ORIGINAL ARTICLE

Characteristics and Surgical Repair Outcomes of Obstetric Fistula Patients Managedata Teaching Hospital in Zambia: A Retrospective Cross-Sectional Study

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Abstract

Background: The obstetric fistula is a chronic maternal morbidity of global public health concern. The condition is preventable and, in most cases, treatable. Surgical repair is the mainstay of treatment with varying degrees of success. The aim of this study was to determine the characteristics, surgical outcomes and factors influencing surgical outcomes of women presenting with obstetric fistulas at a Teaching Hospital in Lusaka, Zambia.

Methods: A retrospective review of medical records for all women who underwent obstetric fistula repair surgeryat Women and Newborn Hospital from 2017 to 2019. Descriptive analysis was done. Fischer's exact test was used to measure association between surgical outcomes and variables in the model.

Results: In total,18 out of 29 records of patients who underwent fistula repair were retrieved and analyzed. Ages ranged from 15 to 47 years, mean age 29years. Over two thirds (72.23%) were multiparous, and over 3/4ths (77.8%) underwent caesarean section in the antecedent pregnancy. Success rate for fistula repair was 83%at 2 weeks post-operative.Study findings were inadequate to show a significant association between successful repair and factors in the model.

Conclusion: Majority of women presenting with obstetric fistula were multiparous with a history of prolonged labour, delivery by caesarean section and poor birth outcomes. Success rate for obstetric fistula repair at Women and Newborn Hospital was 83% at 2weeks postoperative. Further studies are needed to assess long-term outcomes and factors influencing surgical outcomes.

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INTRODUCTION

Among maternal morbidities, obstetric fistulas are the most devastating.[1] An Obstetric fistula is as an abnormal opening between a woman's genital and urinary tracts and/or rectum, resulting in continuous leakage of urine and/or faeces.[2,3] The common cause is unrelieved obstructed labour in which the foetal head gets impacted in the maternal pelvis, exerting pressure on the intervening soft tissue. Prolonged impaction causes widespread pressure necrosis and later sloughing of the tissues, leading to the formation of an opening between adjacent organs.[4,5]

An estimated 2million women currently live with the debilitating condition with up to100,000 new cases every year.[6] Universal access to quality obstetric care has led to the elimination of obstetric fistulas in most developed countries. However, obstetric fistulas continue to affect women in low- and middle-income economies particularly Sub-Saharan Africa and South Asia.[7] In these regions only 1 in 10 people have access to safe and affordable surgical and anaesthetic care[8], and to a much less degree, emergency obstetric surgical care. A study in Malawi estimated around 1.6 per 1000 women of reproductive age to be suffering from obstetric fistula.[9] In Zambia, it is estimated that about 5.91 per 1000 women of reproductive age have obstetric fistula symptoms.[10]

Surgical repair is the cornerstone of obstetric fistula treatment. Some fistula repair sites have recorded success rates as high as 98%[11]; however, figures vary from centre to centre. Several factors influence the outcome of repair. These include fistula characteristics such as urethral involvement, degree of scarring (mild, moderate or severe)[12] and fistula size.[13] Failed previous repair[14] and duration of living with fistula[15] also influence whether surgery is successful or not. Apart from the above, factors that affect wound healing influence outcomes of repair. These include the presence of infections such as HIV/AIDS[16], Urinary Tract Infections, VulvalDermatitis[17], the nutritional status and presence ofanaemia[18] These additional factors necessitate a rigorous pre-operative assessment and preparation as well as postoperative care, for improved success of repair.[19] The occurrence of intraoperative complications[20] as well as the skills of the surgeon have a bearing on surgical outcomes.[21]

The success rate for obstetric fistula repair surgery in Zambia, last reported in 2007 by Holme and Colleagues stood at 72.5%.[22] In order to optimize patients outcomes from surgery, it is important that surgical decisions be based on accurate information about patients, indicating the range of outcomes[23] as well as the factors that influence these outcomes in the local setting. The paucity of data regarding the review and assessment of surgical outcomes for the obstetric fistula surgeries conducted at Women and Newborn Hospital poses a challenge for improvement at policy levels, programming as well as service delivery. The present study sought to determine the characteristics, surgical outcomes and factors influencing surgical outcomes of women presenting with obstetric fistulas at Women and Newborn Hospital.

