Sonographic Determination of Length, Height and Width of the Uterus in Different Age Group of Adult Women and its Relationship with Parity and Menopausal Status

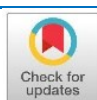Shanila Khanom*[1] , Afrin Jahan Munni[2], Mahfujur Rahman[3], Momtaj Parvin[4], Rumana Fatme[5]

1 Department of Anatomy, Barind Medical College, Rajshahi
2 Department of Anatomy, Ad-Din Akij Medical College, Khulna
3 Department of Physiology, Ad-Din Akij Medical College, Khulna
4 Department of Surgery, Central Medical College, Cumilla
5 Department of Anatomy, Rajshahi Medical College, Rajshahi

ABSTRACT: *Background:* Uterus is an important organ of female reproductive system which is variable in size with age. Menopause is a natural process that occurs due to depletion of ovarian follicles and causes change in the size of uterus. *Methods:* This cross-sectional type of descriptive study was conducted for 1 year from January 2022 to December 2022 in the Department of Anatomy in collaboration with the Department of Radiology and Imaging, Rajshahi Medical College and Hospital, Rajshahi on 145 pre and postmenopausal women. Data was collected through a semi-structured questionnaire and sonographic examination was done using a sonoscape machine fitted 3.5 to 5.0 MHZ transabdominal transducer. *Results:* Out of 145 women, the mean length, height and width of uterus of the women were 7.41±1.63 cm, 3.46±0.84 cm and 4.72±0.93 cm, respectively. There was statistically highly significant difference of the mean length of uterus with the parity of women (p < 0.001) but not with the menopausal status (p > 0.05). There was also statistically significant difference of the mean height and width of the uterus with menopausal status (p < 0.01 in both case) but not with the parity of women (p > 0.05 in both case). *Conclusion:* The study might be useful to enrich knowledge regarding the size of uterus of women with parity and menopausal status.

Keywords: Sonographic Determination, Parity, Menopausal Status.

Article at a glance:

Study Purpose: The purpose of the study was to determine the sonographic length, height and width of the uterus in different age group of adult women and its relationship with parity and menopausal status.

Key findings: Mean length of uterus was 7.41±1.63 cm, height was 3.46±0.84 cm, and width was 4.72±0.93 cm.

Newer findings: There was statistically highly significant difference of the mean length of uterus with the parity of women (p < 0.001) and statistically significant difference of the mean height and width of uterus with menopausal status (p < 0.01 in each case).

Abbreviations: ERC: Ethical Review Committee, SPSS: Statistical Package for the Social Sciences.

INRODUCTION

The uterus is responsible for several reproductive functions and influenced by hormonal levels of the body. Menopause is one of the most important events in women's life being a transition from the reproductive to non-reproductive stage. It is a milestone that may have a negative influence on quality of life. It also brings in several physiological changes that affect the life of a woman.[1] The decrease in the level of sex hormones during menopause in women causes various somatic, vasomotor, sexual and psychological symptoms. The risk of

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osteoporosis, cardiovascular disease, impairment of glucose metabolism and degenerative cognition incidence rises with menopause.[2] The impact of estrogen deficiency after menopause has an effect on the size of uterus. Lower level of estrogen in postmenopausal women is at increased risk of decreasing the size of uterus. The organ is important for Gynecologists and Obstetricians for diagnosis of many diseases such as adenomyosis, endometrial hyperplasia and endometrial carcinoma.[3] The size of uterus that is not matched with the age range of postmenopausal women, is helpful for early detection of many diseases.

