“Counting those never bubble over” Estimated prevalence and its determinants of obstetric fistula among childbearing women in 14 African countries: Multilevel Analysis

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Abstract

Background

Obstetric fistula is a leakage between genital tract and urinary tract and/or between genital tract and rectum. The commonest cause of obstetric fistula is prolonged labour which magnify in the areas of poor prenatal and emergency obstetric care. In Africa, there is poor of quality of obstetric care and poor social support for those who faced fistula. Obstetric fistula shatters the life of the women and the consequence is nasty while multicounty level estimate on the magnitude and determinates of fistula were nil. Multicounty level of estimate of the magnitude of fistula is important to design and fill the gaps of quality of obstetric care and design the appropriate corrective intervention mechanisms of obstetric fistula. Therefore, this study aimed the estimate the magnitude of obstetric fistula and its determinants among childbearing women in 14 Africa countries based on recent demographic and health survey data.

Methods

Secondary data were used from 14 African demographic and health survey database. The data were extracted based on the objective the study and previous literatures. Data were weighted using sampling weight before any statistical analysis to account the sampling design. STATA version 15 was used for extracting, recoding, and for further multilevel analysis. The appropriateness of multilevel analysis were checked by Median odds ratio (MOR), proportional change in Variance (PCV), Intraclass correlation coefficient (ICC), and Akaike Information Criteria (AIC). Four model was build and the best model was selected based on the smallest Akaike Information Criteria (AIC). Both bivariable and multivariable multilevel analysis was done accordingly. Variables with p-value ≤ 0.05 declared as statistical significant with outcome variable for the study. The adjusted odds ratio with 95% confidence interval was used as measure of association.

Results

The magnitude of obstetric fistula was 0.84 [95%CI: 0.79, 0.88]. Maternal age ≥ 41 years [AOR=1.38; 95% CI:1.01,1.93], urban residence [AOR=0.69; 95%CI: 0.53,0.89], women who attended secondary education [AOR=0.59; 95% CI: 0.45,0.77], women who attended higher education [AOR=0.40; 95% CI: 0.25,0.65], female household head [AOR=0.78; 95% CI: 0.64,0.95], husbands who attended primary education [AOR=0.80; 95% CI: 0.65, 0.98], women who give their first birth 16-20years [AOR=0.78; 95% CI: 0.66,0.92], 21-25 years [AOR=0.66; 95% CI: 0.53,0.84], ≥ 26 years [AOR=0.67; 95% CI: 0.48, 0.92], history of terminating pregnancy [AOR=1.51; 95% CI: 1.29, 1.77] and awareness on fistula [AOR=0.35; 95% CI: 0.26,0.45] were the determinants of obstetric fistula identified in this study.

Conclusion

The magnitude of obstetric fistula in 14 African countries were high as compared with the world health organization estimate. Maternal age, residence, educational status, husband's educational status, sex of household head, age at first birth, history of terminating pregnancy and awareness on obstetric fistula were the determinants identified in this study. Therefore, health interventions that reduce the occurrence of obstetric fistula could be designed to address the women who lives in rural area, no formal education, male-headed household, husbands who never attended formal education, and women who had terminated pregnancy should be addressed in advance. Policies and programs of fistula should be tailored the women which characterized as living in rural area, non-educated, young age at first birth and no awareness on fistula as well as male headed households. Evidence based multicounty interventions were highly recommended to eliminate obstetric fistula and to achieve sustainable development goal.

Background

Obstetric fistula is a leakage between genital tract and urinary tract or leakage between genital tract and rectum commonly caused by prolonged or obstructed labor especially in resource poor countries. It is preventable and treatable while it is ashamed and isolated from the communities. Nearly 2 million of women's globally severed from this preventable disease [1–4]. Fistula is the serious medical disorder, which results continuous leakage of stool or urine. Obstetric fistula is the less intentioned and hidden condition in developing countries. The most marginalized women like poor, young, illiterate and women in remote area are mostly affected one. Obstetric fistula is one of the most visible maternal health indicator and is still exist due to the health system failed to give accessible and quality of maternal health care. It is a public health concern, which has an attention in national and international government in recent time [5–7]. Even though there is no real estimate on obstetric fistula nearly two million women were suffered from this problem in developing countries and fifty to hundred thousand of new cases will occur annually[8].

