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Factors associated with female genital mutilation: a systematic review and synthesis of national, regional and community-based studies

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ABSTRACT

Background This systematic review aimed to identify and describe the factors that influence female genital mutilation/cutting (FGM/C).

Methods Searches were conducted in Medline, PsycInfo, Web of Science, Embase and the grey literature from 2009 to March 2020 with no language restrictions, using related MESH terms and keywords. Studies were included if they were quantitative and examined factors associated with FGM/C. Two researchers independently screened studies for inclusion, extracted data and assessed study quality. The direction, strength and consistency of the association were evaluated for determinants, presented as a descriptive summary, and were disaggregated by age and region.

Results Of 2230 studies identified, 54 published articles were included. The majority of studies were from the African Region (n=29) followed by the Eastern Mediterranean Region (n=18). A lower level of maternal education, family history of FGM/C, or belonging to the Muslim religion (in certain contexts) increased the likelihood of FGM/C. The majority of studies that examined higher paternal education (for girls only) and living in an urban region showed a reduced likelihood of FGM/C, while conflicting evidence remained for wealth. Several studies reported that FGM/C literacy, and low community FGM/C prevalence were associated with a reduced likelihood of FGM/C.

Conclusions There were several characteristics that appear to be associated with FGM/C, and these will better enable the targeting of policies and interventions. Importantly, parental education may be instrumental in enabling communities and countries to meet the Sustainable Development Goals.

Key messages

⇒ This systematic review identified 54 articles; most studies were from the African Region, were household surveys and used self-report of female genital mutilation (FGM).
⇒ Higher levels of parental education appeared to be protective against FGM in the majority of studies that examined this factor.
⇒ Most studies identified that family history of FGM, living in a rural area, and having specific religious beliefs increased the likelihood of FGM.

INTRODUCTION

Female genital mutilation (FGM), also known as female genital cutting (FGC), refers to procedures that involve alteration of female genitalia without a medical or therapeutic reason.[1] The United Nations Sustainable Development Goals (SDG target: 5.3) calls for ending FGM/C as a harmful traditional practice against women and girls by 2030.[2] The World Health Organization (WHO) has classified FGM/C into four different types: Type 1, removal of the clitoral glans; Type II, removal of the clitoral glans and labia minora; Type III, narrowing of the vaginal opening, which is known as infibulation; and Type IV, all other harmful non-medical modifications to the female genitalia.[3] Women and girls who undergo FGM/C suffer from a spectrum of short- and long-term complications such as psychological trauma, menstrual problems and chronic infections depending on the type of FGM/C and conditions under which the procedure is performed.[4]

The prevalence of FGM/C varies between continents and countries, with the highest rates being reported in the

African Region (AFR),[5] with almost all women in Somalia, Guinea and Djibouti having undergone FGM/C.[6–8] In high-resource settings, FGM/C is localised to migrant and refugee communities.[9 10]

Household surveys, such as Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS), provide the mainstay of data on FGM/C and allow progress towards the Sustainable Development Goals to be monitored across countries and regions.[11] A better understanding of the risk factors and social determinants associated with FGM/C will enable key stakeholders and policymakers to better inform and strengthen programmatic interventions that aim to eliminate FGM/C. Thus, an understanding of these factors is essential to progress towards eliminating FGM/C and achieving SDG 5.3. This systematic review aimed to comprehensively examine the factors associated with FGM/C, including risk factors, protective factors and social determinants in different geographic regions and countries.

METHODS

Search strategy

A systematic search of published articles was conducted in Medline, PsycInfo, Web of Science and Embase databases from inception to March 2020 with no language restrictions. In addition, searches of the grey literature were also conducted including reports of international non-governmental organisations and Google searches. The search was limited to include studies published between 2009 and 2020. The search terms included various synonyms of FGM/C such as 'female genital cutting', 'female genital alteration' and 'female genital circumcision'. The search strategy is further detailed in online supplemental table 1. Duplicates were removed in EndNote and articles were imported to Distiller SR software.[12] The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guideline was followed.[13]

Inclusion and exclusion criteria

This study was part of a systematic review on FGM/C that examined the prevalence and risk factors of FGM.[14] Studies were included if they examined factors associated with FGM/C, had a case-series, cross-sectional, case-control or cohort design, and compared factors between women or girls with FGM/C to those without FGM/C. Factors examined in this systematic review correspond to risk factors, protective factors and social determinants of FGM/C. We excluded studies that did not report on factors associated with FGM/C using quantitative methods, studies that only presented perspectives or attitudes towards FGM/C, systematic reviews, conference proceedings and letters to editors. Where studies have used the same data source, the most recent publication was included in the review.

Definition of FGM/C

The outcome in this systematic review is FGM/C, which refers to all procedures that involve the total or partial removal of external female genitalia or other injuries to the female genital organs.[3]

Study selection

Two researchers independently screened the titles and abstracts of the articles to determine whether studies qualified for full-text review. At the full-text review stage, two researchers independently assessed the eligibility of studies for inclusion and stated the reasons for exclusion. Disagreements were reconciled through consulting a third reviewer as necessary.

Data extraction

Data were extracted by two reviewers using a tailored data extraction form on Distiller SR.[12] Data from each study were extracted by one reviewer, which was verified by a second reviewer. Disagreements were addressed through discussion and with a third reviewer as necessary. Information extracted from each article included: author, publication year, year of data collection, the age range of the population or sample, study design, sample size, sampling method, country of origin, host country/region, FGM/C type, and risk or protective factor or social determinant of FGM/C. Factors were considered to be any variables that could have a plausible causal relationship with FGM/C. For each factor, the odds ratio (OR), risk ratio and 95% confidence interval (95% CI) were extracted for both unadjusted and adjusted analyses. If a study did not present a point estimate, the proportion in each category and the P-value were extracted.

Study quality assessment and risk of bias

The risk of bias of included studies was assessed using the Clarity Group assessment tool, McMaster University.[15 16] Answers to the tool measures were either 'definitely yes' (low risk of bias), 'probably yes', 'probably no' or 'definitely no' (high risk of bias). We rated the studies as 'low risk of bias for all key domains', 'unclear risk of bias for one or more key domains' and 'high risk of bias for one or more key domains'. No study was excluded from this systematic review based on the methodological quality.

Data synthesis

Any variables considered to have a causal relationship with FGM/C were included in the data synthesis. A meta-analysis was not possible due to the large heterogeneity between studies. As a result, data from included studies were analysed using narrative synthesis. In particular, associated factors were grouped to reflect three different levels of the socio-ecological model (individual, parental/household and community levels). These were categorised into either protective factors or risk factors. Results from individual studies

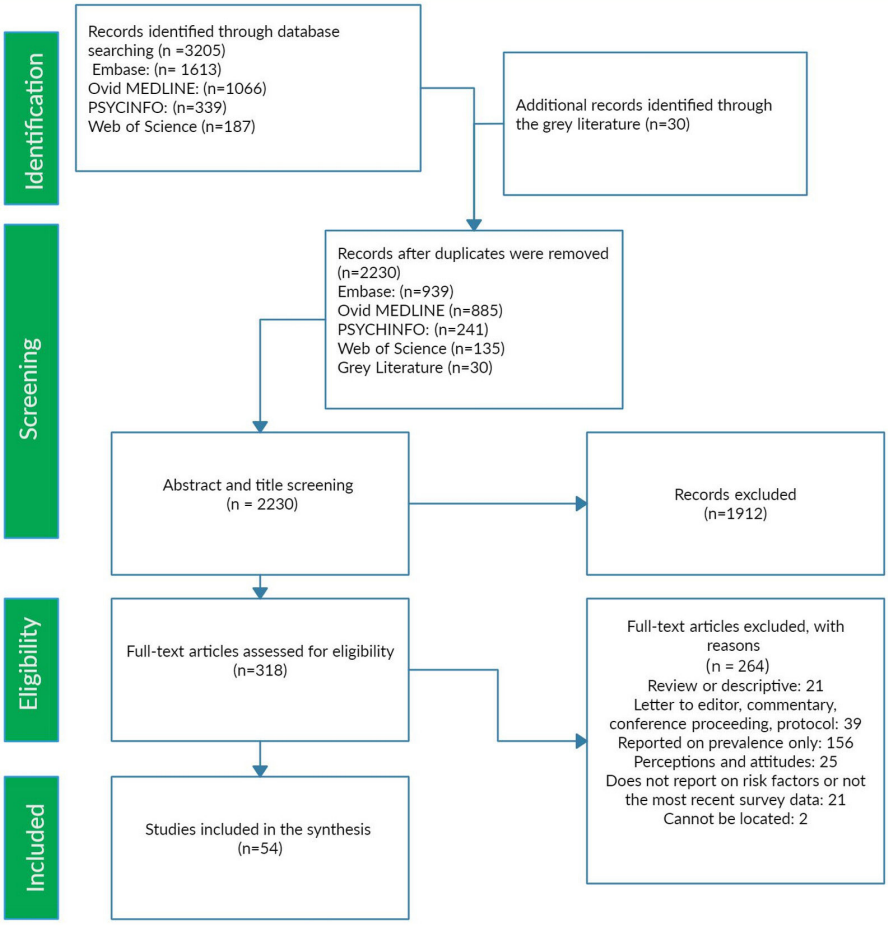

Figure 1 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow chart of study selection.

were further described according to age group (women or girls), country of origin, and WHO region (online supplemental table 2).

Public patient involvement

Ubah Ali, a co-author of this review, is a survivor of FGM and co-founder of Solace for Somaliland Girls, an organisation committed to eradicating all types of FGM across communities in Somaliland. She assisted in the interpretation of the data and drafting of the manuscript to ensure contextualisation of the findings.

RESULTS

A total of 3205 records were retrieved from the databases and the grey literature. After duplicates were removed, 2230 abstracts were screened. A total of 318 articles were selected for full-text assessment, of which 54 were included in the final analysis (figure 1). Of those, 33 studies examined FGM/C status among women of reproductive age, 19 studies examined FGM/C in girls aged 0–15 years and two studies examined FGM/C in both the mother and daughter. In the latter two studies, data were presented for both women and daughters.[17 18] Eight studies had overlapping age groups where the authors did not segregate results between women and girls. These studies were categorised into the most appropriate category as either women[19–21] (table 1) or girls[22–26] (table 2).

The main modality of data collection was household surveys (n=21), including seven studies that used MICS or DHS data, followed by hospitals or clinics (n=16), community-based studies (n=8), schools or universities (n=6) and databases or online survey (n=3). Most studies reported data on FGM/C based on participants' or parents' self-reporting (n=43) and 11 were based on physical examination. Only 22 studies reported on who performed FGM/C; among these, 16 showed that the procedure is most often carried out by a traditional practitioner (data not presented). Over half the studies were conducted in the AFR (n=29), followed by the eastern Mediterranean region (EMR) (n=18), European region (n=3), region of the Americas (n=3) and western Pacific region (WPR) (n=1). Seven studies described the determinants of FGM/C among migrants or refugees in high-resource settings.[10 27–32] Sample sizes in the included articles ranged from 200 to 46 713, with 33 studies based on a sample size of fewer than 1000 women or girls. The range was smaller in migrant studies from 23 to 2173 women. All studies were cross-sectional except four studies that utilised a case-control design.[10 19 33 34] Characteristics of all

Table 1 Determinants of female genital mutilation/cutting (FGM/C) among women of reproductive age (15–49 years)

		Risk factor		Protective effect		Not statistically significant	
Level	**Determinant**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
Individual	Increased wealth	1 study[67]	2 studies[37 40]	1 study[34]	2 studies[17 51]	3 studies[18 29 54]	1 study[68]
	Muslim	3 studies[27 28 30]	6 studies[19 31 36 40 58 61]			3 studies[41 54 62]	3 studies[51 63 68]
Parental factors	Maternal education (high)			2 studies[20 56]	3 studies[36 51 61]	1 study[54]	1 study[52]
	Paternal education (high)			2 studies[20 56]	1 study[52]	1 study[54]	1 study[51]
	Mother subjected to FGM/C	1 study[60]	3 studies[37 51 52]				
	Mother's occupation (employed)			1 study[50]			
Household	Other family members subjected to FGM/C	1 study[60]	1 study[51]				
Community	FGM/C is required by religion		1 study[61]				
	Urban region	1 study[18]	2 studies[19 40]	5 studies[20 33 49 54 56]	3 studies[36 51 61]	2 studies[41 42]	1 study[37]

Studies[19–21] have overlapping age groups.

included studies are described in online supplemental table 2.

Across all studies, there were 34 determinants identified, which were either protective or risk factors for FGM/C. The most common determinants reported among women and girls are summarised in tables 1 and 2, respectively, and include being a Muslim (n=24), mother's level of education (n=24 studies) and area of residence (urban or rural) (n=23). A detailed description of the association of these factors with FGM/C status (results by study) is available in online supplemental table 3. Other less common factors are described in online supplemental table 4.

Risk of bias

Overall, eight articles showed a low risk of bias,[26 35–41] 20 articles had a high risk of bias[10 21 24 25 27 30–32 34 42–52] and 26 articles demonstrated an unclear risk of bias.[17–20 22 23 28 29 33 53–69]

Factors associated with FGM/C

Individual characteristics

Wealth

The association between wealth and FGM/C was examined in 10 studies conducted among women of reproductive age[17 18 29 34 37 40 51 54 67 68] and eight in girls.[17 18 22 38 39 59 64 66] Overall, 9 [66] of 18 studies showed little to no influence for wealth on the FGM/C status of women and girls.[18 22 29 38 39 54 64 66 68] Three of 10 studies showed that being in a higher wealth quintile was protective against FGM/C among women of reproductive age[17 34 51] and two of eight studies showed that an increase in household wealth decreased the likelihood of having a daughter subjected to FGM/C.[17 59]

Religion

Twenty-four studies assessed the association between being Muslim and FGM/C status among women (n=15) and girls (n=9).[18 19 22 23 27 28 30 31 35 36 39–41 46 51 54 57–59 61–63 66 68] Overall, 15 studies found a significant positive association between being Muslim and FGM/C status[18 19 22 27 28 30 31 35 36 39 40 57–59 61] and nine found no significant relationship.[23 41 46 51 54 62 63 66 68] These results were context specific. In addition, a study in Iran found that Sunni Muslim women were more likely to have FGM/C than Shi'a Muslim women .[60](see tables 1 and 2)

Parental characteristics

Mother's age

Nine studies examined the association between mother's age and daughter's FGM/C status.[17 35 38 39 45 55 59 64] Daughters of mothers of older age were more likely to have FGM/C in four of nine studies.[17 35 38 45] Among a pooled sample of six DHS surveys from Nigeria, Egypt, Mali, Kenya, Guinea and Burkina Faso, the age of the mother did not have a statistically significant association with FGM/C.[59]

Maternal education

Seven studies assessed the influence of the level of maternal education on FGM/C among women of reproductive age.[20 36 51 52 54 56 61] A higher level of maternal education was protective against FGM/C, particularly among women whose mothers had attained primary level education compared with uneducated women,[20 36 51] were literate versus illiterate[56] or had reached secondary level schooling and above compared with primary education or no education.[61]

Seventeen studies assessed the influence of the mother's level of education on FGM/C among girls and daughters.[17 22–26 35 38 39 44 45 55 57 59 64 66 69] Fourteen out of seventenn studies showed that increased maternal education, in particular, being literate versus illiterate,[38 55] and having a secondary or higher level of education[17 23 25 26 35 44 59 69] decreased the likelihood of FGM/C among daughters. All 17 studies were either conducted in the AFR (13 studies) or the

Table 2 Determinants of female genital mutilation/cutting (FGM/C) among girls and infants

		Risk factor		Protective effect		Not statistically significant	
Level	**Determinant**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
Parental factors	Mother's increased age	1 study[45]	3 studies[17 35 38]		1 study[66]	3 studies[39 59 64]	1 study[55]
	Increased wealth			1 study[59]	1 study[17]	3 studies[18 39 64]	3 studies[22 38 66]
	Muslim	3 studies[18 57 59]	3 studies[22 35 39]			1 study[46]	2 studies[23 66]
	Maternal education (high)	1 study[66]		6 studies[17 23 25 45 59 69]	8 studies[22 24 26 35 38 44 55 57]	2 studies[39 64]	
	Paternal education (high)			4 studies[23 25 45 69]	2 studies[44 55]	2 studies[46 64]	2 studies[22 24]
	Mother subjected to FGM/C	1 study[59]	2 studies[17 35]	1 study[66]			1 study[39]
	Mother's occupation (employed)		1 study[57]			3 studies[25 59 64]	4 studies[23 38 39 44]
	Father's occupation (employed)			1 study[25]		1 study[64]	2 studies[23 44]
	Mother's marital status (currently married)	1 study[69]*				1 study[39]	2 studies[38 55]
	Mother's knowledge on FGM/C (high)			1 study[25]	1 study[38]		2 studies[55 65]
	Mother's support of FGM/C continuation	3 studies[17 38 39]					1 study[66]
Household	Other family members subjected to FGM/C		1 study[44]				
Community	FGM/C is required by religion	2 studies[22 25]				1 study[39]	
	Urban region			1 study[59]	4 studies[23 38 55 58]	2 studies[39 46]	2 studies[22 44]

Studies[22–25] have overlapping age groups.
*Higher odds ratio for married versus single or divorced (excluding widowed).

EMR (4 studies). Higher levels of maternal education decreased the likelihood of daughter's FGM/C in three of four studies conducted in the EMR[17 26 44] and 11 of 13 studies conducted in the AFR.[22–25 35 38 45 55 57 59 69]

Paternal education

Higher paternal education was protective against FGM/C in three of five studies conducted among women of reproductive age,[20 52 56] while two studies showed no association between paternal education and FGM/C.[51 54] All five studies were conducted in the EMR.[20 51 52 54 56] Six of 10 studies conducted among daughters demonstrated that the risk of FGM/C decreases with increased level of paternal education.[23 25 44 45 55 69] One of the four studies, which showed no statistically significant relationship, examined FGM/C among infants[46] rather than adolescents or young children.

Parents' occupational status and employment

The relationship between having a mother who is a professional or an employee was examined in nine studies and was found to be protective in one study,[50] a risk factor in one[57] and not statistically significant in seven studies.[23 25 38 39 44 59 64] In two studies, the relationship was statistically significant at the unadjusted level but was no longer statistically significant after adjusting for confounders.[23 44]

One of four studies showed that an employed fathers had a lower prevalence of FGM/C among daughters than unemployed fathers,[25] and the relationship was not statistically significant in three studies.[23 44 64]

Family history of FGM/C

Ten studies examined whether a family history of FGM/C affected the likelihood of FGM.[17 35 37 39 44 51 52 59 60 66] In particular, nine studies investigated the relationship between the FGM/C status of girls based on whether their mothers had FGM/C.[17 35 37 39 51 52 59 60 66] Having a mother with FGM/C led to higher odds of a daughter(s) having FGM/C in seven of nine studies.[17 35 37 51 52 59 60] The relationship was especially strong in Iraq (Kurdistan) (adjusted OR (AOR) 15.1, 95% CI 10.6 to 21.6)),[52] Eritrea (AOR 8.59, 95% CI 5.63 to 13.10),[35] Egypt (Sohag and Qena) (AOR 9.12, 95% CI 2.11 to 14.09)[51] and Yemen (AOR 7.40, 95% CI 6.01 to 9.13).[17] Having a family member such as a sister or a grandmother subjected to FGM/C significantly increased the likelihood of being subjected to FGM/C in all three studies reporting FGM/C family history.[44 51 60]

Community-level determinants

Urban versus rural region

Twenty-three studies examined whether FGM/C status differed between urban and rural areas.[18–20 22 23 33 36–42 44 46 49 51 54–56 58 59 61] Of the 23 studies, 13 showed that women living in urban areas were less likely to be subjected to FGM/C,[44] seven studies did not show a statistically significant association[22 37 39 41 42 44 46] and three studies showed that living in an urban area increased the likelihood of FGM/C.[18 19 40] In a study based in Somalia, daughters of women residing in an urban area were 70% less likely to have FGM/C.[38] Living in a rural area was one of the most influential sociodemographic characteristics affecting FGM/C among a sample of young women in Egypt (OR 8.2).[51] Conversely, among Kenyan girls (aged 0–14 years) there was no statistically significant difference of FGM/C by place of residence.[39]

FGM/C as a religious requirement

Four studies examined the association between FGM/C and its practice on religious grounds among girls[22 25 39] and among women aged 15–24 years.[61] All four studies were conducted in the AFR, and three of these studies found a statistically significant association.[22 25 61]

Other risk factors identified from the literature

Several other determinants were reported in the studies. Mothers who had a positive attitude towards FGM/C continuation were more likely to have a daughter subjected to FGM/C in three of four studies.[17 38 39] Girls whose mothers had lower knowledge of FGM/C complications were more likely to be subjected to this practice in one of three studies.[25] The participation of parents in anti-FGM/C activities was associated with a lower likelihood of FGM/C for their daughters in both studies.[55 65] Some determinants were only examined in one study and showed a positive association with FGM/C such as mother's underage marriage,[17] high village FGM/C rate,[22] cultural influence to perform FGM/C or community acceptance[55] or being an undocumented migrant.[28] There was no statistically significant association between FGM/C status and women's decision-making ability,[59] women's ownership of land[39] and domestic abuse[39] (online supplemental table 4).

