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Normal Uterine Size in Women of Reproductive Age in Jos, Nigeria: An Ultrasonographic Investigation.

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Abstract
A cross-sectional study of normal uterine size of 70 women aged 20-40 years was conducted by ultrasonographic measurements. Mean uterine size was found to be 8.24cm x 4.75cm x3.77cm (Length x width x AP diameter) for overall total, 7.46cm x 4.22cm x 3.30cm for Nulliparous women, 8.49cm x 4.87cm x 3.81cm for Primiparous women and 9.10cm x 5.36cm x 4.36cm for Multiparous women. Mean age was 27.99 ± 5.43 years. Uterine size was significantly correlated with parity and age. Linear multiple regression lines to predict uterine size (length,width and AP diameter) using parity and age were also modelled.
Keywords: Ultrasonography, Uterine size, Nulliparous, Primiparous, Multiparous

1. Introduction

Ultrasonography is the most frequently used imaging investigation in the assessment of the female genital tract (Mihu and Mihu, 2011). Knowledge of the normal dimensions of the uterus for evaluating the health status of women is important for forecasting the risk of developing some of the diseases seen by Gynaecologists and Obstetricians. Esmaelzadeh et al,2004 reported that ultrasonographic measurement of the uterine size is valuable for predicting pathologies associated with abnormal uterus. With the emergence of diagnostic ultrasound procedures, it is possible to predict the development of diseases such as uterine myoma (fibroid) and adenomyosis if the specific sonographic measurements are known (Holt et al, 1994).

It requires the assessment of uterus in three dimensions to determine the uterine size. The length is measured from the fundus to the cervix. The anteroposterior diameter is the maximum length in the mid-saggital section of the body of the uterus in the anteroposterior direction. For evaluation of the length and anteroposterior diameter, the transducer is located on the supra-pubic area in a longitudinal direction. To determine the uterine width, the transducer is to be rotated by 90^0 and the maximum measurement is obtained in a cross-section of the fundus (Timor-Tritsch and Moteagudo, 1996). It is a well known fact that the size of the uterus changes with an individual's age and obstetric history. The fundus of the uterus becomes thicker with each pregnancy and after menopause, the fundus reverts to its pubertal size. A uterine length of 10 cm is considered to be normal for a women of reproductive age (Grunfeld, 1996). It is also known that the growth criteria (height, weight and other body indices) are influenced by race, heredity, environment and nutrition (Speroff et al, 1999, Sadler, 2000).

2. Materials and Method

This cross sectional study was carried out at the Faith Alive Foundation Hospital, Jos, Nigeria. Seventy consented patients among those who came for pelvic scans without any gynaecological pathology were randomly selected with stratified approach to cover three parity groups namely, Nulliparous (never having borne children), Primiparous (having borne one child) and Multiparous (having borne ≥ 2 children). The height and weight of each person was measured using the measuring tape and the bathroom scale respectively and the age and parity were also recorded. The ages of the total study population ranges from 20-40 years with a mean age of 27.99 ± 5.43 years. The Ultrasonographic measurements were carried out by a single trained and experienced sonographer using INTERSON SeeMore USB Ultrasound Imaging probe of 3.5MHz attached to a desktop computer unit with SeeMore software installed. For the ultrasound examinations, all patients lay in the supine position and transabdominal conventional full-bladder technique was used. Measurements of uterine length, width and AP diameter were recorded. However, the ultrasound system used in this study may not be the best owing to a standard ultrasound machine but it is sufficient for diagnostic purposes.

3. Results

All the measurements used in the study are shown in the Table 1 below.
Table1. Measurements (P=0 for Nulliparous, P=1 for Primiparous, P=2 for Multiparous)

AGE	L(cm)	AP(cm)	W(cm)	P
21	8.00	4.50	5.00	2
25	9.10	4.30	5.30	2
25	8.50	4.50	5.32	2