In sub Saharan Africa this disorder is sever and at least 33,000 new cases were recorded annually, which is huge number, which highly contributes maternal mortality in the region. From the women who give birth annually in sub-Saharan Africa 30,000 to 130,000 of them develop fistula due to obstructed or prolonged labour. In addition fistula is sever in the place where a limited access and use of obstetric care. Obstetric fistula are more prevalent in the area where poor or limited prenatal and intrapartum care[6, 9–12]. The prevalence of obstetric fistula may vary from country to country or from area to area, in all region of the world the pooled prevalence of fistula were 0.29 per 1000 women. By region 1.57 per 100 women in sub Saharan Africa and South Asia, 1.60 per 1000 women of reproductive age in sub Saharan Africa and 1.20 per 1000 in South Asia [13]. The prevalence of fistula in Ethiopia was 0.4% among reproductive age women [14], in other demographic data analysis the prevalence of fistula in Ethiopia were 0.42% [15], in other study 6 per 10,000 reproductive age women experienced obstetric fistula [16]. Other study showed 0.12% of the women experienced obstetric fistula[17], in Afghanistan the prevalence of obstetric fistula was 0.4%[18], 1.06% experienced obstetric fistula in their lifetime [12], in study conducted in Bangladesh the estimated prevalence of obstetric fistula was 1.69 per 1000 ever married women [19], The incidence

of fistula in rural region of sub-Saharan Africa approximately 33,451 new case annually [20]. In two world region (sub-Saharan Africa and South Asia) there are over 6000 new cases per year[13].

While there is no uniform classification of obstetric fistula. Obstetric cause of fistula can be classified as Vesicovaginal fistula (VVF) and rectovaginal fistula (RVF) and there is iatrogenic types of fistula [6, 7, 21]. The three main cause of obstetric fistula are ischemia of tissue between vagina and urinary tract or rectum, direct tearing of tissues and elective abortion. Even though the causes of fistula are not mutually exclusive, it may occur in complication of delivery and uterine evacuation [2, 22, 23].

The risk factors of obstetric fistula originated from cultural, social, economic and biological that contributes for obstructed and prolonged labor. Sexual violence also results vaginal fistula [24–26]. Different literatures indicated that factors influencing obstetric fistula were age of marriage, marital status, literacy, parity, duration of labor, type of birth attendance, mode and place of delivery[21, 27–34]. In addition there is health facility related factors like delay in reaching care, delay in decision to seek care, and delay in receiving adequate care [33, 35–37]. Literatures showed that obstetric fistula may results from in different initiators like labor more than 24 hours[24], not attending antenatal care[38], and home delivery[39] while this is not found in low prevalence areas. Additional factors associated with fistula in previous literatures were early age at pregnancy, short stature, illiteracy, poverty, not attending antenatal care and rural place of residence or living far away (>3 km) from a health facility[23, 40, 41], duration of labour of >24 hours, seeking delivery services after 6 hours of labour onset, taking more than 2 hours to reach a health facility, having none or primary education and being referred to another facility for emergency obstetrics services[42], women who gave birth 10 or more and residence[12] were factors associated with obstetric fistula. The three delays which contributes for obstetric fistula were delay in the making the decision to seek care, delay in arrival at a health facility; and delay in the provision of adequate care[43].

Fistula has a multidimensional consequence on the women who experienced it such as health consequences like incontinence of urine or faecale or both[21], damage of Vulva or thighs[6], social consequences like stigma and marginalization by community[30, 44], divorce[35, 45], sexual and reproductive health consequences like loss of fertility or amenorrhea[24, 37], absence of sexual intercourse[30, 35, 45], and mental health related consequences like depression[45, 46] were some of the consequences of fistula. Obstetric fistula drop many women's live in dark situation and shatter many women life[7].

The number and/or the magnitude of fistula in the region is the direct reflection of level and quality of perinatal care given by health care system in that specific area. In the area of poor or absent maternal health care, obstetric fistula is high and the treatment is unlikely [1, 5, 31]. Universal access of emergency obstetric care gives the best solution to the problem[7]. Therefore, prevention of obstetric fistula is the good ways of saving the women's life since in Africa treating obstetric fistula is like "taking a serpent by the tail". Most of the African countries lacking the quality of fistula care and perinatal care. Therefore understanding the current prevalence is important to design appropriate intervention mechanisms and

bringing evidence based solution to those resource-limited country. Identifying the factors associated with obstetric fistula is essential to design appropriate intervention approaches and tackle the factors in multicountry situation. In addition, it is important to design appropriate prevention policies and programs that can be all embracing. Therefor this study aimed to estimate the prevalence of obstetric fistula and its determinants among childbearing women in 14 African countries based on the recent demographic and health survey data.

