



## RISK FACTORS FOR OBSTETRIC FISTULA IN NORTHWEST NIGERIA 2013: A CASE CONTROL STUDY

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### ABSTRACT

For each maternal death, approximately 10 to 15 other women sustain serious morbidity, including obstetric fistula (OF). The most effective approach to reducing OF occurrence is to provide essential obstetric services at the community level with prompt access to emergency obstetric services at the first referral level. This study examined availability of Emergency obstetric care (EmOC) services and factors that influenced the utilisation of the services and identified the potential risk factors of obstetric fistula among women in Nigeria. A case-control study with a sample of 200 (1:1) was conducted from August to September 2013 at three selected hospitals in North-Western Nigeria. Cases were patients diagnosed as having OF within the last 3years. Controls were patients (without OF) admitted to maternity units of these hospitals. The odds ratio was used as a measure of association with their corresponding 95% confidence interval. Variables with p-value of <0.1 were included in the logistic regression model to generate adjusted Odds Ratios. Generally, Having Formal educational (OR; 0.013, CI; 0.001-0.530), Having Husband permission (OR; 0.028, CI; 0.001-0.664). Duration of labour  $\geq$  24hr (OR; 2.659, CI; 1.138-7.512), Delay in the decision to seek facility care (OR; 2.770, CI; 1.760-3.950), Affordability of facility care cost (OR; 7.432, CI; 3.925-13.682).are risk factors for obstetric fistula. Health Education programs to both women and men with traditionally palatable messages that will change their attitudes and practices to take responsibility in reproductive health and empowerment of women can be a promising strategy to reduce the occurrence of obstetrics fistula.

**KEYWORDS:** Risk-Factors, Obstetric fistula.

### INTRODUCTION

The World Health Organization report that a staggering 500,000 women die every year from pregnancy and Pregnancy-related illnesses; over 99% of them in developing world.<sup>[1]</sup> For every woman that dies, 20 or more survive only to live thereafter with crippling disabilities.<sup>[2]</sup> One of the most devastating disabilities is an obstetric fistula (OF). It was estimated that around 50 000 to 100 000 new cases of obstetric fistula are believed to occur annually worldwide, and in 2004, the number of estimated cases was 2 million.<sup>[3]</sup>

In Nigeria an annual obstetric fistula incidence is estimated at 2.11 per 1000 births<sup>[4]</sup>, from 100,000–1,000,000 Nigerians live with obstetric fistula.<sup>[4]</sup> Over 70,000 Bangladeshi women live with obstetric fistula<sup>[5]</sup> and about 9,000 new cases occur each year in Ethiopia.<sup>[2]</sup> It is however not impossible that some of these incidences/ prevalence are under reported.

Obstetric fistula is an abnormal communication that exists between the bladder and the vagina (vesicovaginal fistula) or between the rectum and vagina (rectovaginal fistulae) that allows the continuous involuntary leakage of urine or faeces into the vagina.<sup>[6]</sup> This condition, though largely preventable is still a major cause of maternal morbidity and misery in the tropics multiple childhood infections and poor nutrition result in a contracted pelvis predisposing the individual to obstructed labour.<sup>[7]</sup> Most obstetric fistulae follow prolonged obstructed labour and are due to necrosis of the anterior vaginal wall, bladder, urethra and rectum trapped between the pelvic bones and fetal head.<sup>[4]</sup> The most obvious result of an obstetric fistula is the loss of urinary or faecal control or both. The constant leakage of urine or faeces or both, results in devastating social, psychological and physical injury in these otherwise healthy young women.<sup>[8]</sup> Many studies in Nigeria have described varying contributing factors to obstetric fistula, Some risk factors are unique to specific regions and countries for example obstetric fistula was reported to

occur commonly among primipara in northern Nigeria,<sup>[9]</sup> as opposed the eastern part where its mostly among multipara. Other risk factors are illiteracy, ignorance, poverty, unskilled birth attendance, restriction of women's movement, and transportation.<sup>[10]</sup> Hence the need to carry out this study to identify potential risk factors that are context and region specific.

