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Mental health must be more emphasized in the treatment of obstetric fistulas

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Thesis

MENTAL HEALTH MUST BE MORE EMPHASIZED IN THE TREATMENT OF OBSTETRIC FISTULAS

by

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DEDICATION

I would like to dedicate this work to my patient spouse Amadou, my amazing daughter Fadhila, my friends and families who gave me unconditional support.

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I would like to thank Dr. Genadry and Dr. Saide for helping me reach this milestone. I also would like to thank Vanessa Lin for motivating me and helping me find the necessary resources.

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ABSTRACT

Obstetric Fistulas have a high prevalence rate in developing countries where there is a lack of immediate access to maternal health care for women. Although Obstetric Fistulas are physical injuries, they affect women's psychosocial health. This analysis aims to display the inefficiency of focusing on surgical repairs as the only treatment option and to demonstrate the need to integrate mental health treatment at different Obstetric Fistulas treatment stages. A total of 8 research articles from both Pub Med and Web of Science met the inclusion criteria, and the analysis was done by country. The results showed the presence of depressive symptoms, although there is an immediate improvement in quality of life after surgical repair. In some cases, there was worsening of psychological symptoms due to residual incontinence with or without successful fistula closure. These results suggested that whereas surgical repairs positively impact Obstetric Fistula patients, it does not solve the depressive symptoms, which cause women to self-isolate and have suicidal ideations. The mental sequelae caused by Obstetrical Fistulas can only be resolved using structured mental health care that should be started before surgical repair and continued after repair.

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ABBREVIATIONS

CPD .....Cephalo-Pelvic Disproportion

GAD-7 ..... General Anxiety Disorder Seven-item

HSC .....Hopkins Symptom Checklist

ICIQ-SF .....International Consultation on Incontinence Questionnaire Short Form

OFs .....Obstetric Fistulas

PHQ-9..... Patient Health Questionnaire nine-item

POPs .....Pelvic Organ Prolapses

QoL.....Quality of Life

WHO..... World Health Organization

BACKGROUND

Pelvic floor disorders were shown to harm women's mental health. Indeed, a previous study established that women with either Pelvic Organ Prolapses (POPs) or Obstetric Fistulas (OFs) have a high likelihood to test positive for depressive symptoms (Zeleke et al., 2013). While POPs refer to pelvic floor organs' sagging, OFs are injuries connecting the urinary, genital, and gastrointestinal tracts that occur due to childbirth complications. Another study looking into an association between urinary incontinence and depression in women also found a positive relationship between the severity of the incontinence and depressive symptoms (Nygaard et al., 2003). Other studies also found that OFs patients screen positively for mental dysfunction (Goh et al., 2005). These studies demonstrated that women suffer mentally from OFs that affect the pelvic floor and surroundings.

The pelvic girdle

OFs would not be fully understood without mentioning the pelvis and its characteristics. The pelvic girdle is made of two Os Coxae. They articulate with the Sacrum posteriorly and with each other at the Pubic symphysis anteriorly. Each Os Coxae is a fusion of the Ilium, Ischium, and Pubis bones (Morton et al., 2019) (**Figure 1**).

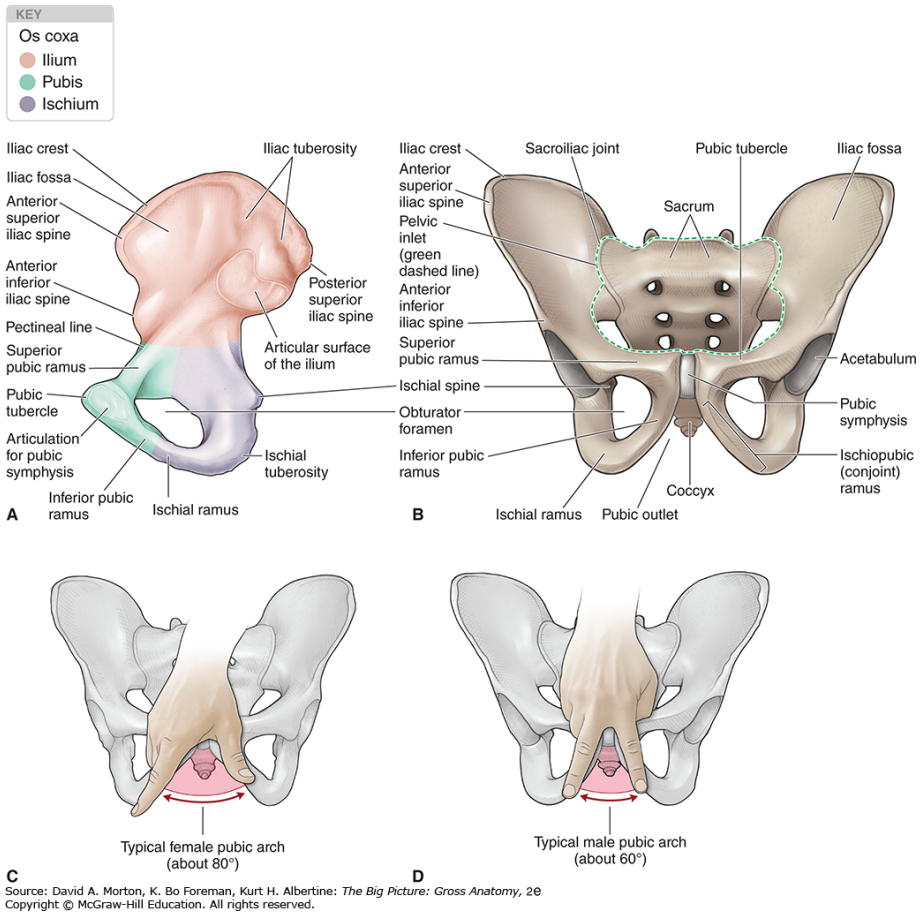
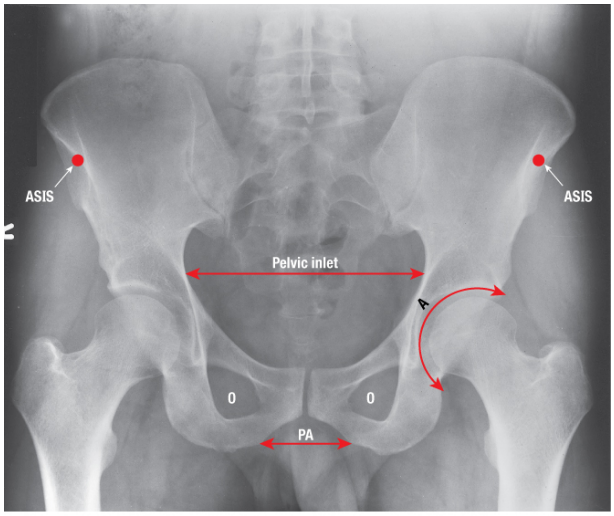


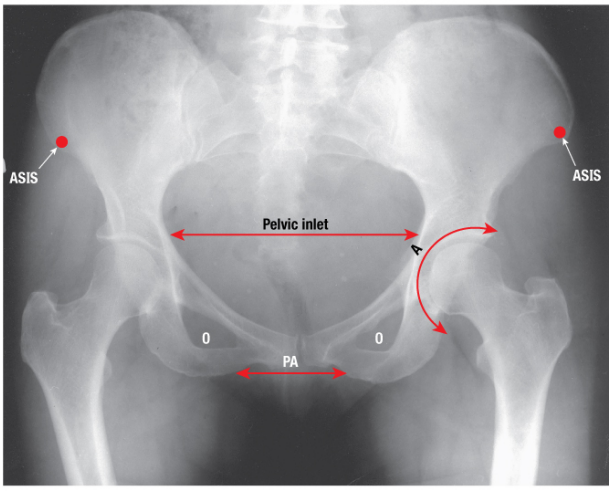
Figure 1. The pelvic girdle. A. Medial view of the os coxa. **B**. Anterior view of the pelvis. **C**. Female pelvis. **D**. Male pelvis. Taken from (Overview of the Abdomen, Pelvis, and Perineum, Morton DA, Foreman K, Albertine KH. *The Big Picture: Gross Anatomy*, 2e; 2019, Chap.6.)

The pelvic griddle's location and morphology make it one of the essential human body structures. It supports the upper body and serves as an anchor for the lower limbs, which helps with posture and movement. Besides, it supports abdominal organs in conjunction with the pelvic floor muscles. Although it plays similar roles in both males and females, the pelvic girdle is also involved in females' childbirth because the birth

canal lies within the pelvic girdle (DeSilva and Rosenberg, 2017). This aspect is the cause of some differences in its shape across genders (**Figure 2**.)



A. Anteroposterior Radiograph, Male Pelvis



B. Anteroposterior Radiograph, Female Pelvis

Figure 2: Radiographs of the male and female pelvis. It showcases crucial differences in the pelvis's structure between a Male (A) and a Female (B). The pelvic inlet, as well as the pubic angle, is broader in females. Also, the Anterior Superior Iliac Spine (ASIS) is rounder in females. Taken from (Grant's Atlas of Anatomy, 14e, 2017, Chap.5).

There are four parental types of the pelvis structure, and an individual (Female or Male) pelvis falls within a single type or is a combination of multiple types (Caldwell and Moloy, 1938.) The Gynecoid type is considered the female type, while the Android type is the male type. The Platypelloid type has a long oval shape in the transverse plane, and the Anthropoid type is narrow and longitudinally oval (Bennet et al., 2019) (**Figure 3**). However, these are considered the parent types.