METHODOLOGY

Study Setting

Zambia is a landlocked country in Southern Africa. The country is divided into 10provinces with a population estimated at 17.9million.[24] The country has a high burden of both communicable and non-communicable diseases. Zambia has high Maternal Mortality Ratio of 252/100 00 live births with a Total Fertility Rate of 5.0.[25] Women and Newborn Hospital, part of the University Teaching Hospitals is located in Zambia's capital city, Lusaka. It is the highest referral facility in the country, receiving patients from the whole country. The Hospital was established in 2016, when the University Teaching Hospital (UTH), operational since 1934, was split into five Hospitals. Women and Newborn Hospital has a bed capacity of 531, and records over 9,000 deliveries per year. A Specialist in the Urogynaecology Unit conducts fistula surgeries. The Ministry of Health sponsors fistula surgeries at the facility. At other fistula repair sites in the country, the Ministry of Health partners with Fistula Foundation and United Nations Development Fund (UNFPA).

Study design

This was a retrospective review of medical records for women with obstetric fistulas, who underwent surgical repair from January 2017 to December2019 at Women and Newborn Hospital, University Teaching Hospitals, Lusaka, Zambia.

Study Population

Records of all women (purposeful sampling) who underwent surgical repair for urogenital and/or rectovaginal fistula acquired during the process of childbirth, including vaginal delivery, operative vaginal delivery, caesarean section, caesarean hysterectomy or laparotomy for raptured uterus from January 2017 to December 2019 were included. Women with urogenital or rectovaginal fistulas arising from trauma, gynaecological surgeries, tumours or radiotherapy were excluded.

Data Extraction and Measures

A checklist guided data extraction, onto a data entry form in Epi info Version 7. This included sociodemographic (age, residence, and marital status); obstetric history (parity, duration of labour, mode of delivery, obstetric surgeries and birth outcomes); duration of living with fistula, previous attempts at fistula repair; intraoperative findings (fistula location, size, presence of scarring);post-operative follow-up (duration of postoperative stay in days and follow-up visits). The outcome variable was Surgical outcome, whose response was dichotomous, Continent (successful repair) or Incontinent (failed repair). The initial plan was to examine outcomes at discharge (2 weeks post-operative), three and six months' postoperative. However due to a high rate of loss to follow-up, the outcome at discharge was the most representative. Therefore, the outcome refers to that pertaining to the time of patient discharge.

Data Analysis

Stata 16.0 was the tool used for analysis. Descriptive analysis was conducted on all the participants' data. The results were reported as mean (standard deviation [SD]) for continuous variables with symmetric distributions or median (first quartile [Q1], third quartile [Q3]) for continuous variables that are skewed. Categorical variables were expressed as number (percent). Fischer's exact test was used to measure the association between treatment outcomes and age, parity, mode of delivery, duration of living with fistula and previous attempt at fistula repair. The significance level (α) was set at 0.05, with 95% confidence intervals.

Ethical Clearance

Ethical clearance was obtained from the University of Zambia School of Medicine Biomedical Research Ethics Committee. The Hospital Administration granted permission to conduct the study at the facility.

RESULTS

A total of 32 fistula repairs were recorded in the theatre register from January 2017 to December 2019. Of the 32 records, two were due to gynaecological complications and one was a case of cervical cancer, leaving a total of 29 obstetric fistulas repaired. Eighteen patient files were retrieved after a meticulous search of all record storage facilities within the Hospital. The study findings are based on data retrieved from the 18 records retrieved.

The mean age of participants was 29.33 ± 2.08 years (Table 1). The women were from eight provinces of Zambia, namely Lusaka (38.88%),Central (16.66%), Eastern (16.66%), Copperbelt, Muchinga, Northern,North-Western, and Southern provinces each represented 5.56% of the sample.Concerning marital status, half (50%) were married and of the remaining half, a minority (5.56%) were divorced and less than a quarter (16.67%) had never been married. Over two thirds (72.23%) were multiparous. The mode of delivery in the antecedent pregnancy was by caesarean section for most of the women (77.78%). About 50% of the women had prolonged labourof varying duration while a third (33.33) did not specify duration of labour. Two thirds of the participants (66.67%), had a poor birth outcome, still birth.Two women (11.11%) had had a raptured uterus). A majority (88.89%) had lived with the fistula for over 6 months with about two thirds (66.67%) having lived with the

condition for ≥2 years. Half (50%) of the fistula locations were high, and of the low fistulas 38.89% were circumferential.

