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Pattern of Congenital Uterine Anomalies among Infertile Women With and Without Recurrent Miscarriages, in Southwest Nigeria

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Abstract

Study: To determine the prevalence and pattern of congenital uterine anomalies (CUA) detected at hysteroscopy among infertile women (IW) in Southwest Nigeria.

Design: Clinical retrospective cohort study

Setting: Nordica Fertility Center, a private establishment in, Lagos, Nigeria.

Patients: One thousand one hundred and eighteen consecutive infertile women.

Intervention: Hysteroscopy

Main outcome measure(s): Congenital uterine anomalies, type of anomalies, miscarriages

Results: Of the 1118 IW examined, 26 (2.3%) had CUA, majority of which were sub-septate uterus (19/26; 73.1%); others were bicornuate (3, 11.5%), arcuate (2, 7.7%), unicornuate (1, 3.8%) and intracervical septum (1, 3.8%).The means (± SD) of age (years), BMI (Kg/m^2) and duration of subfertility (years)among IW with CUA were 38.7 (6.6), 27.4 (5.9) and 7.5 (6.9) respectively. CUA was more prevalent among IW in the age group of 35-39 years (9/26; 34.6%), in overweight (15/26, 57.7%). 24 (92.3%) had secondary infertility and 9 (34.6%) gave a history of spontaneous miscarriage. The mean uterine cavity depth of IW with CUA (7.81 ± 1.01; 95% CI= 7.4, 8.2) was significantly smaller (t= -2.26, df=27.7, P-value=0.015) than that of IW without CUA (8.27 ± 1.50; 95% CI= 8.2, 8.4). Among IW with CUA, 1 (3.8%) had obliterated right ostium while 2 (7.7%) had obliterated left ostium.

Conclusion: The 2.3% CUA prevalence among IW was comparable to other studies. Sub-septate uterus was the most frequent CUA. Majority of the IW with CUA had secondary infertility and significantly smaller uterine cavity depth.

Recommendation: Our study suggested that not combining laparoscopy with hysteroscopy is a relatively minor hindrance in diagnosis.

Keywords: Congenital uterine anomaly, Infertility, Miscarriages, Southwest Nigeria

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Introduction

During embryogenesis, between the 8th and 16th week of fetal life, the paired paramesonephric ducts or Müllerian ducts, primal equivalent of the female genitalia, segregate to form the uterine adnexae such as the fallopian tubes, corpus uterus, the cervix and the superior aspect of the vagina [1]. According to Letterie [2] and Braun [3], this process is distinguished by three stages: (i) Organogenesis: the development of both Müllerian ducts. (ii) Fusion: the lower Müllerian ducts fuse to form the upper vagina, cervix and uterus; this is termed lateral fusion. The upper cranial part of the Müllerian ducts will remain unfused and form the Fallopian tubes. (iii) Septal absorption: after the lower Müllerian ducts fuse, a central septum is left which starts to resorb at about 9 weeks eventually leaving a single uterine cavity and cervix. Abnormal fusion of the para-mesonephric

