

Age-related morphometric changes of the human cervix uteri in Lower Assam: A cross-sectional cadaveric study.

Santosh Kumar Sahu*¹, Joydev Sarma², Rup Sekhar Deka³, Pradipta Ray Choudhury⁴, Kunja Lal Talukdar⁵

1. Assistant Professor, Department of Anatomy, Jorhat Medical College and Hospital, Jorhat, Assam, India

2. Professor, Department of Anatomy, Gauhati Medical College and Hospital, Guwahati, Assam, India.

3. Professor, Department of Anatomy, Nalbari Medical College and Hospital, Nalbari, Assam, India.

4. Associate Professor, Department of Anatomy, Silchar Medical College and Hospital, Silchar, Assam, India.

5. Former Professor, Department of Anatomy, Gauhati Medical College and Hospital, Guwahati, Assam, India.

Page | 1

ABSTRACT

Background: The uterine cervix undergoes anatomical changes throughout life under the influence of age, hormonal status, and reproductive factors. Knowledge of normal cervical morphometry is important for gynecological surgery, radiological interpretation, and the diagnosis of cervical abnormalities.

Methods: A cross-sectional cadaveric study was conducted in the Department of Anatomy, Gauhati Medical College and Hospital, Assam, between May 2012 and September 2013. Thirty cervical specimens obtained from unclaimed female cadavers were included. Specimens with gross pathological abnormalities were excluded. Samples were categorized into Group A (20–35 years), Group B (36–49 years), and Group C (≥ 50 years). Cervical length and breadth were measured using slide calipers, and weight was recorded using a laboratory weighing machine. Statistical comparisons were performed using Student's t-test, with $p < 0.05$ considered significant.

Results: Mean cervical length increased from 2.370 cm in Group A to 2.670 cm in Group B and declined to 2.120 cm in Group C. Mean cervical breadth decreased progressively from 2.266 cm to 1.999 cm across the groups. Cervical weight remained stable during the reproductive years (22.620 g and 22.610 g) but decreased markedly after 50 years of age (12.390 g). Significant differences were observed between postmenopausal and reproductive-age groups for all parameters ($p < 0.001$).

Conclusion: Cervical dimensions reach their maximum during the reproductive period and regress significantly after menopause. These findings provide baseline morphometric data that may assist anatomists, gynecologists, and radiologists in clinical practice and surgical planning.

Recommendation: Age-related reductions in cervical dimensions should be considered during gynecological procedures and radiological assessments in postmenopausal women. Larger multicentric studies are recommended to establish regional reference standards.

Keywords: Cervix uteri, morphometry, cervical length, cervical breadth, aging, cadaveric study, Assam.

Submitted: January 20, 2026 **Accepted:** May 20, 2026 **Published:** June 12, 2026

Corresponding Author: Santosh Kumar Sahu

Email: dr.santoshgmc@gmail.com

Assistant Professor, Department of Anatomy, Jorhat Medical College and Hospital, Jorhat, Assam, India.

INTRODUCTION

The uterine cervix varies in size throughout a woman's life due to parity, hormonal status, and age [1]. In adult females, it typically constitutes one-third of the total uterine length [2]. In Indian clinical practice, accurate morphological data are essential for managing pelvic organ prolapse and performing

safe hysterectomies [3]. This study provides a detailed morphometric analysis of the cervix to establish regional anatomical standards for the Assamese population.

Materials And Methods

Study Design

This was a cross-sectional cadaveric observational study designed to assess age-related morphometric variations in the human cervix uteri.

Study Setting

The study was conducted in the Department of Anatomy, Gauhati Medical College and Hospital (GMCH), Guwahati, Assam, India, from May 2012 to September 2013. GMCH is a tertiary-care teaching institution that provides comprehensive medical services and serves as a major referral center for northeastern India.

Participants

Thirty cervical specimens obtained from unclaimed female cadavers in the Department of Forensic Medicine, Gauhati Medical College and Hospital, were included in the study.

Inclusion Criteria

- Female cadavers aged 20 years and above.
- Intact cervix and uterus available for examination.
- Specimens free from decomposition affecting measurements.

Exclusion Criteria

- Presence of cervical tumors.
- Uterine fibroids involving the cervix.
- Gross congenital anomalies or traumatic damage affecting cervical morphology.

Data Collection

Following dissection, cervical specimens were carefully isolated. Cervical length was measured from the internal os to

the external os using a calibrated slide caliper. Cervical breadth was measured at the midpoint of the cervix using the same instrument. Specimen weight was measured in grams using a standard laboratory weighing machine. All measurements were performed using uniform procedures to ensure comparability among age groups.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical methods. Mean and standard deviation were calculated for each parameter. Intergroup comparisons were performed using Student's t-test. Statistical significance was set at $p < 0.05$. No missing data were encountered because all specimens underwent a complete morphometric assessment.

Ethical Consideration

Ethical approval was obtained from the Institutional Ethics Committee, Gauhati Medical College and Hospital, Guwahati, Assam, before commencement of the study. Cervical specimens were collected from unclaimed cadavers after completion of all medico-legal formalities in accordance with institutional and ethical guidelines.