The vaginal route approach was used in repairing two-thirds (66.67%) of the cases. Fourteen women (77.78%) were undergoing fistula repair for the first time. The duration of hospital stays postoperative ranged from 2 days to 35 days, with median duration of hospital stay of16 days (15, 17). With regards to follow-up after discharge, 44.44% of the participants were lost to follow up with only a third (33.33%) having the first review post operation. Of the remainder, 16.67% were discharged to be review at local facility whilst 5.56% were discharged without a review date due to inoperable fistula.

The success rate of repairs at discharge was 83% (15/18), that is, they were dry and continent with the remaining 17% (3/18) remaining incontinent after surgery. Of these, one had a failed repair due to extensive scarring whilst the remaining two had residual stress incontinence.

The study findings were insufficient to show any significant relationship between, age, parity and mode of delivery,duration of living with fistula and previous attempts at fistula repair, with successful repair (Table 3).

Table 1: Socio Demographic and Pregnancy Related Characteristics of Obstetric Fistula

Variable	Frequency	Percentage
Age		
15 to 19	2	11.11
20 to 24	3	16.67
25 to 29	5	27.78
30 to 34	2	11.11
35 to 39	4	22.22
40 and above	2	11.11
Marital Status		
Never married	3	16.67
Married	9	50
Divorced	1	5.56
Unknown	5	27.78
Residence (Province)		
Central	3	16.66
Copperbelt	1	5.56
Eastern	3	16.66
Lusaka	7	38.88
Muchinga	1	5.56
North-Western	1	5.56
Northern	1	5.56
Southern	1	5.56
Parity		
1	5	27.78
2	3	16.67
3	1	5.56
4	5	27.78
> or =5	4	22.22
Mode of Delivery - Antecedent Pregnancy		
SVD	2	11.11
Forceps/Vacuum	2	11.11
Caesarean Section	14	77.78
Duration of Labour		
0 -24 hours	1	5.56
25 to 48hrs	2	11.11
49 to 72hours	1	5.56
>72 hours	1	5.56
Prolonged(Duration Not Specified)	7	38.89
Unspecified	6	33.33
Birth Outcomes		
Good	4	22.22
Still Birth	12	66.67
Unknown	2	11.11

Table 1 above shows the sociodemographic and pregnancy characteristics based on 18 patient records. The mean age of the fistula patients was 29.33years ± 2.08.

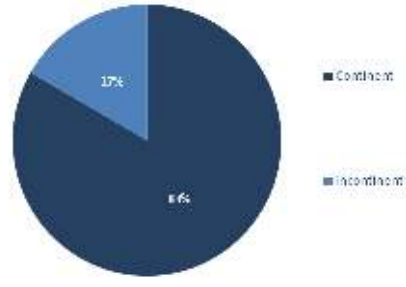

Figure 1: Surgical Outcomes for Obstetric Fistula Surgeries

The success rate at discharge was 83% as demonstrated in Figure 1 above. The mean duration of hospital stay post-surgery was 16.39days ± 1.52.

Table 2: Fistula Characteristics and Post-Surgical Follow-up

Variable	Frequency	Percentage
Duration Living with Fistula		
<6months	2	11.11
6 months to 1 year	4	22.22
2 to 5years	3	16.67
5 to 9 years	6	33.33
10years and above	3	16.67
Fistula Location		
High	9	50
Circumferential	7	38.89
Not Indicated	2	11.11
Surgical Approach		
Abdominal	6	33.33
Vaginal	12	66.67
Duration Hospital Stay After Surgery (Days)		
0 to 7	1	5.56
8 to 14	3	16.67
15 to 21	11	61.11
22 to 28	2	11.11
29 to 35	1	5.56
Previous Attempts at Repair		
No previous attempt	14	77.78
1 Previous attempt	2	11.11
2 Previous Attempts	2	11.11
Follow Up Post Surgery		
First Post OT Review	6	33.33
Discharged to be reviewed from local facility	3	16.67
Discharged due to failed repair also lost to follow-up	1	5.56
Lost to follow-up	8	44.44

