Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Volume 3, Issue 2 (2025)

Online ISSN 3007-1941
Print ISSN 3007-1933

https://msra.online/index.php/Journal/about

Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Volume 3, Issue 2 (2025)

# Ultrasonographic Assessment Of Urinary Bladder Characteristics With Benign Prostatic Hyperplasia

Aqsa Tariq[1], Muhammad Faisal Nazir[2], Aroosa Manazir[3], Anisa Iftikhar[4*], Asim Ali[5], Nusrat Ul Hasnain[6], Syed Sami Ahmad[7], Samar Bukhari[8], Sibtain Ahmad[9]

## Article Details

**Keywords**: Ultrasonic, Urinary Bladder, Prostatic Hyperplasia

**Aqsa Tariq**
Department of Allied Health Sciences, Superior University Lahore, Sargodha Campus, Pakistan
**Muhammad Faisal Nazir**
Department of Allied Health Sciences, University of Lahore, Pakistan
**Aroosa Manazir**
Department of Allied Health Sciences, Superior University Lahore, Sargodha Campus, Pakistan
**Anisa Iftikhar***
Department of Biology, Clarkson University, Potsdam, USA. Corresponding Author Email: iftikha@clarkson.edu
**Asim Ali**
Department of Allied Health Sciences, University of Lahore, Pakistan
**Nusrat Ul Hasnain**
Department of Allied Health Sciences, University of Lahore, Pakistan
**Syed Sami Ahmad Samar Bukhari**
Department of Allied Health Sciences, Superior University Lahore, Sargodha Campus, Pakistan
**Sibtain Ahmad**
Center for Advanced Studies Agriculture and Food Security (CAS-AFS), University of Agriculture, Faisalabad, Pakistan. dr_sibtainhmd6@uaf.edu.pk

## ABSTRACT

This study aims to determine ultrasonographic assessment of urinary bladder characteristics with begin prostatic hyperplasia. Methodology: The study was performed at university clinic green town, Lahore. We use descriptive study project to collect the data. A standardize questionnaire was used to collect the data of 136 participants were interviewed. This study included data of the 136 participants, in which 22 (16.2%) patients had vesicle calculus, 31 (22.8%) patients had VUJ calculus, 37 (27.2%) patients had urinary bladder echoes, 63 (46.3%) patients had cystitis and 123 (90.4%) patients had BPH.123 BPH patients, 33 patients had urinary bladder echoes and 90 patients had no urinary bladder echoes. Out of 136 patients, 13 patients had no BPH in which 4 patients had urinary bladder echoes. Out of 123 BPH patients, 20 patients had vesicle calculus and 103 patients had no vesicle calculus Out of 136 patients, 13 patients had no BPH in which 2 patients had vesicle calculus. Out of 123 BPH patients, 27 patients had VUJ calculus and 96 patients had no VUJ calculus. Out of 136 patients, 13 patients had no BPH in which 2 patients had VUJ calculus. It may conclude that ultrasound has been proven to diagnose early prostatic enlargement and other prostate related pathologies, BPH is the most common pathology in age between 50 to 60 years and urinary bladder out flow obstruction were common in age between 25to 35 respectively.

## INTRODUCTION

Benign prostatic hyperplasia (BPH) refers to the nonmalignant growth or hyperplasia of prostate tissue and is a common cause of lower urinary tract symptoms in men. Disease prevalence has been shown to increase with advancing age. Indeed, the histological prevalence of BPH at autopsy is as high as 50% to 60% for males in their 60's, increasing to 80% to 90% of those over 70 years of age [1]. These include bladder outlet obstruction (BOO), lower urinary tract symptoms (LUTS), and benign prostatic enlargement (BPE). BPH describes the histological changes, benign prostatic enlargement (BPE) describes the increased size of the gland (usually secondary to BPH) and bladder outlet obstruction (BOO) describes the obstruction to flow.2Those with BPE who present with BOO are termed benign prostatic obstruction [2]. Lower urinary tract symptoms (LUTS) simply describe urinary symptoms shared by disorders affecting the bladder and prostate (when in reference to men). LUTS can be subdivided into storage and voiding symptoms. These terms have largely replaced those historically termed "prostatism" [3].

