

## RESEARCH ARTICLE

## Female genital mutilation practice, associated factors, and its consequences on women's reproductive health in Senegal

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Female genital mutilation (FGM) practice is unhygienic and unhealthy traditional practices which have affected girls and women's health adversely for all-time, and such practice is prevalent in many African countries. This study intended to examine factors associated with the FGM prevalence, attitudes toward the discontinuation of the practice, and consequences of FGM practice on reproductive health in terms of sexual transmitted infections/symptoms (STIs/STSS) among women of reproductive ages in Senegal. To fulfill the study objective on factors associated the prevalence of FGM and attitudes toward the continuation of FGM practice, the 2019 Senegal Demographic Health Survey (DHS) data sets were used based on binary logit and multinomial logit regression models. The results show that rural areas, married women, women of Muslim religion, Poular women, women of lower education and lower wealth, and women who were never exposed to social media reported a higher prevalence rate of FGM and were more likely to support continuation of FGM practice. To fulfill the research goal on consequences of FGM practice on STIs/STSS, the 2010 – 2011 DHS was employed because the 2019 DHS did not collect data on STIs/STSS. FGM practice was associated with lower knowledge about STIs/STSS and higher prevalence of STIs/STSS. Our findings suggest that education promotion, poverty reduction, rural development, and dissemination of the adverse consequences of FGM practice could help reduce FGM practices. These findings could have important implications for achieving the sustainable development goals.

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**1. Introduction****1.1. Status quo of the female genital mutilation practice**

The World Health Organization (WHO) defined female genital mutilation (FGM) as all procedures which involve partial or total removal of the external female genitalia and injury to the female genital organs, whether for cultural or any other non-therapeutic reasons (WHO, 2012). FGM, also known as female genital circumcision or female genital cutting (FGC), is an umbrella term being used to cover various methods that involve

partial or complete cutting of female genitals, which is commonly performed during childhood. FGC is carried out using knives, razors, scissors, or sometimes pieces of glass and blunt blades, etc. In some rare traditional cases, it has also been reported to use other various tools to perform genital cutting like sharp stones (Banks *et al.*, 2006; WHO, 2022). Regardless of tools that it uses, FGM is an unhygienic and unhealthy traditional practice which affected girls and women's health all time (Diop & Askew, 2009).

FGM is deeply entrenched within socio-cultural beliefs over decades and generations around preserving a girl's purity and controlling women's sexuality or chastity. Such practices are more prevalent in economically and socially deprived communities and among the less educated, economically, and socially weaker subpopulations (Holmes *et al.*, 2017; Kloning *et al.*, 2018; Rawat, 2017; Tamire & Molla, 2013; UNICEF, 2017; WHO, 2001). Women become puppets when they are uninformed and unaware of health hazards caused by such rigid practices (Alcaraz *et al.*, 2014).

It is estimated that FGM practices are widespread and deeply rooted practice, performed in more than 28 countries of Africa and in a few other scattered communities worldwide (UNICEF, 2017; UNICEF & Gupta, 2013; WHO, 2001, 2012). According to the WHO estimation, between 100 and 140 million women and girls have undergone through FGM practices, and almost 2 million or more are added each year (UNICEF, 2017; WHO, 2013). In many regions of some African countries, over more than 80% of women have ever experienced FGM practice (UNICEF, 2022).

However, FGM is not only a severe form of discrimination against girls and women but also a violation to the human rights of girls and women. The negative consequences and violation of the human rights of FGM have been recognized by several international rights treaties that affirm the rights of physical integrity and freedom from all forms of torture, inhumane, degrading treatment and discrimination. Many international organizations such as the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW) considers this practice as violence against women (CEDAW, 1992). The World Conference on Human Rights (WCHR) launched a global movement against the violence against women and has catalyzed international action on elimination of FGM several decades ago (WCHR, 1993). WCHR supports all measures by the United Nations and its specialized agencies to ensure the effective protection and promotion of human rights of the girl-child. WCHR urges its member states to repeal existing laws and regulations and remove customs and practices which discriminate against and cause harm to the girl-child (WHO, 1996). The United Nations Sustainable Development Goals (SDGs) (United Nations,

2015, p22) have explicitly stated in its Goal 5 Target 5.3 to "Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation" by 2030.

## 1.2. Female genital mutilation and health consequences

FGM practice can lead to various health hazards, some of which may have life-threatening consequences in later life (Klein *et al.*, 2018; WHO, 2000). Studies have shown that women and girls who experienced FGM practice may suffer from immediate or long-term health complications such as severe pain, bleeding, hemorrhage, infections, tetanus, oliguria, and sepsis (Almroth *et al.*, 2005; Coomarasamy *et al.*, 2016; Gebremichael, 2002; Hilber *et al.*, 2007; Insight, 2010; Infections, 2012; Okonofua *et al.*, 2002; Utz-Billing & Kentenich, 2008; WHO, 2012). There is a consensus that FGM plays a significant role in the development of Pelvic Inflammatory Diseases (PID). Women who had undergone infibulated have a higher risk of infection and can further cause infertility (Pastor-Bravo *et al.*, 2018; Kimani *et al.*, 2020). Furthermore, young women and girls may suffer more from health complications compared to older reproductive women.

