

## Risk factors for obstetric fistula: a clinical review

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**Abstract** Obstetric fistula is the presence of a hole between a woman's genital tract and either the urinary or the intestinal tract. Better knowledge of the risk factors for obstetric fistula could help in preventing its occurrence. The purpose of this study was to assess the characteristics of obstetric

fistula patients. We conducted a search of the literature to identify all relevant articles published during the period from 1987–2008. Among the 19 selected studies, 15 were reports from sub-Saharan Africa and 4 from the Middle East. Among the reported fistula cases, 79.4% to 100% were obstetrical while the remaining cases were from other causes. Rectovaginal fistulae accounted for 1% to 8%, vesicovaginal fistulae for 79% to 100% of cases, and combined vesicovaginal and rectovaginal fistulae were reported in 1% to 23% of cases. Teenagers accounted for 8.9% to 86% of the obstetrical fistulae patients at the time of treatment. Thirty-one to 67% of these women were primiparas. Among the obstetric fistula patients, 57.6% to 94.8% of women labor at home and are secondarily transferred to health facilities. Nine to 84% percent of these women delivered at home. Many of the fistula patients were shorter than 150 cm tall (40–79.4%). The mean duration of labor among the fistula patients ranged from 2.5 to 4 days. Twenty to 95.7% of patients labored for more than 24 h. Operative delivery was eventually performed in 11% to 60% of cases. Obstetric fistula was associated with several risk factors, and they appear to be preventable. This knowledge should be used in strengthening the preventive strategy both at the health facility and at the community level.

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### Introduction

#### Definition and pathophysiology

Obstetric fistula is the presence of a hole between a woman's genital tract and urinary tract (i.e., vesicovaginal fistula) or between the genital tract and the intestines (i.e.,

rectovaginal fistula). The vesicovaginal fistula is characterized by the leakage of the urine through the vagina, and rectovaginal fistula is characterized by the leakage of flatus and stool through the vagina. Both vesicovaginal and rectovaginal fistula are associated with a persistent offensive odor leading to the social stigma and ostracization of these affected women [1, 2]. There are three prominent causes of obstetric fistula. The cause of obstetric fistula is ischemia of the soft tissue between the vagina and the urinary tract or between the vagina and the rectum by compression of the fetal head. The second most common cause of obstetric fistula is the direct tearing of the same soft tissue during precipitous delivery or obstetric maneuvers. The last and least common cause is elective abortion [3, 4]. These causes are not mutually exclusive and may have additive effects. Each of these causes occurs as a complication of delivery or uterine evacuation usually in the absence of skilled medical staff assistance.

### Incidence and prevalence

Obstetric fistula is found in all developing countries including South Africa. However, the majority of obstetric fistulae

are confined to the “fistula belt” across the northern half of sub-Saharan Africa from Mauritania to Eritrea and in the developing countries of the Middle East Asia.

Several population-based estimates of obstetric fistula have been presented in the obstetrical literature. The most frequently cited estimate is the one introduced by Waaldijk in 1993 when he cited an incidence rate of 1 to 2 per 1,000 deliveries. This incidence rate suggested a worldwide incidence of 50,000 to 100,000 new cases annually; and a worldwide prevalence of 2 million cases of obstetric fistulae [5]. A recent study highlighted the lack of a scientific basis for this incidence and prevalence of fistulae [6]. These authors reported an estimated prevalence of 188 per 100,000 women aged 15 to 49 years in South Saharan Africa and emphasized the need for population-based studies.