## MATERIALS AND METHOD

### Study design and site

This was a comparative case-control study conducted between May to September 2013 at three fistula hospitals in northwest Nigeria, namely Babar Ruga VVF hospital Katsina, Maryam Abacha VVF hospital Sokoto and Farida VVF hospital Zamfara. These facilities managed both fistula and other gynaecological conditions. The three states are similar in terms of religious, social economic and cultural background. The groups were matched base on socio-economic and social status, in Nigeria the health care system has three tiers, primary, secondary and tertiary. The VVF hospitals belong to secondary category and services, mostly patronized by the low socioeconomic class of the community (both cases and control).

### Study population and inclusion criteria

The Study population included women who had delivered within the previous three years attending any of the three study sites. A case was defined as a woman with treated or untreated fistula following pregnancy within the previous three years at the study sites and had consented to take part in the study. A control was defined as a woman who had delivered within the previous three years no history of treated or healed fistula, in maternity unit of the study sites and had consented to take part in the study. Patient with more than three years history were excluded to reduce recall bias, also excluded were those with fistula secondary to infection, cancers and trauma. In addition those with mental disorder were also excluded.

### Sample size and sampling

In this study, several risk factors for obstetric fistula were selected based on previous literature in African countries. In a study in Kenya, Zeinab et al (2010) reported age at marriage (OR=3.4), parity (OR=2.9), low education (OR=5.1), age at index delivery (OR=6.8), antenatal visits (OR) = 15.4) as significant factors associated with obstetric fistula. In another study, Barageine et al (2014) reported low education of husband (OR = 3.1) and height lower than 1.50 meters (OR = 3.7) as significant factors associated with obstetric fistula. In this study, age at marriage, parity, education, husband's education, age at index delivery, antenatal visits and height were tested. Since several variables are tested, it was necessary to calculate the minimum required sample size for each variable. For this study, the Power and Sample Size Software was used to calculate the sample size for each variable. The minimum required sample size to test all the selected variables, with  $\alpha =$

0.05 and a power of 90% was 82 per group. In this study a sample size of 100 per group was taken, in anticipation of nonresponse.

Case-patients who met the inclusion criteria were enrolled consecutively as they came to the clinic until the desired sample size was achieved. For the selection of controls, the patients' files were reviewed and the patients who satisfied the criteria were selected using simple random sampling procedure.

## DATA COLLECTION

The instrument used was an interviewer administered questionnaire, the questionnaire was divided into six sections: Demographic and socio-economic information, health seeking behaviours and circumstance around Antenatal care, delivery and modern contraception. Patient case folders were reviewed and compared with patients filled questionnaire, discrepancies were resolved with the patients.

### Analysis

Descriptive analyses of the demographic variables for both cases and controls were done using means, proportions and frequencies. Odds ratios and 95% confidence intervals were calculated at bivariate analysis where exposures were tested for association with the outcome variable (obstetrics fistulae) using chi-square test or Fisher's exact test. Adjusted odds ratio and their 95% confident interval were calculated by including all exposures with p value <0.01 in the multivariate model. All exposures with P value < 0.05 were considered statistically significant.

### Ethical considerations

Ethical clearance was sought and obtained from Health Research Ethical Committee (HREC ZMOH/SUB/482/VOL 1SHREC/01/02/2013) Zamfara state Ministry of health. Clearances to carry out the study were sought and obtained from the hospitals where studies were carried out (Farida VVF hospital, Maryam Abacha VVF hospital and Babbar Ruga VVF Hospital.) Written informed consent was sought and obtained from each participant.

## RESULT

The Mean age at marriage among cases was found to be  $14.32 \pm 3.32$ , while that of the control was  $16.96 \pm 3.45$ . Twenty percent of the cases had their first pregnancy when they were 11–15 years old and 73% had their first pregnancy by the time they were 20 years old. Only Six percent of the controls had their pregnancy by the time they were 11-15 years old. Forty-five percent of the cases were primiparous the as number of parity increases the cases reduced. Ownership of mobile phone (as a proxy of socio-economics status) was lower in the cases (54.0%) as compared to the controls (78.0%). Ninety-three percent (67/72) of the cases took more than two hours to get to a facility irrespective of mode of transport while as 98% (71/72) of controls took two hours or less

to get to a health facility. Fifty-two percent of cases and 90% of controls had attended the antenatal clinic at least

once in the last pregnancy or the pregnancy associated with fistula. (Table 1).

