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Correlation between Prostatic Volume and International Prostatic Symptom Score in Patients with Benign Prostatic Hyperplasia

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ABSTRACT

Objective: To determine the correlation between transabdominal ultrasound prostatic volume and International Prostatic Symptom Score in patients with benign prostatic hyperplasia.
Study Design: Cross-sectional study.
Place and Duration of Study: Armed Forces Institute of Radiology and Imaging, Rawalpindi Pakistan, from Sep 2020 to Apr 2021.
Methodology: Forty five patients were enrolled after taking informed consent. Detailed history was taken and all patients were assessed using the International Prostate Symptom Score. Findings were noted on a predesigned proforma after which all patients were prepared for transabdominal ultrasound in order to achieve bladder volume of at least 50 to 99 ml. Subsequently, transabdominal ultrasound was carried out for determining the volume of the prostate and all findings were subjected to statistical analysis.
Results: Mean age of patients was 66.6±9.91 years, with the mean International Prostate Symptom Score being 20.53±9.84 and volume of prostate being 59.56±27.18 cc. Five patients (11.1%) had mild symptoms, 15(33.6%) had moderate and 25(55.6%) had severe symptoms. With regards to volume of prostate, Grade I, II, III and IV was seen in 6(13.3%), 7(15.6%), 20(44.4%) and 12(26.7%) patients respectively. Significant positive correlation was seen between prostatic volume and International Prostate Symptom Score as indicated by an r=0.437 and *p*=0.003.
Conclusion: Transabdominal prostatic volume was found to be significantly correlated with International Prostate Symptom Score, and can be used as an objective assessment of symptoms severity.

Keywords: Lower Urinary Tract Symptoms, Prostatic Hyperplasia, Severity of Illness Index, Ultrasonography.

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is the growth of either prostatic glandular tissues or stromal tissues or both, grossly and histologically.[1] The prevalence of BPH increases to 50% at 50 years of age and to 90% when an individual is 85 years old.[2] In 50% men who have histologically proven benign prostatic hyperplasia, the symptoms of moderate to severe lower urinary tract symptoms (LUTS) are experienced.[3] For the assessment of severity of LUTS, a scoring system that can be used is International Prostate Symptoms Score (IPSS).[4] It can also be used for assessing the symptoms of patients over time as well as efficacy of treatment at follow up.[5] Studies have shown that 3% of men aged 45-49 years reported LUTS and 30% of patients above 85 years, experience them.[6]

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For assessment of obstruction, non-invasive parameters are preferred by urologists such as flow rate of urine, residual urine and volume of prostate.[7] For managing patients with BPH, estimation of prostate volume is important. It can be measured by digital rectal examination; however, a more reliable and accurate method is ultrasound.[8] It yields reliable estimates regarding size of prostate and its extension in the bladder, residual volume of urine after voiding it (post-void).[9] Furthermore, it helps in assessing the bladder and upper urinary tract simultaneously.[10] Volume of prostate is an important factor that plays a role in treatment selection. In patients with a large volume of prostate, surgical intervention is preferred.[10]

Various studies have been conducted internationally for determining the relation of prostatic volume assessed by ultrasound with IPSS and have yielded conflicting results. However, data in Pakistan is scarce. Therefore, the rationale of the

current study was to determine the correlation of transabdominal ultrasound prostatic volume with International Prostatic Symptom Score in patients with benign prostatic hyperplasia.

METHODOLOGY

This cross-sectional study was conducted at the Armed Forces Institute of Radiology and Imaging, Rawalpindi Pakistan, from Sep 2020 till Apr 2021, after taking approval from the Ethical Review Committee (ERC/IERB approval certificate number: 0044).

Inclusion Criteria: Male patients aged between 40-85 years of age, with histologically proven benign prostatic hyperplasia (i.e. presence of glandular hyperplasia and hyperplasia of stromal tissue with papillary buds, infoldings and cysts), who presented with lower urinary tract symptoms i.e. urinary hesitancy, weak stream and nocturia were included.

Exclusion Criteria: Patients who had prostatic carcinoma, BPH coexisting with stricture, were either on medical treatment or had surgery for BPH and with LUTS caused by other factors were excluded.

Sample size was calculated using OpenEpi calculator keeping expected percentage of LUTS in BPH as 3%,[6] which came to 45. Non-probability consecutive sampling technique was used.

