Spatial distribution and determinant factors of Female Genital Mutilation among reproductive age women in Ethiopia, 2016; Based on Ethiopian National Demographic and Health Survey

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Abstract

Background: Though condemned and considered as a crime by the countries government, Female Genital Mutilation (FGM) remains a common public health problem in Africa and Ethiopia as well. Thus, this study was aimed to assess the spatial distribution and associated factors of female genital mutilation in Ethiopia based on the Ethiopian demographic and Health survey 2016 data. Method: This is a secondary data analysis of Ethiopian Demographic and Health Survey (EDHS) 2016 data based on 7,163 women who were included for FGM interview. The data was weighted using sampling weight as recommended by the program. The MS excel and ArcGIS 10.3 softwares were used for data cleaning and spatial analysis respectively. Global and local level clustering was assessed. For the none spatial data and the determinant factors, data cleaning and analysis was done using STATA 14. Multi-level mixed effect logistic regression model was fitted. Variables with P-value <0.25 in the bi-variable analysis were fitted in the multi-variable analysis. Finally, variables with p-value <0.05 with 95% CI of adjusted odds ratio were reported as a statistically significant determinants of FGM. Result: Female genital mutilation was spatially clustered (Global Moran’s I: 0.46, p<0.001). Significant hot spot clusters were found in Amhara, Oromia, Southern Nations Nationalities and Peoples (SNNP) regions. Mothers age >30 (AOR=2.41, 95% CI: 1.78,3.26) years, never in union (AOR=0.31, 95%CI: 0.22, 0.44), currently not working (AOR=0.71, 95%CI: 0.55, 0.92), women who considered FGM to be continued (AOR=2.86, 95%CI: 1.75, 4.68), not heard of FGM (AOR=0.22, 95%CI: 0.08,0.62), had no formal education (AOR=1.67, 95% CI: 1.03, 2.71), muslim (AOR=3.90, 95%CI:2.5, 6.09) and protestant (AOR=1.76, 95%CI: 1.25, 2.97), and those who thought of FGM as required by religion (AOR=1.99, 95%CI: 1.31,2.99) were found to be significant determinants of female genital mutilation. Conclusion: Female genital mutilation was spatially clustered with hotspot areas located in Amhara, Oromia,
and SNNP regions. Age of the mother, religion, occupation, educational level, marital status, information about Female genital mutilation, and intention about FGM to be stopped or continued were significant determinants of female genital mutilation. 

Key words: Female Genital Mutilations, Spatial analysis

Background

Female Genital Mutilation [FGM] is a partial or complete removal of external genitalia of the female for none medical reason (1). Four types of FGM are practiced in different countries ranging from simple clitoridectomy up to infibulations. Type I (clitoridectomy), is partial or complete removal of the clitoris and/or prepuce; type II (excision), is total or partial removal of the clitoris and the labia minora with or without removal of the labia majora; type III (infibulation), involves narrowing of the vaginal orifice with the creation of a covering seal by cutting and a positioning the labia minora and/or the labia majora, with or without excision of the clitoris; and type IV (all other), all other forms of harmful traditional practice on the female genitalia for none-medical purpose (2, 3). Female genital mutilation is mostly practiced on young girls of infancy up to early adolescence period (4, 5).

Globally, more than 200 million women and girls have undergone FGM so far (3). Female genital mutilation is practiced currently in more than 30 countries including Ethiopia (5). Half of the women and girls who undergone FGM lives in three countries including Egypt, Ethiopia and Indonesia (3). According to the Ethiopian Demographic and Health Survey [EDHS] 2016 report, FGM is still a public health problem with prevalence of 65% (6). Female genital mutilation is considered as child abuse and gross violation of children’s and women’s human rights (4, 7, 8).

Evidences have noted that female genital mutilation has multitude health consequences (1, 4, 9-14). For instance, women who were undergone FGM are at high risk of obstetric
complications during their childbirth (4). Furthermore, all types of FGM end up with immediate complications like hemorrhage and severe pain that will result in and ultimately death (12). Other short term complications including wound infection, sepsis, tetanus and risk of HIV/AIDS transmissions are also possible causes of death due to FGM (10-12, 14). In addition, women who had undergone type II or III FGM increases the risk of needing cesarean section and suffering from postpartum hemorrhage in Africa (4, 10).