ducts (Müllerian ducts) during embryonic life results in a variety of congenital uterine malformations, such as uterus didelphys, uterus bicornisbicollis, uterus bicornisunicollis, uterus subseptae, uterus arcuatus and uterus unicornis [4]. CUA might be difficult to diagnose and correct during the development of the uterus or in early life because the anomaly may not become obvious till the female enters her child-bearing age. Older literatures [5-8] clearly implicated CUA as a risk factor in recurrent miscarriages (RM). While some studies demonstrated an association between major CUA and poor reproductive outcome [6], others maintained that the role of these anomalies, and particularly that of the septate uterus, remains unclear in women presenting with infertility [9,10]. It is therefore imperative to attempt providing accurate evaluation of the prevalence of these anomalies in the RM and infertile populations as much as possible. This would likely make any association between CUA and RM to be clearly visible. Previous studies have demonstrated the difficulties encountered in determining the exact prevalence of CUA from three perspectives: (i) Different diagnostic procedures used; (ii) Subjectivity of the diagnostic criteria used [7,11] and (iii) Inconsistent interpretation of the classification of CUA [12]. According to Gogineni [4], uterine malformations are known to be associated with spontaneous miscarriages, intrauterine growth restriction, preterm deliveries, preterm pre-labor rupture of membranes, breech presentation and increased rate of caesarean delivery. The rates of spontaneous abortion and premature delivery have been reported to reflect the degree of non-fusion of the horns. Few studies in Africa have investigated and detailed CUA. A study in Ghana [13] reported five cases of congenital developmental anomalies of the uterus in a sample of 245 patients among who were one case of agenesis of the lower third of the vagina and another of Müllerian agenesis with absent vagina (Mayer-Rokitanski-Kuster-Hauser syndrome). Abdullahi and Aliyu [14] detailed a case report of bicornuate uterus mimicking ectopic pregnancy in a 26 year old $G_6P_{5+}0$ (3 alive) in Bauchi, North-east Nigeria and van Wyk [15] gave a similar account of a 30 year old woman who presented with a twin pregnancy in a uterus bicornisunicollis. The current study is unique in the sense that it has a large sample size; it presents pattern of congenital anomalies among infertile women that were seen in a private fertility center in Lagos, Nigeria and it covers an extensive period of time - 2003 to 2014. The main objective of this descriptive study, therefore, was to document the prevalence of congenital anomalies in infertile women in a geographical location in Nigeria. Secondary objectives were to present the pattern of these anomalies and show their association with age, body mass index, type of infertility and other indices.

Materials and Methods

Study design: This descriptive observational study was carried out at the endoscopy arm of Nordica Fertility Centre, Lagos, Nigeria (NFC), a private health facility specifically treating infertility issues through In-vitro fertilization (IVF).

Location of study: The fertility center where this study was carried out is located at Ikoyi within Eti-Osa Local Government Area in the southern part of Lagos metropolis 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 who patronized the fertility center were from within the city but few were referred from elsewhere. Data was extracted from the medical records of all women of child-bearing age group who presented with either primary or secondary infertility and who had hysteroscopy 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.

Inclusion criteria: All infertile women who had hysteroscopy were included in this study. The indications for hysteroscopy were: (i) previous uterine surgeries (myomectomy, caesarean section, metroplasty dilatation and curettage and other relevant surgeries (ii) History suggestive of Asherman's syndrome; (iii) Previous history of recurrent failed IVF treatment in the form of at least two cycles elsewhere (iv) After one failed IVF attempt at Nordica Fertility Center; (v) Abnormal findings at sonohysterogram; (vi) Abnormal findings at Hysterosalpingogram (HSG) done within the previous one year; (vii) History of recurrent miscarriages before presentation; (viii) Older infertile women above 45 years.

Exclusion criteria were: (i) history of acute pelvic inflammatory disease and (ii) pelvic cancer

Uterine size was determined by a combination of bimanual palpation and hysteroscopic assessment. 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. They also agreed for the storage and use of the data from the procedures they were to undergo for the purpose of training younger doctors and for research. Stage-by-stage findings at hysteroscopy were recorded by hand on the case note of each patient.

One thousand one hundred and eighteen (1118) 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 when the entire uterine cavity and both tubal ostia were visualized or an attempt to visualize them was made. The procedure was 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.

Chi-square test and Student's t-test were used to analyze different subgroups. Uni- and multivariate logistic regression were applied in order to identify factors that could predict the presence of unsuspected uterine cavity abnormalities. A P value of less than

0.05 was considered statistically significant. All statistical analyses were performed in Stata 13 (StataCorp, Texas 77845 USA).