The etiology of BPH is influenced by a wide variety of risk factors in addition to direct hormonal effects of testosterone on prostate tissue. Although they do not cause BPH directly, testicular androgens are required in the development of BPH with dihydrotestosterone (DHT) interacting directly with prostatic epithelium and stroma. Testosterone produced in the testes is converted to dihydrotestosterone (DHT) by 5-alpha-reductase 2 in prostate stromal cells and accounts for 90% of total prostatic androgens. DHT has direct effects on stromal cells in the prostate, paracrine effects in adjacent prostatic cells, and endocrine effects in the bloodstream, which influences both cellular proliferation and apoptosis (cell death) [4-10].

More than 32 million men worldwide have symptoms related to BPH and BPH affects more than 50% of men over the age of 60 years and as many as 90% of men over the age of 70 years . BPH is a benign disease of the prostate gland and consists of nodular hyperplasia of the fibrous, muscular, and glandular tissue within the periurethral and transition zones. The exact pathophysiology of BPH is still unknown but it is probably associated with hormonal changes that occur as men age [5-12].

BPH appears in TRUS as an echogenic and non-mobile mass. TRUS is mainly used to assess prostate volume, which is crucial for therapeutic strategies. Prostate volume can be estimated by serial planimetry, orthogonal plane, rotational body (single plane, ellipsoid) and three-dimensional methods. Step-section planimetry is assumed to be the most accurate method of determining prostate volume, but it is time consuming and requires cumbersome special equipment. One-dimensional measurements are preferable in the clinic. The prolate ellipsoid formula, multiplying the largest anterioposterior (height), transverse (width) and cephalocaudal (length) prostate diameters by 0.524 (H W L /6) is probably the most commonly used method, since it is rapid, reproducible, and has been shown to have high correlation with the actual prostate volume [6-11].

Background knowledge of normal renal variants may help in the diagnosis of the kidney disease. Renal variants variation may occur in many conditions. Renal variants are also influenced by age, gender, height and the weight of the individual. The renal size of 9cm is normal and acceptable. Renal length is related to gender body weight and height being higher in males.16 The left kidney is larger than right one independent of gender. The renal length and the renal functions are dependent of each other [7-14].

The ultrasonic kidney examination doesn't need patient's preparations & frequently carried out

by patient in supine pose. Kidneys are checked in longitudinal & crosswise examine plane by transducer positioned in sides. While renal insonation is covered through intestinal air, supine examine pose is united by lateral decubitus situation by dorsal transducer moved. Rather, examination is commenced in longitudinal examine plane, analogous to protracted renal diameter as kidneys are easier to differentiate. Curved range transducer among center frequencies of 3 to 6 MHz is used in adult patients [8].

The "reference standard" for detecting bladder outlet obstruction is the pressure-flow study (PFS). However, this diagnostic tool proves to be invasive, expensive and tedious to perform. Therefore, in daily clinical practice, free uroflowmetry, post-void residual volume and prostatic volume are used to estimate bladder outlet obstruction in BPH.27 Several non-invasive tools involving morphological assessments of the prostate gland, particularly, have been shown to correlate well with PFS in detecting patients with bladder outlet obstruction. Interestingly, there is growing evidence that in bladder outlet obstruction involving men with BPH, alterations in the bladder detrusor muscle play a major role in causing symptomatic LUTS, rather than the prostate itself [9].

Study aims to determine ultrasonographic assessment of urinary bladder characteristics with begin prostatic hyperplasia.

## MATERIALS & METHODS

### STUDY DESIGN

It was a descriptive study which was completed in 4 months after approval of synopsis. Sample size about 13640. Convenient sampling technique was used

### SETTINGS

The study was conducting at University Clinic green town, Lahore.

### INCLUSION CRITERIA

The inclusive criteria for the study encompassed males diagnosed with Benign Prostatic Hyperplasia (BPH) experiencing urinary retention, burning micturition, bilateral flank pain, urethritis, and cystitis. These specific conditions were vital for participant selection, ensuring a focused investigation into the interplay between these symptoms and potential treatment outcomes within the context of the study.

