**Research Article**

# Correlation Between Prostate Volume and IPSS Score in Patients with Histologic Benign Prostate Hypertrophy

*Corrélation entre le volume de la prostate et le score IPSS chez les patients présentant une hypertrophie bénigne histologique de la prostate*

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**Mots-clés** : Score IPSS, hypertrophie bénigne de la prostate, volume prostatique, symptômes des voies urinaires inférieures

## ABSTRACT

**Background.** Benign prostatic hypertrophy (BPH) is a common disorder and most common cause of morbidity in ageing men. The evaluation of lower urinary symptoms (LUTS) and the bother associated with it are important for management. The International Prostate Scoring System (IPSS), the quality of life score (QoL) due to urinary symptoms are practiced to quantify the severity of LUTS. **Objective.** To find the correlation between the prostate volume and LUTS based on the IPSS score in patients with histologic BPH. **Methods.** This was a retrospective study from March 2020 to March 2021 at the Nkwen Baptist Hospital. A total of 45 patients were included, age ranged from 40 to 90 years, with histologic confirmation of BPH and a documented IPSS and prostate volume. Data were analysed using SPSS version 26.0, and p value $< 0.05$ was considered statistically significant. **Results.** The mean age was $69.89 \pm 7.526$ years range 40 to 90 years. Most of the patients had moderate symptoms (66.7%) with mean IPSS value of $17.84 \pm 5.661$. There was a moderate positive significant correlation between prostate volume and IPSS (r=0.0410, p=0.006) and no significant correlation between prostate volume and QoL. **Conclusion.** This study showed that there is significant correlation between prostate volume and the IPSS score due to BPH and no significant correlation between the QoL score due to LUTS and transrectal ultrasound calculated prostate volume.

## RÉSUMÉ

**Introduction.** L'hypertrophie bénigne de la prostate (HBP) est un trouble courant et la cause la plus fréquente de morbidité chez les hommes vieillissants. L'évaluation des symptômes urinaires bas et les troubles qui y sont associés sont des facteurs importants pour la prise en charge. Le score IPSS, le score de qualité de vie en rapport avec les symptômes urinaires sont pratiqués pour quantifier la sévérité des troubles urinaires bas. **Objectif.** Trouver la corrélation entre le volume de la prostate et les symptômes urinaires bas sur la base du score IPSS chez les patients atteints d'HBP histologique. **Méthodes**. Il s'agissait d'une étude rétrospective de mars 2020 à mars 2021 à l'hôpital Baptiste de Nkwen. Un total de 45 patients ont été inclus, âgés de 40 à 90 ans, avec une confirmation histologique de l'HBP, un IPSS et un volume prostatique documentés. Les données ont été analysées à l'aide du logiciel SPSS version 26.0 et la valeur p $< 0,05$ a été considérée comme statistiquement significative. **Résultats**. L'âge moyen était de $69,89 \pm 7,526$ ans, allant de 40 à 90 ans. La plupart des patients présentaient des symptômes modérés (66,7 %) avec une valeur IPSS moyenne de $17,84 \pm 5,661$. Il y avait une corrélation significativement positive modérée entre le volume de la prostate et l'IPSS (r = 0,0410, p = 0,006) et aucune corrélation significative entre le volume de la prostate et la qualité de vie. **Conclusion**. Cette étude a montré qu'il existe une corrélation significative entre le volume de la prostate et le score IPSS dû à l'HBP et aucune corrélation significative entre le score de qualité de vie dû aux symptômes urinaires bas et le volume prostatique calculé par échographie transrectale.

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**HIGHLIGHTS OF THE STUDY**

**What is already known in this topic**

There is a controversy on the relationship between the prostate volume and LUTS in the literature. It is assumed that the volume of the prostate does not correlate with the severity of LUTS

**What question does this subject address**

The relationship between the prostate volume and LUTS using the IPSS in patients with histologic benign prostate hypertrophy

**What this study adds to our knowledge**

It confirms the mechanical effect of increased prostate volume on the severity of lower urinary symptoms in patients with histologic BPH.

**How this is relevant to clinical practice policy or further research**

Although we have proved positive correlations between prostate volume and the severity of lower urinary tract symptoms, the relationship is weak and cannot be used in making clinical decisions. This however opens up a debate for further research with better tools and in multiple centers.