Results

From June 2005 until November 2014, a total of 1118 sub-fertile women (SFW) who met the inclusion criteria and underwent hysteroscopy at the endoscopy arm of the Nordica Fertility Center were reviewed. Of these 1118 SFW, only 26 (2.3%) presented with CUA. Apart from this, there was no significant difference in the means of age, body mass index (BMI), duration of subfertility and time trying to conceive (TTC) between the groups with and without diagnosed CUA. There was a significant (χ^2=43.9, P=0.000) proportion of sub-fertile women with CUA (16, 61.5%) in the support service occupational status. Women with secondary infertility (24, 92.3%) were about five times more likely to present with CUA (Fisher's χ^2=4.71; P-value= 0.03; OR=4.93; 95%CI=1.16, 20.98) than those with primary infertility (2, 7.7%) **(Table 1).**

(Table 2) illustrates that of the 26 CUA detected at hysteroscopy, 19 (73.0%) were sub-septate, 3 (11.5%) were bicornuate, 2 (7.7%) were intracervical, 1 (3.9%) was unicornuate and 1 (3.9%) was arcuate, making sub-septate CUA the most prevalent. Sub-septate CUA was also seen more among women aged 35 years and above (14, 73.3%) than among those below 35 years (5, 26.3%) and among overweight sub-fertile women (11, 57.9) than those with normal weight (5, 25.3%) or those who were obese (3, 15.8%). All (100.0%) sub-septate CUA were observed in those with secondary infertility.

As indicated in **(Table 3),** there was a significant evidence of negative association between CUA and type of infertility (Coef. = -0.025, Std Err. = 0.010, t= -2.52, p-values=0.01; 95% CI= -0.45, -0.006) suggesting that type of infertility is a strong predictor of

Table 1 Demographic characteristics of 1118 infertile patients in the study.

		ALL		CUA		No CUA		χ^2	P
		Freq.	%	Freq.	%	Freq.	%		
Total (n)		1118	100.0	26	2.3	1092	97.7	-	-
Variable	Item								
Age (years)	< 30	60	5.4	2	7.7	58	5.3	0.009*	0.93
	30-34	226	20.2	5	19.2	221	20.2	0.015*	0.90
	35-39	312	27.9	9	34.6	303	27.7	0.60	0.44
	40-44	309	27.6	5	19.2	304	27.8	0.94	0.33
	45-49	158	14.1	4	15.4	154	14.1	0.010*	0.92
	≥50	53	4.7	1	3.8	52	4.8	0.075*	0.78
	Mean (± sd)			38.7 (6.6)		39.0 (6.1)		-	0.41
Body Mass Index	< 18.5	11	1.0	0	0.0	11	1.0	0.241*	0.62
	18.5-24.9	299	26.7	7	26.9	292	26.7	0.0004	0.98
	25.0-29.9	490	43.8	15	57.7	475	43.5	2.08	0.15
	≥ 30.0	318	28.5	4	15.4	314	28.8	1.62*	0.20
	Mean (± sd)			27.4 (5.9)		27.7 (4.8)		-	0.40
Occupation	Management	64	5.7	0	0.0	64	5.9	0.71*	0.40
	Professional	457	40.9	7	26.9	450	41.2	2.14	0.14
	Technical/Associate Professional	52	4.7	1	3.8	51	4.7	0.08*	0.78
	Support service	171	15.3	16	61.5	155	14.2	43.9	0.000
	Service/Sales worker	227	20.3	2	7.7	225	20.6	1.88*	0.17
	Farmer/Fishery /Brewer	13	1.2	0	0.0	13	1.2	0.13*	0.71
	Trader	40	3.6	0	0.0	40	3.7	0.21*	0.65
	Plant/Machine operator	3	0.3	0	0.0	3	0.3	2.72*	0.10
	Housewife	37	3.3	0	0.0	37	3.4	0.16*	0.69
	Self-employed	20	1.8	0	0.0	20	1.8	0.003*	0.96
	Unemployed	7	0.6	0	0.0	7	0.6	0.72*	0.40
Time (yrs.) trying to conceive	<5	436	40.0	12	46.1	424	38.8	0.57	0.45
	5-9	338	30.2	7	26.9	331	30.3	0.14	0.71
	10-14	190	17.0	2	7.7	188	17.2	1.03*	0.31
	15-19	111	9.9	4	15.4	107	9.8	0.37*	0.54
	≥ 20	43	3.9	1	3.9	42	3.9	0.27*	0.61
	Mean (± sd)			7.55 (6.90)		7.50 (5.52)		-	0.51
Type of infertility	Primary	320	28.6	2	7.7	318	29.1	4.71*	0.03!
	Secondary	798	71.4	24	92.3	774	70.9		

Table 2 Pattern of congenital uterine anomaly in 26 infertile patients by age (years), BMI (Kg/m2) and type of infertility.

