Article

PAMJ One Health

Research

# Trends of iatrogenic obstetric fistula and determinants of obstetrical vesical vaginal fistula surgical failure at Kivulini maternity center: a 4 years retrospective study

**Annanoela Urassa, Frederick Mbise, Joseph Mlay, Gileard Masenga, Andrew Browning, Glory Mangi, Upendo Kibona, John Lugata, Bariki Mchome**

**Corresponding author:** John Lugata, Department of Obstetrics and Gynecology, Kilimanjaro Christian Medical Center, Moshi, Tanzania. lugataj06@gmail.com

**Received:** 27 Apr 2024 - **Accepted:** 10 Aug 2024 - **Published:** 12 Aug 2024

**Keywords:** Trend, obstetrics vesico-vagina. fistula repair, determinants, Tanzania



**Cite this article:** Annanoela Urassa et al. Trends of iatrogenic obstetric fistula and determinants of obstetrical vesical vaginal fistula surgical failure at Kivulini maternity center: a 4 years retrospective study. PAMJ-One Health. 2024;14(18). 10.11604/pamj-oh.2024.14.18.43772

**Available online at:** https://www.one-health.panafrican-med-journal.com/content/article/14/18/full

**Trends of iatrogenic obstetric fistula and determinants of obstetrical vesical vaginal fistula surgical failure at Kivulini maternity center: a 4 years retrospective study**

Annanoela Urassa[1,2], Frederick Mbise[1,2], Joseph Mlay[1,2], Gileard Masenga[1,2], Andrew Browning[3], Glory Mangi[1,2], Upendo Kibona[1,2], John Lugata[1,2,&], Bariki Mchome[1,2]

[1]Department of Obstetrics and Gynecology, Kilimanjaro Christian Medical Center, Moshi, Tanzania, [2]Faculty of Medicine, Kilimanjaro Christian Medical University College, Moshi, Tanzania, [3]Kivulini Maternity Center, Arumeru, Arusha, Tanzania

**[&]Corresponding author**

John Lugata, Department of Obstetrics and Gynecology, Kilimanjaro Christian Medical Center, Moshi, Tanzania

## Abstract

***Introduction:*** *obstetric vesico-vagina fistula (VVF) is a devastating pregnancy-related disability due to complications of labor that disproportionately affects women in resource-constrained settings. Significant attributes for VVF from developing countries arise from prolonged or obstructed labor however obstetric iatrogenic VVF are increasing significantly in this locality. This study aimed to determine the trend of obstetric iatrogenic VVF repair, the proportion of obstetric VVF repair failure, and risk factors associated with failure of the obstetric VVF repair at Kivulini Maternity Centre in northern Tanzania* ***Methods:*** *his hospital-based retrospective analytical cross-sectional study was conducted from secondary data collected at the Kivulini maternity center in northern Tanzania Arusha region from 2018 to December 2022. All patients with obstetric VVF, who had surgical VVF repair in the mentioned duration, were included. Data was collected by using a checklist. Standard central tendency and dispersion measures were employed appropriately for parametric and non-parametric variables. A Chi-square test was used for categorical data and Multivariable Logistic regression was used for control confounders and to determine factors associated with failure of fistula repair; odds ratio and 95% CI for precision, strength of association, P-value < 0.05 was considered statistically significant.* ***Results:*** *a total of 179 women were included in the final analysis. The trend of obstetrics iatrogenic VVF ranged from 12.8.to 42.5%; the proportion of obstetric VVF repair failure was found to be 35% and factors associated with failure of this repair was severe fibrosis (AOR 6.5; 95%CI 2.30-18.30) P<0.001, partial or total urethra involvement (AOR 30.8295% CI 6.37-148.90) P<0.0001 and distal edge of fistula< 1.5 cm from external urinary meatus (AOR5.0395%CI 1.29-19.56) P<0.020.* ***Conclusion:*** *despite prolonged obstructed labor-related VVF contributing to the majority of VVF, our findings demonstrate obstetrics iatrogenic VVF to be increasing over time. The trend of obstetric iatrogenic VVF in this study ranged from 12.8%-42.5% with the highest in 2022. The overall failure of obstetric VVF repaired in this study is still high above the WHO standard with those remaining with incontinence after repair contributing to the majority of cases. Distance distal edge of fistulab<1.5 cm from external urinary meatus, partial or completely destructed urethra, or severe fibrosis was significantly associated with obstetric fistula repair failure. Prospective interventional studies to improve outcomes among risky women depicted in this study may have the potential to inform clinicians on appropriate surgical intervention to minimize incontinence post-surgical VVF repair.*

## Introduction

Obstetric fistula is a devastating pregnancy-related disability that affects an estimated 50,000 to 100,000 women each year worldwide but not more than 20,000 corrective surgeries occur annually, globally it is estimated that 2 to 4 million women live with obstetric fistula without treatment; these rates are the highest in sub-Saharan Africa and South Asia. In sub-Saharan Africa 33,000 women develop fistula annually and in Tanzania there are 1,200 to 3,000 new cases of Obstetric fistula each year; VVF and rectal vaginal fistula (RVF) are the most common type of fistula that occur in obstetrics [1,2]. Obstetric VVF in our setting can either be due to prolonged/obstructed labor or iatrogenic; If VVF occurs when performing a cesarean section, cesarean hysterectomy, instrumental delivery, or repaired ruptured uterus it refers to obstetric iatrogenic VVF, Worldwide including developing countries number of obstetric surgery had increase and cases of Obstetric iatrogenic VVF are increased significantly as more women gain access to surgery; 8% of

obstetric iatrogenic fistula cases occurred after procedures to address obstetric complications like cesarean section, hysterectomy, and repair of ruptured Uterus [2,3]. Although 10-12% of small VVF can be successfully treated with sustained catheterization alone, the majority of women with VVF require surgical intervention through transvaginal or trans-abdominal techniques. Surgical intervention depends on the ability to gain access to the fistula for choosing a route of surgical repair. After surgical intervention, three possible outcomes for these women are closed fistula and continents, failed fistula closure, and incontinence after successful fistula closure. Obstetric fistula repair failure is a combination of unsuccessful fistula closure and/or incontinence following a successful closure, [4].

