

Ultrasonographically Measured Size of the Uterus in Pubertal, Reproductive and Menopausal Women – Correlating with Age, BMI and Parity

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Abstract

Uterine size varies with age, parity, hormonal status, and body composition, making accurate population-specific reference values essential for interpreting pelvic ultrasonography. Despite widespread ultrasound use in Bangladesh, normative uterine dimensions across menopausal status and BMI categories remain underreported. A cross-sectional, descriptive study was conducted in the Department of Radiology & Imaging of Community Based Medical College, Bangladesh (CBMC,B) Hospital, Mymensingh, Bangladesh, from October 2024 to September 2025, to determine the size of the normal uterus in pubertal, reproductive and menopausal Bangladeshi women by ultrasonography and correlations with their age, body mass index (BMI) and parity. We selected a total of 100 women aged between 11 and 90 years for this study through purposive sampling, who were attending the hospital for routine gynaecological visit. The length, width, and height of the uterus were measured using trans-abdominal ultrasonography. Demographic and clinical data, including BMI and parity were collected through structured questionnaires. We observed that the dimensions of the uterus increased steadily across reproductive age, peaking at 41–50 years (length 8.2±1.5 cm). Postmenopausal groups showed progressive involution, most evident after 60 years. Higher parity was associated with larger uterine dimensions, with maximal size in women with six or more births. BMI demonstrated a modest influence, with overweight and obese women showing larger mean measurements than underweight participants. Nulliparous and low-parity women exhibited smaller dimensions than multiparous groups. These population specific normative values enhance diagnostic precision and support more accurate interpretation of pelvic ultrasonography in clinical practice.

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Introduction

The uterus is a pear-shaped, retroperitoneal muscular organ situated in the female pelvis, structurally composed of three distinct layers: the endometrium, myometrium, and perimetrium.¹ The number of uterine enlargement due to fibroid cases rose by 78.82% over that period, underscoring their persistence as a significant global health burden.² In Bangladesh, increased size of uterus by fibroids are also widely prevalent, with evidence suggesting that approximately 52% of women with gynecological complaints present with a fibroid uterus.³ The uterus is a well-developed organ composed of two main portions: the cervix and the corpus. Typical adult uterine dimensions measure approximately 7.6×3.0×4.5 cm.⁴ The uterus is typically anteverted or anteflexed, tilting forward to form a 90-degree or acute angle with the cervix. Retroversion and retroflexion occur when it tilts or bends backward, with or without angulation at the cervix–body junction.

Minor deviations to the right or left of the midline are normal anatomical variations.¹ Uterine size and shape change across the lifespan, driven by hormones and strongly influenced by parity, making both age and reproductive history critical in assessment.^{1,4} Uterine dimensions can vary with age even among women of reproductive age, reflecting ongoing hormonal and physiological influences.^{4,5} Multiparous women exhibited significantly larger mean uterine dimensions compared to nulliparous

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women, indicating that uterine size is influenced by both parity and age, while BMI showed no significant association.⁶ Parity remains a key determinant of uterine size, often exerting a greater influence than age or other demographic factors.⁷ Knowing normal uterine size helps distinguish physiological variation from pathology, avoiding unnecessary interventions. Unexpectedly large uteri on ultrasound may indicate conditions like fibroids or adenomyosis.^{1,4} Normal uterine dimensions are essential for interpreting ultrasound in symptomatic women and predicting fertility outcomes, as excessively large uteri are associated with reduced pregnancy success.^{8,9} In postmenopausal women, ultrasound assessment of uterine size is crucial, as hormonal decline typically leads to uterine atrophy.⁹ Ultrasonography provides a non-invasive, cost-effective, widely accessible, and radiation-free method for assessing uterine size, suitable for repeated evaluations and screening.⁹ Therefore, this study was proposed to determine the normal uterine size in pubertal, reproductive and menopausal Bangladeshi women using pelvic ultrasonography and correlations with age, BMI and parity.

