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Prostate Volume Measurement by Ultrasonography Over 40 Years Age of Bangladeshi Population

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Abstract

Background: Benign prostatic hyperplasia (BPH) or benign prostatic hypertrophy, is a histologic diagnosis status characterized by proliferation of the 'glandular elements' of the prostate, which may lead to an enlarged prostate gland. In many studies, people over the age of 40 years found as the most vulnerable for BPH. Ultrasonography is a prominent method to determine prostate volume or size. Aim of the study: The aim of the present study was to evaluate the prostate volume measurement for the Bangladeshi population over the age of 40 years by ultrasonography. **Methods:** This prospective, observational study was conducted in the Department of Anatomy, Chattogram Medical College Hospital, Chattogram, Bangladesh during the period from January 2019 to December 2020. In total 157 suspected patients of benign prostatic hyperplasia were selected as the study population. All patients were clinically diagnosed for BPH, based on the present prostate symptoms and digital rectal examination. To measure the prostate volume, abdominal ultrasonography was performed for all the patients. After enucleation, another ultrasonogram was performed for all the patients to measure the existing sizes of the prostates of the patients. All the data were processed, analyzed, and disseminated by MS-word and SPSS programs as per need. **Results:** Finally, in this study in analyzing the volumes of the prostates of the participants according to the abdominal ultrasonographic reports of pre-operative stage we observed, in 9%, 34%, 31%, 30%, 21% and 32% patients, the prostate sizes (In cc) were <20, 21-40, 41-60, 61-80, 81-100 and >100 cc respectively. On the other hand, after enucleation, in 11.46%, 24.20%, 28.66%, 27.39%, 7.01% and 1.27% patients, the prostate sizes (In cc) were found <20, 21-40, 41-60, 61-80, 81-100 and >100 cc respectively. The mean changes of prostate sizes between pre- and post-operative stages among the participant was not significant where the P value was found 0.464. **Conclusion:** The findings of this study support the applications of abdominal ultrasonographic evaluation for suspected benign prostatic hyperplasia patients to know about the exact volumes of their prostates for selecting the appropriate surgical approach.

Keywords:- Prostate gland, Volume, Benign prostatic hyperplasia, BPH, Ultrasonography.

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INTRODUCTION

Benign prostatic hyperplasia is a histologic diagnosis status characterized by proliferation of the 'glandular elements' of the prostate, which may lead to an enlarged prostate gland. Ultrasonography is a very widely used method to determine prostate volume or size. Benign prostatic hyperplasia (BPH), also known as prostate gland enlargement is a very common surgical problem accounting for 20% of elective admissions in the surgical wards.[1] Although BPH is diagnosable by clinical examinations, 'information about gland volume/size', presence of nodules, and 'calcification' are important for selecting the proper management.1 The decision on whether the patient requires surgery as well as the selection of the best surgical method is dependent upon the size of the prostate.[2] Ultrasonography is considered the most prominent method to determine prostate volume or size. Ultrasonography, specifically transrectal ultrasonography (TRUS), is the most commonly applied tool to estimate prostate volume.[3] The ultrasonography computes the 'total volume of the prostate by measuring the length, height as well as the width of the gland and multiplying the product by a coefficient of π/6 (0.52), which is also known as the prolate ellipsoid formula.[4] To estimate the prostate volume, the same formula can also be used in MRI (Magnetic Resonance Imaging) modalities.4 Besides these, another geometrical model is known as bullet formula (L x H x W × 5π/24) or (L x H x W × 0.65) was introduced in 2009 as a potentially superior formula for estimating prostatic volume.[5] In this study, our focus was on ultra-sonographic findings.

Objective

General Objective:

To evaluate the prostate volume measurement for Bangladeshi population over the age of 40 years by ultrasonography.

Specific Objectives

- To assess the age status of the participants.
- To assess the present signs and symptoms among the participants.