FGM has also been evidenced to lead to the risk of sexually transmitted infections (STIs) and other related complications due to the nature and serious conditions by which the procedure is done. Women and girls who experienced FGM practice are more vulnerable to get STI and human immunodeficiency virus (HIV) as compared to their counterparts who had no such experiences (Elmusharaf *et al.*, 2006; O'Neill, 2012; Watkins, 2016; WHO, 2013, 2022). One Nigerian hospital-based study shows that FGC increases various reproductive problems (such as infections and infertility related problems) among those who experienced FGM practice and increases the vulnerability of STIs and HIV (Dare *et al.*, 2004; Hilber *et al.*, 2007; Mandara, 2004). Furthermore, according to an analysis by the United Nations Children's Fund (UNICEF), the proportion of FGM undergone medicalized among the adolescents aged 15 – 19 years is twice as high compared to the women aged between 45 and 49 years (UNICEF, 2020).

## 1.3. Why Senegal?

Senegal is located in West African continent and is divided into 14 administrative divisions. The country covered a land area of nearly 197,000 square kilometers and had 17.14 million population (2021). According to the World Bank (2022), the adult literacy rate of the country was 52% in 2017, and the youth aged 15 – 24 years literacy rate was about 76% for men and 64% for women. Today, about 25% of women of reproductive ages in Senegal, or equivalent to or nearly 2 million, have undergone the FGM practice, with

southeast the highest prevalent areas (UNICEF, 2022). This prevalence of FGM seems largely unchanged in the last two decades. Senegal is a very good research sample for studying FGM and related issues. A recent infographic report based on the Demographic and Health Survey since 2005 released by the United Nations Children's Fund (UNICEF, 2022) has largely filled our knowledge gap about FGM in Senegal. Evidence also shows that FGM practice is most common among girls and women from the poorest families and those from the Muslim religion. There is also a substantial variation in the prevalence of FGM by ethnicity with more than two-thirds in Pour and Soninke and < 3% in Serer and Wolof. By contrast, the difference in the prevalence of FGM by educational level and urban-rural by residence is less pronounced (UNICEF, 2022). Senegal is thus a good sample to study FGM practice and its related issues.

There is evidence that women with different demographic characteristics may have different views and practice behaviors about FGM. For example, women who have knowledge of obstetric health hazard caused by FGM are less vulnerable to have reproductive health problems, while problems are more severe among women who do not have any such knowledge (Coomarasamy *et al.*, 2016; Connor *et al.*, 2016; Herieka & Dhar, 2003; Setegn *et al.*, 2016). Studies have shown that women with lower education are doubly vulnerable, both physically and socially because they do not have adequate information about health hazards, and thus they keep on flowing towards the wave of traditional practices. Consequently, they become a part of the rigid and wrong social practices/systems. By contrast, women with adequate knowledge about various health hazards to some extent can help themselves to unfollow traditional and unhygienic practices, and to seek necessary treatments when in need so as to avoid harmful consequences (Doucet *et al.*, 2017; Kloning *et al.*, 2014). It is thus essential to understand the connection between women's attitudes and level of FGM in Senegal whereas traditional beliefs are powerful (Tamire & Molla, 2013; Watkins, 2016; Doucet *et al.*, 2017).

Furthermore, although some studies have investigated the attitudes toward continuation of FGM among Senegal women (Adigüzel *et al.*, 2019; Ciment, 1999; Levy *et al.*, 2021; Mohammed *et al.*, 2018) it is not sufficient to understand whether women's knowledge and beliefs are associated with their health behaviors and treatment seeking behaviors when in need. Moreover, due to lack of data, the previous studies have not adequately investigated the relationship between STIs and FGM. Taking all together, the primary goals of this study were to (i) investigate factors associated with prevalence of FGM and associated with its performance by traditional practitioners, (ii) examine factors associated with women's

attitude regarding whether FGM should continue or be stopped, and (ii) examine factors associated with having STIs and associated with treatment seeking among STIs. Below we describe the data and methods used for the current study, followed by the results, interpretations of key findings and their implications.

## 2. Data and methods

### 2.1. Data sources

The Demographic Health Survey (DHS) of Senegal 2010 – 2011 and 2019 datasets were used to fulfill the study objectives. The reason why the present study used the 2010 – 2011 dataset is because the 2019 DHS dataset did not collect data on STIs. DHS provides profound and comprehensive information at the individual and household levels. The total sample size for this analysis was 15,688 for STIs (from the 2010 – 2011 dataset) and 8649 for FGM (from the 2019 dataset). The DHS is a nationally representative household survey with a multi-stage stratified systematic sampling design that provides data for a broad range of monitoring and impacts evaluation indicators, health, and nutrition, etc., in the area of population. The survey collected various information on the health issues of men, women, and children. Furthermore, the survey included various key indicators such as fertility rates, under-five mortality rates, contraceptive use, FGM, skilled assistance with births, childhood immunization coverage, nutritional status of children, along with knowledge and STIs, behavior regarding HIV and future perspective. There are several types of questionnaires: household questionnaires, women's questionnaires (women aged 15 – 49 years), children's questionnaires, and men's questionnaires. There are also several standardized questionnaire modules for the countries with interest in topics while information on HIV testing is also available. More details can be found at the DHS official website <https://dhsprogram.com>. This study focused only on the women's questionnaires.