## INTRODUCTION

The prostate is a male accessory exocrine gland found exclusively in mammals [1]. Benign prostatic hypertrophy is the most common non-malignant condition of the prostate developing in aging men [2]. It is a major public health concern, causing high morbidity and substantial worsening of t h e  quality of life (QOL) due to urinary symptoms in men [3]. Benign prostatic hypertrophy accounts for a significant cause of urinary symptoms in adult males [4]. The development of BPH and LUTS is frequent in ageing males. Prevalence has been reported to be 20% at age 40, 30% at age 50, by age 70 with a prevalence of 70%, the likelihood of BPH increases to 80% at age 80 and by age 100 the prevalence is 100% [5]. In Africa the prevalence is estimated at 23.7%  [6]. The global prevalence range of BPH is estimated to be 20 to 60% based on studies conducted in the USA, South Africa and Ghana [7].

Lower urinary tract symptoms (LUTS) are one of the most common presentations in urology clinics. LUTS are used to define the complex of those symptoms which includes bladder storage and voiding symptoms. These symptoms are often associated with prostate enlargement which is a common  etiology of male LUTS [8]. However, LUTS are not specific to only one disease, they may also be present in manyother diseases such as heart failures, urinary tract infections, diabetes, bladder neck cancer, and neurological diseases including Parkinson disease, multiple sclerosis, stroke and cauda-equina syndrome [9] In order to evaluate the severity of the symptoms, several scoring systems have been created, among which the International Prostate Symptom Score (IPSS) is gained wide acceptance [8]. Ultrasound of the prostate is the investigation that enables us to visualize the prostate gland directly and is one of the most common diagnostic modalities performed in patients presenting with LUTS [10]. It can be done using the trans-abdominal approach as well as trans-rectal approach. There is a controversy on the relationship between the prostate volume and LUTS in the literature. The objective of the study was to correlate the prostate volume and LUTS using the IPSS in

patients with histologic benign prostate hypertrophy.

## PATIENTS AND METHOD

**Study design and setting:**

We carried out a hospital based retrospective cross-sectional study in patients managed  for histologic BPH from March 2020 to March 2021 at the Urology Department of Nkwen Baptist Hospital in the NorthWest Region of Cameroon. The Hospital is a 200 bed capacity hospital and the only hospital offering specialized urology services in the Region, NET was the only urologist in active practice in the Region at the time of the study and he made the diagnosis and measured the IPSS and QoL scores.

**Study population:**

We included all male patients aged 40 to 90 years who presented with lower urinary tract symptoms and for whom a diagnosis of BPH was made histologically. Patients with histologic BPH associated with chronic prostatitis and High grade PIN, those with associated urethral strictures and patients in whom prostate volume was not measured by transrectal ultrasonography were excluded. The patients were consecutively recruited.

**Data collection:**

The hospital record of all prostate biopsies was used to determine all the patients who underwent prostate biopsy within the study period. The results of the biopsies were checked to determine patients with a histological diagnosis of BPH. The files of these patients were then sorted out for data collection into a predefined data entry form.

**Variables**

We collected demographic data (age, residence), IPSS score (iLUTS, oLUTS, QoL score), prostatevolume.

**Statistical analysis**

We analyzed the data using the IBM SPSS  software version 26.0. Continuous data were presented as mean with standard deviation or median with interquartile range while discrete variables were presented as frequencies and proportions. The spearman correlation coefficient were used to describe the IPSS  score and various parameters tested while the Pearson's correlation coefficient was used to describe the association between IPSS score and prostate volume, for which a value of r between -1 and 1 was considered to have a relationship between the variables tested. We used the student t-test to  compare
continuous variables and; Chi square test and Fischer's exact tests to compare categorical variables, P- values < 0.05 was considered significant.

**Ethical consideration:**

Ethical clearance was obtained from the Institutional Review Board of the Cameroon Baptist Convention Health Services and administrative authorization was obtained from the administration of the Nkwen Baptist Hospital.

**Operational Definition of Terms**

- *Benign Prostate Hypertrophy (BPH)* is a

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histologic diagnosis where there is an increase in size of stromal and/or epithelial cells in the per urethral area of the prostate [2].

• *Lower Urinary Tract Symptoms (LUTS)* is a constellation of symptoms related to storage and or voiding disturbances in ageing men. It includes a symptoms associated with urine storage or emptying [18].

• *International Prostate Scoring System (IPSS score)* is a validated scoring system used to clinically evaluate LUTS [22]. It involves an evaluation of the irritative symptoms (iLUTS), obstructive symptoms (oLUTS) and the quality of life score based on voiding symptoms (QoL). The IPSS score can be further classified into mild, moderate and severe LUTS. In our study, IPSS score was physician obtained based on patient questioning as opposed to patient generated based on patient filling in the form.