**Table: 1 Characteristics of the women in the case and control groups (N=200)**

Variable	Cases n=100 (%)	Control n= 100(%)	Total n= (%)	$\chi^2/ t$	p value
<b>Age group</b>					
≤ 25	51 (51.0)	44 (44.0)	95 (47.5)	10.815 <sup>Y</sup>	< 0.05*
26 – 35	30 (30.0)	47 (47.0)	77 (77.0)		
36 – 45	10 (10.0)	9 (9.0)	19 (9.5)		
46 – 55	9 (9.0)	0 (0.0)	9 (4.5)		
Median (IQR)	25.0(IQR15.00)	27.0(IQR9.5)	27.6(IQR2.5)	4925.0 <sup>U</sup>	0.854
<b>Age at marriage</b>					
Mean ± SD	14.32 ± 3.32	16.96 ± 3.45	16.29±2.627	-5.511 <sup>t</sup>	<0.001*
<b>Ever attended formal school</b>					
Yes	11 (11.0)	47 (47.0)	58 (29.0)	31.472	<0.001*
No	89 (89.0)	53 (53.0)	142 (71.0)		
<b>Marital status</b>					
Married	64 (64.0)	94 (94.0)	158 (79.0)	24.393 <sup>Y</sup>	<0.001*
Divorced	32 (32.0)	5 (5.0)	37 (18.5)		
Widowed	4 (4.0)	1 (1.0)	5 (2.5)		
<b>Parity</b>					
1	45 (45.0)	22 (22.0)	67 (33.5)	28.245	<0.001*
2 – 3	14 (14.0)	48 (48.0)	62 (31.0)		
≥ 4	41 (41.0)	30 (30.0)	71 (35.5)		
<b>Height</b>					
≤ 1.50	45 (45.0)	29 (29.0)	74 (37.0)	5.491	<0.05*
> 1.50	55 (55.0)	71 (71.0)	126 (63.0)		
<b>Occupation</b>					
Yes	27 (27.0)	24 (24.0)	51 (25.5)	0.237	0.626
No	73 (73.0)	76 (76.0)	149 (74.5)		
<b>Age of husband</b>					
≤ 25	10 (10.0)	5 (5.0)	15 (7.5)	9.114	0.058
26 – 35	28 (28.0)	27 (27.0)	55 (27.5)		
36 – 45	35 (35.0)	47 (47.0)	82 (41.0)		
46 – 55	15 (15.0)	18 (18.0)	33 (16.5)		
> 55	12 (12.0)	3 (3.0)	15 (7.5)		
Mean ± SD	40.36 ± 11.27	40.15 ± 8.41	40.255±9.919	0.149 <sup>t</sup>	0.881
<b>Husband ever attended formal school</b>					
Yes	33 (33.0)	55 (55.6)	88 (44.2)	10.261	<0.001*
No	67 (67.0)	44 (44.4)	111 (55.8)		
<b>Ownership of a mobile phone</b>					
Yes	54 (54.0)	78 (78.0)	132 (66.0)	12.834	<0.001*
No	46 (46.0)	22 (22.0)	68 (34.0)		

$\chi^2$ : Chi-square; t: Independent Samples t-test; Y: Yates corrected chi-square; \*: p-value <0.05

Comparing the cases and controls, the mean age at first pregnancy was higher in controls than in cases ( $p < 0.01$ ). Cases and their spouses had mostly no formal education (89 %), while most controls and their spouses (47%) had some form of formal education ( $p$  value < 0.01) (Table 1). Of the hundred cases, (32%) were divorced and (4%) were Widows as compared to controls where (94%) were married and (5%) were divorced. Most of the women with fistula who were divorced relate the divorce to the fistula onset. Only (27%) of the cases had any form for artisan (Business) that earn them some income compared to controls where 76% had some form

of business where they earn some income. Almost half of the cases (45%) were shorter than 150cm while (71%) the controls were taller than 150 cm. Also, half of the cases (50%) reported a labour duration of more than 24 hours. Seventy-two percent of the controls had labour duration of fewer than 12 hours and only (5 %) had the duration of 24-72 hours. Seventy-three percent (73%) of cases and 72% of controls delivered in a health facility. Only twenty-six percent (19/73) of the cases made the decision to seek facility services within six hours of labour while 52% (38/72) of controls made the decision within six hours of labour.

