SOCIOECONOMIC AND REGIONAL DETERMINANTS OF FEMALE GENITAL MUTILATION PREVALENCE IN NIGERIA: A STATISTICAL ANALYSIS USING MULTINOMIAL LOGISTIC REGRESSION

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Abstract:
Female Genital Mutilation (FGM) is a critical public health concern that perpetuates gender inequality and poses significant health risks for women and girls. This study aims to investigate the socioeconomic and regional factors associated with the circumcision status of Nigerian women, thereby contributing to the understanding of the persistence of FGM in Nigeria. A cross-sectional design was utilized, employing data from the 2018 Nigeria Demographic and Health Survey (NDHS). A multinomial logistic regression model was applied to identify potential predictors of circumcision status, with adjusted odds ratios (AORs) and 95% confidence intervals (CIs) calculated to quantify the associations. The findings reveal that older age, urban residency, higher educational attainment, and increased socioeconomic status correlate with a decreased likelihood of circumcision. Additionally, significant regional variations were observed, with women from the South-East and South-West regions displaying markedly higher odds of being circumcised compared to their counterparts in other regions. These results highlight the imperative for targeted public health interventions in Nigeria, particularly focusing on the regions and demographics most affected by FGM. Strategies should centre on education and economic empowerment to mitigate the prevalence of this practice and advance women's rights.

Keywords: Circumcision Status, FGM, Health Survey, Prevalence, Multinomial regression, Nigeria

1. Introduction

Female genital mutilation (FGM) constitutes a significant violation of human rights and poses serious health risks to women and girls (Muteshi *et al.*, 2016; Tegegn, 2021). This practice is associated with a range of adverse health outcomes, including decreased sexual pleasure, infertility, maternal mortality, and increased susceptibility to infections (Oba, 2008). The prevalence of FGM varies markedly across

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different geographical regions, with reported rates ranging from 0.6% to 98%, reflecting its widespread occurrence in various sociocultural contexts. Current epidemiological data indicate that nearly all countries have reported instances of FGM, though the recorded prevalence is influenced by factors such as migration patterns. In Sudan, for instance, an alarming 96.6% of females undergo FGM before the age of six. The Middle East, Africa, and parts of Asia are identified as regions with the highest prevalence rates. Notably, specific hotspots for FGM have been well-documented, including Egypt, Ethiopia, Tanzania, Somalia, Mali, Burkina Faso, The Gambia, Guinea, Nigeria, Sierra Leone, Iraq, Iran, Yemen, India, Malaysia, and Indonesia (Female Genital Mutilation/Cutting Research Initiative [FGM/C RI], 2019). These data underscore the urgent need for targeted interventions to eradicate FGM and protect the rights and health of affected populations.

Most of the female genital mutilation/cutting (FGM/C) incidents globally occur in Nigeria, also known as female circumcision or female genital cutting (FGC). The ritual is typically a family tradition that young girls between 0 and 15 would go through. It is a process that entails damaging the female genital organs or removing part or all of the external female genitalia anytime it is done for non-medical purposes (Siddhanta & Sinha, 2016). FGM can lead to various serious consequences, including infertility, maternal deaths, infections, and reduced sexual pleasure. As of 2012, it was reported that 27% of Nigerian women aged 15 to 49 had undergone FGM (FGM/C RI, 2019). The circumcision procedures are often performed by a range of practitioners, including skilled caregivers such as community health extension workers (CHEWs), nurses, midwives, doctors, traditional healers, birth attendants, elderly women, and women of childbearing age (Worsley, 1938).

In certain regions of Nigeria, the prevalence of FGM has decreased by half over the past 30 years. However, the rate of FGM among Nigerian girls aged 0 to 14 is on the rise, making Nigeria home to the third-highest number of women and girls who have undergone this procedure worldwide (Muteshi *et al.*, 2016; FGM/C RI, 2019). In May 2015, former President Goodluck Ebele Jonathan enacted a federal law prohibiting FGM (Goldberg, 2017). As the most populous nation in Africa, Nigeria has set a considerable precedent, leading opponents of certain practices to view this decision as a significant advancement for the continent (Topping, 2017). However, despite a decline in these practices, activists and scholars contend that the newly enacted law alone cannot eliminate all forms of violence against women in Nigeria (Dyer, 2016; Goldberg, 2017). Worldwide, over 200 million women and girls have been subjected to bodily mutilation. Nigerians account for over 20 million individuals, representing

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approximately 10% of the population (FGM/C RI, 2019). However, the incidence of this practice varies significantly across different geopolitical regions. Notably, several areas with particularly high prevalence rates have been identified, including Osun State (76.6%), Ebonyi State (74%), Ekiti State (72.3%), Imo State (68%), and Oyo State (65.6%) (United Nations Children's Fund [UNICEF], 2024).

One of the concerning aspects of discontinuing FGM is the involvement of trained practitioners through the medicalization of the procedure Leye *et al.* (2019); respondents shared various justifications for FGM, viewing it as a traditional tribal practice that they believe should be preserved. They associated FGM with superstitions aimed at safeguarding chastity and purity, upholding family honour, maintaining hygiene, and catering to aesthetic preferences. Additionally, they viewed it as a means to protect virginity, prevent promiscuity, and modify sociosexual attitudes, addressing perceived failures in a woman's sexual experiences. Respondents also believed FGM could enhance a husband's sexual enjoyment, boost fertility, and improve matrimonial prospects. Additional justifications for this practice include legal stipulations, such as the inability to inherit property without being circumcised, as well as concerns for maternal and child health during childbirth (Abdoli *et al.*, 2021). In some Nigerian communities, there is a belief that applying secretions from snail footpads to the cut edges of external genitalia can slow their growth. Furthermore, women who have undergone circumcision are often encouraged to take a cautious approach to future sexual activity. Despite this, FGM is commonly performed as a critical aspect of social conformity and cultural identity.