Method

Data source and population

This study was analyzed secondary data from the recent Demographic and Health Surveys which contained detailed obstetric fistula for all interviewed childbearing women. Data were obtained and extracted from individual record (IR) file based on the objective and the previous literature finding variables. Demographic and health survey data were collected by a stratified, multi-stage (cluster), random sampling design. The detailed method of data collection were accessed at demographic and health survey database. The source population were all childbearing age women in survey period across the fourteen African countries whereas the study populations were all reproductive age women were included in this survey in the selected Enumeration Areas (EA). The study included all childbearing age-women found in the selected clusters at least one night before data collection period. All women's who did not give birth before the survey period were excluded from the study. A total of 232,050 reproductive age women were involved in this study.

Variables and measurement

Dependent variable

The outcome variable is obstetric fistula where it is a binary variable which a woman who experience obstetric fistula is coded as '1' for **Yes** while not experienced obstetric fistula is coded as '0' for **No**.

Independent variable

In this study, both the individual and community level variables were included. The independent variables were age, residence, educational status, husbands educational status, wealth status, sex of household head, media exposure, age at first birth, total number of children, working status, history of terminating pregnancy, and awareness on fistula

Operational definition and description of variables

Obstetric fistula

Obstetric fistula among women who had at least one birth in the 5-year period prior to the survey was the outcome of the study which coded as Not experienced obstetric fistula "0" and Experienced obstetric

fistula “1”.

Age of respondents

Current age of the mother recoded in to four categories with values of “0” for ≤ 20 , “1” for 21–30, “2” for 31–40, “3” for ≥ 41 years.

Working status

Women working status was coded as No “if women who didn’t have any work”, coded as ‘0’, and Yes “If a woman were working, she might be self-employed, professional or nonprofessional employee or government employed” coded as ‘1’.

Educational status

The minimum level of education the mother achieve and it was coded as ‘0’ for no formal education, as ‘1’ for primary education, as ‘2’ for secondary, and as ‘3’ higher (college and above level of education) .

Wealth status

Categorized as; poor “if woman was in poorer and poorest household in the DHS database” coded as ‘0’, middle where categorized as middle coded as ‘1’, and rich “if woman was in richer and richest household” coded as ‘2’.

Husband’s educational status

It was an education status of the husbands achieve and it was coded as ‘0’ for no formal education, as ‘1’ for primary education, as ‘2’ for secondary education and as ‘3’ for higher (college and above level of education).

Residence

The place of residence for the mother was coded as ‘0’ for rural and as ‘1’ for urban

Media exposure

a composite variable of frequency of listening radio, watching television and reading newspaper, in which households were said to have media exposure “if they have exposed to either of listening radio or watching television or reading newspaper at least one a week” coded as ‘1’ and no “if they did not have exposure to all of the above media sources once per week” coded as ‘0’.

Age at first birth

According this study age at first birth was categorized as ≤ 15 year coded as ‘0’, 16-20 years coded as ‘1’, 21-25 year coded as ‘2’ and ≥ 36 years coded as ‘3’.

Parity

The parity of the women in this study was categorized as nulliparous coded as '0', ≤ 4 parity coded as '1', 5-8 parity coded as '2' and ≥ 9 parity coded as '3'.

Sex of household head

The variable sex of household head was coded as '0' for male and as '1' for female in the dataset and we used without change.

Total number of children

The total number of children in the household was categorized as '0' for ≤ 3 child, as '1' for 4-6 child, as '2' for 7-9 child, and as '3' for ≥ 10 child

Health facility visit

The women who visit health facility in last 12 months were coded as '1' as Yes and who did not visit health facility were coded as '0' as No.

History of terminating pregnancy

The women who experienced of terminated pregnancy were coded as '1' for Yes and women who did not experienced terminated pregnancy were coded as '0' for No.