The World Health Organization (WHO) identified six key factors that determine the continuation of FGM in developing countries. These include cultural traditions, sexual morals, marriageability, religion, health benefits, and male sexual enjoyments (4, 8, 14-17). Different stakeholders were involved to decrease female genital mutilation globally (3, 4, 18). The world has included FGM and other traditional practices as a target to be eliminated by 2030 in support of Sustainable Development Goals (18). Cognizant to this, the government of Ethiopia is struggling to eliminate FGM through prevention, provision and protection until 2025 (6). Globally, the overall reduction of FGM was observed for the last three decades but the progress is insufficient and uneven over countries for the rapid population growth (3, 4).

The United Nations has declared female genital mutilation as an illegal act to make the world free from FGM (19). However, it has remained one of the major public health problems which put countries at high burden of maternal morbidity and mortality in developing countries including Ethiopia (6). As part of this initiative, Ethiopia has developed prevention, protection and provision strategies, criminalization, and refreshed commitments to end FGM by 2025 (6, 19). Despite the above initiatives and efforts attempted by organizations and countries, significant number of women and girls are practicing FGM mainly in developing countries including Ethiopia. However, there is dearth of literatures regarding the spatial distribution and determinants of FGM. Therefore it is
imperative to explore spatial distribution and identify the determinants factors of FGM.

Methods

**Study design and setting**

A secondary data analysis was conducted from Ethiopian Demographic and Health Survey 2016 data. Ethiopia is located in East Africa at (3°-14° N and 33° - 48°E). It has nine regional states (Afar, Amhara, Benishangul-Gumuz, Gambella, Harari, Oromia, Somali, Southern Nations, Nationalities, and People’s Region (SNNP), and Tigray) and two administrative cities (Addis Ababa and Dire Dawa). Ethiopia is the 2nd populous country in Africa with high fertility rate of 4.6 children per women.

**Data source and measurements**

Every five years, the Demographic and Health Survey of Ethiopia (EDHS) collects data at national level based on representative samples and key indicators including maternal health conditions. Interviewer administered questionnaire was used to collect data on women of reproductive age (15-49) years. The questionnaire included sociodemographic, socio economic, pregnancy, and maternal health service related variables related to women health. A stratified two stage cluster sampling with a total of 645 Enumeration Areas (EAs) (202 in Urban and 443 in rural areas) were selected with probability proportional to EA size. A total of 15,683 women were interviewed for maternal health indicators assessment. Among the 15,683 interviewed, 7,163 households were selected for FGM (6).

Geographic coordinate data (latitude and longitude) were collected for selected enumeration areas. The coordinate data and the data set were accessed through online request from major DHS international (http://www.dhsprogram.com) after registration as an authorized user.
Data analysis

As recommended by the major DHS program of Ethiopia, the data was weighted 1st using the code for women data and the detail is found in major DHS report (6). Data cleaning and descriptive statistics were conducted using STATA 14 software for the non-spatial data. Multicollinearity was checked using Variance Inflation Factor (VIF) by considering a cut of point of VIF>10 to declare as multicollinearity. Geographic Information System (ArcGIS) version10.3 was used for spatial data analysis. Global and local level spatial autocorrelation analysis techniques were used to test the presence of spatial autocorrelation and for identifying significant clusters. Hot spot analysis was conducted using Getis-Ord Gi* statistics to explore how spatial autocorrelation varies across the study areas. To determine the statistical significance of clustering, Gi Z score was computed. A positive z-score >1.96 with significant p-value represents hot spot while negative Z-score <-1.96 with significant p-value represents cold spot. Ordinary kriging interpolation was used to predict the unsampled based on the sampled data and creates smooth surface to predict burden of FGM across the regions of the country.