MATERIAL AND METHODS

This prospective, observational study was conducted in the Department of Anatomy, Chattogram Medical College Hospital, Chattogram, Bangladesh during the period from January 2019 to December 2020. In total 157 suspected patients of benign prostatic hyperplasia were selected as the study population. Ethical committee of the hospital approved this study. According to the exclusion criteria of this study, patients who had the history of pelvic or prostatic surgery, acute/chronic urinary retention, recurrent urinary tract infection (UTI) or bladder stones, cases with chronic or acute prostatitis within the previous 3 months and known cases of prostatic carcinoma, hypertension and diabetes mellitus (DM) were excluded from our study. All patients were clinically diagnosed for BPH, based on the present prostate symptoms and digital rectal examination. By using the transducer in a 45o C caudally angulated position, preoperative abdominal ultrasound examinations were performed with a full bladder (200-300 ml urine). To measure the prostate volume, abdominal ultrasonography was performed for all the patients. A 3.5 MHz transducer was applied to measure the width, height, and length of the prostate. After

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enucleation, another ultrasonogram was performed for all the patients to measure the existing sizes of the prostates of the patients. A pre-designed questioner has used inpatient data collection. All the data were processed, analyzed, and disseminated by MS-word and SPSS programs as per need.

RESULTS

In this study, among total 157 suspected patients of benign prostatic hyperplasia were finally enrolled as the study population. To measure the prostate volume abdominal ultrasonography was performed for all the patients. By using the transducer in a 45o C caudally angulated position, preoperative abdominal ultrasound examinations were performed with a full bladder (200-300 ml urine). A 3.5 MHz transducer was applied to measure the width, height, and length of the prostate. After enucleation, another ultrasonogram was performed for all the patients to measure the existing sizes of the prostates of the patients. The mean (±SD) age of the participants was 62.20 ± 5.14 years. The highest number of participants were found from the 61-70 year's age group which was 38%. Besides this, 24% of participants were from 51-60 years, 21% were from >70 and the rest 17% were from 41-50 year's age groups. In analyzing the signs and symptoms among the patients we found urgency, dribbling, hesitancy, acute retention, dysuria, and palpable bladder in 98%, 96%, 91%, 85%, 81% and 74% participants respectively. In this study, in analyzing the volumes of the prostates of the participants according to the abdominal ultra-sonographic reports of pre-operative stage we observed, in 9%, 34%, 31%, 30%, 21% and 32% patients, the prostate sizes (In cc) were < 20, 21-40, 41-60, 61-80, 81-100 and >100 cc respectively. On the other hand, after enucleation, in 11.46%, 24.20%, 28.66%, 27.39%, 7.01% and 1.27% patients, the prostate sizes (In cc) were found < 20, 21-40, 41-60, 61-80, 81-100 and >100 cc respectively. The mean changes of prostate sizes between pre- and post-operative stages among the participant was not significant where the P value was found 0.464.

Table 1: Demographic among the participants (N=157)

Age group	**n**	%
41-50 yrs.	27	17
51-60 yrs.	37	24
61-70 yrs.	60	38
> 70 yrs.	33	21

Table 2: Signs and symptoms among the participants (N=157)

Symptoms	**n**	%
Urgency	154	98.0
Dribbling	150	96.0
Hesitancy	143	91.0
Acute retention	134	85.0

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Dysuria	127	81.0
Palpable bladder	116	74.0