Several factors have been reported to be responsible for the failure of obstetric fistula repair these include time to surgery, fistula characteristics, surgical techniques, the health status of women in infrastructures where the intervention takes place, and previous repairs [2]. WHO standard for fistula repair outcomes is less than 15% for failed fistula closure and less than 10% for incontinence after successful fistula closure. These standards are intended to reflect the level of quality of services given to patients, but failure fistula repair remains high. In Asia failed fistula repair is estimated at 12.8% - 17.8% compared to 6.5%-58% in Sub-Saharan Africa and, 13%to 49.2%, in East Africa. In Tanzania it ranges from 13.5%to 42.9% [5-7]

Regarding the trend of obstetric fistula previous data from Pakistan demonstrated; a trend increase from 43.2% in 2006-2008 to 71.4 in 2017-2018; the annual increase trend was found to be 3% to 23 % compared to Bangladesh iatrogenic fistula was 19.04% in 2010, 15.68% in 2011 and 30% in 2012.17.9% and in African countries, although most of the fistula are caused prolonged, obstructed labor, but studies has shown the iatrogenic genitourinary fistula are increasing; in Addis Ababa Fistula Hospital, Addis Ababa, Ethiopia: from 2005 to 2019, there was a significant rising trend in iatrogenic genitourinary fistula (1.55-52.9%, $p < 0.001$) and study done in 9 country of sub-Saharan Africa Iatrogenic genito-urinary fistula following cesarean birth rose by 37% aOR 1.37; 95% CI 1.02-1.83 [3,8-12]. Although the majority of the fistula heal successfully after surgical repair the goal set by WHO of less than 15% for failed fistula closure after repair and less than 10% for incontinence after successful fistula closure is a challenge in developing countries including Tanzania, Failure of fistula repair causes women to be exposed to repeated surgery and this leads to social and economic burden on the woman and fistula care programs; Women who had repeated surgery could frequently be exposed to medical complications such as infection, pain, sexual dysfunction, and secondary infertility. Data on surgical outcomes of VVF repair and their long-term trend emanating from East African countries are scarce. We hope findings from this investigation will be informative and potentially devise interventions to mitigate complications associated with VVF repair WHO2018 [4]. This study intends to establish the trends of obstetric iatrogenic, the proportion of failure of fistula repair in northern Tanzania, and determine factors associated with this failure of the fistula repair.

## Methods

**Study design, period, and setting:** facility retrospective analytical cross-sectional study using data extracted from medical records of fistula repairs women at Kivulini Maternity Centre. Data were collected from women who underwent surgery for VVF from 2018 to December 2022. A research investigation took place at the Kivulini Maternity Centre situated in the northern region of Tanzania. The northern part of Tanzania encompasses four regions, namely Tanga, Kilimanjaro, Arusha, and Manyara, with an approximate population of 8,726,288.00 individuals, as per the 2022 census data. The selection of this specific center was based on its status as the most extensive facility for treating fistula in northern Tanzania. The facility is located

in rural Northern Tanzania, near the city of Arusha. Kivulini Maternity Centre also provides surgery for women suffering from obstetric fistula. The surgical procedures are conducted by obstetric fistula-trained surgeons. All patients with obstetric VVF, who were admitted to the Gynecology ward, at Kivulini maternity center and had undergone primary or secondary VVF surgical repair within 4 years from 2018 to December 2022 were included in the study, those with Mis Documentation in patient identification data, none obstetrics VVF and those who were inappropriate for surgery were excluded.

All women who underwent obstetric VVF repair in the 4 years, from 2018 to December 2022 (N=179) were taken by using convenience sampling technique among records of women who underwent fistula repair and met the eligibility criteria from 2018 to December 2022 were included in the study. The records were identified from the registration book of women who underwent obstetric fistula repair and were registered between 2018 and December 2022. Accordingly, 195 records were identified as having had VVF repair in the previous 4 years. All the records were reviewed to ensure that they had all the information required for the study. Mothers´ records that met the inclusion criteria were 179, but 2 were Inappropriate for surgery, 14 records were missing in patient identification data and were excluded. Successful repair was considered when the communication was closed and continence within 21 days following the obstetric fistula surgery procedure, Obstetric Fistula repair failure (Unsuccessful) when the communication was not closed and/or incontinent or had a positive dye test after 21 days of continuous bladder drainage following fistula repair (Figure 1). Additionally, primary VVF repair refers to an initial surgical repair of the VVF while the secondary VVF implies any subsequent surgery conducted after primary VVF repair. The trend of obstetric iatrogenic VVF refers to a change in the proportion of obstetric iatrogenic VVF repair over four years.

**Data collection tools and procedures:** data was collected by using a checklist. Data was collected by the principal researcher and 2 Research assistants (nurses) using a checklist, and then data was entered into the electronic checklist for quality assurance. Secondary data were used. Patient information was extracted from the fistula foundation logbook, patient chart and file, operation logbook, and discharge logbook at the time of discharge.

**Data processing and analysis:** each data was coded by SPSS v25, cleaned and the double check was done to minimize error. Standard central tendency and dispersion measures were employed appropriately for parametric and non-parametric variables. A Chi-square test was used for categorical data to determine associations of different variables for failure fistula repair and multivariable logistic regression analysis was used for control confounders and determine factors associated with failure of fistula repair; odds ratio and 95% CI for precision, strength of association, P value < 0.05 is considered statistically significant.

**Ethical considerations:** ethical approval to conduct the study was obtained from the Kilimanjaro Christian Medical University Ethical Review Committee after the presentation and submitting this research report. Permission to carry out the study was obtained from the Director of the Hospital and the Head of the Department. The obtained information was kept confidential, and participant codes were used instead of names.

**Study outcomes:** the main outcomes of this study were the trend of obstetric iatrogenic VVF repair, the proportion of Failure of VVF repair, and factors associated with failure repairs.

## Results

Overall, 195 medical records of women who had primary and secondary VVF were found, 16 records were excluded; 2 were Inappropriate for surgery, and 14 missing in patient identification data. A total of 179 records of obstetrics VVF

repaired over the four years were included in the analyses (Figure 1).

**Socio-demographic characteristics:** the social demographic characteristics are presented in Table 1. The mean age at presentation was 31.7(SD ± 11.0) more than half were married (n=119, 66.1%) with primary education (n=105, 58.7%) and majority were from Arusha (n=52, 29.1%).

**Obstetric, clinical, and repair characteristics:** obstetric clinical and repair characteristics are presented in Table 2,Table 2.1. The majority of women were Para two to four and most of them delivered vaginally (n=119, 66.5%) with a Median duration of labor of 48 (IQR 24, 48) hours. A total of 107 women (59.8%) had stillbirths for the referent pregnancy. Out of 179 VVF repair cases analyzed, 74% (132 cases) were attributed to Obstructed/Prolonged labor, while 26% (47 cases) were obstetric iatrogenic in nature. It was found that 32% of the patients had previously undergone a repair procedure. All patients were classified according to the Goh classification, with the largest proportion, 49.1%, falling into Goh classification 1. Furthermore, the majority of patients (105 cases, 58.6%) had lived with the fistula for less than one year. The repair was done via the trans vagina route by 91.6% and during surgery 88.3% were done under spinal anesthesia and the majority of the repairs 64.8% took 1-2 hrs. 89.9% of women stay at the hospital for > 14 days with a median duration of stay 21 days (IQR 17, 27), and most of them 59.7% were catheterized for 2-3 weeks.