		Sub-septate		Uni-cornuate		Bi-cornuate		Arcuate		Intracervical	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Variable	Item										
Age (yrs.)	<35	5	26.3	1	100.0	1	33.3	0	0.0	0	0.0
	≥35	14	73.7	0	0.0	2	66.7	1	100.0	2	100.0
BMI Kg/m²	18.5-24.9	5	26.3	1	100.0	1	33.3	0	0.0	0	0.0
	25.0-29.9	11	57.9	0	0.0	2	66.7	1	100.0	1	50.0
	≥30.0	3	15.8	0	0.0	0	0.0	0	0.0	1	50.0
Type of infertility	Primary	0	0.0	1	100.0	0	0.0	0	0.0	1	50.0
	Secondary	19	100.0	0	0.0	3	100.0	1	100.0	1	50.0

Table 3 Multivariate regression analysis with presence or absence of congenital uterine anomaly as dependent variable and age group, body mass index and type of subfertility as independent variables.

Congenital uterine anomaly	Coefficient (r)	Std. Err.	t	P>[t]	95% Confidence Interval
Age group	0.003	0.004	0.78	0.44	-0.004, 0.010
BMIKgm²	0.005	0.006	0.79	0.43	-0.007, 0.016
Type of infertility	-0.025	0.01	-2.52	0.01	-0.45, -0.006

Table 4 Comparison of mean uterine cavity depth among infertile women with CUA and those without CUA.

	Observed	Mean uterine depth	Std. Dev.	95% Confidence Interval
CUA	26	7.81	1.01	7.40, 8.22
Without CUA	1092	8.27	1.5	8.18, 8.36
t-test		-2.26		
Satterwaite's degree of freedom		27.7		
P-value		0.02		

CUA. Age group or body mass index were not associated with presence or absence of CUA.

As illustrated in **(Table 4),** the mean uterine cavity depth (cm) of sub-fertile women with CUA (7.81 ± 1.01) was significantly smaller (t= -2.26; df=27.70; p-value=0.02) than that of women without CUA (8.27 ± 1.50).

(Table 5) shows that overall, there was a higher proportion of women (9, 34.6%) with reported miscarriages among sub-fertile women with CUA compared with those without CUA (325, 29.8%), though the difference did not approach any level of significance. Miscarriages were most common among sub-fertile women with sub-septate uterus (7, 77.8%; ratio 2.9:1). The ratio of miscarriages per woman was higher (2.9:1) in sub-fertile women with CUA than in those without CUA (1/8:1). Sub-fertile women with CUA were twice more likely to have 3-4 miscarriages (χ^2=2.78, P-value=0.09, OR=2.08, 95% CI=0.86, 5.04) and were 9 times more likely to have 5-6 miscarriages (χ^2=4.56, P-value=0.03, OR=9.00, CI=1.66, 48.92) than those without CUA.

Miscarriages of 2 or less were commoner among sub-fertile without CUA (263, 80.9%) than among those with CUA (5, 55.6%) **(Figure 1),** though the overall difference was not statistically significant. **(Figure 2)** illustrates that miscarriages occur more among sub-fertile women with sub-septate CUA than among the other forms of CUA. As expected there was no reported case of miscarriage among those with intracervical septum. **(Figure 3)** indicates a low prevalence of obliteration of the left (2,7.7%) more than the right (1,3.8%) ostium among sub-fertile women with CUA. Interestingly, the figure also indicates that obliteration of both ostia was more common among sub-fertile women without CUA.