Since the DHS data had hierarchical nature and we got a high and significant clustering [ICC=0.61(0.56, 0.65)], we used multilevel mixed effect logistic regression model. Variables having p-value <0.25 in the bi-variable multi-level mixed effect logistic regression model were considered for multivariable analysis. Finally, variables with significant level (p<0.05) were reported with Adjusted Odds Ratio (AOR) with 95% CI as independent determinants of female genital mutilation in Ethiopia.

Results And Discussion

Among the reproductive age women, 1,266 (17.46%) have said female genital mutilation should be continued and 1,710 (23.6%) of them believed that FGM is required by their
religion. Nearly all women 7,157 (98.66%) were heard about FGM while 5,232 (72.19%) of
them had no continuous media exposure (Table 1 and 2).

Female genital mutilation is spatially clustered in Ethiopia (Moran’s I=0.46, P<0.001).
Accordingly, significant hotspot clusters of FGM were detected in Central Amhara, West
and North-east Oromia, and East and North-east SNNP regions while cold spot clusters
were found in most parts of Tigray, Harari, Dire Dawa and Gambela, including Central and
South-West Afar regions (Figure 2). This finding is supported by other studies conducted in
Ethiopia where FGM was spatially clustered with high spot clusters found in Central and
East Amhara, North part of SNNP, East Oromia (20). Other studies conducted in
Kenya(24), Senegal(23),Nigeria(25) all showed that FGM has significant spatial variation.

Determinant factors of female genital mutilation in Ethiopia

The fourth Model that includes both the individual and community level variables was the
better fit as compared to others with high LLR.

Women older than 30 years had more than double (AOR=2.41, 95% CI: 1.78, 3.26) odds
of having FGM compared to women of age ≤30 years. This finding was supported by
different studies conducted in Ethiopia (20, 26), and Ghana (27). This might be due to the
strong emphasis given by the government of Ethiopia in the late 20th and early 21st
century to eliminate the practice of FGM through empowering women in different
strategies including providing access to mass media and education. This would mean that
women who were older have missed access to media exposure, health education, and
other opportunities by health extension workers that can condemn the female genital
mutilation.

With regard to occupation, women who are not currently working had 29 % ( AOR=0.71,
95% CI: 0.55, 0.92) less odds of having FGM as compared to their counterpart. A number of studies however have reported that women who have occupation/are working had lesser odds of practicing FGM than those have no occupation (28-30). To best of our knowledge, there is no clear justification for this finding.

Those mothers who are never in union had 69% (AOR=0.31, 95% CI: 0.22, 0.44) reduced odds of having FGM compared to women who are currently in Union. This finding is in agreement with studies conducted in Sudan where not currently married women had less odds of having FGM (22). In Somali and Harari regional states of Ethiopia the communities circumcise the women to increase marriageability, to make them calm and sexually faithful for their husbands (28). The reason for being never in union reduces the odds of having FGM in Ethiopia might be the different cultural barriers like being circumcised makes females more faithful to their husbands (31). In African countries including Ethiopia, some communities believe that practicing FGM as a pre-request for marriage (17, 32, 33). Additionally, if women do not practice FGM, they might be excluded from the community (32).

Those women whose intention about FGM to be continued had nearly 3 (AOR= 2.86, 95%CI: 1.75, 4.68) times more odds of having FGM compared to those who think FGM to be stopped while those who think of FGM to be continued conditionally had 48% (AOR=0.52, 95% CI: 0.27,0.98) less odds of having FGM compared to those whose intention is FGM to be stopped. This might be due to mothers who support that FGM should be continued are old aged, and uneducated. Even if FGM is declared as an illegal act, male attitude (33), lack of female autonomy and older peoples believe of FGM as a source to keep virginity makes some older people to have intentions as FGM to be a continued arena (27). Those mothers living in a community where FGM is required by religion had 2 (AOR=1.99, 95% CI: 1.32, 2.99) times odds of having FGM as compared to
women where FGM is not required by religion. No more than religion in Muslim religious followers (31)