Methods

This cross-sectional, descriptive study was conducted in the Department of Radiology & Imaging of Community Based Medical College, Bangladesh (CBMC,B) Hospital, Mymensingh, Bangladesh, from October 2024 to September 2025. A total of 100 women who met the inclusion and exclusion criteria were enrolled through purposive sampling method. Our inclusion criteria were: women aged 11–90 years attending routine gynecological evaluation and consented to undergo ultrasonographic assessment. However, women with known gynecological malignancy, fibroids, or congenital uterine anomalies,

pregnant women and women with a history of hysterectomy or major pelvic surgery were excluded. Demographic and clinical information, including age, BMI, residence, education, occupation, menopausal status, and parity, was collected using a structured questionnaire. BMI was calculated as weight in kilograms divided by height in meters squared. Uterine dimensions (length, width, height) were measured using trans-abdominal ultrasonography by experienced radiologists following standardized protocols. Each measurement was recorded in centimeters (cm). BMI was calculated by dividing weight by height squared (kg/m^2). Data was recorded in the data collection sheet. Data was reviewed, cleaned, and coded; then analysis was done by using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed in frequencies and percentages. Continuous variables, including uterine dimensions, were expressed as mean $\pm$ SD. The study was approved by the Ethical Review Committee of Community Based Medical College, Bangladesh (CBMC,B), Mymensingh, Bangladesh.

Results

The majority of the participants were in the 31–40 years age group (26%), followed by 41–50 years age group (24%) and 21–30 years age group (18%). Adolescents (11–20 years) represented the smallest proportion (6%), while older age groups (71–90 years) collectively accounted for 5%. Body mass index (BMI) revealed that most participants were within the normal range (18.5–24.9 kg/m^2 , 44%), with overweight individuals (25–29.9 kg/m^2) and obese women (BMI $\geq 30 \text{ kg/m}^2$) comprising 22% each; underweight participants (BMI $< 18.5 \text{ kg/m}^2$) represented 12%. Premenopausal women formed the majority (68%) compared to postmenopausal women

(32%). Urban residents slightly outnumbered rural participants (57% vs. 43%). Educational attainment varied: 30% primary, 28% secondary, 22% higher education, and 20% without formal schooling. Housewives constituted over (56%), followed by laborers/farmers (17%), professionals/office workers (15%), and other occupations (12%) (Table-I).

Uterine dimensions increased progressively across reproductive age groups (11–50 years), peaking in women aged 41–50 years (length 8.2 ± 1.5 cm; width 4.0 ± 0.9 cm; height 5.0 ± 1.0 cm). Women in the 31–40 years age group exhibited substantial growth (length 7.8 ± 1.3 cm; width 4.0 ± 0.8 cm; height 4.8 ± 0.9 cm). Postmenopausal women showed reduced uterine size, with moderate decreases in 51–60 years age group (length 7.1 ± 1.3 cm; width 3.6 ± 0.7 cm; height 4.3 ± 0.8 cm) and pronounced involution was observed in women over 60 years, e.g., 61–70 years had a mean length of 6.1 ± 0.5 cm, width 2.8 ± 0.4 cm, and height 2.8 ± 0.4 cm, with further reductions in the 71–80 and 81–90 years age group (Table-II, Fig. 1).

BMI influenced uterine size, with underweight women ($16\text{--}18.4$ kg/m²) demonstrating the smallest dimensions (length 5.8 ± 0.8 cm in the $16\text{--}16.9$ kg/m² group). Normal BMI women had mean length 7.1 ± 1.2 cm, width 3.6 ± 0.7 cm, and height 4.6 ± 0.8 cm. Overweight and obese women generally showed larger dimensions (length $7.6\text{--}8.1$ cm across BMI ≥ 25 kg/m²) (Table-III). Nulliparous women (parity 0) had a mean length of 7.4 ± 1.1 cm, width 3.9 ± 0.6 cm, and height 4.7 ± 0.7 cm, nearly similar to women with one childbirth. Slight reductions occurred in parity 2–3, with the lowest length in parity 2 (6.2 ± 1.0 cm). Uterine dimensions increased with higher parity, reaching maximal values in women with parity of ≥ 6 (length 8.4 ± 1.3 cm; width 4.1 ± 0.7 cm; height 5.0 ± 0.8 cm) (Table-IV).

Table-I: Demographic characteristics of the study participants (N=100)

Variables	Category	Frequency	Percentage
Age group (in years)	11–20	6	6.0
	21–30	18	18.0
	31–40	26	26.0
	41–50	24	24.0
	51–60	14	14.0
	61–70	7	7.0
	71–80	3	3.0
	81–90	2	2.0
BMI (kg/m ²)	16–16.9	4	4.0
	17–18.4	8	8.0
	18.5–24.9	44	44.0
	25–29.9	22	22.0
	30–34.9	12	12.0
	35–39.9	6	6.0
	≥ 40	4	4.0
Menopausal status	Premenopausal	68	68.0
	Postmenopausal	32	32.0
Residence	Urban	57	57.0
	Rural	43	43.0
Education	No formal education	20	20.0
	Primary	30	30.0
	Secondary	28	28.0
	Higher	22	22.0
Occupation	Housewife	56	56.0
	Laborer/Farmer	17	17.0
	Serviceholder	15	15.0
	Others	12	12.0

