Original Article

A retrospective analysis of the trends in the prevalence of female genital mutilation and associated factors among women of reproductive age in Nigeria 2011–2021

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Abstract

Background: Female genital mutilation (FGM) is widely acknowledged globally as a violation of the fundamental human rights of girls and women. FGM is still widely practiced in Nigeria but at diminishing rates. Primary care physicians must educate and campaign to end this hazardous practice in Nigeria, especially in high-incidence areas. This study fills the knowledge gap by identifying FGM determinants to help policymakers reduce it. **Method:** The study employed a retrospective cross-sectional design using data from the United Nations International Children's Emergency Fund for 2011, 2016–2017, and 2021. The sampling involved multistage cluster sampling. Data analysis utilized IBM-SPSS, presenting FGM prevalence across years and exploring associations with various factors. **Results:** This study analyzed 63,365 Nigerian women across a decade (2011, 2016–2017, and 2021). FGM awareness fluctuated (35.1% in 2016–2017, 33.0% in 2011, and 31.9% in 2021), while FGM prevalence increased from 46.6% (2011) to 69.5% (2021). Education correlated with lower FGM prevalence. Geographic disparities were observed, with the Southwest having the highest (70.1%) and the Northeast having the lowest (34.5%) prevalence. Religion influenced FGM rates, with Christians (54.2%) and those with other/no religion (58.0%) showing higher rates than Muslims (52.6%). Urban women had a slightly lower prevalence (52.6%) than rural women (54.2%), and wealth quintiles displayed variations. Variability was also evident among states, ranging from 2.0% to 86.3%. Daughters' circumcision was influenced by maternal circumcision status, education, region, religion, and wealth quintile. Common FGM procedures involved removing genital flesh (63.7%) and nicking without removal (55.1%), often performed by nurses/midwives (63.7%). **Conclusion:** The study emphasized the urgent need for continuous awareness campaigns and education to combat FGM among Nigerian women. Education emerged as a critical factor in reducing FGM, highlighting the importance of investing in girls' education.

Keywords: Circumcision, daughter, female genital mutilation, prevalence, reproductive age

Introduction

Female genital mutilation (FGM) has been designated a global public health concern because of the severe impact on women's physical and mental health, as well as the violation of their sexual and reproductive health rights.[1,2] FGM refers to surgeries that involve the removal and injury (cauterization or lengthening of the clitoris or labia minora) of a woman's external genitalia for any purpose (cultural or religious).[3] The World Health Organization (WHO) considers all forms of FGM a severe violation of women's human rights, making it a top-priority problem. This is a concern shared by the United Nations Development Program (UNDP), UNICEF, and the United Nations Entity for Gender Equality and the

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Received: 27-10-2023 **Revised:** 06-12-2023
Accepted: 26-02-2024 **Published:** 26-07-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_1742_23

How to cite this article: Sanni FO, Sanni EA, Onyeagwaibe C, Ahamuefula T. A retrospective analysis of the trends in the prevalence of female genital mutilation and associated factors among women of reproductive age in Nigeria 2011–2021. J Family Med Prim Care 2024;13:3084-93.

Empowerment of Women (UN Women).[4] According to the World Health Organization, over three million adolescent women are at risk of experiencing FGM yearly; this figure might be as high as 140 million.[5] FGM has been linked to several adverse health outcomes, including clitoral cysts, bleeding, fistulas, obstetric difficulties, urinary tract infections, retention, vaginal rips, and psychological trauma.[4,6] Despite these challenges, this ancestral practice remains surprisingly common, especially in developing areas such as sub-Saharan Africa, the Middle East, and Southeast Asia.[4,6] An estimated 92 million African females aged 10 and above are subjected to FGM.[7] Nigeria is one of 28 African nations practicing FGM.[8]

FGM is still widely practiced in Nigeria but at diminishing rates. Higher rates of FGM were identified in older, married Muslim women in rural regions.[4] According to Kandala *et al.,*[9] regional incidence varies from 1.5% to 61%. Most cases of FGM occur in the south, where Gayawan and Lateef[10] also showed that women are more likely to view the practice favorably. On the contrary, Okeke, Anyaehie, and Ezenyeaku[11] discovered that only 14.3% of mothers in southeastern Nigeria circumcised their daughters, suggesting waning acceptance in some regions.

FGM continues to thrive in Nigeria due to several reasons. According to Aod and van de Kwaak,[12] the primary causes are social (cultural tradition), biological (female subjection), and educational (a lack of healthcare knowledge). Cultural solid tradition and a lack of knowledge of the harms of FGM were also shown to contribute to its growth in southeastern Nigeria, according to research by Ibekwe Perpetus C.[8] However, Kpozehouen *et al.*[4] and Gayawan and Lateef[10] discovered that greater education and socioeconomic levels reduce support for FGM, suggesting that education and empowerment may help abolish the practice. Cultural customs, a lack of knowledge, and gender inequity continue to drive FGM's persistence in specific parts of Nigeria even as the practice's overall frequency decreases. Accelerating the removal of this harmful practice in Nigeria requires increased information and campaigning from primary care physicians, particularly in high-incidence regions. However, longitudinal studies on the trend of FGM and their associated factors for a more extended timeframe are scarce. This study aimed to bridge this knowledge gap, providing evidence for policymakers to reduce FGM by addressing the associated factors.