Table: 2 Obstetrics characteristics of cases and controls (N=200)

Variable	Cases n (%)	Control n (%)	Total n (%)	$\chi^2/t$	p-value
<b>Age at marriage</b>					
11 – 15	68 (68.0)	29 (29.0)	97 (48.5)	27.888 <sup>Y</sup>	<0.001*
16 – 20	30 (30.0)	61 (61.0)	91 (45.5)		
21 – 25	2 (2.0)	7 (7.0)	9 (4.5)		
26 – 30	0 (0.0)	3 (3.0)	3 (1.5)		
<b>Duration of labour</b>					
≤ 12	24 (24.0)	72 (72.0)	96 (48.0)	61.235	<0.001*
13 – 24	26 (26.0)	23 (23.0)	49 (24.5)		
25 – 48	27 (27.0)	2 (2.0)	29 (14.5)		
49 – 72	21 (221.0)	3 (3.0)	24 (12.0)		
> 72	2 (2.0)	0 (0.0)	2 (1.0)		
<b>Attended ANC clinic</b>					
Yes	52 (52.0)	90 (90.0)	142 (71.0)	35.066	<0.001*
No	48 (48.0)	10 (10.0)	58 (29.0)		
<b>Husband grants permission for ANC</b>					
Yes	52 (52.0)	88 (88.0)	140 (70.0)	30.857	<0.001*
No	48 (48.0)	12 (12.0)	60 (60.0)		
<b>Estimated cost of medication per visit</b>					
Affordable	13 (29.5)	61 (69.3)	74 (56.1)	18.837	<0.001*
Not affordable	31 (70.5)	27 (30.7)	58 (43.9)		
<b>Place of delivery</b>					
Home	27 (27.0)	28 (28.0)	55 (27.5)	0.025	0.874
Facility	73 (73.0)	72 (72.0)	145 (72.5)		
<b>Duration from onset of labour to decision to seek service (n = 145)</b>					
< 6 hours	19 (26.0)	38 (52.8)	57 (39.3)	10.872	<0.001*
≥ 6 hours	54 (74.0)	34 (47.2)	88 (60.7)		
<b>Time taken from home to facility (n = 145)</b>					
< 2 hours	67 (93.1)	71 (98.6)	138 (95.8)	1.565 <sup>Y</sup>	0.211
≥ 2 hours	5 (6.9)	1 (1.4)	6 (4.2)		

Table: 2 Obstetrics characteristics of cases and controls (N=200) continued

Variable	Cases n (%)	Control n (%)	Total n (%)	$\chi^2/t$	p-value
<b>Referral to other facility (n = 145)</b>					
Yes	19 (26.0)	6 (8.5)	25 (17.4)	7.751	<0.05*
No	54 (74.0)	65 (91.5)	119 (82.6)		
<b>Age at 1<sup>st</sup> pregnancy</b>					
11 – 15	20 (20.0)	6 (6.0)	26 (13.0)	12.836 <sup>Y</sup>	<0.05*
16 – 20	74 (74.0)	73 (73.0)	147 (73.5)		
21 – 25	5 (5.0)	15 (15.0)	20 (10.0)		
26 – 30	1 (1.0)	6 (6.0)	7 (3.5)		
Mean ± SD	17.26±2.11	19.02 ±2.74	18.14 ±2.593	-5.091	<0.001*
<b>Mode of delivery</b>					
SVD	69 (69.0)	98 (98.0)	167 (83.5)	30.521	<0.001*
CS	31 (31.0)	2 (2.0)	33 (16.5)		

$\chi^2$ : Chi-square; t: Independent Samples t-test; Y: Yates corrected chi-square; \*: p-value <0.05

Table: 4.24, below show Fifty-three percent of the cases have knowledge of contraception however only 12.0% of

them are using any method of contraceptive as compared with 31.0% of controls who are using a contraceptive.