The FGM has serious health implications, including immediate issues such as severe pain, bleeding, and infections. Long-term consequences can include chronic pain, psychological distress, complications during childbirth, and an increased risk of maternal and neonatal mortality. FGM also perpetuates a cycle of discrimination and injustice, fundamentally violating human rights and hindering gender equality. Over the years, various international organizations, governments, and grassroots movements have successfully campaigned to outlaw this practice. Initiatives such as legal frameworks, awareness campaigns, and community engagement have made strides in reducing its incidence in some regions. However, the practice persists in many areas, and effecting change in deeply entrenched cultural norms, as well as ensuring the enforcement of anti-FGM laws, remains a significant challenge.

1.1 Related Literatures

A significant body of research has addressed the issue of FGM in Africa. It represents a widespread social issue that transcends geographical boundaries; however, it continues to require focused attention

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and comprehension (Powell & Mwangi-Powell, 2017). Current estimates suggest that more than 200 million women and girls globally have been subjected to this practice (FGM/C RI, 2019), a figure that exceeds the total populations of Singapore, Korea, Peru, Spain, Canada, and Finland combined. The observed increase in FGM prevalence is primarily reflective of global population growth. Despite ongoing efforts that have led to a reduction in overall rates, projections indicate that 68 million girls will remain at risk between 2015 and 2030 unless interventions aimed at eradicating this practice are substantially intensified. The current estimates of 3.9 million girls mutilated each year will rise to 4.6 million by 2030 if the current levels of risk continue (United Nations Population Fund [UNFPA], 2022). FGM is a violation of women's rights, reflecting significant gender inequality and severe discrimination. It is important to note that there are no health benefits associated with FGM; nonetheless, those who support this practice often believe it to be linked to concepts of modesty and femininity, controlling women's sexuality, upholding cultural norms, avoiding social stigma within the community, enhancing marriage prospects, and serving as a rite of passage into adulthood (Adebola, 2020).

The prevailing societal perceptions regarding female beauty often equate cleanliness and aesthetic appeal with specific physical attributes. Among these, some individuals contend that women who have undergone FGM are more attractive than their uncut counterparts. However, extensive research indicates that FGM does not confer any health benefits and is associated with a range of complications, including varying degrees of physical trauma related to the procedure's severity (Dyer, 2016). Furthermore, FGM has been linked to adverse outcomes affecting sexual, psychological, and physical health, as well as maternal and child welfare (Dyer, 2016; Tegegn, 2021). These may encompass diminished self-esteem and a reduction in sexual pleasure, among other negative consequences. While certain advocates assert that FGM has religious justification, empirical evidence reveals that no religious texts explicitly mandate this practice. In Nigeria, more than 50% of the population lives in rural areas. Historically, FGM/C has been more prevalent in these rural regions, however, recent data indicates a notable shift: 24.2% of women aged 15 to 49 in urban areas have undergone FGM/C, compared to 15.6% in rural areas. Among younger girls, the trend appears different, with only 16.3% of those aged 0 to 14 in urban settings and 21.1% in rural areas reporting experiences of FGM/C (UNICEF, 2024). Additionally, the overall prevalence of FGM/C among women aged 15 to 49 decreased from 29.6% in 2008 to 19.5% in 2018.

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The overall prevalence may not accurately reflect the progress made in recent years, primarily due to the broad age range of women included in the data. When the latest statistics are analyzed by age group, it is clear that the prevalence stands at 31.0% for women aged 45–49, compared to 13.7% for the youngest age group (UNICEF, 2024). However, it is encouraging to observe a gradual decline in FGM among younger populations. This decline can be attributed to increasing awareness among parents, families, and community leaders regarding the harmful effects of the practice, alongside the efforts of national and international campaigns aimed at eradicating it (UNFPA, 2024).