Methodology

Study area

This study focused on the Federal Republic of Nigeria as the geographical area of investigation. Nigeria, located in West Africa, is the most populous country on the continent and is characterized by its diverse cultural, ethnic, and socioeconomic landscape. The study encompassed urban and rural regions across the country, reflecting the wide range of social contexts and settings where FGM and its associated factors are observed. The choice of Nigeria as the study area was driven by the significance of addressing FGM within a country that has experienced varying levels of prevalence and has implemented efforts to combat the practice over time. This investigation aimed to contribute to a more comprehensive understanding of the evolving nature of FGM and its determinants in Nigeria, thereby aiding in developing targeted interventions and policies to reduce its prevalence and protect the rights and well-being of women and girls.

Study design

This research employed a retrospective cross-sectional study design to investigate the trend of FGM and its associated factors in Nigeria. The study utilized secondary sources of data collected in the years 2011, 2016–2017, and 2021. A cross-sectional approach was chosen to provide a snapshot of FGM prevalence and associated factors during specific periods, allowing for the assessment of temporal trends and associations. The primary data source for this study was national-level survey reports conducted in Nigeria. These surveys include the ones carried out by UNICEF in 2011, 2016–2017, and 2021. These comprehensive and representative surveys provide information on FGM prevalence and associated factors.

Study population

The study population was drawn from data collected during 2011, 2016–2017, and 2021 by UNICEF, which are nationally representative surveys conducted across various states and regions of Nigeria. The study aimed to provide a comprehensive overview of FGM trends and associations within the designated population by including a broad range of participants from different sociodemographic backgrounds.

Sampling

The sampling strategy for the UNICEF surveys involved a multistage cluster sampling design to achieve nationally representative samples of households across different regions of Nigeria. The data from these surveys encompass various demographic, socioeconomic, and cultural characteristics, enabling a comprehensive analysis of FGM trends and their determinants.

Data analysis

Data were cleaned, transferred into a spreadsheet, and analyzed using IBM-SPSS version 28. Descriptive statistics was used to present the prevalence of FGM at different time points (2011, 2016–2017, and 2021). Chi-square tests and logistic regression analyses were used to examine associations between FGM and various factors. The level of significance was set at 5%. Results were presented in tables and charts.

Ethical consideration

This study was based solely on secondary data from publicly available survey reports; thus, ethical approval is not required. All data used in this research are de-identified and aggregated nationally to ensure participant confidentiality.

Results

Sociodemographic profile of the women enrolled in the study

As shown in Table 1, a higher proportion of women were interviewed in 2016–2017 compared to other survey years. The educational status of the participants shows that the majority of the respondents attained secondary education, followed by non-formal education and higher education. Geographically, the highest representation was in the Northwest, and the lowest was in the Northeast. The majority were Christians, followed by Muslims, and other/no religion. Most women resided in rural areas, compared to urban areas. The wealth index quintile showed a more uniform distribution across different economic groups, with the first quintile being the poorest and the fifth quintile being the richest.

Distribution of respondent's knowledge of FGM with year

As shown in Figure 1, in 2011, 33.0% of the women interviewed were aware of FGM. During 2016–2017, the proportion increased to 35.1%, whereas it decreased to 31.9% in 2021. The Chi-square test results indicate a statistically significant difference in awareness of FGM across these three periods ($X^2 = 270.335$, $P < 0.001$). This suggests that there have been notable shifts in the distribution of attention over time.

Table 1: Sociodemographic profile of the women who participated in the study

Variable	Frequency (*n*=63365)	Percentge
Year of survey		
2011	20543	32.4
2016–2017	22279	35.2
2021	20543	32.4
Education level		
Non-formal	19901	31.4
Primary	15934	25.1
Secondary	22918	36.2
Higher	4612	7.3
Geopolitical Zones		
Northcentral	10552	16.7
Northeast	7123	11.2
Northwest	11708	18.5
Southeast	10838	17.1
Southsouth	12317	19.4
Southwest	10827	17.1
Religion		
Christianity	36221	57.2
Islam	26396	41.7
Other/No religion	748	1.2
Area of residence		
Rural	42804	67.6
Urban	20561	32.4
Wealth index quintile		
First quintile- Poorest	9431	14.9
Second quintile	12587	19.9
Third quintile- Middle	14443	22.8
Fourth quintile	14539	22.9
Fifth- Richest	12365	19.5

Prevalence of FGM among Nigerian women of reproductive age 2011–2021

As shown in Table 2, the prevalence of circumcision was the highest in 2021, followed by 2011 and 2016–2017. Compared to 2011, the AOR of being circumcised was lower (0.91 (0.88–0.95)) in 2016–2017 and higher (3.24 (3.10–3.38)) in 2021 ($P < 0.05$). Women with higher education had a circumcision prevalence, while those with non-formal, primary, and secondary education had higher likelihoods of circumcision, with AORs of 1.70 (1.56–1.84), 1.51 (1.40–1.63), and 1.16 (1.08–1.24), respectively ($P < 0.05$).