This was found to be statistically significant ( $p$ -value 0.001). Among those who use a contraceptive, the traditional method of contraceptive was found to be used more in cases (41.7%) than in the controls (12.9%).

Eighty-eight percent of the cases never use any form of modern method of contraceptive while 31% of the control uses some form of a modern contraceptive.

**Table: 3 Knowledge and use of contraception in cases and controls**

	Cases	Control	Total	$\chi^2/t$	$p$ -value
Variable	n (%)	n (%)	n (%)		
<b>Knowledge of contraception</b>					
Yes	53 (53.0)	46 (46.0)	99 (49.5)	0.980	0.322
No	47 (47.0)	54 (54.0)	101 (50.5)		
<b>Use of any method of contraception</b>					
Yes	12 (12.0)	31 (31.0)	44 (22.0)	10.695	<0.001*
No	88 (88.0)	69 (69.0)	156 (78.0)		
<b>Method of contraception used</b>					
Traditional	5 (41.7)	4 (12.9)	9 (20.9)	2.761 <sup>Y</sup>	0.097
Modern	7 (58.3)	27 (87.1)	34 (79.1)		

$\chi^2$ : Chi-square; Y: Yates corrected chi-square; \*:  $p$ -value <0.05

The table 425 below summarises the distribution of the cases by age group and parity. The majority (60.0%) of the cases were primi para and  $\leq 25$  year, furthermore as the age increase the number of cases decrease, same

applied for Para 1 and above. The relationship between the age group and the parity of the cases was not found to be significant ( $p$ -value 0.193).

**Table: 4 Distribution of fistula cases by age and parity (N=100)**

	Primipara	>1 parity	Total	$\chi^2$	$p$ -value
Age group	n (%)	n (%)	n (%)		
$\leq 25$	29 (64.4)	22 (40.0)	51 (51.0)	4.731	0.193
26 – 35	11 (24.4)	19 (34.5)	30 (30.0)		
36 – 45	2 (4.4)	8 (14.5)	10 (10.0)		
46 – 55	3 (6.7)	6 (10.9)	9 (9.0)		

$\chi^2$ : Chi-square; Y: Yates corrected chi-square; \*:  $p$ -value <0.05

At multivariate analysis, patients who ever attended formal school have (OR; 0.013, CI; 0.001-0.530) of having a fistula. Those with duration of labour  $\geq 24$  hours have 2.6 times the increase in the odds of having fistula as compared with those with shorter duration of labour (OR;2.659, CI;1.138-7.512). Furthermore, those who estimated that they cannot afford the cost of facility care have 7.43 times increase in the odds of having

fistula as compared with those who can afford care (OR;7.432, CI;3.925-13.682). In addition, delay in taking a decision to seek the care of more than 6 hours after onset of labour was found to be associated with 2.77 times increased odds of having a fistula (OR;2.770, CI;1.760-3.950). A husband who permits their spouse to attend ANC has lesser odds (Protective) of having fistula (OR; 0.028, CI; 0.001-0.664).

**Table: 5 Factors associated with obstetrics fistula**

Variables	OR	95% CI	AOR	95% CI	$p$ -value
Age ( $\leq 25$ / others)	1.325	0.759 – 2.311	4.809	0.487-47.482	0.179
Patients who Ever attended formal school (Yes/ No)	0.113	0.045 – 0.285	0.013	0.001 – 0.530	<0.05*
Married (Yes/ No)	0.139	0.067 – 0.292	0.260	0.018 – 3.840	0.327
Primi parity (Primi parity/others)	2.901	1.567 – 5.369	1.088	0.134 – 8.808	0.937
Height ( $\leq 1.50m$ / >1.50)	2.003	1.116 – 3.594	1.405	0.186–10.604	0.742
Husband ever attended formal education (Yes/ No)	0.394	0.22 – 0.700	0.427	0.057 – 3.193	0.407
Age at marriage ( $\leq 18$ / > 18 years)	7.761	2.862–21.046	6.006	0.271–13.090	0.257
Duration of labour ( $> 24$ hours / $\leq 24$ hours)	19.000	7.124-50.676	2.659	1.138 – 7.512	<0.05*
Estimated cost facility care (Not affordable/ Affordable)	5.387	2.444–11.875	7.432	3.925–13.682	<0.05*
Duration from onset of labour to decision to seek facility service ( $> 6$ hours/ $\geq 6$ hours)	3.467	1.735 – 6.932	2.770	1.760 – 3.950	<0.05*
Referred to other facility (Yes/ No)	3.361	1.388 – 8.138	2.333	0.203 – 6.847	0.497

