Original Article

Study on Morphometric Changes of Total Length of Prostatic Urethra in Different Age Groups of Bangladeshi Population

Epsi EZ[1], Kabir A[2], Ajmery S[3], Azam NNE[4], Ara R[5], Islam S[6]

1.   **Dr. Effat Zerin Epsi, Associate Professor, Department of Anatomy, Mymensingh Medical College*

2.   *Dr. Anamul Kabir, Associate Professor, Department of Anatomy, Jahurul Islam Medical College, Kishoreganj*

3.   *Dr. Suny Ajmery, Associate Professor, Department of Pharmacology, Jahurul Islam Medical College, Kishoreganj*

4.   *Dr Nazmun Nur-E-Azam, Assistant Professor, Department of Anatomy, City Medical College, Gazipur*

5.   *Dr. Rifat Ara, Assistant Professor, Department of Anatomy, Sheikh Hasina Medical College, Jamalpur*

6.   *Dr. Shamima Islam, Lecturer, Department of Anatomy, Mymensingh Medical College*

* For Correspondence

Abstract

Background: *Benign Prostatic Syndrome (BPS) is characterized by the Benign Prostatic Enlargement (BPE), Lower Urinary Tract Symptomatology (LUTS) and Bladder Outlet Obstruction (BOO) represents a major health care issue in most of the countries. It is evaluated that near about 80% of men older than 50 years have symptoms arising from LUTS and that 25% of cases will seek medical treatment for relief of BPE. Surgical treatments are very much essential and that's why it is obligatory to find out the total length of prostatic urethra in various surgical procedures such as transurethral resection of the prostate gland (TURP) in benign prostatic hyperplasia, radical prostatectomy & prostatic ablation as a treatment of prostate cancer, urethral reconstructive surgery, prostatic urethral lift &urethroplasty in stricture urethra.*

Methods: *A cross sectional descriptive study was analyzed in Anatomy Department, Mymensingh Medical College, Mymensingh, Bangladesh to identify the difference in total length of the prostatic urethra of Bangladeshi population in relation to age. The present study was carried out on 67 postmortem human prostate gland which are brought from the morgue of the Forensic Medicine Department of Mymensingh Medical College and sampling technique was non-random purposive type. The samples were collected from Bangladeshi cadaver who were from 10-80 years of age. The specimens were divided into three groups - Group A (up to 18 years), Group B (age ranging from 19-45 years) and Group C (above 45 years) in proportion to age. Dissection of the specimens were accomplished according to standard autopsy procedures.*

Results: *The total length of the prostatic urethra was estimated and measurement was recorded in a data sheet. The mean (±SD) total length of the prostatic urethra was 1.50±0.54 cm, 2.55±0.61 cm and 2.72±0.83 cm in Group A, B and C respectively. It was observed that the mean total length of the prostatic urethra was increased with age of people. Variance analysis reveals that mean differences of total length of the prostatic urethra were highly significant among all age groups. The total length of prostatic urethra was increased with older age group people. Students unpaired 't' test was performed to identify differences between age groups for statistical analysis.*

Conclusion: *The result of the study will enhance the knowledge regarding the total length of prostatic urethra of Bangladeshi people which will be helpful for various surgical intervention. Ethical clearance has been taken from the ethical review committee (ERC) of Mymensingh Medical College, Mymensingh.*

Key words: *Prostatic Urethra, Length, Cadaver, Age, Benign Prostatic Enlargement.*