Discussion

Our study evaluated the pattern and prevalence of CUA among a mostly homogeneous population of infertile women who presented at the Nordica Fertility Center (NFC) in Nigeria. Many authors confirm the difficulty and near impossibility of detecting the prevalence of CUA anomaly in an apparently normal population [17,18] because, unlike other congenital defect such as cleft lip and cleft palate, CUA is unseen and usually undetected at birth. Moreover, these anomalies may not adversely affect or interfere with the normal physiological functions of the female body until she reaches child-bearing age. Even at child-bearing age, it is when she actually gets pregnant or is attempting to get pregnant that any of these anomalies presents itself.

There are certain key findings in our study. Firstly, over the 12-year period of study, the prevalence of CUA among infertile women who consulted NFC was 2.3%. This figure disagrees with the 7-8% reported by Saravelos [16], Lin [19], Chan [20]. Possible reasons why the current study reported low incidence of CUA might be related to the racial distribution of the condition, environmental factor, nutrition and genetics. A 2003 study by Kobayashi and Behringer [21] claimed that the role of genetic factors in the development of CUA was unclear. In contrast, Hammoud [22] provided strong evidence suggesting that familiarity contributes to CUA with first-degree relatives having a 12-fold risk of developing an abnormality [16]. Nonetheless, studies consider

Table 5 Frequency distribution of miscarriages by type of congenital uterine anomaly.

		Miscarriages														
		0		1-2		3-4		5-6		7-8		>8		Total count of miscarriages		Ratio of miscarriage/ woman
CUA Present (n=26)	Type of CUA	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	-
	Sub-septate	12	70.6	3	60.0	2	66.7	2	100.0	0	0.0	0	0.0	20	87.0	2.9:1
	Uni-cornuate	1	5.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0:1
	Bi-cornuate	2	11.7	1	20.0	0	0.0	0	0.0	0	0.0	0	0.0	1	4.3	1:1
	Arcuate	1	5.9	1*	20.0	0	0.0	0	0.0	0	0.0	0	0.0	2	8.7	2:1
	Intra-cervical	1	5.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0:1
	Total	17	65.4	5	15.4	2	11.5	2	7.7	0	0.0	0	0.0	23	100.0	2.6:1
Total count of reported miscarriages		0	0.0	6	26.1	7	30.4	10	43.5	0	0.0	0	0.0	23	100.0	2.6:1
CUA Absent (n=1092)		764	70.0	265	24.3	49	4.5	11	1.0	2	0.2	1	0.1	-	-	-
Total number of reported miscarriages				334		164		58		15		25		596	100.0	1.8:1
χ^2				0.68		2.78		4.56		0.07		0.01		-	-	-
P-value				0.41		0.09		0.03		0.79		0.91		-	-	-
Odds Ratio				0.68		2.08		9.00		0.00		0.00		-	-	-
95% Confidence Interval				0.27, 1.71		0.86, 5.04		1.66, 48.92		undefined		undefined		-	-	-

