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Detection of Intrauterine Lesions by Hysteroscopy among Women with Fertility Challenges in an *In-Vitro* Fertilization Center in Lagos, Nigeria

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Abstract

Background: Hysteroscopy is an essential tool of choice to make intrauterine abnormalities (IUA) visible and to allow for appropriate and adequate corrections. IUA are considered to be detrimental to the chances of conception after *in-vitro* fertilization.

Objective: To determine the frequency and pattern of IUA identified at hysteroscopy among infertile women (IW) attending Nordica Fertility Centre (NFC) in Lagos, Nigeria.

Methods: This is a retrospective study of 1115 consecutive IW that underwent diagnostic or therapeutic hysteroscopy at the endoscopy arm of NFC between June 2005 and November 2014. Age (years) was categorized into <30, 30-34, 35-39, 40-44, 45-49 and ≥50 and Body Mass Index (BMI kg/m^2) into underweight (<18.5), normal (18.5-24.9), overweight (25.0-29.9), obese (≥30.0). Analysis was done using STATA 13 and the level of significance was set at P<0.05.

Results: The means (± SD) of age (years), BMI (Kg/m^2) and duration of infertility were 39.0 (6.1), 27.7 (4.8) and 7.5 (5.5) respectively. Three hundred and nineteen (28.6%) and seven hundred and ninety-five (71.4%) presented with primary and secondary infertility respectively. In all, 681 (61.1%) IW had abnormal hysteroscopic findings consisting of intra-uterine adhesion [IUA] (338, 30.3%), sub-mucous fibroid (173,15.5%), endometrial polyps (146,13.1%), endocervical adhesions (36,3.2%), intra-uterine septum (26,2.3%), endocervical polyps (14,1.3%) and endometritis (2, 0.2%). The prevalence of sub-mucous fibroid (84, 48.6%) and IUA (168,49.7%) were higher among overweight IW

Conclusion: Our data are an additional argument to propose prior intra-uterine evaluation by hysteroscopy before *In-vitro* fertilization. Our study therefore recommends routine hysteroscopy prior to *in-vitro* fertilization process.

Keywords: Hysteroscopy, Infertility, Intra-uterine adhesions, Fibroids, Nigeria

Abbreviations: AUB: Abnormal uterine bleeding, BMI: Body Mass Index, CS: Caesarian section, D&C: Dilatation and curettage, WCBA: Women in child-bearing age, SSA: Sub-Saharan Africa, HSG: Hysterosalpingogram, IUA: Intra-uterine adhesions, NFC: Nordica Fertility Center, IVF: *In-vitro* fertilization, WHO: World health Organization

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Introduction

Among most women in child-bearing age (WCBA) in sub-Saharan Africa (SSA), having a child is often described as "fruit of marriage." However, it is not in all cases that a woman in child-bearing age is able to conceive and bring that conception to full term for

many reasons among which is uterine pathology. The uterus is a central organ in the female reproductive system, supported in its functions by the adnexae as well as the endocrine system which produces some hormones. Infertility is a common presentation in day-to-day practice of obstetrics and gynecology. Congenital or acquired uterine abnormalities are often implicated as some of the causes of infertility. Sahu [1] suggested that infertility related to uterine cavity abnormalities is estimated to be the causal factor in as many as 10% to 15% of couples seeking treatment. Furthermore, studies have reported abnormal uterine findings in 34% to 62% of infertile women [2]. Race has not been shown to conclusively affect presence of intrauterine anomalies described in this study.