### Risk factors

Seven primary risk factors for obstetrical fistula commonly reported include the place of birth and presence of a skilled birth attendant, the duration of labor and the use of a

**Table 1** Classification of the selected studies. Studies selected for analysis of obstetrical fistula patients characteristics (Part 1)

Area of study	Author	Journal	Publication year	Studydesign	Year ofstudy	Type	Total fistula	Total OF
South Australia	Rieger et al. [20]	ANZJOG	2004	Retrospecti	1999–2001	RVpur	89	89 (100%)
Saudi Arabia	Rahman et al. [10]	JOG	2003	Retrospect	1986–2001	RVpur	52	52 (100%)
Niger	Nafiou et al. [21]	Int J G O	2007	Retrospect	2003–2005	VVpur	104	104 (100%)
Niger	Meyer et al. [22]	Am J O G	2007	Retrospect	2005–2006	VVpur	58	58 (100%)
Nigeria	Ijaiya and Aboyeji [23]	WAJM	2004	Retrospect	1989–1998	VVpur	34	34 (100%)
Nigeria	Melah et. al [4]	J OG	2007	Survey	2001–2003	VVc	80	75/80 (93.7)
Pakistan	Ahmad et. al [24]	Int J G O	2005	Retrospect	1978–2003	VVc	1086	1,086 (100%)
Nigeria	Waaldijk [5, 25]	Am J O G	2004	Retrospect	1992–2001	VVc	1716	1,716 (100%)
Nigeria	Wall et al. [26]	Am J O G	2004	Retrospect	1992–1999	VVc	932	899/932 (95.5)
Mali	Qi Li Ya et al. [27]	Med Afr N	2000	Retrospect	1998–1999	VVc	34	27/34 (79.4)
Nigeria	Hilton and Ward [28]	IUGJPFLLD	1998	Retrospect	1989–1995	VVc	2389	(2,202/2,389) 92%
Niger	Arrowsmith [29]	J Urol	1994	Retrospect	1990–1993	VVc	98	93/98 (94.9)
Senegal	Gueye et al. [30]	Med Afr N	1992	Retrospect	1986–1992	VVc	123	118/123 (95.9)
Burki, Tchad; Gabon	Falandry [31]	Press Med	1992	Retrospect	1979–1990	VVc	230	213/230 (93%)
Zambia	Holme et al. [7]	Br J O G	2007	Retrospect	2003–2005	V/R	259	259 (100%)
Malawi	Rijken and Chilopora [32]	Int J G O	2007	Retrospect	1997–2005	V/R	407	379/407 (93.1)
Pakistan	Jokhio and Kelly [33]	Int J G O	2006	Retrospect	1999–2005	V/R	116	116 (100%)
Ethiop	Gessessew and Mesfin [8]	Eth M J	2003	Retrospect	1993–2001	V/R	193	184/193 (95.3)
Niger	Harouna et al. [9]	Med Afr N	2001	Survey	NP	V/R	52	52 (100.0%)

*IUGJPFLLD* Int Urogynecol J Pelvic Floor Dysfunct, *Retrospect* retrospective case series study, *RVpur* Pur rectovaginal fistulas, *VVpur* pure vesicovaginal fistula, *VVc* vesicovaginal fistula including associated rectovaginal fistula in the same patient, *V/R* studies including pure vesicovaginal cases, pure rectovaginal cases and associated cases, *OF* obstetric fistula