DISCUSSION

This study showed that there was a wide variety of determinants for FGM/C at the individual, familial, community and structural levels. Parental education and living in an urban area appeared to have protective effects against FGM/C for both women and girls in the majority of studies. For both women and girls, the majority of studies showed that being a Muslim, perceiving that FGM/C has religious grounds, and having a family history of FGM/C were risk factors for FGM/C. Furthermore, proxy factors related to women's status in society appeared to be related to FGM/C, such as underage marriage and education.

FGM/C is a harmful practice that removes healthy female genital tissue causing short- and long-term impacts on the health and well-being of women.[70] Furthermore, the practice violates the human rights of women and girls and is an extreme form of

discrimination.[71] In addition to the individual and societal impacts, the estimated economic cost of FGM/C due to obstetric, gynaecological, mental and sexual complications amounts to US$1.4 billion every year.[72]

Results in context

FGM/C is a result of interrelated and complex factors associated with gender norms; this review showed that the literature focused on determinants at the micro and meso levels, and data were scarce on the impact of social norms on FGM/C. Social norms are unhidden rules among community members that guide behaviour by setting a perception of rewards, benefits or punishment.[73] Furthermore, women and girls have a social obligation to continue with FGM/C, and deciding to stop the practice places women and girls at risk of shame, stigmatisation, exclusion and rejection from their communities.[71]

This study demonstrated that the majority of studies that examined rurality or family history of FGM/C showed they were risk factors for FGM/C; these variables may be proxy indicators for social norms. A systematic review examining men's attitudes, beliefs and behaviours regarding FGM/C demonstrated mixed perceptions about the practice as some men wished to abandon the practice but others considered it a social obligation.[74] An enabling environment to support the discontinuation of FGM/C demands enhancing the men's role, whether the husbands, fathers or community leaders, as promoters who can partner to break this social convention.[71] Qualitative studies report that women believe FGM/C is a religious obligation.[75 76] Narratives and experiences of communities that practise FGM/C suggest that FGM/C is a ritual or tradition that has been a social and cultural norm across generations and is a requirement for marriage.[76 77]

This review found that the majority of studies identified urban status as protective against FGM/C among women. Although some urbanised cities are lagging in achieving gender equality goals, there appears to be an association between urbanisation and women's ability to make strategic life choices.[78] One reason for this relationship is that urbanisation improves women's educational participation and empowers them economically and politically.[79] The relationship between residence in urban areas and female schooling may explain how urbanisation contributes to better gender equality and well-being for women.[78 43]

This systematic review showed that the majority of studies assessing parental education found that it was protective against FGM/C for women and girls. This finding is supported by the literature; Link and Phelan argue that female education is one of the main proxy variables for autonomy and that it plays a role in preventing violent outcomes.[80] The demonstrated association between education and FGM/C may be a reflection of the effect of education on improving the interpersonal skills of women and girls, their social status and cultural outlook, and their ability to lead independent lives and oppose gender roles and traditions.[81]

There were several factors related to women's status in society that were shown to be risk factors for FGM/C, including low maternal education status, child marriage, being an undocumented migrant, and living in a village with high FGM/C rates. Progress towards gender equality through women's inclusion in the workplace and education may be a pathway to ending FGM/C.[82] Furthermore, the United Nations General Assembly stated in a resolution that member states should "pursue a comprehensive, culturally sensitive, systematic approach that incorporates a social perspective and is based on human rights and gender equality principles in providing education and training to families, local community leaders and members of all professions relevant to the protection and empowerment of women and girls to increase awareness of and commitment to the elimination of female genital mutilations" (United Nations, 2012; UNFPA, pp. 3–4).[83] The pursuit of gender equality, women's empowerment, and elimination of FGM/C is cross-cutting, and requires engagement at all levels of the socio-ecological model to meet the Sustainable Development Goals.

Strengths and limitations

This review used rigorous search strategies and standardised systematic review methodology to ensure the inclusion of all eligible studies and the accurate synthesis of these studies. This review had several limitations; approximately half of the studies had a high risk of bias. In addition, many studies were cross-sectional, so reverse causality cannot be excluded for many determinants in the included studies. Furthermore, there was considerable heterogeneity between studies due to the broad range of study locations, participants and methods to assess and categorise the various determinants.

This review only presented factors associated with FGM/C as presented in the literature and there may be other related factors that were not reported in the included studies. For example, the commercial or economic determinants of FGM/C, where traditional practitioners perform FGM/C for financial reasons, perpetuating the practice in communities.[84]

Recommendations for future research

The present research mainly demonstrates evidence on FGM/C determinants from resource-poor settings, leaving gaps in knowledge related to migrant health in high-income countries. Further work should be completed to understand the effectiveness of policies and interventions that aim to eradicate FGM/C. An evaluation of "grassroots" and community-level interventions or policies will allow an understanding of the barriers and facilitators to implementation, and the

potential to extrapolate these interventions and policies to other communities.

CONCLUSIONS

This review identified factors related to FGM/C, which include lower parental education, religion, rural residence, and family history of FGM/C. Disrupting the intergenerational trauma of FGM/C through education, advocacy, and changing social norms may be potential pathways to eliminating FGM/C. Gender equality, improving women's status in society, and education of girls are cross-cutting Sustainable Development Goals that will improve the health and well-being of women globally. Approaching women's status in society holistically is vital to tackling harmful practices against women.

Correction notice This article has been corrected since it was first published. Under the section about data extraction, the first two sentences have been modified.

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Supplementary Table 1. Search strategy

Database	Search Terms
PsycINFO	1 Female Genital Mutilation;2 Female Circumcision;3 Female Genital Cutting; 4 Female Genital Alteration; 5 or/1-4; 6 Limit 5 by 2009-2020
Embase	1 'female genital mutilation'/exp; 2 'female genital mutilation'; 3 or/1-2; 4 'female'/exp; 5 female; 6 or/4-5； 7 genital; 8 'mutilation'/exp; 9 mutilation;10- or/8-9;11 7 and 10; 12 11 and 6; 13 Limit 12 by 2009-2020
Ovid Medline	1 female.mp.; 2 Girl*.mp.; 3 wom?n.mp.; 4 or/1-3; 5 adj3 genital*.mp.; 6 adj3 mutilation.mp.; 7 adj3 circumcis*.mp.; 8 adj3 cut*.mp.; 9 adj3 alter.mp.; 10 adj3 alteration.mp.; 11 or/5-10 (1448); 12 4 and 11; 13 Female Genital Mutilation.mp.; 14 Female Circumcision.mp.; 15 Female Genital Cutting.mp.; 16 Female Genital Alteration.mp. (1629); 17 or/13-16; 18 Circumcision, Female.sh. / (1322); 19 12 or 17 or 18 (2024); 20 limit 4 to yr="2009 -Current" (1066)
Web of Science	1 Female Genital Mutilation; 2 Female Circumcision;3 Female Genital Cutting; 4 Female Genital Alteration, 5 or/1-4; 6 Limit 5 by 2009-2020

Supplementary Table 2: Characteristics of studies included in the systematic review

	Author (year)	Date publication; data collection year	Sampling Method	Sampling method for non-FGM	Self-report or examination	Country of origin; Host country (if different)	Region	Total sample size	Total FGM	Participant description (representing group being compared	Age Group	Risk of Bias
	African Region											
1	Nonterah, et al. [1]	2020; 2003-2013	Pregnancy records database.	Pregnancy records database.	Examination	Ghana	Kassena-Nankana district-North Eastern Ghana	9306	1647	Women who delivered at the targeted hospital	Less than 20 to more than 35	High
2	Greis, et al. [2]	2020; 2017	Two-part stratified sampling procedure for villages; a random sample of participant	Those who reported not having FGM or unsure of their FGM status	Self-report	Burkina Faso	10 villages and one sector of Nouna town	696	301	Adolescents aged 12-20	12-20	Unclear
3	Njoku, et al. [3]	2020; (2018-2019)	Hospital-based; systematic sampling	For each participant with FGM being recruited, 2 consecutive participants were recruited.	Examination	Nigeria	Calabar, Nigeria	450	150	Pregnant women	Under 19 to more than 40	High
4	Sylla, et al. [4]	2020, 2012	Multi-facility based; whole sample	Multi-facility based; whole sample	Self-report (head of household)	Mali	Bamako	1920	1027	Girls aged 0-15	0-15	Unclear
5	Kandala, et al. [5]	2019; (Only 2014 used)	Multi-stage cluster sampling (DHS)	Multi-stage cluster sampling (DHS)	Mother's report	Kenya	National	12,434	373	Girls of mothers of reproductive age	0-14	Low
6	Anikwe, et al. [6]	2019; 2012	Facility-based; random sampling	Purposive (women who delivered in the facility within 24 h of selection of a case).	Examination	Nigeria	Abakaliki, Ebonyi, Nigeria	260	260	Pregnant women	Less than 20 to more than 35	Unclear
7	Kandala and Shell-Duncan [7]	2019; (Only 2010-2011 used)	Multi-stage cluster sampling (DHS)	Multi-stage cluster sampling (DHS)	Self-report	Senegal	National	15668	4408	Women	15-49	Low
8	Boyle and Svec [8]	2019; (2010-2014)	Multi-stage cluster sampling (Multiple DHS surveys)	Multi-stage cluster sampling (Multiple DHS surveys)	Mother's report	Multiple Countries *	NA	12,144	6606 **	Women who had daughters aged older than FGM normative age within their regions	Daughters older than normative age in different regions	Unclear
9	Beller and Kröger [9]	2018; (2008-2009)	Stratified random sampling	Parents who do not have a daughter with FGM	Parent's report	Multiple African countries* **	Same	Mothers (n= 6,299) and Fathers (n= 6,778)	Not reported	Parents who have a daughter (study examining daughters with FGM)	Not indicated	High
10	Sakeah, et al. [10]	2018; NA	Two-stage sampling method then proximity selection to select subsequent household	Two-stage sampling method	Self-report	Ghana	Bawku municipality & Pusiga District	830	Pusiga District - 273, Bawku Municipality -236	Women of reproductive age	15-49	Unclear
11	Ojo and Ijadunola [11]	2017, 2013	Multistage cluster sampling (DHS)	Same	Self-report	Nigeria	National	38,948	9,652	Women of reproductive age	15-49	Low
12	Gebremariam, et al. [12]	2016; 2014	School-based, multistage stratified random sampling	School-based, multistage stratified random sampling	Self-report	Ethiopia	Jigjiga district	662	538	High school & college students	15-24	Unclear
13	Gajaa, et al. [13]	2016; 2014	Cluster sampling	Women from the sample who do not have a daughter with FGM	Mother's report	Ethiopia	Hababo Guduru District	610 Mothers with at least one daughter under 15	293 Daughters	Women with at least one daughter under 15 years	0-15	Low
14	Andualem [14]	2016; 2014	Household based; systematic random sampling	Household based; systematic random sampling	Mother's report	Ethiopia	East Gojjam Zone, Western Amhara	805 Daughters	403 Daughters	Women who had daughters less than 5 years	0-5	Unclear

15	Oljira, et al. [15**]	2016; 2013	Multistage cluster sampling (Harar Health and Demographic Surveillance System 2013)	Multistage cluster sampling	Mother's report	Ethiopia	Harar	842 Daughters	160 Daughters	Women with at least one daughter younger than 12 years	0-12	Unclear
16	Ashimi, et al. [16]	2015; 2014	Multi-facilities; systematic random sampling	Multi-facilities; systematic random sampling	Examination and mother's report	Nigeria	Three clinics, Birnin Kudu, Jigawa state	461 Mothers of infants	215	Infants presenting to clinics	Less than 1	Unclear
17	Ifeanyichukwu, et al. [17]	2015; 2014	Household; cluster sampling	Household; cluster sampling	Self-report	Nigeria	Okada Community - Edo State	325	90	Women of reproductive age	15-49	Unclear
18	Chikhungu and Madise [18]	2015 (Only DHS 2010 used)	Multistage cluster sampling	Multistage cluster sampling	Self-report	Burkina Faso	National	17,807	13,551	Women	15-49	Low
19	Bogale, et al. [19]	2014; 2014	Household; stratified random sample	Household; stratified random sample	Self-report	Ethiopia	Bale zone	634	486	Childbearing age women	15-49	Unclear
20	Besera and Roess [20]	2014; 2002	Multi-stage cluster sampling (DHS)	Women from the sample who doesn't have a daughter with FGM	Mother's report	Eritrea	National	8754 Mothers	3168 had at least one daughter with FGM	Women with at least one daughter	Daughters of women of reproductive age	Low
21	Tamire and Molla [21]	2013; 2011	Multi-school based; multi-staged cluster sampling method	Multi-school based; multi-staged cluster sampling method	Self-report	Ethiopia	Hadiya zone, Southern Ethiopia	797	641	High school students	13-25	Unclear
22	Bjälkander, et al. [22]	2013; (2010-2012)	Facility-based; Purposive	Facility-based; Purposive	Self-report and examination	Sierra Leone	Northeastern Sierra Leone	554	451	Attended antenatal clinics	12-47	Unclear
23	Garba, et al. [23]	2012; 2011	Hospital-based; purposive	Hospital-based; purposive	Mother's report	Nigeria	Kano, Northern Nigeria	200	26	Infants in Aminu Kano Teaching Hospital	Less than 1	High
24	Yirga, et al. [24]	2012; 2008	Household; Systematic random sampling	Household; Systematic random sampling	Self-report	Ethiopia	Kersa district, East Hararge, Oromia region, Ethiopia	858 mothers (858 daughters) – determinants for both groups studied	Mothers with FGM- 792, Mothers with 1 or more daughters with FGM- 288	Women of reproductive age	15-49	Unclear
25	Iliyasu, et al. [25]	2012; missing	University-based; multistage sampling	University-based; multistage sampling	Self- report	Nigeria	Bayero University, Kano, Kano State, Northern Nigeria	359	43	University Students	17-40	Unclear
26	Mudege, et al. [26]	2012; missing	Community based-every household	Community based-every household	Self-report	Kenya	Korogocho and Viwandani, informal settlements in Nairobi	527	323	Girls/women in informal settlements	12-24	High
27	Shay, et al. [27]	2010; 2008	Multi-school-based sample; random sample	Multi-school-based sample; random sample	Parent's or families report	Ethiopia	Adis Ababa	407	106	School girls	Under 5 to above 20 [the majority were in the age group 10-15]	High
28	Mitike and Deressa [28]	2009; 2004	Household sample; systematic sampling method	Household sample; systematic sampling method	Parent's report	Somalia; Ethiopia	Somali refugee camps in the Somali Regional State in Eastern Ethiopia.	288	122	492 Parents	12+	Unclear
29	Im, et al. [29]	2019; 2013	Snowballing	Snowballing	Self-report	Somalia; Kenya	Eastleigh	143	Not reported	Refugees	15-35	High
	Eastern Mediterranean Region (EMR)											
1	Abdulah, et al. [30]	2019; 2017	Two stage random sampling	Two stage random sampling	Mother's-report	Iraq	Iraqi Kurdistan region (Duhok, Erbil, and Sulaiymaniy)	5048 daughters	2361 daughters	Mothers and their daughters	All age groups	Unclear

2	Rouzi [31]	2019; 2016-2017	Facility based; purposive	Same	Self-report	Saudi, Naturalized Saudi, and non-Saudi; Saudi Arabia	Jeddah	963	175	Women attending clinics	18-75	Unclear
3	Alosaimi, et al. [32]	2019; (2008-2009)	Multistage sampling	Same for women; For daughters, the control group were mothers without a daughter subjected to FGM/C	Mother's report	Yemen	National	7076 Women with at least one daughter	Women-3384, Daughters (at least one)-2405	Women with at least one daughter with FGM	Daughters of mothers	Unclear
4	Minsart, et al. [33]	2015; 2012-2014	Facility-based, whole sample	Facility-based, whole sample	Examination	Djibouti	Djibouti-City	614	643	Mothers of live births and stillbirths (excluding mothers from West Africa and Europe)	Less than 25 till more than35	High
5	Elduma [34]	2018; 2014	Multistage cluster sampling (MICS)	Multistage cluster sampling (MICS)	Self-report	Sudan	National	21947	19451	Women	15-49	Low
6	Ali, et al. [35]	2018; 2017	Cluster and systematic random sampling	Cluster and systematic random sampling	Self-report	Egypt	Beni-Suef	3353	1846	Young women	12-25	Unclear
7	Milaat, et al. [36]	2018; 2017	Cluster random sampling for the region followed by multi-stage random sampling for the household	Cluster random sampling for the region followed by multi-stage random sampling for the household	Report of the head of the household	Saudi Arabia	Hali semi-urban region.	218	175	Girls less than 18 years	0-18	Unclear
8	Arafa, et al. [37]	2018; (2016-2017)	University-based sample; multi-stage random sampling	University-based sample; multi-stage random sampling	Self-report	Egypt	Beni-Suef University	1723	815	University Students	Mean age=20.89	Unclear
9	Ahmed, et al. [38]	2017; (2015-2016)	Multi- facility; purposive	Multi- facility; purposive	Self-report	Egypt	Suez Canal University	204	135	Students attending clinic	14-19	Unclear
10	Abdel-Aleem, et al. [39]	2016; (2011-2014)	Facility based; purposive	Facility based; purposive	Examination	Egypt	Assiut and Sohag	430	376	Recently married women	17-31	High
11	Abolfotouh, et al. [40]	2015; (2012-2013)	Organization-based; convenient (google survey)	Organization-based; convenient	Self-report	Egypt	Not Applicable (online)	320	47	Medical Students	Not indicated	High
12	Dehghankhalili, et al. [41]	2015; (2010-2013)	Multi-facility based; purposive	Multi-facility based; purposive	Examination	Iran	Hormozgan, Southern Iran	780	535	Women and girls attending clinic	14-38	Unclear
13	Mohammed, et al. [42]	2014; (2011-2012)	Computer based multi-stage random sampling	Computer based multi-stage random sampling	Examination	Egypt	Ismailia	2106	1911	Sexually active women	15-45	High
14	Ali, et al. [43]	2013; 2012	Multi- school based; random	Multi- school based; random	Self-report	Sudan	Kassala, Eastern Sudan	972	810	School girls	9-16	High
15	Saleem, et al. [44]	2013; 2011	Multi-facility based; purposive	Multi-facility based; purposive	Self or parent report	Iraq	Kurdistan region	1508	348	Females visiting PHCs	Up to 20	Low
16	Yasin, et al. [45]	2013; (2007-2009)	Multi-facility-based sample, a convenient sampling	Multi-facility-based sample, a convenient sampling	Examination and Self-report	Iraq	Erbil, Kurdistan Region, Iraq	1987	1397 (self-reported), 1164 (examination)	Women and girls attending clinic	15-49	High
17	Zayed and Ali [46]	2012; missing	Community-based; random sample	Community-based; random sample	Self-report	Egypt	Cairo & Giza	244	156	Muslim females between the age of 5 and 30 years.	Up to 30	High
18	Rasheed, et al. [47]	2011; (2008-2010)	Multi-facility based; all those presenting to certain clinic	Multi-facility based; all those presenting to certain clinic	Self-report and parent report	Egypt	Sohag and Qena	4158	3711	Young women and girls attending clinics	5-25	High
	European Region											
1	Koschollek, et al. [48]	2020; (2015-2016)	Community-based, convenience sampling	Community-based, convenience sampling	Self-report	Multiple Countries; Germany	Six cities Munich, the Rhine-Ruhr region, Cologne, Berlin, Frankfurt	1044	281	Migrants from Saharan Africa	Not indicated	High

							am Main, and the region of Hanover					
2	Mbanya, et al. [49]	2018; 2014	Respondent driven sampling	Respondent driven sampling	Self-report	Somalia; Norway	Oslo	159	82	Migrants	Not indicated	High
3	Koukkula, et al. [50]	2016; (2010-2012)	National Registry; Random sample	National registry; random sample	Self-report	Somali or Kurdish origins; Finland	Helsinki, Espoo, Vantaa, Turku, Tampere, Vaasa	389 (224 Kurdish and 165 Somali)	Somali Origins - 50, Kurdish Origins - 153	Immigrants	18-64	High
	Region of the Americas											
1	Akinsulure-Smith and Chu [51]	2017; (1996-2014)	Whole database (NYU Program for Survivors of Torture)	Whole database (NYU Program for Survivors of Torture)	Self-report	Multiple countries, USA#	New York	514	133	African born women, Survivors of Torture	Average age =34.3	Unclear
2	Chu and Akinsulure-Smith [52]	2016; 2014	Community based, convenience	Community based, convenience	Self-report	Multiple countries† ; USA	New York	68	36	Migrants over 18 years	18+	Unclear
3	Akinsulure-Smith [53]	2012; missing	Community based; Purposive	Community based; Purposive	Self-report	Sierra Leon and Liberia; USA	New York	23	7	Immigrants from West Africa	20-57	High
	West Pacific Region											
1	Gibson-Helm, et al. [54]	2015; (2002-2011)	Whole electronic database	Whole electronic database	Examination	Multiple Countries; Australia	North Africa, Middle and East Africa, West Africa	2173	78	Migrants/ refugees at a pregnancy clinic	From less than 20 to more than 35	High

