

**RELATIONSHIP BETWEEN THE INTERNATIONAL PROSTATE SYMPTOM SCORE
AND THE POST-VOID RESIDUAL VOLUME AMONG PATIENTS WITH LOWER
URINARY TRACT SYMPTOMS IN SRI LANKA**

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ABSTRACT

Objective: To investigate the relationship between the Post-Void Residual (PVR) volume and severity of Lower Urinary Tract Symptoms (LUTS) in a sample of patients of a Sri Lankan population. **Method:** This is a descriptive, cross-sectional study performed using the data obtained from patients attending the urology laboratory at the University of Peradeniya, Sri Lanka. International Prostate Symptom Score (IPSS) was used to assess the severity of LUTS in patients. PVR values were collected from the reports given by the urology laboratory. Data analysis was performed using Pearson test and graphical analysis. **Results:** Study group consisted of 297 patients where 88.1% of the group was male and 11.9 % was female. Incomplete evacuation, intermittency, frequency and total IPSS showed a significant correlation with both PVR and the percentage of PVR. Highest correlation was observed between incomplete evacuation and PVR (.347). When the percentage of PVR out of Pre-Void Volume (PVV) was plotted against total IPSS score in males and females separately, a distinct pattern was shown only in males. **Conclusions:** Severity of LUTS is significantly correlated with PVR volume. That relationship is clearly visible when the PVR volume is measured as a percentage of PVV. Correlation between total IPSS and PVR volume is distinct in males than in females.

KEYWORDS: IPSS, LUTS, Post-Void Residual volume, uroflowmetry.

INTRODUCTION

Lower Urinary Tract Symptoms (LUTS) are frequently observed symptoms, especially in ageing males which reduce their quality of life. Frequently, patients seek medical advice for LUTS because of the bothersome symptoms arising due to this medical condition. According to the National Institute for Health and Care Excellence in the UK, LUTS comprises 3 types of symptoms; storage, voiding and post-micturition symptoms that affect the lower urinary tract ^[1]. These 3 types of symptoms are used to help define the source of the problem. LUTS is assessed based on the severity of the following symptoms; incomplete evacuation, urgency, frequency of urination, weak urine stream, intermittency, straining and nocturia.^[2]

The prevalence and the severity of LUTS are initially identified using standard scales. Among such scales, International Prostate Symptom Score (IPSS) is a common, self-administered tool that is used in both primary and secondary care. This uses a scale ranked from 0 (never) to 5 (almost always) to determine the

severity of LUTS. A total IPSS is obtained and the score is categorized into mild (1-7), moderate (8-19) and severe (20-35).^[3] However, basic screening of LUTS depends on both subjective methods such as IPSS and objective tools such as uroflowmetry, Ultra Sound Scans of Kidney, Ureter and Bladder (USS KUB), Prostate-Specific Antigen (PSA) and pressure-flow study.

Post-Void Residual (PVR) volume is an objective and noninvasive measurement taken just after the patient performed uroflowmetry in the same environment. PVR volume is defined as the amount of residual urine in the bladder after a voluntary void.^[4] As stated in the Campbell-Walsh-Wein Urology, threshold values of PVR volume are not well defined, but volumes less than 100 ml are usually considered within the acceptable range, especially in the older male patients. It can be measured by urethral catheterization or a handheld Ultrasound Scanner (USS). According to previous studies, it has determined that the PVR volume is dependent on the pre-void urinary volume as well. At a study done in Nepal in 2019, it was observed that a

significant difference in PVR volume in patients having initial fullness (up to 250 ml of pre-void volume) and patients having complete fullness (more than 250 ml of pre-void volume).^[5]

There are shreds of evidence available on the relationship between IPSS and PVR volume in different geographic locations. Most of them have shown a weak correlation between PVR volume and IPSS severity.^[6-12] Our study aims to provide a quantitative analysis to elucidate this relationship observed in a particular sample of patients who complained of LUTS on their first visit to the Urology clinic at the THP, Sri Lanka. Other than that, in our study, calculating the PVR as a percentage of pre-void volume is suggested as a more effective way to correlate with IPSS severity.