Written informed consent was taken from all patients. Demographic detail, clinical history and physical examination of all patients was carried out by the researchers themselves and all findings were noted down in a predesigned proforma. At the time of visit, all patients were assessed using an International Prostate Symptom Score (IPSS). It is a self-administered questionnaire, which has 7 questions that are used to assess voiding symptoms (incomplete emptying, intermittency, weak stream and straining to void) and storage symptoms (frequency, urgency, and nocturia). Each item is scored from 0 to 5, with the maximum score being 35. According to IPSS, patients with symptoms were divided into three categories i.e. mild (score 0 to 7), moderate (8 to 19) and severe symptoms (20 to 35). All patients were then prepared for transabdominal ultrasound i.e. prior to evaluation all participants were asked to drink water around 1.2 to 1.5L, in order to achieve bladder volume of at least 50 to 99 ml. After this, transabdominal ultrasound was carried out for determining the volume of the prostate. Prostatic volume was calculated by ellipsoid volume formula i.e. antero-posterior×cranio-caudal×transverse dimensions×0.52 by scanning prostate in the longitudinal and transverse planes to obtain the maximum dimensions of the prostate. Prostate gland was graded according to volume into Grade-I (21 to 30 cc), Grade-II (31 to 50 cc), Grade-III (51 to 80 cc) and Grade-IV (>80 cc). The enlargement of the median lobe was also separately estimated by getting readings both in longitudinal as well as transverse planes. The volume of the median lobe was added to the total volume of the prostate gland. All findings were noted down on the proforma and were subjected to statistical analysis.

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 25.00. Quantitative data such as age, IPSS score and volume of prostate was presented as mean and standard deviation. Qualitative data such as severity of LUTS and prostatic grade according to volume was presented as frequency and percentage. Data was stratified for age. Post-stratification Chi-square test was applied. Correlation between International Prostate Symptom Score and transabdominal prostate volume was assessed by Pearson's correlation. A p-value of ≤0.05 was considered as significant.

RESULTS

A total of 45 males were enrolled. Mean age of patients was 66.6±9.91 years, with the mean International Prostate Symptom Score (IPSS) being 20.53±9.84 and volume of prostate being 59.56±27.18 cc (Table-I). Out of 45 patients, 3(6.7%) were of early middle age (40-50 years), 18(40%) were of late middle age (51-65 years) and 24(53.3%) of old age (>65 years), 5(11.1%) had mild symptoms, 15(33.6%) had moderate symptoms and 25(55.6%) had severe symptoms, with regards to volume of prostate, Grade-I prostate was seen in 6(13.3%) patients, Grade-II in 7(15.6%), Grade-III in 20(44.4%) and Grade-IV in 12(26.7%).

Stratification of data related to age and grades of prostate volume was done (Table-II). It was found that in patients who belonged to early middle age group, 1(2.2%) had mild severity of prostatic symptoms and 2(4.4%) had moderate severity, in late middle age group 4(8.9%) had mild symptoms, 5(11.1%) had moderate and 9(20%) had severe symptoms, and in old age group 10(22.2%) had moderately severe symptoms while 14(31.1%) had severe symptoms. However, it was found that the association between age and lower urinary tract symptoms severity was not statistically significant (p=0.097).

In terms of stratification of grades of prostate volume (Table-III), it was found that in patients who

belonged to early middle age group, prostate volume of Grade-III was present in 2(4.4%) patients and Grade-IV was present in 1(2.2%) patients, in late middle age group Grade-I prostatic volume was present in 2(4.4%) patients, Grade-II was present in 4(8.9%) patients, Grade-III was present in 8(17.8%) and Grade-IV was present in 4(8.9%) patients and in old age group Grade-I prostatic volume was seen in 4(8.9%) patients, Grade-II was seen in 3(7.6%), Grade-III was seen in 10(22.2%) patients and Grade-IV was seen in 7(14.6%) patients, however, it was found that the association between age and grades of prostatic volume was not statistically significant (p=0.879).