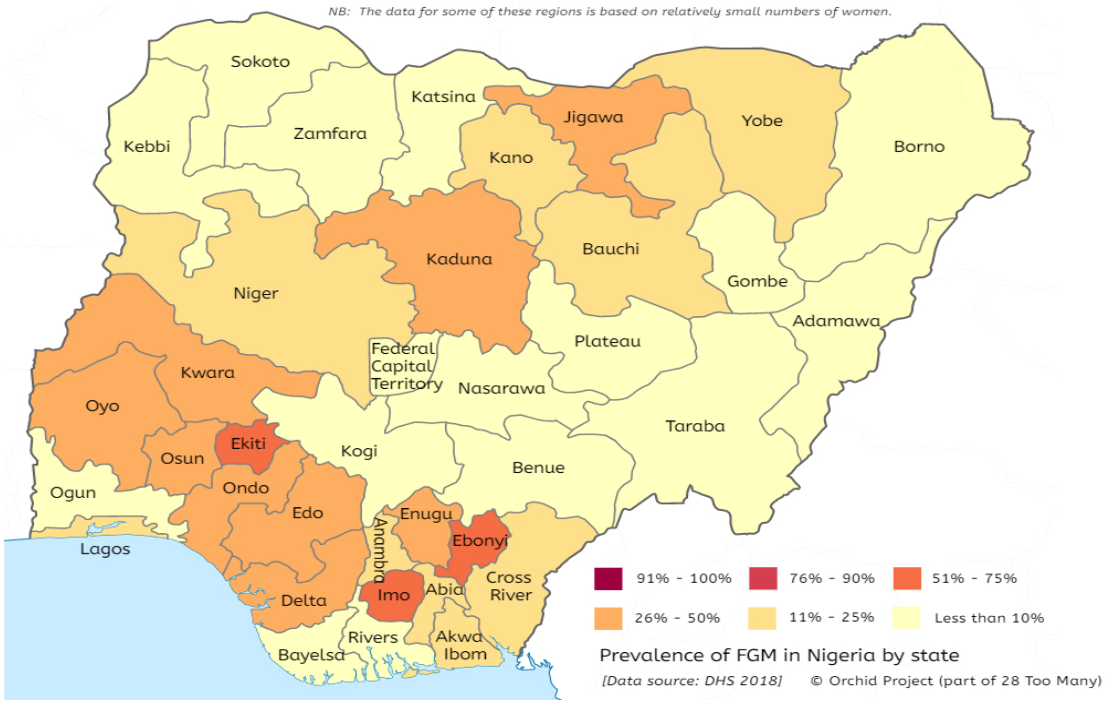

Fig. 1: Map of Nigeria Showing Prevalence of FGM

FGM is prevalent in Nigeria, which has a large population of approximately 299 million and an annual growth rate of 3.1%, according to the 2019 estimates (Department of Economic and Social Affairs [DESA], 2020). Nigeria consists of 36 states, 6 geopolitical zones, and 774 local government areas, encompassing more than 250 ethnic groups. The largest ethnic groups are the Hausa in the north, the Yoruba in the west, and the Igbo in the east (National Population Commission [NPC], 2019). Among the states with the highest prevalence of FGM are Ebonyi, Ekiti, Imo, Jigawa, Kaduna, Osun, and Oyo. Ekiti, Osun, and Oyo are located in the Southwestern region (see Figure 1), while Imo and Ebonyi are in the Southeastern region, and Jigawa and Kaduna are situated in the northern part of Nigeria. Of the

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six largest ethnic groups in the country—the Yoruba, Hausa, Fulani, Ibo, Ijaw, and Kanuri—only the Fulani do not practice any form of FGM.

2. Materials and Methods

This section presents research data and tools used for this study. Further, the statistical approach employed is described.

2.1 Study Area

The geographical scope of this study encompasses the entirety of Nigeria (see Figure 2), which includes 36 states and spans an area of 923,769 km², with approximately 13,000 km² designated as submerged underwater. As of 2016, the population of Nigeria was estimated at 187 million (Merem *et al.*, 2017), and the nation is recognized for its abundant freshwater resources (Okoye & Achakpa, 2007). Prominent river systems, including the Niger, Benue, and Cross Rivers, play critical roles in the country's agriculture, transportation, and hydroelectric power generation. Nigeria's total estimated annual water resource potential is approximately 319 billion cubic meters (BCM), where 272 billion BCM is classified as surface water and 52 billion BCM as groundwater (Ochekpe, 2013).

Despite the substantial volumetric water budgets associated with these river systems, the allocation of this water is diversified across several sectors, encompassing domestic consumption, agricultural irrigation, recreational activities, transportation, and fisheries (Oluwatuyi, 2018). The climatic conditions of Nigeria exhibit a gradient, transitioning from tropical and humid in the southern regions to semi-arid in the northern territories. Significant surface water resources are accessible not only in the Southeast and Southwest regions but also around Lake Chad, the River Niger, and other pertinent catchment areas (Kolawole, 1991). Furthermore, Nigeria possesses a rich cultural heritage, underpinned by an extensive history of artistic expression, music, and literature. The nation is home to numerous United Nations Educational, Scientific, and Cultural Organization (UNESCO) world heritage sites, notably the ancient city of Benin and the Sukur cultural landscape. In recent years, Nigeria's cultural exports have garnered international attention, with its musicians, filmmakers, and fashion designers achieving notable global recognition.

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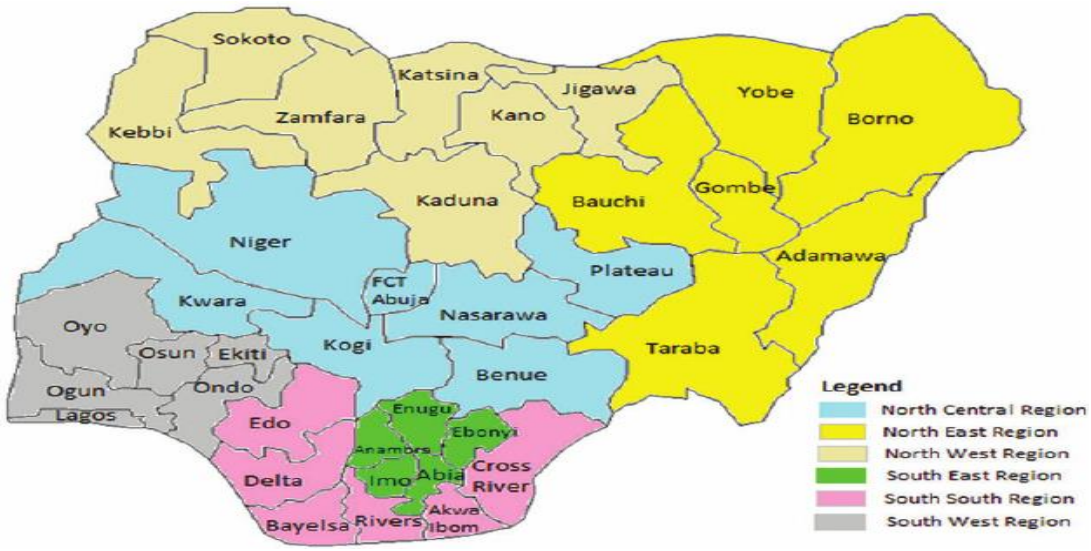