* Six DHS surveys: Burkina Faso 2010, Egypt 2014, Guinea 2012, Kenya 2014, Mali 2012-2013, and Nigeria 2013
** Mothers had a daughter subjected to FGM
*** The survey was conducted in 19 African countries (Botswana, Cameroon, Chad, Democratic Republic of Congo, Djibouti, Ethiopia, Ghana, Guinea Bissau, Kenya, Liberia, Mali, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, and Zambia)
****After a close examination of the work-study, we found an error in the calculation of a number of the odds ratios, i.e., the reference category and the reported direction of the odds ratio. Results reported in this manuscript represent corrections to the odds ratio calculations
Participants from Guinea, Cameroon, Sierra Leone, Zaire/Democratic Republic of Congo, Cote d'Ivoire, Burkina Faso, Congo, Liberia, Mauritania
† Sierra Leone, Guinea, Mali, Gambia

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Supplementary Table 3: The odds ratios and proportions of the main determinants of FGM/C

	Wealth	Mother's education	Father's Education	Urban vs. Rural	Religion	FGM family history	Mother's occupation	Father's occupation	Mother's age	Whether religion requires FGM	Mother's knowledge on FGM	Mothers' perception of FGM	Mother's marital status
Nonterah, et al. [1]							**Unemployed: 62%** **Employed: 38%** **P-value <0.001**						
Sakeah, et al. [2]	Poor: Reference Middle: 0.98 (0.64-1.48) [a] Rich: 1.21 (0.80-1.85) [a]				Religions other than Islam: Reference Islam: 1.45 (0.73-2.91) [a]								
Greis, et al. [3]	Lowest quartile: Reference Second quartile: 0.58 (0.26-1.3) [a] Third quartile: 0.95 (0.63-1.5) [a] Fourth quartile: 0.78 (0.38-1.58) [a] Highest quartile 1.66 (0.90-3.8) [a]	None: Reference Primary: 0.67 (0.32-1.37) [a] **Post-primary: 0.17 (0.07-0.41)** [a] Not applicable/no mother: 1.47 (0.63-3.40) [a]	None: Reference: Primary: 0.77 (0.36-1.68) [a] Post-primary or higher): 0.77 (0.42-1.39) [a] Not applicable/no father:1.38 (0.61-1.39) [a]	Urban: Reference Rural: 0.83 (0.63-1.11) [a]	Muslim: Reference Catholic: 0.88 (0.55-1.41) [a] Animest: 1.15 (0.69-1.90) [a] **Protestant: 0.18 (0.05-0.63)** [a]					**Cutting required: 4.24 (2.05-8.76)** Do not know if cutting is required by religion: 1.20(0.52-2.78)			

Kandala and Shell-Duncan [4]	Richest: Reference **Poorest: 5.77 (4.55-7.33)** **Poorer: 3.35 (2.64 -4.27)** [a] **Middle: 2.16 (1.70-2.73)** [a] **Richer: 1.37 (1.05-1.79)** [a]			Urban: Reference **Rural: 0.78 (0.70-0.87)** [a]	Other than Muslims: Reference **Muslims: 2.52 (1.61-3.96)** [a]								
Kandala, et al. [5]	Middle: Reference Lower Quintile: 1.21 (0.76-1.99) Lowest quintile: 0.94 (0.58-1.59) Higher quintile: 0.86 (0.43-1.66) The highest quintile: 0.45 (0.18-1.00)	Higher: Reference No education: 1.25 (0.35-3.87) Primary: 0.71 (0.19-2.27) Secondary 0.76 (0.23-2.46)		Rural: Reference Urban: 1.31 (0.87-1.99)	Christian: Reference **Muslim: 5.50 (2.65-10.60)** [a] No religion: 1.10 (0.25-3.71) [a]	Mother is not subjected to FGM/C: Reference Mother is subjected to FGM/C: 1.97 (0.69-6.01) [a]	Mother's occupation is informal: 1.08 (0.61-1.9) Mother is not working: 0.62 (0.3-1.28) [a]		Wife's age is greater than husband: Reference Wife is 10 years younger than husband: 0.82 (0.44-1.77) Wife is 1-4 years younger: 0.79 (0.37-1.63) Wife is 5-9 years younger: 0.47 (0.23-1) Wife same age: 0.34 (0.12-1)	FGM required by religion: 1.5 (0.93-2.45) FGM not required by religion: Reference		Support discontinuation of FGM: Reference **Supports the continuation of FGM: 3.08 (1.76-5.55)** (Depends): 1.37 (0.49-3.26)	Currently married: Reference: Currently married: Reference Formerly married: 0.92 (0.79, 1.16) Never: 0.94 (0.59, 1.59)
Mudege, et al. [6]		**Mother with at least primary level: 0.13 (0.02-0.64)** [a]	Has primary education: 1.65 (0.32-8.41) [a]										
Milaat, et al. [7]	Not enough: Reference Enough or more: 0.5 (0.19-1.18)	Less than university: Reference University and above: 0.55 (0.27-1.14)	Less than university: Reference University and above: 0.6 (0.31-1.18)				Professional: 1.8(0.39-8.16) Not Professional: Reference	Professional:1.08(0.48-2.45) Not Professional: Reference	Above 18: Reference Age of mother at marriage is under 18 years 2.08 (0.69-6.29)				

Mitike and Deressa [8]											Knew at least one FGM complication: Reference Parents do not know any of FGM complications: 0.5 (0.2-1.2)		
Oljira, et al. [9]	Monthly income > 1600: Reference ≤600: 0.7(0.4-1.2) [a] Monthly income 601-1000: 1.0(0.6-1.7) [a] ETB 1001-1600: 1.4 (0.7-2.9) [a]	University level: Reference Unable to read and write: 1.1(0.5-2.8) [a] **Grade 1-4: 0.4 (0.2-0.9) [a]** Grade 5-8: 0.9 (0.4-2.1) [a] Grade 9-10: 1.3 (0.5-3.5) [a] Grade 10-12: 0.9 (0.4-2.3) [a]			Protestant: Reference Muslim: 0.9 (0.4-2.4) [a] Orthodox: 1.4 (0.7-3.0) [a] Catholic: 0.5 (0.1-2.3) [a]	**Mother subjected to FGM/C: 0.4 (0.2-0.8) [a]**			Less than 24: Reference **25-29: 0.3 (0.1-0.9) [a]** **30-34: 0.1 (0.0-0.5) [a]** **35-39: 0.1 (0.0-0.4)** **40-44: 0.0 (0.0-0.2) [a]** **45-49: 0.0 (0.0-0.1) [a]** **≥50: 0.1 (0.0-0.2) [a]**			Women do not know: Reference FGM should continue: 0.9 (0.2-4.7) FGM should not continue: 3.5 (0.8-15.9)	
Gajaa, et al. [10]	<555 birr: Reference, 556-1233 birr: 0.91 (0.65-1.51) [a] >1233 birr: 0.24 (0.05-1.24) [a]	Illiterate: Reference **Literate: 0.50 (0.28-0.91) [a]** Primary and above: 0.42 (0.12-1.42) [a]		Rural: Reference Urban**: 0.30 (0.17-0.51) [a]**	Mother's religion Orthodox: Reference Protestant: 0.98 (0.46-2.09) [a] **Traditional: 3.86 (1.14-13.07) [a]** Father's religion: Protestant Christian: 0.62 (0.29-1.34) [a] **Traditional: 0.22 (0.07-0.74) [a]**		Housewife: Reference Student: 2.19(0.27-18.24) [a] Merchant: 1.71 (0.65-4.52) [a] Civil Servant: 0.80 (0.15-4.30) [a]		15-29: Reference **30-39: 1.95 (1.15-3.31) [a]** **40-49: 2.56 (1.40-4.69) [a]**		Mother knew FGM was criminal: Reference **Mother does not know FGM was criminal: 5.00 (3.07-8.19)**	**Mother have a positive attitude on discouraging FGM: 0.26 (0.16–0.43)**	Mother is married: Reference Mother is single: 1.36 (0.64–2.89) [a]

Gebremariam, et al. [11]		Secondary: Reference **Illiterate: 2.4 (1.3-4.3)** [a] Primary: 0.96(0.5-1.7) [a]		Urban: Reference **Rural: 4 (2.4-6.8)** [a]	All Christian: Reference **Muslim: 3.7 (1.1-12)** [a]					**FGM required: 1.7 (1.07-2.8)** [a] Not required: Reference			
Yirga, et al. [12]	For mothers: Not owning a radio: Reference Ownership of a radio: 1.187 (0.67–2.07) For daughters: Ownership of a radio: 1.716 (0.98–3.00)			Urban: Reference **Rural: 0.116 (0.065–0.207).**									
Tamire and Molla [13]		High school and above: Reference **Under high school: 1.84 (1.10-3.38)** [a]	High school and above: Reference, **Under high school: 2.04 (1.25-3.09)** [a]	Urban: Reference, Rural**: 1.97 (1.25-3.09)** [a]	All Christians: Reference, **Muslims:4.21 (1.01-17.00)**		Currently employed: Reference, Farmer: 1.49 (0.63-3.53) [a]	Currently employed: Reference, Farmer: 1.2 (0.47-1.44) a					
Andualem [14]		Literate: Reference **Illiterate: 1.64 (1.24-2.36)** [a]	Literate: Reference **Illiterate: 1.78 (1.38-2.56)** [a]	Urban: Reference **Rural: 1.54 (1.09-2.50)** [a]					Parent's age ≥25: Reference Parent's age <25: 0.61 (0.52-1.86)		Mother knew negative impacts of FGM: 0.89 (0.68-1.49) Mother did not know FGM had a negative impact: Reference Mother did not know FGM was		Married mothers: Reference Single: 0.86 [0.66-1.96]

											criminalized: Reference Mother knew FGM was criminal: 0.78 (0.72-1.74)		
Elduma [15]	Poorest: Reference, **Second: 1.423 (1.237-1.635)** [a] **Middle: 2.614 (2.259-3.026)** [a] **Fourth: 1.543 (1.257-1.893)** [a] Richest: 0.897 (0.662-1.216) [a]			Rural: Reference, Urban: 1.03 (0.90-1.18) [a]		**Having a daughter subjected to FGM/C:36.8 (27.96-48.54)** [a]							
Dehghankhalili, et al. [16]						**Family history mother (94.6%)** **P-value<0.001** **Family history (sister): 66.4%** **P-value<0.001** **Family history (grandmother): 75%** **Having a mother, sister or grandmother subjected to FGM is significantly associated with the practice**							

						P-value <0.001							
Yasin, et al. [17]		Intermediate school and higher education: Reference Illiterate: 1.5 (0.9-2.6) Read and write: 1.4 (0.7-2.8) Primary: 1.3 (0.7-2.5) [a]	Intermediate school and higher education: Reference **Illiterate: 1.4 (1.1-1.9)** Read and write: 1.6 (1.02-2.5) Primary school: 1.3 (0.9-1.8) [a]			Mother not subjected to FGM/C: Reference **Subjected to FGM/C: 15.1 (10.6-21.6)** **Don't Know: 7.3 (4.4-12.0)** [a]							
Saleem, et al. [18]		High school/Higher: Reference **Basic education: 3.2 (1.5-6.6)** **None: 8.00 (3.8-16.5)** [a]											
Ali, et al. [19] (Egypt)		**Illiterate: 34.1%** **Elementary: 25.9%** **High: 40%** **Higher level of education is protective** **P-value<0.01**	**Illiterate: 22.4%** **Elementary: 25.9%** **High: 51.5%** **Higher level of education is protection** **P-value<0.01**	**Significant difference between urban & rural areas prevalence of FGC in urban is 31.8% whereas in rural it is 75.4%** **P<0.001**									
Ali, et al. [20] (Sudan)		**Less than secondary: 1.5 (1-2.2)[a]**	**More than secondary: Reference**	Urban: Reference		**Presence of sister subjected to FGM/C: 4.3 (3.1-5.9)[a]**	Housewife: 0.8 (0.5-1.5) [a]	Non-skilled worker: 0.7 (0.5-1.1) [a]					

			Less than secondary: 2.3 (1.5-3.4) [a]	Rural: 1 (0.7-1.6) [a]									
Arafa, et al. [21]		**Illiterate: Reference** **Literate OR:0.8**	**Illiterate: Reference** **Literate OR:0.91**	**Rural: Reference** **Urban OR: 0.55**									
Mohammed , et al. [22]				**Rural: 75% of type I; 66.7% of type II and 0% none.** **Urban: 25% of type I , 33.3% of type II FGM/C and 100% none.** **Statistically significant at P < 0.05**									
Abdel-Aleem, et al. [23]				Rural: Reference Urban: 1.09 (0.61-1.93)									
Ahmed, et al. [24]	Economic level low: 64.4% Intermediate: 68.7% High: 61.4% P-value: 0.7	Illiterate 58.6% Primary: 63.8% Preparatory: 70.3% Secondary: 69.8% He P-value: 0.8	Illiterate: 61.8% Primary: 65.4% Preparatory: 68.8% Secondary: 67.4% Higher: 67.5% P-value: 0.9	**Urban: 43%** **Rural: 91.8%** Significantly higher among those living in rural areas P-value: 0.0001	Muslim: 66.8%, Christian: 60.0% P-value: 0.6								

Rasheed, et al. [25]	High socioeconomic status: Reference **Low: 2.06(1.42-3.61)** Moderate: 1.13 (0.88-2.24) [a]	Educated: Reference **Illiterate: 2.16(1.33-2.95)** Can read and write: 1.26 (0.88-2.61) [a]	Educated: Reference Illiterate: 1.98(0.56-3.06) Can read and write: 1.36 (0.98-2.15) [a]	Urban: Reference, **Rural: 8.20 (2.77-6.21) [a]**	Christian: Reference, Muslim 1.04 (0.91-1.26) [a]	Mother not subjected to FGM: Reference **Mother subjected to FGM: 9.12 (2.11-14.09) [a]** **Presence of circumcised sisters: 6.28 (1.18-10.89) [a]**							
Chikhungu and Madise [26]		No education: Reference **Primary: 0.80 (0.69-0.92) [a]**		Urban: Reference **Rural: 1.61 (1.20-2.15) [a]**	Christian: Reference **Muslim: 2.13 (1.86-2.45)** **Traditional and other religions: 1.44 (1.14-1.82)** [a]								
Besera and Roess [27]		Primary: 1.08 (0.85-1.38) **Greater or equal to secondary: 0.54 (0.36-0.81)** [a]			Muslim: Reference **Christian: 0.60 (0.45-0.79) [a]**	**Respondent the mother has FGM: 8.59 (5.63-13.10) [a]**			Less than 20: Reference **20-29: 2.47 (1.39-4.40)** **30-39:5.54 (3.06-10.03)** **40-49: 11.90 (6.28-22.54) [a]**				

[23] Alosaimi, et al. [28] (Women)	Lowest tertile: Reference **Second tertile: 0.63 (0.55-0.72)** **Highest tertile: 0.61 (0.53-0.69)** [a] Housing quality: second quartile: 1.04(0.92-1.19) **Highest quartile:1.76(1.55-2.00)** [a]												
Alosaimi, et al. [28] (Daughter)	Lowest tertile: Reference **Second tertile: 0.68 (0.57-0.82)** **Highest tertile: 0.70 (0.59-0.85)** [a] Housing quality second quartile: 0.97 (0.81-1.17) Highest quartile: 1.18(0.99-1.41) [a]	**Lowest tertile: Reference** **Second tertile: 0.79 (0.66-0.94)** **Highest tertile: 0.82(0.69-0.97)**				**Mother subjected to FGM/C: 7.40 (6.01-9.13)** [a]			**Mother aged less than 20 years: Reference** **Aged 20-35: 1.82 (1.51-2.18)** **Aged 36-49: 1.82 (1.51-2.18)**			Mothers believing that the practice should not continue: Reference Should continue: 3.52 (3.10–4.00)	
Boyle and Svec [29]	**Poorest: Reference** **Poor: 0.72 (0.59-0.86)**	Less than primary: Reference Primary: 1.00 (0.84-1.2)		Rural: Reference, **Urban: 0.71 (0.55-0.90)**	**Islam: 4.11 (3.45-4.89)**	**Mother subjected to FGM/C: 33.58 (25.51-44.21)**	Mother earns cash: 0.99 (0.87-1.13)		Mother's age: 0.99 (0.98-1.00)				

	Middle: 0.72 (0.59-0.86) **Rich: 0.58 (0.47-0.71)** **Richest: 0.47 (0.36-0.61)**	**Secondary or higher: 0.62 (0.52-0.75)**											
Njoku, et al. [30]	**Social class: low: 47.2%** **Middle: 26.5%** **Upper 25%** **FGM was higher among those from low social class**												
Anikwe, et al. [31]	**Social class 1: 6.8%, Social class 2: 12.9%, Social class 3: 38.8%, Social 4: 38.3% social class 5: 15.3%, significant at social class 2 and 4** **P value:0.001**			**Urban: 54.8%** **Rural: 45.2%** **P value: 0.012** **The odds of a woman having FGM in the cohort of women residing in rural communities is 66% more than in the group in urban communities**									
Ashimi, et al. [32]		Formal education (primary or secondary): Reference **Informal education (Quranic form of education):**			**Islam: 49.8%** **Christianity: 0%** **P value: 0.001**		Mother not employed: Reference **Mother employed: 2.89(1.66-5.03)** [a]						

		6.39 (3.99-10.23) [a]											
Ifeanyichukwu, et al. [33]					Not significant, Islam: 28.9% Christianity: 25% African traditional religion (ATR): 10% P-value > 0.99								
Iliyasu, et al. [34]					Muslim: Reference, Christian: 1.27 (0.55-2.97) [a] P-value: >0.99								
Garba, et al. [35]			Not significant (Fathers having secondary education and above versus fathers having less than secondary education) P value: 0.18	Residence (Urban versus rural) Not significant P-value: 0.12	Not significant (Islam versus Christianity) P value: 0.19								
Koschollek, et al. [36]					Christian: Reference **Muslim: 3.44 (2.52-4.70)** No, other, or unknown religion: 1.24(0.63-2.43)								

Beller and Kröger [37]		**Mother's increased level of education: 0.72 (0.63-0.82)**	**Father's increased level of education: 0.75 (0.67-0.83)**					**Mother's increasing age: 1.12 (1.08-1.29)**				
Koukkula, et al. [38]					Other than Muslim: Reference **Muslim: 2.02 (1.12-3.63) [a]**							
Shay, et al. [39]		**Less than grade 10: 44.3%** **Grade 10 or higher and college level: 18.8%** **Significantly higher for girls of mothers who attained less than grade 10** **P-value: 0.001**	**Less than grade 10: 51.3%** **Grade 10 or higher and college level: 20.2%** **Significantly higher at grade 10+** **P-value: 0.001**				Mother employed: 22.2% Mother not employed: 28.8% Not significant P-value: 0.08	**Father employed: 24%** **Father not employed: 42.2%** **Significantly higher risk when the father is unemployed** **P-value: 0.009**		**Mother knew FGC has no religious grounds: 23%** **Mother did not know: 32.3%; significant** **P-value:0.03**	**Mother did not know that FGM was harmful: 24.4%** **Mother did not know that FGM was harmful: 50%** **Statistically significantly higher among mothers who do not know FGM is harmful** **P-value: 0.006**		
Bjälkander, et al. [40]				**Rural: Reference** **Urban : 1.98 (1.21-3.22) [a]**	**Christian: Reference** **Muslim: 2.0 (1.28-3.39) [a]**								

Rouzi, et al. [41]	**<≈US$1330: 42.3%** **≈US$1331–US$2665: 32.6%** **More than US$2665: 21.5%** **More wealth is a protective factor.**												
Akinsulure-Smith [42]					**Female Muslim participants had significantly higher rates of FGM/C compared to female Christian participants** **(4 out of 7 verses 2 out of 16)**								
Akinsulure-Smith and Chu [43]					Muslim: 87.9% Christian: 11.4% Other: 0.8% Religion P<0.001								
Sylla, et al. [44]		**Qur'anic: 2.75 (2.00-3.78)** **Illiterate: 1.05-1.39** **Primary: 1.244 (1.07-1.46)** **Secondary: 0.676 (0.58-0.79)** **Higher education:**	**Qur'anic 2.206 (1.68-2.9)** **Illiterate 1.236(1.02-1.5)** **Primary: 1.29 (1.07-1.56)** **Secondary: 0.78 (0.67-0.91)** **Higher education: 0.579 (0.49-0.69)**										**Parents married: 1.03 (1.01-1.06)** Parents divorced: 0.71 (0.23-2.24) Single: 0.58 (0.41-0.81) **Widowed: 6.00 (1.35-26.73)**

		0.289 (0.20-0.41)											
Ojo and Ijadunola [45]	Poorer1.04 (0.79-1.37) Middle:0.82 (0.58-1.18) Richer: 0.76 (0.53-1.10) **Richest 0.59 (0.39-0.82)**			Rural: reference Urban 1.12 (0.85-1.46)	Muslim 0.72 (0.39-1.33) Other Christians 0.55 (0.30-1.02) Catholic 0.59 (0.31-1.12)								
Chu and Akinsulure-Smith [46]	Not significant as reported by the authors												
Bogale, et al. [47]				**Urban: Reference** **Rural:3.31 (1.48-7.43)** [a]	**Protestant: Reference** **Muslim: 3.55 (1.35- 9.37)**[a] **Orthodox: 1.65 (0.61-4.40)**[a]								

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Supplementary Table 4: Other FGM determinants identified in included studies.

