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Maternal Death Self-Risk Perception as a Predictor of Women's Delivery Site Preferences in Ile-Ife, Nigeria

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ABSTRACT

Background: Increased uptake of health facility delivery could improve the worsening maternal mortality in low and middle-income countries. Several factors that determine women's preferred delivery site had been reported in the literature, but none had explored women's self-perception of maternal death as a predictor of their delivery site, hence this study.

Subjects and Method: A cross-sectional study of 183 women recruited serially at the immunization clinic of two primary health facilities in Ile-Ife, Nigeria. Data was obtained using an interviewer-administered questionnaire. Their maternal death self-risk perception score by type of delivery site was determined with a minimum and maximum obtainable score of 7 and 35. Descriptive and inferential statistical analysis was done including a simple and multiple binary logistic regression.

Results: The mean age of the respondents (Mean= 29; SD= 5.26). About 130 (71.0%) of the women delivered at a health facility. The majority of the women (91.8%) were aware of maternal death, while 32 (17.5%) feared death in their last pregnancy, with a mean maternal death self-risk perception score ((Mean= 24.96; SD= 2.69) (95% CI= 24.55 to 25.33)). The higher the maternal death self-risk perception score, the greater the odds of a facility-based delivery (AOR=1.40, 95% CI=1.20 to 1.64, p<0.001). However, alongside other confounding variables, only a facility-based ANC registration (AOR= 607.52, 95% CI= 1.39 to 2.66*10^5, p=0.039) and women's personal reasons (AOR=0.02; 95%CI= 0.01 to 0.51; p=0.018) significantly influenced delivering at a health facility and non-health facility respectively.

Conclusion: The place of ANC registration and personal reasons such as the women's influential decision-makers better predicted their eventual delivery site. Nonetheless, the development and standardization of maternal death self-risk perception criteria for women is encouraged.

Keywords: delivery site, childbirth, maternal health, risk perception, maternal death.

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BACKGROUND

Globally in 2020, about 800 women died every day due to pregnancy-related causes with sub-Saharan Africa accounting for 70% of global maternal deaths having reported 206,000 maternal deaths (WHO, 2023). Women in sub-Saharan Africa (SSA) had a 1 in 41 lifetime risk of maternal death in 2020. Nigeria, a lower middle-income country (LMIC) in SSA had 82,000 maternal deaths with an estimated maternal mortality ratio (MMR) of 1,047 per 100,000 livebirths, accounting for 28.5% of global maternal deaths in 2020 (Dauda, 2023; WHO, 2023). These figures ranked Nigeria third of countries with extremely high MMR in SSA. According to the 2023 Fragile States Index, Nigeria with a score of 98 out of 120 ranked the 15th country on alert for conflicts that could hinder progress towards reducing the burden of maternal deaths (WHO, 2019b). Nigerian women now have a 1 in 19 lifetime risk of maternal death and are 200 times more likely to experience maternal death compared to their counterparts in Sweden and more developed countries (Olonade et al., 2019; WHO, 2019a).

Perinatal and maternal deaths are inextricably linked events in a complicated delivery process which may be secondary to issues with the place of delivery. A meta-analysis of a population cohort study showed that the risk of perinatal deaths was higher with home deliveries compared with facility deliveries, though it was the inverse for maternal mortalities possibly from referred complicated cases (Chinkhumba et al., 2014). Delivering at a health facility by a skilled birth attendant (SBA) is critical and can reduce maternal deaths by 16% to 33% (Graham et al., 2001; Girum and Wasie, 2017), and avert intrapartum stillbirths by 75% (Yakoob et al., 2011).

Increasing women's right to quality skilled attendants during pregnancy and childbirth has been part of global efforts at reducing maternal mortality (WHO, 2018). This should be achieved with increased institutional delivery.

However, there has been low institutional delivery in SSA. In 2022, 69.6% of births were attended to by SBA in SSA (United Nations Children's Fund, 2020; WHO, 2023). It was estimated that by 2030, 19 million births will not be attended by a SBA in Africa (United Nations Children's Fund, 2020). A trend analysis of health facility delivery in SSA across 27 countries from 1990 to 2014, showed an increase from 44% to 57% (Udo and Doctor, 2016). A similar analysis in Nigeria over a decade based on the Nigeria Demographic Health Surveys (NDHS) from 2003 to 2013 showed no significant improvement over the study period (Udo and Doctor, 2016). In Nigeria, 39% of births were delivered in a health facility in 2018, with 43% by a SBA (National Population Commission (NPC) Nigeria and ICF, 2019). According to the World Health Organization, 50.7% of deliveries were attended to by a SBA in Nigeria in 2022 (WHO, 2023).