Conventionally, the cavity of the uterus is assessed using the hystero-salpingogram (HSG) technique. In most cases, simple and straightforward investigations for female infertility would consist of assessment of cervical, uterine, tubal and ovulatory factors. Recently however, the technique of hysteroscopy is being increasingly employed for uninterrupted and straightforward visualization of uterine cavity. This procedure is considered superior to HSG by many workers [3]. Thus, with the introduction of hysteroscopy in gynecologic practice, there has been a revolution in the entire management of intrauterine disease. New methodological and technological developments in the field of diagnostic and operative hysteroscopy have provided a much more efficient, cost effective, time-saving, safe and useful approach to female infertility [4]. In his review work, Caeneiro [4] contends that the most common indication for hysteroscopy is abnormal uterine bleeding (AUB). However, Hamou [5] and Bakour [6] are of the opinion that hysteroscopy, as a procedure, could also be used in cases of infertility and Müllerian anomalies. In recent times, hysteroscopy has become the gold standard for evaluating the uterine cavity for abnormalities [6-8], and due to improved endoscopic developments, can be performed reliably and safely as an office procedure [9]. Intrauterine lesions often obstruct and/or compromise spontaneous fertility as well as decrease pregnancy rates in assisted reproduction [7,8]. Bosteels [7] are of the opinion that there are increased pregnancy rates after the hysteroscopic removal of endometrial polyps, submucous fibroids, uterine septum, or intrauterine adhesions, which can be found in 10% to 15% of women seeking treatment for subfertility. More than two decades ago, the World Health Organization (WHO) recommended hystero-salpingography (HSG) alone for management of infertile women, the reason being that HSG provided information on tubal patency or blockage. At that time, office hysteroscopy was only recommended by the WHO when clinical or complementary exams (ultrasound, HSG) suggest intrauterine abnormality [10] or after *in vitro* fertilization (IVF) failure [11]. Nevertheless, there is a widespread belief by many experts that hysteroscopy is a more precise device because of the high false-positive and false negative rates of abnormalities within the uterus with the use of HSG. Thus, several authorities initiated the use hysteroscopy as a first-line routine exam for infertility patients regardless of guidelines [12]. The advantages of the methodical application of hysteroscopy in the preliminary assessment of infertility is still not explicit enough thus it is recommended that the baseline exploration of the uterine cavity prior to any other procedure to correct infertility should be based on HSG or hystero-sonography [4].

Since abnormal uterine findings are encountered in about 50% of women with reproductive failure [13], evaluation of the uterine cavity has become a very important step in female infertility workup. There is a big lacuna on information concerning hysteroscopy in sub-Saharan Africa thus a scarcity of data. Therefore, this retrospective study aims to describe hysteroscopy findings in a population of 1115 consecutive infertile patients who attended Nordica Fertility Center in Lagos, Nigeria with the objective of documenting incidence of abnormal hysteroscopic findings according to age, body mass index and type of infertility.

Materials and Methods

This retrospective study was conducted at the endoscopy arm of Nordica Fertility Centre (NFC), Lagos, Nigeria, a private health facility specifically attending to male and female infertility and *in-vitro* fertilization (IVF).

This fertility center is currently located at Ikoyi within Eti-Osa Local Government Area in the southern part of the metropolitan with a population of about 4 million. The location of the facility is supplied with modern houses, well-tarred roads, electricity and excellent sewage disposal. Most patients patronizing the fertility center were from within the city but few were referred from elsewhere. Data was extracted from the medical records of all women in child-bearing age group who presented with either primary or secondary infertility between June 2005 and November 2014.

A one-day training was given to three data recording officers specifically for the purpose of retrieving data from medical records of the study patients, coding the data, entering the data into a laptop and cleaning the data. They were assisted and supervised by a seasoned obstetrician/gynecologist in the team (OB). The study was approved by the local Ethics Committee.

All patients who satisfied the following inclusion criteria were sent for either diagnostic or therapeutic hysteroscopy: (i) Women with previous uterine surgeries (myomectomy, caesarean section, metroplasty); (ii) Previous history of recurrent failed IVF treatment in the form of three or more cycles; (iii) After one or two attempt of IVF treatment at the infertility center; (iv) Poor/non-distension of the endometrium at sonohysterogram; (v) Abnormal findings at Hysterosalpingogram (HSG) done within the previous one year; (vi) History of recurrent miscarriages before presentation; (vii) Older infertile women above 45years. Exclusion criteria were: (i) history of pelvic inflammatory disease; (ii) pelvic cancer and (iii) couples whose problem were mainly due to male factor infertility. Hysteroscopy was performed to evaluate and treat the presence of intrauterine abnormalities. A detailed explanation of the procedure was given by the operating surgeon, and all women signed an informed consent before undergoing the procedure. The informed consent form also related to data being used for training and research purposes. Stage-by-stage findings at hysteroscopy were recorded by hand on the case note of each patient.