Table-II: Uterine dimensions in different age group (N=100)

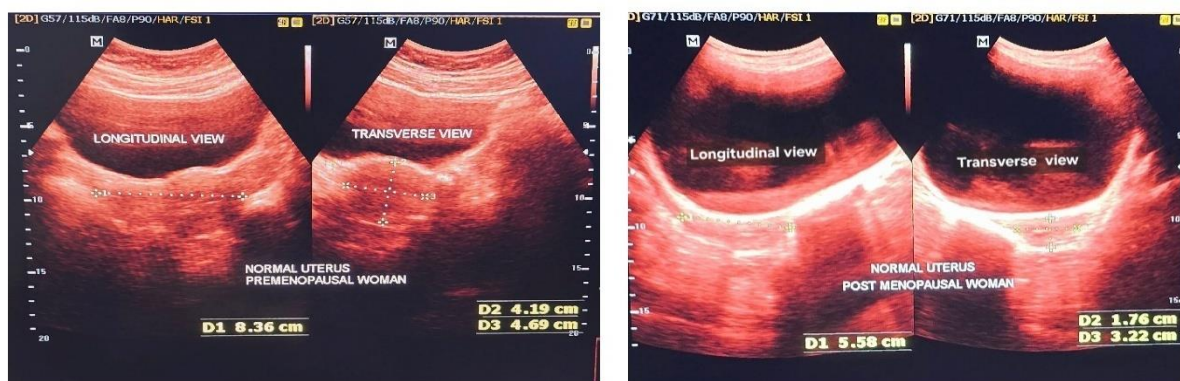
Age Group (in years)	Length (cm) Mean $\pm$ SD	Width (cm) Mean $\pm$ SD	Height (cm) Mean $\pm$ SD
11–20	7.1 $\pm$ 1.1	3.2 $\pm$ 0.7	4.0 $\pm$ 0.7
21–30	7.4 $\pm$ 1.2	3.6 $\pm$ 0.7	4.2 $\pm$ 0.8
31–40	7.8 $\pm$ 1.3	4.0 $\pm$ 0.8	4.8 $\pm$ 0.9
41–50	8.2 $\pm$ 1.5	4.0 $\pm$ 0.9	5.0 $\pm$ 1.0
51–60	7.1 $\pm$ 1.3	3.6 $\pm$ 0.7	4.3 $\pm$ 0.8
61–70	6.1 $\pm$ 0.5	2.8 $\pm$ 0.4	2.8 $\pm$ 0.4
71–80	4.0 $\pm$ 0.5	2.0 $\pm$ 0.3	3.0 $\pm$ 0.4
81–90	5.0 $\pm$ 0.6	2.0 $\pm$ 0.3	3.0 $\pm$ 0.4

Table-III: Uterine dimensions in different BMI categories (N=100)

BMI Category (kg/m ²)	Length (cm) Mean±SD	Width (cm) Mean±SD	Height (cm) Mean±SD
16–16.9	5.8±0.8	3.1±0.4	3.4±0.4
17–18.4	7.8±1.0	3.6±0.7	4.7±1.0
18.5–24.9	7.1±1.2	3.6±0.7	4.6±0.8
25–29.9	7.6±1.3	4.5±0.8	5.1±0.9
30–34.9	8.0±1.5	3.6±0.9	3.9±1.0
35–39.9	7.9±1.2	4.2±0.6	4.6±0.7
≥40	8.1±1.0	4.7±0.5	3.9±0.6

Table-IV: Uterine dimensions by parity (N=100)

Parity	Length (cm) Mean±SD	Width (cm) Mean±SD	Height (cm) Mean±SD
0 (Nulliparous)	7.4±1.1	3.9±0.6	4.7±0.7
1	7.3±1.1	3.9±0.6	4.6±0.7
2	6.2±1.0	3.4±0.5	3.9±0.6
3	6.6±1.0	3.9±0.5	4.1±0.6
4	7.4±1.1	3.6±0.6	4.3±0.7
5	7.6±1.2	3.7±0.6	4.7±0.7
≥6	8.4±1.3	4.1±0.7	5.0±0.8

**Fig. 1:** Ultrasonography of the normal uterus in premenopausal (left) and postmenopausal (right) women

Discussion

In our study population, 31–40 years aged women (26%) were predominant, followed by 41–50 years (24%) and 21–30 years (18%), adolescents (11–20 years) (6%) and older women (71–90 years) (5%). Most participants had normal BMI (18.5–24.9 kg/m²,

44%), while overweight and obese women each comprised 22%; underweight women accounted for 12%. Premenopausal women were 68% and 32% were postmenopausal. Urban residents slightly exceeded rural participants (57% vs. 43%).

