

Female Genital Mutilation/Cutting in Sudan and Subsequent Pelvic Floor Dysfunction.

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Abstract

Background: We aimed to evaluate the socio-demographic characteristics of women with female genital mutilation/cutting (FGM/C) and the results of FGM/C due to pelvic floor dysfunction.

Results: The prevalence of FGM/C was 87,2% in Sudan and Type 3 (50.4%) was the most prevalent. Type 3 (50.4%) was the most prevalent, followed by Type 2 (35%) and Type 1 (8.5%). In the multinomial logistic regression analysis performed for the effect of FGM/C alone on pelvic organ prolapse, it was observed that FGM/C in group 2 was not statistically different when the reference category was taken as group 1. In the evaluation for symptomatic POP (group 3), compared to type 3 FGM/C, there was a significantly less risk of developing POP in patients without FGM/C at a rate of 82.9% (OR(odds ratio): 0,171 (p:0,002), (Confidence Interval (CI) %95; 0,058-0,511), in patients with type 1 FGM/C at a rate of 75% (OR:0,250 (p:0,005), CI %95; 0,094-0,666) and in patients with type 2 FGM / C at a rate of 78.4% (OR:0,216 (p:0,0001), CI%95; 0,115-0,406).

In the multinomial logistic regression analysis performed by including other variables affecting POP when group 1 was taken as the reference category, we found that the possibility of developing mild POP (group 2) decreased in FGM/C type 1 and 2 compared to FGM/C type 3 but it was not statistically significant. However, the evaluation for symptomatic POP showed up a significantly lower risk of developing POP in patients with type 2 FGM/C at a rate of 58.4%, compared to type 3 FGM/C (OR:0,416 (p:0,016), CI%95; 0,205-0,847). In addition, older age and being unemployed were found to be significant risk factors for increasing symptomatic POP (p:0,004, p:0,045; respectively).

Conclusions: Female genital mutilation/cutting (FGM/C) defined by the World Health Organization and consists of all procedures that involving partial or total removal of the external female genitalia or another injury to the female genital organs whether for cultural or other non-medical reasons. Especially type 2 and 3 FGM/C continues to be an important health problem in terms of complications that may develop in advanced ages as well as many short-term complications as a result of mechanical or physiological deterioration of the female genital anatomy.

Background

World Health Organization (WHO) has described female genital mutilation/cutting (FGM/C) as including all procedures of removal of the external female genitalia partially or totally or any injury to the female genital organs for cultural or any other non-medical reasons (1). The word 'mutilation' emphasizes the violence of the practice (2). Four different Types of FGM/C has been defined by WHO depending on which genital tissue has been removed; Type I (Sunna, mild): Partial or total removal of the preputium with or without clitoris, Type 2 (excision, moderate): Clitoridectomy and partial or total excision of the labia minora, Type 3 (infibulation, severe): Removal of the complete external genitalia and narrowing of the vaginal opening to a small orifice, Type 4 (Unclassified): other harmful procedures to the female genitalia as piercing, pricking (1, 2).

Although the prevalence of FGM/C worldwide is unknown, it has been practiced to more than 200 million women in 30 countries in Africa, the Middle East and Asia and is still ongoing practice (1). FGM/C have also been reported from the other world countries such as United States, Spain, South America due to widespread migration (2) and widely prevalent in many Muslim countries although Islam or any religion does not command FGM/C (3–5). The prevalence rates of FGM/C vary considerably in African countries and the highest rate of FGM/C was reported in Somalia (98%) and Guinea (97%) (6). In a recent survey study of 21947 Sudanese women, the prevalence of FGM/C was 89% in Sudan (7). The type of procedure performed also varies with ethnicity (2).

FGM/C is thought to be a tribal tradition or an Islamic imperative and several studies have reported the reason of why a girl consider FGM/C is to have a more honorable social life, to preserve the virginity and to become a mature woman for a safe marriage (7, 8). Moreover, it is believed that FGM/C provides hygiene and makes women more cleaner and beautiful and FGM/C prevalent societies enforced to do it as a prerequisite for marriage (9). Accurately, FGM/C is a violation of the basic human rights and WHO and UNICEF stand against FGM/C based on its negative impact on womens health (10).