**Trends of obstetric Iatrogenic VVF repair:** among 179 women with VVF repair, 47(26%) were obstetric iatrogenic fistula. Among these, 38(21.2%) were caused by cesarean section, 6(3.4%) cesarean hysterectomy, and 3(1.8%) occur during instrumental delivery following assisted vaginal delivery. The proportion of obstetric iatrogenic fistula cases is highest in 2022 at 42.5% and low number in 2021; at 12.8. In 2018, 2019, 2020, and 2021 the proportion was 25.8%, 0. 23.1%, respectively (Figure 2).

**Proportion of failure of obstetric VVF repair:** among women who visited for obstetrics VVF repair surgery, 89.9% underwent fistula repair due to isolated VVF; out of 179, 35 % had unsuccessful repairs at the time of discharge; 15% failed fistula closure and 20% fistulas closed but remained incontinent.

**Factors associated with failure obstetric vesico-vagina fistula repair:** according to the results of the univariable bivariate analysis (Table 3), years of living with the fistula, fibrosis, proximity to the external urethral meatus, Partially/total urethra damage, a prior repair, and pre-existing medical conditions were more likely to be associated with fistula repair failure. In multivariable logistic regression (Table 3.1) after controlling for confounders, only 3 variables had an association with obstetric fistula repair failure p-value < 0.05. These were fibrosis, status of the urethra, and distance from the external urethral meatus. Women who had severe fibrosis were 6.5 times more likely to have a failed fistula repair compared to women who had mild fibrosis having (95%CI(2.30-18.30) p<0.001, women with partial or total urethra involvement were more likely to failed fistula repair compared to women who had intact urethra sphincter (AOR 30.8295% CI 6.37-148.90) P<0.0001. Women who had a distal edge of fistula< 1.5 cm from external urinary meatus were more likely to experience obstetric fistula repair failure compared to women with a distal edge of fistula > 3.5 cm from external urinary meatus (AOR5.0395%CI 1.29-19.56) P<0.020.

## Discussion

By doing a secondary analysis of records of one of the largest fistula repair centers in northern Tanzania with most of its admissions being fistula repair patients, we were able to determine the Trend, proportion, and factors associated with obstetric fistula repair failure among women who

underwent repair in period four years, According to our study we found the trend of the obstetric iatrogenic fistula was increasing from 12.8- 42.5%, the proportion of failure of VVF repair was 35%, severe fibrosis, distance proximity to the external urethral meatus, the Partially/total urethra damage were associated with fistula repair failure

**Trends in fistula repair failure:** the trend of obstetrics iatrogenic VVF in northern Tanzania in the four years studied appears to be rising with a range from 12.8%-42.5%. Trend increase may be due to COVID-19/pandemic and the increase in facility provide CEmoNc. This result is almost similar to the trend seen in a study done in Bangladesh, these similarities may be due to obstetric fistula caused by prolonged and obstructed labor taking a large proportion of the overall fistula repair in the two studies and they both have short duration of study compare to another study for iatrogenic fistula [9]. Studies varied significantly from a study done in Pakistan showing a trend of iatrogenic increase these variations might be explained by in Pakistan iatrogenic fistula takes a large proportion of the overall causes of fistula repair compared to this study also COVID-19 pandemic affected this study due to few numbers of fistula repair during COVID-19 pandemic. During the early stages of the pandemic, the American College of Surgeons (ACS) advised postponing non-urgent surgeries, and millions of procedures were canceled during this time not only in Tanzania but worldwide [8,13]. The study varies with the study done in Ethiopia and the one which was done in nine sub-Saharan African countries, iatrogenic fistula significantly rose. The difference could be explained by the study being affected by inclusion criteria and the longer duration of the study. Inclusion criteria Ethiopia's study includes all genitourinary [10,12].

**Proportion of fistula repair failure:** our study found that the proportion of obstetric fistula repair failure in our specialized fistula unit was 35%. Among these 15% of women undergoing fistula repair did not have adequate fistula closure within 21 days, and 20% of women had incontinence after successful fistula closure. These findings indicate that the fistula closure achieved in this study meets the recommendations set by the World Health Organization (WHO). However, it is noted that incontinence following successful fistula closure was relatively higher comparable to the findings of the previous study conducted in Burundi and Ethiopia The findings´ similarities could be attributable to bladder neck and urethral sphincter injury cannot be easily addressed surgically, leading to more repair failure or inadequate urethral mucosal cooptation. Prolonged obstructed labor results in significant scarring and devascularization compromising tissue integrity, and impairing healing [4,14]. However, the proportion of obstetric fistula repair failure in this study was higher than those of studies conducted in Guinea Tanzania Dodoma, and Ethiopia when comparing our results to those from the study undertaken in Dodoma Tanzania, where unsuccessful repairs were reported to be as low we believe that the two studies were sufficiently different in their aims and analysis, thus comparison cannot be made. The definition used to classify failure in Dodoma was only a positive dye test and continence incontinence outcomes after successful repair were not considered different from the Guinean study may be due to the duration of the study, sample size, fistula characteristics of the participants or surgical technique [15,16].

However, the proportion of this study was lower than that done in Mwanza in Tanzania, Ethiopia, and Angola. The reason behind this difference in the study done in Mwanza and Angola may be explained by those studies which were conducted in areas endemic to Schistosoma in which the prevalence is high, in Mwanza 12.7% to 87.6%. Bladder size and tissue quality due to the disease are known to affect the success of fistula repair [2,17-19]. In general, the proportion of fistula repair failure at Kivulini Maternity Centre can be explained by the fact that Kivulini is an important fistula repair site with highly trained fistula repair specialists and as a result, the most

complex cases are referred here for specialized 'fistula camps'. This is very likely to contribute to the high failure rates.