In contrast to findings from other studies, mothers who had ever heard about FGM had nearly 3/4th (AOR=0.22, 95% CI: 0.08, 0.62) reduced odds of having FGM compared to their counterpart. This finding is against studies conducted in Sudan where having more formal education reduces the odds of having FGM (22), Ghana (27). Many scholars have documented that religion and different traditional and cultural factors could affect the practice of FGM. Accordingly, our study noted that Muslim and Protestant religious followers had nearly four [AOR= 3.90, 95% CI: 2.5, 6.09] and nearly two times (AOR=1.76, 95% CI: 1.05, 2.97) increased odds of being circumcised as compared to orthodox religion followers. This finding is supported by studies conducted in South Ethiopia (26), Somali region of Eastern Ethiopia (29), Ethiopia (20). Inaddtion, those mothers living in a community where FGM is required by religion had 2 (AOR=1.99, 95% CI: 1.32, 2.99) times odds of having FGM as compared to women where FGM is not required by religion. This finding was supported by different studies conducted elsewhere in South Ethiopia (26), Ethiopia (20). The main reason for the increased practice of FGM in such religious community is related to the strong belief and attitude of the community that practicing FGM has religious basis. For instance, a girl who undergo circumcision is considered to be pure and can go for pray and it is considered as an obligation in Islamic religion (31).

In the context of women education, women who had no education had more than one and half (AOR=1.67, 95% CI: 1.03, 2.71) odds of having FGM as compared to those who had above secondary education. Similar results have been reported by different studies in South Ethiopia (26), and Ghana (27). It is evidenced that more educated women can save their daughters from circumcision (34). Mostly, women circumcised their children to get social acceptance and marriage prospect which might be related with the women’s self-
autonomy that would mean more educated women had better decision making ability (35).

Conclusions And Recommendations

Female genital mutilation was spatially clustered. And hotspot clusters were found in Amhara, Oromia and SNNPR. Age of the mother, religion, occupation, educational level, marital status, information about Female genital mutilation, and intention about FGM to be stopped or continued were significantly associated with Female genital mutilation. And it is recommended to give more emphasis on hot spot regions and consider the above listed variables to reduce the magnitude of Female genital mutilation in Ethiopia.

Abbreviations

FGM: Female Genital Mutilation, AOR: Adjusted Odds Ratio, EDHS: Ethiopian Demographic and Health Survey, EA: Enumeration Area, LLR: Log Likelihood Ratio, RR: Relative Risk

Declarations

Ethics approval and consent to participate

Permission for data access was obtained from Major DHS program after registered as authorized user. All the data used for this manuscript are publically available and confidentiality was maintained anonymously.

Consent for publication

Not applicable

Availability of data and material

The data used for preparation of this manuscript are available from http://www.dhsprogram.com and anyone can access through online request as authorized user. The authors prepared the data that was used for preparation of this manuscript can be shared if required.
Competing interests

The authors declare that they have no competing interests.

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Authors’ contributions

AG, GM and MW developed the proposal, extracted the data, worked on analysis, interpreted the results and prepared the manuscript. All authors were contributing equally for the development of this research work.

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Tables

**Table 1:** Weighted proportion of Socio-demographic and economic variables of women in reproductive age in Ethiopia, EDHS 2016 perspective

| Sr. No | Variable name                  | Category | Female Genital Mutilation |
|-------|--------------------------------|----------|---------------------------|
|       |                                |          | No | Yes |
| 1     | **Age in years of respondents** | 15-30    | 1535 | 2538 |
|       |                                | >30      | 612 | 2563 |
| 2     | **Place of residence**         | Urban    | 741 | 9924 |
|       |                                | Rural    | 1406 | 4177 |
| 3     | **Religion**                   | Orthodox | 1301 | 1858 |
|       |                                | Muslim   | 346 | 1942 |
|       |                                | Protestant | 448 | 1226 |
|       |                                | Other | 52 | 77 |
| 4     | **Current occupation**         | Currently not working | 1386 | 3378 |
|       |                                | Currently working | 780 | 1723 |
| 5     | **Marital status**             | Never in union | 885 | 942 |
|       |                                | Currently in union | 1047 | 3637 |
|       |                                | Formerly in union | 188 | 523 |
| 6     | **Wealth index**               | Poor | 620 | 1791 |
|       |                                | Middle | 322 | 1086 |
|       |                                | Rich | 1205 | 2223 |
| 7     | **Highest educational level of women** | No formal education | 647 | 2757 |
|       |                                | Primary | 843 | 1662 |
|       |                                | Secondary | 437 | 452 |
|       |                                | Higher | 221 | 227 |