**Table 2** Organ related classification of obstetrical fistula included in selected studies

Author	Journal	Year of publication	Type	Total OF	RVF	VVF	Combined VVF/RVF
Rieger et al. [20]	ANZJOG	2004	RVpur	89 (100%)	89 (100%)	0	0
Rahman et al. [10]	JOG	2003	RVpur	52 (100%)	52 (100%)	0	0
Nafiou et al. [21]	Int J G O	2007	VVpur	104 (100%)	0	104 (100%)	0
Meyer et al. [22]	Am J O G	2007	VVpur	58 (100%)	0	58 (100%)	0
Ijaiya and Aboyeji [23]	WAJM	2004	VVpur	34 (100%)	0	34 (100%)	0
Melah et. al [4]	J OG	2007	VVc	75/80 (93.7)	0	72/80 (90.0)	8/80 (10%)
Ahmad et. al [24]	Int J G O	2005	VVc	1,086 (100%)	0	950/1,025 (92.7)	75/1,025 (1.5)
Waalwijk [5, 25]	Am J O G	2004	VVc	1,716 (100%)	0	1,505 (87.7)	211 (12.3)
Wall et al. [26]	Am J O G	2004	VVc	899/932 (95.5)	0	800/899 (88.9)	99 (11%)
Qi Li Ya et al. [27]	Med Afr N	2000	VVc	27/34 (79.4)	0	327/34 (79.4%)	7/34 (2.1)
Hilton and Ward [28]	IU J PFD	1998	VVc	(2,202/2,389) 92%	0	2,385/2,484 (96.0)	99/2,484 (4.0%)
Arrowsmith [29]	J Urol	1994	VVc	93/98 (94.9)	0	86/98 (92.5)	7/98 (7.5)
Gueye et al. [30]	Med Afr N	1992	VVc	118/123 (95.9)	0	119/123 (96.7)	4/123 (3.2)
Falandry [31]	Press Med	1992	VVc	213/230 (93%)	0	178/230 (77.4)	52/230 (22.6)
Holme et al. [7]	Br J O G	2007	V/R	259 (100%)	4/297 (1.3)	247/297 (83.2)	18/247 (7.3)
Rijken and Chilopora [32]	Int J G O	2007	V/R	379/407 (93.1)	12/408 (2.9)	396/408 (97.5)	29/408 (7.1)
Jokhio and Kelly [33]	Int J G O	2006	V/R	116 (100%)	3/116 (2.69)	103/116 (88.8%)	5 (4.3)
Gessesew and Mesfin [8]	Eth M J	2003	V/R	184/193 (95.3)	9/193 (4.7)	166/193 (86%)	16/193 (8.3)
Harouna et al. [9]	Med Afr N	2001	V/R	52 (100.0%)	4/52 (7.7)	45/52 (86.5%)	3/52 (5.8)

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Among the fistula cases, 79.4% to 100% were related to the obstetric conditions, while the remaining cases estimated as less than 20% were from other causes (Table 2). Among the overall fistula cases, rectovaginal fistula represents 1% to 8%; vesicovaginal, 79% to 100% of cases and combined vesico and rectovaginal fistula, 1% to 23% of cases (Table 2)

partograph, the lack of prenatal care, early marriage and young age at delivery, older age, lack of family planning, and a number of other poorly defined additional factors [3, 4]. Obstetrical fistula is most often the result of prolonged and obstructed labor. Up to 95.5% of 259 cases of obstetrical fistulae reported in Zambia occurred following labor for more than 24 h before the completion of delivery [7]. Ninety-two percent of 201 fistula cases reported in northern Ethiopian women did not have any antenatal care [8]. Eighty-five percent of the 52 fistula patients in a Niger series delivered at home [9].

These underlying characteristics were not found in other low prevalence series [7, 10]. Only 20.0% of 52 cases of fistula reported in Saudi Arabia had a duration of labor lasting for more than 24 h [10]. In Zambia, only 2.5% of 259 patients reported no antenatal care before delivery [7]. Delivery at home was reported by only 9.6% of the 259 patients in the same report [7].

The data on risk factors for obstetrical fistula are controversial. Better knowledge of the risk factors for obstetrical fistula is needed to educate the community, healthcare providers, policy makers, and program managers to improve prevention of obstetric fistula at a regional and national level.

**Objectives**

The purpose of this study is to assess the current state of knowledge regarding the characteristics of obstetric fistula patients. To do so, we compile the international literature on obstetric fistula to identify the relevant information on the demographic, socioeconomic status of the patients, and circumstance of occurrence of the disease.