*One Sub-fertile woman with arcuate CUA reported 2 miscarriages

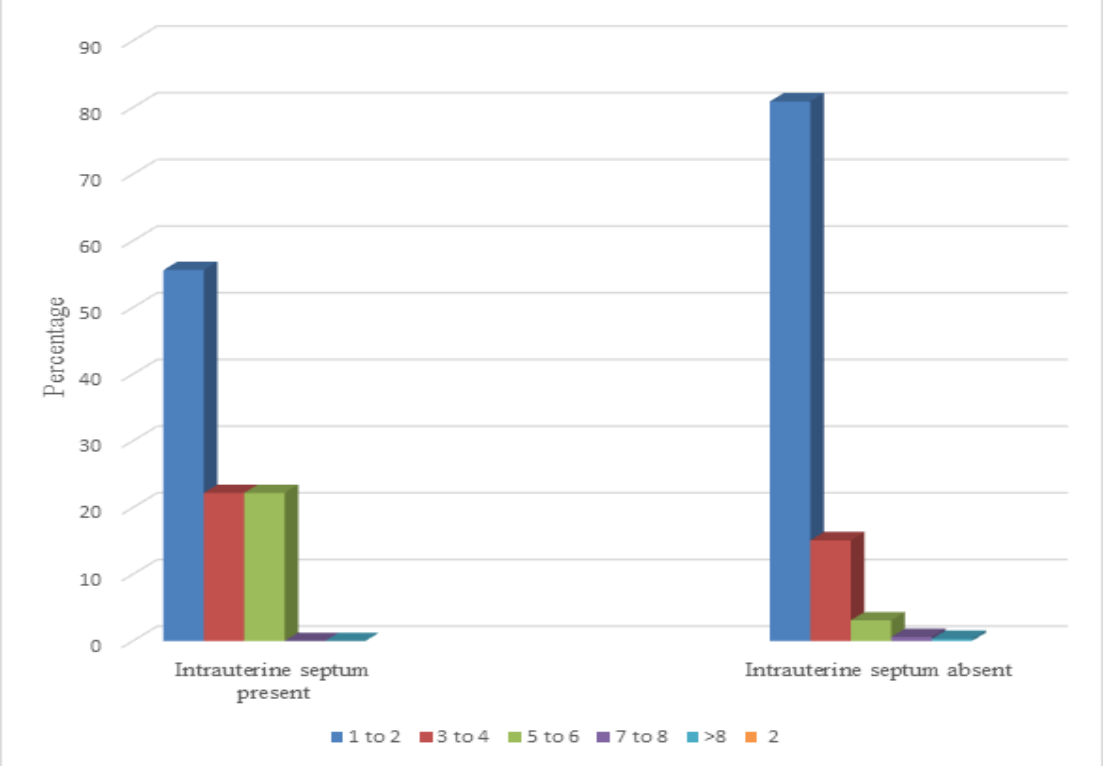

Figure 1 Percent ditribution of number of miscarriages relative to presence or absence of congenital uterine anomaly among infertile women in Lagos, Nigeria.

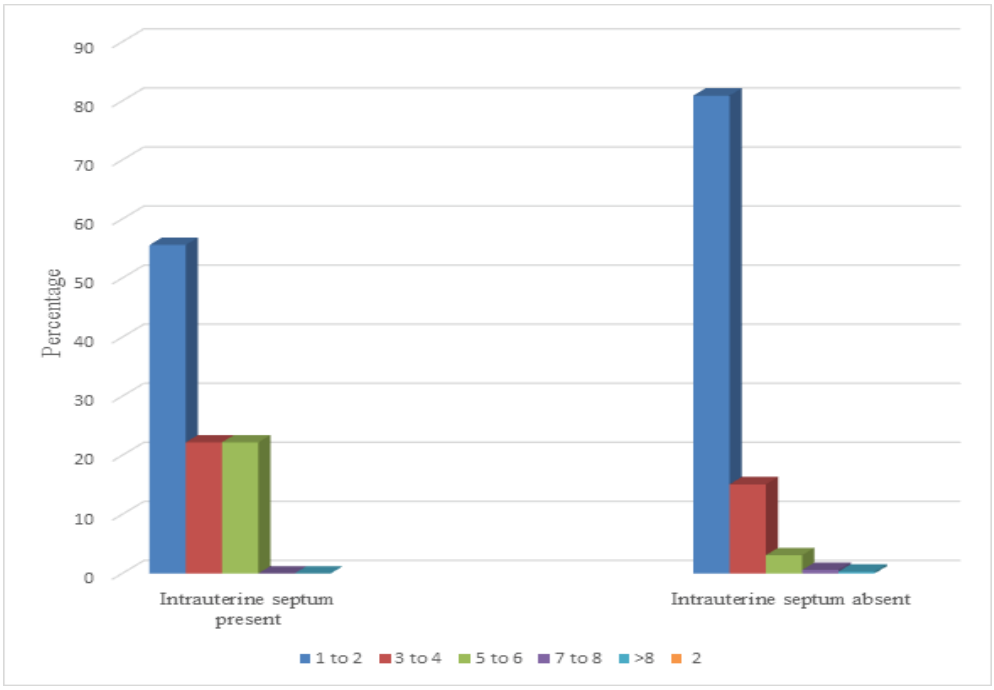

Figure 2 Percent distribution of miscarriages (0, 1 to 2, 3 to 4 an 5 to 6) among subfertile women with congenital uternine anomaly.