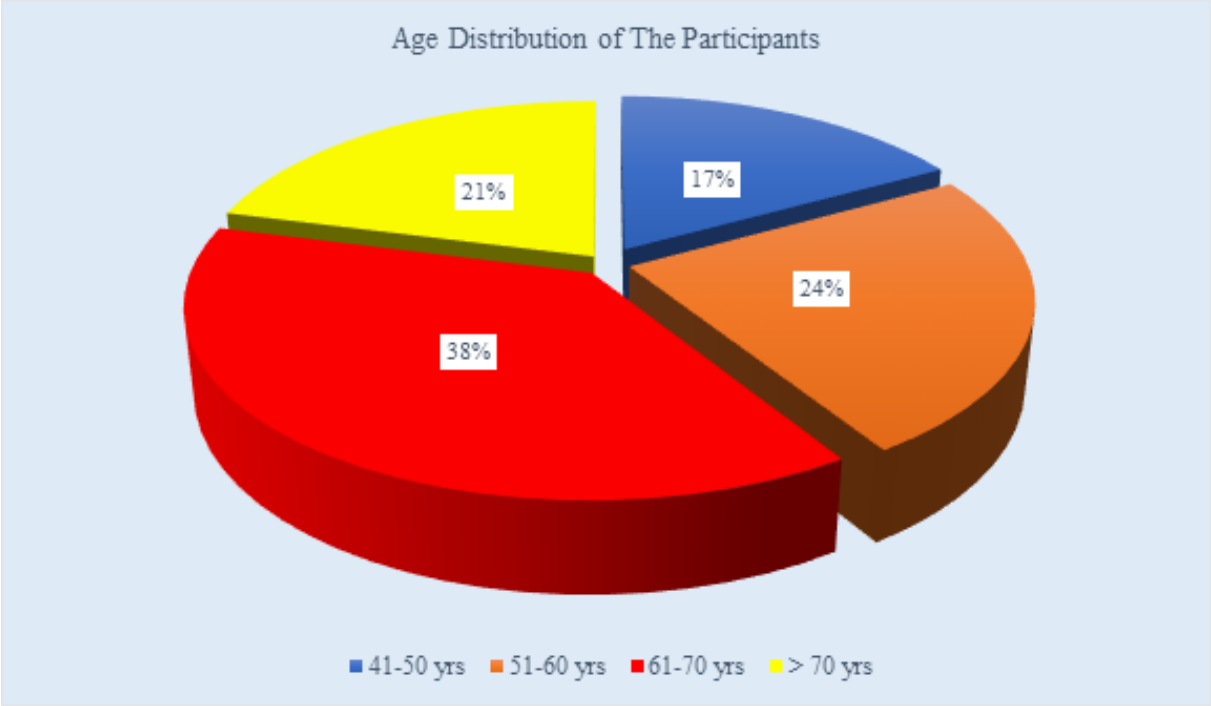

Figure 1: Age distribution of the participants (N=157)

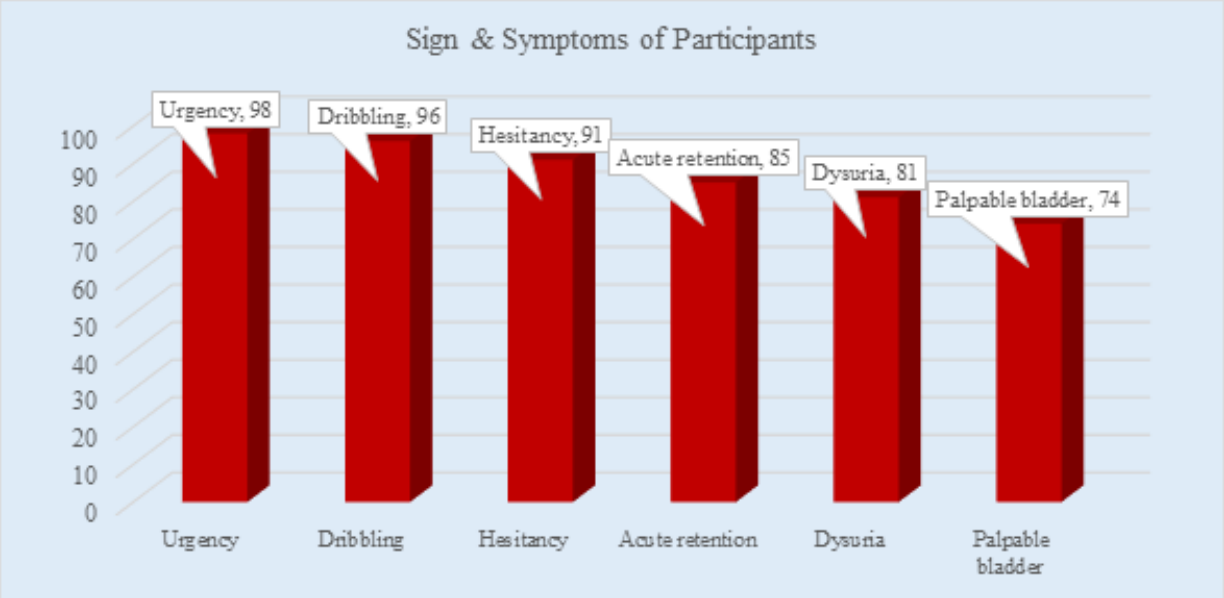

Figure 2: Sign & Symptoms of the participants (N=157)

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Table 3: Pre- and post-operative prostatic volumes measured by abdominal ultrasound (N=157)

Size (cc)	Preoperative		After enucleation		P Value
	n	%	n	%	
< 20	9	5.73	18	11.46	0.464
21-40	34	21.66	38	24.20	
41-60	31	19.75	45	28.66	
61-80	30	19.11	43	27.39	
81-100	21	13.38	11	7.01	
>100	32	20.38	2	1.27	