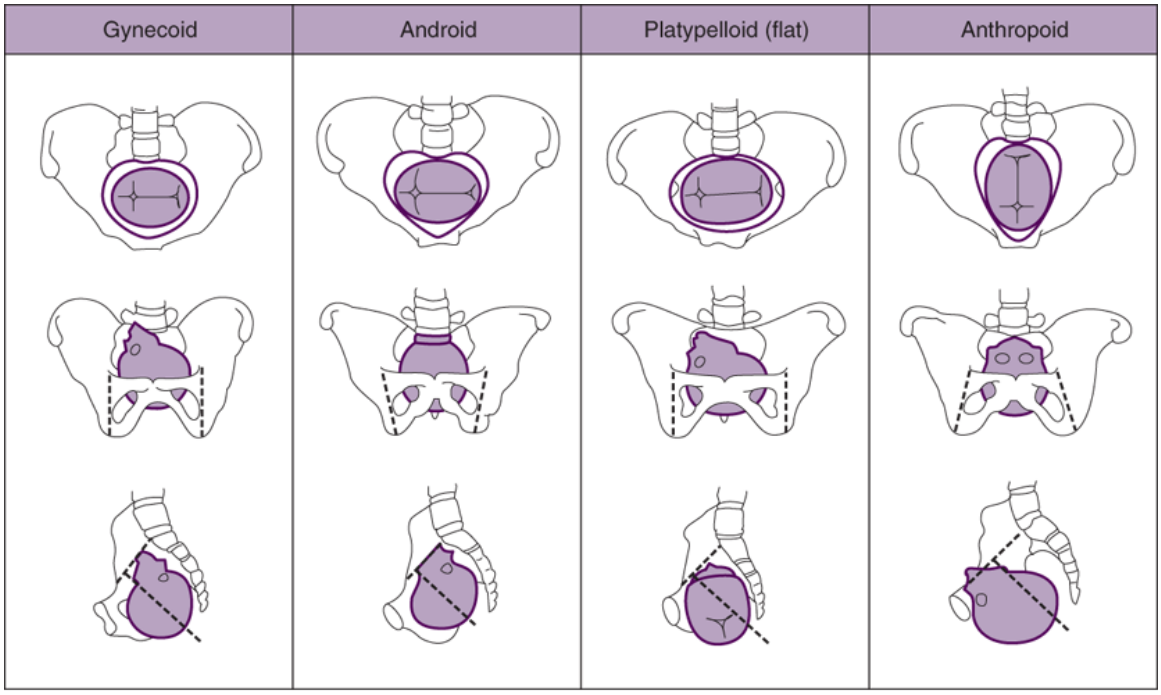


Figure 3. Different types of the pelvis. This image illustrates how the pelvis's shape affects the fetal head's position inside the birth canal. Taken from (Normal & Abnormal Labor & Delivery Terri-Ann Bennett; Christine Proudfit; Ashley S. Roman. *CURRENT Diagnosis & Treatment: Obstetrics & Gynecology, 12e;* 2019, Chap.7).

Obstructed Labor

According to previous studies, humans are more likely to experience obstructed labor than other primates because of the tight-fitting between the fetal head and the maternal birth canal (**Figure 4**) (Schultz, 1969). It causes the Cephalo-Pelvic Disproportion (CPD) rate to increase due to any difference in either the size of the maternal pelvis inlet or the fetal skull (Pavličev et al., 2020).

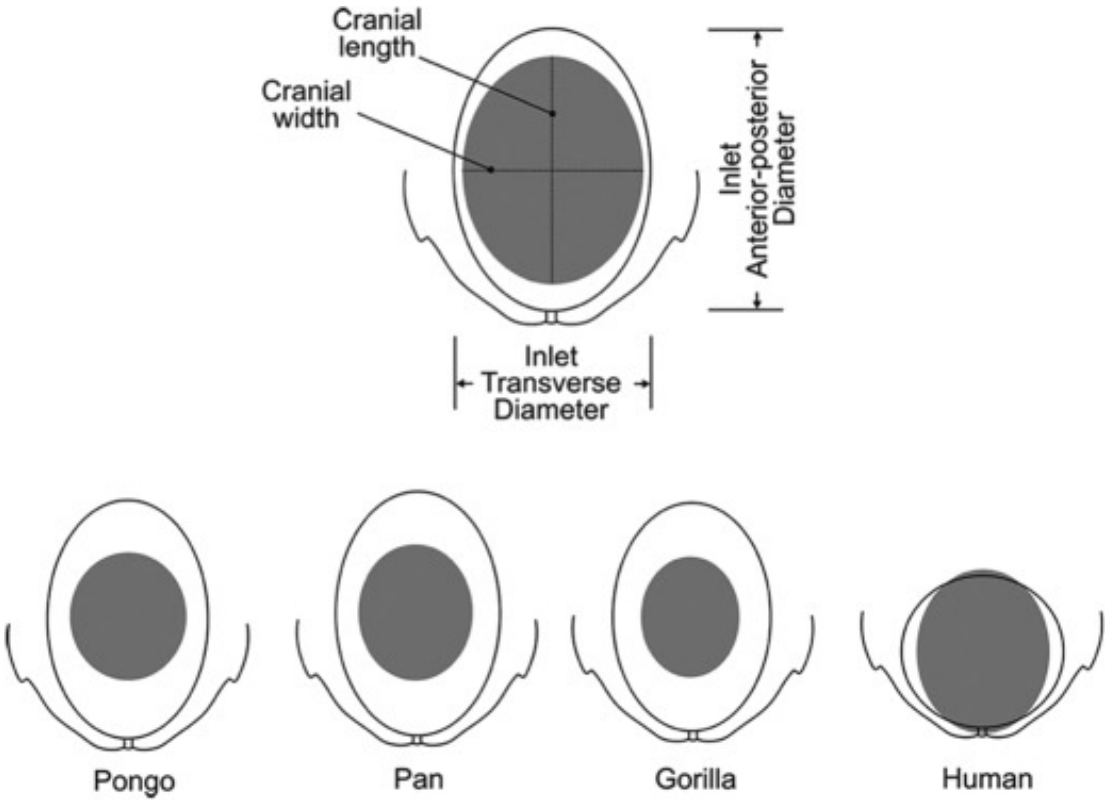


Figure 4. Comparison of cephalopelvic proportion between humans and other primates. Taken from (Pavličev et al., 2020).

Obstetric Fistulas Definition and Classification

A Fistula is an abnormal communication between two hollow organs resulting from many causes such as pelvic surgeries, radiation therapies in the pelvis, inflammation, or obstructed labor (Trovik et al., 2016). While surgeries are more often involved in gynecological fistula, obstructed labor is the most common cause in Obstetric Fistulas. Feto-maternal (Cephalo-Pelvic) disproportion is caused by malformed and or underdeveloped pelvic bones. It is the leading cause of obstructed labor. However, fetal malpresentation is also a cause (Neilson et al. 2003). During Obstructed labor, the fetal body parts compress the organs' soft tissues in the mother's pelvic cavity. Without immediate assistance, tissue damage and necrosis occur due to the cessation of blood flow to the soft tissues.

OFs encompasses Urethro-Vaginal Fistulas, Vesico-Vaginal Fistulas Uretero-Vaginal Fistulas, Vesico-uterine Fistulas, and Recto-Vaginal Fistulas. The location of the injury will specify the type of OF. For example, a Vesico-Vaginal fistula occurs if the damage is between the bladder and the vagina. When the injury is located between the vagina and the rectum, it is called a Recto-Vaginal Fistula.

Although there is no accepted consensus, the classification of OFs depends on several aspects of the injury, such as location, size and number of surgical repairs (Waaldijk, 2004), (Goh et al.,2009). **Appendix I** illustrates the different types of genitourinary fistula classifications (FRAJZYNGIER et al., 2013).

Prevalence of Obstetric Fistulas

The lack of efficient methods to measure the disease's prevalence makes it very hard to know the exact number of women having a variation of OFs. It is estimated that 3.5 million women are affected worldwide (Wall, 2006).

In industrialized countries where women have access to adequate care throughout pregnancy and childbirth, Obstetric Fistulas are rare. The opposite is true in developing countries where emergency obstetric care is minimal, especially in rural areas where women face many more issues that predispose them to the disease. The World Health Organization (WHO) established that 99% of maternal deaths worldwide transpires in the developing world each year. Women in areas of non-existent obstetric care who experience obstructed labor will be dehydrated and exhausted. They will also experience sepsis due to infection, which is the leading cause of death (Neilson et al., 2003). If those women have increased probabilities of having pregnancy or childbirth complications, the percentage of maternal deaths will increase (Wall, 2006).

Other factors lead to OFs (**Figure 5.**) Among them are genetics, lack of education (**Table 1**), early marriage, and malnutrition that predispose women in those areas to contract the disease (Tebeu et al., 2012). Some studies show a correlation between nutrient deficiency such as calcium and a small pelvis as an essential contributing factor to childbirth complications (Konje and Ladipo, 2000). Furthermore, other studies comparing pelvis size between African and European women showed that African women have a smaller pelvis (Baragi et al., 2002).