Several authors have investigated factors predicting women's delivery site preferences and found that facility-based delivery is a complex issue influenced by the woman's characteristics, her social circle, her immediate community, poor access to health facilities, and related contextual issues in her residential country (Moyer and Mustafa, 2013). Other factors include perceived low quality of care and negative health worker attitude, antenatal clinic attendance and previous place of delivery (Moyer and Mus-tafa, 2013; Bohren et al., 2014; Mekie and Taklual, 2019; Johnson et al., 2020; Xu et al., 2022).

Evidence in the literature assessed women's awareness and knowledge of maternal death (Mayekiso et al., 2020). A few others assessed their maternal death risk perceptions and factors associated with this(Alemu

et al., 2022; Sadore, Kebede and Birhanu, 2023). However, studies assessing women's self-risk assessment of maternal death and how this influenced their choice of delivery site are sparse in the literature. Our study explored women's self-risk assessment of maternal death as a predictor of their eventual delivery or birthing site. Findings from our study could inform policies on obstetric risk communication and assisting pregnant women conduct their maternal death self-risk assessment. Hopefully, these may influence their choice for health facility delivery amidst other predictors of institutional delivery.

SUBJECTS AND METHOD

1. Study Design
The study was cross-sectional in design and conducted at two comprehensive health care (CHC) facilities (Eleyele and Enuwa) in Ife Central Local Government Area of Osun state, South-west, Nigeria. These facilities were selected purposively being the two with the highest volume of clientele at their immunization clinics in the LGA. The study was conducted in January 2020.

2. Population and Sample
The study population were women who gave birth nine months before the study and brought their children for vaccination at these facilities. A sample size of 194 was determined using the one sample proportion test in Stata with a 91.6% proportion of women who had health facility delivery in Osun state according to the 2018 NDHS, a 95% confidence limit and 80% power. Serial recruitment of the women was done at the immunization clinics.

3. Study Variables
The women's socio-demographic profile, socioeconomic profile, reproductive health history, pregnancy and delivery site experiences for the index baby were assessed as independent variables. Their perception of

the risks of a possible maternal death event during the pregnancy and delivery of their index baby was also assessed. These included the women's level of awareness, perceived time of occurrence and frequency of occurrence of maternal death by type of delivery sites.

4. Operational Definition of Variables
The women's self-risk perception of maternal death by facility type. This was assessed as a score of the frequency of maternal death occurrence by type of delivery site on a 5-point Likert scale from 'never' to 'almost always'. Three ques-tions assessed the frequency of maternal death in non-health facility delivery sites while 4 questions addressed the health facility deli-very sites. For the non-health facilities, "ne-ver" had a score of 1 and "almost always" a score of 5, while for the health facilities, it was the inverse. The minimum and maxi-mum obtainable scores were 7 and 35 res-pectively. The higher the scores, the better the women's perception of maternal death by facility type. **The eventual place of delivery**, if a health facility (public and private health centers and hospitals), or a non-health facility. The non-health facilities include deliveries at home, the "Iya Agbebi" or Traditional Birth Atten-dants (TBA), or church-based spiritual orga-nizations popularly called Mission Homes.

The index baby referred to was the child from their last delivery brought to the immunization clinic.

5. Study Instrument
A quantitative method of data collection was employed with the use of semi-structured interviewer-administered questionnaires adapted from the literature. The instrument was pre-tested at a similar comprehensive health facility within the study location. The questionnaire was in English and back-translated into the Yoruba language (the people's local dialect). Data was collected as a

client-exit interview after the women were done with their immunization clinic.

6. Data Analysis

The data collected were analyzed using the IBM SPSS version 20 software. Continuous data such as the respondents' age, and age at booking were summarized into means and the categorical data into frequency distribution tables. Monetary conversions were done at ₦360=$1(USD). The socioeconomic status of respondents was defined using the Principal Component Analysis into quintiles with variables such as the accommodation type, water source, and other assets. A simple binary logistic regression gave a Model 0 (not presented). Predictor variables with p-value ≤0.2 in Model 0 were then included in the multiple regression models (as presented). Model 1 tested the association between the women's reproductive and obstetric history and experience with their choice of delivery/ birthing site. Model 2 assessed the predictive role of women's perception of maternal death risks on their choice of delivery site. Model 3 had both predictors in Model 1 and 2 to determine how significantly women's perception of maternal death risk predicted their choice of birthing/delivery site after controlling for other confounding variables. The level of statistical significance was determined at p<0.05, with the confidence intervals of the odds ratios presented. Model build-ups were simultaneous. Model 3 had a Nagelkerke R^2= 0.86, a -2 Log likelihood of 31.54, a Hosmer and Lemeshow Test with p=0.831 for the 183-sample size. and could accurately predict the outcome (place of eventual delivery site) for 90.9% of the individual cases.

7. Research Ethics

Written informed consent was obtained from the respondents. All the Declaration of Helsinki were adhered to. Respondents were assured that they could withdraw their participation at any time. Data was collected after the women were done at the immu-nization clinic per day, hence it did not affect the service delivered. Ethical approval to conduct the research was obtained from the Ife Central LGA Health Authority ethics committee with the number ICLGHA/-05/19/1.