• Mild LUTS are found in patients whose IPSS score is between 0-7

• Moderate LUTS are seen in patients whose IPSS score is between 8-19

• Severe LUTS occur in patients whose IPSS score is between 20-35

• Irritative lower urinary tract symptom (iLUTS) is bladder storage dysfunctional symptoms which include frequency, urgency and nocturia.

• Obstructive lower urinary tract symptoms (oLUTS) are bladder emptying dysfunctional symptoms which include weak voiding stream, incomplete bladder emptying, straining to void and intermittency in voiding.

• Prostate volume was calculated using the prostate ellipsoid formula (length × height × width × $\prod/6$) in cm3 ($\prod/6=0.5238$), using prostate length, height and width measured by a transrectal ultrasonography using a Mindray Digital Ultrasonic Diagnostic Imaging System Model DP—18 and a well-lubricated gloved rectal probe at a frequency of 6.5MHz with the patients in the left lateral position.

## RESULTS

During the study period, a total of 223 prostate biopsies were carried out for which 108 patients were from outpatient prostate ultrasound guided prostate biopsies and 75 patients post prostatectomy histopathology. A total number of 68 patients were excluded from the study which included chronic prostatitis, prostate cancer, and those with medical records lacking variables of interest. From the outpatient prostate biopsy are, 25 of the 108 patients were diagnosed with BPH while from the post prostatectomy arm, 23 of the 75 patients were excluded with diagnosis including chromic prostatitis, prostate cancer or High grade PIN. Of the 52 patients with histologic BPH in the post-prostatectomy arm, 30 were excluded either because prostate volume was measured by a transabdominal ultrasonography or the files lacked key variables. This left is with a total of 45 patients included in the study.

### General characteristics

The mean (SD) age of the study participants was 69.89 (± 7.526) years with the age range of 40 to 90 years. More than three-quarter (75.6%) of the participants resided in North West region of Cameroon. The mean (SD) IPSS score was 17.84(±5.661) ranging from 8 to 32 on a scale of 35. Moderate symptoms were seen in 66.7% patients and severe symptoms were in 33.3% cases. None of the included patients had a mild symptom. The mean (SD) Obstructive lower urinary tract symptoms (oLUTS) was (11.31±4.05) ranging from 4 to 20 on a scale of 20 while the mean (SD) Irritative lower urinary tract symptoms (iLUTS) was 6.53±2.170 ranging from 2 to 12 on a scale of 15. The mean (SD) quality of life (QoL) score due to urinary symptoms was 3.6000 (± 0.726) with 48.9% of the cases having a mixed feeling (3/6). The mean (SD) prostatic volume was 80.780 (± 30.169) mL with the highest prostate volume of 207ml and the lowest prostate volume of 41ml.

| Table 1: general characteristics of the participants | | |
|---|---|---|
| **Variable** | **Frequency(n)** | **Percentage (%)** |
| **Region of origin** | | |
| Northwest | 34 | 75.6 |
| Out of Northwest | 11 | 24.4 |
| **IPSS score** | | |
| Mild (0 - 7) | 0.00 | 0.00 |
| Moderate (8 - 19) | 30 | 66.7 |
| Severe (20 - 35) | 15 | 33.3 |
| **QoL** | | |
| Delighted (0) | 0 | 0.0 |
| Pleased (1) | 0 | 0.0 |
| Mostly satisfied (2) | 2 | 4.4 |
| Mixed (3) | 22 | 48.9 |
| Mostly dissatisfied (4) | 16 | 35.6 |
| Unhappy (5) | 5 | 11.1 |
| Terrible (6) | 0 | 0.0 |
| **Prostate volume (ml)** | | |
| Grade 1 (25 - <50) | 3 | 6.7 |
| Grade 2 (50 - 75) | 23 | 51.1 |
| Grade 3 (> 75) | 19 | 42.2 |
| **IPSS score** | | |
| Mild (0 - 7) | 0.00 | 0.00 |
| Moderate (8 - 19) | 30 | 66.7 |
| Severe (20 - 35) | 15 | 33.3 |

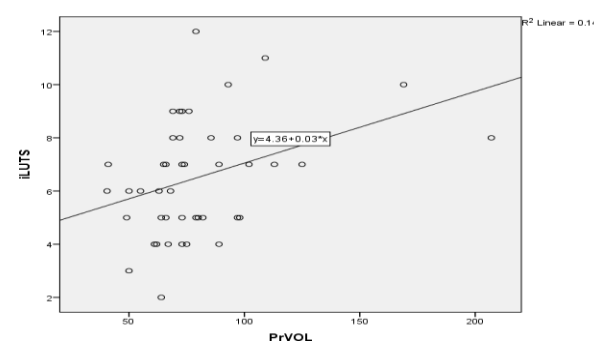**Correlation between International prostate scoring system (IPSS) and prostate volume**



**Figure 1**: Scatter diagram showing correlation between Prostate volume and iLUTS

Figure 1 above shows a weak positive linear relationship between prostate volume and iLUTS with r=0.406, the relationship between prostate volume and iLUTS is statistically significant (p=0.011).