The ultrasonography is simple and the easiest method for determination of size of uterus.[4] It offers the advantages of widespread availability, low cost and lack of exposure to ionizing radiation. It is also a noninvasive, simple, quick, accurate, reliable and harmless method of investigation of the uterus and ovaries and permits multi-sectional scanning of organ.[5] It also helps in the evaluation of the ovarian ovulatory function, along the other investigations recommended for infertility.[6]

It is fact that global average life expectancy is increasing day by day and half of the total population is female. According to a Polish Epidemiological forecast, in 2050 the average female life expectancy will be 87.5 which is 6.4 years longer than today.[7] Now a day, most women spend more than one-third of their lives after menopause. So, health issue of postmenopausal women is a time demanding issue. Menopause alters the size of uterus. It is imperative to know the changes in size of uterus of pre and postmenopausal women. The uterus undergoes remarkable changes in size and appearance over the course of a lifetime. A thorough knowledge of how hormonal changes affect the size of uterus at different stages of life is important for differentiating expected physiologic changes from pathologic conditions. To the best of our knowledge, a very few studies were addressed this problem in the context of Bangladesh. Moreover, the present study would facilitate the Clinicians and Gynaecologists to update their knowledge regarding the size of uterus in healthy adult women of different age groups of Bangladesh.

METHODS

This was a cross-sectional type of descriptive study at the Department of Anatomy, Rajshahi Medical College, Rajshahi over a period of 1 year from January 2022 to December 2022 for sonographic determination of length, height and width of the uterus in different age group of adult women and its relationship with parity and menopausal status. The 145 apparently healthy women who were attending in the outpatient Department of Radiology and Imaging, Rajshahi Medical College Hospital, Rajshahi were included in this study by purposive sampling technique. Prior to the commencement of the study approval was taken from the Ethical Review Committee (ERC), Rajshahi Medical College, Rajshahi and before doing Ultrasonography, consent of the women was taken and then a proper history taking was performed. Sonographic examination was done using a sonoscape machine fitted 3.5 to 5.0 MHZ transabdominal transducer. Examinations were performed on a normal examination table in the supine position with full bladder. All ultrasound examinations were documented on hard copies. The length and height of the uterus as well as the thickness of the endometrium (measured as twice the endometrial height, without hypoechoic layer) were measured in the sagittal section and the mean width of uterus in the frontal section. Total uterine length was calculated from fundus. Height was calculated from anterior to posterior wall and to cervix (external os) in the midsagittal line, perpendicular to the length. All premenopausal women in present study were examined during the first half of the menstrual cycle. For the calculation of normal values, each patient was considered only once. The data were analyzed via Statistical Package for the Social Sciences (SPSS, version 24.0) software. Qualitative variables were described by frequency distribution, while quantitative variables were described by the mean and standard deviation. Relationship of the size of uterus with parity of the women were seen by ANOVA test. Comparison of the size of uterus between pre and postmenopausal women were assessed by Unpaired t test. The statistical significance was evaluated as an appropriate probability level $p < 0.05$ for all tests.

RESULTS

Age distribution of 145 women revealed that 53 (36.60%) were within the age group of 18-27 years, 38 (26.20%) were 28-37 years, 33 (22.80%) were 38-47 years, 18 (12.40%) were 48-57 years and only 3 (2.10%) were ≥ 58 years (Table 1)

Table 1: Distribution of Respondents by Age (n=145)

Age (years)	Frequency	Percentage
18-27	53	36.60%
28-37	38	26.20%
38-47	33	22.80%
48-57	18	12.40%
≥ 58	3	2.10%
Total	**145**	**100.00%**

Mean length of the uterus in different age groups of the adult women showed that mean length of uterus was 8.20±1.45 cm in 28-37 years, 7.99±1.85 cm in 38-47 years, 6.78±1.41 cm in 18-27 years, 6.66±1.10 cm in 48-57 years and 6.39±1.19 cm in ≥ 58 years. The mean length of uterus of the women was 7.41±1.63 cm (Table 2).