### EXCLUSION CRITERIA

Patients with urethral stricture, operated from the prostate or bladder, neurogenic bladder.

### EQUIPMENT

The ultrasound machines of Mindray Z5 and Toshiba xario 100 with convex probe of 7.5-11MHz was used.

### SCANNING TECHNIQUE:

The scanning criteria employed in the study involved patients positioned supine with a full bladder for the prostate scan. Utilizing a convex array probe operating at 3-5 MHz, the probe was angled approximately 30 degrees caudally, using the bladder as a window with slight compression to ensure clear visualization of the inferior portion of the prostate without obstruction from shadow artifacts at the base of the bladder. Images were captured in both sagittal and axial views, and the prostate volume was quantified using machine settings based on measurements of length, width, and depth. These specific scanning protocols were crucial in achieving accurate and consistent imaging results for the study's evaluation.

### DATA COLLECTION PROCEDURE

After getting the ethical approval from the hospital ethical committee patients was recruited in

the study keeping in mind the inclusion and exclusion criteria. Informed consent was taken from each study participants and all possible benefits and expected risks. Basic demographic and clinical information will be noted down on a pre-designed data collection sheet by the researcher himself. Ultrasonography was performed using Toshiba Aplio 200 equipment and the prostate ultrasound scanned with a curvilinear array (03-05 MHZ) transducer. Wear comfortable, loose-fitting clothing. Patient may need to change into a gown for the procedure. Patient lie on bed and open examination area, Two examinations of each subject were performed by one examiner using the same ultrasound scanned Five different calculation algorithms were used on the frozen ultrasound pictures: the prolate ellipsoid method based on the formula: volume = length x width x height x 0.52 on two dimensions; the double area method based. For urinary retention we examined the patient with full bladder and take three measurement and after urination take post void volume.

## RESULTS

### VESICLE CALCLUS

| | Frequency | Percent |
|---|---|---|
| NO | 114 | 83.8 |
| YES | 22 | 16.2 |
| Total | 136 | 100.0 |

Table 1: Total numbers of 136 patients were included in which 22 (16.2%) patients had vesicle calculus.

### VUJ CALCULUS

| | Frequency | Percent |
|---|---|---|
| **NO** | 105 | **77.2** |
| **YES** | 31 | **22.8** |
| **Total** | **136** | **100.0** |

Table 2: Total numbers of 136 patients were included in which 31 (22.8%) patients had VUJ calculus.

### URINARY BLADDER ECHOES

| | Frequency | Percent |
|---|---|---|
| **NO** | 99 | **72.8** |
| **YES** | 37 | **27.2** |
| **Total** | **136** | **100.0** |

Table 3: Total numbers of 136 patients were included in which 37 (27.2%) patients had urinary bladderechoes

### BLADDER WALL THICKNESS /CYSTITIS

| | Frequency | Percent |
|---|---|---|
| **Cystitis** | 63 | **46.3** |
| **Normal** | 73 | **53.7** |

| | | |
|---|---|---|
| **Total** | **136** | **100.0** |

Table 4: Total numbers of 136 patients were included in which 63 (46.3%) patients had cystitis.

| **Benign Prostate Hyperplasia** | | |
|---|---|---|
| | **Frequency** | **Percent** |
| **No** | 13 | **9.6** |
| **Yes** | 123 | **90.4** |
| **Total** | **136** | **100.0** |

Table 5: Total numbers of 136 patients were included in which 123 (90.4%) patients had BPH.

| | | **Frequency** | **Percent** |
|---|---|---|---|
| **Benign prostate hyperplasia** | No | 13 | 9.6 |
| | Yes | 123 | 90.4 |
| **Vesicle calculus** | NO | 114 | 83.8 |
| | YES | 22 | 16.2 |
| **VUJ calculus** | NO | 105 | 77.2 |
| | YES | 31 | 22.8 |
| **Urinary bladder echoes** | NO | 99 | 72.8 |
| | YES | 37 | 27.2 |
| **Urinary bladder echoes** | Cystitis | 63 | 46.3 |
| | Normal | 73 | 53.7 |