Introduction

The prostate is a reproductive organ and accessory gland of the male genital system. It is a muscle driven mechanical gateway between ejaculation and urination. The prostate is located beneath the urinary bladder with the urine passing through it. The prostatic urethra is the portion of the urethra that traverse the prostate and extends from the base to the apex. It starts from the region of bladder neck, courses roughly about 3-4 cm and becomes continuous with the membranous urethra. The prostatic urethra is a narrow fibromuscular tube that carries urine and semen from the urinary bladder and ejaculatory duct respectively to the exterior of the body. The length of the prostatic urethra is nearly about 3-4 cm[1,2,3]. The prostatic urethra is about 1.25 inch (3 cm) and begins at the neck of the bladder. The prostatic urethra is the widest and most dilatable portion of the entire urethra[4]. The prostate is traversed by the urethra, a pair of ejaculatory ducts, contains the prostatic utricle. The prostatic part of urethra goes vertically downwards and divided into proximal and distal segments of approximately equal length by an abrupt anterior angulation of its posterior wall at the midpoint between prostate apex and bladder neck. This angle deviation is roughly about 350. But it is variable and greater in men with nodular hyperplasia. The proximal segment of the prostatic urethra is well observed in an oblique coronal plane of section running along its long axis from the base of seminal colliculus to the bladder neck[5]. Proximal urethral sphincter mechanism in the preprostatic part of urethra that supports in sexual function of closing during ejaculation. If this sphincter get injured, retrograde ejaculation can be occurred. Distal urethral sphincter is visualized at the junction of prostatic and membranous part of urethra. It is horseshoe shaped, with most of the bulk lying anteriorly. It is well defined from muscle of pelvic floor[6].

With recent advances in surgical intervention and exploration for newer techniques toward investigation of the prostatic disorders requires a details knowledge regarding the anatomy of the prostate gland. Considering its clinical importance and insufficient morphological data of different age group in Bangladeshi people, the present study was accomplished. In our country, we have limited publications regarding morphological variations of the prostatic urethra. We mainly depend on foreign textbooks, publications and literatures for research purpose. We need our own standard baseline from which we can compare the morphological parameter like total length of prostatic urethra of our own population. Hence it has been considered to study the total length of prostatic urethra to observe its age-related changes in Bangladeshi people and to compare with the values of other countries.

Materials & Methods

The specimens including prostate, urinary bladder, seminal vesicle and vas deferens were collected from Bangladeshi cadaver of age ranging from 10-80 years from autopsy laboratory of the Department of Forensic Medicine of Mymensingh Medical College, Mymensingh from April to September 2015 and all the specimens of cadaver were taken from medico-legal cases. Prostate having the following criteria were excluded from the present study such as prostate of decomposed body, any injury in the prostate, prostate of congenital anomalies, patient having with prostatectomy operation, known cases of diseases affecting prostate gland. Fresh specimens from persons who died within the preceding 12 hours were selected. Each specimen was tagged by a piece of waxed cloth which bore an identifying number representing individual serial number. Then the specimens were brought to the Department of Anatomy and kept in 10% formol-saline solution for proper fixation and preservation. For convenience of differentiating the total length of prostatic urethra in relation to age, collected specimens were classified into 3 groups: Group A (up to 18 years), Group B (19-45 years) and Group C (above 45 yrs). The formalin fixed specimens were kept in the tap water overnight for washing out excess formalin to minimize the irritation of the eyes and nasal mucosa during dissection and also for softening of the tissue. After cleaning the prostate, the specimen is kept in a metallic tray. With the help of a sharp scalpel the prostate should be cleaned properly and carefully. Anteriorly, wall of the urinary bladder near the neck was felt and cut transversely along the base of prostate up to the internal urethral orifice. Posteriorly, shiny reflected peritoneal fold was identified. With the help of a forceps, scissor and BP blade peritoneal fold was traced out and separated and detached. Thus, vas deferens and seminal vesicles were well visualized and traced out. They were detached and separated from surrounding structures very carefully with the help of a sharp scalpel, BP blade, scissors and dissecting forceps very cautiously as no prostatic tissue

was cut off. The false capsule of prostate was separated. Then the prostate with true capsule, glandular parenchyma, terminal part of the vas deferens, seminal vesicles, ejaculatory duct along with prostatic urethra were washed thoroughly with normal saline water to remove the clotted blood from the specimen. After cleaning the prostate, the specimen is kept in a metallic tray. A coronal section was made which bisected the prostate and revealed the lumen of the prostatic urethra in the long axis of its entire angulated course throughout the gland extended from internal urethral orifice at the level of bladder neck upto just anterior to the apex of the prostate. Total length of prostatic urethra is measured by calculating the summation of length of proximal and distal segment of prostatic urethra. The distance from the internal urethral orifice at the level of bladder neck up to the base of verumontanum or seminal colliculus considered as the length of the proximal segment of prostatic urethra with the help of a point divider. The distance from the base of verumontanum to the distal part of the prostatic urethra just anterior to the apex of the prostate considered as the length of the distal segment of prostatic urethra.