**Table 3** Risk factors of obstetrical fistula and illiteracy status of the patients (Part 2)

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)
Gessesew and Mesfin [8]	Eth M J	2003	156/193(80.8)%

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

**Table 4** Teenage status of the patients

Author	Journal	Year	<20 years at management
Nafiou et al. [21]	Int J G O	2007	13/52 (25%)
Ijaiya and Aboyeji [23]	WAJM	2004	9/34 (26.5)
Ahmad et. al [24]	Int J G O	2005	26/1,025 (2.5%) <sup>a</sup>
Waalwijk [5, 25]	Am J O G	2004	728/1,716 (42.4%) <sup>a</sup>
Qi Li Ya et al. [27]	Med Afr N	2000	6/34 (17.6%) <sup>b</sup>
Rijken and Chilopora [32]	Int J G O	2007	134/407 (32.9)
Jokhio and Kelly [33]	Int J G O	2006	10/112 (8.9)
Gessesew and Mesfin [8]	Eth M J	2003	74/184 (40.3)
Harouna et al. [9]	Med Afr N	2001	45/52 (86.5)

Teenage condition found in a wide range in obstetrical fistula patients ranging from 8.9% to 86% of patients at the moment of management (Table 4)

<sup>a</sup> Present age <16 years old

<sup>b</sup> Present age <21 years old

## Methods

### Data sources

We conducted a search of the literature to identify all relevant articles published during the period of 1987–2008 in the Medline (PubMed, Ovid), Cochrane Trials Register, and Cumulative Index to Nursing and Allied Health databases. We conducted a variety of searches using a combination of the

following medical terms and MeSH headings: *obstetric fistula, urinary fistula, vesicovaginal fistula, vesico vaginal fistula, vesico-vaginal fistula, recto-vaginal fistula, rectovaginal fistula, and recto vaginal fistula*. In addition, potentially relevant publications were identified from the reference lists of identified articles and from review articles. No attempt was made to identify unpublished studies.

### Study selection

Descriptive or analytic studies presenting the characteristics or the outcome of women suffering from genital fistula were initially eligible for inclusion. Data regarding the place of birth, presence of a skilled birth attendant, the duration of labor, mode of delivery, the presence of antenatal care, the age at marriage, the age at first delivery, age at causal delivery, parity at causal delivery, use of family planning, and other additional factors were reviewed. After identification of potentially relevant studies, each of these studies was reviewed in detail, and additional exclusion criteria were applied.

Studies providing complete or partial information on the sociodemographic characteristics of obstetrical fistula patients, access to health care or its consequences were included. Studies were excluded if they reported only the outcome without any presenting sociodemographic characteristics or information about access to emergency health care. Studies were excluded from this analysis if they did not include information on the central tendency or the age of

**Table 5** Parity of the patients

Author	Journal	Year	First parity at operation	First parity at occurrence
Rieger et al. [20]	ANZJOG	2004	34/51 (66.7)	34/51 (66.7%)
Rahman et al. [10]	JOG	2003	28 (80.0%)	–
Nafiou et al. [21]	Int J G O	2007	48/111 (43.2)	57/111 (51.3)
Meyer et al. [22]	Am J O G	2007	26/58 (26.0)	26/58 (44.9)
Ijaiya and Aboyeji [23]	WAJM	2004	17 (50.0%)	–
Melah et. al [4]	J OG	2007	–	75/80 (94.0)
Ahmad et. al [24]	Int J G O	2005	143/1,025 (13.9)	–
Waalwijk [5, 25]	Am J O G	2004	937/1,716 (54.6)	937/1,716 (54.6)
Wall et al. [26]	Am J O G	2004	–	412/889 (46.3)
Qi Li Ya et al. [27]	Med Afr N	2000	–	16/34 (47.1)
Hilton and Ward [28]	IUJPF	1998	190/605 (31.4)	190/605 (31.4%)
Arrowsmith [29]	J Urol	1994	–	–
Gueye et al. [30]	Med Afr N	1992	57/123 (46.3%)	–
Falandry [31]	Press Med	1992	162 (70%)	–
Holme et al. [7]	Br J O G	2007	–	117/239 (49.0)
Rijken and Chilopora [32]	Int J G O	2007	100/379 (49.6)	–
Jokhio and Kelly [33]	Int J G O	2006	–	44/112 (39.3)
Gessesew and Mesfin [8]	Eth M J	2003	87 (47.3%)	–
Harouna et al. [9]	Med Afr N	2001	35/52 (67.3)	–