Awareness on fistula

The women who aware on the fistula were coded as '1' for Yes and the women who did not aware on fistula were coded as '0' for No used as dataset coded.

Data analysis

The variables of the study were extracted from individual record (IR) file dataset using STATA version 15. Before any analysis, the data were weighted using sampling weight to account the sampling design. After the data were cleaned, categorized, coded and weighted by using STATA, the author explored the descriptive statistics by using the frequencies and percentages of data and presented by using tables. Intraclass Correlation Coefficient (ICC), proportional change in variance (PCV) and median odds ratio (MOR) were calculated for the appropriateness of multilevel logistic regression analysis and checking the presence of clustering. We used the ICC value greater than 5% to consider a variation of magnitude of fistula across the cluster. Significant clustering was found therefore multilevel logistic regression were more appropriate. Four models were built; null model (model 0) only dependent variable, model 1 dependent variable and community level factors, model 2 dependent variable and individual level variable and the final model (model 3) was dependent variable and both community level and individual level factors. The best model was selected by comparing the AIC level and the model with smallest Akaike

Information Criteria (AIC) is the best-fitted model. Therefore, a model with a smallest Akaike Information Criteria (AIC) value was selected and all interpretations and inferences were made based on this model. After selecting the best-fitted model, bivariable and multivariable multilevel logistic regression was done to determine the determinants of magnitude of fistula in 14 African countries. Both bivariable and multivariable multilevel analysis was done accordingly. Variable in bivariable analysis with $p\text{-value} < 0.25$ were selected in multivariable multilevel analysis. Finally, $P\text{-value} \leq 0.05$ to declare statistically significant variables. The level of association were declared by odds ratio and 95% confidence interval.

Result

Characteristics of the study population

Among the study participants more than one third, 83,857[36.14%] of them were in the age category of 21-30 years. Of the total respondents most, 154,491[66.58%] were residing in rural area. Nearly thirty nine percent [38.74%] of the study participants were not follow formal education in their last time. More than half of the study participants had their own work during the data collection time (125, 6749 [54.16%]). Concerning the educational status of the husbands, forty four percent of the study. Regards to the wealth status of the study participants showed that more than one third [36.34%] were poor wealth status. Majority of the study, 177,912 [76.67%] of the households were male headed. More than half [52.05%] of the study participants were there is no media exposure in the previous time (Table 1).

Table 1
Socio-demographic and economic distribution of the
study participants in 14 African countries

Variables	Frequency	Percentage (%)
Maternal age		
<=20 years	58,930	25.40
21-30	83,857	36.14
31-40	58,596	25.25
>=41	30,667	13.22
Residence		
Urban	77,559	33.42
Rural	154,491	66.58
Educational status		
No education	89,890	38.74
Primary education	68,061	29.34
Secondary education	61,357	26.45
Higher education	12,702	5.47
Maternal working status		
Working	125,674	54.16
Not working	106,376	45.84
Husband's educational status		
No education	67,003	44.28
Primary education	36,996	24.45
Secondary education	35,215	23.27
Higher education	12,097	7.99
Wealth status		
Poor	84,322	36.34
Middle	45,045	19.41
Rich	102,684	44.25
Sex of household head		

Variables	Frequency	Percentage (%)
Male	177,912	76.67
Female	54,138	23.33
Media exposure		
Yes	111,264	47.95
No	120,786	52.05

Obstetric and reproductive health characteristics

Among the study participants who were involved in this study, nearly half, 107,722 [46.42%] were parity of less than or equal to four. The women who had less than or equal to two child were 128,595[55.42%] in this study. The women's age at first birth were in the age category of 16-20 year were 95,068[40.97%]. Majority [83.66%] of the study participants were visit the health facility in the past 12 month. Eighty eight percent [88.42] of the study participants were never terminated their pregnancy in their own lifetime. With the regards to the awareness of fistula most [65.88%] of the study participants were had no awareness regarding to fistula (Table 2). The prevalence of obstetric fistula among childbearing age women were 0.84 [95%CI: 0.79, 0.88].

Table 2
Obstetric and reproductive health
characteristics of the study participants in 14
African countries.