Age at 1 <sup>st</sup> pregnancy ( $\leq 18$ years/ $> 18$ years)	3.762	2.022 – 6.998	3.410	0.293 – 9.612	0.327
Mode of delivery (SVD/ CS)	0.148	0.072 – 0.303	0.001	0.000	1.000
Use of any form of contraceptive (Yes/ No)	0.304	0.145 – 0.634	0.574	0.054 – 6.065	0.645
Owens a mobile phone (Yes/No)	0.331	0.179 – 0.613	0.096	0.007 – 1.423	0.088
Ever attended ANC (Yes/No)	0.120	0.056 – 0.258	0.727	0.001 – 3.345	0.926
Husband Permission to attend ANC (Yes/ No)	0.045	0.011 – 0.196	0.028	0.001 – 0.664	<0.05*

**OR: Odds ratio; AOR: Adjusted Odds ratio; 95% CI: 95% Confidence Interval; \*:  $p$ -value <0.05**

**R<sup>2</sup>: 0.793; Predictive value: 93.3%;  $\chi^2$ : 89.585;  $p$ -value: <0.001**

## DISCUSSION

The result indicate that duration of labour for more than 24 hours, un- affordability of hospital services cost and more than 2 hours delay from onset of labour to decision to seek facility care, as risk factors for developing obstetrics fistula. Other risk factors included lack of formal education and lack of husband permission to attend antenatal care services. The findings of this study are consistent with a recent study in Kenya, where they found the duration of more than 24hours, a delay from onset of labour to a decision to seek care in the facility as risk factors for obstetric fistula Roca et al.<sup>[11]</sup>

This finding supports previous research into this obstetric fistula area which links Low level of education, socioeconomic status, and ignorance among the patients and their husbands contributed to the low rate of utilisation of skilled birth attendance Nigeria republic, Kenya and Ethiopia respectively<sup>[11,12][13]</sup>

In this series majority of obstetric fistula patients and their spouses are non-literate and likewise in other studies, the contributory factors to the development of obstetric fistula and its consequences are intrinsically associated with low level of education, poverty, non-availability / poor health facility utilization and low socio-economic status (Ijaiya et al., 2010; Tsui et al., 2007).

The low rate of education among the obstetric fistula patients is corroborated by UNFPA report that only 2% of 15-19 year-old married Nigerian girls are in schools, compared to 69% of unmarried girls,<sup>[14]</sup> The more education a girl receives the less she is to be married as a child. A girl of fewer than 18 years cannot make a fully informed choice whether to marry or not to marry therefore child marriage is regarded as a form of forced marriage and violation of girls' rights. This practice is seldom in developed countries but rampant in rural and impoverished areas of sub-saharan Africa and Asia<sup>[15]</sup>, where opportunities and prospect for girl child are limited.

It hinders the achievement of Millennium development goals 3 (improve gender equality and empower women), MDG 4 (reduce child mortality) and MDG 5 (improve maternal health). Studies have shown that child marriage increases the likelihood of HIV infection and of domestic violence.<sup>[16]</sup>

In most cases, men decide and enforce religious beliefs, practices and traditions even in matters that directly concern the women's reproductive health issues (Hunnicut, 2009). Women attain high status only if she delivers many male children. In contrast to the southern part of the country, in Northern Nigeria, while few boys are sent to western school, the girls help in domestic work and are given away in early marriage, predisposing them to the risk of early pregnancy and to the risk of maternal morbidity and mortality. Female school enrollment in most Northern Nigerian communities is considered the waste of resources to the immediate family (Schildkrout, 1982).