The patient at the moment of the occurrence of fistula was primiparous in 31% to 66.7% of patients (Table 5)

**Table 6** Antenatal care and place of delivery

Author	Journal	Year of publication	ANC None	Home/TH attempt	Delivery at home/on the way	Delivery at the hospital
Rieger et al. [20]	ANZJOG	2004	–	–	–	–
Rahman et al. [10]	JOG	2003	–	–	–	–
Nafiou et al. [21]	Int J G O	2007	–	–	45/111 (40.5)	66 (59.5)
Meyer et al. [22]	Am J O G	2007	–	55/58 (94.8)	–	53/58 (91.4)
Ijaiya and Aboyeji [23]	WAJM	2004	–	31/34 (91.1)	–	–
Melah et. al [4]	J OG	2007	72/80 (90.0%)	–	–	61/80 (76.3)
Ahmad et. al [24]	Int J G O	2005	–	–	–	–
Waalwijk [5, 25]	Am J O G	2004	–	–	–	–
Wall et al. [26]	Am J O G	2004	647/889 (72.0%)	–	–	–
Qi Li Ya et al. [27]	Med Afr N	2000	–	–	214/34 (41.2)	20/34 (58.8)
Hilton and Ward [28]	IUJPDF	1998	–	552/605 (91.2%)	–	442/605 (73.1)
Arrowsmith [29]	J Urol	1994	–	–	(14/93) 15%	79/93 (85.0)
Gueye et al. [30]	Med Afr N	1992	–	–	–	–
Falandry [31]	Press Med	1992	–	–	–	–
Holme et al. [7]	Br J O G	2007	6/239 (2.5)	–	23/239 (9.6)	–
Rijken and Chilopora [32]	Int J G O	2007	–	–	–	–
Jokhio and Kelly [33]	Int J G O	2006	92/112 (81.8)	–	–	–
Gessesew and Mesfin [8]	Eth M J	2003	169/184 (92%)	106/184 (57.6%)	–	78/184 (42.4)
Harouna et al. [9]	Med Afr N	2001	40/52 (77.0%)	–	44/52 (84.5)	8/52 (15.4)

Among the obstetrical fistula patients, 57.6% to 94.8% of patients try to labor at home and are secondarily transferred to a health facility, while 9% to 84% of the patients delivered at home (Table 6)

the affected women, proportion of obstetrical causes of fistula, or information about the site(s) of fistulae. Articles were also excluded if they included fewer than 20 cases or if they only reported on selected cases.

#### Data extraction and analysis

From these articles we extracted the following variables for the review: country of the study, study design, age of the patients, place of causal birth, skilled birth attendance; the duration of labor, mode of delivery, the presence of antenatal care; age at marriage, age at causative delivery, parity at the occurrence of the fistula, and a number of little defined additional factors.

#### Results

We found 28 studies that presented some information about the characteristics and outcomes of fistula patients. Four studies were excluded because they reported only 1 to 20 cases [11–14]. Three studies were excluded because it was not possible to determine which fistula cases were obstetrical [15–17]. Two studies were excluded because of the selective status of the included cases [18, 19]. Nineteen studies were chosen for analysis in this review. Tables 1 and 2 show the characteristics of the studies selected [4, 7–10, 20–33]. Among the 19 selected studies, 15 were from sub-Saharan Africa and 4 were from the Middle East (Table 1). Seventeen studies were retrospective case series, and two were

**Table 7** Height of the patients

Author	Journal	Year of publication	Height, <150 cm	Height (mean)	BMI median
Melah et. al [4]	J OG	2007	40.0%	146.2	
Ahmad et. al [24]	Int J G O	2005		145	
Wall et al. [26]	Am J O G	2004	79.4%		
Holme et al. [7]	Br J O G	2007	–	148 <sup>a</sup>	21.2
Harouna et al. [9]	Med Afr N	2001		155 <sup>a</sup>	