### 2.2. Measures

#### 2.2.1. Dependent variables

The six variables were used as dependent variables in this study. First, whether the respondent was circumcised or not? (No "0"/Yes "1"). Second, who performed circumcision? (Traditional circumciser, traditional birth attendant, other traditional, medical personnel, and missing/do not know). These categories were recoded into a dichotomous category of practitioners as traditional circumciser "1" versus all others "0." Third, women's attitude toward the continuation of FGM practice ("1" should continue, "2" should stop, "3" depends, and "8" don't know). The variable was recoded in to three categories: (1) should continue, (2) should

stop, and (3) do not know/depends. Fourth, ever heard of a Sexually Transmitted Infections (STIs) or ST symptoms (STs)? (Yes “1” vs. No “0”). Fifth, whether a woman had STIs/STs measured by three dichotomous questions: had any STIs in past 12 months, bad smelling/abnormal genital discharge, and genital sore or ulcer. If answering “Yes” to any of three questions, the woman was considered having STIs/STs, coded 1 and 0 otherwise. Sixth, whether the respondent who had STIs/STs sought advice/treatment in the last 12 months? (Yes “1” vs. No “0”).

### 2.2.2. Independent variables

The study selected some key socio-economic and demographic variables which were considered as potential characteristics that could affect the outcome of the interest. In a nutshell, age group of the women (15 – 24, 25 – 34, 35 – 44, and 45 – 49 years), place of residence (rural and urban), marital status of the women (never married, married, and others), religion of the respondents (Muslim and non-Muslim), ethnic groups (Poular, Wolof, Serer and others), levels of education (no education, primary education, secondary education, and tertiary education), the wealth index (poorest, poor, middle, rich, and richest), and media exposure (*i.e.*, reading magazines/newspapers, listening to radio, and watching television [yes vs. no]) were used as the independent or predictors in the study. All these variables have been identified as the key factors that are associated with our dependent variables (e.g., Sougou *et al.*, 2021; Ahinkorah *et al.*, 2021).

### 2.3. Analytical methods

In addition to bivariate analyses, binary logit (logistic) regression models were carried out to estimate the prevalence of FGM and its associated factors, factors associated with attitudes toward termination of FGM, factors associated with STIs knowledge, the prevalence of STIs, and factors associated with seek treatments among who had STI symptoms. Multinomial logit regression models were used to examine factors associated with women’s attitude toward the continuation of FGM practice. The application of multinomial logit regression model is because the outcome variable has three categories (continuing, stopped, and do not know/depends). In all analyses, appropriate sampling weights were used to adjust for the complex survey design of the DHS. All analyses of this study were carried out using SPSS v20 and STATA v16.

## 3. Results

### 3.1. Sample characteristics

The weighted percentage distributions of sample by selected background characteristics are shown in the left panel of

**Table 1. Distribution of 8,649 women by selected background characteristics, Senegal, DHS 2019**

Variables	% Distribution of all 8,649 women	% Women having FGM among all 8,649 women	% Traditional circumcisers among 3,303 women having FGM
	(A)	(B)	(C)
Total sample	100.0	25.2	96.4
Age group (years)			
15 – 24	41.2	23.9	95.9
25 – 34	30.9	26.5	96.6
35 – 44	20.9	26.7	96.7
45 – 49	7.0	23.0	97.4
Place of residence			
Rural	51.1	29.1***	97.1+
Urban	48.9	21.1***	95.4+
Marital status			
Never married	29.8	20.3***	96.3
Married	65.4	27.7***	96.4
Others <sup>a</sup>	4.8	21.4***	96.2
Religion			
Muslim	97.2	25.7***	96.4
Non-Muslim	2.8	7.5***	97.6
Ethnic group			
Poular	28.0	54.3***	96.3
Wolof	40.2	0.8***	100.0
Serer	15.3	1.1***	97.3
Others	16.5	57.5***	96.3
Levels of education			
No education	47.2	27.1+	98.4***
Primary	21.1	23.2+	91.6***
Secondary	27.3	24.1+	96.8***
Tertiary	4.4	21.9+	90.3***
Wealth index			
Poorest	16.3	47.6***	95.8*
Poor	17.7	30.0***	97.9*
Middle	19.5	23.2***	98.7*
Rich	21.6	18.2***	95.0*
Richest	24.9	14.7***	94.1*
Media exposure			
No	5.9	55.9***	97.0
Yes	94.1	23.3***	96.3

(1) <sup>a</sup>Widowed/divorced/separated and living with partner. (2) All the percentages in the table were weighted. (3) The statistical tests for Columns B and C were based on Pearson Chi-Square Tests. (4) +*P* < 0.1, \**P* < 0.05, \*\**P* < 0.01, \*\*\**P* < 0.001.

**Table 1.** Women aged 15 – 24, 25 – 34, and 35 – 44 years accounted for 41%, 31%, and 21%, respectively; and women of aged 45 – 49 accounted for 7%. Urban women accounted for nearly 49%. About 65% of women in reproductive ages 15 – 49 were married and approximately 97% were Muslims. Poular and Wolof ethnicities accounted for 28% and 40.2%, respectively, and Serer ethnicity accounted for 15.3%. Around half (47.2%) of Senegal women in reproductive ages had no education, and 21.1%, 27.3%, and 4.4% of them received primary education, secondary education, and tertiary education, respectively. More than 90% of Senegal women in reproductive ages had ever exposed to the mass media.