Determinant	Study	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	Proportions as reported by authors
Living grandmother	Ali, et al. [1]		**7.1 (4.6–10.8)**	
Living conditions	Im, et al. [2]		**Living separately from home**: **0.16 (0.05-0.52)**	
	Shay, et al. [3]			Live with father only: 34.8% Living with mother only: 32% **Living with both:** 12.4% Living with relatives: 48.5% → FGM statistically significantly lower when living with both parents P value: 0.001
Polyvictimization	Im, et al. [2]		**1.23 (1.07-1.40)**	
Village FGC rate (higher)	Greis, et al. [4]		**1.63 (1.40-1.90)**	
Percentage of Muslims in the village (higher)	Greis, et al. [4]	**1.24 (1.01–1.51)**		
Presence of community norms that are not significant: Domestic abuse	Kandala, et al. [5]			Not significant No: Reference Wife Beating for Going Out: 1.00 (0.68-1.45) Wife Beating for Neglecting the Children: 1.51 (1.06-2.2) Wife Beating for Arguing with the Husband: 1.03 (0.67-1.56)

				Wife Beating for Denying Husband Sex: 0.79 (0.53-1.19) Wife Beating for Denying Husband Food: 0.82 (0.48-1.36)
Cultural influence*	Andualem [6]	**1.60 (1.25-2.53)**		
Mother's decision-making and power	Kandala, et al. [5]	Mother owns house: 1.75 (1.14-2.86) Mother owns land: 0.75 (0.48-1.16) **Father Beats Mother** No: Reference Yes: 1.21 (0.77-1.82) Missing/Not available: 1.01 Who makes large household purchases? Alone: Reference Husband/Partner: 1.4 (0.85-2.13) With Husband/partner: 0.91 (0.57-1.41) Who decides on wife's expenditures? Alone: Reference Husband/partner: 0.52 (0.2-1.32) With her husband: 0.68 (0.39-1.18) Missing/not available: 0.9 (0.53-1.48)		

		<u>Who Makes Decision on Mother's Health</u> Alone: Reference Husband/Partner: 1.17 (0.77-1.86) With husband/partner: 0.92 (0.62-1.41)		
	Boyle and Svec [7]			Mother's autonomous decisions: 1.02 (0.95-1.10) Mother takes joint decision: 0.98 (0.93-1.03)
Parent's increased age	Mitike and Deressa [8]		**6.65 (2.6-16.7)**	
Father's increased age	Beller and Kröger [9]	1.10 (1.06-1.13)		
Father's religion	Gajaa, et al. [10]	Orthodox: Reference Protestant Christian: 0.62 (0.29-1.34). **Traditional: 0.22 (0.07-0.74)**		
Participation in anti-FGM activities	Mitike and Deressa [8]	Participation of the parents in anti-FGM activities: **0.3 (0.2-0.6)**		
	Andualem [6]	**Participation in anti FGM interventions: 0.42 (0.29-0.62)** **Received health education on FGM: 0.39 (0.38-0.76)**		
	Mudege, et al. [11]		Since birth: Reference	

Movement from one area to another			Came to Demographic Surveillance Area: 1.50 (0.53-4.30)	
	Mbanya, et al. [12]		**Age at migration to Norway is ≥12 years: 4.78 (1.53-15.00)** Age at migration to Norway is 0-11 years: Reference	
Health system related factors	Koschollek, et al. [13]	**No health insurance or medical treatment voucher for asylum seekers or unknown: 1.6 (1.13-2.25)**		
	Ashimi, et al. [14]	Type of health facility where the infants received care Primary healthcare facility: Reference Secondary facility: 0.73 (0.45-1.18) **Tertiary healthcare facility: 0.49 (0.26-0.92)**		
Other religion related factors	Beller and Kröger [9]	**Mother's private prayer frequency: 0.93 (0.87-0.99)** **Father's private prayer frequency: 0.92 (0.87-0.98)** Perceived religious suppression: Mother: 1.03 (0.88-1.19) Father: 1.10 (1.06-1.13) Parent's religion (unaffiliated as the reference group)		

		Mother Christian Affiliation: 0.47 (0.25-0.90) Father Christian Affiliation: 1.06 (0.59-1.90) **Mother Traditional Affiliation: 10.57 (4.79-23.31)** **Father Traditional affiliation: 9.78 (5-18.78)** Mother Muslim affiliation: 0.79 (0.41-1.52) Father Muslim Affiliation: 1.66 (0.91-3.02) <u>Governmental unfairness towards one's own religious group</u> **Mother: 1.18 (1.08-1.29)** **Father: 1.24 (1.15-1.35)** Father's religious service attendance: 0.98 (0.87-1.09) Mother's religious service attendance: 1.10 (1.02-1.18)		
Consanguinity	Alosaimi, et al. [15]		<u>Odds of experiencing FGM among daughters</u> **Marriage with a second cousin or closer: 1.18 (1.03-1.35)**	
	Milaat, et al. [16]	No parental consanguinity: Reference		

		Parental Consanguinity: 1.7 (0.86-3.3)		
Family factors	Sylla, et al. [17]	**For girls from a polygamous household: 1.37 (1.23-1.53)** Mothers in a monogamous union: 0.78 (0.72-0.85) **Belonging to big family:** **1.37 (1.28-1.47)** Belonging to nuclear family: 0.59 (0.53-0.67)		
	Kandala, et al. [5]	**Mother is in a polygamous union:1.23 (0.86-1.69)** **Marriage by arrangement: 0.89 (0.65-1.2)**		
Child marriage	Alosaimi, et al. [15]		Odds of experiencing FGM among daughters Underage marriage: **1.60 (1.38-1.84)**	
Maternal place of birth or origin	Abolfotouh, et al. [18]			**FGM prevalence among females of rural origin: 25%** **FGM prevalence among females of non-rural origin: 10.8% (P=0.001)**
	Iliyasu, et al. [19]		Geographic origin: North-west: Reference Northeast: 0.87 (0.41-2.70)	

			North central: 1.23 (0.54-5.03) **South-west: 2.31 (1.13-2.14)** **Southeast or South-South: 3.78 (1.21-4.99)**	
	Gibson-Helm, et al. [20]			FGM/C among women from North Africa North Africa Non-humanitarian source countries group: 0.5% North Africa HSC: 5.1% P-value <0.001 Among women from Middle and East Africa Middle and East Africa non- HSCs: 0.3% Middle and East Africa HSCs: 13.8% P-value <0.001 Among women from West Africa West Africa HSCs: 3.3%, West Africa Non-HSCs: 6.7% P-value=0.65
	Yasin, et al. [21]	Urban: Reference Rural: 1.0 (0.8-1.2)		
Maternal Origin	Minsart, et al. [22]			Maternal Origin P value<0.00001

				Djibouti-Somali: 1.7% No FGM, 0.2% for type I FGM, 58.2% for type II, and 40% for infibulated Djibouti-Afar: 0% No FGM, 6.7% for Type I, 40% for type II, 53.3% for infibulated Djibouti Arabic: 21.2% No FGM, 3% for type I, 57.6% for type II, 18.2% for infibulated Somalia: 0% No FGM, 0% for type I, 38.5% for type II, and 61.5% for infibulated Ethiopia: 28% No FGM, 16% for type I, 52% for type II, and 4% for infibulated Yemen: 28.6% No FGM, 0% for type I, 74% for type II, and 0% for infibulated
Residence	Zayed and Ali [23]			<u>Residence (of the participant subjected to FGM/C)</u> Giza: 64.4% Cairo: 62.5% P- value: 0.781
	Abdulah, et al. [24]			Governorate of residence was significantly associated with FGM among daughters P value <0.001
Nationality	Rouzi, et al. [25]			**Saudi: 49.7%** **Saudi (natural): 13.1%** **Non-Saudi: 37.2%** **P value <0.001**

Immigration status	Akinsulure-Smith and Chu [26]			**Undocumented: 43.7%** **Refugee, asylee, TPS, withholding of removal: 10.1%** **Has applied or intends to apply for asylum: 29.5%** **US citizen, permanent resident, valid visa: 4.7%** **Others: 8.5%** ➔ **Statistically significantly higher among undocumented** **P value<0.001**
Living in camp	Im, et al. [2]		**Living outside the camp: Reference** **Living in camp: 1.54 (0.5-4.74)**	
Duration of stay in the camp	Mitike and Deressa [8]		Duration of stay in the camp <10 years: Reference Duration of stay in the camp >10 years: 0.5 (0.1-1.5)	
Islamic sects	Dehghankhalili, et al. [27]			**Shiaa Islam: 51.4%** **Sunni Islam: 48.6%** **P-value: 0.019**

*Defined as normal community practices. Results highlighted in bold are statistically significant.

Brackets report 95% Confidence intervals.

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Supplementary Table 1. Search strategy

Database	Search Terms
PsycINFO	1 Female Genital Mutilation;2 Female Circumcision;3 Female Genital Cutting; 4 Female Genital Alteration; 5 or/1-4; 6 Limit 5 by 2009-2020
Embase	1 'female genital mutilation'/exp; 2 'female genital mutilation'; 3 or/1-2; 4 'female'/exp; 5 female; 6 or/4-5； 7 genital; 8 'mutilation'/exp; 9 mutilation;10- or/8-9;11 7 and 10; 12 11 and 6; 13 Limit 12 by 2009-2020
Ovid Medline	1 female.mp.; 2 Girl*.mp.; 3 wom?n.mp.; 4 or/1-3; 5 adj3 genital*.mp.; 6 adj3 mutilation.mp.; 7 adj3 circumcis*.mp.; 8 adj3 cut*.mp.; 9 adj3 alter.mp.; 10 adj3 alteration.mp.; 11 or/5-10 (1448); 12 4 and 11; 13 Female Genital Mutilation.mp.; 14 Female Circumcision.mp.; 15 Female Genital Cutting.mp.; 16 Female Genital Alteration.mp. (1629); 17 or/13-16; 18 Circumcision, Female.sh. / (1322); 19 12 or 17 or 18 (2024); 20 limit 4 to yr="2009 -Current" (1066)
Web of Science	1 Female Genital Mutilation; 2 Female Circumcision;3 Female Genital Cutting; 4 Female Genital Alteration, 5 or/1-4; 6 Limit 5 by 2009-2020

Supplementary Table 2: Characteristics of studies included in the systematic review

	Author (year)	Date publication; data collection year	Sampling Method	Sampling method for non-FGM	Self-report or examination	Country of origin; Host country (if different)	Region	Total sample size	Total FGM	Participant description (representing group being compared	Age Group	Risk of Bias
	African Region											
1	Nonterah, et al. [1]	2020; 2003-2013	Pregnancy records database.	Pregnancy records database.	Examination	Ghana	Kassena-Nankana district-North Eastern Ghana	9306	1647	Women who delivered at the targeted hospital	Less than 20 to more than 35	High
2	Greis, et al. [2]	2020; 2017	Two-part stratified sampling procedure for villages; a random sample of participant	Those who reported not having FGM or unsure of their FGM status	Self-report	Burkina Faso	10 villages and one sector of Nouna town	696	301	Adolescents aged 12-20	12-20	Unclear
3	Njoku, et al. [3]	2020; (2018-2019)	Hospital-based; systematic sampling	For each participant with FGM being recruited, 2 consecutive participants were recruited.	Examination	Nigeria	Calabar, Nigeria	450	150	Pregnant women	Under 19 to more than 40	High
4	Sylla, et al. [4]	2020, 2012	Multi-facility based; whole sample	Multi-facility based; whole sample	Self-report (head of household)	Mali	Bamako	1920	1027	Girls aged 0-15	0-15	Unclear
5	Kandala, et al. [5]	2019; (Only 2014 used)	Multi-stage cluster sampling (DHS)	Multi-stage cluster sampling (DHS)	Mother's report	Kenya	National	12,434	373	Girls of mothers of reproductive age	0-14	Low
6	Anikwe, et al. [6]	2019; 2012	Facility-based; random sampling	Purposive (women who delivered in the facility within 24 h of selection of a case).	Examination	Nigeria	Abakaliki, Ebonyi, Nigeria	260	260	Pregnant women	Less than 20 to more than 35	Unclear
7	Kandala and Shell-Duncan [7]	2019; (Only 2010-2011 used)	Multi-stage cluster sampling (DHS)	Multi-stage cluster sampling (DHS)	Self-report	Senegal	National	15668	4408	Women	15-49	Low
8	Boyle and Svec [8]	2019; (2010-2014)	Multi-stage cluster sampling (Multiple DHS surveys)	Multi-stage cluster sampling (Multiple DHS surveys)	Mother's report	Multiple Countries *	NA	12,144	6606 **	Women who had daughters aged older than FGM normative age within their regions	Daughters older than normative age in different regions	Unclear
9	Beller and Kröger [9]	2018; (2008-2009)	Stratified random sampling	Parents who do not have a daughter with FGM	Parent's report	Multiple African countries* **	Same	Mothers (n= 6,299) and Fathers (n= 6,778)	Not reported	Parents who have a daughter (study examining daughters with FGM)	Not indicated	High
10	Sakeah, et al. [10]	2018; NA	Two-stage sampling method then proximity selection to select subsequent household	Two-stage sampling method	Self-report	Ghana	Bawku municipality & Pusiga District	830	Pusiga District - 273, Bawku Municipality -236	Women of reproductive age	15-49	Unclear
11	Ojo and Ijadunola [11]	2017, 2013	Multistage cluster sampling (DHS)	Same	Self-report	Nigeria	National	38,948	9,652	Women of reproductive age	15-49	Low
12	Gebremariam, et al. [12]	2016; 2014	School-based, multistage stratified random sampling	School-based, multistage stratified random sampling	Self-report	Ethiopia	Jigjiga district	662	538	High school & college students	15-24	Unclear
13	Gajaa, et al. [13]	2016; 2014	Cluster sampling	Women from the sample who do not have a daughter with FGM	Mother's report	Ethiopia	Hababo Guduru District	610 Mothers with at least one daughter under 15	293 Daughters	Women with at least one daughter under 15 years	0-15	Low
14	Andualem [14]	2016; 2014	Household based; systematic random sampling	Household based; systematic random sampling	Mother's report	Ethiopia	East Gojjam Zone, Western Amhara	805 Daughters	403 Daughters	Women who had daughters less than 5 years	0-5	Unclear

15	Oljira, et al. [15**]	2016; 2013	Multistage cluster sampling (Harar Health and Demographic Surveillance System 2013)	Multistage cluster sampling	Mother's report	Ethiopia	Harar	842 Daughters	160 Daughters	Women with at least one daughter younger than 12 years	0-12	Unclear
16	Ashimi, et al. [16]	2015; 2014	Multi-facilities; systematic random sampling	Multi-facilities; systematic random sampling	Examination and mother's report	Nigeria	Three clinics, Birnin Kudu, Jigawa state	461 Mothers of infants	215	Infants presenting to clinics	Less than 1	Unclear
17	Ifeanyichukwu, et al. [17]	2015; 2014	Household; cluster sampling	Household; cluster sampling	Self-report	Nigeria	Okada Community - Edo State	325	90	Women of reproductive age	15-49	Unclear
18	Chikhungu and Madise [18]	2015 (Only DHS 2010 used)	Multistage cluster sampling	Multistage cluster sampling	Self-report	Burkina Faso	National	17,807	13,551	Women	15-49	Low
19	Bogale, et al. [19]	2014; 2014	Household; stratified random sample	Household; stratified random sample	Self-report	Ethiopia	Bale zone	634	486	Childbearing age women	15-49	Unclear
20	Besera and Roess [20]	2014; 2002	Multi-stage cluster sampling (DHS)	Women from the sample who doesn't have a daughter with FGM	Mother's report	Eritrea	National	8754 Mothers	3168 had at least one daughter with FGM	Women with at least one daughter	Daughters of women of reproductive age	Low
21	Tamire and Molla [21]	2013; 2011	Multi-school based; multi-staged cluster sampling method	Multi-school based; multi-staged cluster sampling method	Self-report	Ethiopia	Hadiya zone, Southern Ethiopia	797	641	High school students	13-25	Unclear
22	Bjälkander, et al. [22]	2013; (2010-2012)	Facility-based; Purposive	Facility-based; Purposive	Self-report and examination	Sierra Leone	Northeastern Sierra Leone	554	451	Attended antenatal clinics	12-47	Unclear
23	Garba, et al. [23]	2012; 2011	Hospital-based; purposive	Hospital-based; purposive	Mother's report	Nigeria	Kano, Northern Nigeria	200	26	Infants in Aminu Kano Teaching Hospital	Less than 1	High
24	Yirga, et al. [24]	2012; 2008	Household; Systematic random sampling	Household; Systematic random sampling	Self-report	Ethiopia	Kersa district, East Hararge, Oromia region, Ethiopia	858 mothers (858 daughters) – determinants for both groups studied	Mothers with FGM- 792, Mothers with 1 or more daughters with FGM- 288	Women of reproductive age	15-49	Unclear
25	Iliyasu, et al. [25]	2012; missing	University-based; multistage sampling	University-based; multistage sampling	Self- report	Nigeria	Bayero University, Kano, Kano State, Northern Nigeria	359	43	University Students	17-40	Unclear
26	Mudege, et al. [26]	2012; missing	Community based-every household	Community based-every household	Self-report	Kenya	Korogocho and Viwandani, informal settlements in Nairobi	527	323	Girls/women in informal settlements	12-24	High
27	Shay, et al. [27]	2010; 2008	Multi-school-based sample; random sample	Multi-school-based sample; random sample	Parent's or families report	Ethiopia	Adis Ababa	407	106	School girls	Under 5 to above 20 [the majority were in the age group 10-15]	High
28	Mitike and Deressa [28]	2009; 2004	Household sample; systematic sampling method	Household sample; systematic sampling method	Parent's report	Somalia; Ethiopia	Somali refugee camps in the Somali Regional State in Eastern Ethiopia.	288	122	492 Parents	12+	Unclear
29	Im, et al. [29]	2019; 2013	Snowballing	Snowballing	Self-report	Somalia; Kenya	Eastleigh	143	Not reported	Refugees	15-35	High
	Eastern Mediterranean Region (EMR)											
1	Abdulah, et al. [30]	2019; 2017	Two stage random sampling	Two stage random sampling	Mother's-report	Iraq	Iraqi Kurdistan region (Duhok, Erbil, and Sulaiymaniy)	5048 daughters	2361 daughters	Mothers and their daughters	All age groups	Unclear