Many patients among the obstetric fistula patients have less than 150 cm of height (40–79.4%; Table 7)

<sup>a</sup>Median height

**Table 8** Duration of labor and mode of delivery

Author	Journal	Year of publication	Labor, mean (days)	Labor >=24 h	Instrumental	Operative delivery	CS
Rieger et al. [20]	ANZJOG	2004	–	–	24/51 (47.0%)	–	–
Rahman et al. [10]	JOG	2003	–	7/35 (20.0)	–	–	–
Nafiou et al. [21]	Int J G O	2007	3 <sup>a</sup>	103/111 (93.0)	–	–	23/111 (20.2)
Meyer et al. [22]	Am J O G	2007	2.61	–	–	21/58 (36.2%)	13/58 (22.4%)
Ijaiya and Aboyeji [23]	WAJM	2004	–	28/34 (82.4)	1/34 (2.9%)	4/34 (11.8%)	2/34 (5.9%)
Melah et al. [4]	J OG	2007	3.6	75/80 (93.7)	–	–	–
Ahmad et al. [24]	Int J G O	2005	–	790/1,086 (72.5)	–	202/1,086 (18.6)	79/1,086 (7.3)
Wall et al. [26]	Am J O G	2004	–	272/898 (30.2)	–	452/898 (50.5)	363/898 (40.4)
Qi Li Ya et al. [27]	Med Afr N	2000	–	34 (100.0)	6/34 (17.6)	–	4/34 (11.8)
Hilton and Ward [28]	IUJPF	1998	2.5	(1,918/2,389) 80.3%	(36/605) 6.0	(224/605) 37.0	(206/605) 34.0%
Arrowsmith [29]	J Urol	1994	2.52	(88/93) 94.9	(9/93) 10%	–	(35/93) 38%
Holme et al. [7]	Br J O G	2007	–	223/233 (95.7)	–	144/239 (60.3)	119/239 (50.2)
Rijken and Chilopora [32]	Int J G O	2007	–	–	34/379 (9.0)	209/379 (55.1)	138/379 (36.4)
Gessesew and Mesfin [8]	Eth M J	2003	3.6	–	52/184 (28.3%)	–	19/184 (10.3%)
Harouna et al. [9]	Med Afr N	2001	4.0	–	–	–	–

The mean duration of labor among the fistula patients ranged from 2.5 to 4 days. Twenty to 95.7% of the patients have been in labor for more than 24 h. Operative delivery was performed for 11% to 60% of cases on index delivery (Table 8)

<sup>a</sup>Median duration of labor

surveys (Table 1, 2). Among the selected studies, there were two reports of only rectovaginal fistulae (RVpur); three studies reported only cases of vesicovaginal fistulae (VVpur); nine studies reported on subjects with both vesicovaginal and associated rectovaginal fistulae in the same patient (VVc), and five reports included pure vesicovaginal cases, pure rectovaginal cases, and associated cases (V/R; Table 1). Among the fistula cases, 79.4% to 100% were obstetrical while the remaining cases were from other causes (Table 2). Rectovaginal fistula represented 1% to 8% of cases; vesicovaginal fistula made up 79% to 100% of cases, and combined vesico and rectovaginal fistula represented 1% to 23% of cases (Table 2). Illiteracy among the obstetrical fistula patients ranged from 19% to 96% (Table 3).

At the time of management, 8.9% to 86% of patients were teenagers (Table 4). Thirty-one to 66.7% of patients were primiparous at the time of the incident delivery resulting in fistula (Table 5).

Among the obstetrical fistula patients, 57.6% to 94.8% of women tried to deliver at home and were secondarily transferred to the health facility. However, 9% to 84% of the patients delivered at home (Table 6). Many obstetrical fistula patients (40–79.4%) were less than 150 cm tall (Table 7).