**Factors associated with obstetric fistula repair failure:** our study found that several fistula-specific characteristics were significantly associated with obstetric fistula repair failure. These were urethral involvement (partial or completely destructed urethra), distance with distal edge of fistula < 1.5 cm from external urinary meatus, or severe fibrosis. We found that women who have partial or complete destruction of the urethra were significantly to have a failure of repair compared to women with no urethral involvement. These findings are similar to the Ethiopia and Guinean likely explanation for this is that urethral involvement might affect sphincter mechanisms and bladder size and therefore cannot be easily addressed surgically, leading to an increased likelihood of repair failure [4,16]. Our study also revealed that those women with severe fibrosis were more likely to experience obstetric fistula repair failure, these findings are consistent with Ethiopia and Congo, likely because the fibrosis phase determines the final strength of the healed wound. Prolonged obstructed labor produces an extensive crush wound that destroys wide swaths of tissue in the pelvis resulting in significant scarring devascularization compromising tissue integrity, impairing healing, and thus increasing the risk of failure of fistula repair [17,20].

Distance with the distal edge of fistula < 1.5 cm from external urinary meatus is another factor that was significantly associated with repair failure. This finding is supported by the studies conducted in Congo and can be explained by the closeness of the fistula to the external urethral meatus or the hymen, largely affecting the function of the urinary system, which leads to a high risk of fistula repair failure [20,21]. The associations observed in the bi-variable analyses with factors such as previous repair, pre-existing medical condition, and years of living with the problem were not sustained in the multivariate analyses. Specifically, Previous studies have demonstrated a relationship between previous repair and the occurrence of failure as in Kenya and Pakistan These studies indicate that reduced viable tissue and scarring following an initial repair might contribute to an increased likelihood of failure in subsequent repair efforts [7,22]. In our study, some characteristics had an association with unsuccessfully of fistula repair but were not statistically significant as it was found fistula with a size of > 3cm had an association with failure of fistula closure and fistula incontinence but not statistically significant unlike previous studies in Ethiopia have demonstrated a relationship between the size of fistula and the occurrence of failure the difference may be explained by intraobserver inter-observer variation during the initial evaluation of the fistula on determine the size of the fistula [4].

**Strength and limitation:** presence of a fistula foundation log book with most of the important variables, research was done in big fistula centers with FIG-accredited gynecological fistula surgeons. This study was limited by the difficulty of knowing the criteria used to diagnose obstetric iatrogenic fistula Hospital based study provides little representation of what is happening in the community (selection bias).

## Conclusion

Despite prolonged obstructed labor-related VVF contributing to the majority of VVF, our findings demonstrate iatrogenic VVF to be increasing over time. The trend of obstetric iatrogenic VVF in this study ranged from 12.8%-42.5% with the highest in 2022. The overall failure of obstetric VVF repaired in this study is still high above the WHO standard, with those remaining with incontinence after repair contributing to the majority of cases. Distance of distal edge of fistula< 1.5 cm from external urinary meatus, partial or completely destructed urethra, or severe fibrosis was significantly associated with obstetric fistula repair failure. Prospective interventional studies to

improve outcomes among risky women depicted in this study may have the potential to inform clinicians on appropriate surgical intervention to minimize incontinence post-surgical VVF repair.

***What is known about this topic***

- *The majority of the fistula heals successfully after surgical repair due to several factors.*

***What this study adds***

- *The findings from this study will be informative and potentially devise interventions to mitigate complications associated with VVF repair.*

## Competing interests

The authors declare no competing interests

## Authors' contributions

Annanoela Urassa, Joseph Mlay, Gileard Masenga, Bariki Mchome, Fredrick Mbise, Andrew Browning, and Glory Mangi, designed the study, collected data, and wrote the initial report, Upendo kibona and John Lugata participated in the design and supervised data collection and analysis. All the authors read and approved the final version of this manuscript.

## Acknowledgments

The authors would like to thank the dedicated health staff and the managers at the Kivulini repair hospitals, the obstetric department at KCMC hospital, the ministry of health, and KCMUCo university for all their support and collaboration. We are also grateful to Prof. Joseph Mlay, Prof. Gileard Masenga, Dr. Bariki Mchome, Dr. Fredrick Mbise, Dr. Andrew Browning Dr. Glory Mangi, Dr. John Lugata, Jane Mcharo Modesta Mitao for their contributions to the initial study.

## Tables and figures

**Table 1**: socio-demographic characteristics of women who underwent obstetric VVF repair (N=179)

**Table 2**: obstetric, clinical, and repair characteristics of women who underwent obstetric VVF repair (N=179)

**Table 2.1**: obstetric, clinical, and repair characteristics of women who underwent obstetric VVF repair (N=179)

**Table 3**: binary logistic regression analyses for factors associated with obstetric fistula repair failure among women underwent VVF repair at Kivulini maternity center (N=179)

**Table 3.1**: binary logistic regression analyses for factors associated with obstetric fistula repair failure among women underwent VVF repair at Kivulini Maternity center (N=179)

**Figure 1**: flow chart for selection study participants among women who underwent VVF repair

**Figure 2**: trends of obstetric VVF type over the four years among women who underwent obstetric VVF repair (N=179)

## References

1. Iancu G. Obstetric fistula. Childbirth Trauma. 2017;231-47. **Google Scholar**
2. Magali KT, Seni J, Massinde AN, Gumodoka B, Rumanyika RN. Short-term complications and associated factors among women undergoing obstetric fistula repair at bugando medical. 2016;55(2): 85-95. **Google Scholar**
3. El-azab AS, Abolella HA, Farouk M. Update on vesicovaginal fistula: A systematic review. Arab J Urol. 2019 Apr 4;17(1): 61-68 **PubMed**| **Google Scholar**