Variables	Frequency	Percentage (%)
Parity		
Nulliparous	61,678	26.58
<=4 parity	107,722	46.42
5-8 parity	52,015	22.42
>=9parity	10,635	4.58
Total number of children		
≤ 2 child	128,593	55.42
3-5child	72,764	31.36
6-9 child	29,374	12.66
≥10 child	1,319	0.57
Age at first birth		
<=15 year	85,955	37.04
16-20 year	95,068	40.97
21-25 year	38,661	16.66
>=26 year	12,369	5.33
Health facility visit in last 12 months		
Yes	37,927	16.34
No	194,123	83.66
Terminated pregnancy		
Yes	26,865	11.58
No	205,185	88.42
Awareness on fistula		
Yes	79,184	34.12
No	152,866	65.88
Experienced obstetric fistula		
Yes	1,948	0.84

Variables	Frequency	Percentage (%)
No	230,102	99.16

Random effect Analysis

The appropriateness of multilevel analysis of the study was done before the actual multilevel analysis of the study. Multilevel analysis is necessary because there is a significant clustering of fistula in this DHS data. The intraclass correlation coefficient (ICC) was 28.33% means 28.33% of the variability in magnitude of fistula among reproductive age women were attributed to the clusters. The median odds ratio (MOR) value of the null model 2.96 also indicates the presence of variation in unmet need for family planning between clusters. It means if we randomly select households from different clusters, those households at the cluster with higher fistula had 2.96 times higher chance of having fistula compared to their counter parts. As shown in Table 3, model 3 has the smallest Akaike Information Criteria (AIC =15733.10) as compared to random intercept only model or null model (AIC=21181.75), model with only community-level factors (AIC=21179.48) and model with only individual-level factors (AIC=16051.09) (Table 3). In addition the proportional change in variance (PCV) increases from 0.77% (null model) to 22.1% (model 3), indicating that mode 3 were the best explains the variability of fistula among the clusters. Therefore, this model is the best-fitted model for the data because it has the smallest AIC as compared to the rest models. So interpretation and reports were made based on this model.

Table 3
Model comparison and random effect analysis of the study conducted in 14 African countries based on DHS data, 2021

Parameter	Null model 0	Model 1	Model 2	Model 3
ICC	28.33%	28.2%	26.40%	26.2%
Variance	1.31[1.09, 1.55]	1.3[1.10,1.54]	1.18[0.98, 1.42]	1.02[1.08,1.54]
MOR	2.96	2.94	2.81	2.61
PCV	Ref.	0.77	9.9	22.1
Model fitness				
AIC	21181.75	21179.48	16051.09	15733.1

Determinants of obstetric fistula

In the final model(model 3) both individual and community-level variables were added to the model for multilevel analysis, of which maternal age, maternal educational status, residence, husbands educational status, sex of household head, age at first birth, history of terminating pregnancy and awareness on fistula were significantly associated with obstetric fistula in 14 African countries (Table 4). The odds of obstetric fistula among women whose age group of ≥ 41 years were 1.38 [AOR=1.38; 95% CI: 1.01, 1.93] times more likely as compared to age group of less than or equal to 15 year. The women who live in

urban area were 31% [AOR=0.69; 95% CI: 0.53, 0.89] less likely experienced obstetric fistula as compared with women's in rural area. The other predictors of obstetric fistula were educational status of the women. The women who attended secondary education were 41% [AOR=0.59,95%CI:0.45,0.77] less likely experienced obstetric fistula as compared with those women who never attended formal education. The odds of fistula among the women's who attended higher education were 60% [AOR=0.40; 95%CI: 0.25, 0.65] less likely as compared with the women who never attended formal education. The women's husband educational status were the other predictors of fistula in Africa. The odds of obstetric fistula among husbands who attended primary education were 20% [AOR=0.80;95%CI:0.65,0.98] less likely as compared with those women whose husband never attended formal education.

Female headed households were 22% [AOR=0.78; 95% CI: 0.64, 0.95) less likely experienced fistula as compare to the household headed by male. The odds of obstetric fistula were 22% [AOR=0.78; 95% CI: 0.66,0.92], 34% [AOR=0.66; 95% CI: 0.53,0.84], 33% [AOR=0.67; 95% CI: 0.48,0.92] less likely among women's who give first birth at age of 16-20 years, 21-25 years, ≥ 26 years as compared with women's who give their first birth less than or equal to 15 years respectively. The odds of fistula among the women who had history of terminating pregnancy were 1.51[AOR=1.51,95%CI:1.29,1.77] times more likely experienced fistula as compared with those who did not have any experience of terminating pregnancy. The other important determinants of obstetric fistula were awareness towards fistula. The odds of obstetric fistula was 65% [AOR=0.35; 95% CI: 0.26, 0.45] less likely among women who had awareness on fistula than the women who had no any awareness on obstetric fistula (Table 4).