In the geopolitical zones, the Northeast had the lowest circumcision prevalence, while the Southwest had the highest above 70%. Compared to the Northeast, the AORs for circumcision were 7.37 (6.85–7.93) in the Southwest, 3.51 (3.28–3.75) in the Northwest, 2.78 (2.60–2.97) in the Northcentral, 2.40 (2.24–2.58) in the Southeast, and 2.00 (1.86–2.14) in the South-south higher than the Northeast. The prevalence of circumcision was 51.6% among Muslims, 54.2% among Christians, and 58.0% among others/no religion. Compared to Islam, the AORs for circumcision were higher (1.40 (1.35–1.46)) for Christianity and others/no religion (1.65 (1.41–1.92)) ($P < 0.05$). In addition, the prevalence of circumcision was higher in urban areas than in rural areas. Urban women were 0.91 (0.87–0.95) times less likely to be circumcised than rural women. Lastly, the prevalence ranged from 47.8% in the wealthiest quintile to 54.3% in the fourth quintile. Compared to the wealthiest quintile, the AORs for circumcision were higher (1.26 (1.20–1.33)) in the fourth quintile, 1.21 (1.14–1.28) in the third quintile, 1.11 (1.04–1.19) in the second quintile, and 1.10 (1.02–1.18) in the first quintile (poorest) ($P < 0.05$).

As depicted in Figure 2, the prevalence of FGM among females of reproductive age in Nigeria from 2011 to 2021 varied significantly across states. The lowest prevalence rates were observed in Sokoto and Yobe, with just 2.0% and 3.1%, respectively. On the other end of the spectrum, states such as Kwara and Ekiti exhibited remarkably high prevalence rates. The data also highlight a regional pattern. Northern states such as

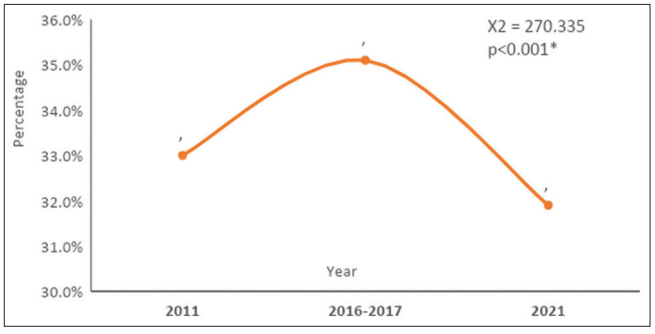

Figure 1: Distribution of respondents' knowledge of female genital mutilation with year

Table 2: Multivariate analysis of factors associated with circumcision among women of reproductive age in Nigeria from 2011-2021

Variable	Circumcised	Not Circumcised	COR (95% CI)	*P*	AOR (95% CI)	*P*
Year of survey						
2011	9570 (46.6)	10,973 (53.4)	Ref	-	Ref	-
2016–2017	9813 (44.0)	12,466 (56.0)	0.90 (0.87–0.94)	<0.001*	0.91 (0.88–0.95)	<0.001*
2021	14,283 (69.5)	6260 (30.5)	2.62 (2.51–2.72)	<0.001*	3.24 (3.10–3.38)	<0.001*
Education level						
Higher	2287 (49.6)	2325 (50.4)	Ref		Ref	
Non-formal	10,651 (52.5)	9250 (46.5)	1.17 (1.10–1.25)	<0.001*	1.70 (1.56–1.84)	<0.001*
Primary	8892 (55.8)	7042 (44.2)	1.28 (1.20–1.37)	<0.001*	1.51 (1.40–1.63)	<0.001*
Secondary	11,836 (51.6)	11,082 (48.4)	1.09 (1.02–1.16)	0.011*	1.16 (1.08–1.24)	<0.001*
Geopolitical Zones						
Northeast	2460 (34.5)	4663 (65.5)	Ref	-	Ref	-
Northcentral	5635 (53.4)	4917 (46.6)	2.17 (2.04–2.31)	<0.001*	2.78 (2.60-2.97)	<0.001*
Northwest	6540 (55.9)	5168 (44.1)	2.40 (2.26–2.55)	<0.001*	3.51 (3.28–3.75)	<0.001*
Southeast	5674 (52.4)	5164 (47.6)	2.08 (1.96–2.22)	<0.001*	2.40 (2.24–2.58)	<0.001*
South-south	5772 (46.9)	6545 (53.1)	1.67 (1.57–1.78)	<0.001*	2.00 (1.86–2.14)	<0.001*
Southwest	7585 (70.1)	3242 (29.9)	4.44 (4.16–4.73)	<0.001*	7.37 (6.85–7.93)	<0.001*
Religion						
Islam	13,613 (51.6)	12,783 (48.4)	Ref	-	Ref	-
Christianity	19,619 (54.2)	16,602 (45.8)	1.11 (1.08–1.15)	<0.001*	1.40 (1.35–1.46)	<0.001*
Others/No religion	434 (58.0)	314 (42.0)	1.30 (1.12–1.50)	<0.001*	1.65 (1.41–1.92)	<0.001*
Area of residence						
Rural	22,523 (52.6)	20,281 (47.4)	Ref		Ref	
Urban	11,143 (54.2)	9418 (45.8)	1.07 (1.03–1.10)	<0.001*	0.91 (0.87–0.95)	<0.001*
Wealth index quintile						
Fifth- Richest	5914 (47.8)	6451 (52.2)	Ref	-	Ref	-
First quintile- Poorest	5090 (54.0)	4341 (46.0)	1.28 (1.21–1.35)	<0.001*	1.10 (1.02–1.18)	0.012*
Second quintile	6865 (54.5)	5722 (45.5)	1.31 (1.25–1.38)	<0.001*	1.11 (1.04–1.19)	0.002*
Third quintile- Middle	7909 (54.8)	6534 (45.2)	1.32 (1.26–1.39)	<0.001*	1.21 (1.14–1.28)	<0.001*
Fourth quintile	7888 (54.3)	6651 (45.7)	1.29 (1.23–1.36)	<0.001*	1.26 (1.20–1.33)	<0.001*
Overall	33,666 (53.1)	29,699 (46.9)	-	-	-	-