4. Tadesse S, Ejigu N, Edosa D, Ashegu T, Dulla D. Obstetric fistula repair failure and its associated factors among women underwent repair in Yirgalem Hamlin fistula center, Sidama Regional State, Southern Ethiopia, 2021: a retrospective cross sectional study. BMC Womens Health. 2022 Jul 10;22(1): 288. **PubMed**| **Google Scholar**
5. Petros P, Williams G, Browning A. Post vesico-vaginal fistula repair incontinence-A new hypothesis and classification potentially guide prevention and cure. Pelviperineology. 2015 Jun 1;34(2): 48. **Google Scholar**
6. Sori DA, Azale AW, Gemeda DH. Characteristics and repair outcome of patients with Vesicovaginal fistula managed in Jimma University teaching. BMC Urol. 2016 Jul 12;16(1): 41 **PubMed**| **Google Scholar**
7. Mwangi HR, Mabeya H, Kipruto H, Wanjala A. Factors Associated with Obstetric Fistula Repair Failure among Women Admitted at Gynocare Women s and Fistula Hospital in Kenya , 2012-2016: A Case Control Study. 2018;2012-6. **Google Scholar**
8. Tasnim N, Bangash K, Amin O, Luqman S, Hina H. Rising trends in iatrogenic urogenital fistula: A new challenge. Int J Gynaecol Obstet. 2020 Jan;148 Suppl 1(Suppl 1): 33-36. **PubMed**| **Google Scholar**
9. Hussain T, Begum A, Akhter N, Ghani T, Hossain DL. Iatrogenic Genitourinary Fistula: A Rising Trend. Bangladesh Journal of Obstetrics & Gynaecology. 2017 Apr 1;32(1): 10-3. **Google Scholar**
10. Ambaw MD. The Trend of Iatrogenic Genitourinary Fistula from 2005 to 2019 and Its Risk Factors at Addis Ababa Fistula Hospital, Addis Ababa, Ethiopia: A retrospective study. 2022;1-17. **Google Scholar**
11. Plus FC. Iatrogenic Fistula: an Urgent Quality of Care Challenge. New York, NY, USA: Fistula Care Plus/EngenderHealth. 2016. **Google Scholar**
12. Ngongo CJ, Raassen TJIP, Mahendeka M, Lombard L, Roosmalen J Van. Iatrogenic genito? urinary fistula following cesarean birth in nine sub-Saharan African countries: a retrospective review.BMC Pregnancy Childbirth. 2022 Jul 5;22(1): 541. **PubMed**| **Google Scholar**
13. Mehta A, Andrew W, Cheng J, Kundu M, Yarlagadda R, Sen M *et al*. Elective surgeries during and after the COVID-19 pandemic: Case burden and physician shortage concerns. Ann Med Surg (Lond). 2022 Sep;81: 104395. **PubMed**| **Google Scholar**
14. Tayler-smith K, Zachariah R, Manzi M, Boogaard W Van Den, Vandeborne A, Bishinga A *et al*. Obstetric Fistula in Burundi: a comprehensive approach to managing women with this neglected disease. BMC Pregnancy Childbirth. 2013 Aug 21;13: 164 **PubMed**| **Google Scholar**
15. Lilungulu A, Gumodoka B, Nassoro M, Soka P, Stephen K. Obstetric fistulae, birth out comes, and surgical repair outcomes: a retrospective analysis of hospital-based data in Dodoma, Tanzania. South Sudan Medical Journal. 2018 Nov 13;11(4): 93-6. **Google Scholar**
16. Delamou A, Delvaux T, Beavogui AH, Toure A, Kolié D, Sidibé S *et al*. Factors associated with the failure of obstetric fistula repair in Guinea: implications for practice. Reprod Health. 2016 Nov 8;13(1): 135. **PubMed**| **Google Scholar**
17. Aynie AA, Yihunie AG, Munae AM. Magnitude of repair failure and associated factors among women undergone obstetric fistula repair in Bahir Dar Hamlin Fistula Center, Amhara Region, Northwest Ethiopia. 2019;5(11): 324-31. **Google Scholar**

18. Bernard L, Giles A, Fabiano S, Giles S, Hudgins S, Olson A *et al*. Predictors of Obstetric Fistula Repair Outcomes in Lubango, Angola. J Obstet Gynaecol Can. 2019 Dec;41(12): 1726-1733. **PubMed**| **Google Scholar**
19. Mazigo HD, Zinga MM, Kepha S, Yard E, Mckee KM, Kabona G *et al*. Precision and geographical prevalence mapping of schistosomiasis and soil-transmitted helminthiasis among school - aged children in selected districts of north-western Tanzania. Parasit Vectors. 2022 Dec 29;15(1): 492. **PubMed**| **Google Scholar**
20. Mubikayi L, Matson DO, Lokomba V, Mboloko J, Kamba JP, Tozin R. Determinants of Outcomes and Prognosis Score in Obstetric Vesico-Vaginal Fistula Repair. Open J Obstet Gynecol. 2017 Jul 1;7(7): 767-77. **Google Scholar**
21. Rajaian S, Pragatheeswarane M, Panda A. Vesicovaginal fistula: review and recent trends. Indian J Urol. 2019 Oct-Dec;35(4): 250-258. **PubMed**| **Google Scholar**
22. AJaved A, Abdullah A, Faruqui N, Syed SS, Binat-ul-Mehdi, Pirzada AJ. Doctor! Will I be dry? Factors determining recurrence after vesicovaginal fistula repair. J Pak Med Assoc. 2015 Sep;65(9): 954-9. **PubMed**| **Google Scholar**

**Table 1:** socio-demographic characteristics of women who underwent obstetric VVF repair (N=179)

| **Variable** | **N (%)** | **Successful (%)** | **Unsuccessful (%)** |
|---|---|---|---|
| **Age** | | | |
| <18 | 8 (4.5) | 5(62.5) | 3(37.5) |
| 18-30 | 93(52.2) | 68(73.1) | 25(26.9) |
| 31-40 | 47(26.4) | 27(57.5) | 20(42.6) |
| >40 | 31(17.4) | 16(51.6) | 15(48.4) |
| Mean (± SD) | 31.7 (± 11.0 | | |
| **Marital status** | | | |
| Single | 31(17.3) | 23(74.2) | 8(25.8) |
| Married/cohabited | 119(66.5) | 80(67.2) | 39(32.8) |
| Divorced | 24 (13.4) | 13(54.2) | 11(45.8) |
| Widowed | 5(2.8) | 1(20.0) | 4(80.0) |
| **Education level** | | | |
| No school | 44(24.6) | 26(59.10 | 18(40.9) |
| Primary school | 97(54.2) | 63(64.9) | 34(35.1) |
| Secondary school | 20(11.1) | 17(85.0) | 3(15.0) |
| * | 18(10.1) | 11(61.1) | 7(38.9) |
| **Address** | | | |
| Kilimanjaro | 8(4.5) | 7(87.5) | 1(12.5) |
| Arusha | 52(29.1) | 37(71.2) | 15(28.9) |
| Manyara | 27(15.1) | 21(77.8) | 6(22.2) |
| Tanga | 6(3.4) | 4(66.7) | 2(33.3) |
| Dodoma | 29(16.2) | 18(62.1) | 11(37.9) |
| Mwanza | 17(9.5) | 7(41.2) | 10(58.8) |
| Others | 40(22.3) | 22(56.4 | 17(43.6) |
| *= represent missing data N=total participants, VVF: vesico-vagina fistula | | | |