Table 1. Illiteracy as a risk factor for OFs. Taken from (Tebeu et al., 2012).

Author	Journal	Year	Illiteracy
Meyer et al. [22]	Am J O G	2007	49/58(84.5%)
Ijaiya and Aboyeji [23]	WAJM	2004	32/34(94.1%)
Melah et. al [4]	J OG	2007	77/80(96.3)
Wall et al. [26]	Am J O G	2004	700/898(77.9)
Holme et al. [7]	Br J O G	2007	42/213(19.7)
Rijken and Chilopora [32]	Int J G O	2007	154/407(37.8)
Jokhio and Kelly [33]	Int J G O	2006	105/116(90.5)
Gessessew and Mesfin [8]	Eth M J	2003	156/193(80.8)%

Illiteracy among the obstetrical fistula patients ranged from 19% to 96% (Table 3)

Repercussions of Obstetric Fistulas

OFs have devastating outcomes, both physical and mental. The most visible aspect of the disease is incontinence, either urinary or fecal, depending on the injury. As depicted in **Figure 5**, besides fetal death, some of the consequences are chronic skin irritation, neurological damage, vaginal scarring and stenosis, and foul odors, which are the leading cause of self-isolation and social stigma. In addition to those, many patients are abandoned by their families, a factor that increases the risk of mental health issues and death (Polan et al., 2015).

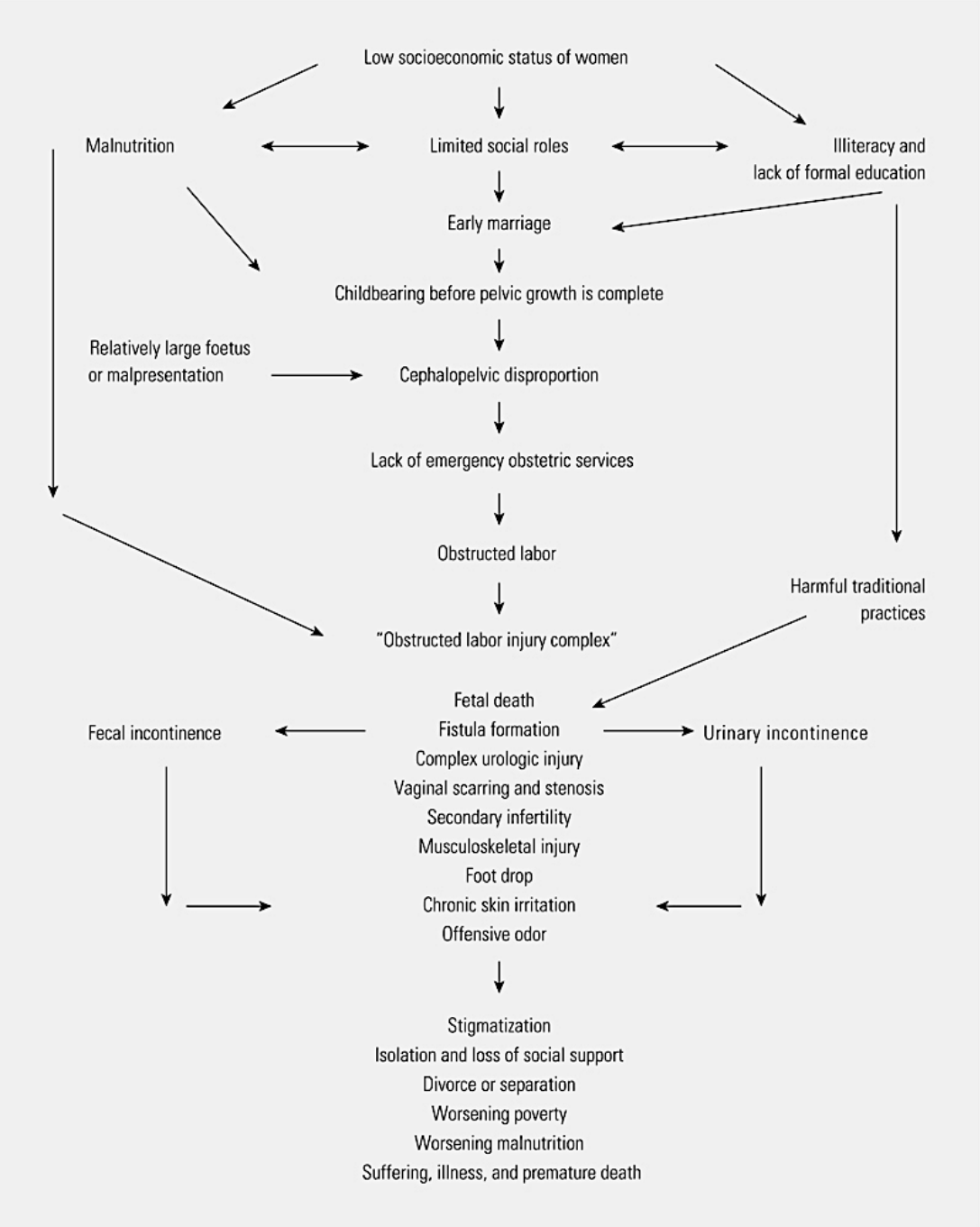


Figure 5. Obstetric Fistulas Pathway. Taken from (Polan et al., 2015).

Conventional Treatment

Obstetric Fistulae is an unconventional disease that does not allow the doctor to deliver a diagnosis and simply order a treatment regimen. The only cure for OFs is through surgical repairs. The outcome depends on the location of the fistula, the competency of the surgeons, the number of repairs done previously, and when the fistula first occurred. Since scaring also makes repair harder, the success rate of fistula repair is affected by the number of previous surgeries (Barone et al., 2012), (Ouedraogo et al., 2018). Although most are successful, **Table 2** shows that some patients experience residual incontinence in 16-32 % of cases after surgery (Browning, 2006). Unfortunately, women who have had successful fistula closure also have depressive symptoms due to residual incontinence (Browning et al., 2007). **Table 3** indicates that successful closure could have two outcomes: successful and continent or successful and incontinent. The data also shows that the degree of incontinence after successful closure can be severe.

Furthermore, the study results in **Table 3** also demonstrated that all the patients had shown symptoms of depressive disorder before surgical repair. All the patients who had unsuccessful closure as well as successful, but had severe incontinence, also had a positive result for depression. It is also essential to notice that even among the patients who had a successful repair and did not experience incontinence, there was a positive result in the depression screen (29%).

Table 2. Measured parameters compared women with residual incontinence after operative repair and those without. Taken from (Browning, 2006).

Table 1. Measured parameters comparing women with residual incontinence after operative repair and those without

	Residual incontinence (n = 155)*	No incontinence (n = 326)*	P
Urethral involvement	145 (94)	173 (53)	<0.001
Women having repeat procedure [number of repeats]**	31 (20) [1–5]	34 (10) [1–3]	0.006
Fistula diameter ≥6 cm	30 (19)	31 (10)	0.004
Small bladder	17 (11)	4 (1)	<0.001
Ureter outside bladder	7 (5)	11 (3)	0.72
Vaginoplasty at operation	87 (56)	77 (24)	<0.001
Flap vaginal reconstruction	22 (14)	4 (1)	<0.001
Rectovaginal fistula present	32 (21)	18 (6)	<0.001
Multiple vesicovaginal fistulae present	9 (6)	18 (6)	1.0
Parity	1.83 (1–11)	2.93 (1–13)	<0.001†
Average fistula diameter (cm)	4.1 (1–10)	3.3 (0.5–8)	<0.001#
Time in labour (days)	3.43 (1–7)	3.16 (0.5–8)	0.053#
Age (years)	22.5 (15–70)	25.9 (14–50)	<0.001#
Time since delivery (months)	20.6 (2–600)	18.3 (1.5–342)	0.92†
Delivery method			
Vaginal delivery	135 (87)	249 (76)	
Caesarean	11 (7)	28 (9)	0.010
Caesarean hysterectomy	9 (6)	49 (15)	
Outcome—live births	4 (3)	19 (6)	0.18

Statistical tests by chi-square for all except *t* test # and Mann–Whitney *U* test †.
*All the numbers in these column are the number (%) except for parity Av fistula diam, length of labour, age and time since del. These latter have the mean and then the range in brackets.
**Women having repeat operations, the number of women is listed, then the percentage and then the range of repeat operations.

Table 3. Depression screening data in OFs Patient before and after surgical repair. A GHQ score above 4 indicates a positive result for depressive symptoms. Taken from Browning et al., 2007).

	n	**Number (%) screening positive (GHQ score >4)**	**Median (IQR)**
Admission (before treatment)	51	51 (100)	27 (23–28)
Discharge (after treatment)	51	18 (35)	2 (0–6)
Failed repairs	3	3 (100)	23
Successfully closed fistula	48	15 (31)	7 (6–15)
Closed and continent	45	13 (29)	7 (5.5–7)
Closed, but severe incontinent	3	3 (100)	20

SPECIFIC AIMS

This thesis's objective is to disclose the limitations of surgical repairs as the sole treatment of Obstetric Fistulas and provide evidence of the importance of psychological therapies at different OFs repair stages. Moreover, we seek to demonstrate why mental health must be more emphasized in the disease's healing process.