*Significant at $p<0.05$

Sokoto, Yobe, and Borno generally have lower prevalence rates ranging from 2.0% to 14.8%. In contrast, Southern states such as Oyo, Ondo, and Kano have notably high rates, exceeding 75%. States such as Akwa Ibom, Rivers, and Cross River in the South-South geopolitical zone also show relatively high prevalence rates, ranging from 27.3% to 36.7%. Meanwhile, southeast states such as Anambra, Ebonyi, and Imo have prevalence rates ranging from 46.5% to 49.1%. It is also worth noting that populous states such as Kano and Lagos have a high prevalences.

Daughters' circumcision and the associated factors among women of reproductive age during 2011–2021

Table 3 shows that the prevalence of daughters being circumcised was the highest in 2016–2017, followed by 2021 and 2011. Compared to 2011, daughters in 2016–2017 had an AOR of 1.14 (1.10–1.19) for being circumcised, while in 2021, they had an AOR of 0.86 (0.83–0.90), $P < 0.001$. For the education level, compared to women with higher education, where the prevalence was 26.7%, women with non-formal, primary, and secondary education had higher likelihoods of having circumcised daughters, with AORs of 2.17 (2.00–2.37), 2.06 (1.90–2.23), and 1.27 (1.18–1.37), respectively ($P < 0.01$).

The Northeast had the lowest prevalence of daughter circumcision, while the Northwest had the highest. Compared to the Northeast, the AORs for having circumcised daughters were 3.34 (3.12–3.58) in the Northwest, 1.72 (1.60–1.86) in the Southeast, 1.67 (1.55–1.80) in the South-south, 1.90 (1.77–2.05) in the Southwest, and 1.41 (1.32–1.52) in the Northcentral ($P < 0.01$). Compared to Christianity, where the prevalence was 34.5%, daughters of Muslim women had an AOR of 1.23 (1.18–1.28), and those of women with other/no religion had an AOR of 1.31 (1.13–1.53) for being circumcised ($P < 0.01$).

For the wealth index quintile, compared to the richest quintile where the prevalence was 32.8%, daughters had an AOR of 0.94 (0.87–1.01; $P = 0.069$) in the first quintile, an AOR of 0.96 (0.90–1.02; $P = 0.164$) in the second quintile, an AOR of 1.08 (1.02–1.14; $P = 0.010$) in the third quintile, and an AOR of 1.06 (1.01–1.13; $P = 0.026$) in the fourth quintile. For women who have ever been circumcised, those who were not circumcised had a prevalence of 27.1% for having circumcised daughters, while those who were circumcised had a prevalence of 49.8%. The AOR for having a circumcised daughter if the mother was circumcised was 2.74 (2.64–2.84), $P < 0.001$.