Total numbers of 136 patients were included in which 22 (16.2%) patients had vesicle calculus, 31 (22.8%) patients had VUJ calculus, 37 (27.2%) patients had urinary bladderechoes, 63 (46.3%) patients had cystitis, 123 (90.4%) patients had BPH.

| | | **BPH** | | **Total** |
|---|---|---|---|---|
| | | **No** | **Yes** | |
| **Vesicle Calculus** | NO | 11 | 103 | **114** |
| | YES | 2 | 20 | **22** |
| **Total** | | **13** | **123** | **136** |

Table 12: Total numbers of 136 patients were included in which out of 123 BPH patients, 20 patients had vesicle calculus and 103 patients had no vesicle calculus Out of 136 patients, 13 patients had no BPH in which 2 patients had vesicle calculus.

## DISCUSSION

BPH is a progressive disease and it is the main cause of LUTS in elderly men. According to a multinational registry, Asian men with BPH usually present with LUTS, along with sexual dysfunction. Out of 136 BPH patients, 33 patients had urinary bladder echoes and 90 patients had no urinary bladder echoes. Out of 136 patients, 13 patients had no BPH in which 4 patients had urinary bladder echoes. Out of 123 BPH patients, 20 patients had vesicle calculus and 103 patients had no vesicle calculus Out of 136 patients, 13 patients had no BPH in which 2 patients had vesicle calculus. Out of 123 BPH patients, 27 patients had VUJ calculus and 96 patients had no VUJ calculus.

Out of 136 patients, 13 patients had no BPH in which 2 patients had VUJ calculus.40According to another study [15] in there was positive but weak correlation between prostate volume and IPSS grading. [16] showed no relationship between prostate size and IPSS score. In results of our study, post void and prevoid in which minimum post void were 10 ml and maximum post void was 229 ml, minimum prevoid was 122 ml and maximum prevoid was 652 ml [17]. In our study, only BWT was significantly related to AUR incidence on univariate analysis. DT was not shown to be significant. The measurements were made of anterior bladder wall at various points. Whether this actually represented the thickness of the entire bladder wall is debatable. Furthermore, we still do not know the cut-off value of BWT or DT for Asian men and for that matter, the range of bladder volume deemed to be adequate for the measurement of bladder thickness [18].

According to [19] the most important consideration for guessing obstruction is peak flow rate (Qmax). If the Qmax is above 10 ml/sec, the obstruction is approximately 90% and if the Qmax is between 10-14 ml/sec then the obstruction is approximately 67% obstruction and if the Qmax is above 15 ml/sec there is only 30% of obstruction. Huge post-void residual volume of above 350 ml suggests bladder dysfunction and somewhat below may respond to appropriate treatment. Huge post-void residual volume might exaggerate progression of disease [20]. This study [21] suggested that urinary retention could be due to larger gland and no statistical significance was found between post-void residual volume and size of prostate gland, suggested that the active component of prostate obstruction could be significant in causing urinary retention. Post-void volume less than 150 ml should be considered unreliable.

A recently published study of 102 men with clinical BPH found a positive predictive value of DWT measurements of 89% using a cutoff value of 2.5 mm and 100% using a cutoff value of 2.9 mm [22]. Both studies demonstrated that the diagnostic accuracy of BOO detection is higher with DWT measurements than with free uroflowmetry, postvoid residual urine, or prostate volume. A third study in which bladder wall thickness (instead of DWT) at a bladder filling volume of 150 ml was measured in 174 men with LUTS found a positive predictive value of 88%. In results of our study, post void and prevoid in which minimum post void were 10 ml and maximum post void was 229 ml, minimum prevoid was 122 ml and maximum prevoid was 652 ml [23].