METHODS

Since the goal of this review is to demonstrate the necessity of integrated mental health care in OF treatment, articles that met the following criteria were included: (a) studies written in English, (b) studies that were free full text, (c) studies published not earlier than 2015, (d) studies from countries with high OF prevalence, (e) studies with a sample size greater than ten patients, (f) studies that focused on the impact of surgical repair on patients' Quality of Life (QoL) and or psychosocial symptoms in OF patients, (g) studies that were longitudinal with follow up data after three months minimum post-surgical repair, and (h) studies that were original, not review articles.

Using the key terms listed in **Appendix II** in Pub Med and Web of Science, a total of 75 articles about Obstetric Fistulas and mental health were identified. Those articles were then narrowed down to studies that were open access and published in 2015 and later. Twenty-six articles met those inclusive criteria. Articles that did not study the association between surgical repair and psychosocial symptoms were excluded. Review articles were also excluded. Once the duplicates were removed, the most recent report from countries with a high prevalence of OFs was selected. A total number of 8 articles from 8 different countries (Ethiopia, Malawi, Kenya, Uganda, Tanzania, Mali, India, Somalia) met the inclusion criteria for review.

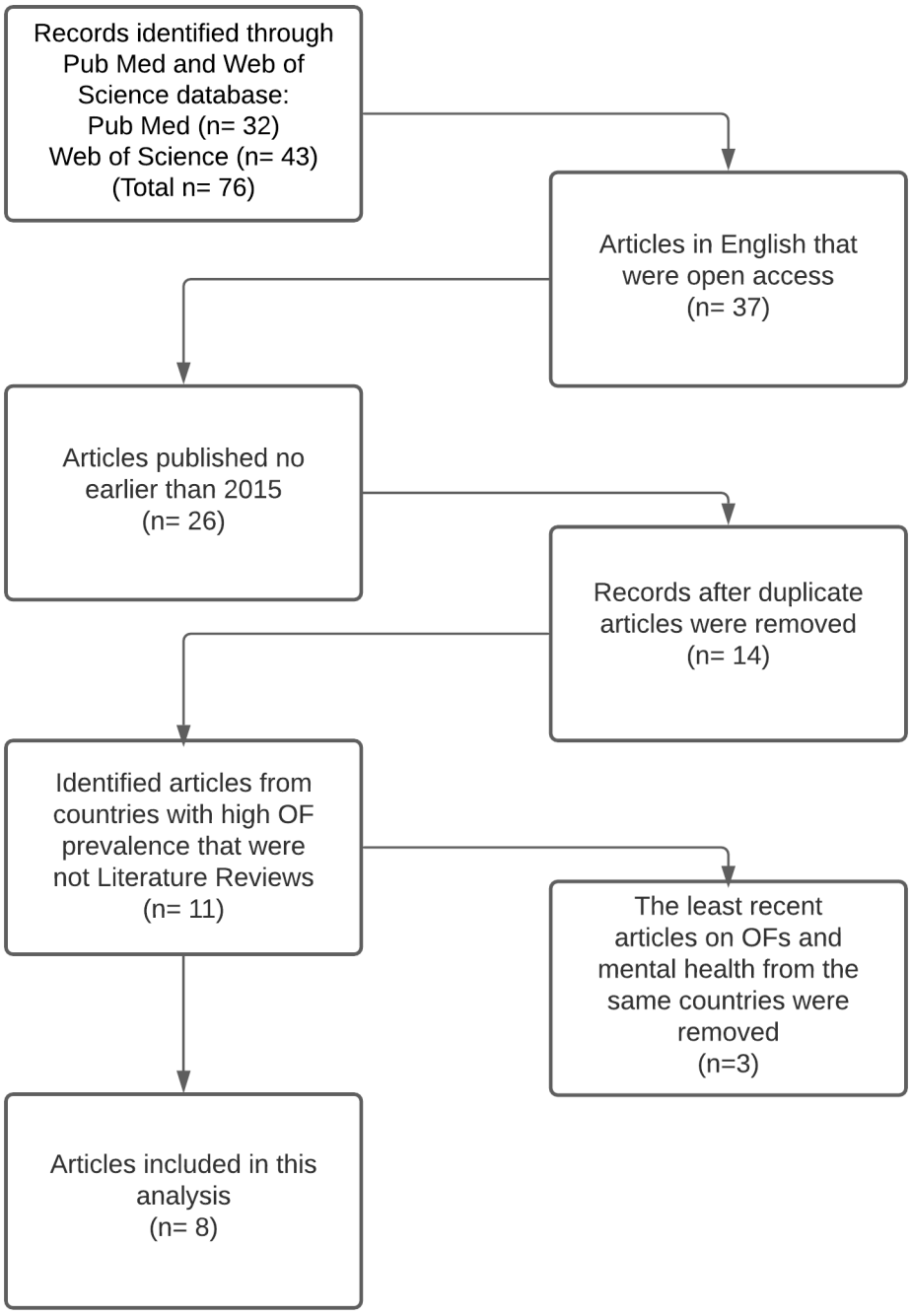


Figure 6. PRISMA diagram for study inclusion/exclusion criteria.

RESULTS

Some of the relevant studies identified in this analysis used the Quality of Life (QoL) changes before and after repair to investigate how much OFs affect their victims. Other studies, however, focused on changes in depressive symptoms following surgical repair. In addition, some studies investigated the association between residual incontinence following repair and psychological disorders.

Consequently, our study will analyze the difference in QoL and depressive/ anxiety symptoms after surgical treatment and the impact of residual incontinence on psychosocial health. The analysis will be done by country to compare similarities and differences in both methods and results. This method will help display the fact that OFs have the same devastating impact on patients' mental health from different geographical locations, traditions, cultures, religions, and demographics, and addresses the need to implement psychosocial health treatment.

Ethiopia

The article published in 2019 by Belayihun and Mavhandu-Mudzusi is among the very few Obstetric Fistula articles from this country. The researchers used a longitudinal study design to investigate the effect of OF repair on the severity of depression and anxiety in OF patients in Ethiopia. The patients were recruited from six various Fistula Care Centers throughout the country, and an original sample size of 219 that matched the

selection criteria was used to conduct the study. Two hundred out of the 219 patients came back for their six-month follow-up appointment.

Using the Patient Health Questionnaire nine-item (PHQ-9) and General Anxiety Disorder Seven-item (GAD-7) scales, depression and anxiety levels were measured before surgical repair and six months after surgery. Both PHQ-9 and GAD-7 scales passed the reliability test and were validated to be used in Ethiopia. As predicted, **Table 4** showed that most OF patients suffer from depression and anxiety before surgical repair, although at different levels. Two hundred patients had shown symptoms of depression (91.3%), and 174 patients had signs of anxiety (79.5%). The finding illustrates how much of an impact the disease has on mental health.

Table 4. Depression and anxiety pre-surgery in OF patients in Ethiopia. The sample size is n= 219. Taken from (Belayihun and Mavhandu-Mudzusi, 2019)

Psychosocial variable	**Depression**	**Anxiety**
	Number (%)	***Number (%)***
Over all prevalence	200 (91.3)	174 (79.5
Level of severity		
No symptom/Minimal	19(8.7)	45 (20.5)
Mild	73 (33.3)	71 (32.4)
Moderate	53 (24.2)	59 (26.9)
Moderately severe	49 (22.4)	
Severe	25 (11.4)	44 (20.1)

At the six-month follow-up appointment post-surgical repair, only 27% of the 200 returning patients presented mild to severe depression symptoms while 73% had none to minimal signs. Twenty-six % of the patients had mild to severe anxiety symptoms, whereas 75% showed none to minimal symptoms. Statistical analyses were used to indicate significant differences in depression and anxiety levels before and after surgical repair **(Table 5**.)

Table 5. Statistical analysis of depression and anxiety differences pre- and post-repair in Ethiopia. The sample size is n=200. There is a statistically significant difference in the prevalence of depression and anxiety because the mean score or p-value is 0.000, which is smaller than 0.001. Taken from (Belayihun and Mavhandu-Mudzusi, 2019.)

Psychological symptoms (depression and anxiety) between pre and post-surgical follow-up among women with obstetric fistula in Ethiopia ($n = 200$)

Symptoms	Baseline *M* *(SD)*	Follow-up *M* *(SD)*	Paired test (2 tailed)		Kruskal Wallis test		Mann-Whitney Test	
			T	*P-value*	X^2	*P-value*	z	*P-value*
Depression	12.29 (5.9)	3.64 (4.6)	15.94	0.000*	178.1	0.000	−13.3	0.000*
Anxiety	9.90 (5.2)	3.35 (4.7)	13.29	0.000*	145.5	0.000	−12.1	0.000*

*$P < 0.001$

This study went further by detecting a positive association between the severity of leaking and psychological distress even though there were some limitations (**Table 6**). The results showed greater anxiety and depression levels in the group that continued to experience leakage (not cured) than the group cured by the surgical repair.

Table 6. Relationship between cure status after surgical repair and psychological distress such as depression and anxiety in Ethiopia. Taken from (Belayihun and Mavhandu-Mudzusi, 2019).

