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Original Research Article

CORRELATION BETWEEN SONOGRAPHIC PROSTATIC VOLUME WITH INTERNATIONAL PROSTATE SYMPTOM SCORE (IPSS) IN BENIGN PROSTATIC HYPERPLASIA: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: The prostate is the largest accessory sex gland in males, comprising a collagenous, fibromuscular, and glandular structure. It functions as an exocrine gland, secreting a fluid (with a pH > 7) that constitutes approximately 20–30% of the seminal fluid produced. **Objective:** To establish a correlation between sonographic prostatic volume and IPSS, potentially leading to better management of patients with BPH.

Material and Methods: This cross-sectional observational study was conducted among male patients aged 40 years and above who presented with LUTS and were referred to the Department of Radio Diagnosis at Rohilkhand Medical College, Bareilly, Uttar Pradesh, for transabdominal sonography.

Results: Majority of patients (35.0%) were in the 60-69 age group, with a significant association between higher age and larger prostate volumes. Prostate volume was categorized into four grades, with Grade II (31-50 cc) representing the highest proportion of patients. There was a significant correlation between increasing prostate volume and severity of IPSS, with patients with severe symptoms (IPSS ≥20) exhibiting larger prostate volumes. Additionally, significant associations were found between prostate volume, nocturia, weak stream, incomplete emptying, and other lower urinary tract symptoms. Multivariate regression analysis revealed that larger prostate volume & age ≥60 were significant predictors of severe IPSS.

Conclusion: The severity of IPSS symptoms was positively correlated with prostate volume. A p-value of <0.001 signifies a highly significant correlation between prostate volume and the severity of IPSS symptoms. A direct correlation between QoL and IPSS scores was observed, with patients having worsening QoL scores showing higher IPSS. A significant p-value of <0.001 was observed for nocturia and prostate volume grades. A statistically significant positive correlation was observed between prostate volume and IPSS indicating larger prostate volumes are associated with increased severity of lower urinary tract symptoms.

Keywords: Sonographic Prostatic Volume, International Prostate Symptom Score (IPSS), Benign Prostatic Hyperplasia.

INTRODUCTION

Benign prostatic hyperplasia (BPH) refers to the abnormal proliferation of both smooth muscle and epithelial cells within the transition zone of the prostate gland. As a result of this hyperplasia, a distinct nodule forms around the periurethral region due to the growth of prostate stromal and epithelial cells.[1] A common clinical manifestation of BPH is

the development of Lower Urinary Tract Symptoms (LUTS), which are often associated with this condition. The clinical triad for diagnosing BPH includes the benign enlargement of the prostate gland, urinary bladder outlet obstruction, and the presence of LUTS.[2]

The prevalence of BPH and LUTS tends to increase with advancing age in men, making it a common condition among the elderly. However, it is important to note that LUTS and BPH are not always directly correlated; not every older individual with LUTS has BPH, and not all individuals with BPH experience LUTS. BPH is rare in men under 40 years of age. At around 60 years of age, histological alterations indicative of BPH are present in about half of the male population, rising to almost 88% in those aged 80. Thus, BPH is generally considered a normal part of the aging process.[3] As life expectancy increases, BPH becomes a significant source of morbidity.

One of the most commonly employed diagnostic modalities for prostatomegaly (enlarged prostate) is ultrasound of the prostate, which allows detailed assessment of the prostate gland.[4] Transabdominal sonography, a non-invasive and straightforward procedure, accurately measures prostate size, indicates whether the prostate is projecting into the urinary bladder, and determines the amount of residual urine remaining in the bladder after urination. It also allows the evaluation of the urinary bladder and upper urinary tract simultaneously, enhancing the assessment.[5]

The International Prostate Symptoms Score (IPSS) is a valuable tool for assessing the severity of urinary symptoms in men and tracking changes over time. It helps predict the potential response to treatments for prostate enlargement. The IPSS involves a series of questions that gauge the severity of symptoms, with higher scores reflecting more severe discomfort. The score ranges from 0 to 35 points, with higher values indicating more significant symptoms.[6]

In addition to its initial use, the IPSS is helpful in monitoring symptom progression over time. This ability to track changes is crucial in determining the effectiveness of treatments and making necessary adjustments to improve a patient's quality of life.

