
Single	3	7	1.72(0.44 – 6.84)	0.527		
Married	121	163				
Parity						
> 3	47	53	0.74(0.46 – 1.21)	0.229		
≤ 3	77	117	Ref			
Religion						
Muslim	41	107	3.47(2.12 – 5.67)	<0.001	3.86(2.15 – 6.91)	<0.001
Christian	81	61	Ref			
Maternal Level of Education						
No Formal Education	17	14	1.77(0.84 – 3.74)	0.131		
Some education	107	156	Ref			
Maternal Occupation						
Unemployed	13	8	2.54(0.95 – 5.88)	0.593		
Employed	111	161	Ref			
Monthly Income						
< Ksh 1,000	52	120	Ref			
None	35	27	1.24(0.60 – 2.56)	0.558	0.90(0.36 – 2.26)	0.827
≥ Ksh 1,000	37	23	3.71(2.01 – 6.86)	<0.001	2.83(1.28 – 6.27)	0.011
Means of transport						
By foot	62	70	0.75(0.47 – 1.22)	0.247		
Vehicle	6	16	1.78(0.66 – 4.82)	0.259		
Motorbike	56	84	Ref			
Distance to the nearest H/F						
< 10KM	87	66	3.71 (2.26 – 6.07)	<0.001	2.39(1.33 – 4.28)	0.001
> 10KM	37	104				
Accompanied by the husband to the clinic						
Yes	100	163	5.59(2.32 – 13.45)	<0.001	9.45(1.84 – 48.34)	0.007
No	24	7	Ref			
Ever used family planning before						
No	91	137	1.46(0.83 – 2.55)	0.186		
Yes	31	32	Ref	`		
Is this your First Pregnancy						
Yes	9	12	1.02(0.42 – 2.51)	0.959		
No	115	157	Ref			
Number of ANC Visits						
≥ 4	24	3	12.89(3.77 – 43.87)	<0.001	4.18 (1.03 – 17.18)	0.045
< 4	97	156	Ref		Ref	

Figure 1: Map showing the study area and distribution of health facilities, Marsabit County, Kenya, 2021
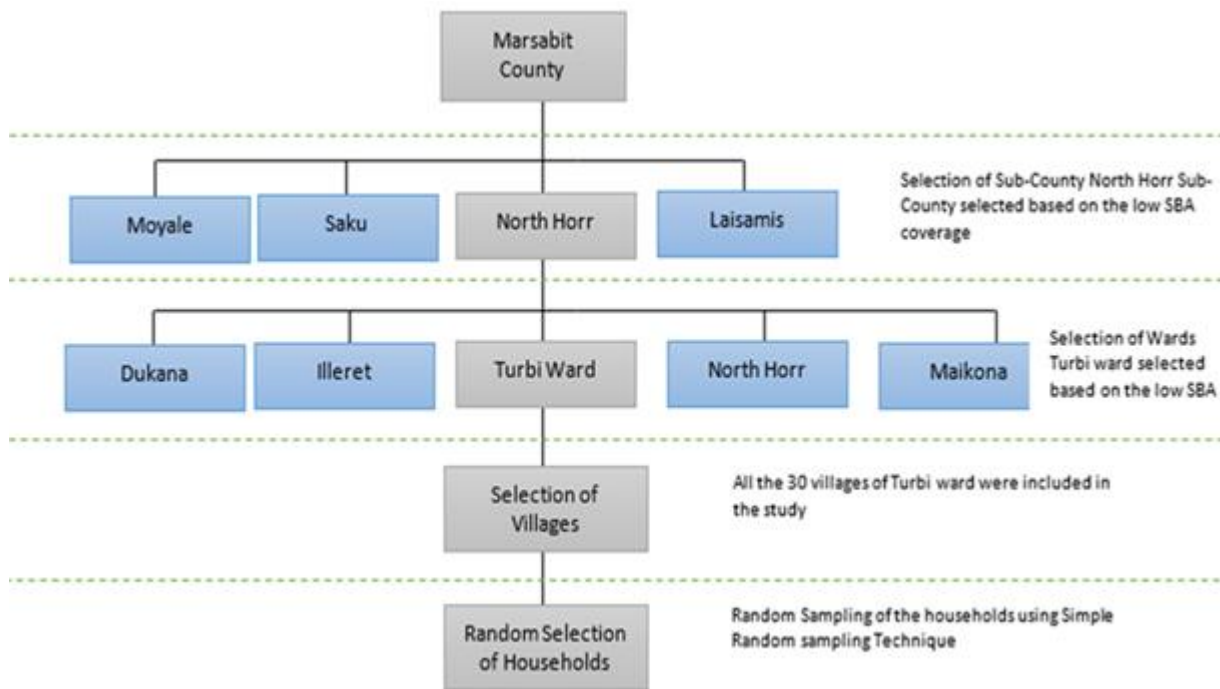
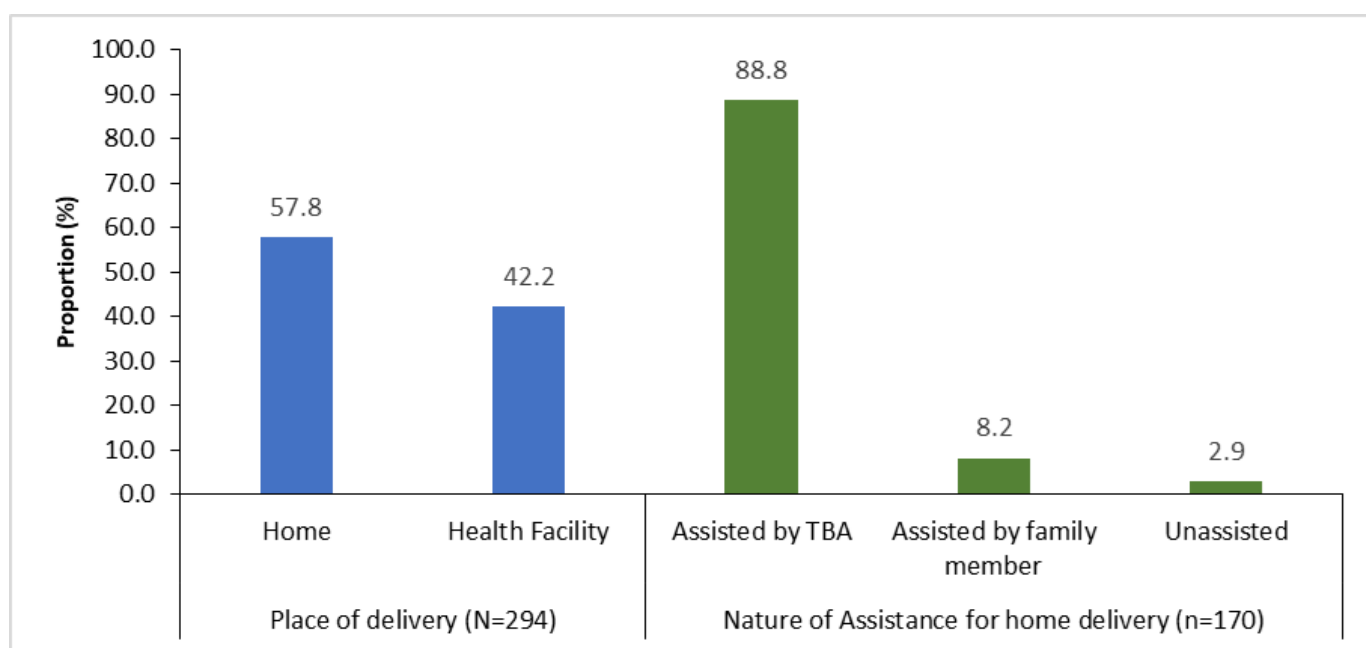**Figure 2:** Schematic presentation of the sampling procedure

Figure 3: Place of delivery and nature of assistance received during delivery