Fig. 2: Map of Nigeria Showing Geo-political Zones

2.2 Source of Data

The data used in this study was cross-sectional secondary data collected during the 2018 Nigeria Demographic and Health Survey (NDHS). The sample size for this study was based on the available data from the 2018 NDHS, which included responses from 41,821 women of reproductive age (15-49 years). A power analysis was not conducted as the study used a predefined sample from a national survey. The datasets generated and/or analyzed during the current study are available from the Demographic and Health Surveys (DHS) Program website (https://dhsprogram.com). Dataset is available here: http://ngfrepository.org.ng:8080/jspui/handle/123456789/3145.

2.3 Statistical Analyses

Descriptive statistical methods were employed to summarize the dataset, while multinomial logistic regression was utilized to identify the predictors influencing circumcision status. The response variable in this study is circumcision status, with predictor variables comprising wealth index, geographic region, religious affiliation, educational attainment, maternal age, and residential context (Mashood, 2021). The results of the analyses were illustrated through bar plots and tabulated data. All statistical analyses were performed using R statistical software (R Core Team, 2023).

2.4 Multinomial Logistic Regression

Multinomial regression is an extension of binary logistic regression, used for modelling the relationship between one or more predictor (independent) variables and a categorical outcome (dependent) variable

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that has more than two categories. When the outcome variable reflects more than two unordered categories, it is frequently utilized. Each category's estimated probabilities are compared to a reference category by the model. Multinomial regression uses the likelihood ratio to determine the probability of the categorical membership of the dependent variable. Below is a formal model of multinomial logistic regression.

$$\Pr(Y = k \mid X) = \frac{e^{(\beta_{0k} + \beta_{1k}X_1 + \beta_{2k}X_2 + \cdots + \beta_{pk}X_p)}}{1 + \sum_{i=1}^{k-1} e^{(\beta_{0i} + \beta_{1i}X_1 + \beta_{2i}X_2 + \cdots + \beta_{pi}X_p)}}$$

Where: $Pr(Y = k|X)$ is the probability that the outcome variable Y takes on category k given the independent variables $X_1, X_2, \ldots X_p$ for category k; $\beta_{0k}, \beta_{1k}, \beta_{2k}, \ldots \beta_{pk}$ are the coefficients associated with each predictor variables $X_1, X_2, \ldots X_p$ for category k; p is the number of predictor variables; and k is the number of categories of the outcome variables. The probability for each category of the outcome variable Y must add up to one, and this is ensured by the equation's denominator. The change in category k's log odds compared to a reference category usually the first category is represented by the coefficients β_k. When the relevant independent variable grows, the odds of category k increase; inversely, when the corresponding independent variable drops, the odds of category k drops. This is indicated by a positive coefficient.

3. Applications

The outcome variable, "circumcision status," offered three response options: "Yes;" "No;" and "Don't know." Following the dataset's guidelines, missing values were categorized as "Don't know." As illustrated in Table 1 and further depicted in Figure 3, a significant 64.68% of respondents were uncertain about their circumcision status, while 23.87% confirmed they were not circumcised, and approximately 12% reported being circumcised. The substantial proportion of women lacking awareness regarding their circumcision status highlights a critical gap in knowledge within this population.

A comprehensive overview of both the outcome or response variable and the covariate distributions is provided in Table 1. Notable differences in the percentages of respondents across the various categorical variables underscore the heterogeneity present within the sample. Gaining insight into the demographic background and potential determinants of circumcision status is crucial for

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contextualizing these findings. The demographic analysis reveals that the majority of participating women were aged between 15 and 19 years. Approximately 60% of the respondents reside in rural areas, while 40.61% live in urban settings. Geographically, nearly one-quarter of the women are from the Northwest region, with 12.15% hailing from the South-South geopolitical zone. The survey participants represent a nearly equal distribution of Christians and Muslims. Regarding educational attainment, 39.93% of reproductive-aged women reported having at least secondary education, whereas 34.43% had no formal education. The women's wealth index exhibits a relatively balanced distribution, with 18.52%, 19.96%, 21.18%, 21.14%, and 19.20% classified as belonging to the poorest, poorer, middle, richer, and richest quintiles, respectively. A significant majority of the women, 62.28%, fall within the intermediate wealth index categories (poorer, middle, and richer) (refer to detailed metrics in Table 1 and Figure 4).