Overall, about 25% of reproductive women experienced FGM practice (Column B in **Table 1**). Bivariate analysis shows that. Bivariate analysis shows that there was no age difference in weighted prevalence of FGM practice, although the youngest women (aged 15 – 24 years) and the oldest women (aged 45 – 49) had lower FGM prevalence (23 – 24%) than the two other age groups (ages 25 – 34 and 35 – 44) (about 28%). Results further show that rural women reported a higher prevalence of FGM practices (29.1%) in comparison to their urban counterparts (21.1%). About 28% of married women reported a practice of FGM in comparison with only 20% among never married women and 21% in those divorced or widowed. Muslim women reported much higher prevalence of FGM (25.7%) than non-Muslim (7.5%). The higher prevalence of FGM found in Poular (54%) and others (57%) in comparison with only 1 – 1.5% among Wolof and Serer ethnicities. Women with tertiary education reported a lower prevalence rate of having FGM in comparison with those in other educational categories: 27% in women with no education, 23 – 24% in women with primary and secondary education. The prevalence rate of having FGM is linked to wealth, from nearly 48% in the poorest down to <15% in the richest. Women with media exposure reported a prevalence rate of having FGM 23%, lower than 56% among those who had non-exposure to media.

Among the women who had a FGM practice, about 96.4% of FGM cases were performed by traditional circumcisers and the remaining 3.6% of cases were performed by other practitioners. This pattern is almost universal for all subgroups of the population with few exceptions. This indicates that even today almost all FGM cases were performed by traditional practitioners in Senegal. The distributional difference was only found by education, wealth, and urban-rural residence. The lowest prevalence of FGM performed by a traditional practitioner was found in those with tertiary (90.3%) and primary education (91.6%), the richest (94.1%), and rich (95.0%) women, and urban women (95.4%).

### 3.2. Factors associated with female genital mutilation

**Table 2** presents odds ratios of practicing FGM and odds ratios of FGM performances by traditional practitioners for study variables controlling for other factors from the binary logit regression models. The results show that controlling for other covariates, women of older ages were more likely to experience FGM practice, but there no difference was found across age groups regarding who performed the FGM. Results further show that women from urban areas were associated 51% lower odds of experiencing FGM practice by a traditional practitioner than their rural counterparts, although there was no difference in experiencing FGM practice between these two groups. Married women were associated with 36% higher odds of experiencing FGM practice than never married women, but they had no difference in who performed the FGM. Non-Muslim women were associated 93% lower odds of experiencing FGM practice than Muslim women, but their higher odds of experiencing FGM practice by traditional practitioners was not statistically significant (likely due to small cases among non-Muslim). Compared to women of Poular ethnicity, women of Wolof or Serer ethnicity were associated 99% lower odds of experiencing FGM practice, but women of other ethnicities were associated 97% higher odds to experience FGM practice. No differences were found by ethnicity regarding whether FGM was performed by a traditional practitioner or not. There is no difference in prevalence of FGM practice across educational levels, but women with higher education were associated with lower odds of experiencing FGM practice by traditional practitioners. The richer a woman, the lower odds she had FGM practice, but well-off women were associated with higher odds of experiencing FGM practice by a traditional practitioner. Women with media exposure were associated with 66% lower odds of experiencing FGM practice compared with their counterparts without media exposure, but their lower odds ratio of experiencing FGM practice by traditional practitioner was not statistically significant.

### 3.3. Women's attitude regarding female genital mutilation practices

**Table 3** presents the weighted distribution of attitudes toward discontinuity of practicing FGM among all 8649 women of productive ages in the DHS 2019 survey. The results reveal that 15.6% and 68.6% of women viewed FGM practice should continue and discontinue, respectively. The remaining 15.8% of women opted to select an answer either depends, do not know, or refusal to answer. Bivariate analyses show that there was a statistical difference in distribution of attitudes by all study variables. Specifically, 58.3% of women who experienced FGM practice answered continuing and 38.1% answered stopping FGM practice, in

**Table 2. Odds ratios of FGM practice and of traditional circumcisions, Senegal, DHS 2019**

Variables	Among all 8,649 women	Among 3,303 FGM women
	FGM practice versus no	Traditional circumcision versus others
Age group (years)		
15 – 24 <sup>®</sup>	1.00	1.00
25 – 34	1.16	1.25
35 – 44	1.36*	1.24
45 – 49	1.77*	1.64
Place of residence		
Rural <sup>®</sup>	1.00	1.00
Urban	0.92	0.49***
Marital status		
Never married <sup>®</sup>	1.00	1.00
Married	1.36*	0.76
Others <sup>a</sup>	1.20	0.95
Religion		
Muslim <sup>®</sup>	1.00	1.00
Non-Muslim	0.07***	1.43
Ethnic group		
Poular <sup>®</sup>	1.00	1.00
Wolof	0.01***	1.00
Serer	0.01***	0.91
Others	1.97***	0.96
Levels of education		
No education <sup>®</sup>	1.00	1.00
Primary	1.11	0.16***
Secondary	1.23	0.45*
Tertiary	1.06	0.16**
Wealth index		
Poorest <sup>®</sup>	1.00	1.00
Poor	1.01	2.92***
Middle	0.68**	7.37***
Rich	0.44***	2.11***
Richest	0.24***	2.43***
Media exposure		
No <sup>®</sup>	1.00	1.00
Yes	0.35***	0.77
N	8,649	3,303
Wald Chi square (df)	783.2 (18)***	103.9 (17)***

