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**Research Article**

# Correlation of sonographic prostate volume with international prostate symptom score in South Indian men

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## ABSTRACT

**Background:** Benign prostatic hyperplasia (BPH) is a common disease in old age individuals, usually starts around the age of 40 years, the prevalence of benign prostatic hyperplasia rises to more than 50% at 50 years of age to as much as 90% at the age of 85 years. Proven BPH patients suffer from moderate to severe lower urinary tract symptoms (LUTS) that are symptoms related to storage and voiding of urine. This study was to determine relationship between sonologically measured prostate Volume and international prostate symptom score (IPSS).
**Methods:** Clinically symptomatic 126 patients in the age group of 40-89 years were studied. All the patients underwent Transabdominal sonography for the estimation of prostate volume and clinical questionnaire for international prostate symptom score. Statistical Analysis by descriptive and analytical statistics using SPSS version 16. Chi-Square test used and P values $\leq 0.05$ was considered to be statistically significant.
**Results:** Among 126 individuals, The maximum number of patients, that is 45 patients had the prostate volume measuring 31-50 cc (35.7%), followed by 25 patients (19.8%) had the volume measuring more than 50 cc. Maximum number of patients 52 (41.3%) were having severe symptoms, 47 (37.3%) patients were having moderate symptoms and 27 patients symptoms and 27 patients (21.4%) were having mild symptoms. Prostate volume had statistically significant but weak correlation observed with IPSS (r=0.40, p=0.001), Weak Stream (r=0.31, p=0.001) and urgency (r=0.31, p=0.001).
**Conclusions:** Prostate volume had statistically significant but weak correlation observed with IPSS.

**Keywords:** Prostate volume, Prostate ultrasonography, Benign prostatic hyperplasia, International prostate symptom score

## INTRODUCTION

Benign prostatic hyperplasia (BPH) can be defined as documentable gross or histologic growth of prostate glandular tissues, stromal tissues, or both. Usually beginning around the age of 40 years, the prevalence of benign prostatic hyperplasia rises to more than 50% at 50 years of age to as much as 90% at the age of 85 years. As life expectancy increases, benign prostatic hyperplasia will be a significant cause of morbidity. About 50% of men with histologically proven BPH have moderate to severe lower urinary tract symptoms (LUTS) that are symptoms related to storage and voiding of urine.[1]

The severity of lower urinary tract symptoms can be estimated by the International Prostate Symptoms Score (IPSS). This scoring system uses a seven point questionnaire with maximum total attainable score of 35

to assess baseline patient discomfort. IPSS is also a useful tool for follow up of patient's symptoms over time.[2]

The measurement of prostatic volume by ultrasonography is a readily available method that can be undertaken to aid decision making. Trans abdominal sonography is easy to perform, and provides reliable measurements of prostate size and its intravesical extension, post-void residual volume, also allowing simultaneous assessment of bladder and upper urinary tract.[3]

Prostatic volume is an important determinant for selecting the treatment, with surgeons preferring open resection for larger prostatic volumes.[1] The purpose of the present study is to determine the relation between sonographically determined prostate volumes and International Prostate Symptoms Score.

## METHODS

The present study was a prospective cohort observational study. The study was approved by Institute Ethical Committee and procedures followed in this study are in accordance with the ethical standard laid down by ICMR's ethical guidelines for biomedical research on human subjects (2006). A written informed consent was obtained from all the patients who participated in the study after explaining the patient's diagnosis, the nature and purpose of the study.

There were 126 individuals in the age group of 40-89 years (mean age of 65.06 years) with lower urinary tract symptoms. All the patients underwent Transabdominal sonography for the estimation of prostate volume and basic laboratory investigation including prostate specific antigen levels in blood. The patients with proven prostatic carcinoma, serum Prostate Specific Antigen levels above 10 ng/ml. and who have undergone previous prostatic surgery were excluded from the study. The International prostate symptom

Score (IPSS) was obtained by clinical questionnaire and personnel interview with the patient, prior to treatment on the following symptoms which they experienced over the past one month. 1) Incomplete emptying 2) Frequency 3) Intermittency 4) Urgency 5) Weak stream 6) Straining 7) nocturia 8) Bothersome score and Quality of life due to urinary symptoms.