Results

Cervical dimensions increased during the reproductive years and regressed after menopause. Mean cervical length was highest in Group B (2.670 cm) and lowest in Group C (2.120 cm). Mean cervical weight was substantially lower in Group C (12.390 g) than in Group A (22.620 g) and Group B (22.610 g). Table 1 presents the mean cervical length, breadth, and weight across the three age groups. Cervical length increased from Group A to Group B and subsequently declined in Group C. Cervical breadth showed a gradual reduction with advancing age, while cervical weight demonstrated a marked decline after 50 years of age.

TABLE 1: Comparison of mean morphological parameters

Parameter	Group A (20-35 years)	Group B (36-49 years)	Group C (50+ years)
Mean length (cm)	2.370	2.670	2.120
Mean breadth (cm)	2.266	2.132	1.999
Mean weight (g)	22.620	22.610	12.390

Table 2 summarizes the statistical comparisons between age groups. Significant differences were observed in cervical length between all groups. The most pronounced reductions in cervical

breadth and weight were observed when postmenopausal women (Group C) were compared with reproductive-age groups.

TABLE 2: Statistical significance (p-values) between groups

Comparison	Length	Breadth	Weight
Group A vs. Group B	<0.001	<0.05	>0.05
Group B vs. Group C	<0.001	<0.001	<0.001
Group A vs. Group C	<0.001	<0.001	<0.001

Page | 3 Figure 1 illustrates the anatomical landmarks used for measuring cervical length between the internal and external os.

Figures



FIGURE 1: Gross specimen of the cervix uteri showing the method of measuring length from the internal os to the external os.

FIGURE 2: Gross specimen of the cervix uteri showing the method of measuring length using a vernier caliper.



Figure 2 demonstrates the use of a vernier caliper for accurate measurement of cervical length.

FIGURE 3: Gross specimen of the cervix uteri showing the method of measuring breadth using a vernier caliper.



Figure 3 shows the methodology used to determine cervical breadth at the midpoint of the cervix.

FIGURE 4: Line Graph showing the distribution of cervical length across the three study groups, highlighting postmenopausal regression.

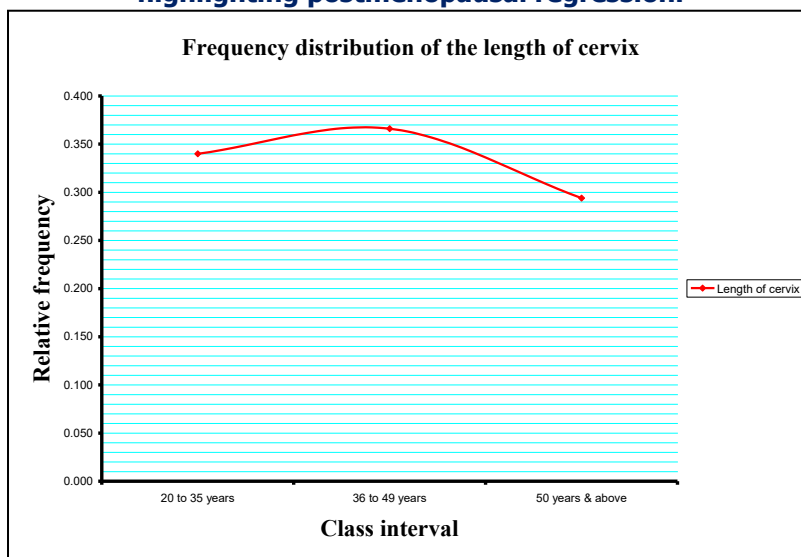


Figure 4 depicts the trend in cervical length across age groups, showing an increase during reproductive years followed by regression after menopause.

DISCUSSION

Cervical length peaks during the active reproductive years (2.670 cm), aligning with standard anatomical benchmarks [4]. This finding is also consistent with findings in the broader South Asian population, where cervical length averages between 2.89 cm and 3.0 cm in reproductive-age females [3,7]. The increase in cervical dimensions during the reproductive years may reflect the influence of hormonal activity and parity, as vaginal delivery can expand cervical dimensions [5]. The marked reduction in cervical weight in Group C suggests postmenopausal regression of cervical tissue. This finding may be related to decreased collagen integrity, glandular activity, and muscle mass after menopause [2, 6].

Surgical Significance

Knowledge of cervical dimensions is important during total abdominal hysterectomy and other gynecological procedures involving the cervix. The ureter passes approximately 1.5–2 cm lateral to the cervix near the internal os [7]. In postmenopausal patients where the cervix regresses, and weight drops to 12.390 gm, the anatomical landmarks become more crowded, increasing the risk of ureteric injury during the clamping of uterine arteries [8,2]. Additionally, these benchmarks aid in diagnosing cervical hypertrophy and ensuring the correct placement of sutures during cervical cerclage [9]. Awareness of

age-related morphometric change may therefore help surgeons and radiologists distinguish physiological variation from pathological enlargement or atrophy.