(1) <sup>a</sup>Referring to widowed/divorced/separated and living with partner. (2) The numbers in the table refer to relative risk ratios based on binary logit regression models. All odds ratios were weighted. (3) <sup>®</sup>Reference category. (4) Figures in the parentheses are the degree of freedom. In the analysis among FGM women, the degree of freedom was reduced to 17 due to zero weighted cases for Wolof ethnicity. (5) +  $P < 0.10$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

comparison with 1.2% and 78.8% among those who did not experience FGM practice. The proportion of answering “depends,” “do not know,” or refusal is much higher among those who did not experience FGM practice (20.0%) and those who had FGM practice (3.6%).

Women who were older ages, from urban areas, not currently married, non-Muslim, Wolof or Serer ethnicity, with more education, richer, and exposed to mass media were more likely to answer to terminate FGM practice. Women with tertiary education had the highest proportion to view that FGM should be terminated (93.7%), followed by the richest women (87.2%), urban women (81.5%), and the rich women (81.1%). Women who were never exposed to social media had the lower proportion of supporting termination of FGM practice (28.5%). The poorest women (38.4%) and women who experienced FGM practice (38.1%) had a proportion of supporting the termination of FGM practice below 40%.

Columns A and B in Table 4 present relative risk ratio of women’s attitude toward whether the FGM practice should be stopped or continued based on multinomial logit model using the 2019 DHS. The results show that women who experienced FGM practice were more than 52 times as high as their non-FGM counterparts to view that FGM should continue versus that FGM should be terminated. Compared to women aged 15 – 24 years, women of other ages were 36 – 47% less likely to support the continuation of FGM practice. Compared to their rural counterparts, urban women were associated 47% lower risk ratio to support the continuation of practice FGM. Women who were Wolof or Serer ethnicity were 61 – 69% less likely to support the continuation of FGM practice in comparison with Poular. The higher level of education of a woman, the lower her likelihood to support continuation of FGM practice. Similarly, the richer a woman, the lower her likelihood to support the continuation of FGM practice. Women who are exposed to media were associated with 44% of lower odds of supporting the continuation of FGM practice. These multivariable analysis findings are generally consistent with the bivariate analysis findings.

Older ages, married women, women from Wolof and Serer, women with higher socioeconomic status (educated and wealth index), and women of exposed to mass media were associated with the lower odds of selecting their views on FGM continuation with options of “depends,” “do not know,” and “missing.”

### 3.4. Relationship between FGM and STI knowledge, STI prevalence, and treatment seeking

Table 5 presents odds ratios of hearing about STIs/STs (Columns A and B), having STIs/STs (Columns C and D),

**Table 3. Distribution of attitudes toward discontinuity of FGM among all 8,649 sampled women by selected background characteristics, Senegal, DHS 2019**

Variables	% Continuing	% Stopping	% Depends/do not know/missing
Total sample	15.6	68.6	15.8
Having FGM			
No	1.2***	78.8***	20.0***
Yes	58.3***	38.1***	3.6***
Age group (years)			
15 – 24	15.4***	62.3***	22.3***
25 – 34	16.0***	71.2***	12.8***
35 – 44	16.2***	73.8***	10.0***
45 – 49	13.1***	77.9***	9.0***
Place of residence			
Rural	22.4***	56.1***	21.5***
Urban	8.5***	81.5***	10.0***
Marital status			
Never married	10.8***	68.8***	20.4***
Married	18.0***	67.6***	14.4***
Others <sup>a</sup>	11.8***	80.1***	8.0***
Religion			
Muslim	15.9***	68.3***	15.8***
Non-Muslim	3.7***	78.9***	18.4***
Ethnic group			
Poular	36.0***	52.6***	11.4***
Wolof	1.3***	80.5***	18.2***
Serer	1.0***	73.8***	25.2***
Others	29.4***	61.7***	8.9***
Levels of education			
No education	20.1***	61.7***	18.2***
Primary	13.6***	67.5***	18.9***
Secondary	11.3***	77.2***	11.5***
Tertiary	3.3***	93.8***	2.9***
Wealth index			
Poorest	38.4***	38.4***	23.2***
Poor	21.6***	54.0***	24.4***
Middle	14.1***	69.4***	16.5***
Rich	7.9***	81.1***	11.0***
Richest	4.3***	87.2***	8.5***
Media exposure			
No	45.3***	28.5***	26.2***
Yes	13.7***	71.1***	15.2***

(1) <sup>a</sup>Widowed/divorced/separated and living with partner. (2) All the percentages in the table were weighted. (3) The statistical significances were based on Pearson Square Tests with all at  $P < 0.001$ .

and seeking treatments among women who had STIs/STSS (Columns E and F) by FGM status. Columns A, C, and E only included FGM practice, whether the respondent knew about STIs/STSS, and age, whereas Columns B, D, and F also included other variables. Given the less reliability of results due to the small sample size for women who had FGM but performed by non-traditional practitioners (2.2%, Table 6), we mainly focused on the comparisons between women with experiencing FGM practice performed by traditional practitioners and women without FGM.