Table 3: Surgical Outcomes and Independent Variables

	Surgical Outcome		
Selected Variables	**Unsuccessful repair (Incontinent)**	**Successful Repair (Continent)**	**P*value**
Age			
15 - 19	1 (5.56)	1 (5.56)	
20 - 24	0 (0.00)	3 (16.67)	
25 - 39	1 (5.56)	4 (22.22)	0.926
30 -34	0 (0.00)	2 (11.11)	
35 - 39	1 (5.56)	3 (16.67)	
≥40	0 (0.00)	2 (11.11)	
Parity			
1	1 (5.56)	4 (22.22)	
2	1 (5.56)	2 (11.11)	
3	0 (0.00)	1 (5.56)	0.786
4	0 (0.00)	5 27.78	
≥5	1 (5.56)	4 (22.22)	
Mode of Delivery			
SVD	1 (5.56)	1 (5.56)	
Forceps/Vacuum	1 (5.56)	1 (5.56)	0.108
Cesarean Section	3 (16.67)	13 (72.22)	
Duration living with fistula			
<6months	1 (5.56)	1 (5.56)	
6months to 1year	1 (5.56)	3 (16.67)	
2 to 5 years	0 (0.00)	3 (16.67)	0.301
6 to 9years	0 (0.00)	6 (33.33)	
≥10	3 (16.67)	3 (16.67)	
Previous Attempts at repair			
0	2 (11.11)	11 (61.11)	1.000
≥1	1 (5.56)	4 (22.22)	

*Comparing proportions of successful and unsuccessful repair

Table 4: Table of Age at Marriage, Giving Birth and Education/Literacy Levels among Zambian Women

Survey	Women giving birth by age 18 Total for ages 20-49	Women first married by exact age 15 Total for ages 20-49	Women first married by exact age 18 Total for ages 20-49	Women with secondary or higher education Total for ages 15-49	Women who are literate Total for ages 15-49	Men who are literate Total for ages 15-49
2018 DHS	32.9	8.1	36.6	48	66.4	81.8
2013-14 DHS	33.6	8.7	41.8	44.8	67.5	82.6
2007 DHS	35.1	10.9	46.3	35.1	63.7	81.5

Source:http://www.statcompiler.com. August 25 2021

DISCUSSION

Socio-demographic and obstetric and fistula characteristics of the women

Among the participants,22.2%developed the fistula during adolescence. This suggests that at 1 in 5 obstetric fistulas in Zambia develops as a complication of adolescent pregnancy. This was a reduction from findings byHolme and colleagues[22], in which over a third of the Zambian women under study developed the fistulae duringadolescence. This is in tandem withNational Demographic Health Survey data[26], which indicated a decrease in the mean age of women giving birth by 18 years from 35.6% (2007) to 33.5% (2018), and an even greater decrease in girls married by age 18 from 46.3% (2007) to 36.6% (2018).Given the association between early pregnancy and fistula development, it is imperative that programs and interventions targeted at mitigating the high birth-rate among teenagers in Zambia be strengthened and scaled up, in order to prevent fistula occurrence. The majority of records did not indicate the level of education. For the three records that did, one woman had not been to school, the other had ended in grade 7 whilst a 15-year-old adolescent was in Grade 8. Improving education levels, particularly above primary education is associated with better pregnancy outcomes and decreases likelihood of obstetric fistulas.[27,28]Efforts to increase empowerment of women and girls through education have seen an increase in women acquiring secondary school education from 35.1% in 2007 to 48.5% in 2018 (See Table 4). The improvement in education levels for women in Zambia is a positive step towards eliminating fistulas.

The women originated form 8 of 10 provinces in Zambia. The wide distribution suggests countrywide challenges in the health system, pertaining access to Emergency Obstetric Care (EMOC) services. Few facilities in the country (12%) meet the criteria for EMOC, andless than 25% of the population live within 15km of an EMOC facility.[30]Apart from access, the quality of EMOC services is also important. The high rate of caesarean sections among the women in the present study, 77.8%, raises concerns on the quality of EMOC services being provided. Recent studies have noted with the concern the rising caesarean section rates among women with obstetric fistulas.[31,32] However, further inquiry is needed to distinguish the truly iatrogenic obstetric fistulas from those who despite having caesarean section, develop fistula due to the pre-existing injury from obstructed labour. Additionally, there is need to strengthen interventions such as prolonged bladder

catheterization in women with a history of prolonged obstructed labour, as this alone can avert fistula formation.[33]