| **Table 2:** obstetric, clinical, and repair characteristics of women who underwent obstetric VVF repair N=179) | | | |
|---|---|---|---|
| **Variable** | **N (%)** | **Successful (%)** | **Unsuccessful (%)** |
| 1 | 45 (25.1) | 33(73.3) | 12(26.7) |
| **Parity** | | | |
| 2-4 | 95 (53.1) | 57(60.0) | 38(40.0) |
| ≥5 | 39 (21.8) | 27(69.2) | 12(30.8) |
| Mean (±SD) | 3.2 (±2.3) | | |
| **Duration of labor (approx. hours)** | | | |
| <24 | 11(6.2) | 10(90.9) | 1(9.1) |
| 24-48 | 53(29.6) | 35(66.0) | 18(34.0) |
| >48 | 113(63) | 70(61.9) | 43(38.1) |
| * | 2(1.1) | 2(100) | 0(0) |
| Median (IQR) | 48(24, 48) | | |
| **Mode of delivery** | | | |
| Vaginal delivery | 119(66.5) | 75(63.0) | 44(37.0) |
| Assisted vagina delivery (instrumental) | 3(1.7) | 1(33.3) | 2(66.7) |
| Cesarean section | 57(31.8) | 41(72.0) | 16(28.0) |
| **Birth outcome** | | | |
| Alive and well | 68(37.9) | 45(66.2) | 23(33.8) |
| Stillbirth | 107(59.8) | 69(64.5) | 38(35.5) |
| * | 4(2.2) | 3(75) | 1(25) |
| **Causes of the fistula** | | | |
| Obstructed labor | 132(74) | 85(64.4) | 47(35.6) |
| Iatrogenic | 47(26) | 32(68.1) | 15(31.9) |
| **Fistula Goh classification** | | | |
| Class 1 | 88(49.1) | 70(79.5) | 18(20.5) |
| Class2 | 45(25.1) | 30(66.7) | 15(33.3) |
| Class3 | 23(12.9) | 12(52.2) | 11(47.8) |
| Class4 | 23(12.9) | 5 (21.7) | 18(78.3) |
| Key: other fistula = rectovaginal, urethrovagina, and ureteric injury obstetric Iatrogenic VVF=caused by cesarean section, cesarean hysterectomy, or instrumental delivery *Represent missing data | | | |

| **Table 2.1**: obstetric, clinical, and repair characteristics of women who underwent obstetric VVF repair (N=179) | | | |
|---|---|---|---|
| **Fistula type** | | | |
| Vesico vagina fistula | 161(89.9) | 108 (67.1) | 53(32.9) |
| Vesico vagina fistula +other fistula | 18(10.1) | 9 (50.0) | 9(50.0) |
| **Previous repair** | | | |
| yes | 57(32) | 24 (42.1) | 33 (57.9) |
| no | 122(68) | 93(76.2) | 29 (23.8) |
| **Duration of VVF** | | | |
| <1 | 105(58.6) | 80(76.2) | 25(23.8) |
| 2-5 | 42(23.5) | 21(50.0) | 21(50.0) |
| >5 | 32(17.9) | 16(50.0) | 16(50.0) |
| Median (IQR) | 1(0.33, 4) | | |
| **Anesthesia used** | | | |
| General anesthesia | 19(10.6) | 10(52.6) | 9(47.4) |
| Spinal anesthesia | 158(88.3) | 105(66.7) | 53(33.5) |
| Saddle anesthesia | 2(1.1) | 2(100.0) | 0(0.0) |
| **Duration of surgery** | | | |
| <1hrs | 35(19.6) | 27(77.1) | 8(22.9) |
| 1-2 hrs | 116(64.8) | 74(63.8) | 42(36.2) |
| >2hrs | 28(15.6) | 16(57.1) | 12(42.9) |
| **Days of hospital stay (days)** | | | |
| <7 | 2(1.1) | 0(0.0) | 2(100.0) |
| 7_14 | 16(9.0) | 11(68.8) | 5(31.6) |
| >14 | 161(89.9) | 106(65.8) | 55(35.2) |
| Median (IQR) | 21(17, 27) | | |
| **Duration of bladder catheterization in weeks** | | | |
| <2 | 60(33.5) | 39(65.0) | 21(35.0) |
| 2_3 | 107(59.7) | 71(66.4) | 36(33.6) |
| >3 | 6(3.4) | 6(100.0) | 0(0.0) |
| * | 6(3.4) | 1(16.7) | 5(83.3) |
| Key: another fistula = rectovaginal, urethrovagina, and ureteric injury obstetric Iatrogenic VVF =caused by cesarean section, cesarean hysterectomy, or instrumental delivery *represent missing data | | | |

**Table 3:** binary logistic regression analyses for factors associated with obstetric fistula repair failure among women who underwent VVF repair at Kivulini Maternity Center (N=179)

| Variable | successful | unsuccessful | COR (95%CI) | P-value | AOR (95%CI) | P-value |
|---|---|---|---|---|---|---|
| **Age** <18 | 5(62.5) | 3(37.5) | 1 | | 1 | |
| 18-30 | 68(73.1) | 25(26.9) | 0.58(0.13-2.6) | 0.478 | 0 .41(0.042- 4.02) | 0.447 |
| 31-40 | 27(57.5) | 20(42.6) | 1.23(0.26-5.78) | 0.789 | 1.18 (0.10-14.60) | 0.896 |
| >40 | 16(51.6) | 15(48.4) | 1.56(0.32-7.7) | 0.583 | 1.75(0.13 23.14) | 0.671 |
| **Education level** | | | | | - | |
| No school | 26(59.10 | 18(40.9) | 1 | | | |
| Primary school | 63(64.9) | 34(35.1) | 0.78(0.38-1.62) | 0.505 | | |
| Secondary school | 17(85.0) | 3(15.0) | 0.25(0.06-1.0) | 0.05 | | |
| **Parity** | | | | | | |
| 1 | 33(73.3) | 12(26.7) | 1 | | 1 | |
| 2-4 | 57(60.0) | 38(40.0) | 1.87(0.84-3.99) | 0.127 | 1.5 (0.42- 5.46) | 0.530 |
| >5 | 27(69.2) | 12(30.8) | 1.22(0.47-3.15) | 0.678 | 0.89 (0.17- 4.58) | 0.893 |
| **Duration of labor** | | | | | | |
| <24 | 10(90.9) | 1(9.1) | 1 | | - | |
| 24-47 | 35(66.0) | 18(34.0) | 5.14(0.61-43.39) | 0.132 | | |
| ≥48 | 70(61.9) | 43(38.1) | 6.14(0.76-49.68) | 0.089 | | |
| **Mode of delivery** | | | | | | |
| Vaginal delivery | 75(63.0) | 44(37.0) | 1.67(0.80-3.50) | 0.171 | | |
| Instrumental | 1(33.3) | 2(66.7) | 5.70(0.50-68.1) | 0.170 | | |
| Cesarean section | 41(72.0) | 16(28.0) | 1 | | | |
| **Birth outcome** | | | | | - | |
| Alive and well | 45(66.2) | 23(33.8) | 1 | 0.819 | | |
| Stillbirth | 69(64.5) | 38(35.5) | 1.10(0.60-2.04) | | | |
| **Fistula type** | | | | | - | |
| Vesico vagina fistula | 108(67.1) | 53(32.9) | 1 | | | |
| Vesicovagina + other fistula | 9(50.0) | 9(50.0) | 2.04(0.80-5.43) | 0.155 | | |
| **Years of living with the problem**** | | | | | | |
| <1yrs | 80(76.2) | 25(23.8) | 1 | | 1 | |
| 2-5yrs | 21(50.0) | 21(50.0) | 3.20(1.51-6.79) | 0.002 | 1.93 (0.67- 5.60) | 0.226 |
| >5yrs | 16(50.0) | 16(50.0) | 3.20(1.40-7.3) | 0.006 | 0.85 (0.22- 3.21) | 0.807 |
| **Fibrosis ***** | | | | | | |
| Mild | 76(86.4) | 12(13.6) | 1 | | 1 | |
| Moderate | 13(68.4) | 6(31.6) | 2.80(0.93-9.16) | 0.066 | 1.50(0.28-6.56) | 0.690 |
| Severe | 28(38.9) | 44(61.1) | 9.95(4.60-20.5) | <0.001 | 6.50 (2.30- 18.30) | <0.001 |