The prostate gland was evaluated trans abdominally after adequate bladder distension. The prostate gland assessed for volume, echo texture, morphology, focal lesions and median lobe parenchymal calcification.. Parenchymal Calcifications The prostate volume was calculated by using Prolate ellipsoid formula Antero-posterior x Transverse x Cranio-caudal x 0.52.The grading of the prostate gland enlargement was done as follows[4] Grade – I- 21 – 30 cc. Grade – II - 31 – 50 cc Grade – III – 51 – 80 cc and Grade – IV – 80 cc and above. The median lobe enlargement was measured separately by obtaining both in longitudinal and transverse planes. The median lobe volume was added to the total prostatic gland volume. The urinary bladder was assessed for various abnormalities like prevoid urine volume, wall thickness, mucosal regularity, calculi, diverticuli, tumor and post void assessment for the residual urine.

***Statistical analysis:***

Statistical analyses were performed by statistics software; SPSS 16 (Chicago, USA). Descriptive statistics was used to provide an overview of sociodemographic profile of the study population. Chi-Square / Fisher exact test was employed to estimate the association between two variables. Spearman correlation coefficient for categorical data and Pearson's correlation coefficient analysis for continuous variables was carried out to assess correlation between prostate volume and other variables. P values $\leq$ 0.05 was considered to be statistically significant for all tests.

## RESULTS

The mean age of patients was 65.06 ± 9.06 years and the age ranged from 40 to 89 years with interquartile range - 58, 65, 72. The maximum number of patients in the sixth decade constituted 35.7% followed by 31.7% of patients in seventh decade.