Over 2/3rds of the women were multiparous, and had experienced prolonged labour of varying degree (Table 1). Similar findings were noted in other settings.[22,34] However, there arecountry-to-country variations, as demonstrated by primiparity having greater association with obstetric fistula development in other instances.[27]Cultural practices and policies on age at marriage might have a role to play in these variations. As is commonly noted among women with obstetric fistulas[35], the still birth-rate among the women captured by the study was high at 67.7%.These women endure the double tragedy of having lost a baby and suffering from incontinence. The duration of having lived with fistula ranged from 2months to 15years. The more recent fistulas indicate the need to scale up emergency obstetric care in the country as new cases of fistula continue to emerge. The long term fistulas however, indicate an ongoing burden of obstetric fistulas, with unmet need for repair. There is need to scale up surgical repair services to relieve potentially thousands of women who continue to suffer physically, emotionally and psychologically from a condition which can be repaired.[36,37]

Surgical Repair Outcomes

The success rate for surgical repair of obstetric fistulas was findings of this study based on the 18 records reviewed showed that 83% (Figure 1) at time of discharge. This is a 10% increase from previous findings in Zambia.[22]and comparable to findings from studies in other sub-Saharan African countries likeBenin[20]and Kenya[38]where the success rates were 83.9% and 82.0% respectively. The mean discharge time was16days post operation. This was in keeping with post-operative catheterization time of 14 days, and a day or two to monitor urination without an indwelling catheter. Although patients at Women and Newborn Hospital have prolonged catheterization (10 days or more)[39], recent observations suggest shorter catheterization periods as equally effective[40,41]with catheterization for 7days post repair non-inferior to catheterization for 14 days.[42] The consensus however is that for most simple fistulas, a catheterization period of 7 to 10 days is adequate.[43]

Outcomes at 3- and 6-months post repair could not be determined due to a high rate of attrition. Half of the patients were lost to follow up, while 3(17%) were discharged for follow up at their local facilities (see Table 2) due to inability to return for review. All of the three patients discharged in this manner were from provinces other than Lusaka. Financial constraints are a possible explanation for the high loss to follow-up.Long distances to facilities offering fistula repair, high cost of travel and accommodation, coupled with poverty, are recognized barriers to accessing fistula repair services.[44] Long term follow-up of patents is critical in assessing the long term outcomes of fistula repair as break down in repair with ensuing incontinence has been documented as late as 6 months post operation.[45] Substantial loss to follow-up therefore hinders the capacity to appraise the long term success of this important intervention.[46] The 'transport *MY* patient program' an initiative launched in 2009, in neighbouring Tanzania, helped increase access to fistula repair services for affected women through provision of transport money via mobile technology. The initiative was meant to overcome the transport costs, which was a major barrier to accessing health services in the country. Such an initiative could be adopted to create a follow-up program for patients who have undergone repair at various sites in Zambia.

Factors Associated with Surgical Outcomes

The study findings were insufficient to show significant association between surgical outcomes of fistula repair and the independent variables in the logistic regression model i.e. age, parity, mode of delivery, duration living with fistula and previous attempts at repair. This was due to the small sample size, which reduced the power of the study. Possible factors favouring successful outcomes were that, the majority were undergoing first time repair and had delivered by caesarean section. The first attempt at fistula repair has the highest probability of success[47], and women delivered by caesarean

section in the antecedent pregnancy tend to have better surgical outcomes than those delivered vaginally.[48] Additionally, the surgeries were conducted by an experienced fistula surgeon, which also favours successful repair.

The loss of nearly 40% of the records of patients operated for obstetric fistulas during the period under study is indicative of a systems information gap and sub-optimal management of medical records. Some patients reportedly go home with their files upon discharge or after the first review for fear of finding the files missing when needed. Other patients might have multiple morbidities requiring use of the same file in other departments. In this regard, a manual system of patient records has proved a significant barrier to accessing essential information on fistula care. A nationwide electronic database for fistula patients, that includes adequate demographic, clinical, and follow up information could significantly overcome this information barrier. Additionally, making hard copies of patient records on discharge would curb the desire to carry original files.