RESULTS

Socio-demographic characteristics of respondents

One hundred and eighty-three women responded which gave a response rate of 94.3%. The women's mean age was 28.99 ± 5.26 Standard Deviation (SD) with most of them 147 (80.3%) older than 24 years of age. A high proportion of the index babies brought for vaccination 126 (68.9%) were ≤ 3 months old. Almost all the respondents were married and were in a monogamous family relationship. Almost all the respondents (93.4%) and their spouses (91.8%) had completed at least a secondary level of education. The respondents were almost evenly distributed across the socioeconomic quintiles derived.

Table 1. Socio-demographic characteristics (n=183)

Variable	Frequency	Percent (%)
Mother's age at last birthday (years)		
≤ 24 years (young woman)	36	19.7
>24 years	147	80.3
Categorized index baby's age		
≤ 3 months	126	68.9
>3 months	57	31.1
Religion		
Christiani	140	76.5

Variable	Frequency	Percent (%)
Moslem	40	21.9
Traditional	3	1.6
Mother's highest level of education		
Primary	8	4.4
Secondary	89	48.6
Tertiary	82	44.8
No formal Education	4	2.2
Mother's occupation		
Student	12	6.6
Unemployed	6	3.3
Teacher	19	10.4
Skilled Professional	7	3.8
Trader/Business/Entrepreneur	92	50.3
Artisan/ Unskilled professional	37	20.2
Civil servant	9	4.9
Clergy	1	0.5
Marital status		
Single	5	2.7
Married	177	96.7
Divorced	1	0.5
Number of wives in marriage (n=178)		
One Wife (Monogamous)	165	92.7
More than one wife (Polygamous)	13	7.3
Respondents' socio-economic status		
Lowest	38	20.8
Second	35	19.1
Middle	37	20.2
Fourth	37	20.2
Highest	36	19.7
Spouse's highest level of education (n=177)	3	1.6
Primary	64	35.0
Secondary	104	56.8
Tertiary	6	3.3
No formal education		
Categorized spouse's occupation (n=177)	54	30.5
Unskilled	123	69.5
Skilled		

Respondents' reproductive health profile

In Table 2, a higher proportion of the women 127 (69.4%) were multiparous. The majority (89.1%) had never had a medical disorder during pregnancy. Of the few who had, 11 (55.0%) had presented with hypertensive-related disease while others had varied conditions. Only 16 (8.7%) of the women had been pregnant >4 times with an average of 2 pregnancies per person. The majority of the women (87.4%) had never experienced a stillbirth at delivery, nor had an abortion (86.9%). Of the 24 (13.1%) who reported a history of abortion, 17 (70.8%) had experienced it once. About 7 (3.8%) had a child who died in the first month of life. Only 31 (16.9%) had ever undergone a Caesarean section and at most once. Indeed, 26 (14.2%) of the respondents delivered their index

baby via a Caesarean section.

The mean first pregnancy was 2.41 and the SD value was 1.39. The mean number of children ever born was 2.23 and the SD value was 1.18. The mean abortions per person (n=24) was 1.33 and the SD value was 0.57. The mean number of Caesarean Section ever had 1.23; SD= 0.50.

Table 2. Women's reproductive health history in previous pregnancies (n=183)

Variables	Frequency	Percentages (%)
Delivery status		
Primipara	56	30.6
Multipara	127	69.4
Had medical illness during or after a pregnancy		
Yes	20	10.9
No	163	89.1
Type of medical illness (n=20)		
High blood pressure	11	55.0
Epilepsy	1	5.0
Sickle cell Disease	1	5.0
Others	7	35.0
Number of pregnancies ever had		
1 pregnancy	56	30.6
2 - 4 pregnancies	111	60.7
> 4 pregnancies	16	8.7
Number of children ever born		
Less than or equal to 4 children ever born.	174	95.1
More than 4 children ever born	9	4.9
Number of stillbirths		
0	160	87.4
1	18	9.8
2	5	2.7
Had an Abortion		
Yes	24	13.1
No	159	86.9
Number of abortions		
1	17	70.8
2	6	25.0
3	1	4.2
Had a child who died in the first month of life		
Yes	7	3.8
No	176	96.2
Ever had a Caesarean Section (C/S)		
Yes	31	16.9
No	152	83.1
Number of Caesarean Section ever had (n =31)		
1	25	80.6
≥ 2	6	19.4
Was the latest delivery for their index baby by C/S	26	14.2
Yes	157	85.8
No		

Pregnancy and delivery experience for index baby

In Table 3, the majority of the women 177 (96.7%) registered for an antenatal care (ANC) clinic at an average of 4 months gestational age, and did so at a health

facility. A few of the women 8 (4.5%) who registered for ANC clinic did so at more than one health facility. The commonest reason given for this was anticipated industrial strike action at the first registered facility. Almost all the women (>90%) attended at least 4 ANC clinics. A high proportion of them 137 (77.4%) had no insurance coverage for their ANC clinic registration. However, a higher proportion (70.0%) of the respondents who paid for their ANC registration paid ≤₦2000 ($5.56) at the time of conducting the study. The mean of age at booking in pregnancy (Mean 3.59; SD 1.33).