**Table 2:** Weighted proportion of variable associated with female genital mutilation in
Considering the prevalence of female genital mutilation, our analysis points out, the prevalence of FGM (65%) was lower as compared to previous studies, 74.3% conducted in Ethiopia (20), Burkina Faso (21), Sudan (22) but higher than studies conducted in Senegal (23). Female genital mutilation had spatial dependency at national and regional level (Moran’s I: 0.46, p<0.001). Thus, further analysis is required to detect specific local level significant clusters. We applied GetisOrd Gi* statistics to detect hot and cold spot clusters.

Table 3: Multi-level mixed effect logistic regression analysis output of Female genital mutilation in Ethiopia, EDHS 2016 perspective
| Currently not working | 1 | 3 | 0.7 | 0.75(0.58,0.9) | 0.71(0.55,0.88) |
|-----------------------|---|---|-----|---------------|-----------------|
|                       | 3 | 3 | 1(0.6)| 6(0.6)     | 0.92(0.68,0.97) |
|                       | 8 | 7 | .54 (0.39)| 0.93(0.6,0.98) |
|                       | 6 | 8 | .0 (0.55)| 0.28(0.5,0.7) |
| Currently working     | 7 | 1 | 1   | 1             |
|                       | 8 | 7 | 0   | 2             |
|                       | 0 | 2 | 3   |