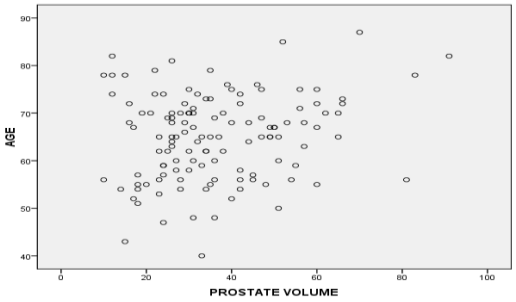


**Figure 1: Correlation between age and prostate volume.**

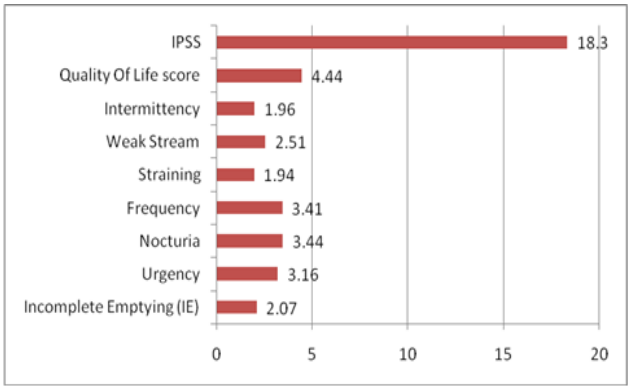


**Figure 2: Mean frequency of presentation of clinical features.**

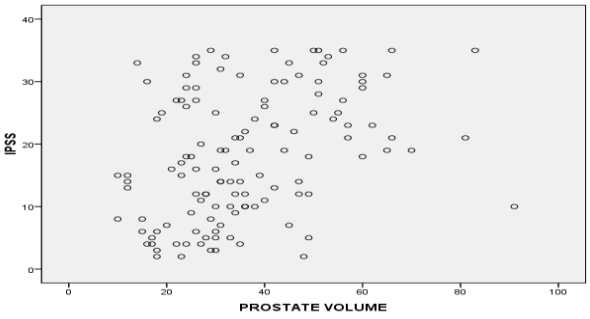


**Figure 3: The correlation between prostate volume and International prostate symptom score (IPSS).**

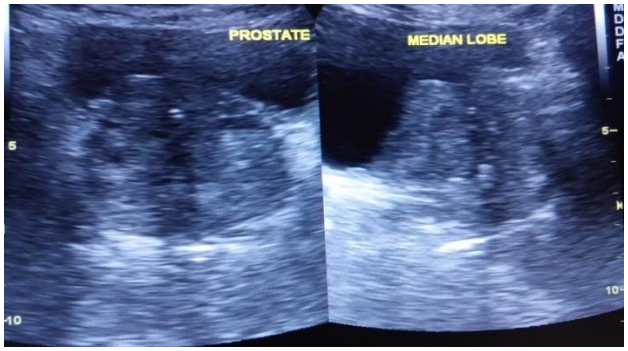


**Figure 4: Prostatomegaly with enlarged median lobe in a 72 years old patient.**

**Table 1: Correlation of IPSS with age.**

| Sr no. | Grading the severity of symptoms (IPSS) | Age in years | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | |
| 1 | Mild | 1(3.8) | 10(37.0) | 10(37.0) | 6(22.2) | 0 | 27(21.4) |
| 2 | Moderate | 3(6.4) | 9(19.2) | 17(36.1) | 15(32.0) | 3(6.3) | 47(37.3) |
| 3 | Severe | 1(2.0) | 13(25.0) | 18(34.5) | 19(36.5) | 1(2.0) | 52(41.3) |
| 4 | Total | 5(3.9) | 32(25.4) | 45(35.8) | 40(31.8) | 4(3.1) | 126 |
| | p=0.51, r=0.11,p=0.21 | | | | | | |

**Table 2: Correlation of IPSS with prostate volume (PV).**

| Sr no. | Prostate volume | IPSS Grading | | | Total, n(%) |
|---|---|---|---|---|---|
| | | Mild n(%) | Moderate n(%) | Severe n(%) | |
| 1 | ≤ 20 | 9(53.0) | 4(23.5) | 4(23.5) | 17(13.4) |
| 2 | 21-30 | 11(28.2) | 16(41.0) | 12(30.8) | 39(30.9) |
| 3 | 31-50 | 7(15.5) | 22(48.9) | 16(35.6) | 45(35.7) |
| 4 | 51-80 | 0 | 3(14.2) | 18(85.8) | 21(16.6) |
| 5 | ≥ 81 | 0 | 2(50.0) | 2(50.0) | 4(3.1) |
| | p=0.001, r=0.40 | 27(21.4) | 47(37.3) | 52(41.3) | 126 |

**Table 3: Correlation of prostate volume with various factors.**

| Sl No. | Factors | Mean | Standard Deviation | Pearson's Correlation Coefficient | P Value |
|---|---|---|---|---|---|
| | Prostate volume | 36.35 | 16.06 | | |
| 1 | Age | 65.06 | 9.02 | 0.19 | 0.03 |
| 2 | Incomplete Emptying (IE) | 2.07 | 2.24 | 0.27 | 0.002 |
| 3 | Urgency | 3.16 | 1.98 | 0.31 | 0.001 |
| 4 | Nocturia | 3.44 | 1.76 | 0.17 | 0.056 |
| 5 | Frequency | 3.41 | 1.89 | 0.28 | 0.002 |
| 6 | Straining | 1.94 | 2.18 | 0.20 | 0.025 |
| 7 | Weak Stream | 2.51 | 2.28 | 0.31 | 0.001 |
| 8 | Intermittency | 1.96 | 2.25 | 0.26 | 0.003 |
| 9 | Quality of Life | 4.44 | 3.26 | 0.27 | 0.002 |
| 10 | IPSS | 18.30 | 10.08 | 0.40 | 0.001 |

Maximum number of patients 52 (41.3%) were having severe symptoms, 47(37.3%) patients were having moderate symptoms and 27 patients (21.4%) were having mild symptoms. Statistically there was no significant association and no correlation between age and severity of symptoms ($p \geq 0.05$) (Table 1) which is also represented in Fig 1.

The commonest clinical presentation was nocturia in 118 patients (93.6%) followed by increased frequency of micturition in 105 patients (83.3%), Urgency in 97

(76.9%) of the patients, Incomplete emptying and Straining in 63(50%) of the patients. The median lobe enlargement was observed in 5 of the patients (3.9%) and international prostate symptoms score (IPSS) in these patients was 18.30. The mean values of the above clinical features are presented in Fig. 2. Statistically there is no significant correlation between median lobe enlargement and IPSS with p value ≥ 0.05(0.25), r=0.10.