The objective of the present study is to examine the relationship between IPSS scores and prostate volumes as measured by TAUS. By investigating whether there is a correlation between the severity of urinary symptoms and prostate size, this research aims to provide insights into how prostate enlargement may influence urinary symptoms. Ultimately, the findings could help in treatment decisions for patients dealing with BPH and associated symptoms.

MATERIALS AND METHODS

This cross-sectional observational study was conducted among male patients aged 40 years and above who presented with LUTS and were referred to the Department of Radio Diagnosis at Rohilkhand Medical College, Bareilly, Uttar Pradesh, for transabdominal sonography over a duration of one year. Prior to commencing the study, ethical clearance was obtained from the Institutional Ethics Committee (IEC) of Rohilkhand Medical College and Hospital.

Sample Size: The sample size was determined using the formula $4pq/L^2$, as reference from Basawaraj NG et al. (2015).[7] With an estimated prevalence (p) of 93.6%, allowable error (L) of 5% and q=100-p=6.4 %, the calculation yielded a sample size of 100 patients.

Inclusion Criteria

- Males aged >40 years.
- Presence of LUTS, including symptoms such as incomplete emptying, frequency, intermittency, urgency, weak stream, straining and nocturia.

Exclusion Criteria

- Patients with a confirmed diagnosis of prostatic carcinoma.
- Patients who had undergone prior open prostatectomy.

Methodology

- Written informed consent was obtained using a standardized proforma.

Clinical Evaluation

- A detailed clinical history was recorded, focusing on LUTS experienced over the preceding month.
- The International Prostate Symptom Score (IPSS) was calculated through a structured questionnaire. The IPSS comprised seven questions, each scored from 0 (no symptoms) to 5 (severe symptoms), with a maximum total score of 35. Symptom severity was categorized as:

Mild (1–7), Moderate (8–19), or Severe (20–35).

- Quality of life (QOL) related to urinary symptoms was assessed using an eighth question, scored from 0 (delighted) to 6 (terrible).

Trans-abdominal Sonography:

- Equipment: Examinations were performed using high-end Samsung ultrasound systems (HS70A, HS40, V7, or RS80) equipped with curvilinear transducers (2–5 MHz).
- Measurements included:
  - Antero-posterior (AP), transverse, and cranio-caudal (CC) dimensions.
  - Median lobe volume, measured independently in longitudinal and transverse planes.
- Prostatic volume was calculated using the prolate ellipsoid formula:

Volume (cc)= AP× Transverse×CC×0.52.

Total prostate volume included the median lobe volume.

- Prostatomegaly Grading:
  - Grade I: 21–30 cc

- Grade II: 31–50 cc
- Grade III: 51–80 cc
- Grade IV: >80 cc

Statistical Analysis

Data were coded, cleaned, and entered into Microsoft Excel. Statistical analysis was performed using SPSS version 23.0. Descriptive statistics (mean, standard deviation, proportions) summarized continuous and categorical variables. A p-value <0.05 was considered statistically significant.

Outcome Measures

- Correlation coefficients between IPSS and prostate volume.
- Distribution of IPSS severity categories across prostatomegaly grades.

RESULTS

Age-wise distribution of patients in the study. Most of the individuals in the study, accounting for 35.0%, belonged to the 60–69 years age group, followed by 28.0% in the 50–59 years group, 17.0% in the 40–49 years group, and 20.0% were aged 70 years or above. Majority of patients, 53 (53.0%), had moderate symptoms, followed by 27 patients (27.0%) with severe symptoms, while 20 patients (20.0%) were categorized as having mild symptoms.

Table 1: Prostatomegaly Grading

Prostate Volume Grade	Number of Patients (%)
Grade I (21–30 cc)	28 (28.0%)
Grade II (31–50 cc)	45 (45.0%)
Grade III (51–80 cc)	22 (22.0%)
Grade IV (>80 cc)	5 (5.0%)

Majority of participants 45 (45.0%), fell into Grade II (31–50 cc), followed by 28 patients (28.0%) in Grade I (21–30 cc). Grade III (51–80 cc) accounted for 22 patients (22.0%), while only 5 patients (5.0%) were observed in Grade IV (>80 cc).