One thousand one hundred and fifteen (1115) consecutive

infertile women met the inclusion criteria and all hysteroscopy procedures were performed under short general anesthesia using a rigid 20-degree 5-mm hysteroscope with an operative channel for the use of grasping forceps, scissors, or bipolar electrode. Instruments were placed through the operative channel when needed for treatment of pathology after the diagnostic portion had been completed. Distention of the uterine cavity was accomplished with normal saline solution. The procedure was considered complete only when the entire uterine cavity and both tubal ostia were visualized or considered a failed hysteroscopy when access into the uterine cavity was not possible. During this procedure, the endocervical canal was carefully evaluated for any pathology. At the end of the hysteroscopy, under direct vision, an endometrial biopsy sample was obtained and sent for histologic examination when indicated.

Statistical Analysis

Age (years) was categorized into <30, 30-34, 35-39, 40-44, 45-49 and ≥ 50 and Body Mass Index (BMI kg/m^2) into underweight (< 18.5), normal (18.5-24.9), overweight (25.0-29.9), obese (≥ 30.0). Analysis was done using STATA 13 and the level of significance was set at P<0.05. Descriptive statistics were presented as numbers and percentages for qualitative data, mean and standard deviations for quantitative data.

Result

All the patients eligible for hysteroscopy were in the child-bearing age group. **Table 1** illustrates the means of age in years (38.0 ± 6.5; range 24-55), body mass index (27.9 ± 4.9; range 17.3-49.3) and duration of sub-fertility (7.0 ± 5.6; range 0.3-25.0) of the patients. As shown in **Table 2,** majority (28.0%) of the patients were aged 35-39 years. Only 4.8% (53/1115) and 5.4% (60/1115) were aged ≥50 years and <30 years respectively. The table also shows that majority (488; 43.8%) of the patients were overweight with a BMI of 25-29.9 while only 1% (11/1115) were underweight. However, a total of 318 (28.5%) of the infertile patients were obese (BMI ≥30). In all, 320 (28.7%) of the patients were diagnosed with primary infertility and 795 (71.3%) with secondary infertility. **Figure 1** illustrates that duration of sub-fertility peaks at 1-3 years and tapers down thereafter. Hysteroscopy revealed normal findings in 434 (38.9%) and abnormal findings in 681 (61.1%) of the infertile women. Majority of infertile women with normal findings at hysteroscopy were aged 30-34 years (115, 25.5%), overweight (175, 40.3%) or with secondary infertility (292, 67.3%). Abnormal findings at hysteroscopy were more prevalent in the age-group 35-39 years (204, 29.9%) and least among those aged less than 30 years (26,3.8%); among infertile women who were overweight (313,46.0%), and among those who presented with secondary infertility (503,73.9%).

Table 3 presents the different categories of abnormal findings at hysteroscopy among the study women. These categories were differentiated according to the anatomical structure of the entire uterus relative to age group. Endocervical polyps were commoner (4,28.6%) among infertile women 30-34 and 35-39 years old respectively whereas endocervical adhesions were seen more (12,3.3%) among older infertile women 40-44 years old.

In the uterine cavity, endometrial polyp (49,33.6%), submucosa leiomyoma (54,31.2%) and intrauterine septum (9,34.6%) were common findings among infertile women aged 35-39 years old while intrauterine adhesions (119,35.2%) among those aged 40-44 years.

Examined individually, right ostium was obliterated in 47 (37.6%), right ostium in 41 (30.6%) and both ostia in 35 (38.5%) of the infertile women all aged 40-44 years.

Table 1 Mean, Standard Deviation and range of Demographic variables.

Variable	Mean (± SD)	Minimum value	Maximum value
Age (yrs.)	38.0 (6.5)	24.0	55.0
BMI (Kg/m²)	27.9 (4.9)	17.3	49.3
Duration of subfertility (yrs.)	7.0 (5.6)	0.3	25.0

Table 2 Outcomes of hysteroscopy among 1115 consecutive infertile women relative to age, body mass index (BMI) and type of infertility.