Table 3. Women's pregnancy experience for index baby (n = 183)

Variables	Frequency	Percentage (%)
Registered for ANC in the pregnancy for this baby		
Yes	177	96.7
No	6	3.3
Facility pregnancy was registered for ANC (n=177)		
Health facility	151	85.3
Non-health facility	18	10.2
Both health and non-health facility	8	4.5
Reasons for multiple ANC registration (n = 20)		
For better and prompt care	3	15.0
Prayers/instructions from clergy	4	20.0
Proximity/ change of location	4	20.0
Anticipated / ongoing strike action	5	25.0
Personal reasons/ benefits	2	10.0
Referred	2	10.0
ANC clinic attendance		
<4 ANC clinic attendance	17	9.6
4 to 6 ANC clinic Attendance	78	44.1
> 6 ANC clinic attendance	82	46.3
Pregnancy care covered under NHIS (n = 177)		
Yes	40	22.6
No	137	77.4
ANC-related services covered for by NHIS		
Investigation	113	64.6
Delivery	8	4.6
Mother's pack	2	1.1
Don't know	52	29.7
Amount paid for ANC registration n = 110		
≤ ₦2000 ($5.56)	77	70.0
> ₦2000 ($5.56)	33	30.0

SD= Standard deviation, ANC= Antenatal care, NHIS= National Health Insurance Scheme

In Table 4, over 80% of the women had intended to deliver at a health facility but 71.0% eventually did. The inverse was the case for intentioned non-health facility delivery where the number who eventually delivered there increased, (17.5% to 29.0%). The singular reason for their intended place of delivery differed. Facility-based ANC accounted for the reasons for 99 (54.7%) of

them followed by personal reasons, 57 (31.5%). For the 21 who had intended to deliver at a health facility but did not, personal reasons majorly accounted for this. The personal reasons included 'the facility being their husband's choice; family always delivering there; spiritual leader instructed on where to deliver; and inability to get to the registered facility on time or rushed

elsewhere due to complications. The health facility-related reasons included 'ongoing strike at the registered facility; cheaper delivery fees; health worker capabilities and attitude, and these had the least proportion. About a quarter of the women, 45 (24.6%) had their delivery attended to by an unskilled birth attendant. About 55% of them had reported that their eventual delivery site was a walking distance from home. The median total delivery cost for all the respondents was ₦6,500 ($18.06) with ₦4,250 ($11.80) - ₦10,000 ($27.80) inter-quartile range (IQR) with 20 (19.0%) of the women paying (>$27.80). Overall, 135 (74.2%) of the women were very satisfied with their eventual place of delivery. For future pregnancies, 145 (79.2%) intend to deliver at a health facility. Health facility reasons accounted for why 116 (83.5%) of them opted for this delivery site. However, 38 (20.8%) intend to deliver at a non-health facility if ever pregnant again, mainly for personal reasons, 23 (63.9%).

Table 4. Women's childbirth experience for index baby (n = 183)

Variables	Frequency	Percentage (%)
Intended facility to deliver index baby		
Health facility delivery	151	82.5
Non-health facility delivery	32	17.5
The eventual facility index baby was delivered		
Health facility delivery	130	71.0
Non-health facility delivery	53	29.0
Singular reason for their intended delivery site		
Place of registration	99	54.7
Other personal reasons	57	31.5
Health facility-related reason	25	13.8
Reason for intending to deliver in a health facility but delivered in non-health facility (n=21)		
Place of registration	4	19.0
Personal reasons	14	66.7
Health facility-related reasons	3	14.3
Delivery attendant		
Skilled Birth Attendant	138	75.4
Unskilled Birth Attendant	45	24.6
Distance of delivery facility to respondents' home		
Walking distance/Not too far	100	54.6
Quite far	59	32.2
Very far	24	13.1
Cost of delivery		
≤ ₦5000 (≤ $13.9)	44	41.9
> ₦5000 to ₦10,000 ($13.9 to $27.8)	41	39.0
> ₦10,000 (> $27.8)	20	19.0
Satisfaction with the place of delivery		
Very satisfactory	135	74.2
Just satisfactory	37	20.3
Unsatisfactory	11	5.5
The intended place to deliver if pregnant again		
Health facility delivery	145	79.2
Non-health facility delivery	38	20.8
Reasons for choice of health facility delivery (n=145)		
Health facility-based reasons	116	83.5
Non-health facility (personal) reasons	23	16.5
Reasons for choice of non-health facility delivery (n=38)		
Health facility-based reasons	13	36.1
Non-health facility (personal) reasons	23	63.9

Women's self-risk perception of maternal death and their perception of maternal death by delivery sites

In Table 5, the women's awareness and perceptions of maternal death are presented. Most of the women 168 (91.8) had heard of women dying from pregnancy and childbirth in times past with 104 (61.9%) of the 168 who knew someone who had died from pregnancy or childbirth. A higher proportion of the women 114 (62.3%) believed most maternal deaths occur during childbirth. They, 99 (54.1%) also believed that most maternal deaths were associated with undergoing a Caesarean section. Seventy-six (41.5%) of the women believed the choice of delivery sites was majorly responsible for maternal death occurrences, while 90 (49.2%) believed both the delivery sites and where women registered for ANC contribute significantly to the occurrence of maternal deaths.