FGM/C / C is widely performed by midwives to girls between the ages of 6 and 12 without any anesthesia and antibiotics in Sudan (11). It is well-known that FGM/C is a harmful procedure and causes many short-term and long-term health consequences based on Type of FGM/C. The short-term physical complications include; severe pain, swelling of genital tissue, infection or tetanus due to unhygienic conditions and unsterilized instruments, fever, acute haemorrhage and related haemorrhagic shock and death, failure to wound healing, acute urine retention and related urinary tract infection, damage to adjacent tissue of the vagina, urethra and rectum,

fracture or dislocation of femur or humerus and serious psychosocial and sexual function impairments (1, 2). The long-term consequences include; recurrent/chronic urinary tract, pelvic and vaginal infections, painful urination, incontinence, female sexual dysfunctions (dyspareunia, reduced sexual sensitivity, female orgasmic disorders, vaginismus, vaginal penetration difficulties), menstrual problems (dysmenorrhoea, haematocolpos), infertility, keloid scar, epidermoid inclusion cyst and neuroma of the clitoris, abscesses on the vulva, vesico-vaginal or recto-vaginal fistulae, childbirth complications (post-partum haemorrhage, deep tearing of the perineum, prolonged and obstructed labour, fistula, inertia or rupture of the uterus, increased risk of emergency caesarean section and maternal death), perinatal risks (need to resuscitate, stillbirth), pelvic organ prolapse, need later surgeries (deinfibulation, clitoral reconstruction, urogynecological procedures), psychological consequences (depression, anxiety, post-traumatic stress disorder) (1–4, 12–16). All these risks increase with the severity of the FGM/C procedure (16). Deinfibulation and clitoral reconstruction allows intercourse or to facilitate childbirth and improves both sexual function and genital anatomy (5, 17). As the severity of FGM/C increases, pelvic floor weakness and pelvic floor disorders occur in the long term, both due to procedural injury of pelvic tissues and consequences of FGM/C procedure like difficult deliveries. Loss of pelvic floor support causes various degrees of pelvic organ prolapse, incontinence, and anatomical distortion of lower urinary tract, ureteral kinking and finally hydronephrosis.

Although there are multiple studies about the psychological and obstetric consequences of FGM/C, only a few studies have been conducted on urogynecological outcomes (13, 18, 19). There are no studies evaluating the association between the stage of pelvic organ prolapse and FGM/C Types, and this issue was expected to be clarified in the present study. The aim of this presented study was to investigate the impact of different types of FGM/C on pelvic floor disorders such as pelvic organ prolapse and related hydronephrosis, and incontinence.

Material And Methods

4320 women who applied to the Sudan Nyala Turkish Hospital Gynecology and Obstetrics outpatient clinic between January 2018 and January 2019 were asked about any prolapsus of genital organs and 528 women with pelvic organ prolapsus were included in the study and classified according to the Baden–Walker Halfway scoring system. This study was conducted retrospectively and single center and approved by the Ethical Review Committee of Sudan Nyala Turkish Hospital, Sudan (Ethics Committee Decision Date - No: 26.06.2018–45/4743). Pregnant women, women under 18 years old, women without uterine or genital prolapse and women who had a history of prior pelvic surgery, another treatments using like pessary for POP and women with FGM/C type 4 were excluded from the study.

Baden–Walker half way consists of four grades: grade 0 – no prolapse, grade 1 –halfway to hymen, grade 2 – to hymen, grade 3 – halfway past hymen, grade 4 –maximum descent. In our study, patients without prolapse (grade 0) were group 1; patients with grade 1 and 2 POP but asymptomatic cases (without urinary incontinence, dyspareunia, dysuria and frequent urinary tract infection) were group 2 and severe symptomatic cases (grade 3 and 4 POP) were group 3.

