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The Relationship Between Prostate Volume Measured Transabdominal Ultrasound And International Prostate Symptom Score In Patients With Benign Prostate Hypertrophy

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ABSTRACT
Benign prostatic hypertrophy (BPH) refers to the enlargement of the prostate gland or urinary dysfunction due to prostate enlargement. Transabdominal ultrasonography is one method used to assess the prostate. The validated International Prostate Symptom Score (IPSS) questionnaire is the best way to evaluate the severity of lower urinary tract symptoms most often caused by BPH. This study is a diagnostic test research with a cross-sectional design. Sampling technique was consecutive sampling method on BPH patients recorded in the Radiology Department of Dr. Moewardi Regional General Hospital during the period from July to August 2023. The total sample consisted of 31 individuals. Research data were obtained through medical record data. Statistical analysis used normality analysis and Spearman correlation test. In this study, 31 patients were diagnosed with BPH. The mean age was 64.93 ± 11.18 years. The majority of patients had grade 1 volume category (67.7%), and most patients had moderate IPSS scores (51.6%). The Spearman correlation test results showed a strong significant relationship between prostate volume results via transabdominal ultrasound and IPSS scores in a positive direction. There is a significant relationship between prostate volume results via TAUS and IPSS scores. The higher the prostate volume value, the higher the IPSS score obtained.

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INTRODUCTION

Lower Urinary Tract Symptoms (LUTS), or symptoms of the lower urinary tract, are common complaints in adult men with significant impacts on quality of life and considerable economic burden. These symptoms are traditionally associated with obstruction of the bladder outlet, most commonly due to benign prostatic hyperplasia (BPH) (Bachmann *et al.*, 2023) . BPH is a term used to describe the process of cellular proliferation, prostate enlargement, or urinary dysfunction caused by prostate enlargement and obstruction of the urinary bladder system. It is a histological term describing growth processes occuring in the stroma and glandular epithelium of the prostate[2].

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BPH triggers a series of symptoms, commonly known as LUTS. LUTS associated with BPH include urgency, frequency, nocturia, incontinence, and decreased urine flow[3]. In older individuals, urodynamic abnormalities in the lower urinary tract, including benign prostatic obstruction and detrusor overactivity/underactivity, are the most common causes of LUTS. Validated questionnaires recommended by the American Urological Association (AUA) symptom score or the International Prostate Symptom Score (IPSS) are the best methods to evaluate the severity of LUTS (Sasidharan *et al.*2022)

Prostate volume enlargement can be measured using ultrasonography to assess the prostate's appearance. Prostate imaging can be performed using methods such as Transabdominal ultrasonography (TAUS), Transrectal ultrasonography (TRUS), computed tomography (CT), and Magnetic resonance imaging (MRI). Assessing prostate size is crucial for selecting interventions (Bachmann *et al.*, 2023). The volume of prostate can be assessed with Digital Rectal Examination (DRE); however, ultrasonography, particularly Transrectal Ultrasonography (TRUS), is more accurate and is currently considered the gold standard (Awaisu *et al.,* 2021).

In a study by Udeh *et al.*, 2012 to establish the relationship between prostate volume and IPSS in Africans with BPH, no significant relationship was established. In an analysis by Sciara *et al.* 1998 in an Italian population, symptom score correlated weakly with prostate volume and age. A study in Netherlands by Bosch *et al.* 1995 showed weak correlation between IPSS and total prostate volume. LUTS arise from the pathology, but seem not to correlate with prostate size. The weak statistical association frequently reported in the literature is mainly the urology clinic-based population from which the patient samples were drawn (Tsukamoto., 2007). The purpose of this study is to find out the relationship between prostate volume measured via Transabdominal Ultrasonography (TAUS) and the grading of LUTS using the standard IPSS.

METHOD

This research constitutes a cross-sectional diagnostic study. The sampling method utilized consecutive sampling of patients diagnosed with benign prostatic hyperplasia (BPH) as documented in the Radiology Department of Dr. Moewardi Regional General Hospital during July to August 2023. The study included a total of 31 participants. Data collection relied on medical records. Statistical analysis encompassed assessing normality and conducting Spearman correlation tests. Ethical approval for this study (2.189/XII/HREC/2023) was provided by the Health Research Ethics Comitte on 11 December 2023

RESULT

The characteristics of benign prostatic hyperplasia patients, the average age of patients is 64.93 ± 11.18 years. The mean volume was 39.73 ± 17.62, with the majority of patients having a volume categorized as grade 1 (67.7%). The average IPSS score was 14.41 ± 8.65, with the majority of patients categorized as having moderate IPSS (51.6%).