Generalizability

The findings of the present study may apply to women of similar demographic and ethnic backgrounds in northeastern India. Although the study was conducted in Lower Assam, the observed age-related trends in cervical morphology are consistent with findings reported in other South Asian populations, suggesting broader clinical relevance. However, caution should be exercised when extrapolating these findings to other populations due to potential differences in ethnicity, parity, nutritional status, and reproductive characteristics.

CONCLUSIONS

Cervical dimensions are maximal during the peak reproductive years and show significant age-related regression after 50 years of age. The significant reduction in length and weight after age 50 must be considered by surgeons to ensure operative safety. The findings provide useful baseline morphometric data for anatomists, gynecologists, and radiologists, especially in the regional context of North Eastern India.

Limitations

The study was limited by its relatively small sample size and single-center design. Information regarding parity, hormonal status, and obstetric history of the cadavers was unavailable, which may have influenced cervical dimensions. Future studies

involving larger multicentric samples and detailed reproductive histories are warranted.

Recommendations

The morphometric changes observed with advancing age should be considered during gynecological surgeries, cervical cerclage procedures, and radiological assessments. Larger multicenter studies involving diverse populations are recommended to establish comprehensive normative data for cervical morphology in Indian women.

Acknowledgement

The authors express their sincere gratitude to the Department of Anatomy and the Department of Forensic Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, for providing the facilities and specimens necessary for conducting this study.

Author Contributions

Santosh Kumar Sahu: Conceptualization, data collection, manuscript preparation, and data analysis.

Joydev Sarma: Study supervision, methodology development, manuscript review.

Rup Sekhar Deka: Data interpretation and manuscript editing.

Pradipta Ray Choudhury: Literature review and critical revision of the manuscript.

Kunja Lal Talukdar: Study design, supervision, and final approval of the manuscript.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author Biography

Dr. Santosh Kumar Sahu is an academician in the Department of Anatomy, Jorhat Medical College and Hospital, Assam, with research interests in gross anatomy and morphometric studies.

Dr. Joydev Sarma is a faculty member in the Department of Anatomy, Gauhati Medical College and Hospital, specializing in anatomical education and research.

Dr. Rup Sekhar Deka serves in the Department of Anatomy, Nalbari Medical College and Hospital, Assam.

Dr. Pradipta Ray Choudhury is affiliated with the Department of Anatomy, Silchar Medical College and Hospital, Assam.

Dr. Kunja Lal Talukdar is a former Professor of Anatomy, Gauhati Medical College and Hospital, with extensive experience in anatomical research and teaching.

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. The study was approved by the Institutional Ethics Committee of Gauhati Medical College and

Hospital, Guwahati. The specimens were collected from unclaimed human cadavers after completion of medico-legal formalities.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare no conflicts of interest.

Payment/services information: All authors have declared that no financial support was received from any organization for the submitted work.

Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

REFERENCES

1. Standring S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 42nd ed. London: Elsevier; 2020
2. Sinnatamby CS. Last's Anatomy: Regional and Applied. 12th ed. Churchill Livingstone; 2011.
3. Uddin MS, Rahman MM, Begum N, et al. Morphology of Cervix - A Postmortem Study. *Bangladesh J Anat.* 2012;10:80-83.
<https://doi.org/10.3329/bja.v10i2.1732>
4. Chakravarty M, Bora D, Doley A. Morphological study of the age-related changes of the cervix. *J. Evolution Med. Dent. Sci.* 2016;5:3322-3325
<https://doi.org/10.14260/jemds/2016/769>
5. Gou K, Baek S, Lutnesky MM, et al. Growth-profile configuration for specific deformations of tubular organs: A study of growth-induced thinning and dilation of the human cervix. *PLoS One.* 2021;16:e0245155.
<https://doi.org/10.1371/journal.pone.0245155>
6. Huzik OV. Micro- and ultrastructure of the uterine cervix in the mature and elderly periods of human ontogenesis. *Reports of Morph.* 2017;23:110-113.
7. Ara ZG, Islam ASMS, Zaman UKS, et al. Study of cervical length in Bangladeshi cadavers. *CBMJ.* 2016;5:26-28.
<https://doi.org/10.3329/cbmj.v5i2.53927>
8. URL:
<https://www.banglajol.info/index.php/CBMJ/article/view/28014>
9. Uddin MS, Al-Muhaimin M, Begum N, et al. Age-related changes of the human uterus - a postmortem study. *Med Today.* 2012;24:70-72. DOI:



Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
<https://doi.org/10.51168/sjhrafrica.v7i2.2715>
Original Article

10.3329/medtoday.v24i2.15010

<https://doi.org/10.3329/medtoday.v24i2.15010>

10. Doley A, Chakravarty M. Histological study of the age-related changes of the cervix. J. Evolution Med.

Dent.

Sci.

2016;5:4851-4854.

<https://doi.org/10.14260/jemds/2016/1118>

Student's Journal of Health Research (SJHR)

(ISSN 2709-9997) Online

(ISSN 3006-1059) Print

Category: Non-Governmental & Non-profit Organization

Email: studentsjournal2020@gmail.com

WhatsApp: +256 775 434 261

**Location: Scholar's Summit Nakigalala, P. O. Box 701432,
Entebbe Uganda, East Africa**