Variable	Item	Findings on Hysteroscopy						χ^2	P-value	Odds Ratio	95% Confidence Interval
		Normal		Abnormal		Total					
		Freq.	%	Freq.	%	Freq.	%				
Age (years)	**<30**	34	7.8	26	3.8	60	5.4	8.4	0.003	0.5	0.3, 0.8
	30-34	115	25.5	109	16	224	20.1	18.2	0.00002	0.5	0.4, 0.7
	35-39	108	24.9	204	29.9	312	28	3.4	0.07	1.3	1.0, 1.7
	40-44	107	24.7	202	29.7	309	27.7	3.3	0.07	1.3	1.0, 1.7
	45-49	51	11.8	106	15.6	157	14.1	3.2	0.07	1.4	1.0, 2.0
	≥50	19	4.4	34	5	53	4.8	0.2	0.6	1.1	0.6, 2.0
BMI (Kg/m²)	**<18.5**	2	0.5	9	1.3	11	1	1.2	0.3	2.9	0.6, 13.5
	18.5-24.9	132	30.4	166	24.4	298	26.7	4.9	0.03	0.7	0.6, 1.0
	25-29.9	175	40.3	313	46	488	43.8	3.4	0.06	1.3	1.0, 1.6
	≥30	125	28.8	193	28.3	318	28.5	0.03	0.87	1	0.7, 1.3
Type of infertility	**Primary**	142	32.7	178	26.1	320	28.7	5.6	0.02	1.4	1.1, 1.8
	Secondary	292	67.3	503	73.9	795	71.3				
Total		434	38.9	681	61.1	1115	100				

Table 4 depicts the classification of the abnormal findings at hysteroscopy according to the BMI of the infertile women. Endocervical adhesions (17, 47.2%), cervical stenosis (23, 45.1%), endometrial polyps (51, 34.9%), submucosa leiomyoma (84,48.6%), intrauterine adhesions (168,49.7%) and intrauterine septum (14, 53.8%) were all most prevalent among infertile women who were overweight (BMI 25.0-29.9). In addition, obliteration of either ostia (60, 48.0%; 66, 49.3%) or both ostia (44, 48.3%) occurred mostly in overweight infertile women.

Endometritis, though in low frequency occurred exclusively among women with secondary infertility while intrauterine septum was observed only in 3.8% of women who presented with primary infertility (Data not shown). There was a statistically significant difference (χ^2=18.0, p=0.00, OR=2.17, CI=1.52, 3.11) among those who presented with endometrial polyps relative to whether their infertility was primary (43.8%) or secondary (56.2%). Based on this, women with primary infertility were more than twice likely to develop endometrial polyps compared with women with secondary infertility. Contrary to this, there was no such statistically significant difference (χ^2=2.33, p=0.13, OR=1.3, CI=0.93. 1.85) among women with primary infertility (33.5%) and secondary infertility (66.5%) who presented with submucosa leiomyoma at hysteroscopy.

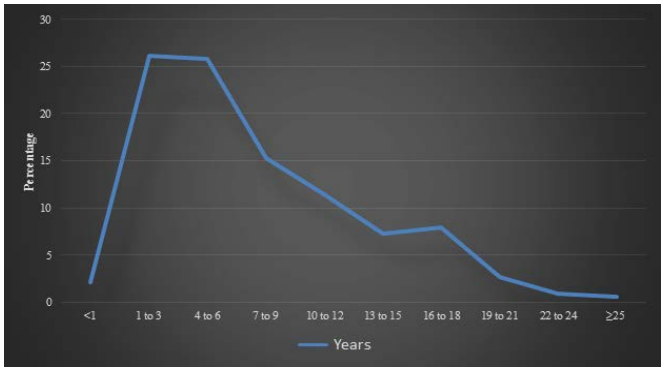

Figure 1 Duration of sub-fertility among 1115 infertile female patients.

Overall, majority (158, 14.2%) of IUA was sequel to previous myomectomy **(Table 5).** Other sources of IUA were D&C (118, 10.6%) and Caesarian section (CS) (31, 2.8%). D&C was a prominent predisposing factor to IUA among younger infertile women aged <30 (6, 5.1%) and those age 30-34 (23, 19.5%) while myomectomy was a major contributing factor in older women aged 35-39 years (48,30.4%) and caesarian section in infertile women aged 40-44 (11, 35.5%), 45-49 (8, 25.8%) and ≥50 (1, 32.0%). Furthermore, D&C was the main factor contributing to IUA more among overweight infertile women (59, 50.0%) and those with secondary infertility (102, 86.4%) while CS was the main factor among obese women (12, 38.7%).

All the abnormalities detected at hysteroscopy were managed either in the same or subsequent operating settings.

Figure 2 shows that percent distribution of abnormal findings at hysteroscopy among women who presented with secondary infertility surpass those who presented with primary infertility.

Table 3 Category of abnormal findings on examination by hysteroscopy among 1115 consecutive infertile women relative to age.