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Table 1. Description of patient characteristics

Characteristics	Frequency		Total
	n	%	
Age (mean ± SD)	64.93	11.18	31
Volume (mean ± SD)	39.73	17.62	31
Grade 1	21	67.7	
Grade 2	7	22.6	
Grade 3	3	9.7	
IPSS score (mean ± SD)	14.41	8.65	31
Mild	8	25.8	
Moderate	16	51.6	
Severe	7	22.6	

From the Spearman correlation test, a significant result was obtained with a 1-tailed Spearman correlation test with a p-value <0.005, indicating a significant correlation between prostate volume results via TAUS and IPSS scores in this study. The data show a level of strength of the relationship between the two variables at 0.562, interpreted as a strong relationship (0.51 - 0.75) with a positive direction. Therefore, it can be concluded that the higher the prostate volume value, the higher the IPSS score obtained.

Discussion

In a radiological study, BPH cases were found in 10% of men aged 30s, 20% of men aged 40s, and rose to 50-60% for men aged 60s, and 80-90% for men aged 70-89. This theory aligns with the findings of this study where the majority of samples suffering from Benign Prostatic Hyperplasia (BPH) had an average patient age of 62 years (±11.18%). Other studies also mention that the average patient age is 63.17 ± 10.26 years (range 42 - 103) with a median of 63 years. The most represented age group is 60 to 69 years, accounting for 44.7% of participants (Mbouché *et al.,* 2022). This is consistent with previous research on 126 samples of Benign Prostatic Hyperplasia (BPH) patients in South India, where the majority of BPH patients were aged between 60-69 years, accounting for 36%[6]. Additionally, it aligns with a study on 32 Benign Prostatic Hyperplasia (BPH) patients in various community health centers in Manado City, where the most common age group affected by BPH was between 60-69 years (31.3%), followed by the age group of 70-79 years at 25% (Bosch *et al.,* 1995). It is also consistent with findings in India, where among 58 samples, the majority of BPH patients were aged between 60-70 years (36.2%) (Tsukamoto *et al.,* 2007). The results of this research align with the theory that states the incidence of Benign Prostatic Hyperplasia (BPH) increases with age. This is associated with the aging process, which leads to a decrease in male hormone levels, especially testosterone. These hormones are present in the prostate gland and are converted into Dihydrotestosterone (DHT), which chronically stimulates the prostate gland, leading to enlargement[9].

The results of this research indicate that the average prostate volume among patients with Benign Prostatic Hyperplasia (BPH) at Dr. Moewardi Regional General Hospital in

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Surakarta is 39.73 cc. The mean IPSS score among BPH patients at Dr. Moewardi Regional General Hospital in Surakarta is 14.41. This is consistent with a study conducted in Sudan on 88 BPH samples, where the average prostate volume was found to be 42.38 cc and the mean IPSS score was 10.52[10]. This is also in line with research conducted in one of the hospitals in Jember on 30 BPH samples, which found an average prostate volume of 52.01 ± 25.18 cc. Additionally, the average IPSS score was found to be 14.83[11].

The findings from this study demonstrate a notable link between prostate volume in patients with BPH. A p-value of <0.001 was obtained, meaning that there is a significant relationship between the scores of prostate volume obtained through TAUS and IPSS scores. The data show a level of strength of the relationship between the two variables at 0.562, interpreted as a moderate relationship (0.40 – 0.599) with a positive direction. Therefore, it can be concluded that the higher the prostate volume value, the higher the IPSS score obtained. This aligns with a study which states that there is a notable link between prostate volume in patients with BPH[12].

The results of this study indicate a significant and meaningful relationship between the scores of prostate volume obtained through Transabdominal Ultrasonography and IPSS scores among BPH patients, suggesting that an increase in IPSS scores in a BPH patient is a consequence of increased volume. The increase in prostate volume leads to narrowing of the prostatic urethra lumen and obstructs flow, resulting in increased intravesical pressure. To void urine, the bladder must contract strongly to overcome this resistance. Continuous contractions can cause anatomical changes in the bladder, such as detrusor hypertrophy, formation of sacculations, cells, and bladder divertic ula. Structural changes in the bladder are perceived by patients as lower urinary tract symptoms. In treating BPH, it is important to consider the degree of symptoms based on the IPSS score and urine flow rate measured by uroflowmetry rather than relying solely on prostate volume results. Therefore, the main goal of therapy for patients with benign prostatic hyperplasia (BPH) is to improve voiding symptoms, enhance quality of life, reduce intravesical obstruction, decrease post-void residual volume, restore kidney function in case of renal failure, and prevent disease progression (Agrawal *et al.*, 2008).

CONCLUSION

Based on the results and discussion of the research, it can be concluded that there is a significant relationship between prostate volume results obtained through transabdominal ultrasound and IPSS scores. The higher the prostate volume value, the higher the IPSS score obtained.

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