The results in Column A show that women who experienced FGM practice performed by traditional were 57% less likely to know about STIs/STSS compared with women who did not have FGM practice when age was controlled for. The lower odds were not altered even when many other key factors were controlled for (see Column B). Women with FGM performed by traditional practitioners were associated with 53% higher odds of having STIs/STSS than women without FGM, and such higher risk was enhanced when other factors were taken into account (OR = 1.63). No difference in treatment seeking behaviors was found between women with FGM performed by traditional practitioners and women without FGM.

#### 4. Discussion

Ending FGM is a matter of human rights, a matter of dignity and equality, and a matter of safe health and education. It is also crucial to achieving the Sustainable Development Goal 5 for gender equality (Powell & Mwangi-Powell, 2017; United Nations, 2015). Using the latest DHS dataset in Senegal, this study analyzed the status quo of the prevalence of practicing FGM in Senegal. We found that about 25% of women in contemporary Senegal were practicing FGM, out of which 96% was performed by traditional practitioners, and these two figures witnessed little changes in the last three decades. This indicates that Senegal needs to pool greater efforts to intensity and accelerate investments in FGM prevention and responses to achieve SDG by 2030 (Shell-Duncan *et al.*, 2013; UNICEF, 2022).

One recent report by UNICEF (2022) systematically analyzed the prevalence of FGM in Senegal by different demographic characteristics. However, unlike the UNICEF study that mainly focuses on bivariate or univariate tabulations, the present study investigated factors associated with prevalence of FGM practice under multivariable regression designs. Overall, we found that in presence of all other study variables, women who were young, never married, Wolof or Serer ethnicity, rich, or

**Table 4. Factors associated with attitudes toward FGM practice, Senegal, DHS 2019**

Variables	Among all 8,649 women		Among 3,303 FGM women <sup>a</sup>
	Should continue versus should stop	Do not know/depends versus should stop	Should continue versus should stop
	(A)	(B)	(C)
Experienced FGM			
No <sup>®</sup>	1.00	1.00	--
Yes	53.23***	0.31***	--
Age group (years)			
15 – 24 <sup>®</sup>	1.00	1.00	1.00
25 – 34	0.64**	0.47***	0.53***
35 – 44	0.61**	0.33***	0.46***
45 – 49	0.53**	0.29***	0.37***
Place of residence			
Rural <sup>®</sup>	1.00	1.00	1.00
Urban	0.48***	0.65***	0.39***
Marital status			
Never married <sup>®</sup>	1.00	1.00	1.00
Married	1.14	0.59***	1.31
Others <sup>b</sup>	0.90	0.47*	1.05
Religion			
Muslim <sup>®</sup>	1.00	1.00	1.00
Non-Muslim	0.64	1.38	0.37*
Ethnic group			
Poular <sup>®</sup>	1.00	1.00	1.00
Wolof	0.39**	0.80+	0.71
Serer	0.31**	1.28+	0.15*
Others	0.86	1.03	0.77*
Levels of education			
No education <sup>®</sup>	1.00	1.00	1.00
Primary	0.69**	1.04	0.62***
Secondary	0.48***	0.38***	0.37***
Tertiary	0.18***	0.16***	0.11***
Wealth index			
Poorest <sup>®</sup>	1.00	1.00	1.00
Poor	0.83	0.84	0.86
Middle	0.71*	0.52***	0.81
Rich	0.43***	0.35***	0.45***
Richest	0.35***	0.31***	0.47***

(Cont'd...)

**Table 4. (Continued)**

Variables	Among all 8,649 women		Among 3,303 FGM women <sup>a</sup>
	Should continue versus should stop	Do not know/depends versus should stop	Should continue versus should stop
	(A)	(B)	(C)
Media exposure			
No <sup>®</sup>	1.00	1.00	1.00
Yes	0.56***	0.38***	0.74+
N	8,649		3,303
Wald Chi-square (df)	1,912.2 (38)***		322.1 (18)***

(1) <sup>a</sup>Cases of “do not know/depends” were excluded due to the non-convergence of models. <sup>b</sup>Referring to widowed/divorced/separated and living with partner. (2) The numbers in the table refer to relative risk ratios based on multivariable multinomial logit regression models. All relatively risk ratios (Columns A and B) and odds ratios (Column C) were weighted. (3) <sup>®</sup>Reference category. (4) Figure in the parentheses is the degree of freedom. (5) +  $P < 0.10$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

exposed to social media tended to have lower prevalence of practicing FGM, and that women from urban areas or women with more education were less likely to practice FGM performed by traditional practitioners, but richer women were more likely to experience FGM performed by traditional practitioners. We further found that nearly 70% of Senegal women wish to discontinue the FGM practice, and that women who were older, from urban area, Wolof or Serer ethnicity, more educated, economically well-off, or exposed to social media were more like to support the discontinuation of FGM. These findings are generally consistent with those reported by the UNICEF (2022), but our results are more robust as they are adjusted for confounding factors.