2	Rouzi [31]	2019; 2016-2017	Facility based; purposive	Same	Self-report	Saudi, Naturalized Saudi, and non-Saudi; Saudi Arabia	Jeddah	963	175	Women attending clinics	18-75	Unclear
3	Alosaimi, et al. [32]	2019; (2008-2009)	Multistage sampling	Same for women; For daughters, the control group were mothers without a daughter subjected to FGM/C	Mother's report	Yemen	National	7076 Women with at least one daughter	Women-3384, Daughters (at least one)-2405	Women with at least one daughter with FGM	Daughters of mothers	Unclear
4	Minsart, et al. [33]	2015; 2012-2014	Facility-based, whole sample	Facility-based, whole sample	Examination	Djibouti	Djibouti-City	614	643	Mothers of live births and stillbirths (excluding mothers from West Africa and Europe)	Less than 25 till more than35	High
5	Elduma [34]	2018; 2014	Multistage cluster sampling (MICS)	Multistage cluster sampling (MICS)	Self-report	Sudan	National	21947	19451	Women	15-49	Low
6	Ali, et al. [35]	2018; 2017	Cluster and systematic random sampling	Cluster and systematic random sampling	Self-report	Egypt	Beni-Suef	3353	1846	Young women	12-25	Unclear
7	Milaat, et al. [36]	2018; 2017	Cluster random sampling for the region followed by multi-stage random sampling for the household	Cluster random sampling for the region followed by multi-stage random sampling for the household	Report of the head of the household	Saudi Arabia	Hali semi-urban region.	218	175	Girls less than 18 years	0-18	Unclear
8	Arafa, et al. [37]	2018; (2016-2017)	University-based sample; multi-stage random sampling	University-based sample; multi-stage random sampling	Self-report	Egypt	Beni-Suef University	1723	815	University Students	Mean age=20.89	Unclear
9	Ahmed, et al. [38]	2017; (2015-2016)	Multi- facility; purposive	Multi- facility; purposive	Self-report	Egypt	Suez Canal University	204	135	Students attending clinic	14-19	Unclear
10	Abdel-Aleem, et al. [39]	2016; (2011-2014)	Facility based; purposive	Facility based; purposive	Examination	Egypt	Assiut and Sohag	430	376	Recently married women	17-31	High
11	Abolfotouh, et al. [40]	2015; (2012-2013)	Organization-based; convenient (google survey)	Organization-based; convenient	Self-report	Egypt	Not Applicable (online)	320	47	Medical Students	Not indicated	High
12	Dehghankhalili, et al. [41]	2015; (2010-2013)	Multi-facility based; purposive	Multi-facility based; purposive	Examination	Iran	Hormozgan, Southern Iran	780	535	Women and girls attending clinic	14-38	Unclear
13	Mohammed, et al. [42]	2014; (2011-2012)	Computer based multi-stage random sampling	Computer based multi-stage random sampling	Examination	Egypt	Ismailia	2106	1911	Sexually active women	15-45	High
14	Ali, et al. [43]	2013; 2012	Multi- school based; random	Multi- school based; random	Self-report	Sudan	Kassala, Eastern Sudan	972	810	School girls	9-16	High
15	Saleem, et al. [44]	2013; 2011	Multi-facility based; purposive	Multi-facility based; purposive	Self or parent report	Iraq	Kurdistan region	1508	348	Females visiting PHCs	Up to 20	Low
16	Yasin, et al. [45]	2013; (2007-2009)	Multi-facility-based sample, a convenient sampling	Multi-facility-based sample, a convenient sampling	Examination and Self-report	Iraq	Erbil, Kurdistan Region, Iraq	1987	1397 (self-reported), 1164 (examination)	Women and girls attending clinic	15-49	High
17	Zayed and Ali [46]	2012; missing	Community-based; random sample	Community-based; random sample	Self-report	Egypt	Cairo & Giza	244	156	Muslim females between the age of 5 and 30 years.	Up to 30	High
18	Rasheed, et al. [47]	2011; (2008-2010)	Multi-facility based; all those presenting to certain clinic	Multi-facility based; all those presenting to certain clinic	Self-report and parent report	Egypt	Sohag and Qena	4158	3711	Young women and girls attending clinics	5-25	High
	European Region											
1	Koschollek, et al. [48]	2020; (2015-2016)	Community-based, convenience sampling	Community-based, convenience sampling	Self-report	Multiple Countries; Germany	Six cities Munich, the Rhine-Ruhr region, Cologne, Berlin, Frankfurt	1044	281	Migrants from Saharan Africa	Not indicated	High

							am Main, and the region of Hanover					
2	Mbanya, et al. [49]	2018; 2014	Respondent driven sampling	Respondent driven sampling	Self-report	Somalia; Norway	Oslo	159	82	Migrants	Not indicated	High
3	Koukkula, et al. [50]	2016; (2010-2012)	National Registry; Random sample	National registry; random sample	Self-report	Somali or Kurdish origins; Finland	Helsinki, Espoo, Vantaa, Turku, Tampere, Vaasa	389 (224 Kurdish and 165 Somali)	Somali Origins - 50, Kurdish Origins - 153	Immigrants	18-64	High
	Region of the Americas											
1	Akinsulure-Smith and Chu [51]	2017; (1996-2014)	Whole database (NYU Program for Survivors of Torture)	Whole database (NYU Program for Survivors of Torture)	Self-report	Multiple countries, USA#	New York	514	133	African born women, Survivors of Torture	Average age =34.3	Unclear
2	Chu and Akinsulure-Smith [52]	2016; 2014	Community based, convenience	Community based, convenience	Self-report	Multiple countries† ; USA	New York	68	36	Migrants over 18 years	18+	Unclear
3	Akinsulure-Smith [53]	2012; missing	Community based; Purposive	Community based; Purposive	Self-report	Sierra Leon and Liberia; USA	New York	23	7	Immigrants from West Africa	20-57	High
	West Pacific Region											
1	Gibson-Helm, et al. [54]	2015; (2002-2011)	Whole electronic database	Whole electronic database	Examination	Multiple Countries; Australia	North Africa, Middle and East Africa, West Africa	2173	78	Migrants/ refugees at a pregnancy clinic	From less than 20 to more than 35	High

* Six DHS surveys: Burkina Faso 2010, Egypt 2014, Guinea 2012, Kenya 2014, Mali 2012-2013, and Nigeria 2013
** Mothers had a daughter subjected to FGM
*** The survey was conducted in 19 African countries (Botswana, Cameroon, Chad, Democratic Republic of Congo, Djibouti, Ethiopia, Ghana, Guinea Bissau, Kenya, Liberia, Mali, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, and Zambia)
****After a close examination of the work-study, we found an error in the calculation of a number of the odds ratios, i.e., the reference category and the reported direction of the odds ratio. Results reported in this manuscript represent corrections to the odds ratio calculations
Participants from Guinea, Cameroon, Sierra Leone, Zaire/Democratic Republic of Congo, Cote d'Ivoire, Burkina Faso, Congo, Liberia, Mauritania
† Sierra Leone, Guinea, Mali, Gambia

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Supplementary Table 3: The odds ratios and proportions of the main determinants of FGM/C

	Wealth	Mother's education	Father's Education	Urban vs. Rural	Religion	FGM family history	Mother's occupation	Father's occupation	Mother's age	Whether religion requires FGM	Mother's knowledge on FGM	Mothers' perception of FGM	Mother's marital status
Nonterah, et al. [1]							**Unemployed: 62%** **Employed: 38%** **P-value <0.001**						
Sakeah, et al. [2]	Poor: Reference Middle: 0.98 (0.64-1.48) [a] Rich: 1.21 (0.80-1.85) [a]				Religions other than Islam: Reference Islam: 1.45 (0.73-2.91) [a]								
Greis, et al. [3]	Lowest quartile: Reference Second quartile: 0.58 (0.26-1.3) [a] Third quartile: 0.95 (0.63-1.5) [a] Fourth quartile: 0.78 (0.38-1.58) [a] Highest quartile 1.66 (0.90-3.8) [a]	None: Reference Primary: 0.67 (0.32-1.37) [a] **Post-primary: 0.17 (0.07-0.41)** [a] Not applicable/no mother: 1.47 (0.63-3.40) [a]	None: Reference: Primary: 0.77 (0.36-1.68) [a] Post-primary or higher): 0.77 (0.42-1.39) [a] Not applicable/no father:1.38 (0.61-1.39) [a]	Urban: Reference Rural: 0.83 (0.63-1.11) [a]	Muslim: Reference Catholic: 0.88 (0.55-1.41) [a] Animest: 1.15 (0.69-1.90) [a] **Protestant: 0.18 (0.05-0.63)** [a]					**Cutting required: 4.24 (2.05-8.76)** Do not know if cutting is required by religion: 1.20(0.52-2.78)			

Kandala and Shell-Duncan [4]	Richest: Reference **Poorest: 5.77 (4.55-7.33)** **Poorer: 3.35 (2.64 -4.27)** [a] **Middle: 2.16 (1.70-2.73)** [a] **Richer: 1.37 (1.05-1.79)** [a]			Urban: Reference **Rural: 0.78 (0.70-0.87)** [a]	Other than Muslims: Reference **Muslims: 2.52 (1.61-3.96)** [a]								
Kandala, et al. [5]	Middle: Reference Lower Quintile: 1.21 (0.76-1.99) Lowest quintile: 0.94 (0.58-1.59) Higher quintile: 0.86 (0.43-1.66) The highest quintile: 0.45 (0.18-1.00)	Higher: Reference No education: 1.25 (0.35-3.87) Primary: 0.71 (0.19-2.27) Secondary 0.76 (0.23-2.46)		Rural: Reference Urban: 1.31 (0.87-1.99)	Christian: Reference **Muslim: 5.50 (2.65-10.60)** [a] No religion: 1.10 (0.25-3.71) [a]	Mother is not subjected to FGM/C: Reference Mother is subjected to FGM/C: 1.97 (0.69-6.01) [a]	Mother's occupation is informal: 1.08 (0.61-1.9) Mother is not working: 0.62 (0.3-1.28) [a]		Wife's age is greater than husband: Reference Wife is 10 years younger than husband: 0.82 (0.44-1.77) Wife is 1-4 years younger: 0.79 (0.37-1.63) Wife is 5-9 years younger: 0.47 (0.23-1) Wife same age: 0.34 (0.12-1)	FGM required by religion: 1.5 (0.93-2.45) FGM not required by religion: Reference		Support discontinuation of FGM: Reference **Supports the continuation of FGM: 3.08 (1.76-5.55)** (Depends): 1.37 (0.49-3.26)	Currently married: Reference: Currently married: Reference Formerly married: 0.92 (0.79, 1.16) Never: 0.94 (0.59, 1.59)
Mudege, et al. [6]		**Mother with at least primary level: 0.13 (0.02-0.64)** [a]	Has primary education: 1.65 (0.32-8.41) [a]										
Milaat, et al. [7]	Not enough: Reference Enough or more: 0.5 (0.19-1.18)	Less than university: Reference University and above: 0.55 (0.27-1.14)	Less than university: Reference University and above: 0.6 (0.31-1.18)				Professional: 1.8(0.39-8.16) Not Professional: Reference	Professional:1.08(0.48-2.45) Not Professional: Reference	Above 18: Reference Age of mother at marriage is under 18 years 2.08 (0.69-6.29)				

Mitike and Deressa [8]											Knew at least one FGM complication: Reference Parents do not know any of FGM complications: 0.5 (0.2-1.2)		
Oljira, et al. [9]	Monthly income > 1600: Reference ≤600: 0.7(0.4-1.2) [a] Monthly income 601-1000: 1.0(0.6-1.7) [a] ETB 1001-1600: 1.4 (0.7-2.9) [a]	University level: Reference Unable to read and write: 1.1(0.5-2.8) [a] **Grade 1-4: 0.4 (0.2-0.9) [a]** Grade 5-8: 0.9 (0.4-2.1) [a] Grade 9-10: 1.3 (0.5-3.5) [a] Grade 10-12: 0.9 (0.4-2.3) [a]			Protestant: Reference Muslim: 0.9 (0.4-2.4) [a] Orthodox: 1.4 (0.7-3.0) [a] Catholic: 0.5 (0.1-2.3) [a]	**Mother subjected to FGM/C: 0.4 (0.2-0.8) [a]**			Less than 24: Reference **25-29: 0.3 (0.1-0.9) [a]** **30-34: 0.1 (0.0-0.5) [a]** **35-39: 0.1 (0.0-0.4)** **40-44: 0.0 (0.0-0.2) [a]** **45-49: 0.0 (0.0-0.1) [a]** **≥50: 0.1 (0.0-0.2) [a]**			Women do not know: Reference FGM should continue: 0.9 (0.2-4.7) FGM should not continue: 3.5 (0.8-15.9)	
Gajaa, et al. [10]	<555 birr: Reference, 556-1233 birr: 0.91 (0.65-1.51) [a] >1233 birr: 0.24 (0.05-1.24) [a]	Illiterate: Reference **Literate: 0.50 (0.28-0.91) [a]** Primary and above: 0.42 (0.12-1.42) [a]		Rural: Reference Urban**: 0.30 (0.17-0.51) [a]**	Mother's religion Orthodox: Reference Protestant: 0.98 (0.46-2.09) [a] **Traditional: 3.86 (1.14-13.07) [a]** Father's religion: Protestant Christian: 0.62 (0.29-1.34) [a] **Traditional: 0.22 (0.07-0.74) [a]**		Housewife: Reference Student: 2.19(0.27-18.24) [a] Merchant: 1.71 (0.65-4.52) [a] Civil Servant: 0.80 (0.15-4.30) [a]		15-29: Reference **30-39: 1.95 (1.15-3.31) [a]** **40-49: 2.56 (1.40-4.69) [a]**		Mother knew FGM was criminal: Reference **Mother does not know FGM was criminal: 5.00 (3.07-8.19)**	**Mother have a positive attitude on discouraging FGM: 0.26 (0.16–0.43)**	Mother is married: Reference Mother is single: 1.36 (0.64–2.89) [a]

Gebremariam, et al. [11]		Secondary: Reference **Illiterate: 2.4 (1.3-4.3)** [a] Primary: 0.96(0.5-1.7) [a]		Urban: Reference **Rural: 4 (2.4-6.8)** [a]	All Christian: Reference **Muslim: 3.7 (1.1-12)** [a]					**FGM required: 1.7 (1.07-2.8)** [a] Not required: Reference			
Yirga, et al. [12]	For mothers: Not owning a radio: Reference Ownership of a radio: 1.187 (0.67–2.07) For daughters: Ownership of a radio: 1.716 (0.98–3.00)			Urban: Reference **Rural: 0.116 (0.065–0.207).**									
Tamire and Molla [13]		High school and above: Reference **Under high school: 1.84 (1.10-3.38)** [a]	High school and above: Reference, **Under high school: 2.04 (1.25-3.09)** [a]	Urban: Reference, Rural**: 1.97 (1.25-3.09)** [a]	All Christians: Reference, **Muslims:4.21 (1.01-17.00)**		Currently employed: Reference, Farmer: 1.49 (0.63-3.53) [a]	Currently employed: Reference, Farmer: 1.2 (0.47-1.44) a					
Andualem [14]		Literate: Reference **Illiterate: 1.64 (1.24-2.36)** [a]	Literate: Reference **Illiterate: 1.78 (1.38-2.56)** [a]	Urban: Reference **Rural: 1.54 (1.09-2.50)** [a]					Parent's age ≥25: Reference Parent's age <25: 0.61 (0.52-1.86)		Mother knew negative impacts of FGM: 0.89 (0.68-1.49) Mother did not know FGM had a negative impact: Reference Mother did not know FGM was		Married mothers: Reference Single: 0.86 [0.66-1.96]

											criminalized: Reference Mother knew FGM was criminal: 0.78 (0.72-1.74)		
Elduma [15]	Poorest: Reference, **Second: 1.423 (1.237-1.635)** [a] **Middle: 2.614 (2.259-3.026)** [a] **Fourth: 1.543 (1.257-1.893)** [a] Richest: 0.897 (0.662-1.216) [a]			Rural: Reference, Urban: 1.03 (0.90-1.18) [a]		**Having a daughter subjected to FGM/C:36.8 (27.96-48.54)** [a]							
Dehghankhalili, et al. [16]						**Family history mother (94.6%)** **P-value<0.001** **Family history (sister): 66.4%** **P-value<0.001** **Family history (grandmother): 75%** **Having a mother, sister or grandmother subjected to FGM is significantly associated with the practice**							

						P-value <0.001							
Yasin, et al. [17]		Intermediate school and higher education: Reference Illiterate: 1.5 (0.9-2.6) Read and write: 1.4 (0.7-2.8) Primary: 1.3 (0.7-2.5) [a]	Intermediate school and higher education: Reference **Illiterate: 1.4 (1.1-1.9)** Read and write: 1.6 (1.02-2.5) Primary school: 1.3 (0.9-1.8) [a]			Mother not subjected to FGM/C: Reference **Subjected to FGM/C: 15.1 (10.6-21.6)** **Don't Know: 7.3 (4.4-12.0)** [a]							
Saleem, et al. [18]		High school/Higher: Reference **Basic education: 3.2 (1.5-6.6)** **None: 8.00 (3.8-16.5)** [a]											
Ali, et al. [19] (Egypt)		**Illiterate: 34.1%** **Elementary: 25.9%** **High: 40%** **Higher level of education is protective** **P-value<0.01**	**Illiterate: 22.4%** **Elementary: 25.9%** **High: 51.5%** **Higher level of education is protection** **P-value<0.01**	**Significant difference between urban & rural areas prevalence of FGC in urban is 31.8% whereas in rural it is 75.4%** **P<0.001**									
Ali, et al. [20] (Sudan)		**Less than secondary: 1.5 (1-2.2)[a]**	**More than secondary: Reference**	Urban: Reference		**Presence of sister subjected to FGM/C: 4.3 (3.1-5.9)[a]**	Housewife: 0.8 (0.5-1.5) [a]	Non-skilled worker: 0.7 (0.5-1.1) [a]					

			Less than secondary: 2.3 (1.5-3.4) [a]	Rural: 1 (0.7-1.6) [a]									
Arafa, et al. [21]		**Illiterate: Reference** **Literate OR:0.8**	**Illiterate: Reference** **Literate OR:0.91**	**Rural: Reference** **Urban OR: 0.55**									
Mohammed , et al. [22]				**Rural: 75% of type I; 66.7% of type II and 0% none.** **Urban: 25% of type I , 33.3% of type II FGM/C and 100% none.** **Statistically significant at P < 0.05**									
Abdel-Aleem, et al. [23]				Rural: Reference Urban: 1.09 (0.61-1.93)									
Ahmed, et al. [24]	Economic level low: 64.4% Intermediate: 68.7% High: 61.4% P-value: 0.7	Illiterate 58.6% Primary: 63.8% Preparatory: 70.3% Secondary: 69.8% He P-value: 0.8	Illiterate: 61.8% Primary: 65.4% Preparatory: 68.8% Secondary: 67.4% Higher: 67.5% P-value: 0.9	**Urban: 43%** **Rural: 91.8%** Significantly higher among those living in rural areas P-value: 0.0001	Muslim: 66.8%, Christian: 60.0% P-value: 0.6								

Rasheed, et al. [25]	High socioeconomic status: Reference **Low: 2.06(1.42-3.61)** Moderate: 1.13 (0.88-2.24) [a]	Educated: Reference **Illiterate: 2.16(1.33-2.95)** Can read and write: 1.26 (0.88-2.61) [a]	Educated: Reference Illiterate: 1.98(0.56-3.06) Can read and write: 1.36 (0.98-2.15) [a]	Urban: Reference, **Rural: 8.20 (2.77-6.21) [a]**	Christian: Reference, Muslim 1.04 (0.91-1.26) [a]	Mother not subjected to FGM: Reference **Mother subjected to FGM: 9.12 (2.11-14.09) [a]** **Presence of circumcised sisters: 6.28 (1.18-10.89) [a]**							
Chikhungu and Madise [26]		No education: Reference **Primary: 0.80 (0.69-0.92) [a]**		Urban: Reference **Rural: 1.61 (1.20-2.15) [a]**	Christian: Reference **Muslim: 2.13 (1.86-2.45)** **Traditional and other religions: 1.44 (1.14-1.82)** [a]								
Besera and Roess [27]		Primary: 1.08 (0.85-1.38) **Greater or equal to secondary: 0.54 (0.36-0.81)** [a]			Muslim: Reference **Christian: 0.60 (0.45-0.79) [a]**	**Respondent the mother has FGM: 8.59 (5.63-13.10) [a]**			Less than 20: Reference **20-29: 2.47 (1.39-4.40)** **30-39:5.54 (3.06-10.03)** **40-49: 11.90 (6.28-22.54) [a]**				