Key: COR=crude odds ratio, 1=reference category; p-value significant at, N=number (%), medical condition HIV, hypertension, anemia, Other fistula = rectovaginal, Urethrovagina, and ureteric injury, AOR=adjusted odds ratio; adjusted for age, parity, previous repair, distance from external urethral meatus status of the urethra, fibrosis, years of living with the problem, **significant in univariate and bivariate analysis, ** significant in both bivariate analysis and multivariable analysis, VVF=vesico-vagina fistula

| **Table 3.1**: binary logistic regression analyses for factors associated with obstetric fistula repair failure among women who underwent VVF repair at Kivulini Maternity Center (N=179) | | | | | | |
|---|---|---|---|---|---|---|
| **Distance from external urethral meatus*** ** | | | | | | |
| Distal edge of fistula > 3.5cm from the external urinary meatus | 65(79.3) | 17.(20.7 | 1 | | 1 | |
| The distal edge of the fistula is 2.5□3.5 from the external urinary meatus | 30(65.2) | 16(34.8) | 2.0(0.91-4.58) | 0.084 | 1.22(0.42- 3.54) | 0.714 |
| The distal edge of the fistula 1.5 – < 2.5 cm from the external urinary meatus | 12(52.2) | 11(47.8) | 3.50(1.32-9.31) | 0.012 | 0.87(0.18 4.24) | 0.868 |
| The distal edge of the fistula < 1.5 cm external from the external urinary meatus | 10(35.7) | 18(64.3) | 6.88(2.69-17.61) | <0.001 | 5.03(1.29- 19.56) | 0.020 |
| **Size of the fistula** | | | | | - | |
| < 1.5cm | 63(68.5) | 29(31.5) | 1 | | | |
| 1.5-3 cm | 23(69.7) | 10(30.3) | 0.94(0.40-2.24) | 0.897 | | |
| > 3 cm | 31(57.4) | 23(42.6) | 1.61(0.80-3.23) | 0.179 | | |
| **Status of the urethra*** ** | | | | | | |
| Intact | 114(78.1) | 32(21.9) | 1 | | 1 | |
| Partially/total damage | 3(9.1) | 30(90.9) | 35.63(10.21-121.33) | <0.001 | 30.82(6.37- 48.90) | <0.0001 |
| **Duration of bladder catheterization** | | | - | | - | |
| <2 | 39(65.0) | 21(35.0) | | | | |
| 2-3 | 71(66.4) | 36(33.6) | | | | |
| >3 | 6(100.0) | 0(0.0) | | | | |
| **Duration of surgery** | | | | | - | |
| <1hrs | 27(77.1) | 8(22.9) | 1 | | | |
| 1-2 hrs | 74(63.8) | 42(36.2) | 1.91(0.80-4.60) | 0.145 | | |
| >2hrs | 16(57.1) | 12(42.9) | 2.53(0.85-7.51) | 0.094 | | |
| **Medical condition*** | | | | | - | |
| No | 111(68.9) | 50(31.1) | 1 | | | |
| Yes | 6(33.3) | 12(66.7) | 4.44(1.58-12.50) | 0.005 | | |
| **Previous surgery** ** | | | | | | |
| Yes | 24(42.1) | 33(57.9) | 4.41(2.25-8.62) | <0.001 | 1.33( 0 .43- 4.08) | 0.620 |
| No | 93(76.2) | 29(23.8) | 1 | | 1 | |
| Key: COR=crude odds ratio, 1=reference category; p-value significant at, N=number (%), medical condition HIV, hypertension, anemia, Other fistula = rectovaginal, Urethrovagina, and ureteric injury, AOR=adjusted odds ratio; adjusted for age, parity, previous repair, distance from external urethral meatus status of the urethra, fibrosis, years of living with the problem, **significant in univariate and bivariate analysis, ** significant in both bivariate analysis and multivariable analysis, VVF=vesico-vagina fistula | | | | | | |