Seong Jin Park et al., 2008 evaluated the usefulness of sonography as an initial diagnostic tool in patients with suspected VUJ calculus. We performed a prospective study of 318 patients with VUJ stone and found urolithiasis with sonography in 291 of 296 patients with confirmed VUJ. Finding of their study support our results where, 4.5% had right sided VUJ stone, 8.7% had left sided VUJ stone [27]. In result of our study, out of 136 patients, 27 patients had VUJ calculus and 96 patients had no VUJ calculus [24].

In another study, Kanno et al showed that the stone sizes detected by US were almost the same as those detected by NCCT.7 Similarly, in their study, about 73% concordance obtained for the vesicle calculus confirms the reliability of the stone size measurement by US and suggests that US might be adequate and worth performing. In result of our study, out of 136 patients, 13 patients had no BPH in which 2 patients had vesicle calculus. Out of 123 BPH patients, 27 patients had VUJ calculus and 96 patients had no VUJ calculus [26,28, 29].

## CONCLUSION

Ultrasound has been proven to diagnose early prostatic enlargement and other prostate related pathologies, BPH is the most common pathology in age between 50 to 60 years and urinary

bladder out flow obstruction were common in age between 25to 35

**REFERENCES**

1. Ho CC, Ngoo KS, Hamzaini AH, Rizal AM, Zulkifli MZ. Urinary bladder characteristics via ultrasound as predictors of acute urinary retention in men with benign prostatic hyperplasia. Clin Ter. 2014 Mar 1;165(2):75-81.
2. Ahmed AF. Sonographic parameters predicting the outcome of patients with lower urinary tract symptoms/benign prostatic hyperplasia treated with alpha1-adrenoreceptor antagonist. Urology. 2016 Feb 1;88:143-8.
3. Neill MG, Gilling PJ, Kennett KM, Frampton CM, Westenberg AM, Fraundorfer MR, Wilson LC. Randomized trial comparing holmium laser enucleation of prostate with plasmakinetic enucleation of prostate for treatment of benign prostatic hyperplasia. Urology. 2006 Nov 1;68(5):1020-4.
4. Calogero AE, Burgio G, Condorelli RA, Cannarella R, La Vignera S. Lower urinary tract symptoms/benign prostatic hyperplasia and erectile dysfunction: from physiology to clinical aspects. The Aging Male. 2018 Oct 2;21(4):261-71.
5. Eze BU, Mbaeri TU, Orakwe JC. Anterior Bladder Wall Thickness, Post-Void Urine Residue, and Bladder Emptying Efficiency as Indicators of Bladder Dysfunction in Nigerian Men with Benign Prostatic Hyperplasia. Nigerian Journal of Clinical Practice. 2020 Sep 1;23(9):1215-.
6. Zhong J, Feng Z, Peng Y, Liang H. A systematic review and meta-analysis of efficacy and safety following holmium laser enucleation of prostate and transurethral resection of prostate for benign prostatic hyperplasia. Urology. 2019 Sep 1;131:14-20.
7. Bilal A, Ansari MS. Prevalence and severity of epilepsy in district Chiniot, Pakistan. Occup Med Health Affairs. 2021;9(3).
8. Cazzuli G, Damián JP, Molina E, Pessina P. Post- castration prostatic involution: A morphometric and endocrine study of healthy canines and those with benign prostatic hyperplasia. Reproduction in Domestic Animals. 2022 Feb;57(2):157-64.
9. Eze BU, Ani CO, Mbaeri TU. Is intravesical prostatic protrusion associated with more complications in benign prostatic hyperplasia patients?. LUTS: Lower Urinary Tract Symptoms. 2021 Oct;13(4):468-74.
10. Bilal A. Impacts of depression on pregnancy: A review. Occup Med Health Aff. 2021;9(2).
11. Rastrelli G, Cipriani S, Lotti F, Cellai I, Comeglio P, Filippi S, Boddi V, Della Camera PA, Santi R, Boni L, Nesi G. Testosterone does not affect lower urinary tract symptoms while improving markers of prostatitis in men with benign prostatic hyperplasia: a randomized clinical trial. Journal of Endocrinological Investigation. 2022 Mar 17:1-3.
12. Bilal A, Tanvir F, Ahmad S, Azam AR, Qasim M, Zafar H, Tanvir F. Therapeutical evaluation of bioactive compounds of Nigella sativa for HER2-positive breast cancer treatment. Journal of Population Therapeutics & Clinical Pharmacology. 2024;31(9):3149-64.
13. Peyronnet B, Seisen T, Phe V, Misrai V, de la Taille A, Roupret M. Lower urinary tract symptoms related to benign prostatic hyperplasia and erectile dysfunction: A systematic review. Presse Medicale (Paris, France: 1983). 2016 Oct 10;46(2 Pt 1):145-53.
14. Rana YP, Swami YK. A prospective study on the correlation between clinical outcome and residual prostatic adenoma weight ratio after transurethral resection of the prostate