Pathology	Item	n	Age group (years)						χ^2	P-value
			>30	30-34	35-39	40-44	45-49	≥50		
			Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)		
Of the Cervix	*Endocervical polyps*	14	0 (0.0)	4 (28.6)	4 (28.6)	3 (21.4)	2 (14.3)	1 (7.1)	1.7	0.89
	Endocervical adhesions	36	2 (5.6)	9 (25.0)	8 (22.2)	12 (33.3)	5 (13.9)	0 (0.0)	3.1	0.69
Of the Canal	*Stenosis*	51	4 (7.8)	8 (15.7)	13 (25.5)	14 (27.5)	10 (19.6)	2 (3.9)	2.5	0.78
Of the Uterine cavity	*Endometrial Polyps*	146	9 (6.2)	34 (23.3)	49 (33.6)	34 (23.3)	17 (11.6)	3 (2.1)	7.4	0.19
	Submucous Leiomyoma	173	6 (3.5)	23 (13.3)	54 (31.2)	50 (28.9)	32 (18.5)	8 (4.6)	9.8	0.08
	Endometritis	2	0 (0.0)	1 (50.0)	0 (0.0)	1 (50.0)	0 (0.0)	0 (0.0)	2.3	0.81
	Intrauterine Adhesions	338	12 (3.6)	37 (10.9)	89 (26.3)	119 (35.2)	58 (17.2)	23 (6.8)	41.1	0
	Intrauterine Septum	26	2 (7.7)	2 (7.7)	9 (34.6)	8 (30.8)	4 (15.4)	1 (3.8)	2.9	0.72
Of the Ostium	*Right ostium obliterated*	125	2 (1.6)	22 (17.6)	27 (21.6)	47 (37.6)	19 (15.2)	8 (6.4)	12.1	0.03
	Left ostium obliterated	134	3 (2.2)	19 (14.2)	34 (25.4)	41 (30.6)	25 (18.7)	12 (9.0)	14.2	0.01
	Both *right and left ostia obliterated*	91	1 (1.1)	13 (14.3)	20 (22.0)	35 (38.5)	16 (17.6)	6 (6.6)	-	-
	χ^2		8.8	80.5	121.5	180.4	75.3	14.7	-	-
	P-value		0.003	0	0	0	0	0	-	-

Discussion

Infertility examination requires evaluation of the gross morphology including contour of the uterine cavity [14]. Interference with normal physiological functions of the uterus may originate from congenital uterine malformation or as acquired lesions. Such acquired lesions include but are not limited to uterine fibroids, endometrial polyps, and intrauterine adhesions, acting singly or in synergy to cause infertility by obstructing appropriate and accurate embryo implantation and growth [15] thus delaying natural conception.

The key findings of this study are first, the mean 72.3% of the infertile women in the study were overweight and obese. In many ways, women's health are often compromised by obesity and overweight, leading to increased relative risk of diabetes and coronary artery diseases, low back pain and knee osteoarthritis [16]. Obesity disturbs fecundity throughout a woman's life. Kulie

Table 4 Classification of abnormal findings on examination by hysteroscopy among 1115 consecutive infertile women relative to body mass index (BMI).

Pathology	*Item*		Body Mass Index (Kg/m²)					
			Underweight	Normal	Overweight	Obese	χ^2	P-value
		n	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)		
Of the Cervix	*Endocervical polyps*	14	0 (0.0)	7 (50.0)	3 (21.4)	4 (28.6)	4.6	0.2
	Endocervical adhesions	36	0 (0.0)	8 (22.2)	17 (47.2)	11 (30.6)	0.81	0.85
Of the Canal	*Stenosis*	51	1 (2.0)	13 (25.5)	23 (45.1)	14 (27.4)	0.59	0.9
Of the Uterine cavity	*Endometrial polyps*	146	1 (0.7)	44 (30.1)	51 (34.9)	50 (34.2)	5.8	0.12
	Submucous	173	3 (1.7)	48 (27.7)	84 (48.6)	38 (22.0)	5.4	0.14
	Leiomyoma							
	Endometritis	2	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	1	0.8
	Intrauterine adhesions	338	5 (1.5)	66 (19.5)	168 (49.7)	99 (29.3)	14.6	0.002
	Intrauterine septum	26	0 (0.0)	5 (19.2)	14 (53.8)	7 (26.9)	1.5	0.69
Of the Ostium	*Right ostium obliterated*	125	0 (0.0)	26 (20.8)	60 (48.0)	39 (31.2)	4.2	0.24
	Left ostium obliterated	134	0 (0.0)	27 (20.1)	66 (49.3)	41 (30.6)	5.2	0.153
	Right and left	91	0 (0.0)	14 (15.4)	44 (48.3)	33 (36.3)	-	-
	-Not seen							
	χ^2	-	-	69.3	209.2	203.6	-	-
	P-value	-	-	0	0	0	-	-