Limitations

Since the study was a record review, missing files, missing data and high rate of loss to follow up negatively affected the assessment of effectiveness of the surgery at 3 and 6 months as was originally intended by the authors. The missing data also hindered assessment of other important factors such as educational status, duration of labour, fistula size and degree of scarring on the surgical outcomes. Factors associated with successful repair were not determined due to the small sample size. Additionally, despite participants representing 8 of 10 provinces, the small sample size, limits generalizability of findings. In spite of the limitations, information generated by the study elucidates the benefits of investing in fistula repair surgeries as they have good success rates, as well as investing in EMOC services for fistula prevention. The study also highlights the need for deliberate efforts to improve record keeping and initiate an electronic data base for all fistula patients (nationwide). This would generate quality data, making a good basis for strengthening research and program evaluation as per United Nations General Assembly Resolution in ending obstetric fistulas.[49]

CONCLUSION

The majority of women presenting for obstetric fistula repair at Women and Newborn Hospital were multiparous with a history of prolonged labour, delivery by caesarean section and poor birth outcomes. One in five obstetric fistulas develops as a complication of adolescent pregnancy. The success rate for fistula repair stands at 83% at 2weeks postoperative. There is need for robustness of data collection, record keeping and follow-up mechanisms in order to improve the quality of data and enable assessment of long-term outcomes of obstetric fistula repair and associated factors. This in turn will inform policies and programming pertaining to fistula prevention and treatment.

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Competing Interests

The authors declare that they have no conflict of interest.

Contribution of authorship

MMI, LK and CM conceived and designed the study. TM and MMI collected the data while LK performed and/or supervised all the surgeries. MMI and TM analyzed the data. All authors participated in editing the final write-up and approved the paper for publication.

REFERENCES

1. Ahmed S, Anastasi E, Laski L. Double burden of tragedy: stillbirth and obstetric fistula. *The Lancet Global Health.* 2016;4(2):e80-e2.

2. Creanga AA, Ahmed S, Genadry RR, Stanton C. Prevention and treatment of obstetric fistula: Identifying research needs and public health priorities. *International Journal of Gynecology*. 2007;99:S151-S4.
3. Polan ML, Sleemi A, Bedane MM, Lozo S, Morgan MA. Obstetric Fistula. In: Debas HT, Donkor P, Gawande A, Jamison DT, Kruk ME, Mock CN, editors. *Essential Surgery: Disease Control Priorities*, Third Edition (Volume 1). Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2015.
4. Creanga A, Ahmed S, Genadry RR, Stanton CJIJoG, Obstetrics. Prevention and treatment of obstetric fistula: Identifying research needs and public health priorities. 2007;99:S151-S4.
5. Arrowsmith S, Hamlin EC, Wall LL. Obstructed labor injury complex: obstetric fistula formation and the multifaceted morbidity of maternal birth trauma in the developing world. *Obstetrical & Gynecological Survey*. 1996;51(9):568-74.
6. WHO. Obstetric Fistula World Health Organisation Website: Worl Health Organisation; 2018 [updated 2018, February 19th cited 2021 July 6th]. Available from: https://www.who.int/news-room/facts-in-pictures/detail/10-facts-on-obstetric-fistula.
7. Wall LL. Preventing obstetric fistulas in low-resource countries: insights from a Haddon matrix. *J Obstet Gynecol Survey*. 2012;67(2):111-21.
8. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. *Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development*. 2015;386(9993):569-624.
9. Changole J, Thorsen VC, Kafulafula U. A road to obstetric fistula in Malawi: capturing women's perspectives through a framework of three delays. *Int J Womens Health*. 2018;10:699-713.
10. Singini MG. Obstetric fistula among women aged 15-49 years in Zambia: University of Witwatersrand; 2017.
11. Browning A, Whiteside S. Characteristics, management, and outcomes of repair of rectovaginal fistula among 1100 consecutive cases of female genital tract fistula in Ethiopia. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2015;131(1):70-3.
12. Barone MA, Frajzyngier V, Ruminjo J, Asiimwe F, Barry TH, Bello A, et al. Determinants of postoperative outcomes of female genital fistula repair surgery. *Obstetrics and Gynecology*. 2012;120(3):524-31.
13. Egziabher TG, Eugene N, Ben K, Fredrick K. Obstetric fistula management and predictors of successful closure among women attending a public tertiary hospital in Rwanda: a retrospective review of records. *BMC research notes*. 2015;8:774.
14. Kayondo M, Wasswa S, Kabakyenga J, Mukiibi N, Senkungu J, Stenson A, et al. Predictors and outcome of surgical repair of obstetric fistula at a regional referral hospital, Mbarara, western Uganda. *BMC urology*. 2011;11:23.
15. RaassenRaassen TJ, Verdaasdonk EG, Vierhout ME. Prospective results after first-time surgery for obstetric fistulas in East African women. *Int Urogynecol J Pelvic Floor Dysfunct*. 2008;19(1):73-9.
16. Shephard SN, Lengmang SJ, Anzaku SA, Mamven OV, Kirschner CV. Effect of HIV infection on outcomes after surgical repair of genital fistula. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2017;138(3):293-8.
17. Dereje M, Woldeamanuel Y, Asrat D, Ayenachew F. Urinary tract infection among fistula patients admitted at Hamlin fistula hospital, Addis Ababa, Ethiopia. *BMC infectious diseases*. 2017;17(1):150.
18. Clevenger B, Mallett SV, Klein AA, Richards T. Patient blood management to reduce surgical risk. *The British Journal of Surgery*. 2015;102(11):1325-37.
19. Ahmad S, Nishtar A, Hafeez G, Khan Z. Management of vesico-vaginal fistulas in women. *International Journal of Gynecology Obstetrics*. 2005;88(1):71-5.