The mean age of the participants was 60.2 ± 11.3 years and the average prostate volume was found out to be 42.5 ± 20.7 cc.

Table 2: Correlation Between Age and Prostate Volumes

Age Group	Mean Prostate Volume (cc)
40–49	36.4 ± 15.8
50–59	34.8 ± 12.3
60–69	42.8 ± 19.7
≥70	57.6 ± 27.3

The mean prostate volume in the 40–49 age group was 36.4 ± 15.8 cc, which significantly increased to 42.8 ± 19.7 cc in the 60–69 group, and further to 57.6 ± 27.3 cc in individuals aged ≥70 years.

Table 3: IPSS Scores vs. Prostate Volume

IPSS Severity	Mean Prostate Volume (cc)
Mild	31.9 ± 14.1
Moderate	36.5 ± 9.4
Severe	61.8 ± 27.6

Patients with mild symptoms had a mean prostate volume of 31.9 ± 14.1 cc, those with moderate symptoms had a mean volume of 36.5 ± 9.4 cc, while patients classified under the severe category exhibited the highest mean prostate volume of 61.8 ± 27.6 cc.

Table 4: Quality of Life (QoL) Scores

QoL Score	Number of Patients (%)
0–2 (Delighted)	9 (9.0 %)
3–4 (Mostly Satisfied)	34 (34.0%)
5–6 (Terrible)	57 (57.0%)

Majority of 57 patients (57.0%) reported a score of 5–6, indicating a terrible quality of life. This was followed by 34 patients (34.0%) who were mostly satisfied with scores ranging from 3–4. Only 9 patients (9.0%) reported being delighted, with a QoL score of 0–2.

Participants with a QoL score of 0–2 had a significantly lower mean IPSS of 5.0 ± 0.0. As the QoL score increased to 3–4 and 5–6, the mean IPSS values also increased to 11.7 ± 4.7 and 19.7 ± 5.0 respectively, suggesting a direct correlation between worsening QoL and higher symptom severity.

Most patients (32%) reported three nocturnal episodes, followed by 22% who experienced two episodes. Four nocturnal episodes were observed in 15% of participants, while 12% reported five episodes. Furthermore, 10% of patients had no nocturnal episodes, and 9% experienced one episode.

24 patients (24.0%) experienced 7 or fewer episodes of urination per day, while the majority, 47 patients (47.0%), reported having between 8 to 10 daily episodes. Additionally, 29 patients (29.0%) had 11 or more episodes daily.

15 percent of patients had weak stream, 84 percent of had urgency,83 percent had straining while 84 percent had intermittency.

Nocturia (≥4 episodes) was present in 14.2% (n=4) of Grade I cases and 100.0% (n=5) of Grade IV cases, with a statistically significant p-value of <0.001. Incomplete emptying was noted in 7.2% (n=2) of Grade I cases compared to 60.0% (n=3) in Grade IV cases, with a highly significant p-value of 0.016.

Table 5: Multivariate Regression – Predictors of Severe IPSS

Predictor	Odds Ratio	95% CI	p-value
Prostate Volume	1.09	1.0-1.12	<0.001
Age	1.03	0.99-1.07	0.999

Prostate volume was a significant predictor, with each 1 cc increase in volume associated with higher odds of developing severe IPSS (OR = 1.09, 95% CI: 1.0–1.12, p<0.001). However, age did not demonstrate a statistically significant association with outcome (OR = 1.03, 95% CI: 0.9–1.07, p ~0.999). This indicates that prostate volume rather than age is more strongly linked with severity of symptoms in studied population.