All data were recorded in the pre-designed data sheet, analyzed by SPSS program (Version 22.0) and compared with the findings of other national and international studies and standard text books.

Results

The maximum total length of the prostatic urethra was 2.2 cm, 3.5 cm and 4 cm in Group A, B and C respectively. The minimum total length of the prostatic urethra was 0.5 cm in Group A, 1 cm in Group B and 0.9 cm Group C.

The mean (±SD) total length of the prostatic urethra was 1.50±0.54 cm, 2.55±0.61 cm and 2.72±0.83 cm in Group A, B and C respectively. It was also observed that the mean total length of the prostatic urethra was increased with age.

The maximum mean total length of the prostatic urethra was in Group C (2.72 cm) and minimum was in Group A (1.50 cm). The mean difference of total length of the prostatic urethra between Groups was statistically highly significant between Group A& B and Group A & C (where P=0.000 and 0.001) but non significant between Group B & C (where P=0.380).

All the above findings are shown in table 1

Table-I: Total Length of the Prostatic Urethra in Different Age Groups

Age Group	Number of Specimen	Total length of the Prostatic Urethra in cm Mean ± SD (Minimum – Maximum)
A (upto 18 years)	8	1.50±0.54 (0.5-2.2)
B (19 to 45 years)	41	2.55±0.61 (1-3.5)
C (above 45 years)	18	2.72±0.83 (0.9-4)

Comparison of Total Length of the Prostatic Urethra among the Age Groups

Comparison between Variables		Mean Difference	Std. Error	P	Level of Significance
A	B	-1.04634	0.23165	0.000	Highly significant
B	C	-0.17033	0.1926	0.380	Non significant
C	A	1.21667	0.3204	0.001	Highly significant

Table-I (Fig. 1) depicts that the mean (±SD) total length of the prostatic urethra was 1.50±0.54 cm, 2.55±0.61 cm, 2.72±0.83 cm in Group A, B and C respectively. It was evident from the results that the mean total length of the prostatic urethra was increased with age. Mean difference between age Groups was statistically highly significant between Group A& B and Group C & A but non significant between Group B & C.
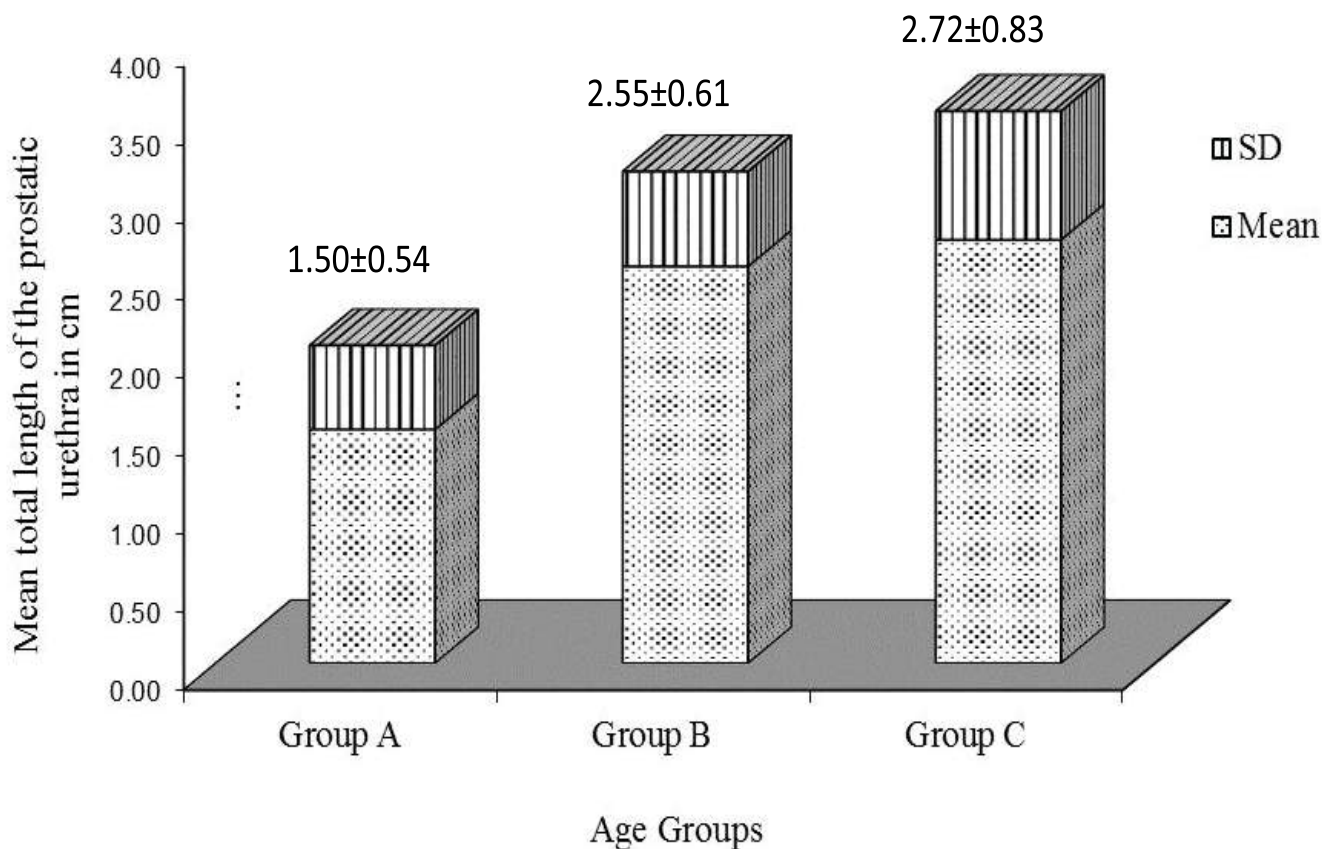