Four different Types of FGM/C has been defined by WHO depending on which genital tissue has been removed (1).

Type I (Sunna, mild): Partial or total removal of the preputium with or without clitoris

Type 2 (excision, moderate): Clitoridectomy and partial or total excision of the labia minora

Type 3 (infibulation, severe): Removal of the complete external genitalia and narrowing of the vaginal opening to a small orifice

Type 4 (Unclassified): Other harmful procedures to the female genitalia as piercing, pricking

Patients with FGM/C were classified into 3 groups according to the World Health Organization (WHO) 's typing of FGM/C, and 32 patients without FGM/C were included as the control group. A total of 528 patients and 4 groups were included in the study and variables were compared. Demographic and clinical characteristics of the patients, age, parity, Type of birth, comorbidity, incontinence, smoking, living area, job, educational status, menopausal status were recorded using patient files and hospital system. Body mass index (BMI) of patients was calculated in kg / m² and grouped as < 25 and ≥ 25.

For descriptive statistics, the mean, standard deviation, median, min-max values and frequencies were used, depending on whether there was a normal distribution or not. Statistical significance between categorical variables was determined by Chi-Square (χ^2) test. Normal distribution for numerical data was made using the Kolmogorov-Smirnov test. For numerical data, parametric or non-parametric tests were used according to the normal distribution state. Kruskal-Wallis test was used to analyze the age difference

between the groups. Univariate Multinomial logistic regression analysis was used for the relationship between FGM/C and pelvic organ prolapse, taking Group 1 (non-POP cases) as the reference category. Multivariate multinomial logistic regression analysis was performed by adding variables such as education (yes, no), residence (rural, urban), age, job (yes, no), parity (yes, no), smoking (yes, no), BMI (< 25, ≥ 25), menopausal status (yes, no). The data was analyzed by using Statistical Package for the Social Sciences (SPSS)-23.0 program. P values in all tests are two-sided, and p-value less than 0.05 was considered to be statistically significant.

Results

The number of women with female genital mutilation/cutting (FGM/C) was 3767 out of 4320 women. The prevalence of FGM/C among all women in Sudan was 87,2%. The prevalence of FGM/C among 528 women with pelvic floor dysfunction was 87%. The demographic and clinical characteristics of the patients were shown in Table 1. 496 patients with FGM/C were divided into 3 groups according to the WHO's classification; 45 patients (8.5%) were FGM/C Type 1, 185 patients (35%) were Type 2 FGM/C, 266 patients (50.4%) were Type 3 FGM/C. 32 (6.1%) patients with no cutting were determined as the control group. Regarding the type of FGM/C performed, Type 3 was the most prevalent, followed by Type 2 and Type 1.