Figure 2 shows a moderate positive linear relationship between prostate volume and oLUTS, r=0.367 with a statically significant relationship between prostate volume and oLUTS (p=of 0.013).
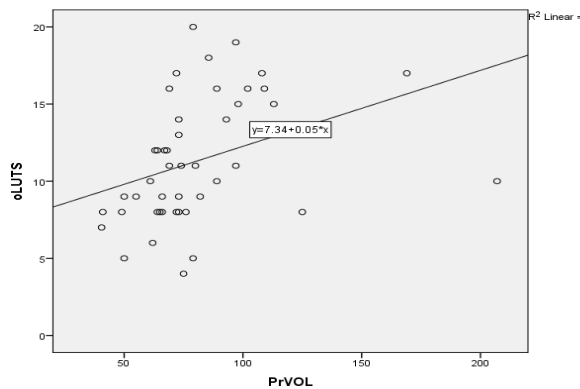


**Figure 2**: Scatter diagram showing correlation between Prostate volume and oLUTS

Figure 3 shows a moderate positive linear relationship between prostate volume and the total IPSS (iLUTS + oLUTS), r=0.410. The relationship between prostate volume and IPSS was statistically significant (p=0.006)
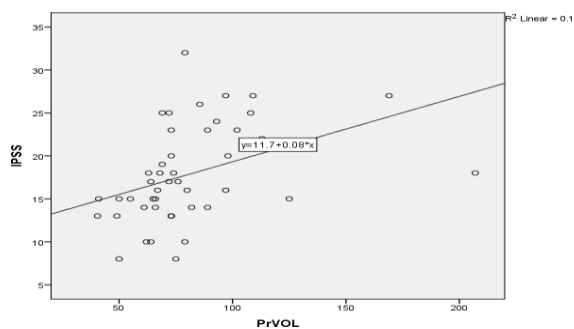


**Figure 3**: Scatter diagram showing correlation between Prostate volume and IPSS

In figure 4, we correlated the Prostate volume and the QoL score. This shows that there is a very weak positive linear relationship between prostate volume and QoL score with r=0.225. This relationship was not statically significant (p=0.137).
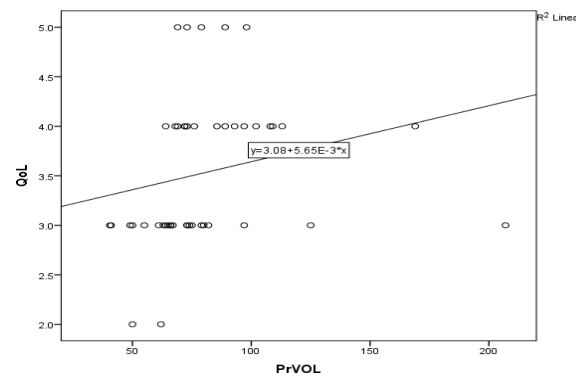


**Figure 4**: Scatter diagram showing correlation between Prostate volume and QoL

## DISCUSSION

Benign prostatic enlargement is a common cause of LUTS in men older than 50 years [11]. Benign prostatic hypertrophy and lower urinary tract symptoms are quite prevalent in men with advancing age [7, 13, 14]. The mean (SD) age of the participants in our study was 69.892±7.526 years; the age range was 40 to 90 year and the peak age group between 68–72 years. Our findings are slightly higher than those reported by Badmus et al (64.47±8.88 years) [15] in Southwestern Nigeria and Awaisu et al (64.2±9.0 years) [16] in Osun state and Zaira, Kaduna state respectively in Nigeria. However, we had similar participants mean age with those reported in studies in Asia: Wang et al [17] reported a mean age of 68.0(±7) years china, and Hossain et al [13] reported a mean age of 66.7(±9.85) years in Dhaka, Nepal.