[23] Alosaimi, et al. [28] (Women)	Lowest tertile: Reference **Second tertile: 0.63 (0.55-0.72)** **Highest tertile: 0.61 (0.53-0.69)** [a] Housing quality: second quartile: 1.04(0.92-1.19) **Highest quartile:1.76(1.55-2.00)** [a]												
Alosaimi, et al. [28] (Daughter)	Lowest tertile: Reference **Second tertile: 0.68 (0.57-0.82)** **Highest tertile: 0.70 (0.59-0.85)** [a] Housing quality second quartile: 0.97 (0.81-1.17) Highest quartile: 1.18(0.99-1.41) [a]	**Lowest tertile: Reference** **Second tertile: 0.79 (0.66-0.94)** **Highest tertile: 0.82(0.69-0.97)**				**Mother subjected to FGM/C: 7.40 (6.01-9.13)** [a]			**Mother aged less than 20 years: Reference** **Aged 20-35: 1.82 (1.51-2.18)** **Aged 36-49: 1.82 (1.51-2.18)**			Mothers believing that the practice should not continue: Reference Should continue: 3.52 (3.10–4.00)	
Boyle and Svec [29]	**Poorest: Reference** **Poor: 0.72 (0.59-0.86)**	Less than primary: Reference Primary: 1.00 (0.84-1.2)		Rural: Reference, **Urban: 0.71 (0.55-0.90)**	**Islam: 4.11 (3.45-4.89)**	**Mother subjected to FGM/C: 33.58 (25.51-44.21)**	Mother earns cash: 0.99 (0.87-1.13)		Mother's age: 0.99 (0.98-1.00)				

	Middle: 0.72 (0.59-0.86) **Rich: 0.58 (0.47-0.71)** **Richest: 0.47 (0.36-0.61)**	**Secondary or higher: 0.62 (0.52-0.75)**											
Njoku, et al. [30]	**Social class: low: 47.2%** **Middle: 26.5%** **Upper 25%** **FGM was higher among those from low social class**												
Anikwe, et al. [31]	**Social class 1: 6.8%, Social class 2: 12.9%, Social class 3: 38.8%, Social 4: 38.3% social class 5: 15.3%, significant at social class 2 and 4** **P value:0.001**			**Urban: 54.8%** **Rural: 45.2%** **P value: 0.012** **The odds of a woman having FGM in the cohort of women residing in rural communities is 66% more than in the group in urban communities**									
Ashimi, et al. [32]		Formal education (primary or secondary): Reference **Informal education (Quranic form of education):**			**Islam: 49.8%** **Christianity: 0%** **P value: 0.001**		Mother not employed: Reference **Mother employed: 2.89(1.66-5.03)** [a]						

		6.39 (3.99-10.23) [a]											
Ifeanyichukwu, et al. [33]					Not significant, Islam: 28.9% Christianity: 25% African traditional religion (ATR): 10% P-value > 0.99								
Iliyasu, et al. [34]					Muslim: Reference, Christian: 1.27 (0.55-2.97) [a] P-value: >0.99								
Garba, et al. [35]			Not significant (Fathers having secondary education and above versus fathers having less than secondary education) P value: 0.18	Residence (Urban versus rural) Not significant P-value: 0.12	Not significant (Islam versus Christianity) P value: 0.19								
Koschollek, et al. [36]					Christian: Reference **Muslim: 3.44 (2.52-4.70)** No, other, or unknown religion: 1.24(0.63-2.43)								

Beller and Kröger [37]		**Mother's increased level of education: 0.72 (0.63-0.82)**	**Father's increased level of education: 0.75 (0.67-0.83)**					**Mother's increasing age: 1.12 (1.08-1.29)**				
Koukkula, et al. [38]					Other than Muslim: Reference **Muslim: 2.02 (1.12-3.63) [a]**							
Shay, et al. [39]		**Less than grade 10: 44.3%** **Grade 10 or higher and college level: 18.8%** **Significantly higher for girls of mothers who attained less than grade 10** **P-value: 0.001**	**Less than grade 10: 51.3%** **Grade 10 or higher and college level: 20.2%** **Significantly higher at grade 10+** **P-value: 0.001**				Mother employed: 22.2% Mother not employed: 28.8% Not significant P-value: 0.08	**Father employed: 24%** **Father not employed: 42.2%** **Significantly higher risk when the father is unemployed** **P-value: 0.009**		**Mother knew FGC has no religious grounds: 23%** **Mother did not know: 32.3%; significant** **P-value:0.03**	**Mother did not know that FGM was harmful: 24.4%** **Mother did not know that FGM was harmful: 50%** **Statistically significantly higher among mothers who do not know FGM is harmful** **P-value: 0.006**		
Bjälkander, et al. [40]				**Rural: Reference** **Urban : 1.98 (1.21-3.22) [a]**	**Christian: Reference** **Muslim: 2.0 (1.28-3.39) [a]**								

Rouzi, et al. [41]	**<≈US$1330: 42.3%** **≈US$1331–US$2665: 32.6%** **More than US$2665: 21.5%** **More wealth is a protective factor.**												
Akinsulure-Smith [42]					**Female Muslim participants had significantly higher rates of FGM/C compared to female Christian participants** **(4 out of 7 verses 2 out of 16)**								
Akinsulure-Smith and Chu [43]					Muslim: 87.9% Christian: 11.4% Other: 0.8% Religion P<0.001								
Sylla, et al. [44]		**Qur'anic: 2.75 (2.00-3.78)** **Illiterate: 1.05-1.39** **Primary: 1.244 (1.07-1.46)** **Secondary: 0.676 (0.58-0.79)** **Higher education:**	**Qur'anic 2.206 (1.68-2.9)** **Illiterate 1.236(1.02-1.5)** **Primary: 1.29 (1.07-1.56)** **Secondary: 0.78 (0.67-0.91)** **Higher education: 0.579 (0.49-0.69)**										**Parents married: 1.03 (1.01-1.06)** Parents divorced: 0.71 (0.23-2.24) Single: 0.58 (0.41-0.81) **Widowed: 6.00 (1.35-26.73)**

		0.289 (0.20-0.41)											
Ojo and Ijadunola [45]	Poorer1.04 (0.79-1.37) Middle:0.82 (0.58-1.18) Richer: 0.76 (0.53-1.10) **Richest 0.59 (0.39-0.82)**			Rural: reference Urban 1.12 (0.85-1.46)	Muslim 0.72 (0.39-1.33) Other Christians 0.55 (0.30-1.02) Catholic 0.59 (0.31-1.12)								
Chu and Akinsulure-Smith [46]	Not significant as reported by the authors												
Bogale, et al. [47]				**Urban: Reference** **Rural:3.31 (1.48-7.43)** [a]	**Protestant: Reference** **Muslim: 3.55 (1.35- 9.37)**[a] **Orthodox: 1.65 (0.61-4.40)**[a]								

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Supplementary Table 4: Other FGM determinants identified in included studies.

Determinant	Study	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	Proportions as reported by authors
Living grandmother	Ali, et al. [1]		**7.1 (4.6–10.8)**	
Living conditions	Im, et al. [2]		**Living separately from home**: **0.16 (0.05-0.52)**	
	Shay, et al. [3]			Live with father only: 34.8% Living with mother only: 32% **Living with both:** 12.4% Living with relatives: 48.5% → FGM statistically significantly lower when living with both parents P value: 0.001
Polyvictimization	Im, et al. [2]		**1.23 (1.07-1.40)**	
Village FGC rate (higher)	Greis, et al. [4]		**1.63 (1.40-1.90)**	
Percentage of Muslims in the village (higher)	Greis, et al. [4]	**1.24 (1.01–1.51)**		
Presence of community norms that are not significant: Domestic abuse	Kandala, et al. [5]			Not significant No: Reference Wife Beating for Going Out: 1.00 (0.68-1.45) Wife Beating for Neglecting the Children: 1.51 (1.06-2.2) Wife Beating for Arguing with the Husband: 1.03 (0.67-1.56)

				Wife Beating for Denying Husband Sex: 0.79 (0.53-1.19) Wife Beating for Denying Husband Food: 0.82 (0.48-1.36)
Cultural influence*	Andualem [6]	**1.60 (1.25-2.53)**		
Mother's decision-making and power	Kandala, et al. [5]	Mother owns house: 1.75 (1.14-2.86) Mother owns land: 0.75 (0.48-1.16) **Father Beats Mother** No: Reference Yes: 1.21 (0.77-1.82) Missing/Not available: 1.01 Who makes large household purchases? Alone: Reference Husband/Partner: 1.4 (0.85-2.13) With Husband/partner: 0.91 (0.57-1.41) Who decides on wife's expenditures? Alone: Reference Husband/partner: 0.52 (0.2-1.32) With her husband: 0.68 (0.39-1.18) Missing/not available: 0.9 (0.53-1.48)		

		<u>Who Makes Decision on Mother's Health</u> Alone: Reference Husband/Partner: 1.17 (0.77-1.86) With husband/partner: 0.92 (0.62-1.41)		
	Boyle and Svec [7]			Mother's autonomous decisions: 1.02 (0.95-1.10) Mother takes joint decision: 0.98 (0.93-1.03)
Parent's increased age	Mitike and Deressa [8]		**6.65 (2.6-16.7)**	
Father's increased age	Beller and Kröger [9]	1.10 (1.06-1.13)		
Father's religion	Gajaa, et al. [10]	Orthodox: Reference Protestant Christian: 0.62 (0.29-1.34). **Traditional: 0.22 (0.07-0.74)**		
Participation in anti-FGM activities	Mitike and Deressa [8]	Participation of the parents in anti-FGM activities: **0.3 (0.2-0.6)**		
	Andualem [6]	**Participation in anti FGM interventions: 0.42 (0.29-0.62)** **Received health education on FGM: 0.39 (0.38-0.76)**		
	Mudege, et al. [11]		Since birth: Reference	

Movement from one area to another			Came to Demographic Surveillance Area: 1.50 (0.53-4.30)	
	Mbanya, et al. [12]		**Age at migration to Norway is ≥12 years: 4.78 (1.53-15.00)** Age at migration to Norway is 0-11 years: Reference	
Health system related factors	Koschollek, et al. [13]	**No health insurance or medical treatment voucher for asylum seekers or unknown: 1.6 (1.13-2.25)**		
	Ashimi, et al. [14]	Type of health facility where the infants received care Primary healthcare facility: Reference Secondary facility: 0.73 (0.45-1.18) **Tertiary healthcare facility: 0.49 (0.26-0.92)**		
Other religion related factors	Beller and Kröger [9]	**Mother's private prayer frequency: 0.93 (0.87-0.99)** **Father's private prayer frequency: 0.92 (0.87-0.98)** Perceived religious suppression: Mother: 1.03 (0.88-1.19) Father: 1.10 (1.06-1.13) Parent's religion (unaffiliated as the reference group)		

		Mother Christian Affiliation: 0.47 (0.25-0.90) Father Christian Affiliation: 1.06 (0.59-1.90) **Mother Traditional Affiliation: 10.57 (4.79-23.31)** **Father Traditional affiliation: 9.78 (5-18.78)** Mother Muslim affiliation: 0.79 (0.41-1.52) Father Muslim Affiliation: 1.66 (0.91-3.02) <u>Governmental unfairness towards one's own religious group</u> **Mother: 1.18 (1.08-1.29)** **Father: 1.24 (1.15-1.35)** Father's religious service attendance: 0.98 (0.87-1.09) Mother's religious service attendance: 1.10 (1.02-1.18)		
Consanguinity	Alosaimi, et al. [15]		<u>Odds of experiencing FGM among daughters</u> **Marriage with a second cousin or closer: 1.18 (1.03-1.35)**	
	Milaat, et al. [16]	No parental consanguinity: Reference		

		Parental Consanguinity: 1.7 (0.86-3.3)		
Family factors	Sylla, et al. [17]	**For girls from a polygamous household: 1.37 (1.23-1.53)** Mothers in a monogamous union: 0.78 (0.72-0.85) **Belonging to big family:** **1.37 (1.28-1.47)** Belonging to nuclear family: 0.59 (0.53-0.67)		
	Kandala, et al. [5]	**Mother is in a polygamous union:1.23 (0.86-1.69)** **Marriage by arrangement: 0.89 (0.65-1.2)**		
Child marriage	Alosaimi, et al. [15]		Odds of experiencing FGM among daughters Underage marriage: **1.60 (1.38-1.84)**	
Maternal place of birth or origin	Abolfotouh, et al. [18]			**FGM prevalence among females of rural origin: 25%** **FGM prevalence among females of non-rural origin: 10.8% (P=0.001)**
	Iliyasu, et al. [19]		Geographic origin: North-west: Reference Northeast: 0.87 (0.41-2.70)	

			North central: 1.23 (0.54-5.03) **South-west: 2.31 (1.13-2.14)** **Southeast or South-South: 3.78 (1.21-4.99)**	
	Gibson-Helm, et al. [20]			FGM/C among women from North Africa North Africa Non-humanitarian source countries group: 0.5% North Africa HSC: 5.1% P-value <0.001 Among women from Middle and East Africa Middle and East Africa non- HSCs: 0.3% Middle and East Africa HSCs: 13.8% P-value <0.001 Among women from West Africa West Africa HSCs: 3.3%, West Africa Non-HSCs: 6.7% P-value=0.65
	Yasin, et al. [21]	Urban: Reference Rural: 1.0 (0.8-1.2)		
Maternal Origin	Minsart, et al. [22]			Maternal Origin P value<0.00001

				Djibouti-Somali: 1.7% No FGM, 0.2% for type I FGM, 58.2% for type II, and 40% for infibulated Djibouti-Afar: 0% No FGM, 6.7% for Type I, 40% for type II, 53.3% for infibulated Djibouti Arabic: 21.2% No FGM, 3% for type I, 57.6% for type II, 18.2% for infibulated Somalia: 0% No FGM, 0% for type I, 38.5% for type II, and 61.5% for infibulated Ethiopia: 28% No FGM, 16% for type I, 52% for type II, and 4% for infibulated Yemen: 28.6% No FGM, 0% for type I, 74% for type II, and 0% for infibulated
Residence	Zayed and Ali [23]			<u>Residence (of the participant subjected to FGM/C)</u> Giza: 64.4% Cairo: 62.5% P- value: 0.781
	Abdulah, et al. [24]			Governorate of residence was significantly associated with FGM among daughters P value <0.001
Nationality	Rouzi, et al. [25]			**Saudi: 49.7%** **Saudi (natural): 13.1%** **Non-Saudi: 37.2%** **P value <0.001**

Immigration status	Akinsulure-Smith and Chu [26]			**Undocumented: 43.7%** **Refugee, asylee, TPS, withholding of removal: 10.1%** **Has applied or intends to apply for asylum: 29.5%** **US citizen, permanent resident, valid visa: 4.7%** **Others: 8.5%** ➔ **Statistically significantly higher among undocumented** **P value<0.001**
Living in camp	Im, et al. [2]		**Living outside the camp: Reference** **Living in camp: 1.54 (0.5-4.74)**	
Duration of stay in the camp	Mitike and Deressa [8]		Duration of stay in the camp <10 years: Reference Duration of stay in the camp >10 years: 0.5 (0.1-1.5)	
Islamic sects	Dehghankhalili, et al. [27]			**Shiaa Islam: 51.4%** **Sunni Islam: 48.6%** **P-value: 0.019**

*Defined as normal community practices. Results highlighted in bold are statistically significant.

Brackets report 95% Confidence intervals.

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Supplementary Table 1. Search strategy

Database	Search Terms
PsycINFO	1 Female Genital Mutilation;2 Female Circumcision;3 Female Genital Cutting; 4 Female Genital Alteration; 5 or/1-4; 6 Limit 5 by 2009-2020
Embase	1 'female genital mutilation'/exp; 2 'female genital mutilation'; 3 or/1-2; 4 'female'/exp; 5 female; 6 or/4-5； 7 genital; 8 'mutilation'/exp; 9 mutilation;10- or/8-9;11 7 and 10; 12 11 and 6; 13 Limit 12 by 2009-2020
Ovid Medline	1 female.mp.; 2 Girl*.mp.; 3 wom?n.mp.; 4 or/1-3; 5 adj3 genital*.mp.; 6 adj3 mutilation.mp.; 7 adj3 circumcis*.mp.; 8 adj3 cut*.mp.; 9 adj3 alter.mp.; 10 adj3 alteration.mp.; 11 or/5-10 (1448); 12 4 and 11; 13 Female Genital Mutilation.mp.; 14 Female Circumcision.mp.; 15 Female Genital Cutting.mp.; 16 Female Genital Alteration.mp. (1629); 17 or/13-16; 18 Circumcision, Female.sh. / (1322); 19 12 or 17 or 18 (2024); 20 limit 4 to yr="2009 -Current" (1066)
Web of Science	1 Female Genital Mutilation; 2 Female Circumcision;3 Female Genital Cutting; 4 Female Genital Alteration, 5 or/1-4; 6 Limit 5 by 2009-2020

Supplementary Table 2: Characteristics of studies included in the systematic review

	Author (year)	Date publication; data collection year	Sampling Method	Sampling method for non-FGM	Self-report or examination	Country of origin; Host country (if different)	Region	Total sample size	Total FGM	Participant description (representing group being compared	Age Group	Risk of Bias
	African Region											
1	Nonterah, et al. [1]	2020; 2003-2013	Pregnancy records database.	Pregnancy records database.	Examination	Ghana	Kassena-Nankana district-North Eastern Ghana	9306	1647	Women who delivered at the targeted hospital	Less than 20 to more than 35	High
2	Greis, et al. [2]	2020; 2017	Two-part stratified sampling procedure for villages; a random sample of participant	Those who reported not having FGM or unsure of their FGM status	Self-report	Burkina Faso	10 villages and one sector of Nouna town	696	301	Adolescents aged 12-20	12-20	Unclear
3	Njoku, et al. [3]	2020; (2018-2019)	Hospital-based; systematic sampling	For each participant with FGM being recruited, 2 consecutive participants were recruited.	Examination	Nigeria	Calabar, Nigeria	450	150	Pregnant women	Under 19 to more than 40	High
4	Sylla, et al. [4]	2020, 2012	Multi-facility based; whole sample	Multi-facility based; whole sample	Self-report (head of household)	Mali	Bamako	1920	1027	Girls aged 0-15	0-15	Unclear
5	Kandala, et al. [5]	2019; (Only 2014 used)	Multi-stage cluster sampling (DHS)	Multi-stage cluster sampling (DHS)	Mother's report	Kenya	National	12,434	373	Girls of mothers of reproductive age	0-14	Low
6	Anikwe, et al. [6]	2019; 2012	Facility-based; random sampling	Purposive (women who delivered in the facility within 24 h of selection of a case).	Examination	Nigeria	Abakaliki, Ebonyi, Nigeria	260	260	Pregnant women	Less than 20 to more than 35	Unclear
7	Kandala and Shell-Duncan [7]	2019; (Only 2010-2011 used)	Multi-stage cluster sampling (DHS)	Multi-stage cluster sampling (DHS)	Self-report	Senegal	National	15668	4408	Women	15-49	Low
8	Boyle and Svec [8]	2019; (2010-2014)	Multi-stage cluster sampling (Multiple DHS surveys)	Multi-stage cluster sampling (Multiple DHS surveys)	Mother's report	Multiple Countries *	NA	12,144	6606 **	Women who had daughters aged older than FGM normative age within their regions	Daughters older than normative age in different regions	Unclear
9	Beller and Kröger [9]	2018; (2008-2009)	Stratified random sampling	Parents who do not have a daughter with FGM	Parent's report	Multiple African countries* **	Same	Mothers (n= 6,299) and Fathers (n= 6,778)	Not reported	Parents who have a daughter (study examining daughters with FGM)	Not indicated	High
10	Sakeah, et al. [10]	2018; NA	Two-stage sampling method then proximity selection to select subsequent household	Two-stage sampling method	Self-report	Ghana	Bawku municipality & Pusiga District	830	Pusiga District - 273, Bawku Municipality -236	Women of reproductive age	15-49	Unclear
11	Ojo and Ijadunola [11]	2017, 2013	Multistage cluster sampling (DHS)	Same	Self-report	Nigeria	National	38,948	9,652	Women of reproductive age	15-49	Low
12	Gebremariam, et al. [12]	2016; 2014	School-based, multistage stratified random sampling	School-based, multistage stratified random sampling	Self-report	Ethiopia	Jigjiga district	662	538	High school & college students	15-24	Unclear
13	Gajaa, et al. [13]	2016; 2014	Cluster sampling	Women from the sample who do not have a daughter with FGM	Mother's report	Ethiopia	Hababo Guduru District	610 Mothers with at least one daughter under 15	293 Daughters	Women with at least one daughter under 15 years	0-15	Low
14	Andualem [14]	2016; 2014	Household based; systematic random sampling	Household based; systematic random sampling	Mother's report	Ethiopia	East Gojjam Zone, Western Amhara	805 Daughters	403 Daughters	Women who had daughters less than 5 years	0-5	Unclear