Table 1
Demographic And Clinical Features Of POP Patients

		No POP (Group 1) (n: 69)	Mild POP (Group 2) (n: 230)	Severe POP (Group 3) (n: 229)	Total (n: 528)	<i>P-value</i>
Age (median/min-max)		42(32–65)	44(31–88)	49(30–91)		0,001 ^a
BMI (kg/m ²)	< 25	25(4,7%)	74(14%)	29(5,5%)	128(24,2%)	0,001 ^b
	≥ 25	44(8,3%)	156(29,5%)	200(37,9%)	400(75,8%)	
Job	No	43(8,1%)	135(25,6%)	93(17,6%)	271(51,3%)	0,001 ^b
	Yes	26(4,9%)	95(18%)	136(25,8%)	257(48,7%)	
Parity	No	7(1,3%)	15(2,8%)	6(1,1%)	28(5,3%)	0,027 ^b
	Yes	62(11,7%)	215(40,7%)	223(42,2%)	500(94,7%)	
Urinary Incontinence	No	29(5,5%)	122(23,1%)	26(4,9%)	177(33,5%)	0,001 ^b
	Yes	40(7,6%)	108(20,5%)	203(38,4%)	351(66,5%)	
HUN	No	41(7,8%)	109(20,6%)	34(6,4%)	184(34,8%)	0,001 ^b
	Yes	28(5,3%)	121(22,9%)	195(36,9%)	344(65,2%)	
Smoking	No	68(12,9%)	214(40,5%)	205(38,8%)	487(92,2%)	0,041 ^b
	Yes	1(0,2%)	16(3%)	24(4,5%)	41(7,8%)	
Assisted vaginal delivery	No	45(8,5%)	163(30,9%)	62(11,7%)	270(51,1%)	0,001 ^b
	Yes	24(4,5%)	67(12,7%)	167(31,6%)	258(48,9%)	
Delivery method	No	7(1,3%)	15(2,8%)	6(1,1%)	28(5,3%)	0,001 ^b
	VD	52(9,8%)	170(32,2%)	201(38,1%)	423(80,1%)	
	C/S	10(1,9%)	45(8,5%)	22(4,2%)	77(14,6%)	
Parity	No	7(1,3%)	15(2,8%)	6(1,1%)	28(5,3%)	0,001 ^b
	1	22(4,2%)	65(12,3%)	30(5,7%)	117(22,2%)	
	2–5	38(7,2%)	138(26,1%)	95(18%)	271(51,3%)	
	≥ 5	2(0,4%)	12(2,3%)	98(18,6%)	112(21,2%)	
Residence	Rural	43(8,1%)	153(29%)	165(31,3%)	361(68,4%)	0,227 ^b
	Urban	26(4,9%)	77(14,6%)	64(12,1%)	167(31,6%)	
Educational status	No	32(6,1%)	112(21,2%)	125(23,7%)	269(50,9%)	0,324 ^b
	Read and write	37(7%)	118(22,3%)	104(19,7%)	259(49,1%)	
Menopausal Status	No	54(10,2%)	151(28,6%)	120(22,7%)	325(61,6%)	0,001 ^b
	Yes	15(2,8%)	79(15%)	109(20,6%)	203(38,4%)	
Baseline comorbidity	No	68(12,9%)	219(41,5%)	177(33,5%)	464(87,9%)	0,001 ^b
	Yes	1(0,2%)	11(2,1%)	52(9,9%)	64(12,2%)	

		No POP (Group 1) (n: 69)	Mild POP (Group 2) (n: 230)	Severe POP (Group 3) (n: 229)	Total (n: 528)	<i>P-value</i>
FGM/C type	No	7(1,3%)	16(3%)	9(1,7%)	32(6,1%)	0,001 ^b
	Type 1	8(1,5%)	22(4,1%)	15(6,6%)	45(8,5%)	
	Type 2	34(6,4%)	96(18,2%)	55(10,4%)	185(35%)	
	Type 3	20(3,8%)	96(18,2%)	150(28,4%)	266(50,4%)	
POP: Pelvik Organ Prolapsus						
BMI: Body Mass Index.						
HUN: Hydroureteronephrosis						
VD: Vaginal delivery						
C/S: Cesarean section						
FGM/C: Female Genital Mutilation/Cutting						
a: Kruskal-wallis						
b: Chi-square						
The median age of symptomatic patients (group 3) was 49 (min: 30-max: 91), and it was significantly higher than the other groups (p:0,001).						
The number of patients living in rural areas was higher in all 3 groups, the highest rates of POP were among housewives and unemployed women.						

There was a significant difference between the groups in terms of BMI and menopausal status (sirasıyla p: 0,001 ve p:0,001). It was observed that symptomatic POP was more common in patients who gave birth (p:0,027) and as the parity increased, the frequency of POP increased (p:0,001). Approximately 80.1% of the patients had a normal vaginal delivery (p: 0.001), 258 of them had a history of assisted vaginal delivery (p: 0.001). 92.2% of our patients in the study were non-smokers. The frequency of incontinence increased among the groups as the degree of pelvic organ prolapse increased (p: 0,001). The frequency of hydronephrosis in group 3 POP cases was significantly different from the other groups (p:0,001). No statistical difference was found between the POP groups in terms of the patients' residence and education level (p: 0,227, p: 0,324; respectively). It was observed that Type 3 FGM/C was performed in 266 patients, and it was the largest group in group 3 patients with a rate of 28.4% (p:0,001).