In our study, the mean IPSS was 17.89±5.66. This finding is similar to that reported Kenneth et al in Kumasi, Ghana on LUTS due to BPH which showed a mean IPSS of 17.5±7.83 [18]. Awaisu et al[16] in Kaduna state, Nigeria showed a mean IPSS value 16.3±7.1[71] and Ofoha et al [19] in Jos, Nigeria all showed mean IPSS of 15.3 which are lower than that found in our study [77]. Reports from out of the continent of Africa showed higher mean IPSS, Gnyawali et al [20] and Agrawal et al [21] both in Nepal respectively reported mean IPSS of 23.6±6.0 and 23.5. Ezz Ei Din et al [22] in the Netherlands reported a mean IPSS of 26.1±10.2. This difference may be due to a relatively larger sample size in these western studies when compared with our study and those of other African studies. This however means patients in our setting and other African countries seek treatment for LUTS earlier than patients from other continents, which contradicts the notion of delay presentation for care noticed in Africa. The method used to determine the SPSS score in our setting was physician determined while in other settings, the IPSS is patient determined. This difference can create a physician underestimation of the problem in our setting, thereby lowering the mean IPSS score.

The mean iLUTS in our study was 6.53±2.17, similar to reports in China by Wang et al (6.53±3.8) [17]. Our mean oLUTS was 11.31±4.05 slightly higher than that reported by Wang et al (9.44±5.38) [17].

In our study, we observed that the Quality of life assessment due to urinary symptoms showed that 22 (48.9%) patients had mixed feelings (QoL=3) due to

LUTS secondary to BPH and 5 (11.1%) patients were unhappy (QoL=5) and 16 (35.6%) patients were mostly dissatisfied (QoL=4). This trend is similar to with the findings of Awaisu et al [16] in Nigeria Kaduna-state who found that Quality of life assessmentout of 150 patients (51.7%) and 42 patients (14.5%) were unhappy (QoL=5) and mostly dissatisfied (QoL=4), respectively. This trend differs from that reported by Bosch et al[22] in Rotterdam, the Netherlands whose results showed that 31% of men were delighted, 24% were 'pleased, 29% mostly satisfied 'and 10% felt about equally satisfied and dissatisfied' about their urinary condition. Few men were 'mostly dissatisfied' (5%)or felt 'unhappy' (1%).our study further demonstrate that lower urinary tract symptoms in patients with benign prostatic enlargement significantly affect the quality of life. This difference is explained by the fact that we sampled patients with disturbing urinary symptoms and who showed up for care while Bosch et al sampled men with or without symptoms.

In our study, the mean prostatic volume was $80.71\pm30.169cm^3$. Our figures are quite visibly higher than those reported by Awaisu et al ($52.52\pm30.53cm^3$) [16], Gnyawali et al [20] in Kathmandu, Nepal ($47.5\pm16.63 cm^3$) [12], Hossain et al [13] in Dhaka, Indonesia ($60.23\pm38.16$).

We found a significant but very weak positive linear relationship between iLUTS/prostate volume (r=0.406 and p=0.011), a significant but weak positive linear relationship between oLUTS and prostate volume(r=0.367 and p=0.013) and a significant but weak positive linear relationship between total IPSS score and prostate volume (p=0.006 and r=0.410). Cakiroglu et al [23] (r=0.45 and p=0.00) [69] and Wanget al in China [17] (r=0.27 p=0.00) [68] reported similar correlations to ours. However, Hossain et al [13] in Dhaka, Indonesia demonstrated a strong relationship between these two entities (r=0.585 and p<0.001) and Awaisu et al [16] in Nigeria showed a positive significant relationship (r=0.176 and p=0.002). Ofoha et al [19] in Jos, North-Central Nigeria, on the otherhand, reported a positive insignificant correlation between the prostate volume and IPSS (r=0.13 and p=0.18). Similar findings of insignificant correlation between prostate volume and IPSS were reported by Bosh et al (r=0.19 p=0.001) [22]. Several factors may account for these differences including discrepancies in the determination of the IPSS (physician administered or patient administered), the level of clinical experience of the radiologist determining the prostate volume, the route of ultrasonography (transabdominal or transrectal), the type of ultrasound probe used.

Patients feelings of well-being should be taken into account in the clinical management of BPH [24] .We found that, there was no relationship between the QoL and prostate volume (r=0.225 and p=0.137).

## CONCLUSION

The particularity of this study is the exclusive inclusion of patients with histological BPH, which is different from most other studies which includes patients with both histologic and clinical BPH. We conclude that there is significant correlation between transrectal calculated prostate volume and the International Prostate Symptoms Score (IPSS) due to histologically determined BPH and no significant correlation between the quality of life score due to lower urinary tract symptoms and transrectal ultrasound calculated prostate volume. The relationship between transrectal calculated prostate volume and the International Prostate Symptoms Score (IPSS) however correlates weakly and as such, the prostate volume cannot be satisfactorily used as a determinant for the treatment of symptomatic histological BPH.

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