20. Benski AC, Delavy M, Rochat CH, Viviano M, Catarino R, Elsig V, et al. Prognostic factors and long-term outcomes of obstetric fistula care using the Tanguiéta model. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2020;148(3):331-7.
21. Elneil S. Global efforts for effective training in fistula surgery. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2015;131 Suppl 1:S64-6.
22. Holme A, Breen M, MacArthur C. Obstetric fistulae: a study of women managed at the Monze Mission Hospital, Zambia. *BJOG : An International Journal of Obstetrics and Gynaecology*. 2007;114(8):1010-7.
23. Francis DM. Surgical decision making. *ANZ Journal of Surgery*. 2009;79(12):886-91.
24. Bank W. The World Bank in Zambia worldbank.org: The World Bank; 2021 [updated 2021, March 19th Available from: https://www.worldbank.org/en/country/zambia/overview.
25. Zambia Statistics Agency MoHZ, ICF. Zambia Demographic and Health Survey 2018. In: Agency ZS, editor. Lusaka, Zambia, and Rockville, Maryland, USA: Zambia Statistics Agency, Ministry of Health, and ICF; 2019.
26. Zambia Statistics Agency MoHMZ, and ICF. Zambia Demographic and Health Survey 2018. In: Agency ZS, editor. Lusaka, Zambia, and Rockville, Maryland, USA: Zambia Statistics Agency, Ministry of Health, and ICF; 2019.
27. Muleta M, Rasmussen S, Kiserud T. Obstetric fistula in 14,928 Ethiopian women. *Acta obstetricia et gynecologica Scandinavica*. 2010;89(7):945-51.
28. Roka ZG, Akech M, Wanzala P, Omolo J, Gitta S, Waiswa P. Factors associated with obstetric fistulae occurrence among patients attending selected hospitals in Kenya, 2010: a case control study. *BMC Pregnancy Childbirth*. 2013;13:56.
29. Levine AC, Marsh RH, Nelson SW, Tyer-Viola L, Burke TF. Measuring access to emergency obstetric care in rural Zambia. *Int J Emerg Med*. 2008 Jun;1(2):113-9. doi: 10.1007/s12245-008-0032-4. Epub 2008 May 31. PMID: 19384661; PMCID: PMC2657244.
30. Gabrysch S, Simushi V, Campbell OM. Availability and distribution of, and geographic access to emergency obstetric care in Zambia. *Int J Gynaecol Obstet.* 2011 Aug;114(2):174-9. doi: 10.1016/j.ijgo.2011.05.007. Epub 2011 Jun 12. PMID: 21669427.
31. Ngongo CJ, Raassen T, Lombard L, van Roosmalen J, Weyers S, Temmerman M. Delivery mode for prolonged, obstructed labour resulting in obstetric fistula: a retrospective review of 4396 women in East and Central Africa. *BJOG : An International Journal of Obstetrics and Gynaecology.* 2020;127(6):702-7.
32. Onsrud M, Sjøveian S, Mukwege D. Cesarean delivery-related fistulae in the Democratic Republic of Congo. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2011;114(1):10-4.
33. Care FJNYEFC. Urinary Catheterization for Primary and Secondary Prevention of Obstetric Fistula: Report of a Consultative Meeting to Review and Standardize Current Guidelines and Practices, March 13-15 at the Sheraton Hotel, Abuja, Nigeria. 2013.
34. Sih AM, Kopp DM, Tang JH, Rosenberg NE, Chipungu E, Harfouche M, *et al*. Association between parity and fistula location in women with obstetric fistula: a multivariate regression analysis. *BJOG : An International Journal of Obstetrics and Gynaecology*. 2016;123(5):831-6.
35. Cowgill KD, Bishop J, Norgaard AK, Rubens CE, Gravett MG. Obstetric fistula in low-resource countries: an under-valued and under-studied problem--systematic review of its incidence, prevalence, and association with stillbirth. *BMC Pregnancy Childbirth*. 2015;15:193.
36. El Ayadi AM, Barageine J, Korn A, Kakaire O, Turan J, Obore S, et al. Trajectories of women's physical and psychosocial health following obstetric fistula repair in Uganda: a longitudinal