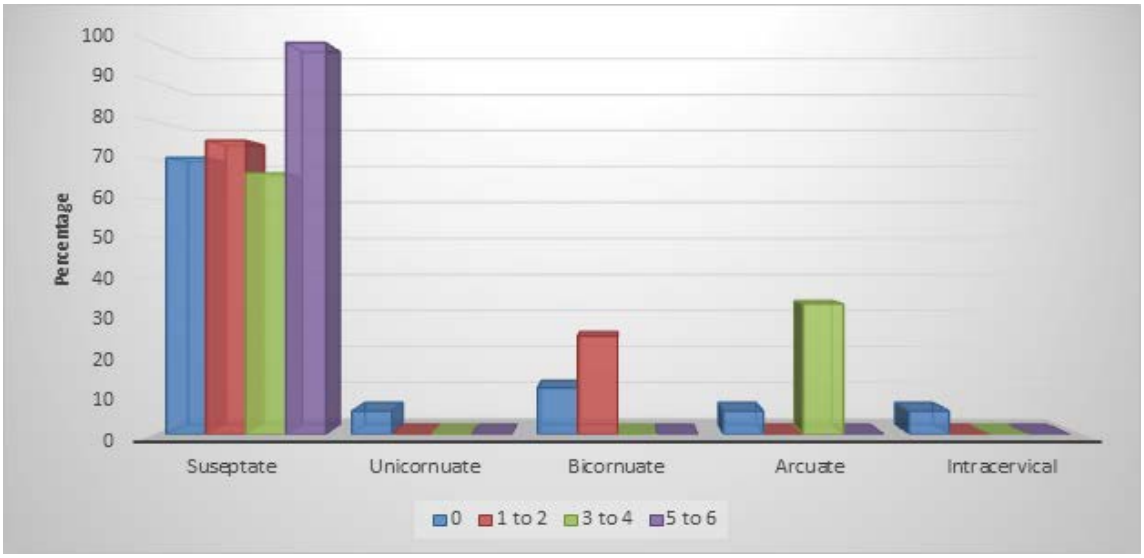

Figure 3 Hysteroscopic visualization of both right and left ostia among infertile women with and without congenital uterine anomaly.

it unlikely that a specific genetic etiology is responsible for each type of anomaly because members of the same family could have different phenotypic expressions of uterine anomalies. Our study is also one of the few that proposes the prevalence of CUA to be relatively low, especially among infertile women in Africa. Most authors review works in the developed and developing countries probably because there is a paucity of studies on CUA especially in African setting. In terms of different anomalies, sub-septate uterus was the commonest in our study, accounting for 1.7% (19/1118) among all the infertile women in our study and 73.1% (19/26) among all congenital uterine anomalies. The overall CUA prevalence of 1.7% is similar to what Ugur, [22] and Taylor [23] reported from Turkey and from Canada respectively but much smaller than what others [24-26] reported from Croatia [24], Iran [25] and China [26] respectively. Other CUA discovered were bicornuate, arcuate and unicornuate in lesser frequencies. Incidentally, there were two cases of intra-cervical septum found in women over 35 years of age, one of who was overweight and the other obese, each presenting with primary and secondary infertility. Intracervical septum would probably not lead to any menstrual irregularity since the endometrium is not directly

involved in the pathology. Moreover, intracervical septum could be easily corrected during hysteroscopy and may not lead to any appreciable hemorrhage.

Our study also shows that CUA was found mostly among older infertile women ≥ 35 years, overweight and those with professional occupation. The reason for this is probably because these women presented late for infertility investigation or prior investigations did not reveal these anomalies based on methods of investigation.