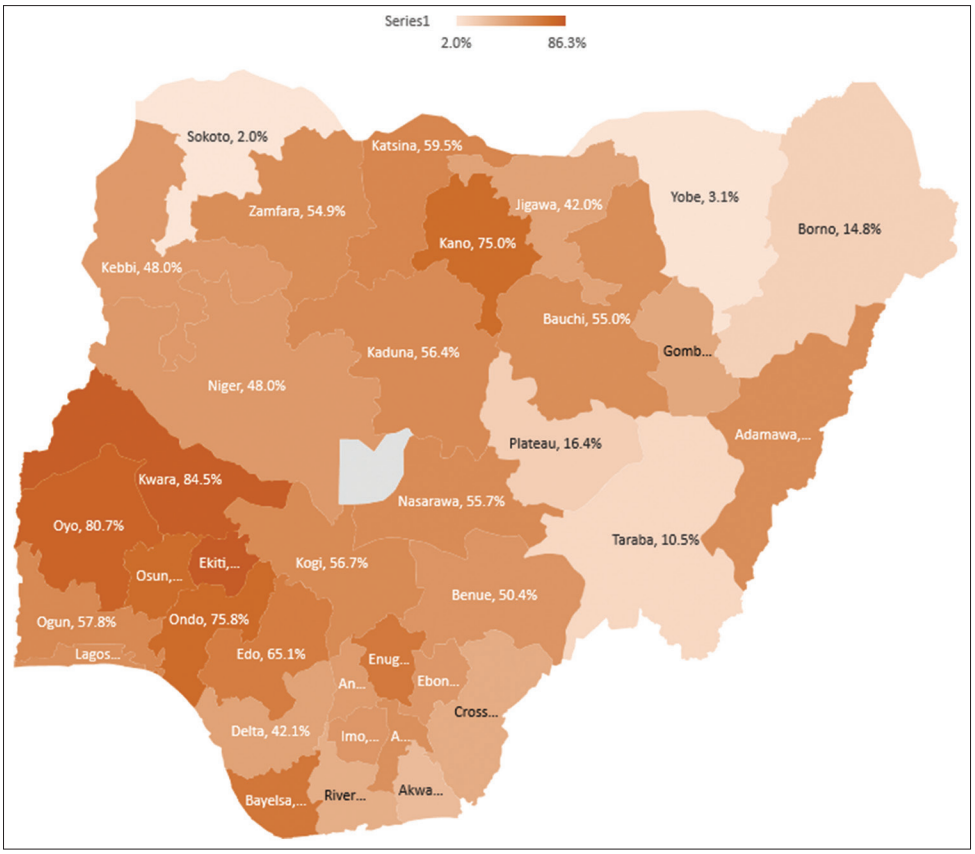

Figure 2: Prevalence of FGM across Nigerian States 2011–2021

The area of residence did not show a significant difference in the prevalence of daughter circumcision ($P > 0.05$). Similarly, for knowledge of FGM, the prevalence was similar between those without knowledge and those with knowledge ($P > 0.05$). Area of residence and knowledge of FGM were not included in AOR because they are not significant factors associated with FGM.

Genital mutilation procedure and persons who performed FG among women who were circumcised

As shown in Table 4, among the respondents who were circumcised, the most common type of genital mutilation procedure was removing flesh from the genital area. This was followed by nicking the genital area without removing flesh. The procedure where the genital area was sewn, closed, or sealed was reported in 35% of the cases.

Most individuals performing these procedures were nurses or midwives, followed by traditional circumcisers, who performed the procedure. Doctors were responsible for a smaller portion, and other traditional or health professionals were responsible for below 2% of cases.

Discussion

This study examined the trend of FGM and its related variables among Nigerian women of reproductive age across a decade (2011–2021). FGM's detrimental impacts on women are well-acknowledged across the world. Genital mutilation has affected approximately 140 million women globally.[13] According to the 2013 countrywide Demographic and Health study (NDHS), Nigeria has a countrywide FGM prevalence of 25% (National Population Commission, 2020), up from 30% in the previous 2008 study.[14] The Multiple Indicator Cluster Surveys (MICS) also show a progressive drop, from 26% in 2007 and 27% in 2011 to 18% in 2016.[15,16] The study suggests that the participants generally had a moderate level of formal education as the majority (36.2%) have attained secondary education. Their education levels could be associated with better awareness and empowerment, potentially influencing attitudes and decisions about FGM.[17]

Distribution of respondent's knowledge of FGM with year

The findings show significant shifts in FGM awareness levels across the surveyed years. Awareness level increased from 33.0% in 2011 to 35.1% in 2016–2017, whereas it decreased to 31.9% in 2021. The observed trends in FGM awareness levels could be attributed to various factors. Considering educational campaigns, policy changes, and cultural shifts over the past decade is crucial. In 2016–2017, there may have been intensified educational efforts or media campaigns contributing to the increased awareness.

Conversely, the decline in 2021 might have been influenced by complacency or waning efforts, which could signify a slowdown in progress toward eradicating FGM. This emphasizes the need

Table 3: Multivariate analysis of factors associated with daughter circumcision among women of reproductive age in Nigeria from 2011 to 2021