Forty-one (22.4%) of the women had thought they could die during the pregnancy or delivery of their index baby, and this influenced the choice of place of birth for 29 (70.7%) of them. Thirty-two (17.5%) of the women did not just think of dying but were afraid of dying at some point during the pregnancy or delivery of their index baby. A higher proportion of those afraid of dying, 19 (59.4%) experienced this fear during childbirth. Prolonged labor pains 11 (34.4 %), previous personal experiences and fears, 8 (25.0%) and the experiences of others 5 (15.6%) accounted for most of the reasons for this fear. Indeed, 33 (18.0%) of the women believed they would have died if not for God's intervention. To prevent this fear of dying in future pregnancies, 10 (31.3%) of those who experienced the fear of dying plan to change their delivery site. However, more than half of them, 17 (53.2%) plan to do nothing different. See Table 5.

Table 5. Women's self-perception of maternal death (n = 183)

Variables	Frequency	Percentage (%)
Ever heard of women dying from pregnancy and childbirth	168	91.8
Yes	15	8.2
No		
Knew someone who died from pregnancy/childbirth in the past 5 years (n=168)		
Yes	104	61.9
No	64	38.1
Period believed women often die most from pregnancy	2	1.1
Early pregnancy	10	5.5
Late pregnancy	114	62.3
During delivery	51	27.9
Days after delivery	6	3.3
Weeks after delivery		
Mode of delivery believed to be most associated with their deaths Normal delivery	84	45.9
Caesarean Section (Operation)	99	54.1
Place(s) believed is most responsible for their death		
Where she registered for antenatal care	7	3.8
Where she delivered	76	41.5
Both	90	49.2
None	10	5.5

Variables	Frequency	Percentage (%)
Ever thought of dying as a result of this pregnancy		
Yes	41	22.4
No	142	77.6
Thought of dying affected the choice of delivery site (n = 41)	29	70.7
Yes	12	29.3
No		
Afraid of dying at some point during the latest pregnancy	32	17.5
Yes	151	82.5
No		
If yes, when respondents were most afraid (n = 32)		
During pregnancy	11	34.4
During delivery	19	59.4
After delivery	2	6.3
Reasons for the fear (n = 32)		
Stories and experiences of others	5	15.6
Previous personal experiences and fears	8	25.0
Prolonged labor pains	11	34.4
Excessive bleeding	1	3.1
Health status of the fetus	3	9.4
No reasons	4	12.5
Could have died during pregnancy for index baby if not for God		
Yes	33	18.0
No	150	82.0
What to do to prevent fear of dying if pregnant again (n=32)	3	9.4
Change the place I registered for ANC only	10	31.3
Change the place where I delivered the baby only	2	6.3
Change both where I registered for ANC and delivered the baby	17	53.2
Do nothing different		
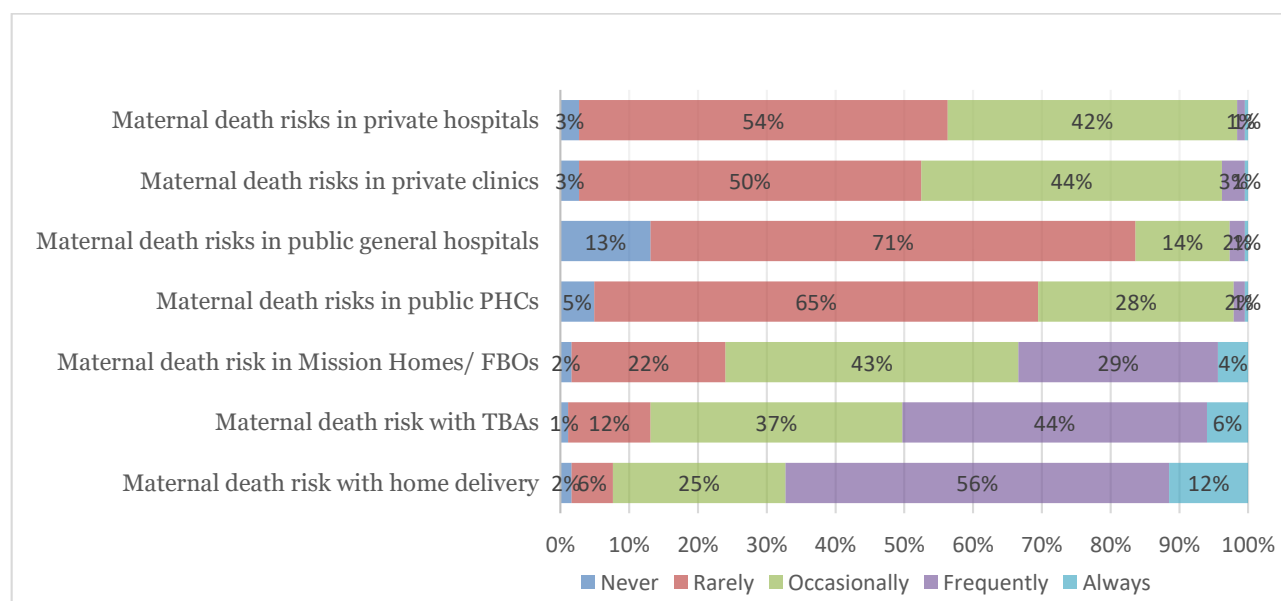
Figure 1. Women's perceived occurrence of maternal death by delivery sites