In the multinomial logistic regression analysis performed for the effect of FGM/C as only variable on pelvic organ prolapse, it was observed that FGM/C in group 2 was not statistically different when the reference category was taken as group 1. It was observed that symptomatic POP (group 3) was statistically significantly reduced in other types compared to Type 3 FGM/C (respectively, No-FGM/C OR(odds ratio): 0,171 (p:0,002), (Confidence Interval (CI) %95; 0,058 - 0,511), FGM/C tip 1 OR:0,250 (p:0,005), CI %95; 0,094 - 0,666), FGM/C tip 2 (OR:0,216 (p:0,0001), CI%95; 0,115-0,406) (Table 2). In the evaluation for symptomatic POP (group 3), compared to type 3 FGM/C, there was a significantly less risk of developing POP in patients without FGM/C at a rate of 82.9% (OR(odds ratio): 0,171 (p:0,002), (Confidence Interval (CI) %95; 0,058 - 0,511), in patients with type 1 FGM/C at a rate of 75% (OR:0,250 (p:0,005), CI %95; 0,094 - 0,666) and in patients with type 2 FGM / C at a rate of 78.4% (OR:0,216 (p:0,0001), CI%95; 0,115-0,406) (Table 2).

Table 2
Relationship of FGM/C types with POP as a single variable.

POP group		B	SE	P-value	Unadjusted OR	95% Confidence interval	
						Lower	Upper
Group 2	No FGM/C	-0,742	0,516	0,150	0,476	0,173	1,308
	FGM/C type 1	-0,557	0,480	0,246	0,573	0,222	1,469
	FGM/C type 2	-0,531	0,317	0,094	0,588	0,316	1,094
	FGM/C type 3	-	-	-	-	-	-
Group 3	No FGM/C	-1,764	0,557	0,002	0,171	0,058	0,511
	FGM/C type 1	-1,386	0,498	0,005	0,250	0,094	0,666
	FGM/C type 2	-1,534	0,323	0,0001	0,216	0,115	0,406
	FGM/C type 3	-	-	-	-	-	-
POP: Pelvik organ prolapsus							
FGM/C: Female genital mutilation/Cutting							
SE: Standart error							
B: Coefficient							
The reference category is: Group 1							

In the multinomial logistic regression analysis performed by including other variables affecting POP when group 1 was taken as the reference category, we found that the possibility of developing mild POP (group 2) decreased in FGM/C type 1 and 2 compared to FGM/C type 3 but it was not statistically significant. However, we found that the effect of type 2 FGM/C on severe symptomatic POP was statistically significantly less than FGM/C type 3. (OR:0,416 (p:0,016), CI%95; 0,205-0,847) (Table 3). However, the evaluation for symptomatic POP showed up a significantly lower risk of developing POP in patients with type 2 FGM/C at a rate of 58.4%, compared to type 3 FGM/C (OR:0,416 (p:0,016), CI%95; 0,205-0,847). In addition, older age and being unemployed were found to be significant risk factors for increasing symptomatic POP (p:0,004, p:0,045; respectively) (Table 3).