	Circumcised Daughter	Daughter not circumcised	COR (95% CI)	*P*	AOR (95% CI)	*P*
Year of survey						
2011	7732 (37.6)	12,811 (62.4)	Ref	-	Ref	-
2016–2017	9246 (41.5)	13,033 (58.5)	1.18 (1.13–1.22)	<0.001*	1.14 (1.10–1.19)	<0.001*
2021	7831 (38.1)	12,712 (61.9)	1.02 (0.98–1.06)	0.314	0.86 (0.83–0.90)	<0.001*
Education level						
Higher	1230 (26.7)	3382 (73.3)	Ref	-	Ref	-
Non-formal	9403 (47.2)	10,498 (52.8)	2.46 (2.29–2.64)	<0.001*	2.17 (2.00–2.37)	<0.001*
Primary	6878 (43.2)	9056 (56.8)	2.09 ((1.94–2.25)	<0.001*	2.06 (1.90–2.23)	<0.001*
Secondary	7298 (31.8)	15,620 (68.2)	1.29 (1.20–1.38)	<0.001*	1.27 (1.18–1.37)	<0.001*
Geopolitical Zones						
Northeast	1774 (24.9)	5349 (75.1)	Ref	-	Ref	-
Northcentral	3643 (34.5)	6909 (65.5)	1.59 (1.49–1.70)	<0.001*	1.41 (1.32–1.52)	<0.001*
Northwest	6940 (59.3)	4768 (40.7)	4.39 (4.11–4.68)	<0.001*	3.34 (3.12–3.58)	<0.001*
Southeast	3783 (34.9)	7055 (65.1)	1.62 (1.51–1.73)	<0.001*	1.72 (1.60–1.86)	<0.001*
Southsouth	4110 (33.4)	8207 (66.6)	1.51 (1.41–1.61)	<0.001*	1.67 (1.55–1.80)	<0.001*
Southwest	4559 (42.1)	6268 (57.9)	2.19 (2.05–2.34)	<0.001*	1.90 (1.77–2.05)	<0.001*
Religion						
Christianity	12,509 (34.5)	23,712 (65.5)	Ref	-	Ref	-
Islam	11,961 (45.3)	14,435 (54.7)	1.57 (1.52–1.62)	<0.001*	1.23 (1.18–1.28)	<0.001*
Others/No religion	339 (45.3)	409 (54.7)	1.57 (1.36–1.82)	<0.001*	1.31 (1.13–1.53)	<0.001*
Wealth index quintile						
Fifth- Richest	4051 (32.8)	8314 (67.2)	Ref	-	Ref	-
First quintile- Poorest	4135 (43.8)	5296 (56.2)	1.60 (1.52–1.69)	<0.001*	0.94 (0.87–1.01)	0.069
Second quintile	5221 (41.5)	7366 (58.5)	1.46 (1.38–1.53)	<0.001*	0.96 (0.90–1.02)	0.164
Third quintile- Middle	5855 (40.5)	8588 (59.5)	1.40 (1.33–1.47)	<0.001*	1.08 (1.02–1.14)	0.010*
Fourth quintile	5547 (38.2)	8992 (61.8)	1.27 (1.20–1.33)	<0.001*	1.06 (1.01–1.13)	0.026*
Ever been circumcised						
No	8034 (27.1)	21,665 (72.9)	Ref		Ref	
Yes	16,775 (49.8)	16,891 (50.2)	2.68 (2.59–2.77)	<0.001*	2.74 (2.64–2.84)	0.000*
Area of residence						
Urban	7968 (39.2)	12,593 (61.2)	Ref	-	Ref	-
Rural	16,841 (39.3)	25,963 (60.7)	1.03 (0.99–1.06)	0.153	-	-
Knowledge of FG						
No	1013 (38.5)	1618 (61.5)	Ref	-	Ref	-
Yes	23,796 (39.2)	36,938 (60.8)	0.97 (0.90–1.05)	0.485	-	-

*Significant at $p<0.05$

Table 4: Genital mutilation procedure and persons who performed FGM among women who were circumcised

Procedure	Frequency (*n*=33,666)	Percentage
Flesh removed from the genital area	21,449	63.7
Genital area nicked without removing flesh	18,566	55.1
Genital area sewn closed (or sealed)	11,796	35
Person circumcising respondent		
Doctor	3770	11.2
Nurse/midwife	21,434	63.7
Traditional circumciser	7942	23.6
Community health extension worker (CHEW)	21	0.1
Other traditional/health professional	487	1.4

for consistent and sustained efforts among primary health physicians to educate and engage communities in anti-FGM initiatives. Aberese Ako and Akweongo[18] found a similar upward trend in FGM awareness in Ghana, attributing it to a government-led awareness campaign. In contrast, a study by Cetorelli *et al.*[19] in Mali reported decreased awareness due to community-specific factors.

Prevalence of FGM among Nigerian women of reproductive age 2011 – 2021

The study found notable variations in FGM prevalence across different years, educational levels, geographical regions, religious affiliations, urban-rural divides, and wealth quintiles. The increase (69.5%) in FGM prevalence in 2021 compared to 2011 (46.6%) and 2016–2017 (44.0%) suggests that efforts to curb this practice may require reinforcement. The observed increase in FGM prevalence from 2011 to 2021 may be attributed to cultural factors, inadequate awareness campaigns, and limited enforcement of anti-FGM laws. Oduro *et al.*[20] have reported varying trends in FGM prevalence, with some showing declines and others indicating stagnation. These inconsistencies highlight

the complexity of FGM dynamics across different regions and time frames. The absence of sustained efforts to combat the practice could explain this surge. The rising prevalence of FGM in Nigeria implies an urgent need for intensified intervention programs, stricter legal measures, culturally sensitive education, and active involvement of primary health care practitioners to reverse this concerning trend.