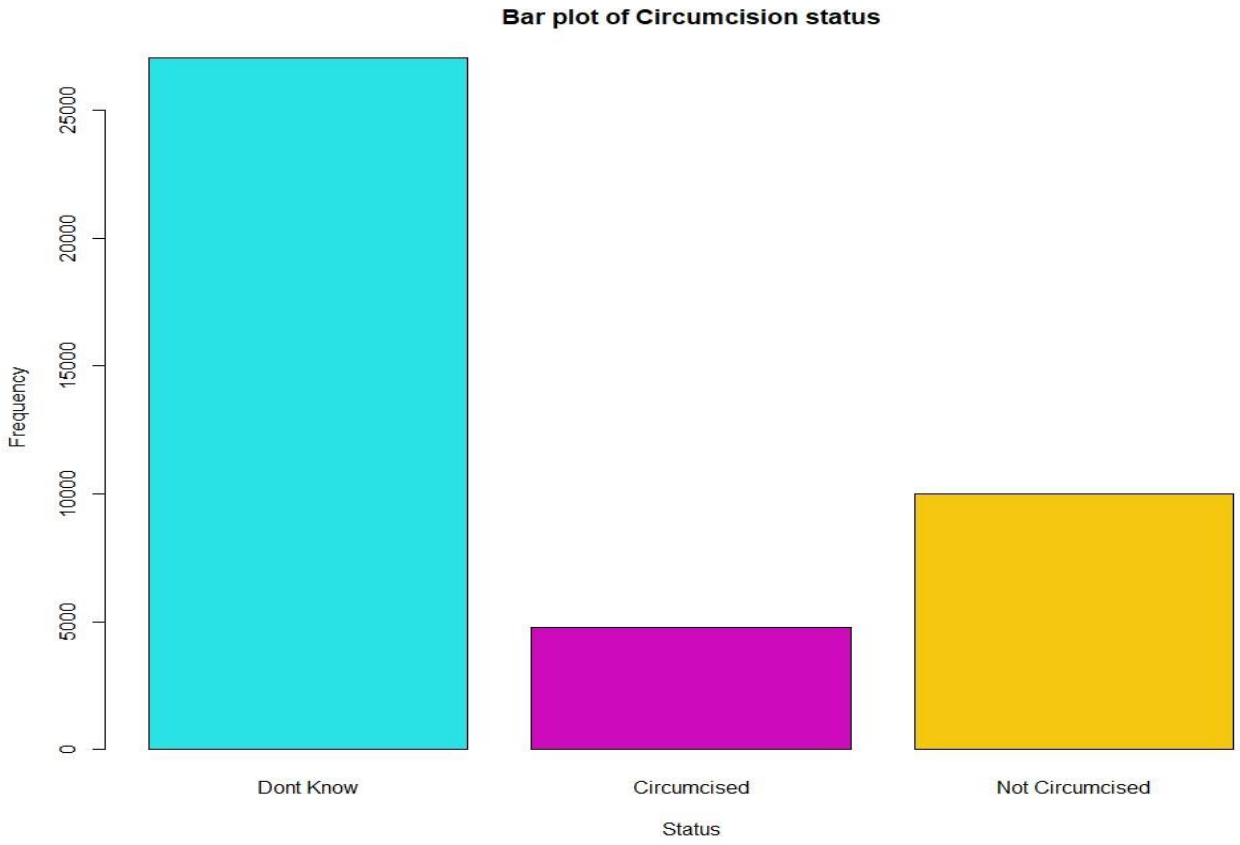

Fig. 3: The Bar Plot Showing the Circumcision Status of Reproductive Aged Women

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Table 1: The Distribution of the Response Variable and Covariates.

Variables	Categories	Frequency (%) N = 41,821
Circumcision status	Not circumcised	9982 (23.87)
	Circumcised	4788 (11.45)
	Don't Know	27051 (64.68)
Mother's Current Age (Years)	15 – 19	8423 (20.14)
	20 – 24	6844 (16.36)
	25 – 29	7203 (17.22)
	30 – 34	5997 (14.34)
	35 – 39	5406 (12.93)
	40 – 44	4057 (9.70)
	45 – 49	3891 (9.30)
Place of residence	Urban	16984 (40.61)
	Rural	24837 (59.39)
Educational level	No education	14398 (34.43)
	Primary	6383 (15.26)
	Secondary	16698 (39.93)
	Higher	4342 (10.38)
Wealth Index	Poorest	7747 (18.52)
	Poorer	8346 (19.96)
	Middle	8859 (21.18)
	Richer	8840 (21.14)
	Richest	8029 (19.20)
Region	Northcentral	7772 (18.58)
	North East	7639 (18.27)
	North West	10129 (24.22)
	South East	5571 (13.32)
	South South	5080 (12.15)
	South West	5630 (13.46)
Religion	Christian	20506 (49.03)
	Islam	20959 (50.12)
	Others	356 (0.85)