In Figure 1, a high proportion of the women believed maternal deaths occurred more frequently at home, 123 (68.0%); at the TBAs 92 (50.0%); and only more occasionally at FBOs /mission homes 78 (42.6%). According to the women, public health facilities fared better in the rarity of occurrence of maternal deaths (65.0% in primary health centers, 71.0% in general hospitals) compared to private health facilities (50.0% in private clinics and 54.0% in private hospitals). Overall, the women's mean score for their perception of maternal death risk and frequency by type of health facility was Mean= 24.96; SD= 2.69 (95%CI: 24.55 to 25.33).

Table 6 shows the multiple binary logistic regression for predictors of women's eventual delivery site for their index baby. Models one, two and three are presented. Model one shows the other predictors of women's eventual delivery site excluding their perceived risk of maternal death. Their personal reasons for choosing the delivery site significantly predicted their choice of delivering at a non-health facility compared to their place of registration and health facility-related reasons. In Model 2, only the perceived risk of maternal death score by facility type had a p-value ≤0.2 in Model 0 and was included in Model 2. With every unit increase in the respondents' perceived risk for maternal death during their pregnancy and delivery, they had 1.4 times greater odds of delivering at a health facility, and this was statistically significant, (AOR= 1.40; 95% CI= 1.20 to 1.64; p<0.001). However, in Model 3, after controlling for the confounding variables, their perceived risk of maternal death no longer significantly predicted their choice of eventual delivery site for their index baby. Rather, their personal reasons for choosing their delivery site persistently negatively influ-

enced their choice of a health facility delivery, (AOR=0.02; 95%CI= 0.00 to 0.51; p= 0.018).

Besides, the place women registered for their ANC, which did not significantly predict their choice of delivery site in Model 1, now did in Model 3. Women who registered at a health facility for antenatal care had 607.5 times greater odds of delivering at a health facility (AOR=607.52; 95%CI= 1.39 to $2.66*10^5$; p=0.039), compared to those who registered at a non-health facility or at both a health facility and a non-health facility. The place where the women registered for ANC and their singular reason for the eventual place of delivery were not correlated, hence both were included in the regression models (Spearman's rho (ρ)= 0.08, p=0.267; 95%CI= -0.08 to 0.24).

DISCUSSION

The majority of the women we studied were aware of maternal death as a possible pregnancy outcome and many knew at least someone who had suffered such a fate. Many of them believed such deaths occur more during childbirth and as a consequence of the place of birth. About a fifth of the women feared death during the delivery of their index baby. The women attributed the more frequent occurrence of maternal deaths to non-health facility deliveries and had a fairly high mean score of maternal death self-risk assessment by type of delivery site, 25.0 ± 2.7, (95%CI= 24.6 to 25.3), 82.5% of the obtainable score. The women's self-risk perception of maternal death could singly significantly influence their choice of delivery site. However, alongside other predictors of choice of delivery site, it lost its significance. Rather, registering at a health facility for ANC and women's personal reasons for choosing their place of birth influenced their choice of delivery site.

Table 6. Multiple binary logistic regression analysis showing maternal death self-

risk perception alongside other predictors of women's eventual delivery site for index baby

Note: Significant predictors are in bold. Statistically significant AOR has *p<0.05, **p<0.01, ***p<0.001.