Table 4

Determinants of obstetric fistula among reproductive age women in 14 African country in, 2021.

V Variables	Category	Model 0 (Null)	CMode 1 AOR[95% CI]	Mode 2 AOR[95% CI]	Model 3 AOR[95% CI]
Maternal age	<=20			1	1
	21-30			1.08[0.84,1.38]	1.05[0.82,1.34]
	31-40			1.24[0.91,1.68]	1.18[0.82,1.34]
	>=41			1.43[1.03,2.01]	1.38[1.01,1.93]
Educational status	No education			1	1
	Primary education			0.85[0.69,1.04]	0.85[0.7,1.03]
	Secondary education			0.61[0.46,0.80]	0.59[0.45,0.77]
	Higher education			0.44[0.27,0.71]	0.40[0.25,0.65]
Residence	Rural		1		1
	Urban		0.9[0.77,0.98]		0.69[0.53,0.89]
Maternal working status	Working			1.09[0.93,1.27]	1.08[0.93,1.27]
	Not working			1	1
Husbands educational status	No education			1	1
	Primary education			0.81[0.65,1.00]	0.80[0.65,0.98]
	Secondary education			0.87[0.66,1.15]	0.81[0.61,1.06]
	Higher education			1.44[1.01,1.96]	1.37[0.99,1.89]
Wealth status	Poor			1	1
	Middle			1.05[0.84,1.31]	1.02[0.82,1.27]
	Rich			1.17[0.94,1.46]	1.08[0.86,1.37]
Sex of household head	Male			1	1
	Female			0.83[0.66,1.03]	0.78[0.64,0.95]
Media exposure	Yes			0.91[0.78,1.07]	0.87[0.75,1.01]
	No			1	1

V Variables	Category	Model 0 (Null)	CMode 1 AOR[95% CI]	Mode 2 AOR[95% CI]	Model 3 AOR[95% CI]
Parity	nulliparous			1	1
	<=4 parity			1.39[0.97,2.00]	1.44[1.01,2.06]
	5-8 parity			1.25[0.81,1.92]	1.32[0.87,2.00]
	>=9parity			1.17[0.71,1.91]	1.22[0.76,1.98]
Age at first birth	<=15 year			1	1
	16-20 year			0.81[0.68,0.97]	0.78[0.66,0.92]
	21-25 year			0.69[0.54,0.88]	0.66[0.53,0.84]
	>=26 year			0.65[0.46,0.92]	0.67[0.48,0.92]
Total number of children	≤ 2 child			1	1
	3-5child			0.96[0.8,1.15]	0.97[0.81,1.17]
	6-9 child			0.85[0.65,1.12]	0.86[0.65,1.13]
	≥10 child			0.86[0.44,1.62]	0.89[0.47,1.69]
Health facility visit	Yes			1.14[0.94,1.37]	1.14[0.96,1.36]
	No			1	1
History of terminating pregnancy	Yes			1.54[1.31,1.82]	1.51[1.29,1.77]
	No			1	1
Awareness on fistula	Yes			0.37[0.28,0.48]	0.35[0.26,0.45]
	No			1	1

Discussion

Obstetric fistula has devastating consequences on the live of the women and it shatters the women's life. This problem eliminated from developed nation while it continuously affects the poorest of the poor[47, 48]. Previously obstetric fistula were not give a full attention in maternal and reproductive health arena [49–53]. Even though UNFPA plan to end fistula [48] there is a limited study conducted with nationally representative data at multi-country level. Therefore, this study aimed to estimate the magnitude and its determinants of obstetric fistula in 14 African countries. The current study finding showed that the magnitude of fistula among childbearing women were 0.84 [95%CI: 0.79, 0.88]. According to world health organization estimate suggested that 3 out of 1000 women of reproductive age women were experienced fistula which is lower than the current study estimate[54]. In addition, this finding is lower than the pooled