Table 3
Relationship between multivariate multinomial logistic analysis and POP

POP Group		B	SE	P-value	Adjusted OR	95% Confidence interval	
						Lower	Upper
Group 2	No FGM/C	-0,505	0,620	0,416	0,604	0,179	2,035
	FGM/C type 1	-0,445	0,615	0,470	0,641	0,192	2,140
	FGM/C type 2	-0,401	0,351	0,253	0,669	0,336	1,332
	FGM/C type 3	-	-	-	-	-	-
	Parity No	-0,478	0,547	0,382	0,620	0,212	1,812
	Parity Yes	-	-	-	-	-	-
	BMI < 25	0,312	0,383	0,415	1,366	0,645	2,892
	BMI ≥ 25	-	-	-	-	-	-
	Job No	-0,016	0,296	0,956	0,984	0,551	1,756
	Job Yes	-	-	-	-	-	-
	Smoking No	-1,608	1,049	0,125	0,200	0,026	1,565
	Smoking Yes	-	-	-	-	-	-
	Rural	0,153	0,298	0,607	1,166	0,650	2,09
	Urban	-	-	-	-	-	-
	Education No	0,145	0,290	0,617	1,156	0,655	2,039
	Education Yes	-	-	-	-	-	-
	Menopause No	-0,530	0,364	0,146	0,589	0,288	1,202
	Menopause Yes	-	-	-	-	-	-
	Age (continous)	0,004	0,018	0,826	1,004	0,970	1,039
Group 3	No FGM/C	-0,162	0,700	0,818	0,851	0,216	3,357
	FGM/C type 1	0,488	0,693	0,482	1,629	0,418	6,338
	FGM/C type 2	-0,877	0,362	0,016	0,416	0,205	0,847
	FGM/C type 3	-	-	-	-	-	-
	Parity No	-0,887	0,662	0,180	0,412	0,112	1,508
	Parity Yes	-	-	-	-	-	-
	BMI < 25	-0,752	0,469	0,109	0,472	0,188	1,181
	BMI ≥ 25	-	-	-	-	-	-
	Job No	-0,613	0,306	0,045	0,542	0,297	0,987
	Job Yes	-	-	-	-	-	-
	Smoking No	-1,744	1,050	0,097	0,175	0,022	1,369
	Smoking Yes	-	-	-	-	-	-
	Rural	0,109	0,316	0,731	1,115	0,600	2,073
	Urban	-	-	-	-	-	-

	95% Confidence interval					
Education No	0,279	0,304	0,358	1,322	0,729	2,396
Education Yes	-	-	-	-	-	-
Menopause No	-0,173	0,385	0,653	0,841	0,396	1,788
Menopause Yes	-	-	-	-	-	-
Age (continuous)	0,052	0,018	0,004	1,054	1,017	1,091
POP: Pelvik organ prolapsus						
FGM/C: Female genital mutilation/Cutting						
BMI: Body Mass Index						
SE: Standart error						
B: Coefficient						
Adjusted odds ratio: was used for; age, job (yes, no), parity (yes, no), smoking (yes, no), BMI (< 25, ≥ 25), Menopausal Status (yes, no), Educational status (yes, no), Residence (rural, urban)						
The reference category is: Group 1						

Discussion

It is seen that as the severity of FGM/C increases, the incidence of symptomatic POP (group 3) increases. Development of symptomatic POP (group 3) in patients with type 3 FGM/C was approximately 17 times higher than in patients without FGM/C, when group 1 was taken as reference. In the multivariable analysis, it was observed that type 3 FGM/C caused symptomatic POP approximately 2.4 times more than type 2 FGM/C. Our study revealed that FGM/C had a significant relation with symptomatic POP.

Severe FGM/C (especially type 3), which is performed at an early age before the development of the genital organs, disrupts the mechanical structure and dynamism of the endopelvic fascia and causes anatomical defects, also frequent and chronic infections play an important role in the formation of POP. In addition, factors that impaired the support of the pelvic endopelvic fascia such as delivery (operative vaginal delivery), malnutrition and menopause are known to cause POP. Therefore, it is a logical approach to consider the association between FGM/C, which practices at the juvenile period (most often FGM/C is performed in the 2–8 age range) traumatically to the genital area and causes psychological effects, and POP in the African population.

United Nations, World Health Organization, Amnesty International, and various world states try to end the practice which they call "genital mutilation", and which is extremely harmful to the health of the woman and her future children. They react to the impairment of the female genital anatomy as a result of any type of FGM/C and even the distinction between female and male circumcision, and they want both practices to be prevented (1, 2, 6).