The southern ethnic groups with a low prevalence of fistula are predominantly Christians, which could be related to the fact that, development of western education in Nigeria commenced as an upshot of Christian religion, introduced by the British colonists; perhaps this is why western education was not readily embraced by the Northerners (Gann & Duignan, 1978). One of the most important factors contributing to the occurrence of obstetric fistula in developing countries is poverty (Muhammad, 2009). In this series, three variables affordability of health care cost, ownership of hand phone and occupation of the participants was used as a proxy for estimation of the socioeconomic status participants. The finding depict majority of the control own a hand-phone, and has some form of business (Artisans) as means of income generation, compared to the cases where only half possess hand-phone and have a means of income generation. This finding was corroborated by a study in Africa which show women with obstetric fistula suffer ostracism.<sup>[17]</sup>

Unaffordability of transportation, consultation and medication cost, were cited as the reason for the preference for patronising traditional birth attendants and home deliveries in the qualitative seasons, many families view the health care bill as catastrophic. In this series, a majority of the control group could afford the healthcare bill when compared with the cases. This is similar to a study in north-eastern Pakistan, Faisalabad (Muhammad 2009).

In northern Nigeria, when a woman for whatever reason (health related inclusive) leaves her matrimonial home without her husband permission is considered an abomination.<sup>[18]</sup> There is a strong belief that women's movement must be under strict male control and permission from the husband or a suitable male surrogate

must be obtained before money can be spent on health care (Ijaya 2010).

The majority of the patients in this series had early marriage and pregnancy, which is similar to findings from other parts of sub-Saharan Africa, where most of the fistula patients were married before the age of 20 years.<sup>[19]</sup> Nigeria demographic and health survey 2008 shows that north-west Nigeria had the least age at first marriage in Nigeria.<sup>[20]</sup>

Women that marry early are more likely to have their first child earlier that is why obstetric fistula is most common among prim parous women in areas, where early marriage is prevalent as in this study centres, and many other communities in developing countries. A study from Africa countries on adolescent marriages report, girls are giving out in marriage before attaining menarche.<sup>[21]</sup> In child pregnancy, the pelvis has not reached its full development for safe passage of a term foetus, hence the young girl is prone to developing cephalo-pelvic disproportion and ultimately prolong obstructed labour. If the obstruction is not relieved early it leads to pressure necrosis and vesicovaginal fistula.

Compared to control, a majority of cases were shorter than (<1.5cm), and the when tested by itself, short stature was significantly associated with fistula. Small stature is related to small pelvic capacity (pelvic contracture) which increases the risk of developing obstructed labour during delivery, consequently leading to obstetric fistula. This is supported by studies from Zaria and Sokoto, Nigeria where a majority of fistula patients were found to have short stature compared to other populations (Rahimi, Capes, & Ascher, 2013; Udeh, 2015). However, when controlled for other variables, short stature was not significant.

In this study, antenatal care uptake among the women in the control group was higher compared to the fistula group. However, antenatal care uptake was not significantly associated with fistula at multivariate analysis. There has been massive community mobilisation going on by the government on the need to attend antenatal care for all pregnant women. This had impacted in the antenatal care coverage but facility delivery is still low, as shown in the qualitative study above. Further analysis showed that antenatal care uptake was not associated with place of delivery and type of delivery. This was also true in a study conducted in Zambia, where 97.5% of fistula patients had an antenatal care in the index pregnancy (Holme, Breen, & MacArthur, 2007).

Although both cases and control reported to had reached the facility from home in less than 2hr of onset of labour. The women who had to walk had a higher risk of fistula compared to those who could afford to travel in a car or taxi. The majority of the respondents in this study stayed within less than 2hr from home to the health facilities.