for benign prostatic hyperplasia. International Surgery Journal. 2022 Jan 29;9(2):438-43.
15. Bilal A, Bibi R, Umar M, Sajjad A, Kharal S, Noor E, Fatima K, Munir A. The relationship between obesity and breast cancer among women of Punjab, Pakistan. The Research of Medical Science Review. 2025;3(2):668-84.
16. Andersson KE. Erectile physiological and pathophysiological pathways involved in erectile dysfunction. The Journal of urology. 2003 Aug 1;170(2):S6-14.
17. Calogero AE, Burgio G, Condorelli RA, Cannarella R, La Vignera S. Lower urinary tract symptoms/benign prostatic hyperplasia and erectile dysfunction: from physiology to clinical aspects. The Aging Male. 2018 Oct 2;21(4):261-71.
18. Schmidt VF, Schirren M, Heimer MM, Kazmierczak PM, Cyran CC, Wildgruber M, Seidensticker M, Ricke J, Solyanik O. Semi-Automatic MRI Feature Assessment in Small-and Medium-Volume Benign Prostatic Hyperplasia after Prostatic Artery Embolization. Diagnostics. 2022 Feb 25;12(3):585.
19. Shimizu S, Tsounapi P, Shimizu T, Honda M, Inoue K, Dimitriadis F, Saito M. Lower urinary tract symptoms, benign prostatic hyperplasia/benign prostatic enlargement and erectile dysfunction: are these conditions related to vascular dysfunction?. International Journal of Urology. 2014 Sep;21(9):856-64.
20. Romanelli F, Sansone A, Lenzi A. Erectile dysfunction in aging male. Acta Biomed. 2010;81(Suppl 1):89-94.
21. Habib E, Abdallah MF, ElSheemy MS, Badawy MH, Nour HH, Kamal AM, AbdelMohsen M, Roshdy MA, Meshref A. Holmium laser enucleation versus bipolar resection in the management of large- volume benign prostatic hyperplasia: A randomized controlled trial. International Journal of Urology. 2022 Feb;29(2):128-35.
22. Bilal A. Clinical diagnosis and treatment of absence seizures: Case study. MAR Ophthalmology. 2021;2(1).
23. Wang X, Su Y, Yang C, Hu Y, Dong JY. Benign prostatic hyperplasia and cardiovascular risk: a prospective study among Chinese men. World Journal of Urology. 2022 Jan;40(1):177-83.
24. Akram A, Shahin F, Asif I, Bilal A, Abbas KJ, Younas E. EXPLORING THE ROLE OF GUT BACTERIA IN DIGESTIVE SYSTEM OF COW. Journal of Medical & Health Sciences Review. 2025 May 8;2(2).
25. Bilal A. Rabies is a zoonotic disease: a literature review. Occup. Med. Health Aff. 2021;9(2).
26. Ferré- Dolcet L, Frigotto L, Contiero B, Bedin S, Romagnoli S. Prostatic fluid composition and semen quality in dogs with benign prostatic hyperplasia undergoing treatment with osaterone acetate. Reproduction in Domestic Animals. 2022 Jan;57(1):72-9
27. Verze, Paolo, Tommaso Cai, and Stefano Lorenzetti. "The role of the prostate in male fertility, health and disease." Nature Reviews Urology 13.7 (2016): 379.
28. Mulhall, J. P. (2013). Saving your sex life: A guide for men with prostate cancer. CIACT.
29. Kemei, William Kipchirchir. Prostate disorders and prostate specific antigen (PSA) levels among patients above 50 years of age at Moi Teaching and Referral Hospital Eldoret. Diss. Moi University, 2014