Figure 1: Bar diagram showing the mean ± SD total length of the prostatic urethra in different age groups
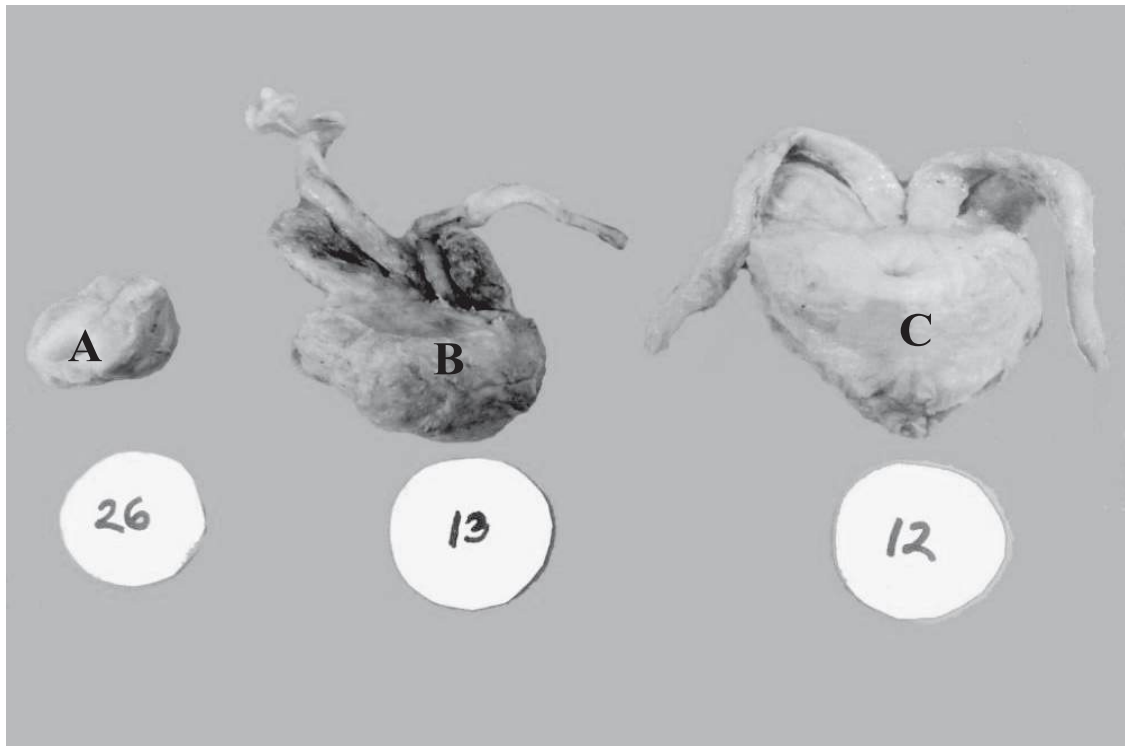
Figure 2: Photograph showing prostate of three different age groups (Here, Group A= upto 18 years, Group B= 19 to 45 years and Group C= Above 45 years)