Table 6: Diagnostic Accuracy of Prostate Volume (>50 cc) for Predicting Severe IPSS (≥20)

Parameter	Value (95% CI)	Formula
Sensitivity	74.0% (55.3–86.8%)	TP / (TP + FN)
Specificity	90.4% (81.5–95.2%)	TN / (TN + FP)
Positive Predictive Value	74.0% (55.3–86.8%)	TP / (TP + FP)
Negative Predictive Value	90.4% (81.5–95.2%)	TN / (TN + FN)
Area Under Curve (AUC)	0.81 (0.67–0.92)	-

Among patients with a prostate volume greater than 50 cc, 20 had severe symptoms (IPSS ≥20), representing true positives, while 7 had non-severe symptoms (IPSS <20), classified as false positives, resulting in a total of 27 patients in this group. Conversely, among those with a prostate volume of 50 cc or less, 6 presented with severe symptoms (false negatives), whereas 67 had non- severe symptoms (true negatives), giving a total of 73 patients in this category.

Table 7: Prostate Volume (>30 cc) vs. Moderate/Severe IPSS (≥8 score)

Parameter	Value (95% CI)	Formula
Sensitivity	87.5% (78.5–93.0%)	TP / (TP + FN)
Specificity	90.0% (69.8–97.2%)	TN / (TN + FP)
Positive Predictive Value	97.2% (90.4–99.2%)	TP / (TP + FP)
Negative Predictive Value	64.2% (45.8–79.2%)	TN / (TN + FN)
AUC	0.88 (0.8–0.95)	-

Among the 72 individuals with prostate volume >30 cc, 70 were true positives (TP) having IPSS ≥8, while 2 were false positives (FP) with IPSS <8. Conversely, among the 28 individuals with prostate volume ≤30 cc, 10 were false negatives (FN) having IPSS ≥8, and 18 were true negatives (TN) with IPSS <8.

Sensitivity was observed to be 70.4% with a 95% confidence interval (CI) of 51.5–84.1%, indicating a high ability to correctly identify true positives. Specificity was 97.3% (95% CI: 90.5– 99.2%), reflecting strong accuracy in detecting true negatives. The Positive Predictive Value (PPV) was found to be 90.5% (95% CI: 71.1– 97.3%) denoting the proportion of positive results that were true positives. Lastly, the Negative Predictive Value (NPV) stood at 89.9 % (95% CI: 81.3–94.8 %), suggesting a high reliability of negative results.

Table 8: Correlation between Prostate volume (cc) and IPSS (Ordinal Scale)

	MEAN	SD
PROSTATE VOLUME (cc)	42.47	20.72
IPSS (Ordinal Scale)	2.04	0.67

Note: IPSS values are based on ordinal coding (Mild = 1, Moderate = 2, Severe = 3).

Correlation between Prostate volume (cc) and IPSS (Ordinal Scale)

	Correlation Coefficient (ρ)	p-value	Interpretation
Prostate Volume vs IPSS Severity	0.604	< 0.001	Moderate to strong positive correlation

Spearman's rank correlation analysis revealed a statistically significant positive correlation between prostate volume and IPSS severity (ρ = 0.604, p < 0.001), indicating that larger prostate volumes are

associated with increased severity of lower urinary tract symptoms.

DISCUSSION

In this prospective analysis, the largest proportion of participants (35.0%) belonged to the 60–69-year age group, aligning with the age range in which BPH most commonly occurs. Additionally, the study found that the majority of patients (53.0%) exhibited moderate symptoms based on the IPSS. Our findings were compared with similar studies conducted in India and other regions to contextualize and understand the relationships between prostate volume and LUTS in BPH.

In our study, the highest proportion of patients (35.0%) belonged to the 60-69 years age group, which is in line with the findings of Basawaraj NG (2015), where 32.5% of participants were aged 60-69 years (Basawaraj NG, 2015).[7] The findings of our study suggest that age does not play a significant role in determining symptom severity. This observation is consistent with Udeh's report, which also found no meaningful association between prostate volume and symptom severity, despite the presence of age-related patterns.