The mean duration of labor among the fistula patients ranged from 2.5 to 4 days. Twenty to 95.7% of patients labored for more than 24 h. Operative delivery was performed in 11% to 60% of fistula cases (Table 8). The indexed delivery resulted in stillbirth for 78% to 96% of patients [7, 8, 22, 26, 28, 29, 32] (Table 9).

## Discussion

We found that 8.9% to 86% of obstetrical fistula patients are teenagers at the time of management (Table 4), and

**Table 9** Stillbirth status of the patients

	Author	Journal	Year of publication	Stillbirth
Niger	Arrowsmith [29]	J Urol	1994	89/93 (96%)
Nigeria	Wall et al. [26]	Am J O G	2004	824/898 (91.7%)
Niger	Meyer et al. [22]	Am J O G	2007	53/58 (91.4%)
Nigeria	Hilton and Ward [28]	IUJPF	1998	543/605 (89.7%)
Ethiopia	Gessesew and Mesfin [8]	Eth M J	2003	167/193 (86.6%)
Malawi	Rijken and Chilopora [32]	Int J G O	2007	305/379 (80.5)
Zambia	Holme et al. [7]	Br J O G	2007	185/239 (78.1%)

The index delivery resulted in stillbirth for 78% to 96% of the patients (Table 9)

31% to 66.7% were primiparous at the moment of occurrence. (Table 5). Previous studies found a higher rate of obstetrical complications in teenagers; Unfer et al. reported a higher rate of cesarean section in teenagers compared to women in their twenties. Unfer et al. also reported a higher incidence of low birth weight infants and acute intrapartum distress in adolescent mothers [34]. The increased obstetrical risk in teenagers can partially be explained by anatomic immaturity. Teenage pregnancies account for a higher proportion of all pregnancies (7–30%) in developing countries [35, 36]. These findings suggest that efforts to reduce obstetrical fistula should target teenagers.

We found that 57.6% to 94.8% of obstetrical fistula patients tried to labor at home but were later transferred to health facilities and 9% to 84% of the patients delivered at home (Table 6).

The WHO recommends that labor should be monitored with a partograph (an instrument on which the labor events are recorded) and interpreted for decision making during labor and delivery. This is impossible if women choose to labor at home [37, 38]. When women try to labor at home unsuccessfully, they are more likely to come to the hospital at a late stage. This may be further delayed by the absence of transportation, poor roads, heavy rains, and great distances to the health facility. In many developing countries, patients have to use their own money to pay for health care, and this may further delay treatment.

The mean duration of labor in fistula patients ranged from 2.5 to 4 days. Twenty to 95.7% of these women had labored for more than 24 h, and operative delivery was performed in 11% to 60% of the indexed deliveries leading to fistula formation (Table 8). Cephalopelvic disproportion (CPD) was the most common indication for cesarean delivery in sub-Saharan Africa [39–41]. Previous studies have found CPD as the primary indication in 30%, 33%, and 34% of cesarean deliveries in Senegal, Cameroon, and Namibia, respectively.

Delay in intervention increases the time of compression of the mother's soft pelvic organs (i.e., bladder and rectum) between the fetal presenting part (i.e., the fetal head) and the mother's pelvic bones, leading to uterine rupture, obstetric fistula, and fetal death. These observations suggest that emergency obstetrical care should be a cornerstone of any obstetrical fistula prevention program. We found that more than 78% of fistula patients did not have a live baby. Our findings strongly emphasize on the association between obstetric fistula (OF) and stillbirth. This suggests that the OF patients will not suffer only from their physical condition but will also suffer from psychological setbacks due to the loss of the pregnancy [7, 8, 22, 26, 28, 29, 32].

## Conclusion

Obstetric fistula is associated with several risk factors, and they appear to be preventable. This disease is associated with teenage status at delivery, primiparity, prolonged labor, home delivery, and short status at delivery. Knowledge of the leading risk factors for obstetrical fistula in a given population is of paramount importance and should be studied. This knowledge should be used in strengthening preventive strategies both at the health facility and at the community level.

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