study. *Tropical Medicine & International Health: TM & IH*. 2019;24(1):53-64.
37. Barageine JK, Beyeza-Kashesya J, Byamugisha JK, Tumwesigye NM, Almroth L, Faxelid E. "I am alone and isolated": a qualitative study of experiences of women living with genital fistula in Uganda. *BMC Women's Health*. 2015;15:73.
38. Hawkins L, Spitzer RF, Christoffersen-Deb A, Leah J, Mabeya H. Characteristics and surgical success of patients presenting for repair of obstetric fistula in western Kenya. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2013;120(2):178-82.
39. Chang OH, Ganesh P, Wilkinson JP, Pope RJ. Extended bladder catheterization for women with positive dye tests after obstetric vesicovaginal fistula repair surgery. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2020;149(1):61-5.
40. Nardos R, Menber B, Browning A. Outcome of obstetric fistula repair after 10-day versus 14-day Foley catheterization. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2012;118(1):21-3.
41. Torloni MR, Riera R, Rogozińska E, Tunçalp Ö, Gülmezoglu AM, Widmer M. Systematic review of shorter versus longer duration of bladder catheterization after surgical repair of urinary obstetric fistula. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2018;142(1):15-22.
42. Barone MA, Widmer M, Arrowsmith S, Ruminjo J, Seuc A, Landry E, et al. Breakdown of simple female genital fistula repair after 7 day versus 14 day postoperative bladder catheterisation: a randomised, controlled, open-label, non-inferiority trial. *Lancet* (London, England). 2015;386(9988):56-62.
43. Widmer M, Tunçalp Ö, Torloni M, Oladapo O, Bucagu M, Gülmezoglu A. Improving care for women with obstetric fistula: new WHO recommendation on duration of bladder catheterisation after the surgical repair of a simple obstetric urinary fistula. I*nternational Journal of Obstetrics and Gynecology*. 2018;125(12):1502.
44. Baker Z, Bellows B, Bach R, Warren C. Barriers to obstetric fistula treatment in low-income countries: a systematic review. *Tropical Medicine & International Health : TM & IH*. 2017;22(8):938-59.
45. Hancock B. Practical obstetric fistula surgery: Royal Society of Medicine Press; 2009.
46. Bishinga A, Zachariah R, Hinderaker S, Tayler-Smith K, Khogali M, van Griensven J, et al. High loss to follow-up following obstetric fistula repair surgery in rural Burundi: is there a way forward? *Public Health Action*. 2013;3(2):113-7.
47. Roenneburg ML, Genadry R, Wheeless CR, Jr. Repair of obstetric vesicovaginal fistulas in Africa. *American Journal of Obstetrics and Gynecology*. 2006;195(6):1748-52.
48. Delamou A, Utz B, Delvaux T, Beavogui AH, Shahabuddin A, Koivogui A, et al. Pregnancy and childbirth after repair of obstetric fistula in sub-Saharan Africa: Scoping Review. *Tropical Medicine & International Health : TM & IH*. 2016;21(11):1348-65.
49. Intensification of efforts to end obstetric fistula [Internet]. United Nations General Assembly. 2018 [cited 2021, July 8th]. Available from http://www.endfistula.org/publications/un-resolution-fistula-2018