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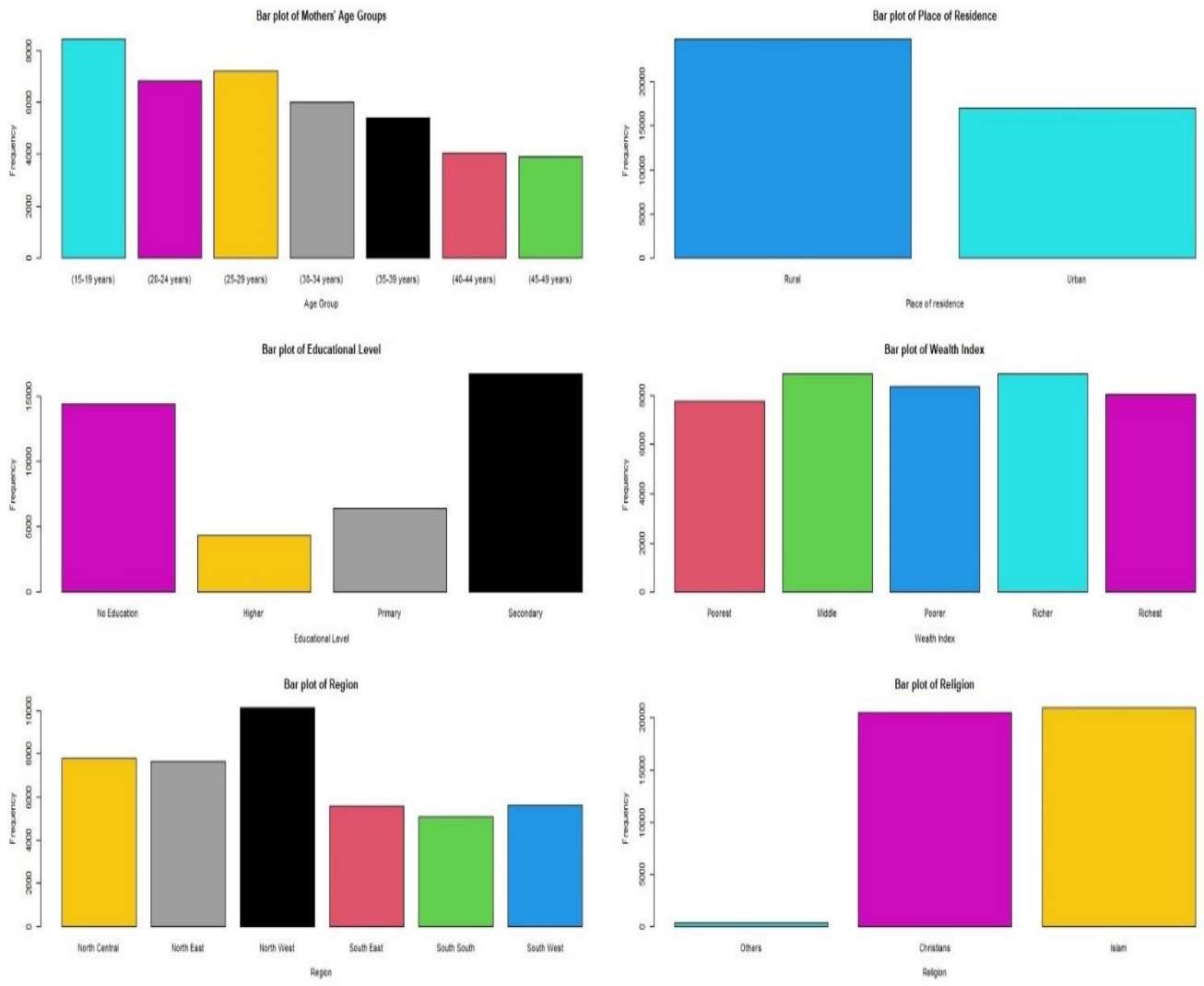

Fig. 4: Bar Plots of the Covariates

Table 2 presents the distribution of each explanatory variable concerning the response variable. In the course of this analysis, all missing values associated with the response variable were systematically excluded. Consequently, the final dataset comprised 15,512 women with valid responses, ensuring robust statistical evaluation. In the bivariate analysis, the Chi-square test was employed to investigate the association between the explanatory variables and the response variable, "mother's circumcision status," with a significance threshold set at 5%. The findings demonstrated that all explanatory variables exhibited statistically significant relationships with the mother's circumcision status, underscoring the critical role of these factors in influencing the prevalence of FGM.

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Table 2: The Distribution of Covariates Across the Response Variable.

Variables		Mother's Circumcision Status			Total (N = 15,512)	P-value based on X^2
		Not Circumcised (n = 9,982)	Circumcised (n = 4,788)	Don't Know (n = 742)		
Mother's Current Age (Years)	15 – 19	1683 (10.85)	669 (4.31)	151 (0.97)	2503	281.89 (<0.0001)
	20 – 24	1741 (11.22)	596 (3.84)	129 (0.83)	2466	
	25 – 29	1790 (11.54)	708 (4.56)	125 (0.81)	2623	
	30 – 34	1488 (9.59)	676 (4.36)	94 (0.61)	2258	
	35 – 39	1319 (8.50)	686 (4.42)	100 (0.64)	2105	
	40 – 44	1039 (6.70)	683 (4.40)	72 (0.46)	1794	
	45 – 49	922 (5.94)	770 (4.96)	71 (0.46)	1763	
Place of residence	Urban	4174 (26.91)	2535 (16.34)	409 (2.64)	7118	188.18 (<0.0001)
	Rural	5808 (37.44)	2253 (14.52)	333 (2.15)	8394	
Educational level	No education	3538 (22.81)	1384 (8.92)	221 (1.42)	5143	146.5 (<0.0001)
	Primary	1374 (8.86)	917 (5.91)	96 (0.62)	2387	
	Secondary	3664 (23.62)	1942 (12.52)	329 (2.12)	5935	
	Higher	1406 (9.06)	545 (3.51)	96 (0.62)	2047	
Wealth Index	Poorest	2016 (13.00)	761 (4.91)	112 (0.72)	2889	103.88 (<0.0001)
	Poorer	1826 (11.77)	814 (5.25)	111 (0.72)	2751	
	Middle	1852 (11.94)	1060 (6.83)	146 (0.94)	3058	
	Richer	2037 (13.13)	1173 (7.56)	194 (1.25)	3404	
	Richest	2251 (14.51)	980 (6.32)	179 (1.15)	3410	
Region	North Central	1376 (8.87)	446 (2.88)	100 (0.64)	1922	1773.2 (<0.0001)
	North East	2650 (17.08)	243 (1.57)	60 (0.39)	2953	
	North West	2333 (15.04)	1221 (7.87)	166 (1.07)	3720	
	South East	1238 (7.98)	1227 (7.91)	142 (0.92)	2607	
	South South	1332 (8.59)	538 (3.47)	30 (0.19)	1900	
	South West	1053 (6.79)	1113 (7.18)	244 (1.57)	2410	
Religion	Christian	4712 (30.38)	2619 (16.88)	364 (2.35)	7695	85.129 (<0.0001)
	Islam	5193 (33.48)	2154 (13.89)	378 (2.44)	7725	
	Others	77 (0.50)	15 (0.10)	0 (0.00)	92	

Table 3 presents the results of a multinomial logistic regression analysis aimed at predicting circumcision status, with "Not circumcised" established as the reference category. The interpretation of the coefficients from this model elucidates the relationships between predictor variables and the response variable. Notably, the intercept represents the log odds of women who are either circumcised or uncertain about their circumcision status in comparison to those categorized as "Not circumcised."