The finding that young or never married women tended to have lower prevalence of FGM practice is also consistent with a recent study focusing on Sub-Saharan countries (Ahinkorah *et al.*, 2021). Such finding is likely due to their increased awareness among younger generations about the negative sequences of FGM practice. Generally speaking, women who have a higher socioeconomic status or more resources (in terms of education, wealth, and urban-rural residence) tended to have a lower prevalence rate of FGM practice and a lower proportion of FGM practice performed by traditional practitioners and were more likely to support the termination of such practice. These findings are expected since more resourceful women could have more power to make their own decision to avoid harmful practice to themselves and they are also more

**Table 5. Associations between FGM and STI knowledge, prevalence of STIs, and treatment seeking, 2010 – 2011 DHS, Senegal**

Variables	Among all 15,688 sampled women				Among 1,417 women with STIs/STs	
	Heard about STIs/STs versus no		Having STIs/STs versus no		Treatment seeking versus no <sup>a</sup>	
	(A)	(B)	(C)	(D)	(E)	(F)
FGM practice and type of practice						
No FGM <sup>®</sup>	1.00	1.00	1.00	1.00	1.00	1.00
FGM non-traditional	1.61***	0.83	0.88	1.05	1.69***	1.28
FGM traditional	0.43***	0.44***	1.53*	1.63*	0.88	0.92
N	15,688	15,688	15,688	15,688	1,417	1,417
Wald Chi square (df) <sup>b</sup>	79.8 (5)	595.6 (20)	98.8 (6)	244.9 (21)	49.2 (6)	149.1 (21)

(1) numbers in the table refer to odds ratios based on binary logit models. Results in Columns A, C, and E only controlled for age and/or whether ever heard about STIs/STs, whereas results in Columns B, D, and F controlled for all variables in Table 5. (2) <sup>a</sup>Among 1,417 women who answered the question of seeking treatment. It consists of all 197 women who reported having STIs/STs and 1,222 women who had symptoms within the past 12 months. <sup>b</sup>All models were significant at  $P < 0.001$ . (3) The percentages in the table were weighted. (4) +  $P < 0.1$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

knowledgeable about the adverse impacts of FGM practice on their health (Diop & Askew, 2009; Doucet *et al.*, 2020; Santos-Hövenner *et al.*, 2015; UNICEF, 2022). Women who were exposed to social media were tended to have a lower prevalence rate of FGM practice and were more likely to choose non-traditional practitioners if they had to practice FGM. Literature has indicated that media exposure could play a major role in spreading knowledge related women health and knowledge about harmfulness of FGM practice (Essén & Johnsdotter, 2004; Onuh *et al.*, 2006; Kloning *et al.*, 2018). Our finding supports such argument. Empowerment through education is another important factor that helps in strengthening women and girls in decision making against FGM (Karmaker *et al.*, 2011; Williams-Breault, 2018). Our finding also supports such statement. Indeed, promoting education and increasing exposure to social media are essential protective weapons to fight against these harmful traditional practices and to help eradicate FGM practice.

One noteworthy finding is that Muslim women and women of Poular ethnicity are found to be more likely to experience FGM practice and support the continuation of the practice, indicating that traditional beliefs and cultural practices in these subpopulations in Senegal are strong (Muthumb *et al.*, 2015). Senegal is a religiously and ethnically diverse country where the majority of women belong to Muslim religion. The Muslim communities carry out several phenomena for FGM practices (Duivenbode & Padela, 2019). Although they are hinged on some common themes, that is, parents' social status, the family's honor, marriage opportunity, inherit practice, and many others social norms (Muthumbi *et al.*, 2015). Adoption of these practices among Muslim women is the common causes for high FGM practices, sometimes girls/women accepting willingly and sometimes forcefully

(Morrone *et al.*, 2002). Apart from religion, women's ethnicity also causative in FGM practices. If girls/women from Poular ethnic group not accepting FGM practice, they may not get respected from their communities and may have less chance to get married. These factors are primarily responsible for continuation of FGM practices (Van Bavel, 2020; Shell-Duncan *et al.*, 2021). Institutional religious structure may also play a large role in sustaining FGM among Muslims women (Hayford & Trinitapoli, 2011; Shakirat *et al.*, 2020).

Finally, our study shows a significant association between FGM, knowledge about STIs/STs, and the prevalence STIs/STs among reproductive age group women in Senegal, with FGM women having low knowledge about STIs/STs and higher prevalence of STIs/STs. These findings highlight the importance of promotion of education and publicizing the knowledge of adverse consequences of FGM practice on women's health.