Predictor variables	Model 1		Model 2		Model 3	
	AOR	95%CI	AOR	95%CI	AOR	95%CI
Perceived risk of maternal death			***1.40	1.20 to 1.64	1.78	0.88 to 3.63
No of children ever born	0.76	0.28 to 2.04			0.87	0.30 to 2.52
Socio-economic status						
Lowest	44.28	0.32 to $6.10*10^4$			220.11	0.45 to $1.08*10^4$
Second	1.47	0.09 to 24.11			0.58	0.03 to 11.39
Middle	30.05	0.28 to $3.19*10^4$			60.18	0.27 to $1.35*10^4$
Fourth	4.14	0.20 to 84.74			6.38	0.22 to 186.06
Highest	Ref	-			Ref	-
No of wives in marital home	0.83	0.01 to 68.14			0.74	0.01 to 80.35
Respondent registered for ANC						
Yes	0.01	0.00			0.01	0.00
No	Ref				Ref	-
Place registered for ANC	'					
Health facility	92.77	0.96 to $9.01*10^4$			***607.52**	**1.39 to**
Non-health facility	1.35E+16	0.00			2.09E+16	**$2.66*10^5$**
Both	Ref	-			Ref	0.00
Age of pregnancy at booking	1.52	0.41 to 5.59			1.72	0.42 to 7.14
Ever had a Caesarian section						
Yes	Ref	-			Ref	-
No	0.80	0.03 to 25.64			0.51	0.01 to 20.61
Had health insurance cover						
Yes	0.29	0.02 to 3.87			0.24	0.01 to 3.94
No	Ref	-			Ref	-
Intended place to deliver						
Health facility	1.37E+26	0.00			1.73E+26	0.00
Non-health facility	Ref	-			Ref	-
Distance to eventual delivery site						
Walking distance	0.00	0.00			0.00	0.00
Quite far	0.00	0.00			0.00	0.00
Very far	Ref	-			Ref	-
Cost of delivery	1.00	1.00 – 1.00			1.00	1.00 to 1.00
Ease of payment for delivery						
Easy	$3.11*10^{10}$	0.00			5.68E+11	0.00
Difficult	$5.23*10^8$	0.00			1.59E+11	0.00
Very difficult	Ref	-			Ref	-
Singular reason for choosing eventual delivery site						
Place of registration	Ref	-			Ref	-
Other personal reasons	***0.03**	**0.00 – 0.54**			***0.02**	**0.00 to 0.51**
Health facility related reason	0.43	0.01 – 18.91			0.29	0.00 to 18.81

ANC- Antenatal care; AOR- Adjusted Odd Ratio; CI- Confidence interval

Women's perceptions of the risk of maternal death in pregnancy and childbirth

Our respondents were well aware of the occurrence of maternal mortality, especially during childbirth. A qualitative study of reproductive-aged women in the Qaukeni sub-district, Eastern Cape, South Africa also revealed some women were aware of maternal deaths, its causes and how to

identify danger signs in pregnancy. (Mayekiso et al., 2020). When women also view maternal mortality as a problem, it becomes easier to solve. We then explored if their level of awareness was reflected in their choice of delivery site.

More than a quarter of the women studied (29.0%) delivered their index babies at a non-health facility. This finding is higher than the <10% reported in the NDHS 2018 said to have had their latest childbirth at a non-health facility in Osun state, Nigeria, which is the same as our study state(National Population Commission (NPC) Nigeria and ICF, 2019). Almost 10% of the women who delivered at a non-health facility in our study never intended to but for some personal reasons. The common personal reasons that mainly influenced their delivery site preference were their family members (spouse) and more importantly, their spiritual leaders. This pattern is common in sub-Saharan Africa, Nigeria inclusive (Yaya et al., 2018). The spouse, dependence on TBAs, and spiritual leader influences were found as drivers of non-health facility deliveries in a qualitative study of women with a 2-year prior history of childbirth in Ethiopia (Roro et al., 2014).

Respondents' maternal death self-risk perception and women's choice of delivery site

The thought or fear of death among the women studied did not significantly influence their choice of health facility delivery. This is because, the majority of those who feared death experienced it during delivery, hence, the decision on where to deliver their index child had already been made. A higher proportion of women with negative birth outcomes feared death during labor and delivery than during pregnancy in Zanzibar (Ali et al., 2022). Intrapartum hemorrhage has caused near-death experiences for some women, and this

may lead to extreme fear (Hashemi et al., 2023). Fearing death during childbirth may be too late to be remedied if the place of delivery contributed to this fear. Hence, the need for women to be supported or guided in making the right decisions on their choice of delivery site.

However, the women studied were able to rightly adjudge the possibility and frequency of occurrence of maternal death by type of health facility, with a fairly high maternal risk perception score. According to the women studied, it was riskier to deliver at a non-health facility than at a health facility. And of the non-health facilities, they felt safer delivering in churches otherwise called *Mission Homes* where limited medical attention is provided, but rather spiritual assistance for their births. Preference for church-based spiritual deliveries was also found among women in the South-west (Fabusiwa, Adejugbagbe and Akinboboye, 2016), and South-south Nigeria (Udoma et al., 2008), but limited religious influences on the place of delivery was found in North-central Nigeria (Al-Mujtaba et al., 2016). Faith-based organizations with the right infrastructure and the use of modern medical and dental approaches have contributed significantly to the provision of health services globally (Olivier et al., 2015; World Health Organization, 2021). However, there are also congregational-sized faith-based organizations that attend to deliveries using spiritual means only such as praying on water, oil and stones. They discourage the use of orthodox medicine and delay in response to childbirth complications (Kenneth et al., 2016). This is dangerous to the health and well-being of women and their newborns, hence the practice should be monitored, controlled or discouraged. The wife of a southern state governor in Nigeria had proposed a bill to ban church-based deliveries, claiming they worsen maternal

mortality in the state (Ewokor, 2016).