Exploratory association between cure with psychological symptoms after post-surgical repair among women who completed surigical repair treatment in Ethiopia ($n = 200$)

Variable	Cure status after surgical repair		Group difference (t-test)	*P*-value
	Cured *M (SD)*	Not Cured *M (SD)*		
Depression symptoms	1.16 (2.5)	3.9 (4.3)	−4.3	0.000**
Anxiety symptoms	1.24 (2.6)	3.4 (4.3)	−3.3	0.002*

*$p < 0.01$, ** $p < 0.001$

Overall, the study demonstrated how traumatic OFs could be on patients and how much surgical repairs improved patients' QoL by significantly decreasing their psychological distress levels. Additionally, the researchers established a relationship between incomplete fistula closure and greater depression and anxiety symptoms. Consequently, only patients who received successful surgical repair experienced an increase in QoL. The patients whose surgeries were unsuccessful experienced a decrease in QoL. To address this issue, the researchers recommended a targeted, integrated mental health treatment.

Malawi

A Study by Kopp et al. in 2019 looked into the relationship between urinary incontinence, quality of life, and depression after surgical repair of Vesico-Vaginal Fistulas in Malawi. The study was done at the Fistula Care Center in Lilongwe with a sample size of 290. Participants had had a surgical repair at least in the past 12 months. The median time is 35.5 months before the study. 84.8% of the participants had one antecedent fistula repair, 10.3% had two, and 4.9% had three or more repairs. Self-reported urinary incontinence was assessed using the one-hour pad test, which consists of weighing the pads that the patients have worn after one hour. Pads with an increased weight of 1.5 grams or higher after being worn were considered positive for incontinence. The depression variable was quantified using the PHQ-9, and the QoL was assessed using the King's Health Questionnaire, a validated tool to use in female urinary incontinence.

Fifty participants (17.2%) had a positive one-hour pad test with a median weight of 12.7 grams, and 49 of those self-reported urinary incontinence before the test. The study found out that of the participants who had self-reported incontinence (56 total), 69.6% had a positive one-hour pad test after their surgical repair. During this study, 25% had increased leakage, and 25% had a decrease in leakage. In comparison, 41.1% remained the same (**Table 7**).

Table 7. Urinary Incontinence one-hour pad test results in Malawi. Taken from (Kopp et al., 2019).

	Reported urinary incontinence (n=56)	No reported urinary incontinence (n=234)	p-value
1-hour pad weight at discharge from last repair at FCC			<0.001
<1·5 grams (negative)	12 (21.4)	139 (59.4)	
≥1·5 grams (positive)	39 (69.6)	76 (32.5)	
Missing	5 (8.9)	19 (8.1)	
1-hour pad weight at time of follow-up			<0.001
<1·5 grams (negative)	7 (12.5)	233 (99.6)	
≥1·5 grams (positive)	49 (87.5)	1 (0.4)	
Change in pad weights			0<.001
More leaking at discharge	14 (25.0)	34 (14.5)	
More leaking at follow-up	14 (25.0)	0 (0.0)	
Similar leaking	23 (41.1)	181 (77.4)	
Missing	5 (8.9)	19 (8.1)	

Additionally, 30 out of the 56 participants who self-reported incontinence affirmed having an increment in QoL post-surgical repair. When it comes to depression, 10 participants were positive for depressive disorder, and eight reported worsening in QoL. There were some cases of suicidal ideation among the participants who scored below 10 (4 participants) on the PHQ-9 (a score above ten is positive for the depressive disorder). Those 4 participants also reported residual incontinence (**Table 8**).

Table 8. Characteristics of participants who were positive for depressive disorder and suicidal ideation in Malawi. Taken from (Kopp et al., 2019).

Age	Self-reported incontinence	Pad weight (grams)	Overall QOL since repair	Does incontinence affect QOL?	Married	Number of living children	Hysterectomy
Characteristics of women with depressive symptoms at follow-up (n=10; 3·4%)							
44	Yes	6.9	Slightly improved	A lot/greatly	Yes	0	No
45	Yes	45.1	No different	A lot/greatly	Yes	0	Yes
34	Yes	25.9	A little worse	Moderately	Yes	0	Yes
72	Yes	16.0	A little worse	A lot/greatly	No	1-2	No
26	Yes	25.1	A little worse	A lot/greatly	Yes	1-2	Yes
49	Yes	42.0	Worse	A lot/greatly	Yes	0	Yes
35	Yes	42.1	Worse	Moderately	Yes	0	No
48	Yes	36.0	Worse	A lot/greatly	Yes	0	Yes
50	Yes	8.5	Much worse	A lot/greatly	Yes	1-2	No
35	Yes	13.0	Much worse	A lot/greatly	Yes	0	No
Characteristics of women with suicidal ideation at follow-up (n=4; 1·4%)							
30	Yes	1.4	Slightly improved	Moderately	Yes	0	No
30	Yes	12.0	No different	A lot/greatly	Yes	≥3	No
25	Yes	0.2	A little worse	Not at all	No	0	No
60	Yes	54.9	Much worse	A lot/greatly	No	0	No

*QOL=quality of life

Overall, this study established that women who had residual incontinence experienced decreased QoL and presented major psychological distress characteristics. It also emphasized the need to focus on psychosocial treatments, particularly in patients with residual incontinence.

Uganda

A study from El Eyadi et al. that was published in 2019 also looked into the interrelationship between physical and psychosocial symptoms in women from Uganda a year post fistula repair. This study's main goal was to assess the impact that the surgical repair had on the patients' psychosocial health 3-, 6-, 9- and 12-months post-surgery compared to pre-surgery conditions. All 60 participants were recruited from the same hospital in Kampala. To measure physical health, a combination of multiple tools was used: the Stanford Self-Rated Health measure for general health, the International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF) self-reported symptoms. Some of the tools used for psychosocial health were the Hopkins Symptom Checklist (HSC) to measure depression (score above 1.75 is positive for the depressive disorder) and the WHO Quality of Life (QOL)-BREF to assess the quality of life.

Although the range between fistula development and repair was between 2 weeks to 31 years, 97% of the participants delivered at a health care facility. The improvements across all the variables from pre-surgical conditions (baseline) can be appreciated in **Figure 7.** The results show a consistent reduction of negative physical and mental health symptoms and increased QoL up to 6 months post-repair. In the case of QoL, it increased from baseline to 6 months, then declined slightly at 12 months overall. Negative self-perception seemed to improve from baseline to 3 months post-repair, then remained constant throughout 12 months.

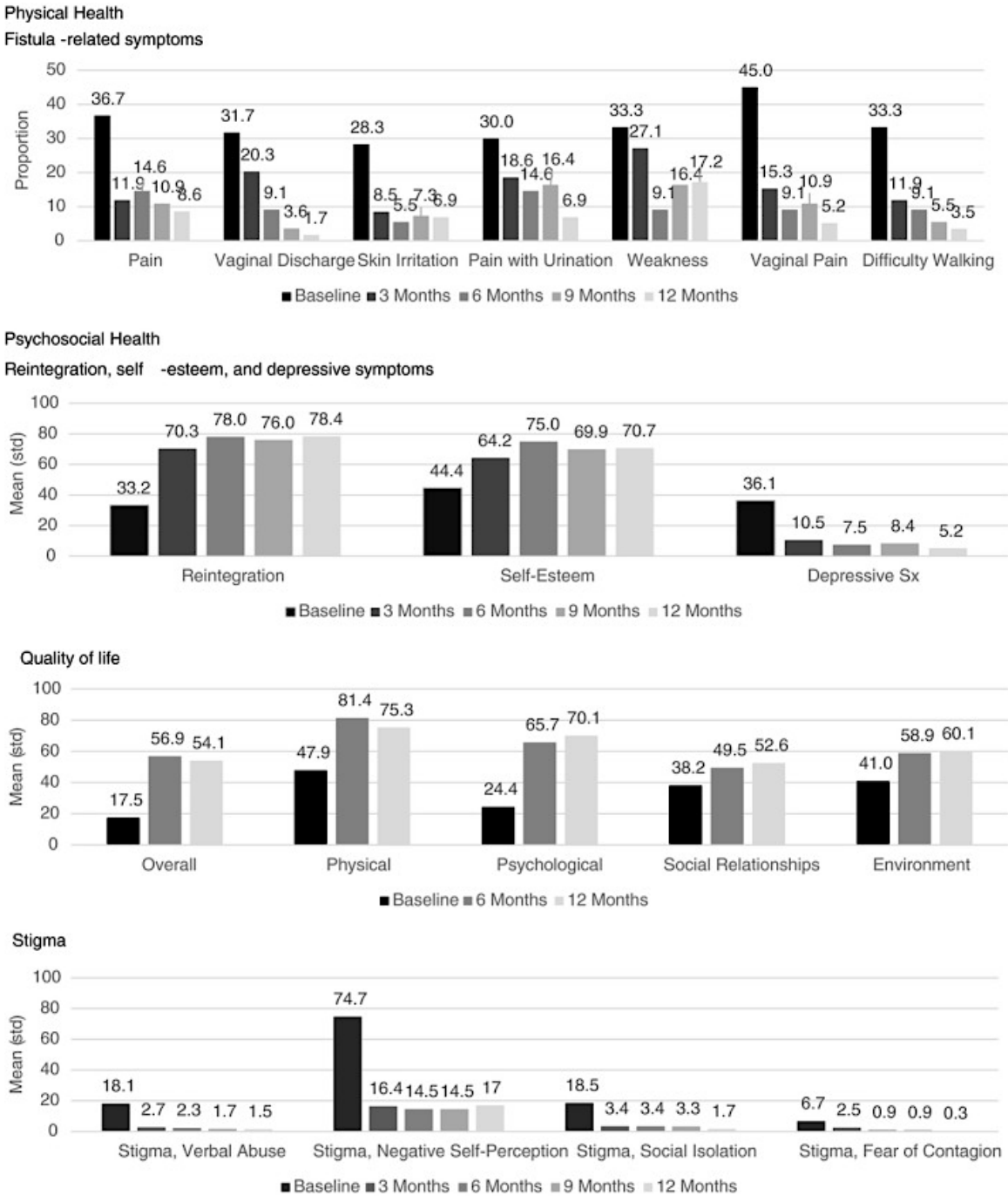


Figure 7. Comparison of physical and psychosocial symptoms from baseline (pre-surgery) up to 12 months post-surgery in Uganda. Taken from (El Eyadi et al., 2019).