34	8.50	4.10	5.50	2
33	9.40	4.20	5.70	2
35	9.30	4.30	5.20	2
40	9.80	4.20	5.60	2
33	9.50	4.20	5.50	2
38	9.70	4.25	5.65	2
40	9.80	4.35	5.60	2
28	9.40	4.40	5.40	2
39	9.40	4.50	5.50	2
32	9.50	4.50	5.60	2
20	7.80	3.30	4.60	2
23	8.20	3.70	5.20	2
30	8.60	4.70	5.80	2
40	9.70	4.41	5.62	2
31	9.00	4.72	5.49	2
38	9.86	4.57	4.81	2
37	9.40	4.71	5.28	2
35	9.44	4.75	5.43	2
26	8.23	4.48	4.78	2
29	9.10	4.28	5.26	2
27	9.26	4.74	5.54	2
22	8.00	3.80	4.90	1
28	8.00	3.60	4.80	1
27	8.40	3.90	4.60	1
26	8.70	3.90	5.10	1
25	8.40	4.10	4.30	1
25	8.00	3.80	4.70	1
32	8.60	3.60	5.00	1
34	9.00	4.50	4.80	1
34	8.80	4.20	5.20	1
33	8.60	3.70	5.00	1
31	9.50	3.40	5.00	1
28	8.20	3.30	4.80	1
23	8.20	3.70	4.70	1
25	8.67	3.23	4.95	1
34	8.24	4.46	5.20	1
20	6.00	3.00	3.50	0
24	6.90	3.00	3.60	0
23	6.80	2.90	3.40	0
23	6.90	3.00	4.10	0
23	6.90	3.50	3.80	0
20	7.10	3.00	3.50	0
28	7.60	3.50	4.50	0
28	7.60	3.00	4.50	0
26	7.50	3.00	4.20	0
26	7.40	3.50	4.20	0
27	7.50	3.40	4.20	0
27	7.40	3.10	4.20	0
32	7.60	3.10	4.40	0
31	8.50	3.60	4.80	0
23	7.70	3.00	3.80	0
22	7.30	3.20	4.00	0
26	7.80	3.50	4.20	0
25	8.00	3.40	4.50	0
29	7.80	3.50	4.60	0
28	7.90	4.10	4.50	0
20	6.20	3.00	3.70	0
26	7.80	2.40	4.20	0
26	7.80	2.90	4.60	0

22	7.80	3.60	4.60	0
23	7.60	3.40	4.60	0
23	7.22	3.30	4.25	0
23	8.00	3.70	4.70	0
28	7.87	4.13	4.52	0
22	7.05	3.59	4.13	0
23	7.86	3.51	4.38	0
26	7.85	3.40	4.82	0

Descriptive statistics of Nulliparous, Primiparous, Multiparous and Overall total groups are given in Table 2 (a),(b), (c) and (d) respectively.

Table 2 (a) Descriptive statistics of Nulliparous group.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	31	20.00	32.00	24.9355	3.08691
LENGTH	31	6.00	8.50	7.4597	.53353
AP	31	2.40	4.13	3.2977	.36409
WIDTH	31	3.40	4.82	4.2258	.39816

Table 2 (b). Descriptive statistics of Primiparous group.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	15	22.00	34.00	28.4667	4.20657
LENGTH	15	8.00	9.50	8.4873	.41783
AP	15	3.23	4.50	3.8127	.38061
WIDTH	15	4.30	5.20	4.8700	.23890

Table 2 (c). Descriptive statistics of Multiparous group.

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	24	20.00	40.00	32.0417	6.24485
LENGTH	24	7.80	9.86	9.1037	.61096
AP	24	3.30	4.75	4.3608	.33196
WIDTH	24	4.60	5.80	5.3617	.30696

Table 2 (d). Descriptive statistics of Total group

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	70	20	40	27.99	5.433
LENGTH	70	6.00	9.86	8.2436	.91102
AP	70	2.40	4.75	3.7726	.58802
WIDTH	70	3.40	5.80	4.7533	.60714
PARITY	70	0	2	.90	.887

From the above tables, the mean uterine size for each study group can be written in the form,
(Length ± S.D.) x (Width ± S.D.) x (AP Diameter ± S.D.)
Nulliparous Group:
Mean age = 24.94 ± 3.09 years
Uterine size = (7.46 ± 0.53) cm x (4.23 ± 0.40) cm x (3.30 ± 0.36) cm

Primiparous Group:
Mean age = 28.47 ± 4.21 years
Uterine size = (8.49 ± 0.42) cm x (4.87 ± 0.24) cm x (3.81 ± 0.38) cm
Multiparous Group:

Mean age = 32.04 ± 6.25 years
Uterine size = (9.10 ± 0.61) cm x (5.36 ± 0.31) cm x (4.36 ± 0.33) cm

Overall total Group:
Mean age = 27.99 ± 5.43 years
Uterine size = (8.24 ± 0.91) cm x (4.75 ± 0.61) cm x (3.77 ± 0.59) cm
The inter-correlations among the study parameters for the total group are given in the Table 3 below.