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The estimated coefficients of –2.8869 for the circumcised group and 2.1572 for the uncertain group are statistically significant (P<0.05).

The analysis reveals that reproductive-aged women with higher educational attainment exhibit increased log-odds of being circumcised (P=0.0018) and of being uncertain about their circumcision status (P<0.05) when compared to women with no formal education. Additionally, the circumcision status of reproductive-aged women who are uncertain is significantly influenced by their socioeconomic status, with those belonging to the poorer, middle, richer, and richest wealth indices showing a marked difference in comparison to their counterparts in the poorest wealth index. Furthermore, women identified in the richer and richest wealth index categories who are circumcised also demonstrate a significant association. Statistical significance (P<0.05) indicates that the log-odds of being circumcised increase by 0.0236 for each unit increment in the mother's age, whereas the log-odds of being uncertain about circumcision status decrease by 0.0131 for each unit decrement in the mother's age. Moreover, residing in urban areas significantly influences circumcision status relative to rural areas (P<0.05). A comparable trend is observed for the uncertain group, where a significant difference in log odds based on urban versus rural residency is noted (P<0.05).

Geographically, circumcision status demonstrates variation across regions. When contrasted with the North Central region, the North East, South East, South-South, and South West regions are significantly associated with circumcision outcomes (P<0.05). The North East, North West, South East, and South-South regions show statistically significant differences for those uncertain about their circumcision status at a 5% significance level with the North Central region. Religious affiliation also plays a significant role, as being Christian or Muslim substantially influences the likelihood of circumcision when compared to the "Others" category (P<0.05). However, the effects of Christianity (P=0.1317) and Islam (P=0.0755) on the uncertain group are less pronounced and do not achieve statistical significance.

In summary, the findings highlight the critical role of various socio-demographic and geographic factors in predicting circumcision outcomes. Specifically, attributes such as maternal age, educational attainment, regional differences, religious affiliation, and wealth indices appear to have a significant impact on circumcision status.

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Table 3: Model Summary of the Multinomial Logistic Regression

Covariates		Circumcision Status (**Ref** = Not Circumcised)							
		Circumcised				**Don't Know**			
		Estimate	**AOR**	**C.I.**	**P-value**	**Estimate**	**AOR**	**C.I.**	**P-value**
Intercept		–2.8869	0.0557	(0.0307, 0.1011)	< 0.05	2.1572	8.6467	(6.5015, 11.4996)	< 0.05
Mother's Current Age		0.0236	1.0238	(1.0199, 1.0278)	< 0.05	–0.0131	0.9870	(0.9845, 0.9896)	< 0.05
Place of residence (**ref** = Rural)	Urban	0.2428	1.2748	(1.1709, 1.3879)	< 0.05	–0.1143	0.8920	(0.8416, 0.9454)	< 0.05
Educational level (**ref** = No education)	Primary	0.1178	1.1250	(0.9946, 1.2725)	0.0610	–0.0260	0.9744	(0.8992, 1.0559)	0.5265
	Secondary	–0.0060	0.9941	(0.8787, 1.1246)	0.9247	–0.0514	0.9499	(0.8794, 1.0261)	0.1914
	Higher	–0.2535	0.7761	(0.6620, 0.9099)	0.0018	–0.4881	0.6138	(0.5543, 0.6796)	< 0.05
Wealth Index (**ref** = Poorest)	Poorer	–0.0619	0.9399	(0.8302, 1.0643)	0.3284	0.1464	1.1576	(1.0723, 1.2498)	< 0.05
	Middle	–0.1245	0.8829	(0.7753, 1.0054)	0.0603	0.1487	1.1603	(1.0679, 1.2607)	< 0.05
	Richer	–0.3459	0.7076	(0.6156, 0.8134)	< 0.05	0.0150	1.0151	(0.9267, 1.1119)	< 0.05
	Richest	–0.7427	0.4759	(0.4075, 0.5556)	< 0.05	–0.1780	0.8369	(0.7560, 0.9266)	< 0.05
Region (**ref** = North central)	North East	–1.5294	0.2167	(0.1817, 0.2584)	< 0.05	–0.9611	0.3825	(0.3525, 0.4150)	< 0.05
	North West	0.1670	1.1818	(1.0282, 1.3583)	0.0187	–0.4967	0.6085	(0.5594, 0.6620)	< 0.05
	South East	1.3726	3.9456	(3.3961, 4.5839)	< 0.05	–0.4636	0.6290	(0.5718, 0.6920)	< 0.05
	South South	0.5786	1.7836	(1.5197, 2.0932)	< 0.05	–0.5390	0.5833	(0.5313, 0.6404)	< 0.05
	South West	1.3656	3.9180	(3.3956, 4.5208)	< 0.05	–0.0862	0.9174	(0.8346, 1.0085)	0.0742
Religion (**ref** = Others)	Christian	0.9583	2.6072	(1.4850, 4.5773)	< 0.05	–0.2003	0.8185	(0.6308, 1.0620)	0.1317
	Islam	1.4718	4.3569	(2.4654, 7.6993)	< 0.05	–0.2404	0.7863	(0.6032, 1.0250)	0.0755