analysis study in Sub Saharan Africa that indicated that the prevalence of fistula was 1.60 and South Asia, 1.20[13] and the study conducted in Ethiopia, which indicated that the lifetime prevalence of obstetric fistula was 1.06[12] and South India [17]. This variation could be due to the variation in the quality of maternal health care among the countries and the difference in the quality of obstetric care services in those regions with the current study area. This implies that universal access of quality of maternal care could eliminate obstetric fistula. Prenatal care, skill birth attendants and access emergency obstetric care has a great effort to prevent obstetric fistula[55]. The other possible justification of this variation could be UNFPA and other national and international organization gives an emphasis to end fistula which could be lower the current magnitude of the study. Specifically the study conducted in South India was before the action of to end fistula and before the start of sustainable development goal which focus on maternal health improvement and reduction of maternal mortality.

While the current study finding higher than the study conducted in Ethiopia[15–17], Afghanistan[18], Bangladesh[19], Rajasthan, India[56] and rural Maharashtra[57]. This could be due to variation in intervention and access of emergency obstetric care services. The current study was multi-country and nationally representative while previous study conducted in single area with small sample size, which may lower the magnitude. Specifically in Maharashtra, India, more than half study participants had formal education and majority of them were economically active since fistula are common among poor and illiterate women. The other possible reason could be there is variation in social support and burden of obstructed labor across the countries.

This study also identified the determinants of obstetric fistula in African country. The determinants identified were maternal age, educational status of the women, residence, husband's educational status, sex of the household head, age at first birth, history of terminating pregnancy and awareness on fistula. The odds of obstetric fistula among older women (age ≥ 41) were 1.38 times more likely experienced fistula as compared with the women age less than or equal to 20 years. This finding was comparable with the study conducted in Uganda which showed that the odds of obstetric fistula were increased at the older age[58] and the study conducted in India which indicated that the occurrence of fistula were more common above the age of 29 years[59]. This could be due to the women may bear macrosomic infant when age increases[60] which could contribute obstructed labor and fistula. The other possible reason could be the women's at older age decreased health seeking behaviour and reluctant to take maternal health services like antenatal care and skill birth delivery.

The risk of experiencing obstetric fistula among the women who had secondary and higher education were 41% and 60% less likely as compare with the women who never attended formal education respectively. This finding is comparable with the study conducted in Kenya which showed that women who never attended formal education were at risk of obstetric fistula[59], in study conducted in India[56], in another study conducted rural community showed in poor educational level women obstetric fistula were more prevalent[61]. In other study conducted in north- eastern Nigeria indicated that illiteracy was one of the major risk factors for obstetric fistula[23] and in study conducted in Cameroon indicated that poor educational level women were associated with more experienced obstetric fistula[22]. This could be

due to maternal educational status had a net effect on maternal health services utilization[62] and had positive association with maternal health service use which can lead to reduce risk of obstetric fistula. The other possible reasons could be in less educated women maternal health service utilization is lower[63] which could elevate the risk of fistula. This could be due to the increased women's health seeking behaviour and educated women could have an increased literacy level. The other possible reason could be educated women could be more in use of contraceptive, skilled delivery and deciding to take health services.

The odds of experiencing obstetric fistula among urban residence were 31% less likely as compared with the women who live in rural area. This finding is comparable with the study conducted in Cameroon [22], in Ethiopia [15], Zambia [24], West Africa[64]), north-eastern Nigeria[23], and in Ethiopia[65] which indicated that rural place residence were more risk for obstetric fistula. This could be due to maternal health service utilization is lower among women living in rural area [63] which could increase the risk of obstetric fistula. Geographical access to health facility is one of the factors to address universal access of maternal health services[66] which could contribute the risk of fistula. In rural area, there could be long distance and low quality of service that lower maternal health service usage[67] which may accelerate the occurrence of fistula. This could be due to the lower access to emergency obstetric care and other maternal health services like ANC and skilled delivery. The other possible reason could be traditional practices like FGM and sexual violence may be common in rural areas. This implies that critically see the maternal health services and community value on women's health is important to save the women's from shattering of their lives.