Most of the patients mentioned that it is not the distance, but the unavailability of transportation was the major barrier to go to a health facility (In qualitative enquiries above). When they do not own a family car or cannot afford to hire a car or taxi, it is not easy for the women to reach the health facility safely and in time, especially at night. A similar finding from Northeastern Nigeria showed that distance of more than 3km from the women's homes to the health facilities is a risk factor for obstetric fistula (Melah et al., 2007). Transport problems and long distances have been identified as contributors to delay in reaching the health facilities (Holme et al., 2007; Wall & Lewis, 2012b). Access to subsidised hospital shuttle across the community will serve as an ad-hoc solution to this problem. Meanwhile, hospitals need to be improved by providing better low-cost transportation services (such as ambulances) to enable women to get to facilities (any time of the day) in good time.<sup>[22]</sup> Several studies have reported a median duration of labour among obstetric fistula patients ranging from 20 to 28 hours and that more than 70% to 96% of patients had been in labour for more than 24 hours.<sup>[23]</sup> In this study, hours of labour was significantly associated with fistula. All the women in the control group delivered within 12 hours of labour, while in the fistula group only 24% of the women delivered with 12 hours. This observation is similar to a finding in a Kenyan study, where it was reported that 78% of fistula patients went through long hours of labour (McFadden, & Mabeya, 2011). As reported in other studies as well, prolonged obstructed labour is the most common cause of obstetric fistula (Ampofo et al, 1989; Lewis, Karshima, Kirschner, & Arrowsmith, 2004). Followed by *Gishiri cut*, (incision made on the anterior vaginal wall by Hausa traditional health practitioners to treat infertility, amenorrhea or to relieve obstructed labour) which accounted for 6.2% cases of obstetric fistula in Maiduguri (Ampofo. et al, 1990). Other causes included gynecological operations, advanced cervical cancer, caesarian section, forceps delivery, uterine rupture, craniotomy and traumatic vaginal laceration resulting from trauma/fall (Orji, Aduloju, & Orji, 2007).

In addition to the physical trauma suffered by obstetric fistula patients, they also suffer both psychological and social trauma. One of the undesirable outcomes of obstetric fistula secondary to obstructed labour is perinatal loss, with sex predilection (Male children) as depicted by studies in Zambia and Niger Republic reported 78% and 91% stillbirths in obstetric fistula-obstructed labour, respectively (Holme et al., 2007; Meyer et al., 2007). During prolonged obstructed labour the fetus may experience fatal hypoxemia, fetal distress and subsequently fetal death. If delivered before fetal death, the baby may have birth asphyxia, neurological complications or neonatal death.

In this series, higher frequency of separation/divorce was noted in obstetric fistula patients than among the controls. This observation is similar to the findings in

Ethiopia, Niger republic, and Zambia findings (Holme et al., 2007; Nafiou et al., 2007; Tsui, Creanga, & Ahmed, 2007). In some situations, the obstetric fistula patients are abandoned by their family members and ostracized by their communities (Lewis & De Bernis, 2006).

All the women in this study had some knowledge on contraceptives. Some had used the modern contraception methods while others had used traditional methods. The use of modern contraception is unique among medical interventions in terms of its potential benefits in reducing poverty, and maternal and child mortality and morbidity. However, in many poor countries, especially in sub-Saharan Africa, high fertility and high unmet need for family planning exist and the populations are projected to double in the next few decades (Cleland et al., 2006).

The 2008 Nigerian demographic and health survey revealed that northern Nigeria had the highest fertility rate and low utilisation of modern contraceptives. The national average fertility rate in Nigeria is currently at 5.7 children per women but in the Northern zone, it is 7.3 children per women (Nigerian Health Demographic Survey & (NHDS), 2003). In general, the contraceptive prevalence rate in southern Nigeria was reported as 27 % while in the northern part it is seven percent. Teenage pregnancy accounts for 8% in the south-east and it is 45 % in the northern part. The use of modern contraceptives among married women in the southern zone was reported as 21% in contrast to three percent (3%) in the north-western zone (Bankole et al., 2008).

But interestingly participants in this study expressed willingness to use modern contraception which may help them as a means to delay pregnancy till they attain maturity, or completely healed for those with fistula defect. Promotion of the use of modern contraception in countries with high birth rates has the potential to reduce poverty and hunger and avert 32% of all maternal deaths and nearly 10% of childhood deaths (Cleland et al., 2006). It will also influence substantially to improve women's esteem, and achievement of individual aspiration.

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