Thanks to the recent effective measures of all these international organizations, practicing severe FGM/C types such as type 2 and 3 have been reduced by the awareness of the societies especially the new generation young women of the harms of this practice. It is not surprising that the type 3 FGM/C patients in our study were older and had more symptomatic POP. Especially in these groups where younger age FGM/C ratios are low, simpler excision methods such as type 1 are used and pelvic anatomy is exposed to less trauma, POP, and related complications are seen lower.

Female genital mutilation/cutting (FGM/C) is still commonly practiced and associated with serious health problems in women's life. The prevalence of FGM/C vary across and within countries. In a prospective study in 2006 by WHO, including 28 obstetric centers of 6 African countries and 28393 women, the prevalence of FGM/C was reported 82% in Sudan (16). In our study, the prevalence of FGM/C was found to be 87.2%, consistent with recent studies that reported prevalence of FGM/C in Sudan was 89% (7), 87.9% (15) and 80.2% in another study (20). Considering the FGM/C Types, we found Type 3 FGM/C to be the most common, consistent with the studies conducted in Sudan (16, 21, 22). Regarding ethnicity and changing mentality, in some communities Type 1 FGM/C is practiced most

frequently (3, 13, 23). Advanced invasive procedure carries out severe complications, so type 3 is the most associated type with complications.

This presented study was done in a FGM prevalent country, Sudan, and was designed specifically to investigate the relation between different types of FGM and pelvic floor dysfunction. The median age of participants was 49 years (min:30-max:91) in the study and higher than other studies on FGM/C (3, 16), as it is a study conducted among women with pelvic floor disorders. If we consider the types according to age in our study, we realized that the new generation prefers the less complicated Type of FGM/C due to awareness of the practice. 50% of the no FGM/C group and 77.8% of the Type 1 FGM/C group were women under the age of 40. Women aged 70 and over had Type 3 FGM/C most frequently (84.6%). Older age was associated with both increased FGM/C rates (24, 25) and more complicated types of FGM/C (Type 2, 3). The reason is that almost all women in the past had to embrace female circumcision, and it was difficult or impossible to come across a woman who had not practiced. However, FGM/C had declined among youth, possibly due to human rights and legal protection, and even due to imposed prison sentences, FGM is now performed in secrecy in some communities or none at all.

Our study demonstrated that FGM/C was more prevalent among women living in rural areas in accordance with the literature (7, 26). As shown in many studies we found that non-employed and non-educated women were more likely to have undergone FGM/C and the significance of women's education to eradicate the practice of FGM/C is obvious (3, 7, 14, 27, 28). FGM/C practice rates decreased after the introduction of national training programs, and the availability of guidelines for FGM/C management for healthcare professionals and the general population.

The relationship between FGM/C type and the occurrence of delivery-related problems was statistically significant in our study. In accordance with various studies, women with FGM/C Type 3 were significantly more likely to undergo cesarean section (C/S) with a rate 33.8%, followed by Type 2 (10.8%) and Type 1 did not increase the risk for C/S. Wuest et al reported higher risk for emergency C/S and deep vaginal tears in circumcised women, WHO reported significantly higher C/S and episiotomy rates among women with type 2 and 3 FGM/C and type 1 was ineffective on C/S rates (16, 29). Only a study declared that FGM/C had no risk for delivery except perineal tearing (30). Spontaneous vaginal delivery was most frequent with a range of 53.1% in no cutting group. Among assisted vaginal delivered women, episiotomy with or without vacuum or forceps was highly prevalent in women with FGM/C than women without FGM/C. Episiotomy without vacuum or forceps was most common in FGM/C Type 1 group (62.2%), and episiotomy with vacuum or forceps was most common in FGM/C Type 3 group (13.1%). These findings were supported by Yassin et al with an episiotomy rate of 76.5% (21). FGM is usually performed in girls younger than 10 years old and even the least invasive type causes varying amounts of scar formation. The presence of this less elastic scar tissue causes varying degrees of perineal and vaginal tears during childbirth. Even, Birge et al. have presented a large epidermal inclusion cyst of the clitoris, an intensive scarring mass, in a woman with type 3 FGM/C, blocking urination and sexual functions due to genital anatomical disruption caused by repetitive episiotomies and deinfibulations (31). Complications of FGM/C are ranging from prolonged labor, assisted delivery, postpartum hemorrhage, difficulty in urination, urinary tract infections, hydronephrosis, kidney failure, urogenital fistula to maternal and infant death. As a result, prolapse and related complications increase due to defects on the muscles and fascia of the genitalia and pelvic floor, after the deterioration of the genital anatomy and complicated deliveries. Sudan is still one of the highest prevalent country of maternal mortality (311/100000) in the world according to report of WHO in 2015 (32).