Table 2: Sonographic Determination of the Mean Length of the Uterus in Different Age Groups of the Adult Women (n=145)

Age (years)	Measurement of Mean Length of the Uterus (cm)				
	Mean ± SD	Median	Mode	Minimum	Maximum
18-27	6.78 ± 1.41	6.88	5.38	2.27	10.80
28-37	8.20 ± 1.45	8.47	8.15	3.92	11.10
38-47	7.99 ± 1.85	8.04	8.20	1.18	11.20
48-57	6.66 ± 1.10	6.40	5.10	5.10	8.84
≥ 58	6.39 ± 1.19	5.90	5.52	5.52	7.75
Overall	**7.41 ± 1.63**	**7.53**	**8.20**	**1.18**	**11.20**

Multiple modes were present. The smallest value was shown.

Mean height of the uterus in different age groups of the adult women showed that mean height of uterus was 3.96±0.93 cm in 28-37 years, 3.59±0.77 cm in 38-47 years, 3.27±0.67 cm in 18-27 years, 2.87±0.84 cm in ≥ 58 years and 2.79±0.55 cm in 48-57 years. The mean height of uterus of the women was 3.46±0.84 cm (Table 3).

Table 3: Sonographic Determination of the Mean Height of the Uterus in Different Age Groups of the Adult Women (n=145)

Age (years)	Measurement of Mean Height of the Uterus (cm)				
	Mean ± SD	Median	Mode	Minimum	Maximum
18-27	3.27 ± 0.67	3.20	2.57	2.29	5.10
28-37	3.96 ± 0.93	3.89	3.36	2.61	7.87
38-47	3.59 ± 0.77	3.70	3.50	1.89	4.97
48-57	2.79 ± 0.55	2.66	2.13	2.13	3.75
≥ 58	2.87 ± 0.84	3.35	1.90	1.90	3.37
Overall	**3.46 ± 0.84**	**3.36**	**2.90**	**1.89**	**7.87**

Multiple modes were present. The smallest value was shown.

Mean width of the uterus in different age groups of the adult women revealed that mean width of uterus was 4.94±0.80 cm in 28-37 years, 4.81±0.87 cm in 38-47 years, 4.76±0.98 cm in 18-27 years, 4.26±1.54 cm in ≥ 58 years and 3.99±0.71 cm in 48-57 years. The mean width of uterus of the women was 4.72±0.93 cm (Table 4).

Table 4: Sonographic Determination of the Mean Width of The Uterus (Frontal Section) in Different Age Groups of the Adult Women (n=145)

Age (years)	Measurement of mean width of the uterus (cm)				
	Mean±SD	Median	Mode	Minimum	Maximum
18-27	4.76±0.98	4.50	4.20	2.89	8.40
28-37	4.94±0.80	5.01	4.25	2.30	6.00
38-47	4.81±0.87	4.76	5.03	3.49	6.67
48-57	3.99±0.71	3.40	2.05	2.05	5.06
≥ 58	4.26±1.54	4.89	2.50	2.50	5.38
Overall	4.72±0.93	4.70	3.93	2.05	8.40

Multiple modes existed. The smallest value was shown.

Out of 145 women, it was found that 84 (57.90%) of the women were multiparous, 34 (23.40%) were nulliparous and 27 (18.60%) were primiparous (Figure 1).
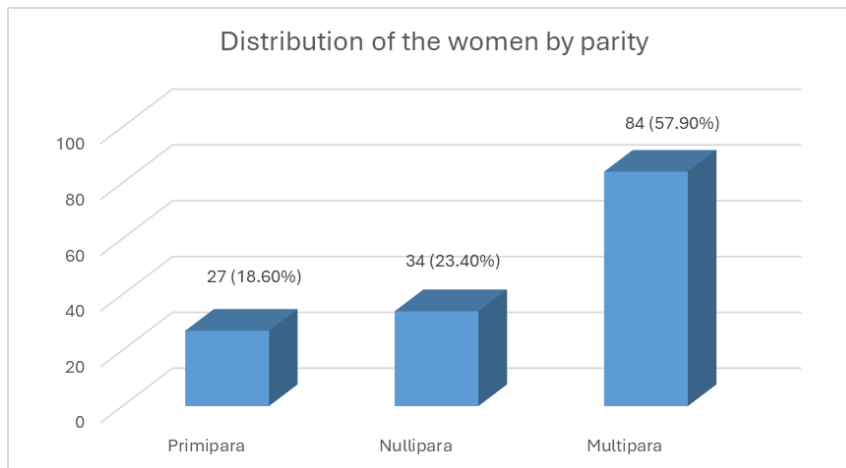
Figure 1: Distribution of the Women by Parity (n=145)