Table 5 Frequency distribution of observed predisposing factors to intrauterine adhesions (IUA) among 1115 infertile women by age (in years), BMI (Kg/m²) and type of infertility.

		Observed predisposing factors to IUA						
		None	Metroplasty	Myomectomy	Dilatation and curettage	Caesarian Section	Tuberculous endometritis	Polypectomy at hysteroscopy
	n	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
Age (yrs)								
<30	60	53 (6.6)	0 (0.0)	1 (0.6)	6 (5.1)	0 (0.0)	0 (0.0)	0 (0.0)
30-34	224	185 (23.0)	0 (0.0)	10 (6.3)	23 (19.5)	4 (12.9)	1 (100.0)	1 (100.0)
35-39	312	225 (28.0)	0 (0.0)	48 (30.4)	32 (27.1)	7 (22.6)	0 (0.0)	0 (0.0)
40-44	309	207 (25.7)	2 (100.0)	54 (34.2)	35 (29.7)	11 (35.5)	0 (0.0)	0 (0.0)
45-49	157	103 (12.8)	0 (0.0)	30 (19.0)	16 (13.6)	8 (25.8)	0 (0.0)	0 (0.0)
≥50	53	31 (3.9)	0 (0.0)	15 (9.5)	6 (5.1)	1 (32.0)	0 (0.0)	0 (0.0)
Total	1115	804 (72.1)	2 (0.2)	158 (14.2)	118 (10.6)	31 (2.8)	1 (0.09)	1 (0.09)
BMI								
<18.5	11	6 (0.7)	0 (0.0)	3 (1.9)	2 (1.7)	0 (0.0)	0 (0.0)	0 (0.0)
18.5-24.9	298	245 (30.5)	1 (50.0)	31 (19.6)	15 (12.7)	6 (19.4)	0 (0.0)	0 (0.0)
25.0-29.9	488	329 (40.9)	1 (50.0)	84 (53.2)	59 (50.0)	13 (41.9)	1 (100.0)	1 (100.0)
≥30.0	318	224 (27.9)	0 (0.0)	40 (25.3)	42 (35.6)	12 (38.7)	0 (0.0)	0 (0.0)
Total	1115	804 (72.1)	2 (0.2)	158 (14.2)	118 (10.6)	31 (2.8)	1 (0.09)	1 (0.09)
Type of infertility								
Primary	320	262 (32.6)	1 (50.0)	37 (23.4)	16 (13.6)	2 (6.5)	1 (100.0)	1 (100.0)
Secondary	795	542 (67.4)	1 (50.0)	121 (76.6)	102 (86.4)	29 (93.5)	0 (0.0)	0 (0.0)
Total	1115	804 (72.1)	2 (0.2)	158 (14.2)	118 (10.6)	31 (2.8)	1 (0.09)	1 (0.009)