In our study, 53.0% of the participants demonstrated moderate symptoms (IPSS 8–19), while 27.0% presented with severe symptoms (IPSS 20–35), and the remaining 20.0% exhibited mild symptoms (IPSS 0–7). These results are consistent with the findings of Basawaraj NG (2015), who reported severe symptoms in 41.3% of patients, moderate symptoms in 37.3%, and mild symptoms in 21.4%.[7]

Our study found that 45.0% of patients had a prostate volume between 31-50 cc (Grade II), while 28.0% had a prostate volume between 21-30 cc (Grade I), and 22.0% had a volume between 51-80 cc (Grade III). This is consistent with findings from Munde et al. (2022), who reported that 39.0% of their patients had prostate volumes between 31-50 cc and 38.0% had volumes between 51-80 cc. [4] The result of our study indicates that enlargement of prostate is linked to a progressive worsening of symptoms.

In our study population, the mean patient age was 60.2 ± 11.3 years, while the average prostate volume measured 42.5 ± 20.7 cc. Similarly, studies by Basawaraj NG (2015) found a mean prostate volume of 45.5 ± 18.2 cc in a study of South Indian patients aged 50–80 years, which was statistically significant ($p<0.05$).[7] Gnyawali et al. (2014) reported a mean prostate volume of 47.2 ± 20.1 cc in a prospective cohort, with a slight positive correlation between age and prostate size ($r=0.38$).[8]

Our study demonstrated a gradual increase in prostate volume with increasing age. For instance, the 40–49 age group had a mean volume of 36.4 ± 15.8 cc, which increased to 57.6 ± 27.3 cc in individuals aged ≥70 years. This finding is supported by the study by Basawaraj NG (2015), which showed a similar trend with prostate volume ranging from 30.1 ± 7.3 cc in the 40–49 group to 60.3 ± 19.4 cc in the ≥70 age group.[7]

In contrast, a study by Gnyawali et al. (2014) found that age had only a weak correlation with prostate volume ($r=0.21$).[8] This discrepancy could be explained by the smaller sample size in their study or variations in demographic factors, which may have restricted the ability to identify a stronger correlation. However, the results from Udeh et al. (2018), where they reported a mean volume of 53.5 ± 15.9 cc in men aged ≥70, aligned with our finding.[9]

Our findings demonstrated a significant association between prostate volume and the severity of LUTS. Patients with mild symptoms (IPSS: 0–7) had a mean prostate volume of 31.9 ± 14.1 cc, while those with severe symptoms (IPSS: 20–35) exhibited a higher mean prostate volume of 61.8 ± 27.6 cc. Comparable results were reported by Basawaraj NG (2015), who found a statistically significant association between prostate volume and IPSS severity ($r = 0.40$, $p = 0.001$).[7] They found that patients with a mean prostate volume of 48.2 ± 15.7 cc had moderate-to-severe symptoms, whereas patients with a mean volume of 31.3 ± 10.2 cc had mild symptoms.

The majority of our patients reported a "terrible" quality of life (QoL score 5– 6) with 57.0% of the total sample. This finding is consistent with the study by Gnyawali et al. (2014), which found that a majority of their participants (52%) reported a similar poor QoL due to LUTS in BPH.[8]

Our findings indicated that QoL scores were strongly correlated with IPSS, with patients reporting a higher IPSS (19.7 ± 5.0) having a significantly lower QoL score. This finding aligns with Basawaraj NG's study, where patients with high IPSS scores also reported low QoL, emphasizing the direct impact of symptom severity on patient satisfaction and daily activities.[7]

Our study found that 24 patients (24.0%) experienced 7 or fewer episodes per day, 47 patients (47.0%) had 8–10 episodes, and 29 patients (29.0%) had 11 or more episodes daily. This result is consistent with findings by Gnyawali et al. (2014) who observed a similar distribution in symptom severity based on frequency of urination, but did not find such a significant correlation between frequency and prostate volume.[8] The higher frequency of urination in our study reflects the expected progression of BPH, where increasing prostate volume puts pressure on bladder, exacerbating symptoms.