Menopausal status revealed that 113 (77.90%) of the women were premenopausal and remaining 32 (22.10%) were postmenopausal (Figure 2).
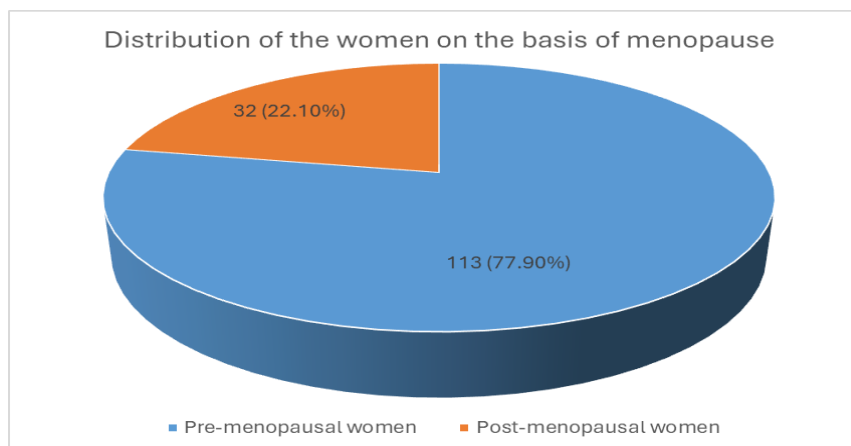
Figure 2: Distribution of the Women Based on Menopausal Status (n=145)

Mean length of the uterus among the nulliparous women was 6.44±1.20 cm, primiparous women was 7.85±1.55 cm and multiparous women was 7.65±1.66 cm. Mean height of the uterus among the nulliparous women was 3.31±0.74 cm, primiparous women was 3.47±0.67 cm and multiparous women was 3.51±0.93 cm. Mean width of the uterus among the nulliparous women was 4.78±1.03 cm, primiparous women was 4.84±0.82 cm and multiparous women was 4.65±0.92 cm. There was statistically highly significant difference of the mean length of the uterus with the parity of the women (p < 0.001). But there was no statistically significant difference of the mean height and width of the uterus with the parity of the women (p > 0.05 in each case) (Table 5).

Table 5: Relationship of the Mean Length, Height and Width of the Uterus with Parity of the Women (n=145)

Different Parameters of the Uterus	Parity (mean ± SD)			df	F-value	p-value
	Nullipara	Primipara	Multipara			
Mean length (cm)	6.44 ± 1.20	7.85 ± 1.55	7.65 ± 1.66	2	8.81	< 0.001
Mean height (cm)	3.31 ± 0.74	3.47 ± 0.67	3.51 ± 0.93	2	0.65	> 0.05
Mean width (cm)	4.78 ± 1.03	4.84 ± 0.82	4.65 ± 0.92	2	0.45	> 0.05

(Data were analyzed by ANOVA-Test and were expressed as mean ± SD.)

Mean length of the uterus among the premenopausal women was 7.52 ± 1.59 cm and among the postmenopausal women was 6.10 ± 1.73 cm. Mean height of the uterus among the premenopausal women was 3.57 ± 0.83 cm and among the postmenopausal women was 3.05 ± 0.78 cm. Mean width of the uterus among the premenopausal women was 4.84 ± 0.89 cm and among the postmenopausal women was 4.29 ± 0.94 cm. There was no statistically significant difference of the mean length of the uterus between the pre and postmenopausal women (p > 0.05). But the mean height and width of the uterus were higher among the premenopausal women than the postmenopausal women (p < 0.01 in each case) (Table 6).