Husband's educational status was one of the determinants for obstetric fistula. The odds of obstetric fistula among women whose husbands attended primary education were 20% less likely as compared with the women whose husbands never attended formal education. The husbands contribute to the maternal health service use[68] which can improve the risk of experiencing obstetric fistula. This could be partners/husbands educational status were less likely associated with obstructed labor[69] which is a main risk for obstetric fistula. This could be due to increased husbands support to take maternal health service, improve the intake of health services and support his wife to take skilled delivery and antenatal care. This implies that husband's education could improve the women's future life from abject. The risk of obstetric fistula was lower among female-headed households as compared with male-headed households. The odds of obstetric fistula among the household headed by female were 22% less likely as compared with the household headed by male. This could be due to female headed household could be more likely to receive maternal health services than the male headed households do[70]. This could be the women able to access and control resources which can cover the service and transport cost to take maternal health services. The other possible reasons for this could be the women's autonomy to decide for maternal health services are easy and they could reduce their risk of obstetric fistula.

The odds of obstetric fistula among the women who give their first birth at the age of 16-20 years, 21-25 years, and ≥ 26 years were 22%, 34% and 33% less likely as compared with the women who give birth less than or equal to 15 years respectively. This finding was comparable with the study conducted in

Ethiopia[65],Tanzania[71], and India[59] which showed that early childbearing were significantly associated with obstetric fistula. This could be due to physically maturity is the main factor for the occurrence of fistula[59]. This could be due to younger and early adult age women were immature pelvis and more at risk of obstructed labor that results obstetric fistula. Other possible reason could be those younger and early adult age girls and women had poor in maternal health service utilization.

The women who had history of terminating pregnancy were 1.51 times more likely at risk of developing obstetric fistula as compare to the women who never experience obstetric fistula. This finding were comparable with the study conducted in Uganda showed that induced abortion is one of the attributes of fistula[72]. This could be due to low access of obstetric care and poor quality of care that results to obstetric fistula. The other possible reasons could be due to poor/limited access of prenatal care of the women. The other determinants of obstetric fistula were awareness towards fistula. The odds of experiencing fistula among aware women were 65% less likely as compare with those women who had no awareness on fistula. This could be better knowledge on the problem able to prevent from the occurrence[2]. This could be due to understanding of the women regarding fistula consequences that could set early prevention method for it.

Conclusion

The magnitude of obstetric fistula were 0.84% higher as compare to world health organization estimate which showed the occurrence of fistula were 3 per 1000 women. The determinants of obstetric fistula identified in this study were maternal age ≥ 41 , residence, women who attended secondary education, women who attended higher education, female household head, husbands who attended primary education, women who give their first birth 16-20years, 21-25 years, ≥ 26 years, history of terminating pregnancy and awareness on fistula. The sun should never rise twice in one glob for the women therefore national and international organization could work to decrease the risk of fistula. Programs and policy should be design to address those women older age, younger age at first birth male-headed households, women who never attended formal education and had no awareness on fistula. In the long run high level of education of women, increasing age at first birth, and increased awareness on fistula could reduce the risk of experiencing obstetric fistula.

Abbreviations

AOR

Adjusted odds ratio

AIC

Akaike Information Criteria

CI

Confidence interval

DHS

Demographic and health survey

IR
Individual record
ICC
Intraclass Correlation Coefficient
PCV
proportional change in variance
MOR
median odds ratio
RVF
rectovaginal fistula
UNFPA
United Nations Population Fund;
VVF
Vesicovaginal fistula

Declarations

Consent for Publication

Not applicable

Ethics approval and consent to participant

A waiver of written informed consent was secured from Demographic and Health Surveys (DHS) program data archivists to download the dataset for this study. After the data were downloaded from the measure DHS website the research of this study will maintain the confidentiality of the data. Since it was based on secondary data, which was publicly available, ethical approval was not required. However, we accessed the data set from the DHS website (<https://dhsprogram.com/>) through registering or online requesting. The DHS data were conducted in accordance with the Declaration of Helsinki.

Data Availability statement

The datasets analyzed during the current study are available from the demographic and health survey dataset with the reasonable request. The author included all result-based data within the manuscript and the data set can be accessed online from www.measuredhs.com/data

Competing interest

The author declare that they have no competing interests.

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Authors contribution

MS involved in the conception of the study. MS involved in the conceptualized, design, data processing and accuracy, analysis and interpretations of the findings. MS prepared the draft of the manuscript. The author read and approved the final manuscript.

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