Our study demonstrated that certain symptoms, such as nocturia and incomplete bladder emptying, were significantly more prevalent in patients with larger prostate volumes. For example, nocturia (≥4 episodes) was present in 100.0% (n=5) of patients with prostate volume greater than 80 cc, compared to 14.2 % (n=4) in the Grade I group (prostate volume 21–30 cc). These findings are consistent with those reported by Gnyawali et al. (2014), who reported that symptoms like nocturia and incomplete emptying were more prevalent in patients with larger prostate volumes (Gnyawali et al., 2014).[8]

In our study, the analysis of symptoms between patients with mild (IPSS 0–7) and severe (IPSS 20–35) symptoms showed marked differences. For incomplete emptying, weak stream, and nocturia, the severe group had significantly higher scores than the mild group. These findings are consistent with those of Kim et al. (2020), who also reported that severe symptoms were more strongly associated with higher IPSS scores, particularly in voiding symptoms such as weak stream.[10] Basawaraj NG (2015) similarly reported higher symptom severity in BPH patients with larger prostate volumes, but the correlation was not as strong as in our study.[7]

CONCLUSION

The severity of IPSS symptoms was positively correlated with prostate volume. Patients with mild symptoms had a mean prostate volume of 31.9 ± 14.1 cc, while those with severe symptoms had a mean volume of 61.8 ± 27.6 cc. A p-value of <0.001 signifies a highly significant correlation between prostate volume and the severity of IPSS symptoms. The distribution of QoL scores showed that 57.0% of patients reported poor QoL, with scores of 5–6. Thirty-four percent of patients were mostly satisfied with a QoL score of 3–4, and 9.0% reported being delighted (score 0–2). A direct correlation between QoL and IPSS scores was observed, with patients having worsening QoL scores showing higher IPSS. Patients with a QoL score of 0–2 had a mean IPSS of 5.0 ± 0.0, markedly lower than the 19.7 ± 5.0 mean IPSS recorded in the 5–6 QoL group. A significant p-value of <0.001 was observed for nocturia and prostate volume grades. A statistically significant positive correlation was observed between prostate volume and IPSS indicating larger prostate volumes are associated with increased severity of lower urinary tract symptoms.

REFERENCES

1. Meena BK, Meena S.Evaluation of sonographic volume in relation with International Prostate Symptom Score.International Journal of Pharmaceutical and Clinical Research 2020;12(4);22-6
2. Roehrborn CG, McConnell JD, Saltzman B, Bergner D, Gray T, Narayan P et al. Storage (irritative) and voiding (obstructive) symptoms as predictors of benign prostatic hyperplasia progression and related outcomes. European urology. 2002; 42(1):1-6
3. Girman CJ. Population-based studies of the epidemiology of benign prostatic hyperplasia. British journal of urology. 1998;82:34-43.
4. Munde AS,Desai N S. Study of correlation between prostatic volume on ultrasonography and clinical symptoms using International prostate Symptom score(IPSS) in cases of prostatomegaly. MedPulse International Journal of Surgery,2022;22(1): pp 05-10
5. Garcia NR, Sanz ME, Arias FF. Diagnosis and follow up of benign prostatic hyperplasia by ultrasound.Arch Esp Urol.2006;59:353-60.
6. Hosseini M, Ebrahimi SM, SeyedAlinaghi S, Mahmoodi M. Sensitivity and specificity of international prostate symptom score (IPSS) for the screening of Iranian patients with prostate cancer. Acta Medica Iranica. 2011:451-5
7. Basawaraj NG, Dasan TA, Patil SS. Correlation of sonographic prostate volume with international prostate symptom score in South Indian men. International Journal of Research in Medical Sciences.2015;3(11):3126-30.
8. Gnyawali D, Sharma U. Correlation of prostate volume with'International prostate symptom score'and'benign prostatic hyperplasia-impact index'in benign prostatic hyperplasia. Journal of Society of Surgeons of Nepal. 2014;17(1):6-10.
9. Udeh EI, Ozoemena OF, Ogwuche E. The relationship between prostate volume and international prostate symptom score in Africans with benign prostatic hyperplasia. Nigerian Journal of Medicine. 2012 Jul 1;21(3):290-5.
10. Kim HJ, Moon JH, Oh YH, Kong MH, Park KK, Huh JS. Relationship between prostate volume and lower urinary tract symptom in health checkup subjects. Korean J Urol Oncol. 2020;18(1):53-60.