Furthermore, the study showed a correlation between urinary incontinence and psychosocial health in participants who self-reported physical symptoms and those who did not (**Table 9**).

Table 9. Relationship between urinary incontinence/ physical symptoms and psychosocial health in Uganda. Mean (SD) Improvement is represented by increases in value for reintegration, self-esteem, and quality of life and decreases in depressive symptoms and stigma. Psychosocial measures are standardized to range 0–100. *Among age <45 only. Adapted from (El Eyadi et al., 2019).

	Baseline	**3 months**	**6 months**	**9 months**	**12 months**
	***n* = 60**	***n* = 59**	***n* = 55**	***n* = 55**	***n* = 58**
Physical health					
General health					
Excellent	0 (0)	2 (3.4)	2 (3.6)	0 (0)	0 (0)
Very good	0 (0)	18 (31.5)	30 (54.6)	24 (43.6)	24 (41.4)
Good	0 (0)	15 (25.4)	7 (12.7)	9 (16.4)	16 (27.6)
Fair	11 (18.3)	17 (28.8)	12 (21.8)	18 (32.7)	17 (29.3)
Poor	49 (81.7)	7 (11.9)	4 (7.3)	4 (7.3)	1 (1.7)
Urinary incontinence	59 (98.3)	23 (38.9)	18 (32.7)	20 (36.4)	19 (32.8)
Frequency of urinary incontinence					
Never	1 (1.7)	36 (61)	37 (67.3)	35 (63.6)	39 (67.2)
Once per week or less	0 (0)	1 (1.7)	1 (1.8)	3 (5.5)	5 (8.6)
Two or three times per week	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Once per day	2 (3.3)	4 (6.7)	1 (1.8)	2 (3.6)	4 (6.9)
Several times per day	12 (20)	7 (11.9)	6 (10.9)	7 (12.7)	4 (6.9)

All the time	45 (75)	11 (18.6)	10 (18.2)	8 (14.6)	6 (10.3)
Faecal incontinence	3 (5)	1 (1.7)	0 (0)	0 (0)	0 (0)
Menstrual cycle*	*n* = 55	*n* = 54	*n* = 50	*n* = 50	*n* = 53
Regular	18 (32.7)	29 (53.7)	35 (70)	33 (66.6)	32 (60.4)
Irregular	2 (3.6)	2 (3.7)	1 (2)	3 (6)	5 (9.4)
Amenorrheic	35 (63.6)	23 (42.6)	14 (28)	14 (28)	16 (30.2)

Psychosocial health	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Reintegration	33.2 (20.4)	70.4 (27.1)	78.0 (23.7)	75.9 (25.7)	78.4 (19.2)
Self-esteem	44.4 (15.4)	64.2 (19.0)	72.4 (24.0)	69.9 (20.3)	70.7 (19.8)
Depressive symptoms	36.1 (16.9)	10.5 (13.2)	7.5 (9.6)	8.4 (11.8)	5.2 (7.7)
Quality of life					
Overall	17.5 (10.7)		56.9 (16.5)		54.2 (16.5)
Physical	47.9 (24.2)		81.4 (16.5)		75.3 (13.4)
Environment	41.0 (15.1)		58.9 (11.9)		60.2 (11.2)
Social relationships	38.2 (22.2)		49.5 (22.7)		52.6 (15.9)
Psychological	24.4 (15.1)		65.7 (21.6)		69.0 (17.4)
PTSD screen-positive *N* (%)	10 (16.7)		1 (1.8)		0 (0)
Stigma					
Negative self-perception	74.7 (36.2)	16.4 (32.5)	14.5 (29.4)	14.5 (32.9)	17.8 (33.6)
Social isolation	18.5 (27.2)	3.4 (10.1)	3.4 (13.3)	3.3 (10.3)	1.4 (6.1)
Verbal abuse	18.1 (26.5)	2.7 (7.8)	2.3 (7.2)	1.7 (6.4)	1.2 (3.8)
Fear of contagion	6.7 (18.4)	2.5 (8.7)	0.9 (5.0)	0.9 (5.0)	0 (0)
Social support	42.7 (10.0)	45.6 (12.3)	56.1 (20.5)	44.4 (11.6)	55.7 (19.4)

Ultimately, this study also showed a significant overall improvement in QoL following fistula surgical repair, especially in a participant with resolved urinary incontinence compared to one with residual incontinence. Like previous studies from Ethiopia and Malawi, researchers also expressed the need to include counseling foci for women recovering from OFs in Uganda.

Tanzania

The study that met the inclusion criteria for this review was done by Wilson et al. and was published in 2016. The goal of the research was to look into the impact of OF repair on psychosocial symptoms. The study was done on 28 women who had OFs for an average of 11 years before repair. All the participants had their surgeries done at the same hospital. The baseline data was collected before repair, and follow-up data was collected three months post-surgery. Physical symptoms were self-reported. The Center for Epidemiologic Studies Depression Scale (CES-D; $\alpha = .85$) and the PTSD Checklist-Civilian Version (PCL-C; $\alpha = .83$) were some of the tools used to assess the psychological symptoms. The Duke-UNC Functional Social Support Questionnaire (FSSQ; $\alpha = .89$) was also one of the tools used to measure social outcomes. Even though 17 of the 28 participants self-reported physical symptoms of uncured fistula, the results showed an overall improvement of psychosocial symptoms (**Table 10**). Moreover, an exploratory analysis showed a positive association between severity of leaking and depression, somatic symptoms, and PTSD. However, data showed that participants with lower residual incontinence have the highest avoidance behaviors.

Table 10. Comparison between baseline and three months follow-up of psychosocial symptoms in Tanzania. Taken from (Wilson et al., 2016).

Variable	Baseline *M (SD)*	Follow-up *M (SD)*	Paired *t*	*p*	Holm–Bonferroni adjusted α
Depression symptoms	27.7 (9.5)	4.8 (5.6)	11.69	<.001	.008
PTSD symptoms	47.3 (11.2)	22.4 (5.8)	9.88	<.001	.013
Somatic symptoms	17.3 (12.8)	3.3 (4.8)	6.19	<.001	.025
Avoidant coping	7.1 (2.7)	4.9 (1.8)	3.47	.002	.05
Social support	2.3 (0.9)	4.0 (0.5)	−10.60	<.001	.01
Stigma	20.7 (13.8)	1.2 (2.0)	7.80	<.001	.017

After demonstrating that surgical repair had a positive impact on psychosocial symptoms in OF patients, this study also recommended targeted mental health interventions.

Mali

The most recent study done in this country regarding OFs and Mental health issues is from Watt et al. and was published in 2020. The researchers' goal was to demonstrate the importance of integrated mental health screening in OF patients living in Mali. Some of the methods used for depression screening, such as the PHQ-9, were similar to those used in other countries' studies. The study used a sample size of 167 at baseline from 4 different care centers, but the sample size dropped to 127 at follow-up. The baseline data was collected before surgical repair, and the second data set was collected at follow-up (3 months post-repair.) PHQ-9 score ranges for depression in this study were between 5 and 9 (mild), between 10 and 14(moderate), and above 20 (severe).

Table 11 showed an increase in the number of patients with no depressive symptoms or reduced severe depression at follow-up. When analyzing moderate depression symptoms, the data showed little change from baseline to follow-up. In addition, it could be appreciated from the table that almost half of the participants presented symptoms of mild depression at baseline and follow-up. Even if we saw an increase in mild depression compared to baseline, the study found that 40% of the participants had persistent suicidal ideation at follow-up. The data in **Table 12** indicates an overall decrease in PHQ-9 score at follow-up.

Table 11. Comparison of depression severity between baseline and follow-up in Mali. Taken from (Watt et al., 2020.)

Depression Severity (PHQ-9 score)	Baseline (n = 167)	Follow-up (n = 127)
No Depression (0–4)	15.6%	30.8%
Mild Depression (5–9)	47.9%	52.3%
Moderate Depression (10–14)	19.1%	12.3%
Severe Depression (15–27)	17.4%	4.6%

Table 12. The difference in PHQ-9 scores between baseline and follow-up with n=127, in Mali. Taken from (Watt et al.2020)

	Mean (SD)	t	p-value
Baseline	8.79 (4.36)	4.78	< .001
Follow-up	6.59 (4.22)		

With most participants (71%) having had more than one repair, it is safe to assume that they had residual incontinence from previous repair at baseline. The data collected in **Table 13** reflects the results of self-reported answers to questions about the impact that the disease had on them at baseline. From the table, it could also be inferred that OFs contributed to decreased QoL for women in Mali.