The findings show that educational attainment is a significant factor influencing FGM prevalence. Women with higher education (49.6%) exhibited a lower prevalence of circumcision compared to other level of education. This underscores the importance of education in challenging deeply rooted cultural practices such as FGM. Similar findings have been reported in other African countries,[11,21] underlining the consistent role of education in reducing FGM prevalence. Women with higher education may be more aware of the health risks and legal consequences, reducing the likelihood of undergoing FGM. Hence, investment in girls' education may contribute to a reduction in FGM prevalence. Promoting education, especially among marginalized communities, with active involvement from primary health care practitioners, can be a powerful tool in combating FGM.

Geopolitical disparities were evident in the findings, with the Southwest having the highest FGM prevalence at 70.1% and the Northeast the lowest at 34.5%. Regional disparities may be linked to cultural and ethnic variations, with some regions adhering more strongly to the practice than others. The regional differences suggest that targeted interventions may be necessary, tailored to each region's specific cultural contexts, to reduce FGM prevalence effectively. Previous studies[22,23] have documented similar regional disparities in FGM prevalence within Nigeria. In addition, collaboration with local leaders and communities is vital to address these variations effectively. The study suggests that there is a higher likelihood of women who are Christians (AOR: 1.40) and those from other/no religion (AOR: 1.65) being circumcised compared to Islam ($P < 0.05$). These findings challenge stereotypes suggesting that FGM is solely a religious practice. Instead, it highlights the complex interplay of cultural and religious factors. Given that, interfaith dialogue and collaboration are necessary for comprehensive anti-FGM efforts. Cross-national studies[24,25] have revealed varying degrees of FGM prevalence among different religious communities, highlighting the need for context-specific interventions.

The study found that women living in urban areas (54.2%) were slightly less likely to be circumcised than rural women (52.6%). Urban areas may benefit from ongoing awareness campaigns, while rural areas may require more targeted efforts and community involvement. Urbanization may contribute to decreased FGM prevalence due to increased access to education and exposure to anti-FGM campaigns. Expanding urbanization and urban-focused anti-FGM initiatives could help further reduce prevalence. Studies in neighboring countries such as Ghana[26] have reported similar urban-rural differentials in FGM prevalence, suggesting shared challenges and opportunities in addressing this issue. Wealth quintiles showed variations in FGM prevalence, with the poorest quintile (47.8%) having the lowest prevalence and the fourth quintile (54.3%) having the highest. Economic disparities may influence FGM prevalence, with women from wealthier households potentially having more access to education and healthcare. Addressing economic disparities and providing resources to disadvantaged communities can reduce FGM prevalence. Studies in sub-Saharan Africa[27] have also reported similar socioeconomic disparities in FGM prevalence, highlighting the need for comprehensive approaches to address these underlying factors.

Similarly, the findings reveal a significant variation in FGM prevalence, with some states demonstrating alarmingly high rates while others exhibit considerably lower prevalence. The higher prevalence rates in the South and South-south geopolitical zones and the Southeast may be attributed to cultural practices and social norms deeply entrenched in these regions. These findings underscore the importance of targeted interventions and awareness campaigns in these high-prevalence areas. It is worth noting that populous states such as Lagos and Kano, despite their demographic diversity, still exhibit alarmingly high prevalence rates. The variance in prevalence rates across these states underscores the complex, multifaceted nature of FGM practice in Nigeria, influenced by cultural, social, and perhaps even economic factors. This geographical disparity suggests that interventions to reduce FGM must be state-specific and culturally sensitive to be effective. This suggests that socioeconomic factors, alongside cultural influences, play a role in perpetuating FGM practices in urban centers.[24] The persistently high prevalence of FGM in some Nigerian states highlights the urgent need for comprehensive and region-specific strategies to combat this harmful practice. However, these strategies should consider the cultural context, socioeconomic conditions, and access to education and healthcare services.

Daughters' circumcision and the associated factors

The findings show a significant variation and prevalence in the circumcision of daughters across periods, education levels, regions, religions, wealth quintiles, and maternal circumcision status. The study found that the prevalence of daughters being circumcised varied over the study period. Notably, the highest prevalence was observed in 2016–2017 (41.5%). This noteworthy temporal variation suggests a dynamic nature of FGM prevalence in Nigeria. The reduction in daughters' FGM prevalence from 2011 to 2021 could be attributed to increased awareness campaigns, advocacy efforts, and changes in social norms. These findings align with the global trend of declining FGM prevalence. For instance, previous research by Kandala *et al.*[9] also reported declining trends in daughters' FGM prevalence in other African countries, demonstrating a broader shift away from this practice. In addition, educational attainment emerged as a significant factor associated with daughters' circumcision. Women with non-formal, primary, and secondary education levels had a higher likelihood of having circumcised daughters compared to those with higher

education levels. This finding underscores the importance of education in challenging traditional practices such as FGM. Women with higher education are more likely to be aware of the health risks associated with FGM and less inclined to subject their daughters to the practice. Research by De Cao and La Mattina[28] and El-Dirani *et al.*[29] has consistently shown a negative association between maternal education and FGM prevalence.