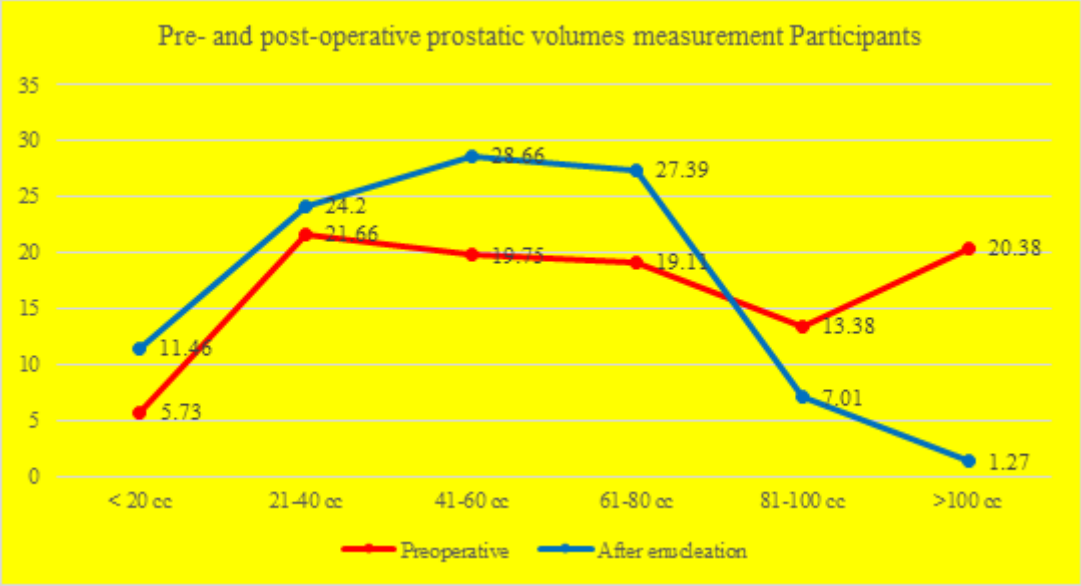

Figure 3: Pre- and post-operative prostatic volumes measurement of the participants (N=157)

DISCUSSION

The aim of the present study was to evaluate the prostate volume measurement for the Bangladeshi population over the age of 40 years by ultrasonography. The highest number of participants were found from the 61-70 year's age group which was 38%. Besides this, 24% of participants were from 51-60 years, 21% were from >70 and the rest 17% were from 41-50 year's age groups. In our study, in analyzing the volumes of the prostates of the participants according to the abdominal ultra-sonographic reports of pre-operative stage we observed, in 9%, 34%, 31%, 30%, 21% and 32% patients, the prostate sizes (In cc) were 100 cc respectively. Assessment of the size of the prostate is an important factor in the management of Benign prostatic hyperplasia (BPH).[6] In such cases abdominal ultrasonography is in need. Intravenous urography or IVU and cystoscopy are not useful at all for determining the exact prostatic size or selecting the proper surgical approach.[7] As per the recommendation of Roehrborn et al., the best predictor of prostatic weight is abdominal ultrasound (r = 0.975).[8]

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The reliability of abdominal ultrasonography in the measurement of the volumes of the prostate was also confirmed by many other studies.[9,10] In this current study, after enucleation, in 11.46%, 24.20%, 28.66%, 27.39%, 7.01% and 1.27% patients, the prostate sizes (In cc) were found 100 cc respectively. The majority of the enucleated glands weighed less than 60 gm (71.7%) suggests the procedure of choice would have been transurethral resection of the prostate (TURP).[11] Surgeons can depend upon the findings of ultrasonography in selecting the appropriate treatment method for BPH patients. The correlation coefficient in several series generally shows a statistically significant correlation between prostatic volume measured on abdominal ultrasonography and the weight of the prostate removed at surgery, indicating that it is a useful tool for selecting the appropriate surgical approach. Some studies have shown a similar correlation. Styles et al. found that abdominal estimation of prostatic volume, correlated well with the 'transrectal method', and good inter-observer agreement was found with the use of both modalities.[12] Ishida et al. demonstrated that 'abdominal measurement of prostatic volume' correlated well with the resected weight (r=0.956).[13,14]

Limitations of the study

This was a single-centered study with a small sample. Due to the limited sample size, the findings of this study might not reflect the exact scenario of the whole country.

CONCLUSIONS

The findings of this study support the applications of abdominal ultrasonographic evaluation for suspected benign prostatic hyperplasia patients to know about the exact volumes of their prostates for selecting the appropriate surgical approach. For getting more specific information regarding this issue we would like to recommend conducting more studies in several places with larger sample sizes.

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