Table 13. Participant Self-reported social impact of fistula in Mali, n=167. Taken from (Watt et al., 2020).

Impact	% Reported
Disturbing fistula memories	92%
Stillborn child	85%
Feeling punished by God	80%
Feeling hopeless about the future	78%
Financial dependence	69%
Feeling like they brought trouble to their family	68%
Feeling like they didn't deserve to live	64%
Avoided leaving the house	47%
Gossiped about	43%
Divorce/abandonment	25%
People stopped visiting	16%
Made to sleep/eat separately	15%
Hidden from the community by their family	12%
Stopped attending community events	10%

The research from this country showed evidence of continued depressive disorders in women with unsuccessful fistula closure. Although the investigation did not indicate this round of surgical repair's success rate, the data demonstrated the impact of OFs on women's psychosocial health. Researchers also emphasized the need for mental health screening to provide adequate care for OFs patients.

Kenya

Published in 2017, the study conducted by Khisa et al. tried to determine factors that affect social reintegration and efficient support mechanisms during the healing process of vaginal fistulas in Kenya. There were 16 participants from three different care centers. Data was collected before surgery and at the six months follow-up post-surgery in interview questions. The responses were analyzed, and observations were made on both social isolation and social reintegration.

The interview responses showed that the participants experienced social stigma, poor role identity, financial difficulties, and decreased self-worth because of OFs. These experiences seemed to have vanished right after fistula-repair, because the participants were looking forward to getting their lives back. Thus, participants reported an improvement in QoL. Following that period, however, participants were concerned about their futures. They realized the difficulties they would have to overcome in their journey to normalcy. The internalized stigma due to their past experiences became one of those obstacles. Furthermore, some participants continued to experience physical and emotional abuse even after repair, that impacted their mental health and social reintegration.

From this study, researchers assessed the difficulty of social reintegration for OF patients due to the negative impact the disease has on their psychosocial health even after repair. They also recognized the need for continuous holistic treatment for OF patients after surgery for successful social reintegration.

India

The most relevant study from this country was done by Singh et al. and was published in 2015. Singh et al. investigated the difference in QoL pre-surgery and post-surgery in OF patients in India. This study used a sample size of 101 participants who underwent surgical repair at the same hospital. The WHO QOL-BREF questionnaire was used to record the overall change of QoL and its components (Physical, Psychological, Social, and Environment) . before surgical repair and three months after successful rehabilitation. A mean score below 40 stipulated a poor QoL, and a score between 41 and 60 suggested a moderate QoL. Also, a score above 60 indicated a good QoL.

Statistical analysis revealed a significant improvement in QoL overall, (and each of the components of QoL except for the environment), which remained unchanged **(Table 14**). Besides, Singh et al. also investigated the change in QoL compared to participant's demographics and fistula history. The analysis showed no statistically significant difference in QoL changes due to age, parity, incontinence duration, and type of surgical repairs.

Table 14. Comparison in QoL before surgery and three months after surgery in India with N=101. Adapted from (Singh et al., 2015).

WHO QOL-BREF parameters	Preoperative	Postoperative	p-value	Average percent overall
The overall quality of life	8.25 ± 2.67	93.25 ± 7.20	0.0001*	85.0
Physical	15.04 ± 2.56	83.61 ± 5.09	0.0001*	68.6
Psychosocial	16.42 ± 4.49	75.79 ± 6.33	0.0001*	59.4
Social	51.75 ± 11.91	76.17 ± 8.53	0.0001*	24.4
Environment	34.81 ± 6.89	33.88 ± 6.13	0.08	−0.9
* $p < 0.05$ is significant.				

In India, researchers demonstrated an overall improvement in QoL of OF patients after a successful repair. Although there was no change in the QoL environment component, Sing et al. attributed this to the fact that the patients' economic environment remained constant before and after surgery.

Somalia

A study published by Mohamed et al. in 2018 looked into the experiences of OF patients after surgical repair in Somalia. Twenty-one participants had had surgical repairs at two different fistula care centers. Data collection was done through open-ended interview questioning.

The responses revealed that most participants had a history of OF for less than four years (52.4 %) with a range of 1 to 9 years. Eighty-five and 7 tenths % of the participants had had one surgical repair, while 9.5% had had 3 to 4 repairs. Only 1 participant had more than four repairs done. All the participants were married before fistula injury, but **Table 15** shows that 47.6% of the participants got divorced as a result of the disease.

Table 15. The Demographic and characteristics of OF study participants in Somalia. Adapted from (Mohamed et al., 2018).

Variable	Characteristics		
	Category	Number	Percentage (%)
Current age (years)	15–24	10	47.6
	25–34	7	33.3
	35–44	2	9.5
	45–54	1	4.8
	55 and above	1	4.8
Age at OBF occurrence (years)	15–24	18	85.7
	25–34	2	9.5
	35–44	1	4.8
	45–54	0	0.0
	55 and above	0	0.0

Region	Benadir	17	81.0
	Mudug	4	19.0
Residence	Rural	12	57.1
	Urban	9	42.9
Education	Formal education	6	28.6
	No formal education	15	71.4
Occupation	Unemployed	15	71.4
	Employed	6	28.6
Current marital status	Married	9	42.9
	Widowed	2	9.5
	Divorced	10	47.6
Place of last delivery	Home	16	76.2
	Health facility	5	23.8
Number of years lived with obstetric fistula	1–3	11	52.4
	4–6	4	19.0
	7–9	3	14.3
	Above 9	3	14.3
Number of surgeries	1–2	18	85.7
	3–4	2	9.5
	Above 4	1	4.8

Parity	Primigravid	9	42.9
	Para 2–4	7	33.3
	Para 5 or more	5	23.8

Participants also shared multiple challenges that they were facing due to OFs which were compiled in **Table 16**. Weakness, skin irritation, aches were just some of the physical challenges they face. Due to constant urine and feces incontinence, most of the participants also experienced unpleasant odors that were the cause of divorce in some participants. The psychosocial distress that they experienced resulted from divorce, social stigma, and rejection, which caused self-isolation. Besides psychosocial difficulties, some of the participants also experienced financial challenges. The pain and irritation caused participants to have poor performance in managing their household chores and fulfilling their workplace duties.

Additionally, the odors due to incontinence caused some participants to lose their jobs and to have difficulty finding new ones. The interviews also revealed different types of coping mechanisms among the participants. While some tried to be "extra clean" to remedy the smell from incontinence, others self-isolated themselves so that they could avoid shame.

Even though this study did not directly measure the impact of surgical repair on the QoL, based on participants' QoL interview responses, it could be inferred that the participants experienced residual incontinence post-surgery. Thus, it is safe to assume that all these challenges they faced were related to continuous incontinence. The researchers' recommendations in this study were to increase funding and train local surgeons for Obstetric Fistula care and implement efficient social reintegration following surgical repair.

Table 16. Challenges and coping strategies faced by OF patients, post-surgery in Somalia. Taken from (Mohamed et al. 2018).

Themes	Categories
Challenges of living with obstetric fistula	(i) Physical challenges
	(a) Smell and wounds
	(b) Urine and fecal incontinence
	(ii) Psychosocial challenges
	(a) Stigma and isolation
	(b) Disrupted marital relationships and immediate divorces
	(iii) Socioeconomic challenges
	(a) Dependency and powerlessness
	(b) Profound poverty and financial constraints
Coping strategy	(iv) Withdrawal from the community
	(v) Improved personal hygiene

Source: thematic analysis of the field data 2017.

DISCUSSION

Even though the first registered case of Obstetric Fistulas (Vesico-Vaginal Fistula) was found on an Egyptian mummy of the Eleventh Dynasty in 2050 BC, it remains an under-researched area (Polan et al., 2015). Consequently, finding and analyzing relevant articles are complicated. The majority of those articles about OF treatment suggest surgical repair of damaged tissues. However, recent studies investigating psychosocial health in OFs patients are minimal.

After a careful search, only eight papers from different countries met our inclusion criteria for this analysis. It communicates the degree to which Obstetric Fistulas are under-researched and not widely known in the research world. Although it makes a thorough investigation very difficult, relevant information was obtained that could help in this analysis.

Comparing the settings of the studies across several countries, it appeared that some had dedicated fistula centers, while others have OF patients treated at a conventional hospital. Some countries relied on a single physician to perform the surgeries, and others on foreign surgeons. Also, the studies used patients with various OF history. The participants in India, for example, had a maximum fistula history of 3 months, while participants in Malawi have a median fistula history of 35.5 months before surgical repair. Besides, there was a difference in the number of surgical repairs participants had had before the studies. For instance, among the participants in Mali, the majority of the patients had previous fistula repairs, while the participants in India did

not. The study length and variables were also different. Some studies focused only on changes three months post-surgeries, while others examined changes six months or up to twelve months post-surgery. Malawi was the only country that extended its research focus to beyond twelve months. All the studies had a psychosocial component, and the data collected mainly were self-reported via questionnaires or interviews.

Furthermore, all the studies demonstrated a statistically significant overall improvement in the participants' QoL regardless of the country. They recommended integrated mental health care for OF patients for optimal psychosocial health and better social reintegration. Although they all reached the same conclusion, several points are worth being noted.