Furthermore, regional disparities in daughter FGM prevalence are pronounced, with the Northwest region having the highest prevalence (59.3%) and the Northeast region the lowest (24.9%). The Northwest region exhibits a significantly higher likelihood of daughters' circumcision than the Northeast. Regional variations in daughter FGM prevalence highlight the influence of cultural and social factors on this practice. The Northwest region's higher prevalence may be attributed to entrenched cultural norms and a lack of access to education and awareness programs. A study by Kandala and Komba[22] noted similar regional disparities in daughter FGM prevalence in Nigeria, reflecting localized variations in cultural practices. In addition, the study found that daughters of Muslim women and those of women with other/no religion had higher odds of being circumcised than daughters of Christian women. The findings suggest that efforts to address FGM must consider religious dynamics and engage religious leaders in advocacy and awareness campaigns. Religious beliefs and practices play a significant role in FGM prevalence. Research by Abdisa, Desalegn, and Tesew[30] in other African countries has reported similar associations between religion and daughter FGM prevalence.

In addition, the findings revealed that maternal circumcision status is a strong predictor of daughters' circumcision. Women who have undergone circumcision are more likely to have circumcised daughters. Maternal circumcision status reflects the intergenerational transmission of the practice. Women circumcised may perceive it as a cultural norm and are more likely to perpetuate it in their families. A study by Alemu and Haile[31] emphasized the intergenerational link between maternal circumcision and daughters' circumcision.

Genital mutilation procedure and persons performed FG among women who were circumcised

The study found that the most common type of FGM procedure reported by respondents was "removing flesh from the genital area," with 21,449 (63.7%) cases. The high prevalence of FGM procedures involving the removal of flesh from the genital area and nicking without removal is alarming. These procedures often lead to severe physical and psychological consequences for women. In addition, the majority of FGM procedures were conducted by nurses or midwives, accounting for 21,434 (63.7%) cases. Traditional circumcisers performed the procedure in 7942 (23.6%) cases, while doctors were responsible for a smaller portion, with 3770 (11.2%) cases. Other traditional or health professionals were involved in 487 (1.4%) cases. The fact that nurses or midwives perform a significant proportion of these procedures raises questions about their awareness of the harmful effects of FGM and the need for targeted education and training in healthcare settings. However, the involvement of traditional circumcisers indicates the persistence of traditional beliefs and practices surrounding FGM. This underscores the importance of community-based interventions that target traditional leaders and engage in dialog to change perceptions about FGM.[32] The involvement of traditional circumcisers also remains a concerning trend as their methods may lack the necessary medical hygiene standards, increasing the risk of complications. Encouragingly, the involvement of doctors in a smaller proportion of cases may suggest some progress in discouraging the medicalization of FGM. The findings suggest a need for targeted interventions to raise awareness about the harmful consequences of FGM among healthcare providers, particularly nurses and midwives. In addition, efforts to collaborate with traditional circumcisers and provide alternative livelihood opportunities may be necessary to reduce their involvement in FGM procedures.

Limitations of the study

This study's reliance on secondary data from the National Demographic and Health Surveys (NDHS) conducted in 2011, 2016–2017, and 2021 limits its ability to capture real-time changes in FGM prevalence and associated factors. The timing of the data collection may not account for potential developments in FGM practices between survey years. While NDHS surveys employ a robust multistage cluster sampling design, inherent sampling biases may affect the generalizability of findings across different regions or states of Nigeria. The study predominantly employed quantitative methods, potentially missing qualitative and contextual nuances in FGM practices. Finally, the cross-sectional design limits the ability to establish causal relationships between associated factors and FGM trends.

Conclusion

This study evaluated FGM prevalence and associated characteristics in Nigerian women aged 15–49 from 2011 to 2021. To end FGM, preserve women's rights, and improve their health, urgent and consistent action is essential. Despite awareness programs, new data show a reduction, emphasizing the need for ongoing education. In 2021, FGM prevalence rose alarmingly. Factors include cultural influences, insufficient campaigns, and weak enforcement of anti-FGM laws. To reverse this trend, comprehensive and culturally specific treatments are needed. Education is powerful; thus, investing in females' education would help challenge long-held practices. State-specific treatments and healthcare provider coordination are needed to address regional inequities. The study shows primary care providers' worrying engagement, recommending prompt education and discouragement of medicalization. Collaboration with traditional circumcisers and alternative livelihoods is crucial. This study concludes that FGM in Nigeria is dynamic and requires ongoing, context-specific efforts to end it. Education, legal enforcement, cultural engagement, and partnership with healthcare practitioners and traditional leaders are needed to cease this destructive practice and protect Nigerian women and girls.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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