A higher proportion of women with CUA had duration of infertility less than five year when compared with those without congenital uterine abnormality. This agrees with the report of Hassan [27] that emerging evidence from recent literature reviews suggests possible causal associations between these anomalies (particularly the septate uterus) and infertility, and demonstrates significant improvements in the fecundity of women with septate uteri and otherwise unexplained infertility after hysteroscopic metroplasty.

Interestingly, women with primary infertility showed very low frequency of uterine malformations and only two of them (7.7%) presented with this problem. This agrees with the work of Butt [1] that also shows low (16.7%) frequency in this category of women but disagrees with previous reports that have found a high incidence of uterine anomalies in patients with no obvious cause of primary infertility [28]. A previous study submits that a septate uterus may not necessarily be an infertility factor and that in secondary infertility; a contribution from the uterine septum in delayed conception cannot be excluded [29].

Interestingly, women with CUA in our study reported higher ratio of number of miscarriage per woman than those without CUA, especially among those with septate uterus. In this scenario, septate uterus is most likely to decrease intra-uterine space on one hand and may interfere with the growth of the fetus. From another perspective septate uterus may actually inhibit the physiological function of the placenta, reduce blood flow to and from the fetus and cause other biochemical pathologies at microscopic level.

Another interesting finding in our study was that the depth of uterine cavity (cm) in CUA (7.81 ± 1.01; 95% Confidence Interval 7.40, 8.22) was significant shallower (t-test= -2.26; df=27.70; P-value=0.02) than the depth of uterine cavity in infertile women without CUA (8.27 ± 1.50, 95% Confidence Interval 8.18, 8.36). This agrees with the results of Salim [30] that uterine cavity is significantly shorter in infertile women with both arcuate and sub-septate uteri. The consequences of shallow uterine cavity may be related to intra-uterine growth retardation (IUGR), possible reduction in the size of amniotic sac and the volume of amniotic fluid and miscarriage. Though our study shows that infertile women with sub-septate uterus were 1½ times more likely to experience miscarriage, in contrast, Chan [31] reported that arcuate uteri are specifically associated with miscarriage, though their systematic review focused on second-trimester miscarriage. That women with sub-septate CUA in our study were nine times more likely to have miscarriages might be an indication of the severity of the CUA. Obliteration of the left ostium more than the right ostium might indicate that sub-septate CUA occurs more on the left side of the uterus very close to the left osteum. This is probably a developmental factor during embryogenesis. CUA might be one of the factors that cause obliteration of both ostia, as shown in this study, emphasizing visualization of both ostia during hysteroscopic examination of women presenting with infertility.

Conclusion

Congenital uterine anomalies are infrequent among infertile women. There is association between congenital uterine anomalies and adverse reproductive outcome. Septate uterus was the commonest congenital uterine anomaly found in the study and this occurred most amongst women presenting with secondary infertility, among those aged 35 years and above and among overweight patient. The reproductive performance of the sub-septate uterus was the poorest, while that of the bicornuate uteri was better than expected.

Limitation and strength

This study has some limitations that are worth mentioning. First, we did not carry out laparoscopy on all patients which could have helped in confirming the diagnosis of certain congenital uterine anomaly. Over the period, hysteroscopy was performed by different trained professionals, therefore inter-observer variation was inevitable. Also, this was a facility-based and not a community-based study. The strength of the study lies in (i) large sample size (ii) conducive atmosphere for the procedures, (iii) availability of state of the art facilities and experienced manpower who have been conducting hysteroscopy procedures for decades.

Recommendation

From the findings of this study we recommend routine hysteroscopy for infertile women to detect CUA which can have adverse effect on IVF treatment and outcome. There may also be a need for combined laparoscopy and hysteroscopy for appropriate diagnosis of CUA, especially when there is a history of multiple miscarriages. A multicenter study will be desirable.

Conflict of interest

The authors declare no conflict of interest in any part of this paper.

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