From our findings, the higher the women's maternal death risk perception score, the more their likelihood of delivering at a health facility. This is a positive finding that could increase the uptake of health facility deliveries and be attended to by SBAs with a possible reduction in the burden of maternal morbidities and mortalities. Women's increased access to maternal death self-risk prediction assessment tools early in pregnancy could help them make better-informed choices on their place of delivery. Many of the existing maternal death risk assessment tools can only be applied by healthcare providers for their management of women during ANC or childbirth (Aoyama et al., 2018; Al-Hindi et al., 2020). A 7-item community maternal danger score algorithm used by community workers for pregnant women in Makurdi, Nigeria with a high predictive ability for SBA (area under curve of 0.73, 95% CI 0.69–0.77) could be adapted for women's use, and tested for its global applicability (Bola et al., 2022).

However, alongside other predictors, their maternal death self-risk perception scores no longer significantly influence their choice of delivery site. Rather, registering at a health facility for ANC and their personal reasons for the choice of delivery site did. Existing studies in the literature have also documented a significant association between facility-based ANC and health facility-based delivery but with more emphasis on early registration and the number of visits (Dahiru and Oche, 2015; Boah et al., 2018). Nonetheless, efforts should be made to improve women's trust in the registered health facilities for ANC by all the relevant stakeholders in the health system. This is to discourage women who registered at multiple facilities- both health and non-health because of health system-related reasons such as industrial actions.

The woman's family members and their spiritual leaders were some of the personal reasons that significantly influenced their non-health facility delivery. These key stakeholders thus need to be targeted with the right information. We recommend that during ANC clinics, women should be asked about the influential decision-makers in their lives, such as their spouse, their mother/mother-in-law, and their spiritual fathers. And a day is set aside to celebrate these people, and also educate them on the importance of health facility delivery. This intervention may help strengthen women's intention to deliver at a health facility.

The inability to get to the intended health facility for delivery was another personal reason that influenced women's eventual place of birth. This is an example of a Phase Two delay of the "three delay" model framework contributing towards maternal mortality (Gunawardena et al., 2018). Phase Two delays may also be caused by a lack of funds or a lack of women's autonomy such as dependence on a spouse to decide time to leave for her birth. Emphasis on assessing women's birth preparedness and complication readiness at every ANC clinic using a checklist is needful. This should include an assessment of their knowledge of the danger signs in pregnancy and signs of labor onset.

A few of the women were resolute on delivering at a non-health facility, being their family practice. Where women deliver must be made safe for them. Thus, stan-dardization of the *Mission homes* and the TBA facilities should be done. We recommend that these facilities be licensed by the government to practice. These non-health facilities must meet a minimum criterion of the requisite skills for their human resources, and basic infrastructure and equipment for safe delivery. These non-health facilities should be supervised by the formal health-

care system with designated referral health facilities. Referral of their complicated cases should be without shame or trepidation, and with the full cooperation of the referral facilities. For women who opt for home deliveries, community health workers may be assigned to deliver such, and at a higher cost. When women know they can choose their preferred delivery site, and be supported in their decision by the health system, more women may uptake facility-based ANC and deliveries. The *"Abiye"* (Safe Motherhood) project in a Nigerian state adopted similar models and found them effective in increasing health facility delivery and reducing maternal mortality (Ajayi and Akpan, 2020).

Our study highlighted the role of empowering women in determining their own risk for maternal mortality by their chosen place of birth. The study has also proffered several programmatic and policy recommendations to improve the uptake of health facility deliveries. However, the study is limited in its power and the generalizability of its findings.

In conclusion, the higher the women's ability to perceive the risk of maternal death by type of place of birth, the higher their odds of delivering at a health facility. However, facility-based ANC better influenced facility-based deliveries while critical decision makers in the women's lives and phase 2 delays negatively influenced it. We recommend the development and standardization of a self-risk perception score for maternal mortality that is widely tested, for adoption.

AUTHOR CONTRIBUTION
OTE conceptualized the research idea. All the authors contributed to the design of the research and development of the research tools. OSO, APG and TAO collected the data and OTE and OSO analyzed the data and

reported the findings. UCO discussed the findings and developed the manuscript from scratch. OTE did a major revision of the manuscript. All the authors contributed to the final version of the manuscript submitted for publication.

CONFLICT OF INTEREST
There are no conflicts of interest to be declared.

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