METHOD

Data collection was done at the Urology laboratory, University of Peradeniya, Sri Lanka from May 2021 to May 2022. Patients who are initially diagnosed with LUTS at GUC (First-visit patients) were sent to the Urology lab by the consultant. Patients who are already on medical treatment for LUTS, patients whose total voided volume is less than 150 ml and patients below 18 years old were excluded from the study. A well-structured questionnaire which is printed in Sinhala was used for data collection for IPSS and PVR volume values were collected from the reports given by the Urology laboratory. The questionnaire was consisted of the detailed demographics (Name, location, age, education, occupation, and marital state), IPSS score sheet and the patients' history (Smoking, alcohol consumption, surgical history, other comorbidities). Selected participants were provided with the information sheet which was prepared in Sinhala or English containing details of the study. Once the participant was satisfied

with the information that was provided, the consent form was signed. Recruited participants were explained about their right of withdrawal and how to practice that right. After they agree, values of PVR were entered into a database by the invigilator who was a trained research assistant who has successfully conducted similar clinical research previously. Then the questions in the questionnaire were asked orally by the invigilator in Sinhala or English by each patient. One such face-to-face interview lasted for about 5-10 minutes. All data were stored in a password protected Google sheet for the analysis to be done later. Data were analyzed using SPSS v25.0 (Statistical Package for the Social Sciences 25.0). This was a descriptive cross sectional analysis. Graphical analysis, Pearson correlation and regression analysis were used to predict the correlations between IPSS and uroflowmetry parameters. The analysis was performed within the significance level of 0.01.

RESULTS AND DISCUSSION

This study group consisted of 297 patients who attended the urology laboratory at the University of Peradeniya, from 7th May 2021 to 30th May 2022. Out of them, 88.1% was males while 11.9 % was female. Mean age of the total study group was 62 years while the mean ages of male and female groups were 63 and 55 years respectively. Table 1 shows the summary of descriptive statistics of all IPSS criteria in the study population. According to the IPSS scores, nocturia was the most prevalent symptom (87.4%) while straining was the least occurring symptom (51%). Measured volume of PVR varied from 0 – 1096 ml and the mean PVR is 77.21 ml which is lower than the threshold value given in Campbell-Walsh-Wein Urology (100 ml). Complaining LUTS was more common in elderly males compared to females in this study sample.

Table 1: Descriptive statistics of IPSS criteria recorded from the study.

	Incomplete evacuation	Frequency	Intermittency	Urgency	Weak Stream	Straining	Nocturia	Residual volume (ml)
Mean	2.35	2.49	2.48	2.81	2.96	1.61	2.28	77.2136
Mode	0	3	0	5	5	0	2	0.00
Std. Deviation	1.924	1.702	1.957	1.852	1.867	1.867	1.455	99.48712
Maximum	5	5	5	5	5	5	5	1096.00
Minimum	0	0	0	0	0	0	0	0.00
Prevalence (score 1-5)	71.9%	82.3%	73.2%	82.3%	82.9%	51%	87.4%	-

Statistical correlation was analyzed between each IPSS score and PVR volume using Pearson correlation. Then, percentage of PVR volume out of PVV was used instead of absolute values of PVR volume and the correlation was performed again. A statistically significant correlation with PVR volume was observed related to incomplete evacuation, intermittency and frequency. Highest correlation was observed between incomplete evacuation and PVR volume (.347). Additionally, straining and nocturia, which did not have a significant correlation with PVR volume showed a significant

correlation with percentage of PVR (Table 2). More number of symptoms is significantly correlated with the percentage of PVR than the absolute values. When comparing the Pearson coefficients of all those correlated symptoms, it is clear that the value of the coefficient and the significance have been increased when PVR volume was measured as a percentage. For instance, highest correlated symptom is incomplete evacuation. Its coefficient has increased from .347 to .441 when percentage of PVR volume was considered. This analysis suggests that, measuring PVR volume as a percentage of

PVV is more efficient to observe a correlation with IPSS criteria. In this analysis, it was assumed that all IPSS criteria show a linear relationship with both depending variables.