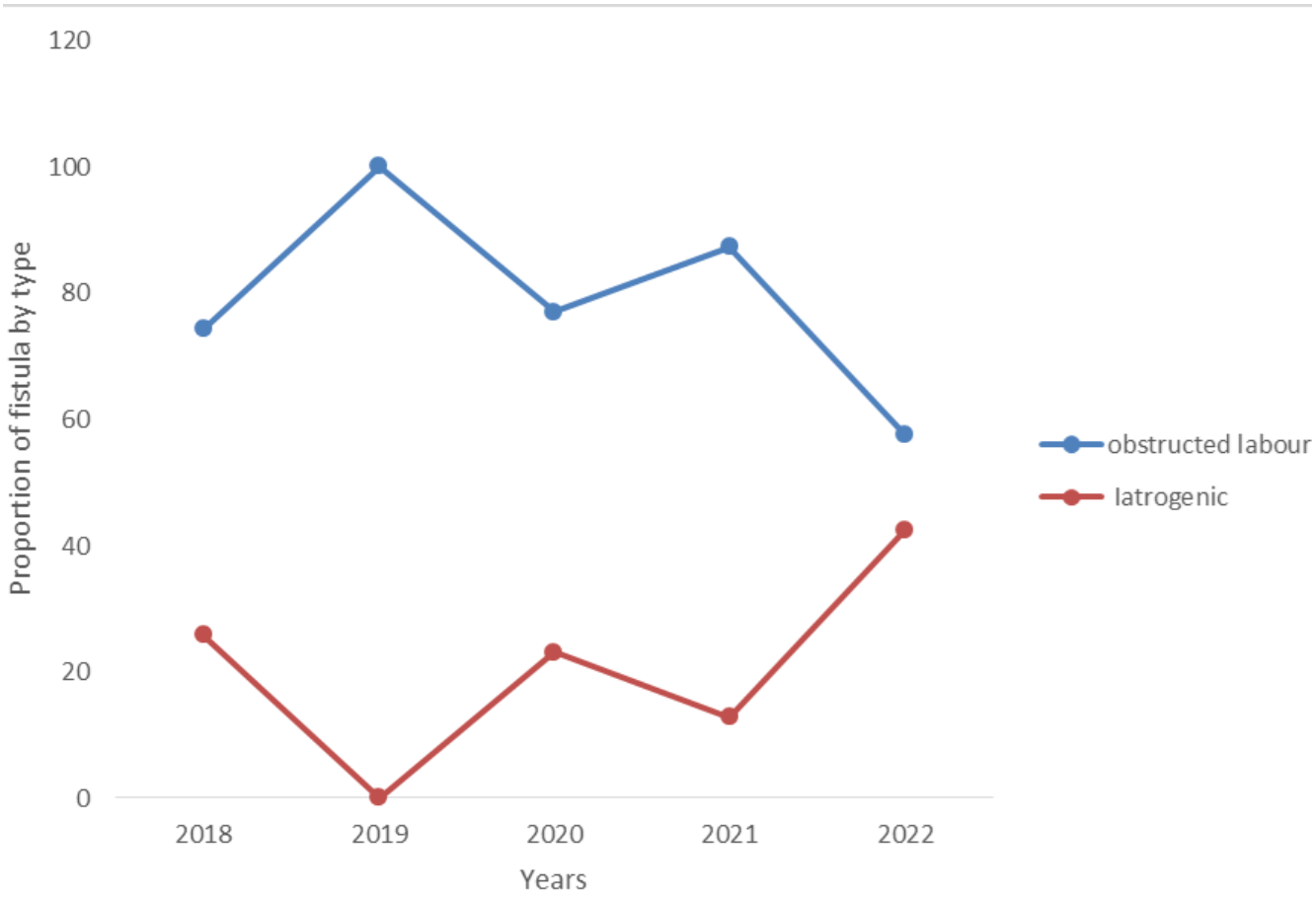


**Figure 1**: flow chart for selection study participants among women who underwent VVF repair

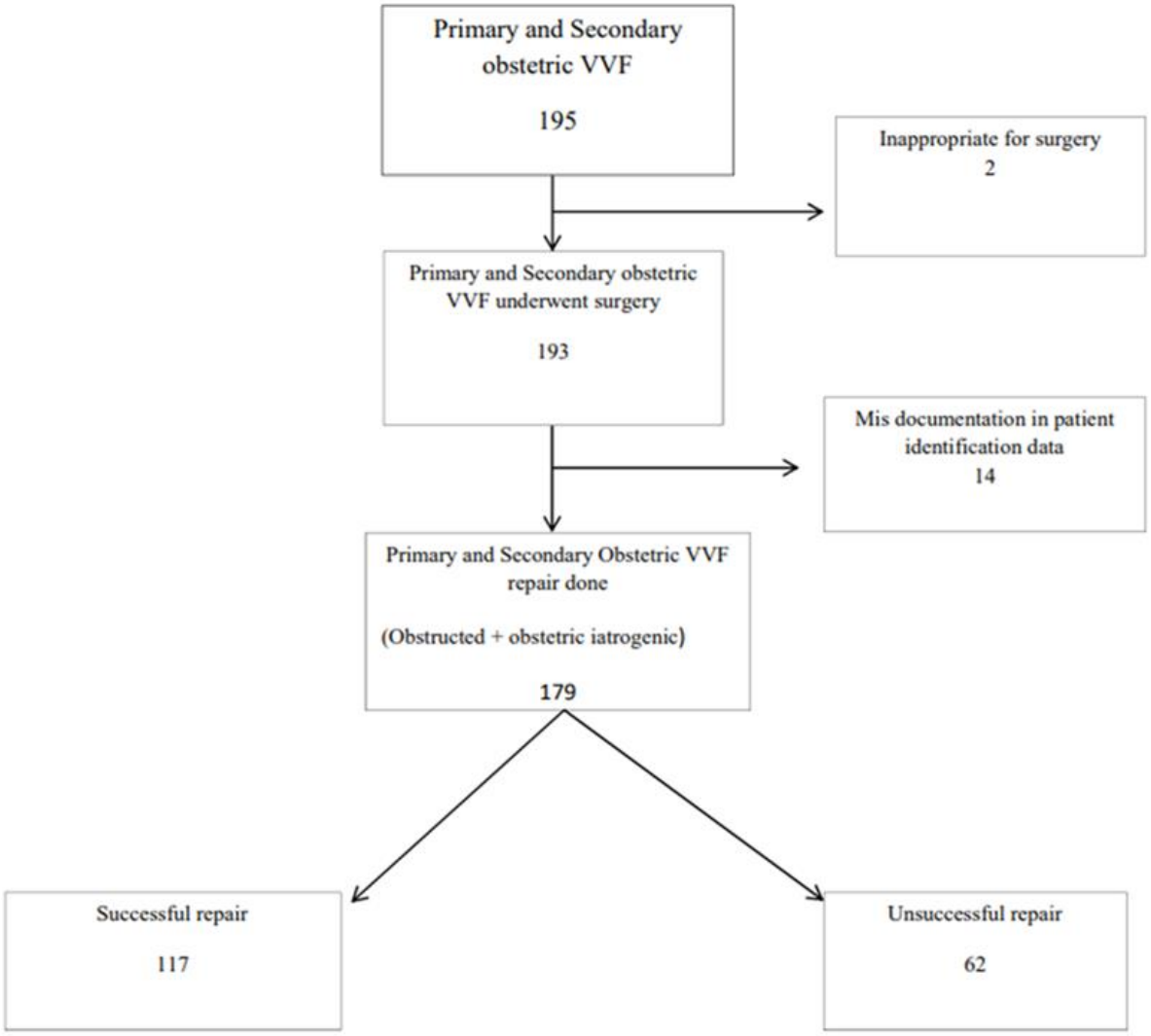


**Figure 2**: trends of obstetric VVF type over the four years among women who underwent obstetric VVF repair (N=179)