15	Oljira, et al. [15**]	2016; 2013	Multistage cluster sampling (Harar Health and Demographic Surveillance System 2013)	Multistage cluster sampling	Mother's report	Ethiopia	Harar	842 Daughters	160 Daughters	Women with at least one daughter younger than 12 years	0-12	Unclear
16	Ashimi, et al. [16]	2015; 2014	Multi-facilities; systematic random sampling	Multi-facilities; systematic random sampling	Examination and mother's report	Nigeria	Three clinics, Birnin Kudu, Jigawa state	461 Mothers of infants	215	Infants presenting to clinics	Less than 1	Unclear
17	Ifeanyichukwu, et al. [17]	2015; 2014	Household; cluster sampling	Household; cluster sampling	Self-report	Nigeria	Okada Community - Edo State	325	90	Women of reproductive age	15-49	Unclear
18	Chikhungu and Madise [18]	2015 (Only DHS 2010 used)	Multistage cluster sampling	Multistage cluster sampling	Self-report	Burkina Faso	National	17,807	13,551	Women	15-49	Low
19	Bogale, et al. [19]	2014; 2014	Household; stratified random sample	Household; stratified random sample	Self-report	Ethiopia	Bale zone	634	486	Childbearing age women	15-49	Unclear
20	Besera and Roess [20]	2014; 2002	Multi-stage cluster sampling (DHS)	Women from the sample who doesn't have a daughter with FGM	Mother's report	Eritrea	National	8754 Mothers	3168 had at least one daughter with FGM	Women with at least one daughter	Daughters of women of reproductive age	Low
21	Tamire and Molla [21]	2013; 2011	Multi-school based; multi-staged cluster sampling method	Multi-school based; multi-staged cluster sampling method	Self-report	Ethiopia	Hadiya zone, Southern Ethiopia	797	641	High school students	13-25	Unclear
22	Bjälkander, et al. [22]	2013; (2010-2012)	Facility-based; Purposive	Facility-based; Purposive	Self-report and examination	Sierra Leone	Northeastern Sierra Leone	554	451	Attended antenatal clinics	12-47	Unclear
23	Garba, et al. [23]	2012; 2011	Hospital-based; purposive	Hospital-based; purposive	Mother's report	Nigeria	Kano, Northern Nigeria	200	26	Infants in Aminu Kano Teaching Hospital	Less than 1	High
24	Yirga, et al. [24]	2012; 2008	Household; Systematic random sampling	Household; Systematic random sampling	Self-report	Ethiopia	Kersa district, East Hararge, Oromia region, Ethiopia	858 mothers (858 daughters) – determinants for both groups studied	Mothers with FGM- 792, Mothers with 1 or more daughters with FGM- 288	Women of reproductive age	15-49	Unclear
25	Iliyasu, et al. [25]	2012; missing	University-based; multistage sampling	University-based; multistage sampling	Self- report	Nigeria	Bayero University, Kano, Kano State, Northern Nigeria	359	43	University Students	17-40	Unclear
26	Mudege, et al. [26]	2012; missing	Community based-every household	Community based-every household	Self-report	Kenya	Korogocho and Viwandani, informal settlements in Nairobi	527	323	Girls/women in informal settlements	12-24	High
27	Shay, et al. [27]	2010; 2008	Multi-school-based sample; random sample	Multi-school-based sample; random sample	Parent's or families report	Ethiopia	Adis Ababa	407	106	School girls	Under 5 to above 20 [the majority were in the age group 10-15]	High
28	Mitike and Deressa [28]	2009; 2004	Household sample; systematic sampling method	Household sample; systematic sampling method	Parent's report	Somalia; Ethiopia	Somali refugee camps in the Somali Regional State in Eastern Ethiopia.	288	122	492 Parents	12+	Unclear
29	Im, et al. [29]	2019; 2013	Snowballing	Snowballing	Self-report	Somalia; Kenya	Eastleigh	143	Not reported	Refugees	15-35	High
	Eastern Mediterranean Region (EMR)											
1	Abdulah, et al. [30]	2019; 2017	Two stage random sampling	Two stage random sampling	Mother's-report	Iraq	Iraqi Kurdistan region (Duhok, Erbil, and Sulaiymaniy)	5048 daughters	2361 daughters	Mothers and their daughters	All age groups	Unclear

2	Rouzi [31]	2019; 2016-2017	Facility based; purposive	Same	Self-report	Saudi, Naturalized Saudi, and non-Saudi; Saudi Arabia	Jeddah	963	175	Women attending clinics	18-75	Unclear
3	Alosaimi, et al. [32]	2019; (2008-2009)	Multistage sampling	Same for women; For daughters, the control group were mothers without a daughter subjected to FGM/C	Mother's report	Yemen	National	7076 Women with at least one daughter	Women-3384, Daughters (at least one)-2405	Women with at least one daughter with FGM	Daughters of mothers	Unclear
4	Minsart, et al. [33]	2015; 2012-2014	Facility-based, whole sample	Facility-based, whole sample	Examination	Djibouti	Djibouti-City	614	643	Mothers of live births and stillbirths (excluding mothers from West Africa and Europe)	Less than 25 till more than35	High
5	Elduma [34]	2018; 2014	Multistage cluster sampling (MICS)	Multistage cluster sampling (MICS)	Self-report	Sudan	National	21947	19451	Women	15-49	Low
6	Ali, et al. [35]	2018; 2017	Cluster and systematic random sampling	Cluster and systematic random sampling	Self-report	Egypt	Beni-Suef	3353	1846	Young women	12-25	Unclear
7	Milaat, et al. [36]	2018; 2017	Cluster random sampling for the region followed by multi-stage random sampling for the household	Cluster random sampling for the region followed by multi-stage random sampling for the household	Report of the head of the household	Saudi Arabia	Hali semi-urban region.	218	175	Girls less than 18 years	0-18	Unclear
8	Arafa, et al. [37]	2018; (2016-2017)	University-based sample; multi-stage random sampling	University-based sample; multi-stage random sampling	Self-report	Egypt	Beni-Suef University	1723	815	University Students	Mean age=20.89	Unclear
9	Ahmed, et al. [38]	2017; (2015-2016)	Multi- facility; purposive	Multi- facility; purposive	Self-report	Egypt	Suez Canal University	204	135	Students attending clinic	14-19	Unclear
10	Abdel-Aleem, et al. [39]	2016; (2011-2014)	Facility based; purposive	Facility based; purposive	Examination	Egypt	Assiut and Sohag	430	376	Recently married women	17-31	High
11	Abolfotouh, et al. [40]	2015; (2012-2013)	Organization-based; convenient (google survey)	Organization-based; convenient	Self-report	Egypt	Not Applicable (online)	320	47	Medical Students	Not indicated	High
12	Dehghankhalili, et al. [41]	2015; (2010-2013)	Multi-facility based; purposive	Multi-facility based; purposive	Examination	Iran	Hormozgan, Southern Iran	780	535	Women and girls attending clinic	14-38	Unclear
13	Mohammed, et al. [42]	2014; (2011-2012)	Computer based multi-stage random sampling	Computer based multi-stage random sampling	Examination	Egypt	Ismailia	2106	1911	Sexually active women	15-45	High
14	Ali, et al. [43]	2013; 2012	Multi- school based; random	Multi- school based; random	Self-report	Sudan	Kassala, Eastern Sudan	972	810	School girls	9-16	High
15	Saleem, et al. [44]	2013; 2011	Multi-facility based; purposive	Multi-facility based; purposive	Self or parent report	Iraq	Kurdistan region	1508	348	Females visiting PHCs	Up to 20	Low
16	Yasin, et al. [45]	2013; (2007-2009)	Multi-facility-based sample, a convenient sampling	Multi-facility-based sample, a convenient sampling	Examination and Self-report	Iraq	Erbil, Kurdistan Region, Iraq	1987	1397 (self-reported), 1164 (examination)	Women and girls attending clinic	15-49	High
17	Zayed and Ali [46]	2012; missing	Community-based; random sample	Community-based; random sample	Self-report	Egypt	Cairo & Giza	244	156	Muslim females between the age of 5 and 30 years.	Up to 30	High
18	Rasheed, et al. [47]	2011; (2008-2010)	Multi-facility based; all those presenting to certain clinic	Multi-facility based; all those presenting to certain clinic	Self-report and parent report	Egypt	Sohag and Qena	4158	3711	Young women and girls attending clinics	5-25	High
	European Region											
1	Koschollek, et al. [48]	2020; (2015-2016)	Community-based, convenience sampling	Community-based, convenience sampling	Self-report	Multiple Countries; Germany	Six cities Munich, the Rhine-Ruhr region, Cologne, Berlin, Frankfurt	1044	281	Migrants from Saharan Africa	Not indicated	High

							am Main, and the region of Hanover					
2	Mbanya, et al. [49]	2018; 2014	Respondent driven sampling	Respondent driven sampling	Self-report	Somalia; Norway	Oslo	159	82	Migrants	Not indicated	High
3	Koukkula, et al. [50]	2016; (2010-2012)	National Registry; Random sample	National registry; random sample	Self-report	Somali or Kurdish origins; Finland	Helsinki, Espoo, Vantaa, Turku, Tampere, Vaasa	389 (224 Kurdish and 165 Somali)	Somali Origins - 50, Kurdish Origins - 153	Immigrants	18-64	High
	Region of the Americas											
1	Akinsulure-Smith and Chu [51]	2017; (1996-2014)	Whole database (NYU Program for Survivors of Torture)	Whole database (NYU Program for Survivors of Torture)	Self-report	Multiple countries, USA#	New York	514	133	African born women, Survivors of Torture	Average age =34.3	Unclear
2	Chu and Akinsulure-Smith [52]	2016; 2014	Community based, convenience	Community based, convenience	Self-report	Multiple countries† ; USA	New York	68	36	Migrants over 18 years	18+	Unclear
3	Akinsulure-Smith [53]	2012; missing	Community based; Purposive	Community based; Purposive	Self-report	Sierra Leon and Liberia; USA	New York	23	7	Immigrants from West Africa	20-57	High
	West Pacific Region											
1	Gibson-Helm, et al. [54]	2015; (2002-2011)	Whole electronic database	Whole electronic database	Examination	Multiple Countries; Australia	North Africa, Middle and East Africa, West Africa	2173	78	Migrants/ refugees at a pregnancy clinic	From less than 20 to more than 35	High

* Six DHS surveys: Burkina Faso 2010, Egypt 2014, Guinea 2012, Kenya 2014, Mali 2012-2013, and Nigeria 2013
** Mothers had a daughter subjected to FGM
*** The survey was conducted in 19 African countries (Botswana, Cameroon, Chad, Democratic Republic of Congo, Djibouti, Ethiopia, Ghana, Guinea Bissau, Kenya, Liberia, Mali, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, and Zambia)
****After a close examination of the work-study, we found an error in the calculation of a number of the odds ratios, i.e., the reference category and the reported direction of the odds ratio. Results reported in this manuscript represent corrections to the odds ratio calculations
Participants from Guinea, Cameroon, Sierra Leone, Zaire/Democratic Republic of Congo, Cote d'Ivoire, Burkina Faso, Congo, Liberia, Mauritania
† Sierra Leone, Guinea, Mali, Gambia

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Supplementary Table 3: The odds ratios and proportions of the main determinants of FGM/C

	Wealth	Mother's education	Father's Education	Urban vs. Rural	Religion	FGM family history	Mother's occupation	Father's occupation	Mother's age	Whether religion requires FGM	Mother's knowledge on FGM	Mothers' perception of FGM	Mother's marital status
Nonterah, et al. [1]							**Unemployed: 62%** **Employed: 38%** **P-value <0.001**						
Sakeah, et al. [2]	Poor: Reference Middle: 0.98 (0.64-1.48) [a] Rich: 1.21 (0.80-1.85) [a]				Religions other than Islam: Reference Islam: 1.45 (0.73-2.91) [a]								
Greis, et al. [3]	Lowest quartile: Reference Second quartile: 0.58 (0.26-1.3) [a] Third quartile: 0.95 (0.63-1.5) [a] Fourth quartile: 0.78 (0.38-1.58) [a] Highest quartile 1.66 (0.90-3.8) [a]	None: Reference Primary: 0.67 (0.32-1.37) [a] **Post-primary: 0.17 (0.07-0.41)** [a] Not applicable/no mother: 1.47 (0.63-3.40) [a]	None: Reference: Primary: 0.77 (0.36-1.68) [a] Post-primary or higher): 0.77 (0.42-1.39) [a] Not applicable/no father:1.38 (0.61-1.39) [a]	Urban: Reference Rural: 0.83 (0.63-1.11) [a]	Muslim: Reference Catholic: 0.88 (0.55-1.41) [a] Animest: 1.15 (0.69-1.90) [a] **Protestant: 0.18 (0.05-0.63)** [a]					**Cutting required: 4.24 (2.05-8.76)** Do not know if cutting is required by religion: 1.20(0.52-2.78)			

Kandala and Shell-Duncan [4]	Richest: Reference **Poorest: 5.77 (4.55-7.33)** **Poorer: 3.35 (2.64 -4.27)** [a] **Middle: 2.16 (1.70-2.73)** [a] **Richer: 1.37 (1.05-1.79)** [a]			Urban: Reference **Rural: 0.78 (0.70-0.87)** [a]	Other than Muslims: Reference **Muslims: 2.52 (1.61-3.96)** [a]								
Kandala, et al. [5]	Middle: Reference Lower Quintile: 1.21 (0.76-1.99) Lowest quintile: 0.94 (0.58-1.59) Higher quintile: 0.86 (0.43-1.66) The highest quintile: 0.45 (0.18-1.00)	Higher: Reference No education: 1.25 (0.35-3.87) Primary: 0.71 (0.19-2.27) Secondary 0.76 (0.23-2.46)		Rural: Reference Urban: 1.31 (0.87-1.99)	Christian: Reference **Muslim: 5.50 (2.65-10.60)** [a] No religion: 1.10 (0.25-3.71) [a]	Mother is not subjected to FGM/C: Reference Mother is subjected to FGM/C: 1.97 (0.69-6.01) [a]	Mother's occupation is informal: 1.08 (0.61-1.9) Mother is not working: 0.62 (0.3-1.28) [a]		Wife's age is greater than husband: Reference Wife is 10 years younger than husband: 0.82 (0.44-1.77) Wife is 1-4 years younger: 0.79 (0.37-1.63) Wife is 5-9 years younger: 0.47 (0.23-1) Wife same age: 0.34 (0.12-1)	FGM required by religion: 1.5 (0.93-2.45) FGM not required by religion: Reference		Support discontinuation of FGM: Reference **Supports the continuation of FGM: 3.08 (1.76-5.55)** (Depends): 1.37 (0.49-3.26)	Currently married: Reference: Currently married: Reference Formerly married: 0.92 (0.79, 1.16) Never: 0.94 (0.59, 1.59)
Mudege, et al. [6]		**Mother with at least primary level: 0.13 (0.02-0.64)** [a]	Has primary education: 1.65 (0.32-8.41) [a]										
Milaat, et al. [7]	Not enough: Reference Enough or more: 0.5 (0.19-1.18)	Less than university: Reference University and above: 0.55 (0.27-1.14)	Less than university: Reference University and above: 0.6 (0.31-1.18)				Professional: 1.8(0.39-8.16) Not Professional: Reference	Professional:1.08(0.48-2.45) Not Professional: Reference	Above 18: Reference Age of mother at marriage is under 18 years 2.08 (0.69-6.29)				

Mitike and Deressa [8]											Knew at least one FGM complication: Reference Parents do not know any of FGM complications: 0.5 (0.2-1.2)		
Oljira, et al. [9]	Monthly income > 1600: Reference ≤600: 0.7(0.4-1.2) [a] Monthly income 601-1000: 1.0(0.6-1.7) [a] ETB 1001-1600: 1.4 (0.7-2.9) [a]	University level: Reference Unable to read and write: 1.1(0.5-2.8) [a] **Grade 1-4: 0.4 (0.2-0.9) [a]** Grade 5-8: 0.9 (0.4-2.1) [a] Grade 9-10: 1.3 (0.5-3.5) [a] Grade 10-12: 0.9 (0.4-2.3) [a]			Protestant: Reference Muslim: 0.9 (0.4-2.4) [a] Orthodox: 1.4 (0.7-3.0) [a] Catholic: 0.5 (0.1-2.3) [a]	**Mother subjected to FGM/C: 0.4 (0.2-0.8) [a]**			Less than 24: Reference **25-29: 0.3 (0.1-0.9) [a]** **30-34: 0.1 (0.0-0.5) [a]** **35-39: 0.1 (0.0-0.4)** **40-44: 0.0 (0.0-0.2) [a]** **45-49: 0.0 (0.0-0.1) [a]** **≥50: 0.1 (0.0-0.2) [a]**			Women do not know: Reference FGM should continue: 0.9 (0.2-4.7) FGM should not continue: 3.5 (0.8-15.9)	
Gajaa, et al. [10]	<555 birr: Reference, 556-1233 birr: 0.91 (0.65-1.51) [a] >1233 birr: 0.24 (0.05-1.24) [a]	Illiterate: Reference **Literate: 0.50 (0.28-0.91) [a]** Primary and above: 0.42 (0.12-1.42) [a]		Rural: Reference Urban**: 0.30 (0.17-0.51) [a]**	Mother's religion Orthodox: Reference Protestant: 0.98 (0.46-2.09) [a] **Traditional: 3.86 (1.14-13.07) [a]** Father's religion: Protestant Christian: 0.62 (0.29-1.34) [a] **Traditional: 0.22 (0.07-0.74) [a]**		Housewife: Reference Student: 2.19(0.27-18.24) [a] Merchant: 1.71 (0.65-4.52) [a] Civil Servant: 0.80 (0.15-4.30) [a]		15-29: Reference **30-39: 1.95 (1.15-3.31) [a]** **40-49: 2.56 (1.40-4.69) [a]**		Mother knew FGM was criminal: Reference **Mother does not know FGM was criminal: 5.00 (3.07-8.19)**	**Mother have a positive attitude on discouraging FGM: 0.26 (0.16–0.43)**	Mother is married: Reference Mother is single: 1.36 (0.64–2.89) [a]

Gebremariam, et al. [11]		Secondary: Reference **Illiterate: 2.4 (1.3-4.3)** [a] Primary: 0.96(0.5-1.7) [a]		Urban: Reference **Rural: 4 (2.4-6.8)** [a]	All Christian: Reference **Muslim: 3.7 (1.1-12)** [a]					**FGM required: 1.7 (1.07-2.8)** [a] Not required: Reference			
Yirga, et al. [12]	For mothers: Not owning a radio: Reference Ownership of a radio: 1.187 (0.67–2.07) For daughters: Ownership of a radio: 1.716 (0.98–3.00)			Urban: Reference **Rural: 0.116 (0.065–0.207).**									
Tamire and Molla [13]		High school and above: Reference **Under high school: 1.84 (1.10-3.38)** [a]	High school and above: Reference, **Under high school: 2.04 (1.25-3.09)** [a]	Urban: Reference, Rural**: 1.97 (1.25-3.09)** [a]	All Christians: Reference, **Muslims:4.21 (1.01-17.00)**		Currently employed: Reference, Farmer: 1.49 (0.63-3.53) [a]	Currently employed: Reference, Farmer: 1.2 (0.47-1.44) a					
Andualem [14]		Literate: Reference **Illiterate: 1.64 (1.24-2.36)** [a]	Literate: Reference **Illiterate: 1.78 (1.38-2.56)** [a]	Urban: Reference **Rural: 1.54 (1.09-2.50)** [a]					Parent's age ≥25: Reference Parent's age <25: 0.61 (0.52-1.86)		Mother knew negative impacts of FGM: 0.89 (0.68-1.49) Mother did not know FGM had a negative impact: Reference Mother did not know FGM was		Married mothers: Reference Single: 0.86 [0.66-1.96]

											criminalized: Reference Mother knew FGM was criminal: 0.78 (0.72-1.74)		
Elduma [15]	Poorest: Reference, **Second: 1.423 (1.237-1.635)** [a] **Middle: 2.614 (2.259-3.026)** [a] **Fourth: 1.543 (1.257-1.893)** [a] Richest: 0.897 (0.662-1.216) [a]			Rural: Reference, Urban: 1.03 (0.90-1.18) [a]		**Having a daughter subjected to FGM/C:36.8 (27.96-48.54)** [a]							
Dehghankhalili, et al. [16]						**Family history mother (94.6%)** **P-value<0.001** **Family history (sister): 66.4%** **P-value<0.001** **Family history (grandmother): 75%** **Having a mother, sister or grandmother subjected to FGM is significantly associated with the practice**							