Merz *et al.* stated that the mean age ranged from 16 to 52 years (mean 32.4 years).¹⁰ In another study done by Bumbuliene *et al.* reported that BMI was $17.8 \pm 1.8 \text{ kg/m}^2$ and $20.4 \pm 1.4 \text{ kg/m}^2$.¹¹ Chavan & Srinivasan reported that the majority of participants of their study (67%) resided in rural areas.¹²

In this study, we observed that uterine size increased with reproductive age, peaking at 41–50 years ($8.2 \pm 1.5 \text{ cm} \times 4.0 \pm 0.9 \text{ cm} \times 5.0 \pm 1.0 \text{ cm}$) and remaining substantial at 31–40 years ($7.8 \pm 1.3 \text{ cm} \times 4.0 \pm 0.8 \text{ cm} \times 4.8 \pm 0.9 \text{ cm}$), then declined postmenopause, with marked involution in women >60 years (61–70 years: $6.1 \pm 0.5 \text{ cm} \times 2.8 \pm 0.4 \text{ cm} \times 2.8 \pm 0.4 \text{ cm}$) and further reductions in those aged 71–90 years. A previous study done by Esmaelzadeh, Rezaei & Haji Ahmadi found that multiparous women had larger uterus compared to nulliparous women ($90.8 \times 51.7 \times 43.0 \text{ mm}^3$ vs. $72.8 \times 42.8 \times 32.4 \text{ mm}^3$).⁷ Merz *et al.* stated that uterine size declined progressively with increasing years since menopause.¹⁰ Bakhtawar *et al.* reported that the average uterus measured $7.50 \pm 1.0 \text{ cm}$ in length, $4.57 \pm 0.73 \text{ cm}$ in width, and $3.57 \pm 0.93 \text{ cm}$ in thickness.¹³

We also observed that uterine size increased with BMI – the smallest in underweight women (5.8 cm), moderate in normal BMI (7.1 cm), and largest in overweight/obese women (7.6–8.1 cm). The mean height and weight were $158.8 \pm 7.2 \text{ cm}$ and $61.5 \pm 12.1 \text{ kg}$, with a mean BMI of $24.4 \pm 4.3 \text{ kg/m}^2$. Similar observations were reported by Esmaelzadeh, Rezaei & Haji Ahmadi and Mahrukh *et al.*^{7,14}

In this study, uterine size was found the smallest in parity 0–1, and increased with higher parity, peaking in women with ≥ 6 births ($8.4 \pm 1.3 \text{ cm} \times 4.1 \pm 0.7 \text{ cm} \times 5.0 \pm 0.8 \text{ cm}$). Esmaelzadeh, Rezaei & Haji Ahmadi found that uterine size was significantly associated

with parity and age, but showed no correlation with BMI.⁷ Merz *et al.* reported that uterine length averaged $7.3 \pm 0.8 \text{ cm}$ in nulliparous, $8.3 \pm 0.8 \text{ cm}$ in primiparous, and $9.2 \pm 0.8 \text{ cm}$ in women with ≥ 2 deliveries.¹⁰ Dutta & Bayan stated that mean uterine weight was 59.62 g in reproductive women and 31.27 g in postmenopausal women,¹⁵ difference in weight also coincides with the difference in linear measurements of pre- and post-menopausal women. However, uterine dimensions can also vary with menstrual cycle phase, bladder fullness in trans-abdominal scans, and operator technique or probe orientation.^{1,5}

This study was limited by its relatively small sample size and single-center design, which may affect generalizability. Ultrasonographic measurements were operator-dependent, and minor interobserver variation could not be fully excluded. The cross-sectional nature prevented assessment of temporal changes in uterine size. Additionally, exclusion of women with gynecological pathology may limit comparison with broader clinical populations. Future multicenter studies with larger cohorts and longitudinal follow-up would help validate and expand these findings.

Conclusion

This study provides a structured reference for normal uterine dimensions across pubertal, reproductive and menopausal Bangladeshi women using standardized ultrasonography. Uterine size showed clear variation with age, BMI and parity, with maximal dimensions observed during late reproductive years and gradual involution after menopause. Parity emerged as a strong determinant of uterine size, while BMI demonstrated a modest but consistent influence. These findings underscore the importance of

population-specific normative data to enhance diagnostic accuracy, support early detection of uterine pathology, and improve clinical decision-making in gynecological practice. Establishing such baseline measurements strengthens the interpretive value of pelvic ultrasound in routine and specialist care.

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