Table 6: Comparison of the Mean Length, Height and Width of the Uterus with Menopausal Status of the Women (Premenopausal Women=113, Postmenopausal Women=32)

Different Parameters of the Uterus	Menopausal Status (mean±SD)		t-value	p-value
	Premenopausal	Postmenopausal		
Mean length (cm)	7.52 ± 1.59	6.10 ± 1.73	1.61	> 0.05
Mean height (cm)	3.57 ± 0.83	3.05 ± 0.78	3.15	< 0.01
Mean width (cm)	4.84 ± 0.89	4.29 ± 0.94	3.02	< 0.01

(Data were analyzed by Unpaired t-Test and were expressed as mean ± SD.)

DISCUSSION

In the present study, out of 145 respondents, 53 (36.60%) were within the age group of 18-27 years, 38 (26.20%) were 28-37 years, 33 (22.80%) were 38-47 years, 18 (12.40%) were 48-57 years and only 3 (2.10%) were ≥ 58 years. Mohammad *et al.* showed that 101 (48.80%) women were within the age group of 21-30 years, 60 (29.00%) were 31-40 years, 18 (8.70%) were < 20 years, 14 (6.80%) were 41-50 years and 14 (6.80%) were > 50 years which were nearly similar with the study.[8] Merz et al. reported that out of 155 women, the age ranged 16 to 52 years and mean was 32.4 years which was also nearly similar with the study.[9] These dissimilarities might be due to age ranges which were taken by Mohammad *et al.* and Merz *et al.* were not similar with the study. [8, 9] The length of uterus was 8.20±1.45 cm in 28-37 years, 7.99±1.85 cm in 38-47 years, 6.78±1.41 cm in 18-27 years, 6.66±1.10 cm in 48-57 years and 6.39±1.19 cm in ≥ 58 years observed by this study. The mean length of uterus of the women was 7.41±1.63 cm and range was 1.18 to 11.20 cm. Parmar *et al.* findings on uterine size of postmenopausal Sudanese women were not agreed with the present results of the minimum and maximum parameters of length 4 - 9.3 cm.[10] Uterine

size depends on several factors, among them age is important.

In the current study, the mean height of uterus was 3.96±0.93 cm in 28-37 years, 3.59±0.77 cm in 38-47 years, 3.27±0.67 cm in 18-27 years, 2.87±0.84 cm in ≥ 58 years and 2.79±0.55 cm in 48-57 years age groups. The mean height of uterus of the women was 3.46±0.84 cm. Merz et al. reported that a significant reduction in uterine size and in the corpus-cervix ratio were observed after the menopause.[9] The reduction in uterine size was related to years since menopause. These dissimilarities might be due to the height of the uterus rapidly decreased after menopause. In this study postmenopausal women were only being 22.10% but Merz et al. enrolled 64%.[9] The mean width of uterus was 4.94±0.80 cm in 28-37 years, 4.81±0.87 cm in 38-47 years, 4.76±0.98 cm in 18-27 years, 4.26±1.54 cm in ≥ 58 years and 3.99±0.71 cm in 48-57 years age groups was found by this study. The mean width of uterus of the women was 4.72±0.93 cm, and range was 2.05-8.40 cm. Hamad *et al.* found that the depth and width showed mild significant differences between study age groups.[5] Mean width was 3.95±0.78 cm. Width appeared slightly increasing with age from 20-49 years while decreasing at age 50- 69 years and appeared significant differences (p < 0.05). Depth and width also increased with parity in all study groups. Parmar *et al.* findings on uterine size of postmenopausal Sudanese women were not consistent with the present results of minimum and maximum parameters of width 1.5 - 4.9 cm.[10] The mean length of the uterus among the nulliparous women was 6.44±1.20 cm, the primiparous women was 7.85±1.55 cm and the multiparous women was 7.65±1.66 cm revealed by the present study. So, there was highly significant difference of mean length of the uterus with the parity of women (p < 0.001). Nearly similar findings were obtained in a study done by Merz *et al.* where mean uterine length was 7.3 ± 0.8 cm in nulliparous, 8.3 ± 0.8 cm in primiparous and 9.2 ± 0.8 cm in multiparous women.[9] Statistically there was a significant difference between the nulliparous and primiparous and multiparous which were similar with this study. Significant changes in uterine size could also be found in women who delivered once and those who delivered twice or more.[9]