Figure 3: Photograph showing total length of prostatic urethra
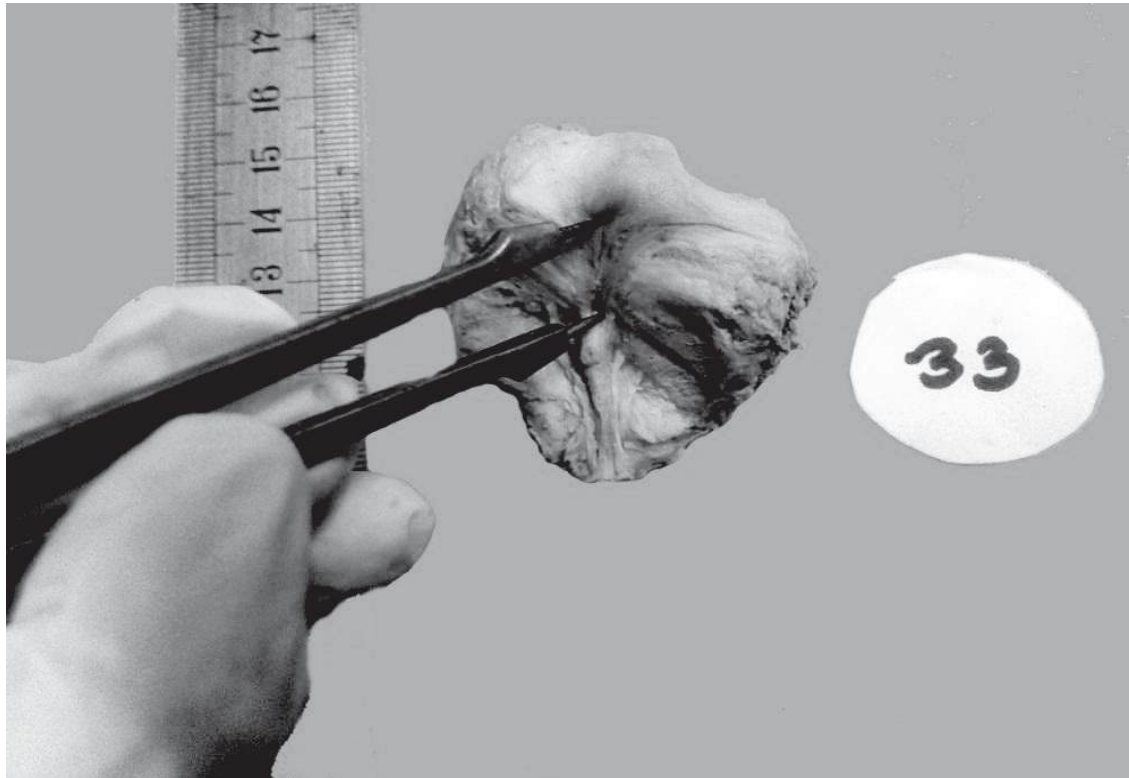
Figure 4: Photograph showing method of measuring proximal segment of the prostatic urethra
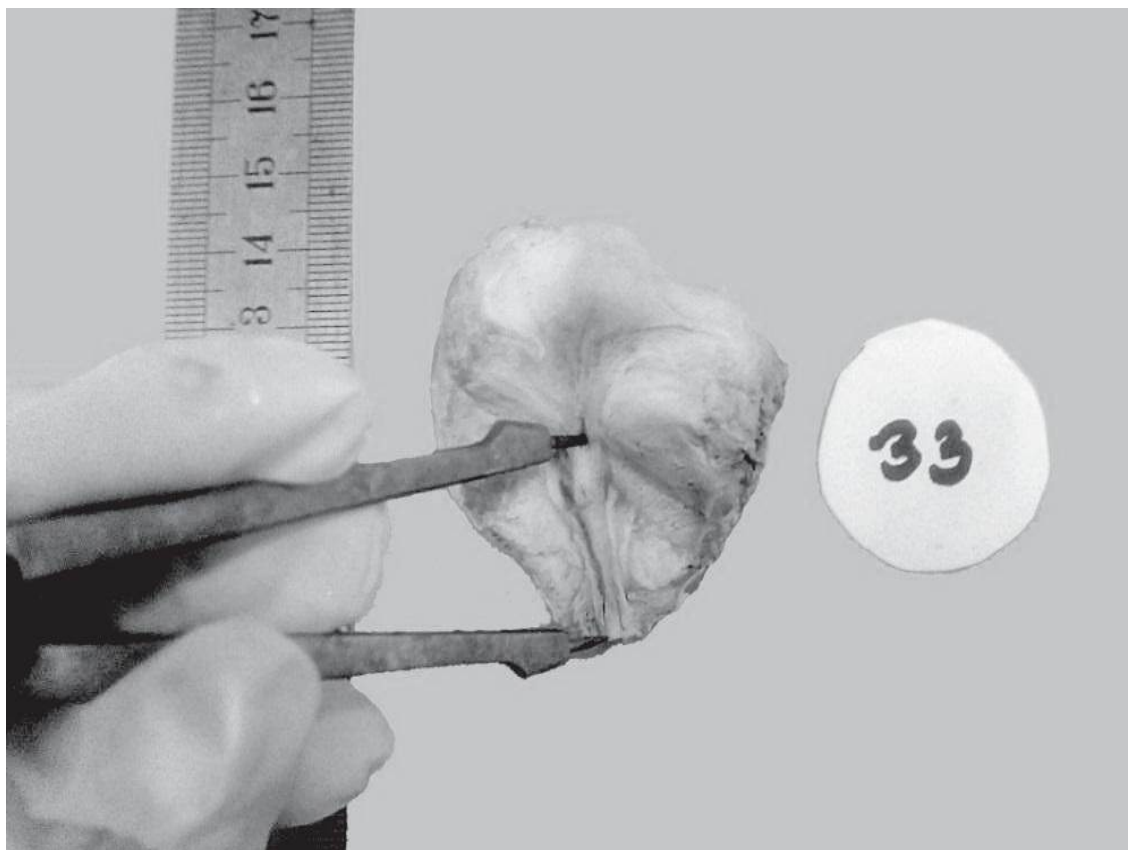