Table 2: Results of the Pearson correlation test of each IPSS criteria with PVR and percentage of PVR.

Dependent variable Independent variable	PVR		Percentage of PVR out of PVV	
	Pearson coefficient	Sig.	Pearson coefficient	Sig.
Incomplete evacuation	.347**	.000	.441**	.000
Frequency	.163**	.005	.231**	.000
Intermittency	.180**	.002	.225**	.000
Urgency	-.011	.856	.135	.020
Weak stream	.051	.378	.092	.113
Straining	.054	.356	.153**	.008
Nocturia	.053	.365	.223**	.000
Total score	.201**	.000	.341**	.000

** Correlation is significant at the 0.01 (2-tailed)

The mean percentage of PVR volume from the PVV was plotted against each total IPSS in males (Figure 1) and females (Figure 2) separately. According to the graphs, a clear relationship between total IPSS and PVR percentage was observed among men. In figure 1, it is

clear that the majority of PVR percentages were more than the average value (21.19) in the group of severely symptomatic patients. However, such relationship was not observed within the female cohort.

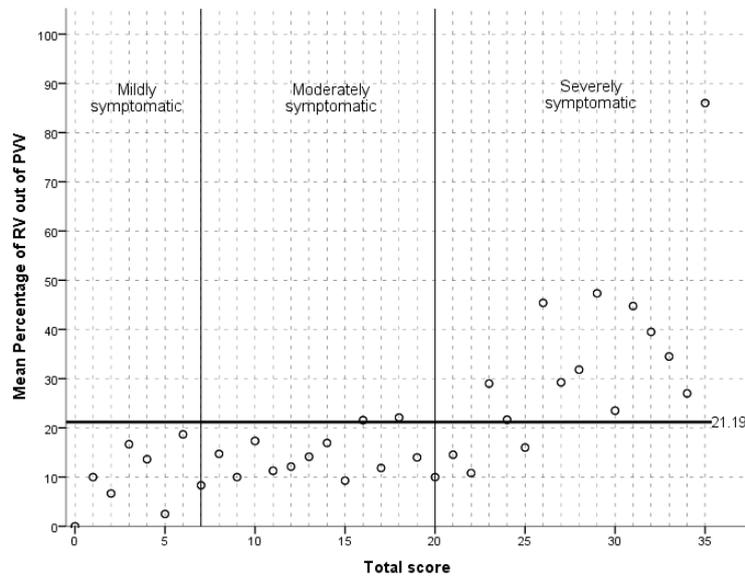


Figure 1: Graph of mean percentage of PVR out of PVV against total IPSS score of males

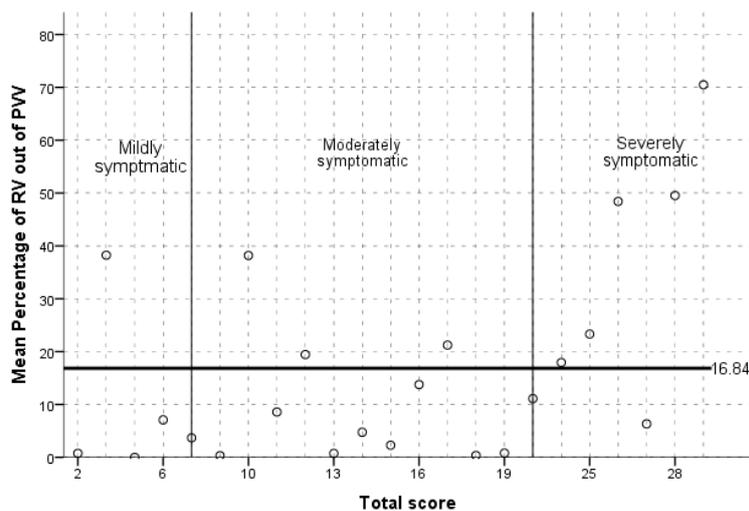


Figure 2: Graph of mean percentage of PVR out of PVV against total IPSS score of females.