Hamad *et al.* reported that the mean length of uterus was increased at 20-49 years and decreased in 49-69 years age groups.[5] Increased mean length was related to parity, in nulliparous was 5.68±1.24 cm, in primiparous 6.15±1.72 cm and in multiparous 7.28±1.33 cm. Piiroinen and Kaihola showed that uterine size in adulthood was parity related and within the same parity group of women, there was no age related effect on uterine size.[11] In this study, the mean height of uterus among the nulliparous women was 3.31±0.74 cm, primiparous women was 3.47±0.67 cm and multiparous women was 3.51±0.93 cm. There was no statistically significant difference of total height of the uterus with the parity of women (p > 0.05). Hamad *et al.* reported that the depth and width showed mild significant differences between study age groups.[5] Increased depth and width were recorded which was related to parity. Esmaelzadeh et al. showed that mean size of uterus of nulliparous and multiparous women were 7.28cm×4.4×3.24 and 9.08cm×5.17cm ×4.3cm, respectively.[6] Sirisena *et al.* observed significant differences of uterine size with age and parity.[12] The difference in uterine measurements was obtained in the present study differed from those reported in other countries might be due to the impact of factors such as race, heredity, environment and diet. The mean width of the uterus among the nulliparous women was 4.78±1.03 cm, primiparous was 4.84±0.82 cm and multiparous was 4.65±0.92 cm was found in the present study. There was no statistically significant difference between the width of the uterus with the parity of women (p > 0.05). Findings of Shipp and Bromley were not similar with the present study where the width of uterus was 2.7 cm in nulliparous women.[13] The width of uterus was decreased with progressed age in general and increased with parity. The mean length of the uterus among the premenopausal women was 7.52 ± 1.59 cm and the postmenopausal women was 6.10 ± 1.73 cm seen by this study. There was no statistically significant difference of the mean length of the uterus between the pre and postmenopausal women (p > 0.05). But dissimilar findings were observed in a study done by Merz *et al.* where the comparison between the premenopausal nulliparous and the postmenopausal women.[9] There was a statistically significant difference in uterine length and width (p < 0.05). These dissimilarities might be due to sample size which was 765 pre and postmenopausal women but in this study, sample size was only 145.

In the current study, mean width of the uterus among the premenopausal women was 4.84 ± 0.89 cm and postmenopausal women was 4.29 ± 0.94 cm.

There was statistically significant difference of the mean width of the uterus between the pre and postmenopausal women (p < 0.01). Similar findings were observed in a study where the comparison between the premenopausal nulliparous and postmenopausal women revealed statistically significant difference in uterine width after menopause.[9-28]

CONCLUSION

The sonographic technique supports good knowledge about the normal uterine dimension and helps the gynecologists to assess the health status of uterus and detect any pathological or congenital anomalies. It is an important tool to identify the different gynaecological abnormalities.

Ethical Approval

Ethical approval of the study was obtained from the Ethical Review Committee, Rajshahi Medical College, Rajshahi. Informed consent was taken from all participants. All the study methodology was carried out following the relevant ethical guidelines and regulations.

Conflict of Interest: Authors declared no conflict of interest.
Consent for Publication: Taken.

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*Correspondence: Dr. Shanila Khanom, Email: dr.shanilakhanom823@ gmail.com