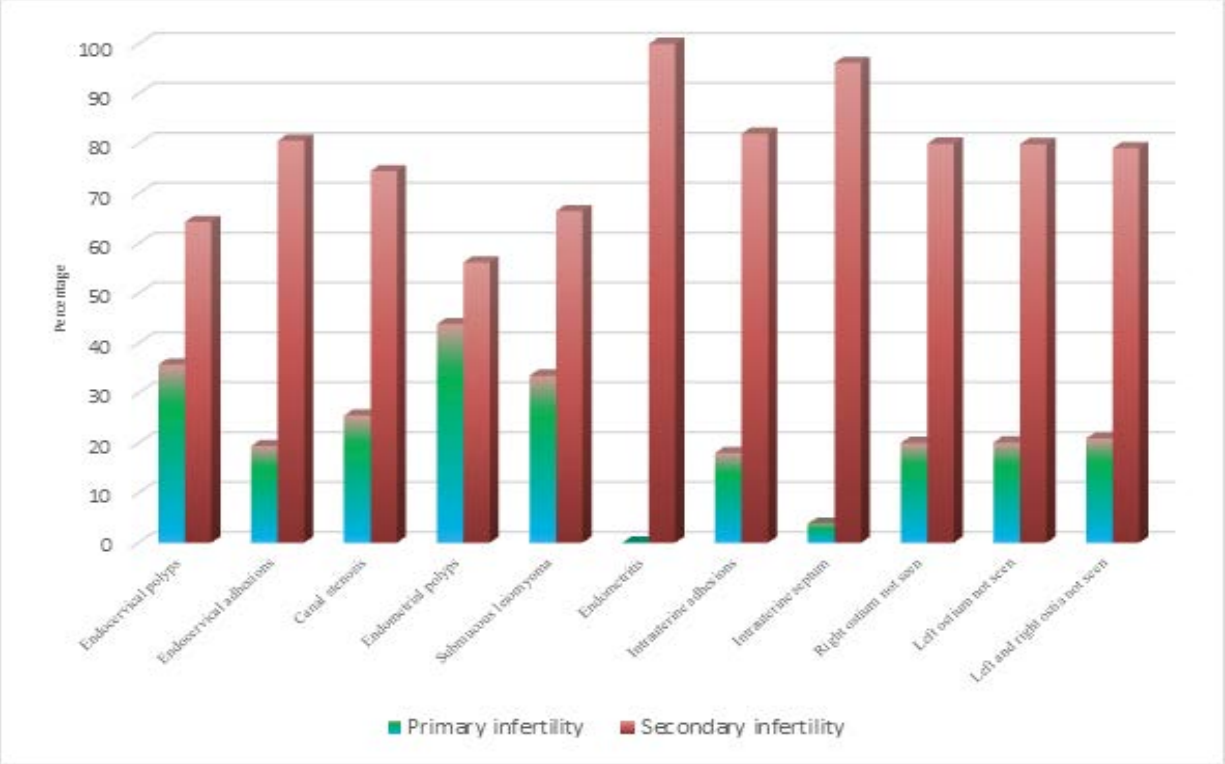

Figure 2 Percent distribution of abnormal hysteroscopic findings among 1115 consecutive infertile women relative to type of infertility.

[16] emphasize that the impact of obesity and Polycystic Ovary Syndrome (PCOS) on reproductive function can be attributed to multiple endocrine mechanisms [16] and that abnormal obesity is linked with an elevated circulating insulin levels resulting in increased functional androgen levels (caused by suppression of sex-hormones-binding globulin synthesis and increased ovarian androgen production). Furthermore, the authors stressed aromatization in peripheral adipose tissue as the cause of protracted elevation of circulating estrogen and that anovulatory cycles and subfertility are partial clinical manifestation of the resulting hyper-androgenism and menstrual cycle abnormalities. In addition, Shah [17], contends that leptin inhibits ovarian follicular development and steroidogenesis and thus may contribute to reproduction difficulties in obese women [17].

The secondly key finding in this study is the high prevalence (61.1%) of unsuspected intrauterine abnormalities (IUA) discovered during hysteroscopy evaluation of women who presented with history of infertility. Various authors have recorded the prevalence of unsuspected intrauterine abnormalities to be between 20-45% [18-23]. The 61% prevalence of IUA presented in our study is higher than the31% to 57% reported by others [15,24,25]. Unlike other study [1], a significant difference (χ^2=5.6; P=0.02; OR=1.4, CI=1.1, 1.8) was found in the rate of uterine pathology when women with primary infertility (26.1%) were compared with those with secondary infertility (73.9%).

The chances of finding an unsuspected uterine pathology seemed to increase with the woman's age. Few studies in African setting have documented the effect of female age on the presence or absence of intrauterine pathology. It is likely that our study is the first to report on this relationship. In addition, data from our study shows that uterine pathologies occurred in low frequencies when the woman's age is <30 years (endocervical polyps=0%; endocervical adhesions=5.6%; intrauterine adhesions-3.6%) but the pathologies increased gradually as age increased till 40-44 years when these pathologies gradually declined. This is similar to the report of Dicker [26-28] that higher rates of abnormal findings such as submucous myomas, endometrial hyperplasia, and polyps are more prevalent among older women above the age of 40 years old. Koska [12] also reported high rates of abnormal findings as ranging from 30% at 30 years of age to 60% though abnormal uterine findings in our study did not approach this 60% after 42 years.