						P-value <0.001							
Yasin, et al. [17]		Intermediate school and higher education: Reference Illiterate: 1.5 (0.9-2.6) Read and write: 1.4 (0.7-2.8) Primary: 1.3 (0.7-2.5) [a]	Intermediate school and higher education: Reference **Illiterate: 1.4 (1.1-1.9)** Read and write: 1.6 (1.02-2.5) Primary school: 1.3 (0.9-1.8) [a]			Mother not subjected to FGM/C: Reference **Subjected to FGM/C: 15.1 (10.6-21.6)** **Don't Know: 7.3 (4.4-12.0)** [a]							
Saleem, et al. [18]		High school/Higher: Reference **Basic education: 3.2 (1.5-6.6)** **None: 8.00 (3.8-16.5)** [a]											
Ali, et al. [19] (Egypt)		**Illiterate: 34.1%** **Elementary: 25.9%** **High: 40%** **Higher level of education is protective** **P-value<0.01**	**Illiterate: 22.4%** **Elementary: 25.9%** **High: 51.5%** **Higher level of education is protection** **P-value<0.01**	**Significant difference between urban & rural areas prevalence of FGC in urban is 31.8% whereas in rural it is 75.4%** **P<0.001**									
Ali, et al. [20] (Sudan)		**Less than secondary: 1.5 (1-2.2)[a]**	**More than secondary: Reference**	Urban: Reference		**Presence of sister subjected to FGM/C: 4.3 (3.1-5.9)[a]**	Housewife: 0.8 (0.5-1.5) [a]	Non-skilled worker: 0.7 (0.5-1.1) [a]					

			Less than secondary: 2.3 (1.5-3.4) [a]	Rural: 1 (0.7-1.6) [a]									
Arafa, et al. [21]		**Illiterate: Reference** **Literate OR:0.8**	**Illiterate: Reference** **Literate OR:0.91**	**Rural: Reference** **Urban OR: 0.55**									
Mohammed , et al. [22]				**Rural: 75% of type I; 66.7% of type II and 0% none.** **Urban: 25% of type I , 33.3% of type II FGM/C and 100% none.** **Statistically significant at P < 0.05**									
Abdel-Aleem, et al. [23]				Rural: Reference Urban: 1.09 (0.61-1.93)									
Ahmed, et al. [24]	Economic level low: 64.4% Intermediate: 68.7% High: 61.4% P-value: 0.7	Illiterate 58.6% Primary: 63.8% Preparatory: 70.3% Secondary: 69.8% He P-value: 0.8	Illiterate: 61.8% Primary: 65.4% Preparatory: 68.8% Secondary: 67.4% Higher: 67.5% P-value: 0.9	**Urban: 43%** **Rural: 91.8%** Significantly higher among those living in rural areas P-value: 0.0001	Muslim: 66.8%, Christian: 60.0% P-value: 0.6								

Rasheed, et al. [25]	High socioeconomic status: Reference **Low: 2.06(1.42-3.61)** Moderate: 1.13 (0.88-2.24) [a]	Educated: Reference **Illiterate: 2.16(1.33-2.95)** Can read and write: 1.26 (0.88-2.61) [a]	Educated: Reference Illiterate: 1.98(0.56-3.06) Can read and write: 1.36 (0.98-2.15) [a]	Urban: Reference, **Rural: 8.20 (2.77-6.21) [a]**	Christian: Reference, Muslim 1.04 (0.91-1.26) [a]	Mother not subjected to FGM: Reference **Mother subjected to FGM: 9.12 (2.11-14.09) [a]** **Presence of circumcised sisters: 6.28 (1.18-10.89) [a]**							
Chikhungu and Madise [26]		No education: Reference **Primary: 0.80 (0.69-0.92) [a]**		Urban: Reference **Rural: 1.61 (1.20-2.15) [a]**	Christian: Reference **Muslim: 2.13 (1.86-2.45)** **Traditional and other religions: 1.44 (1.14-1.82)** [a]								
Besera and Roess [27]		Primary: 1.08 (0.85-1.38) **Greater or equal to secondary: 0.54 (0.36-0.81)** [a]			Muslim: Reference **Christian: 0.60 (0.45-0.79) [a]**	**Respondent the mother has FGM: 8.59 (5.63-13.10) [a]**			Less than 20: Reference **20-29: 2.47 (1.39-4.40)** **30-39:5.54 (3.06-10.03)** **40-49: 11.90 (6.28-22.54) [a]**				

[23] Alosaimi, et al. [28] (Women)	Lowest tertile: Reference **Second tertile: 0.63 (0.55-0.72)** **Highest tertile: 0.61 (0.53-0.69)** [a] Housing quality: second quartile: 1.04(0.92-1.19) **Highest quartile:1.76(1.55-2.00)** [a]												
Alosaimi, et al. [28] (Daughter)	Lowest tertile: Reference **Second tertile: 0.68 (0.57-0.82)** **Highest tertile: 0.70 (0.59-0.85)** [a] Housing quality second quartile: 0.97 (0.81-1.17) Highest quartile: 1.18(0.99-1.41) [a]	**Lowest tertile: Reference** **Second tertile: 0.79 (0.66-0.94)** **Highest tertile: 0.82(0.69-0.97)**				**Mother subjected to FGM/C: 7.40 (6.01-9.13)** [a]			**Mother aged less than 20 years: Reference** **Aged 20-35: 1.82 (1.51-2.18)** **Aged 36-49: 1.82 (1.51-2.18)**			Mothers believing that the practice should not continue: Reference Should continue: 3.52 (3.10–4.00)	
Boyle and Svec [29]	**Poorest: Reference** **Poor: 0.72 (0.59-0.86)**	Less than primary: Reference Primary: 1.00 (0.84-1.2)		Rural: Reference, **Urban: 0.71 (0.55-0.90)**	**Islam: 4.11 (3.45-4.89)**	**Mother subjected to FGM/C: 33.58 (25.51-44.21)**	Mother earns cash: 0.99 (0.87-1.13)		Mother's age: 0.99 (0.98-1.00)				

	Middle: 0.72 (0.59-0.86) **Rich: 0.58 (0.47-0.71)** **Richest: 0.47 (0.36-0.61)**	**Secondary or higher: 0.62 (0.52-0.75)**											
Njoku, et al. [30]	**Social class: low: 47.2%** **Middle: 26.5%** **Upper 25%** **FGM was higher among those from low social class**												
Anikwe, et al. [31]	**Social class 1: 6.8%, Social class 2: 12.9%, Social class 3: 38.8%, Social 4: 38.3% social class 5: 15.3%, significant at social class 2 and 4** **P value:0.001**			**Urban: 54.8%** **Rural: 45.2%** **P value: 0.012** **The odds of a woman having FGM in the cohort of women residing in rural communities is 66% more than in the group in urban communities**									
Ashimi, et al. [32]		Formal education (primary or secondary): Reference **Informal education (Quranic form of education):**			**Islam: 49.8%** **Christianity: 0%** **P value: 0.001**		Mother not employed: Reference **Mother employed: 2.89(1.66-5.03)** [a]						

		6.39 (3.99-10.23) [a]											
Ifeanyichukwu, et al. [33]					Not significant, Islam: 28.9% Christianity: 25% African traditional religion (ATR): 10% P-value > 0.99								
Iliyasu, et al. [34]					Muslim: Reference, Christian: 1.27 (0.55-2.97) [a] P-value: >0.99								
Garba, et al. [35]			Not significant (Fathers having secondary education and above versus fathers having less than secondary education) P value: 0.18	Residence (Urban versus rural) Not significant P-value: 0.12	Not significant (Islam versus Christianity) P value: 0.19								
Koschollek, et al. [36]					Christian: Reference **Muslim: 3.44 (2.52-4.70)** No, other, or unknown religion: 1.24(0.63-2.43)								

Beller and Kröger [37]		**Mother's increased level of education: 0.72 (0.63-0.82)**	**Father's increased level of education: 0.75 (0.67-0.83)**					**Mother's increasing age: 1.12 (1.08-1.29)**				
Koukkula, et al. [38]					Other than Muslim: Reference **Muslim: 2.02 (1.12-3.63) [a]**							
Shay, et al. [39]		**Less than grade 10: 44.3%** **Grade 10 or higher and college level: 18.8%** **Significantly higher for girls of mothers who attained less than grade 10** **P-value: 0.001**	**Less than grade 10: 51.3%** **Grade 10 or higher and college level: 20.2%** **Significantly higher at grade 10+** **P-value: 0.001**				Mother employed: 22.2% Mother not employed: 28.8% Not significant P-value: 0.08	**Father employed: 24%** **Father not employed: 42.2%** **Significantly higher risk when the father is unemployed** **P-value: 0.009**		**Mother knew FGC has no religious grounds: 23%** **Mother did not know: 32.3%; significant** **P-value:0.03**	**Mother did not know that FGM was harmful: 24.4%** **Mother did not know that FGM was harmful: 50%** **Statistically significantly higher among mothers who do not know FGM is harmful** **P-value: 0.006**		
Bjälkander, et al. [40]				**Rural: Reference** **Urban : 1.98 (1.21-3.22) [a]**	**Christian: Reference** **Muslim: 2.0 (1.28-3.39) [a]**								

Rouzi, et al. [41]	**<≈US$1330: 42.3%** **≈US$1331–US$2665: 32.6%** **More than US$2665: 21.5%** **More wealth is a protective factor.**												
Akinsulure-Smith [42]					**Female Muslim participants had significantly higher rates of FGM/C compared to female Christian participants** **(4 out of 7 verses 2 out of 16)**								
Akinsulure-Smith and Chu [43]					Muslim: 87.9% Christian: 11.4% Other: 0.8% Religion P<0.001								
Sylla, et al. [44]		**Qur'anic: 2.75 (2.00-3.78)** **Illiterate: 1.05-1.39** **Primary: 1.244 (1.07-1.46)** **Secondary: 0.676 (0.58-0.79)** **Higher education:**	**Qur'anic 2.206 (1.68-2.9)** **Illiterate 1.236(1.02-1.5)** **Primary: 1.29 (1.07-1.56)** **Secondary: 0.78 (0.67-0.91)** **Higher education: 0.579 (0.49-0.69)**										**Parents married: 1.03 (1.01-1.06)** Parents divorced: 0.71 (0.23-2.24) Single: 0.58 (0.41-0.81) **Widowed: 6.00 (1.35-26.73)**

		0.289 (0.20-0.41)											
Ojo and Ijadunola [45]	Poorer1.04 (0.79-1.37) Middle:0.82 (0.58-1.18) Richer: 0.76 (0.53-1.10) **Richest 0.59 (0.39-0.82)**			Rural: reference Urban 1.12 (0.85-1.46)	Muslim 0.72 (0.39-1.33) Other Christians 0.55 (0.30-1.02) Catholic 0.59 (0.31-1.12)								
Chu and Akinsulure-Smith [46]	Not significant as reported by the authors												
Bogale, et al. [47]				**Urban: Reference** **Rural:3.31 (1.48-7.43)** [a]	**Protestant: Reference** **Muslim: 3.55 (1.35- 9.37)**[a] **Orthodox: 1.65 (0.61-4.40)**[a]								

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Supplementary Table 4: Other FGM determinants identified in included studies.

Determinant	Study	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	Proportions as reported by authors
Living grandmother	Ali, et al. [1]		**7.1 (4.6–10.8)**	
Living conditions	Im, et al. [2]		**Living separately from home**: **0.16 (0.05-0.52)**	
	Shay, et al. [3]			Live with father only: 34.8% Living with mother only: 32% **Living with both:** 12.4% Living with relatives: 48.5% → FGM statistically significantly lower when living with both parents P value: 0.001
Polyvictimization	Im, et al. [2]		**1.23 (1.07-1.40)**	
Village FGC rate (higher)	Greis, et al. [4]		**1.63 (1.40-1.90)**	
Percentage of Muslims in the village (higher)	Greis, et al. [4]	**1.24 (1.01–1.51)**		
Presence of community norms that are not significant: Domestic abuse	Kandala, et al. [5]			Not significant No: Reference Wife Beating for Going Out: 1.00 (0.68-1.45) Wife Beating for Neglecting the Children: 1.51 (1.06-2.2) Wife Beating for Arguing with the Husband: 1.03 (0.67-1.56)

				Wife Beating for Denying Husband Sex: 0.79 (0.53-1.19) Wife Beating for Denying Husband Food: 0.82 (0.48-1.36)
Cultural influence*	Andualem [6]	**1.60 (1.25-2.53)**		
Mother's decision-making and power	Kandala, et al. [5]	Mother owns house: 1.75 (1.14-2.86) Mother owns land: 0.75 (0.48-1.16) **Father Beats Mother** No: Reference Yes: 1.21 (0.77-1.82) Missing/Not available: 1.01 Who makes large household purchases? Alone: Reference Husband/Partner: 1.4 (0.85-2.13) With Husband/partner: 0.91 (0.57-1.41) Who decides on wife's expenditures? Alone: Reference Husband/partner: 0.52 (0.2-1.32) With her husband: 0.68 (0.39-1.18) Missing/not available: 0.9 (0.53-1.48)		

		<u>Who Makes Decision on Mother's Health</u> Alone: Reference Husband/Partner: 1.17 (0.77-1.86) With husband/partner: 0.92 (0.62-1.41)		
	Boyle and Svec [7]			Mother's autonomous decisions: 1.02 (0.95-1.10) Mother takes joint decision: 0.98 (0.93-1.03)
Parent's increased age	Mitike and Deressa [8]		**6.65 (2.6-16.7)**	
Father's increased age	Beller and Kröger [9]	1.10 (1.06-1.13)		
Father's religion	Gajaa, et al. [10]	Orthodox: Reference Protestant Christian: 0.62 (0.29-1.34). **Traditional: 0.22 (0.07-0.74)**		
Participation in anti-FGM activities	Mitike and Deressa [8]	Participation of the parents in anti-FGM activities: **0.3 (0.2-0.6)**		
	Andualem [6]	**Participation in anti FGM interventions: 0.42 (0.29-0.62)** **Received health education on FGM: 0.39 (0.38-0.76)**		
	Mudege, et al. [11]		Since birth: Reference	

Movement from one area to another			Came to Demographic Surveillance Area: 1.50 (0.53-4.30)	
	Mbanya, et al. [12]		**Age at migration to Norway is ≥12 years: 4.78 (1.53-15.00)** Age at migration to Norway is 0-11 years: Reference	
Health system related factors	Koschollek, et al. [13]	**No health insurance or medical treatment voucher for asylum seekers or unknown: 1.6 (1.13-2.25)**		
	Ashimi, et al. [14]	Type of health facility where the infants received care Primary healthcare facility: Reference Secondary facility: 0.73 (0.45-1.18) **Tertiary healthcare facility: 0.49 (0.26-0.92)**		
Other religion related factors	Beller and Kröger [9]	**Mother's private prayer frequency: 0.93 (0.87-0.99)** **Father's private prayer frequency: 0.92 (0.87-0.98)** Perceived religious suppression: Mother: 1.03 (0.88-1.19) Father: 1.10 (1.06-1.13) Parent's religion (unaffiliated as the reference group)		

		Mother Christian Affiliation: 0.47 (0.25-0.90) Father Christian Affiliation: 1.06 (0.59-1.90) **Mother Traditional Affiliation: 10.57 (4.79-23.31)** **Father Traditional affiliation: 9.78 (5-18.78)** Mother Muslim affiliation: 0.79 (0.41-1.52) Father Muslim Affiliation: 1.66 (0.91-3.02) <u>Governmental unfairness towards one's own religious group</u> **Mother: 1.18 (1.08-1.29)** **Father: 1.24 (1.15-1.35)** Father's religious service attendance: 0.98 (0.87-1.09) Mother's religious service attendance: 1.10 (1.02-1.18)		
Consanguinity	Alosaimi, et al. [15]		<u>Odds of experiencing FGM among daughters</u> **Marriage with a second cousin or closer: 1.18 (1.03-1.35)**	
	Milaat, et al. [16]	No parental consanguinity: Reference		

		Parental Consanguinity: 1.7 (0.86-3.3)		
Family factors	Sylla, et al. [17]	**For girls from a polygamous household: 1.37 (1.23-1.53)** Mothers in a monogamous union: 0.78 (0.72-0.85) **Belonging to big family:** **1.37 (1.28-1.47)** Belonging to nuclear family: 0.59 (0.53-0.67)		
	Kandala, et al. [5]	**Mother is in a polygamous union:1.23 (0.86-1.69)** **Marriage by arrangement: 0.89 (0.65-1.2)**		
Child marriage	Alosaimi, et al. [15]		Odds of experiencing FGM among daughters Underage marriage: **1.60 (1.38-1.84)**	
Maternal place of birth or origin	Abolfotouh, et al. [18]			**FGM prevalence among females of rural origin: 25%** **FGM prevalence among females of non-rural origin: 10.8% (P=0.001)**
	Iliyasu, et al. [19]		Geographic origin: North-west: Reference Northeast: 0.87 (0.41-2.70)	

			North central: 1.23 (0.54-5.03) **South-west: 2.31 (1.13-2.14)** **Southeast or South-South: 3.78 (1.21-4.99)**	
	Gibson-Helm, et al. [20]			FGM/C among women from North Africa North Africa Non-humanitarian source countries group: 0.5% North Africa HSC: 5.1% P-value <0.001 Among women from Middle and East Africa Middle and East Africa non- HSCs: 0.3% Middle and East Africa HSCs: 13.8% P-value <0.001 Among women from West Africa West Africa HSCs: 3.3%, West Africa Non-HSCs: 6.7% P-value=0.65
	Yasin, et al. [21]	Urban: Reference Rural: 1.0 (0.8-1.2)		
Maternal Origin	Minsart, et al. [22]			Maternal Origin P value<0.00001

				Djibouti-Somali: 1.7% No FGM, 0.2% for type I FGM, 58.2% for type II, and 40% for infibulated Djibouti-Afar: 0% No FGM, 6.7% for Type I, 40% for type II, 53.3% for infibulated Djibouti Arabic: 21.2% No FGM, 3% for type I, 57.6% for type II, 18.2% for infibulated Somalia: 0% No FGM, 0% for type I, 38.5% for type II, and 61.5% for infibulated Ethiopia: 28% No FGM, 16% for type I, 52% for type II, and 4% for infibulated Yemen: 28.6% No FGM, 0% for type I, 74% for type II, and 0% for infibulated
Residence	Zayed and Ali [23]			<u>Residence (of the participant subjected to FGM/C)</u> Giza: 64.4% Cairo: 62.5% P- value: 0.781
	Abdulah, et al. [24]			Governorate of residence was significantly associated with FGM among daughters P value <0.001
Nationality	Rouzi, et al. [25]			**Saudi: 49.7%** **Saudi (natural): 13.1%** **Non-Saudi: 37.2%** **P value <0.001**

Immigration status	Akinsulure-Smith and Chu [26]			**Undocumented: 43.7%** **Refugee, asylee, TPS, withholding of removal: 10.1%** **Has applied or intends to apply for asylum: 29.5%** **US citizen, permanent resident, valid visa: 4.7%** **Others: 8.5%** ➔ **Statistically significantly higher among undocumented** **P value<0.001**
Living in camp	Im, et al. [2]		**Living outside the camp: Reference** **Living in camp: 1.54 (0.5-4.74)**	
Duration of stay in the camp	Mitike and Deressa [8]		Duration of stay in the camp <10 years: Reference Duration of stay in the camp >10 years: 0.5 (0.1-1.5)	
Islamic sects	Dehghankhalili, et al. [27]			**Shiaa Islam: 51.4%** **Sunni Islam: 48.6%** **P-value: 0.019**

*Defined as normal community practices. Results highlighted in bold are statistically significant.

Brackets report 95% Confidence intervals.

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