The maximum number of patients, that is 45 patients had the prostate volume measuring 31-50 cc (35.7%), followed by 25 patients (19.8%) had the volume measuring more than 50 cc. The lowest prostate volume was 10 cc and the largest prostate was 91 cc, mean being 36.98 cc ± 18.05, with interquartile range 25, 33, 47 having median value of 33 cc. There is linear relationship between these variables i.e. prostate volume and IPSS (P =0.001). A positive weak correlation was found between PV and IPSS grading (Table 2) which is also depicted in fig 3. There was statistically significant but no correlation found between the prostate volume (PV) with age (r=0.19, p=0.03), incomplete emptying (r=0.27, p=0.002), frequency (r=0.28, p=0.002), straining (r=0.20, p=0.02), intermittency (r=0.26, p=0.003) quality of life (r=0.28, p=0.002) and nocturia (r=0.17, p=0.056). Prostate volume had statistically significant but with weak correlation observed with IPSS (r=0.40, p=0.001), Weak Stream (r=0.31, p=0.001) and urgency (r=0.31, p=0.001) (Table 3).

## DISCUSSION

Benign prostatic hyperplasia (BPH) is a cause of increased morbidity and burden in ageing men due to frequently associated lower urinary tract symptoms (LUTS), the LUTS may impair quality of life. BPH is also a progressive disease, mainly characterized by a deterioration of LUTS over time[5] It is better to assess the severity of symptoms rather than the increase in the prostatic volume in the management of BPH[6] Both American urology association and European urology association practice guideline agree to use the international prostate symptom score (IPSS) to evaluate severity of BPH.[7] It is translated and linguistically validated in many languages to use as universal tool for researchers around the world The IPSS is widely used to assess the severity of lower urinary tract symptoms in older men with features of bladder outlet obstruction. The IPSS in combination with uroflowmetry is used to guide treatment decisions, whether to manage medically or surgically. The IPSS is also used to evaluate therapeutic response in men with lower urinary tract symptoms. Ultrasonography of prostate is routinely done to assess prostate morphology, size, echo-pattern and median lobe enlargement. Trans abdominal ultrasonography helps not only in assessment of prostate but also urinary bladder, kidneys and ureters. Prevoid and postvoid residual urine can also be measured. The prostate volume, patient clinical symptoms and ultrasonography findings of kidney, ureter and urinary bladder are vital in clinical decision making.

The mean age of patients in our study was 65.06 ± 9.06 years which is almost similar with study by Sanjeev singla et. al. who had mean age of 67.7 years.[8] Nocturia was a commonest bothersome symptom found in 70 % of patients in a study by Mostafa et al.[9] In our study also nocturia was commonest bothersome symptom found in 93.6 % patients and it was main reason for the patients to seek medical help. Our study found a positive but weak correlation between prostate volume and IPSS grading, which is comparable to Overland Bet al. According to Overland Bet al positive modest correlation noted between IPSS and prostate volume.[10] Another study by Tsukamoto et al showed that a change in IPSS was associated with a change in prostate volume,[11] whereas study by Agrawal et al., Sanjeev singla et al, Udeh et al, and Ezz et al. showed no relationship between prostate size and IPSS score.[6,8,12,13] There was no correlation between the age and IPSS in our study, which is similar with Agrawal et al., but Bosch JL et[14] states that very weak correlation between the IPSS and age (r = 0.09, P = 0.04). There is lot of variations in the findings by different authors, but most of studies found no strong correlation between the IPSS and prostate volume. The prostate volume alone is not useful in the estimation of disease severity,[15] patient symptomatology also to be considered.

## CONCLUSION

There is no correlation between the age and international prostate symptom score. The median lobe enlargement was not associated with significant increase in the international prostate symptom score. Nocturia was commonest bothersome symptom. No correlation found between the prostate volume with, incomplete emptying, frequency, straining intermittency, quality of life and nocturia. Prostate volume had statistically significant but weak correlation observed with total international prostate symptom score, weak stream and urgency.

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