| Marital status        |        |        |        |       |       |
|-----------------------|--------|--------|--------|-------|-------|
| Never in union        | 8 | 9 | 0.1 | 0.31(0.22,0.4) | 0.31(0.22,0.4) |
|                       | 8 | 4 | 6(0.6) | 2(0.6) | .44 |
|                       | 5 | 2 | .12 (0.06)| 0.23(0.14,0.33) |
| Currently in union    | 1 | 3 | 1 | 1 | |
|                       | 0 | 6 |  | 2 | 0.31(0.22,0.4) |
|                       | 4 | 3 |  |  | 0.87(0.62,1.2) |
|                       | 7 | 7 |  |  | 0.75(0.53,1.08) |
| Formerly in union     | 1 | 5 | 1.0 | 0.93(0.65,1.3) | 0.92(0.63,1.3) |
|                       | 8 | 2 | 6(0.6) | 3(0.6) | .32 |
|                       | 8 | 3 | .76 (0.48)| 1.48(0.8,2.1) |
| \[104x441| Wealth index | 2 | 4 | 8 | 5 | 3 |
| Poor                  | 620 | 179 | 1.2 | 0.87(0.62,1.2) | 0.75(0.53,1.08) |
|                       | 1 | 3 | 0(0.6)| 1(0.6) | 0.08 |
|                       | 1 | 3 | 0.94 | 1.66) (0.4,2.0) |
| Middle                | 322 | 108 | 1.3 | 1.12(0.78,1.6) | 1.07(0.74,1.5) |
|                       | 6 | 5 | 0(0.6)| 2(0.6) | .55 |
|                       | 6 | 5 | 0.99 | 1.84(0.6,2.1) |
| Rich                  | 120 | 222 | 1 | 1 | 1 |
| \[104x441| FGM to be continued or stopped |        |        |        |       |       |
| Continue              | 98 | 1 | 4.8 | 4.36(2.73,4.93) | 2.86(1.75,4.68) |
|                       | 1 | 7(3) | 6.96 |  | |
|                       | 6 | .11 | 6.96 |  | |
|                       | 8 | .7 (65) | 6.96 |  | |
| Stop                  | 196 | 3 | 1 | 1 | 1 |
|                       | 4 | 7 |  |  |  |
|                       | 8 | 4 |  |  |  |
| Depends on            | 88 | 1 | 0.9 | 0.61(0.34,1.0) | 0.52(0.27,0.98) |
|                       | 4 | 4(0.6) | 7 |  | |
|                       | 9 | .55 (1.63)| 7 |  | |
| Media Exposure        |        |        |        |       |       |
| Non Frequent          | 134 | 3 | 1.6 | 1.30(0.94,1.8) | 1.30(0.91,1.8) |
|                       | 4 | 8 | 7(1) | 1(1) | .85 |
|                       | 8 | .27 |  |  |  |
|                       | 8 | .2 |  |  |  |
|    |    |    |    | Frequent | 803 | 20 | 1 | 1 | 1 |
|----|----|----|----|----------|-----|----|---|---|---|
| 7  | Ever heard of FGM |    |    | No       | 60  | 37 | 0.2 | 0.25(0.08,0.7) | 0.22(0.08,0.62) |
|    |                         |    |    | Yes      | 208 | 506| 1  | 1  | 1  |
| 8  | Highest educational level of women |    |    | No education | 647 | 275| 4.9 | 1.96(1.21,3.1) | 1.67(1.03,2.71) |
|    |                         |    |    | Primary  | 843 | 166| 1.4 | 1.23(0.82,1.8) | 1.10(0.73,1.66) |
|    |                         |    |    | Secondary | 437 | 452| 0.9 | 1.17(0.79,1.7) | 1.12(0.74,1.67) |
|    |                         |    |    | Higher   | 221 | 227| 1  | 1  | 1  |
| 9  | Place of residence |    |    | Urban    | 741 | 992| 1  | 1  | 1  |
|    |                         |    |    | Rural    | 140 | 417| 2.7 | 1.89(1.36,2.63) | 1.32(0.83,2.09) |
| 1  | Religion |    |    | Orthodox | 130 | 185| 1  | 1  | 1  |
|    |                         |    |    | Muslim   | 346 | 194| 4.6 | 3.70(2.48,5.50) | 3.90(2.50,6.09) |
|    |                         |    |    | Protestant| 448 | 122| 1.6 | 1.63(1.09,2.46) | 1.76(1.05,2.97) |
|    |                         |    |    | Other    | 52  | 77 | 1.5 | 1.40(0.69,2.87) | 1.42(0.53,3.77) |
|       | Yes  | 198  | 152 | 3.2  | 2.79(1.98, 3.94) | 1.99(1.32, 2.99) |
|-------|------|------|-----|------|-----------------|-----------------|
|       | 1    | 1    | 5   | (2   | .30             | .4. 77)         |
|       | No   | 181  | 341 | 1    | 1               | 1               |
|       | 5    | 0    |     |      |                 |                 |
|       | Other| 133  | 179 | 0.9  | 1.03(0.69, 1.52) | 1.00(0.61, 1.65) |
|       |      | 9    |     | (0   | .66             | .1. 48)         |

**Random coefficient**

|                             | Variance | 4.58(3.62, 5.80) | 2.85(2.25, 3.59) | 3.81(3.00, 4.82) |
|-----------------------------|----------|------------------|------------------|------------------|
|                             | IC       | 0.61(0.56, 0.65) | 0.57(0.52, 0.62) | 0.60(0.55, 0.64) |
|                             | CC       |                  |                  |                  |

**Model comparison**

|                      | AIC      | 6263             | 6505.916         | 5794.48          |
|----------------------|----------|------------------|------------------|------------------|
|                      | LLR      | -2947.0897       | -3244.958        | -2876.2411       |

*Model 1: null model; model 2: individual level variables; Model 3: community level variables; Model 4: final model with both individual and community level variables; AIC: Akakie Information Criteria; BIC: Bayessian Information Criteria; LLR: Log Likelihood Ratio*

**Figures**
Proportion of cases (female genital mutilation) in Ethiopia, 2016 Ethiopian Demographic and Health survey perspective. A single dot represents one enumeration area (cluster) of the survey.
Figure 2

Hot spot analysis of FGM in Ethiopia using GetisOrd Gi* statistics, EDHS 2016

Perspective. A dot represents one enumeration area of the survey.