#### 4.1. Limitations

Cautions are needed when interpreting our findings. First, the cross-sectional design of this study does not allow for an investigation of long-term health effects among women who experienced FGM practice. Longitudinal panel studies are clearly needed for understanding long-term effects. Second, no examinations for intermediate effects, no comparisons over time, and no causal relationships between FGM and STIs/STs were not performed due to data unavailability. Relatedly, some factors related to family's or husbands' characteristics were not modeled, which may bias the associations between our study variables and FGM practice. Third, information on the timing of FGM was not available. Furthermore, some key factors related to STIs/STs were not modeled, such as contraceptive use

**Table 6. Sample distribution, proportion of women having knowledge about STIs, prevalence of STIs, and treatment seeking behaviors, Senegal, 2010 – 2011 DHS**

Variables	Among all 15,688 sampled women			Among 1,417 women with STIs and symptoms
	% Sample (A)	% knowledge about STIs/STs (B)	% Had any STIs/STs in last 12 months (C)	% STIs/STs treatment seeking <sup>a</sup> (D)
Total	100.0	94.5	9.20	59.8
No FGM	74.3	96.5***	8.83*	42.5***
FGM, non-trad.	2.2	87.7***	13.26*	50.9***
FGM, traditional	23.4	94.6***	10.00*	63.7***
Age group (years)				
15 – 24	42.4	95.1**	6.24***	48.4***
25 – 34	31.2	96.4**	12.61***	65.7***
35 – 44	20.4	96.6**	10.60***	65.6***
45 – 49	6.0	95.6**	7.62***	46.5***
Place of residence				
Rural	50.7	93.4***	9.87*	48.0***
Urban	49.3	98.4***	8.40*	74.0***
Marital status				
Never married	29.2	96.4+	2.18***	49.4
Married	66.0	95.6+	12.19***	60.8
Others <sup>b</sup>	4.8	96.2+	10.80***	57.0
Religion				
Muslim	95.4	95.8	9.10	58.6**
Non-Muslim	4.6	96.5	11.28	78.5**
Ethnic group				
Poular	26.5	93.5***	9.82*	52.2*
Wolof	38.7	97.1***	8.06*	63.3*
Serer	15.0	96.3***	9.37*	61.4*
Others	19.8	96.2***	10.45*	62.7*
Levels of education				
No education	57.9	93.9***	9.90*	51.6***
Primary	21.8	97.6***	9.65*	70.0***
Secondary	18.3	99.4***	6.54*	75.0***
Tertiary	2.0	99.5***	8.45*	98.3***
Wealth index				
Poorest	16.5	88.3***	11.56*	40.3***
Poor	17.9	93.9***	8.38*	50.5***
Middle	19.9	97.5***	8.83*	58.5***
Rich	22.3	97.8***	8.36*	68.7***
Richest	23.5	99.4***	9.27*	76.5***
Media exposure				
No	8.2	86.4***	10.69+	42.3***
Yes	91.8	96.7**	9.07+	61.6***

(1) <sup>a</sup>Among 1,417 women who answered the question of seeking treatment. It consists of all 197 women who reported having STIs and 1222 women who had symptoms within the last 12 months. <sup>b</sup>Widowed/divorced/separated and living with partner. (3) Levels of statistical significance were obtained from Pearson Chi-square tests. (4) +*P* < 0.1, \**P* < 0.05, \*\**P* < 0.01, \*\*\**P* < 0.001.

and sexual partner's STIs/STs, which prohibited us from examining the reliable causal relationship between FGM and the prevalence of STIs/STs. Fourth, we only focused on consequences of FGM on STIs/STs, while excluding its other negative consequences that have been well-documented, such as physical and psychological (Diop & Askew, 2009; UNICEF, 2022; WHO, 2012). All these could undermine the value of the current study. We welcome further studies address these limitations to shed light on the theme.

## 4.2. Implications

Despite the limitations, the current study contributes to the field of women's reproductive health and gender equality in relation to SDGs. Women's educational level, economic status, exposure to social media, urban-rural residence, and ethnicity were found to be strong predictors of the FGM practice and the prevalence of STIs/STs. These findings indicate that effective intervention programs aiming to reduce or eliminate FGM practice should be targeted to rural women, women with lower education, poor women, and Poular women. Although the Senegal's central and local governments have been working together with international governmental and non-governmental organizations and other stakeholders using a variety of strategies to reduce FGM practices and prevent women from STI and HIV, and the country even has a strong law against the FGM practices (Kloning *et al.*, 2018; Rouzi, 2013), our findings suggest that the Senegal Government needs to make more efforts to further reduce and eventually eliminate FGM practices in order to achieve SDGs within less than a decade. Specifically, the Senegal Government may consider implementing intervention programs that focus more on promotion of women's education, their economic empowerment, poverty reduction, and dissemination of knowledge about consequences of the FGM practice, especially among rural and Poular women.

## 5. Conclusions

To prevent and eliminate FGM harmful practice, it's essential to understand patterns associated with such practices and its adverse consequences, especially among women. With this motivation, this study used the 2019 DHS and the 2010 – 2011 DHS to examine factors associated with FMG among reproductive aged women in Senegal. Overall, the findings of this study suggest that economic empowerment, poverty reduction, education promotion among women may help reduce and eventually eliminate FGM practice in Senegal. The Senegal Government and its local governments should make more efforts in disseminating knowledge and increasing public

awareness about the negative health consequences of FGM practice, launching more effective intervention programs to promote education and poverty reduction that not only target Goal 5 Target 5.4, but also target other SDGs.

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## Conflict of interest

The authors have no conflicts of interest to declare.

## Author contributions

*Conceptualization:* Ramu Rawat and Noli Nivedita Tirkey

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*Writing – original draft:* Ramu Rawat and Noli Nivedita Tirkey

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## Ethics approval and consent to participate

Not applicable.

## Consent for publication

Not applicable.

## Availability of data

Data utilized to this paper is from secondary sources and available to public (<https://dhsprogram.com/data/available-datasets.cfm>).

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