All the countries had a significant improvement in QoL up until six months after surgical repairs. However, there was a decrease in the QoL of participants whose surgeries were unsuccessful in Ethiopia and Malawi. In Uganda, besides the evidence of a decline in QoL at 12 months, there were negative self-perception cases. There were decreased QoL cases and increased suicide ideation in Malawi, where data was collected from participants who had a surgical repair in at least the last 12 months. Also, data indicated worsening psychological distress in patients who had more extended fistula history, lost their babies, and had a hysterectomy. Apart from dealing with incontinence, those participants had to face the idea of never being able to bear children again, which has enormous traumatic implications for women. In both of these countries, there was a positive relationship between residual incontinence and depression symptoms. The more severe the leaking was, the more aggressive the psychological symptoms.

Furthermore, researchers in Tanzania also established a relationship between residual incontinence and the severity of depression. The most notable result was that women with minor leaking showed signs of avoidant behaviors, which shows the necessity of implementing mental health care and OFs coping strategies in all patients. Besides, in Somalia and Mali, participants had similar psychosocial characteristics at follow-up as OF patients who did not have surgical repair. Participants reported self-isolation, divorce, despair, gender role issues, and increased financial hardships, which are similar ordeals OF patients dealt with before repair in other studies (Gebresilase, 2014), (Mselle and Kohi, 2015). Participants with more extended fistula history thought it was either a curse or a divine punishment.

The overall increase in QoL within three months of surgical repair, regardless of its success rate across these studies, could perhaps be explained by Kenya's results. Here, interviews' data indicated an initial feeling of relief in OF patients immediately following surgical repair, whether it was successful or not. Researchers interpreted those results as the "miracle phase" because the participants characterized fistula repair as a chance for "rebirth." It can also be interpreted as the “hopeful phase.” Those euphoric feelings were subsidized with the realization of how difficult social reintegration was going to be. The trauma associated with the disease affected them so much so that they were scared of the future. These are similar results seen in a separate study from Malawi, published in 2016 by Drew et al. They found that participants were concerned about their ability to build

new relationships, bear children, and fix their financial burdens in the future. Participants were also afraid of needing subsequent fistula repairs.

In summary, we saw an increase in QoL in all the studies following post-surgical repair. However, we also noted various levels of psychosocial disorder symptoms in OF patients regardless of fistula repair. Therefore, this analysis illustrates that surgical repairs, although necessary, are not sufficient. Mental health must be more emphasized in the disease's healing process. To figure out the reasons for changes in the degree of improvement of QoL immediately after repair, compared to a few months later, more studies should be conducted. More research should be focused on the impact of surgical repair on QoL of OF patients beyond a year to assess long-term efficacy. Also, a suggestion for future direction will be an investigation of the effect of mental health care in OF patients.

CONCLUSION

Obstetric Fistula patients will never get their prior lives back, but they should be able to live a comfortable life without stigma and self-isolation. Although all the studies analyzed demonstrated that surgical repairs increase the patients' quality of life immediately, they also showed the limitations of surgical treatments. Thus, they brought to light the importance of finding a holistic approach to treat the disease. OFs are primarily physical injuries, but they have grave consequences that affect the patients and their relationships with their families and community.

Every patient with an OF history must have a mental health screening and be assigned a mental health professional who will help with psychosocial distress management and better-coping strategy regardless of surgical repair outcome. Prevention is undeniably the most efficient way to eradicate the disease, as adapted in Western Countries. Prevention could be done by raising awareness of OF and increase access to adequate maternal care for pregnant women. Moreover, there should be an increase in funding for more research, more training for local surgeons to reduce the waiting time for surgical repairs, creation of dedicated fistula care centers with adequate equipment and well-trained personnel, and education of people about the disease. Countries with high OF prevalence should also implement better social reintegration strategies.

APPENDIX I

Table A1. The different Classification system of Genitourinary Fistula. Taken from (FRAJZYNGIER et al., 2013.)

Classification system	Classification system component	Variable used to operationalize component
Goh	Type 1 Distal edge of the fistula >3.5 cm from the external urinary meatus Type 2 Distal edge of the fistula 2.5-3.5 cm from external urinary meatus Type 3 Distal edge of the fistula 1.5-<2.5 cm from external urinary meatus Type 4 Distal edge of the fistula <1.5 cm from external urinary meatus	Type 1 Urethral length > 3.5 cm Type 2 Urethral length 2.5-3.5 cm Type 3 Urethral length 1.5-<2.5 cm Type 4 Urethral length <1.5 cm
	a. Size <1.5 cm in the largest diameter b. Size 1.5-3 cm in the largest diameter c. Size >3 cm in the largest diameter	a. Available from dataset b. Available from dataset c. Available from dataset
	i. None or only mild fibrosis (around fistula and/or vagina) and/or vaginal length >6cm, normal bladder capacity ii. Moderate or severe fibrosis (around fistula and/or vagina) and/or reduced vaginal length and/or bladder capacity iii. Special considerations, e.g., post-radiation, ureteric involvement, circumferential fistula, prior	i. None or only mild fibrosis and normal bladder capacity ii. Moderate or severe fibrosis and small bladder capacity iii. Ureteric involvement, circumferential fistula, previous repair

Lawson	i. Juxta-urethral ii. Mid-vaginal iii. Juxta-cervical iv. Vault v. Massive combination fistula	i. Available from dataset ii. Available from dataset iii. Available from dataset iv. Available from dataset v. Available from dataset
Tafesse	Class 1 Non-circumferential, not previously operated Class 2 Non-circumferential, previously operated Class 3 Circumferential, not previously operated Class 4 Circumferential, previously operated Urethral involvement I. No involvement (length>4cm) II. Urethra involved but not middle 1/3 (length 2.7-3.9 cm) III. Middle 1/3 partly involved (length 1.4-2.6 cm) IV. Middle 1/3 completely involved, but some urethral tissue remains (<1.4 cm) V. No urethra Bladder size a. Longitudinal diameter >7 cm b. Longitudinal diameter 4-7 cm c. Longitudinal diameter <4 cm	Class 1 Available from dataset Class 2 Available from dataset Class 3 Available from dataset Class 4 Available from dataset Urethral involvement I. No involvement (length>4cm) II. Urethra involved but not middle 1/3 (length 2.7-3.9 cm) III. Middle 1/3 partly involved (length 1.4-2.6 cm) IV. Middle 1/3 completely involved, but some urethral tissue remains (<1.4 cm) V. No urethra Bladder size a. Longitudinal diameter >7 cm b. Longitudinal diameter 4-7 cm c. Longitudinal diameter <4 cm

	Anterior vaginal tissue loss 1. Less than 50% of anterior vagina is involved (>3.5 cm of healthy vagina remains) 2. More than 50% of the anterior vagina wall is involved (<3.5 cm of healthy vagina remains) 3. Obliterated vagina (cannot admit > 1 finger)	Anterior vaginal tissue loss 1. Minimal tissue loss 2. Moderate tissue loss 3. Extensive tissue loss or obliterated vagina
Waaldijk	Classification Type 1 Not involving the closing mechanism Type 2 Involves closing mechanism A. *Without* (sub)total urethra involvement B. *With* (sub)total urethra involvement a. *Without* circumferential defect b. *With* circumferential defect Type 3 Ureteric and other exceptional fistulas Size Small <2 Medium 2-3 Large 4-5 Extensive≥ 6	Classification Type 1 Not involving the closing mechanism and not involving complete destruction of bladder neck Type 2 Involves closing mechanism or destruction of bladder neck A. Intact or partially damaged urethra B. Completely destroyed urethra a. Available from dataset b. Available from dataset Type 3 Mixed vesicovaginal and rectovaginal fistulas, cervical and ureteric fistulas Size Available from dataset Available from dataset Available from dataset Available from dataset

WHO	Defining Criteria	Simple	Complex	
	Number of fistulas	■ single	■ multiple	■ Available from dataset
	Site	■ Vesico vaginal (VVF)	■ All non-VVF urinary fistula	■ Non-VVF excludes ureteric and urethral fistulas
			■ recto-vaginal (RVF)	
			■ mixed VVF/RVF	
			■ involvement of cervix	
	Size (diameter)	■ <4cm	■ >4cm	■ Available from dataset
	Involvement of the urethra / continence mechanism	■ absent	■ present	■ Available from dataset
	Scarring of vaginal tissue	■ absent	■ present	■ Available from dataset
	Presence of circumferential defect	■ absent	■ present	■ Not included in multivariate analysis
	Degree of tissue loss	■ minimal	■ extensive	■ Moderate and minimal tissue loss is considered "minimal."
	Ureter/bladder involvement	■ ureters are inside the bladder, not draining into the vagina	■ one or both ureters draining into the vagina ■ one or both ureters at edge of fistula	■ Created composite measure representing ureteric involvement (either ureteric location or ureters draining into the vagina or at the edge of the vagina)
	Number previous repair attempts	■ no previous attempt	■ failed previous repair attempts	■ Available from dataset

APPENDIX II

Table A2. The list of key terms used in the database search process.

The following is the lists of Key Terms used in database searches:
• "Vesicovaginal Fistulas repair" OR • "Rectovaginal Fistulas repair" OR • "Obstetric Fistulas repair" OR • "Obstetric Fistulas" AND • "Depression" OR • "Quality of Life" OR • "Mental Health" OR • "Psychological disorder" OR • "Anxiety"

LIST OF JOURNAL ABBREVIATIONS

BJOG	An International Journal of Obstetrics & Gynaecology
BMC	BioMed Central

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