The overall prevalence of endometrial polyps in our study was 13.1%, occurring mostly among the age group 35-39 years (33.6%). Dreisler [28] reported a lower overall incidence of 7.8% among the Danes and a lower prevalence of 0.9% among infertile women aged <30 compared to the 6.2% found in our study. Endometrial polyps grow from the inner lining of the uterus (the endometrium). As shown in our study, the incidence increases with age, but peaked earlier than the traditionally period between 40 and 50 years, before gradually declining after menopause.

Another interesting finding in the current study is the overall high incidence of intrauterine adhesion (30.3%) especially among infertile women aged 40-44 years (35.2%), among overweight (49.7%) and among those that presented with secondary infertility (82.0%). The 30.3% incidence reported in our study is

lower than the 37.5% reported by Taskin [29] after monopolar resection of a single fibroid and in the 45% after resection of multiple fibroids. The anatomical structure of the endometrium shows two layers - the functional intra-cavity layer that is lost with the each menstruation and the underlying basal layer which is required for regenerating the functional layer. Any type of injury or abuse to the basal layer can lead to the development of intrauterine scars resulting in adhesions, which can obliterate the cavity to varying degrees [30]. An idiosyncrasy of intrauterine trauma is that adhesions frequently occur concurrently on apposing surfaces, due to the limited spatial capacity of the cavity [30]. This is reasonably obvious in case of blind techniques, such as a dilatation and curettage reported as a prevalence of 10.6% (118/1115) in this report. The association between trauma, synechiae, and specific symptoms is what had already been identified by Joseph Asherman in the first half of last century (amenorrhoea traumatica) [31]. Gynecology synechae have a specific significance because of the potential impact this condition has on reproductive function. Thus, according to Yang performing a second-look or control hysteroscopy as a follow-up of the primary surgery, especially in high risk cases, seems to be a feasible and effective way to diagnose and treat synechiae, often at their early, fibrinous stage [32]. The most common predisposing factor to intrauterine adhesions in the current study was myomectomy (14.2%) which was performed most frequently on infertile women 40-44 years of age.

Another interesting finding is that submucous leiomyoma was detected in 15.5% (173/1115) of infertile women, especially among those aged 35-39 years of age, a younger age group than that described by other authors in Nigeria [33] but a similar age group described in a Hungarian study [34]. The connection between infertility and uterine fibroids is still vague. However, it is well known that the incidence of uterine fibroids increases widely with age [35]. Uterine leiomyoma may be associated with miscarriage or preterm delivery, especially the submucous variety which could either interfere with implantation or compete with the fetus for space [36].

There is need for a randomized case–control study to determine optimum management for uterine abnormalities especially leiomyoma, synechae and polyps in women aged 40 years and above in our environment and the dose–effect relationship of myomectomy for large uterine fibroids and infertility. There is also need for study to reduce the incidence of uterine abnormalities.

In conclusion, data from our study has shown that the incidence of uterine pathologies (congenital and acquired) in women with primary or secondary infertility is relatively high at 61%, thus, justifying, in our opinion, the use of diagnostic hysteroscopy as part of first-line routine investigation of infertile women regardless of age. We have also shown that high body mass index is a risk factor for the development of abnormal uterine findings. Myomectomy and dilatation and curettage are procedural risk factors leading to intrauterine pathologies such as synechae. More randomized controlled studies with adequate controls are needed not only to substantiate the effectiveness of the hysteroscopic removal of suspected endometrial polyps, submucous fibroids, uterine septum, or intrauterine adhesions in women with unexplained subfertility or prior to assisted reproductive technology but also for the determination of optimum management of these uterine abnormalities.

Study Limitations and Strength

Limitations to this study include the lack of a control group. However, we were unable to find and follow up cases of hysterectomy for uterine pathologies, such as leiomyoma of similar morphology with which to compare the results. Another limitation of this study is that the follow-up period of the patients was not uniform and the patients who had complete resolution of symptoms were more likely to default early, thereby skewing the number of patients with recurrence of preoperative symptoms. The strength of the study lies mainly in the large sample size.

Conflict of Interest

The author declares that there is no conflict of interests regarding the publication of this paper.

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