CONCLUSIONS

According to this study, incomplete evacuation, intermittency, frequency and total score are significantly correlated with PVR volume. The symptom that has the highest influence on amount of PVR volume is incomplete evacuation. Coefficient of correlation and the significance has been increased when the PVR volume is measured as a percentage of PVV. Graphical analysis depicts that in men when the symptoms are severe the percentage value of PVR volume increases above the average value. Therefore, it is clear that there is significant correlation between severity of LUTS and PVR volume in this population.

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REFERENCES

- Hollingsworth JM and Wilt TJ. Lower urinary tract symptoms in men. *BMJ*, 2014; 349 (June 2015). <https://dx.doi.org/10.1136/bmj.g4474>.
- International Prostate Symptom Score - an overview. ScienceDirect Topics [Internet]. [cited 2022 May 17]. Available from: <https://www.sciencedirect.com/topics/medicine-and-dentistry/international-prostate-symptom-score>
- Lammers HA, Teunissen TAM, Bor H, Smid IS and Lagro-Janssen ALM. No relationship between the International Prostate Symptom Score and Post-Void Residual volume in primary care. *Research and Reports in Urology*, 2020; 12: 167–174.
- Kaplan SA, Wein AJ, Staskin DR, Roehrborn CG, Steers WD. Urinary retention and Post-Void Residual urine in men: Separating truth from tradition. *Journal of Urology*, 2008; 180: 47–54.
- Pathak R, Pradhan S, Tuladhar A, Shrestha A, Acharya R. Effect of Premicturitional Bladder Volume on the accuracy of sonographic assessment of Post Void Residual Urine Volume measurement by transabdominal Ultrasonography. *Med J Shree Birendra Hosp*, 2019; 18(1): 30–6.
- Berges R, Oelke M. Age-stratified normal values for prostate volume, PSA, maximum urinary flow rate, IPSS, and other LUTS/BPH indicators in the German male community-dwelling population aged 50 years or older. *World J Urol.*, 2011; 29(2): 171–8.
- Blanker MH, Groeneveld FPMJ, Bohnen AM, Bernsen RMD, Prins A, Thomas S, et al. Voided volumes: Normal values and relation to lower urinary tract symptoms in elderly men, a community-based study. *Urology*, 2001; 57(6): 1093–8.
- Eckhardt MD, Van Venrooij GEPM, Boon TA. Symptoms, prostate volume, and urodynamic findings in elderly male volunteers without and with LUTS and in patients with LUTS suggestive of benign prostatic hyperplasia. *Urology*, 2001; 58(6): 966–71.
- Singla S, Garg R, Singla A, Sharma S, Singh J, Sethi P. Experience with uroflowmetry in evaluation of lower urinary tract symptoms in patients with benign prostatic hyperplasia. *J Clin Diagnostic Res.*, 2014; 8(4): 1–4.
- Han JH, Kwon JK, Lee JY, Kang DH, Choi HC, Lee JS, et al. Is periurethral calcification associated with urinary flow rate and symptom severity in men with Lower Urinary Tract Symptoms-Benign Prostatic Hyperplasia? A retrospective review. *Urology*, 2015; 85(5): 1156–61.
- Klingler HC. The ICS ‘BPH Study’: uroflowmetry, lower urinary tract symptoms and bladder outlet obstruction. *Curr Opin Urol.*, 1999; 9(2): 171.
- Porru D, Bartoletti R, Austoni E, Carrino M, Gianneo E, Melloni D. Relationship of flow rate with symptoms, quality of life and other clinical parameters in patients with LUTS suggestive of BPH. *Eur Urol.*, 2001; 40(1): 23–7.