Although many studies have been conducted on sexual, physical and obstetric complications, and survey studies have been conducted on the difficulties and reasons of women mutilation experience and practice (3, 15) data about consequences of different types of FGM/C on urogynecological problems such as incontinence is scarce. In a few recent study evaluating urogynecological problems, FGM/C related lower urinary tract problems have been suggested as urgency, urinary retention and urinary incontinence (13, 33). Incontinence was mostly observed in type 3 FGM/C in our study, followed by type 2, and the most common type was mixt type incontinence. No cutting and type 1 FGM/C was unrelated with incontinence. Nerve damage and loss of strength-injury to the pelvic floor muscles play role of developing incontinence. Additionally, Birge et al reported that urogenital fistula was highly associated with Type 2 and 3 FGM/C (34).

Although the prevalence of FGM/C in general population was 87.2%, we observed that this rate increased to 87% in women with POP. Regardless of the type, it is understood that FGM/C is significantly associated with POP and increases rate of POP. We revealed that type 3 FGM/C, which is the most invasive and hard procedure of FGM/C, is the most related type with pelvic organ prolapsus and related hydronephrosis and incontinence. FGM/C complications are based on damage to pelvic floor muscles and nerves. So to speak, FGM/C is a deliberated pelvic floor injury procedure. When FGM/C-related difficult deliveries and other risk factors of loss of pelvic floor

support are added to this, pelvic floor dysfunction is inevitable. Weakness of the pelvic floor muscles due to neuropathic damage or mechanical muscular damage causes pelvic organ prolapse and / or dysfunction. This study is one of the pioneering studies investigating the effect of FGM/C types on pelvic floor disorders such as pelvic organ prolapse and incontinence. However, the relationship between POP and FGM/C decreases when confounding variables are added to the model. This result proves that we should not ignore the fact that there are many factors affecting POP. But the thought of the relationship between FGM/C and POP would be logical. Hence, it will be more beneficial to conduct detailed research on this issue.

Conclusion

In conclusion, despite the anti-circumcision laws and all preventive efforts of the World Health Organization, UNICEF and many local non-governmental organizations, FGM/C still continues at a high rate all over the world. Especially type 2 and 3 FGM/C continues to be an important health problem in terms of complications that may develop in advanced ages as well as many short-term complications as a result of mechanical or physiological deterioration of the female genital anatomy.

Declarations

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Conflict of Interest / Disclosure

The authors have no conflicts of interest to declare.

Ethics declarations:

Statement of Ethics and Consent inform

This study was conducted retrospectively and in a single center and approved by the Ethical Review Committee of Sudan Nyala Turkish Hospital, Sudan (Ethics Committee Decision Date - No: 26.06.2018 - 45/4743).

This study has been performed with the appropriate participants' informed consent in compliance with the Helsinki Declaration.

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Authors' contributions

ANS. contributed to the study design and execution, data analysis, manuscript drafting and critical discussion. ÖB. And MSB contributed to the study design and execution, data analysis, manuscript drafting and critical discussion. All authors read and approved the final manuscript.

Availability of data and materials statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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