C.I. means Confidence Interval, and **AOR** means Adjusted Odds Ratio

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4. Discussion

The study provides critical insights into the factors associated with circumcision status among women of reproductive age in Nigeria. Researchers incorporated factors that demonstrated significant associations with circumcision status, as identified in previous studies (Abiodun *et al.*, 2011; Mudege *et al.*, 2012; Chidiebere, 2015; Ahinkorah *et al.*, 2021). A multinomial logistic regression model was employed to evaluate these factors, with results summarized in Table 3. The model contrasts two outcome categories—being circumcised and reporting "Don't Know"—against a baseline category of "Not Circumcised." Findings indicate that, while controlling for all covariates, the odds of circumcision among reproductive-aged women are 2.8869 times less compared to their not circumcised counterparts. Conversely, individuals who are uncertain of their circumcision status have 2.1572 times higher predicted odds, underscoring the complexity of knowledge surrounding FGM. The study identifies that older age, urban residency, higher educational attainment, and increased affluence are factors associated with a reduced likelihood of circumcision and an enhanced awareness of one's circumcision status. Moreover, significant regional and religious disparities in circumcision practices were observed, highlighting the influence of cultural and religious factors on FGM.

Educational attainment emerged as a pivotal factor influencing circumcision status. Women who completed primary education exhibited a marginally significant 12.50% higher probability of being circumcised compared to those with no formal education (AOR = 1.1250; 95% CI: 0.9946, 1.2725), albeit this finding did not reach statistical significance at the conventional threshold of $p < 0.05$. This ambiguous association may reflect the intricate interplay between cultural norms, social beliefs, and the limited scope of primary education concerning FGM-related issues. This finding contrasts with a study conducted in Senegal, wherein women with primary education demonstrated a higher likelihood of having undergone FGM. In contrast, higher levels of education correlate with a 22.39% reduced likelihood of circumcision compared to women lacking any formal education (AOR = 0.7761; 95% CI: 0.6620, 0.9099). This suggests a potential inverse relationship between educational attainment and the risks associated with FGM. Educated women are often more informed about the adverse consequences of FGM and are empowered to make autonomous decisions regarding their health and bodily autonomy. Additionally, higher education is associated with greater financial stability, expanded economic opportunities, and exposure to diverse cultural perspectives, which may collectively enable individuals to reject FGM practices. This finding aligns with existing literature (Gajaa *et al.*, 2016;

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Gayawan & Lateef, 2019; Kandala & Shell-Duncan, 2019; Ahinkorah *et al.*, 2020; Gbadebo *et al.*, 2021; El-Dirani *et al.*, 2022; Laleh *et al.*, 2022), which indicates that women with advanced education tend to exhibit lower support for the continuation of FGM. Regarding the "Don't Know" category, women with higher educational attainment are found to be 38.62% less likely to express uncertainty about their circumcision status compared to their less educated counterparts (AOR = 0.6138; 95% CI: 0.5543, 0.6796). This suggests that education enhances knowledge and awareness concerning one's circumcision status, potentially due to improved access to information and opportunities for dialogue surrounding FGM.

Maternal age displayed a statistically significant association with circumcision status, with the odds of circumcision increasing by approximately 2.38% for each additional year of age (AOR = 1.0238; 95% CI: 1.0199, 1.0278). This finding indicates that older women are more likely to have undergone FGM compared to younger women, potentially attributable to evolving cultural norms and increasing societal awareness of the risks associated with FGM over time. Younger cohorts may experience a declining likelihood of undergoing FGM due to heightened educational efforts and advocacy against the practice. Cohort effects may also contribute to the observed positive correlation between age and circumcision status, as older generations were more likely to have undergone FGM in their formative years due to prevailing cultural practices. This is consistent with findings from Mohammed *et al.* (2018), which also indicated that older women had a higher likelihood of having undergone FGM than their younger counterparts. Conversely, the likelihood of having an uncertain status decreased by approximately 1.31% for each additional year of age (AOR = 0.9870; 95% CI: 0.9845, 0.9896), suggesting that older women are more likely to have clearer notions regarding their circumcision status.

5. Conclusion

This study underscores the multifaceted nature of FGM in Nigeria, whereby there are significant sociodemographic and regional disparities in its prevalence. The main findings indicate that older maternal age and higher education are associated with a higher likelihood of being circumcised, while residents in the Northwest region showed the same association. The research also demonstrates that better education and information to raise awareness should be given to empower women but shows a knowledge gap in circumcision status. Understanding these determinants is key to developing effective interventions aimed at curbing FGM and promoting women's and girls' health and rights in Nigeria.

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However, the cross-sectional nature of the data limits causal interpretations. Further research using longitudinal data is recommended to better understand the dynamics of FGM over time.

Ethics Approval and Consent to Participate

No ethical approval was required for this study as it utilized secondary data from the 2018 Nigeria Demographic and Health Survey (NDHS), which is publicly available and anonymized. The NDHS obtained consent to participate during data collection.

Conflict of Interest Statement

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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Authors' Contributions

- Lawal Olumuyiwa Mashood: Conceptualization, methodology, data curation, formal analysis, supervision, writing—original draft, review, and visualization.
- Jessica Ibrahim Musa: Writing— original draft, editing, formal analysis, and conceptualization.
- Oluwafemi Samson Balogun: Writing—review and editing, and project administration.
- Joshua Sholademi Ojebisi: Writing—review and editing, and data curation.

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