Table-I: Descriptive Statistics of Patients (n=45)

Variable	Mean±SD n(%)
Age (years)	66.6±9.91
International Prostate Symptom Score	20.53±9.84
Prostate volume (cc)	59.56±27.18
Age Groups:	
Early Middle Age (40 to 50 years)	3(6.7%)
Late Middle Age (51 to 65 years)	18(40%)
Old Age (> 65 years)	24(53.3%)
Lower Urinary Tract Symptoms Severity:	
Mild symptoms	5(11.1%)
Moderate symptoms	15(33.3%)
Severe symptoms	25(55.6%)
Grade of Prostate:	
Grade I	6(13.3%)
Grade II	7(15.6%)
Grade III	20(44.4%)
Grade IV	12(26.7%)

Table-II: Association of Age with Lower Urinary Tract Symptoms Severity (n=45)

Age Groups (years)	Lower Urinary Tract Symptoms Severity as Assessed By IPSS			Significance Value
	Mild Severity	Moderate Severity	Severe Symptoms	
Early Middle Age (40-50)	1(2.2%)	0(0%)	2(4.4%)	0.097
Late Middle Age (51-65)	4(8.9%)	5(11.1%)	9(20%)	
Old Age (>65)	0(0%)	10(22.2%)	14(31.1%)	

Table-III: Association of Age with Grade of Prostatic Volume (n=45)

Age Groups (years)	Grade of Prostatic Volume				Signifi-cance Value
	Grade-I	Grade-II	Grade-III	Grade-IV	
Early Middle Age (40-50)	0(0%)	0(0%)	2(4.4%)	1(2.2%)	0.879
Late Middle Age (51-65)	2(4.4%)	4(8.9%)	8(17.8%)	4(8.9%)	
Old Age (>65)	4(8.9%)	3(6.7%)	10(22.2%)	7(15.6%)	

It was found that there was a positive correlation between prostatic volume and International Prostate Symptoms Score as indicated by an r value of 0.437 and this correlation was found to be statistically significant i.e. p=0.003.

DISCUSSION

The current study revealed that transabdominal prostate volume was significantly positively correlated with the International Prostate Symptom Score (IPSS) i.e. with increased volume of prostate there was an associated increase in the symptom's severity of the patients as well. Age did not appear to have any significant association with either volume of prostate or IPSS.

In one study, a weak significant correlation was found between prostate volume and IPSS.[11]

Different studies found that with a change in IPPS, a change in volume of prostate was seen, thus denoting that a correlation existed between the two.[12,13] Whereas, other international studies revealed that these two parameters were not significantly correlated with each other.[14,15] Similar to our study, Agrawal *et al.*,[2] revealed that IPSS and prostate volume has no relation with the age of the patients. In another study, a weak correlation was found between age and IPSS (r=0.09, p=0.04).[16] There are a lot of variations in the findings of different researchers regarding the relationship between prostate volume and IPSS.

The mean IPSS score in our study was 20.53±9.84, which was different from other study results. Ofoha *et al.*,[3] found that the mean IPSS score was 15.3±6.34. In another study by Awaisu *et al.*,[4] it was found that the mean IPSS score was 16.3±7.1, which was also less than current study results. This difference may be due to delayed medical advice seeking behavior of the patients in our setting as the majority of the individuals in the current study presented with symptoms of moderate and severe category, which could have led to increased IPSS mean score.

The mean volume of prostate in our study was 59.56±27.18. Awaisu *et al.*,[4] revealed that in their study the mean volume of the prostate was 52.58±30.53. This difference in the mean value between these two studies may be attributed to the use of transrectal ultrasonography of the prostate in a study done by Awaisu *et al.*,[4] whereas our study used a transabdominal approach. In another study by Gynyawali *et al.*,[5] transabdominal ultrasonographic

assessment of volume of prostate revealed that the mean value was 47.5±16.63, which was less compared to the current study.

BPH progresses over time, leading to increased severity of symptoms with the passage of time.[11,12] For early management, a better approach is to determine the severity of LUTS at an early stage, rather than looking for the volume of prostate.[13,14,16] Use of IPSS for assessment of severity of symptoms related to BPH is recommended in practice guidelines provided by American as well as European Urology Association and both these associations have recommended to use it for assessing severity of BPH.[17,18] As significant correlation was revealed between prostate volume and IPSS by the results of our study as well, it is recommended to involve transabdominal prostate volume measurement in the routine assessment of patients coming with BPH. This will help in deciding about further management of such patients and thus can improve the quality of life.

CONCLUSION

The results of current study concludes that a significant correlation existed between transabdominal prostate volume and IPSS. Therefore, in settings where uroflowmetry is not available readily, transabdominal prostate volume can be used as an alternative measure for objective assessment in order to quickly establish the severity of the condition and take further management steps.

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Authors' Contributions:

Following authors have made substantial contributions to the manuscript as under:

HS & RB: Conception, study design, drafting the manuscript, approval of the final version to be published.

MS & SW: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

QUAG & SA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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