Table 3.Correlations of study parameters

Correlations

		AGE	LENGTH	WIDTH	AP	PARITY
AGE	Pearson Correlation	1	.786**	.686**	.586**	.547**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	70	70	70	70	70
LENGTH	Pearson Correlation	.786**	1	.885**	.761**	.806**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	70	70	70	70	70
WIDTH	Pearson Correlation	.686**	.885**	1	.791**	.833**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	70	70	70	70	70
AP	Pearson Correlation	.586**	.761**	.791**	1	.801**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	70	70	70	70	70
PARITY	Pearson Correlation	.547**	.806**	.833**	.801**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	70	70	70	70	70

**. Correlation is significant at the 0.01 level (2-tailed).

It can be seen from the above table that uterine length (r= 0.786),width (r=0.686), AP diameter (r=.586) and parity (r=0.547) are all strongly correlating with the age of individual with $p < 0.01$ for the age range 20-40 years used in this study. Moreover, uterine length is strongly correlating with width (r=0.885), AP diameter (r=0.761) and parity of the individual (r=0.806) with $p < 0.01$. From the multiple regression, the following relationship can be established to determine the uterine length, width and AP diameter using the age and the parity.

Uterine length = 0.083(Age) + 0.551(Parity) + 5.437. ($p < 0.01$)
Uterine width = 0.037(Age) + 0.447(Parity) + 3.325 ($p < 0.01$)
AP diameter = 0.023(Age) + 0.455(Parity) + 2.726 ($p < 0.05$)

Table 5 (a), (b) and (c) show the multiple regression coefficients and the model summary for the above equations.
Table 5(a). Multiple Regression coefficients and Model Summary for Uterine length

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.437	.268		20.268	.000
	PARITY	.551	.064	.537	8.649	.000
	AGE	.083	.010	.492	7.937	.000

a. Dependent Variable: LENGTH

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.905[a]	.819	.814	.39288

a. Predictors: (Constant), AGE, PARITY

Table 5(b). Multiple Regression coefficients and Model Summary for Uterine width

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.325	.202		16.447	.000
	AGE	.037	.008	.328	4.677	.000
	PARITY	.447	.048	.653	9.315	.000

a. Dependent Variable: WIDTH

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.877[a]	.769	.762	.29607

a. Predictors: (Constant), PARITY, AGE

Table 5(c) Multiple Regression coefficients and Model Summary for AP diameter

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.726	.233		11.698	.000
	AGE	.023	.009	.210	2.520	.014
	PARITY	.455	.055	.686	8.218	.000

a. Dependent Variable: AP

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.820[a]	.673	.663	.34127

a. Predictors: (Constant), PARITY, AGE

4. Discussion and Conclusion

Table 6. Comparison of mean uterine size (Length, Width and AP diameter) according to parity

PARITY	L (cm)	W (cm)	AP (cm)	Researchers
Nulliparous	7.00	4.00	4.00	Holt et al, 1994
	7.30	4.00	3.70	Merz et al, 1996
	7.28	4.20	3.24	Esmaelzadeh et al, 2004
	7.46	4.23	3.30	Present study
Primiparous	8.30	4.60	3.90	Merz et al, 1996
	8.49	4.87	3.81	Present study
Multiparous	9.20	5.10	4.30	Merz et al, 1996
	9.08	5.17	4.30	Esmaelzadeh et al, 2004
	9.10	5.36	4.36	Present study

The results obtained from this study on uterine size in each group were compared with available results of previous studies done by some other researches and found to be comparable. For example, the uterine length for the overall total group consist of Nulliparous, Primiparaous and Multiparous by Waldroup and Liu,1997 was 8.00 cm and that by Esmaelzadeh et al, 2004 was 8.66 cm and the present study was 8.24 cm. Similarly, the uterine width was found to be 5.50 cm, 4.96 cm and 4.75 cm respectively and the AP diameter was 3.00 cm, 4.06 cm and 3.77 cm respectively. Table 6 shows the comparison of uterine length, width and AP diameter according to parity as reported by past studies. The results obtained from the present study when compared with the previous studies done elsewhere can also agree with the fact that uterine size can vary among people of different races, nutrition and environment etc reported by Speroff et al,1999 and Sadler,2000. Moreover the uterine size is found to be significantly correlating with parity and age within the age group of this study. The mean values of uterine size determined by this study can serve as the reference values for this locality in gynaecological patient

management and reduction of chances of primary infertility. Moreover, the modelled linear equations can be used to compare uterine dimensions of patients to establish the abnormal growth of the uterus due to pelvic diseases where clinically suspected.

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