Figure 5: Photograph showing method of measuring distal segment of the prostatic urethra

Discussion

From the present study, it can be stated that the mean total length of the prostatic urethra was ranges from 1.50-2.72 cm. The mean (±SD) total length of the prostatic urethra was 1.50±0.54 cm, 2.55±0.61 cm and 2.72±0.83 cm in Group A, B and C respectively. It was also observed that the mean total length of the prostatic urethra was increased with age. The maximum mean total length of the prostatic urethra was in Group C and minimum was in Group A. The mean difference of total length of the prostatic urethra was statistically highly significant between Group A & B and Group A & C.

Hollinshed stated that the length of the prostatic urethra is about 2.4 cm[7]. Rogers & Jacob and Schenkman stated that the length of prostatic urethra is 2.5 cm[8,9]. The values were almost nearer to the result of present study in Group B. According to Snell, Kulkarni, Knipe and Bickle, Wikipedia, Free Enclycopedia the prostatic urethra is about 3 cm [4,10,11,12]. Standring et al., Sinnatamby, Ross and Pawlina stated that the prostatic urethra is 3-4 cm in length from the neck of the bladder through the prostate gland[1,2,3]. Moore, Dalley and Agur stated that the length of the prostatic urethra is 4 cm[13]. These values were higher than the results of present study. It may be due to racial and environmental factors. All the above authors did not mention the age of their study population. The western authors did not mention whether they studied on living body or cadaver. Begum observed that the mean prostatic length was 2.2 cm in Group A (10-20 years), 2.72 cm in Group B (21-40 years) and 3.32 cm in Group C (41-70 years) which were little higher than the present study in all groups[14]. Khan found that the mean length of the prostate was 2.01 cm in Group A (15-20 years), 2.59 cm in Group B (21-40 years) and 3.6 cm in Group C (41-65 years) which were higher in all Groups of the present study[15]. Ahmed observed that the mean length of prostate was 2.49 cm in Group A (10-20 years), 2.75 cm in Group B (21-40 years) and 2.89 cm in Group C (41-70 years) which were almost similar to the present study[16]. Parvez reported that the mean length of prostate was 1.450±0.128 cm in Group A (10-18 years), 2.357±0.285 cm in Group B (19-45 years) and 3.596±0.176 cm in Group C (46-70 years) which were almost similar in Group A & B and slightly higher in Group C of the present study[17].