## SUPPORTING FIGURES DIAGRAMS

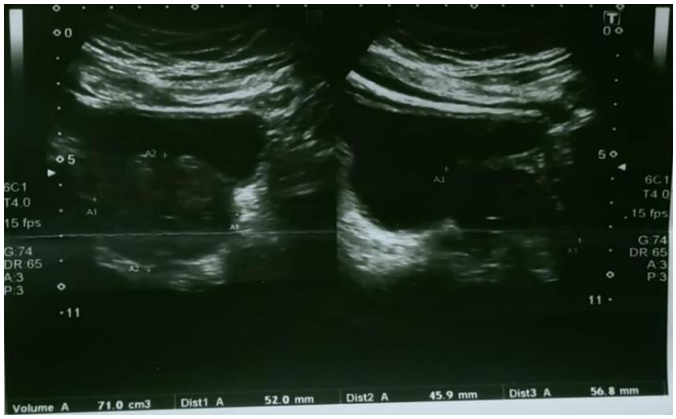
**IMAGE 01**


USG image shows BPH in 43 years old patient (56 grams)

**IMAGE 02**


USG image shows BPH in 43 years old patient (33.5 grams)

**IMAGE 03**

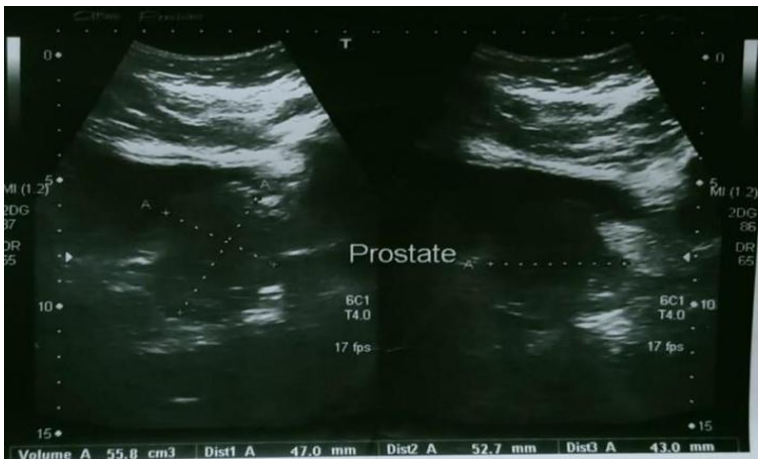



USG image shows BPH in 87 years old patient (71 grams)

**IMAGE 04**

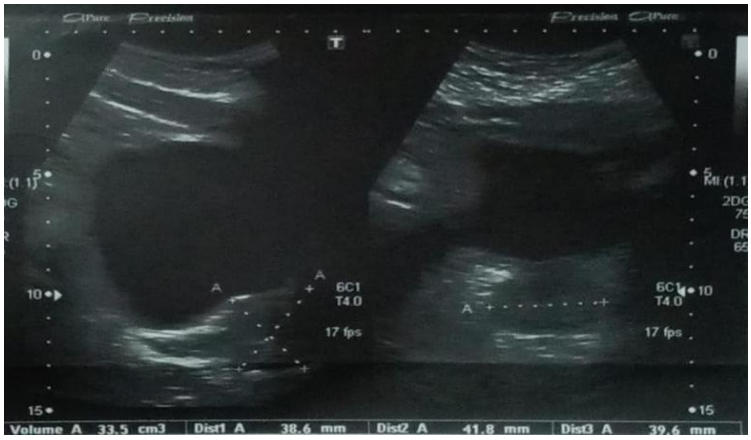

USG image shows BPH in 58 years old patient (56.5 grams)

**IMAGE 05**




USG image shows BPH in 66 years old patient (55.8 grams)

**IMAGE 06**




USG image shows BPH in 81 years old patient (33.5 grams)