The results of present study also stated that the maximum length of the prostatic urethra was in Group C and minimum in Group A. Different authors selected different inclusion criteria and the results are recorded in different ways - difference in age grouping, mean length or ranges, make it difficult to compare with others. Few authors did not mention whether they considered fresh or fixed specimens for the study. The racial factors and effect of fixatives were also be responsible for higher or lower values.

Conclusion

From the present study, it was concluded that maximum mean length of the prostatic urethra was in Group C and minimum in Group A. The total length of prostatic urethra was increased with age and mean difference between age Groups was statistically highly significant between Group A & B and Group C & A but non significant between Group B & C. We can come to an end that the final result of the study provide the baseline information about morphometrical data regarding prostatic urethral length which was increasing with ages of Bangladeshi people which will help in surgical and urological intervention of different prostatic diseases.

References

1. Moore, KL, Dalley, AF and Agur, AMR. Clinical Oriented Anatomy 6th ed. Baltimore: Lippincott Williams & Wilkins, A south Asian edition. 2009: 377-82.

2. Standring S et al. Gray's Anatomy. 40th ed. Churchill Livingstone: Elsevier. 2008: 1255-59.

3. Kulkarni NV. Clinical Anatomy (A problem solving approach). 2nded. New Delhi: Jaypee Brothers medical publishers LTD. 2012: 763-6.

4. Ross MH and Pawlina W. Histology: A text and atlas with correlated cell and molecular biology, 6th ed. Baltimore: Lippincott Williams and Wilkins, Wolters Kluwer India Pvt Ltd. 2011: 808-12.

5. Chaurasia BD. Human anatomy, 6th ed. Calcutta: CBS Publishers and Distributors. 2014;(2): 401-5.

6. Snell RS. Clinical Anatomy by Regions. 9th ed. Philadelphia: Wolters Kluwer (India) Pvt Ltd. 2015: 275-78.

7. Sinnatamby CS. Last's Anatomy Regional and Applied. 11th ed. Edinburgh: Churchill Living stone. 2006:309-10.

8. Rogers AW and Jacob S. Textbook of Anatomy. Edinburgh: Churchill Living stone. 1992: 648-84.

9. Ellis H. Clinical Anatomy: A revision and applied anatomy for clinical student. 11th ed. London: Blackwell Scientific Publication. 2006: 116-8.

10. Schenkman NS. Male Urethra Anatomy. Available from: emedicine. Medscape .com/article/ 1972482-overview, updated: July 2013;11.

11. McNeal JE. 1984, Anatomy of the prostate and morphogenesis of BPH, ProgClinBiol Res. 1984; 145: 28-32.

12. Wikipedia. The free encyclopedia. Human Prostate, viewed on March 28, 2015.

13. Moore KL, Dalley AF and Agur AMR. Clinical Oriented Anatomy. 6thed. Baltimore: Lippincott Williams & Wilkins, A south Asian edition. 2009:377-82.

14. Begum S. An Anatomical Study of Age Related Changes of Prostate in Bangladeshi People, Department of Anatomy, Dhaka Medical College, University of Dhaka, Bangladesh. 1990. (Thesis).

15. Khan SH. Gross and Histomorphological Study of the Prostate: an age perspective in Bangladeshi males. Department of Anatomy, Dhaka Medical College, University of Dhaka, Bangladesh. 1995. (Thesis).

16. Ahmed R. Histomorphological Study of Prostate in Bangladeshi People. Department of Anatomy, Dhaka Medical College, University of Dhaka, Bangladesh 2007. (Thesis).

17. Parvez S. Gross and Histomorphological Study of prostate in Bangladeshi people, Department of Anatomy. Dhaka Medical College, University of Dhaka, Bangladesh. 2010. (Thesis).