The Relationship between Prostate Volume and International Prostate Symptom Score in Africans with Benign Prostatic Hyperplasia

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ABSTRACT

OBJECTIVE: To determine the relationship between prostate volume and international prostate symptom score (IPSS) in Africans with benign prostatic hyperplasia (BPH).

PATIENTS AND METHOD: This was a prospective study of 120 men aged between 45 to 85years, who were referred to the urology outpatient facility for treatment of clinical BPH between July 2007 and October 2008 in Jos University Teaching Hospital. These patients were properly evaluated; a digital rectal examination was done to estimate the prostate size. The pre-treatment IPSS of the patient was also obtained. The prostate volume of each patient was then estimated by transabdominal ultrasound.

RESULTS: The mean prostate volume was $72.79 \pm 44.38 cm^3$. The mean values for the different diameters of the prostate were $5.63 \pm 1.17cm$ (longitudinal diameter), $4.48 \pm 0.95cm$ (anterior posterior diameter), $4.97 \pm 1.06cm$ (transverse diameter). The Pearson's correlation between pre-treatment International prostate symptom score and prostate volume was -0.0035 (P>0.05).

CONCLUSION: This study has shown that there is no significant relationship between international prostate symptom score and prostate volume in Africans. This is same with similar studies done in other parts of the world.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common urological condition among men[1.] In the United States approximately 400,000 prostatectomies are performed annually for BPH[2].

Generally, it is acceptable that there is a minimal direct correlation between prostate volume and symptoms of BPH[3]. Transition zone (TZ) volume can be used as a predictor of severity of symptoms of BPH. Terris et al[4] reported that TZ volume correlated well with the severity of BPH symptoms. Transabdominal suprapubic ultrasound has been used to estimate the size of the prostate and studies done by Prasspoulos et al[5] showed a strong correlation between suprapubically assessed and tranrectally obtained measurement of total prostate gland and transition zone of the prostate. Suprapubic ultrasound was adjudged less cumbersome and a widely available tool.

Barry et al[6] developed the American Urological Association (AUA) score in 1992 which was adopted by the World Health Organization (WHO) in 1994 as the international prostate symptom score (IPSS).

The AUA symptom index consists of seven questions that assess frequency, nocturia, intermittency, urgency, incomplete emptying, weak stream, and straining, with each graded with a score of 0-5. Total score ranges from 0-35. Patients are categorized as: (1) mild (score 0-7) (2) moderate (score 8-19) and (3) severe (score 20-35).

The IPSS is a modification of AUA symptom index with an inclusion of quality of life[7]. Studies done in different centers all over the world showed little correlation between international prostate symptom score and prostate volume[8, 9]. This in principle should not be assumed to be same with African men. Considering that results of most scientific studies tend to vary among different races.

PATIENTS AND METHODS

This was a prospective study approved by the Hospital Ethical Committee.

Patients who were pathologically diagnosed with BPH by transrectal biopsy specimen of the prostate at the urological outpatient from 2007 to 2008; including those with normal PSA values and normal digital rectal examination findings, who gave their informed consent were included in the study. The reason for biopsy were increased PSA (>4ng/ml) or abnormal digital rectal examination. Those with biopsy evidence of prostate cancer, prostatitis, prostate intraepithelial neoplasia or atypical small acinar proliferation detected at any point during follow up were excluded from the study. We also excluded those who have received any form of medical, minimally invasive or open surgical treatment.

The sample size was calculated using the statistical formula shown below:

$$N = \frac{Z^2 PQ}{\delta^2} \quad [10]$$

Where N= minimum sample size for a comparative study design Z= the standard normal deviation corresponding to 95% level of significance. The value obtained from the normal distribution table is 1.96

P=prevalence rate obtained from Yeboah's Study=21%[11]=0.21

Q=(1-P)

δ= Absolute precision i.e. value required(in percentage points) which in actual term describes the maximum difference between the population rate and the sample rate that can be tolerated; taken for this study to be 10% (0.01)

$$N= \frac{1.96^2 \times 0.21 \times 0.79}{0.1^2} = 63.732 \approx 64$$

Each subject was interviewed to obtain demographic and social history. Detailed history was taken to rule out other causes of the lower urinary tract symptoms and to identify co-morbidities that may interfere with the study i.e. diabetes mellitus. A pre-treatment IPSS was obtained from the patients.

Subsequently, patients had serum prostate specific antigen (PSA) assay; and were then sent for transabdominal suprapubic ultrasound. Those with elevated PSA had transrectal prostate biopsy.

For the abdominal ultrasound, patients were requested to attend with a full bladder. In each patient, the prostate was scanned in the longitudinal and transverse planes. In the longitudinal plane the maximum cranio-caudal diameter of the gland was measured while in the transverse plane, the maximum transverse diameter and the antero-posterior diameter were measured. The abdominal ultrasound was done by a consultant radiologist.

Prostate volume (V cm^3) was then calculated using the formula $V=\alpha \times \beta \times \gamma \times \pi\backslash6$; where α is transverse diameter; β is anterior-posterior diameter; γ is the longitudinal diameter; $\pi\backslash6$ is 0.52[12].

The data collected was analyzed using a multipurpose computer statistically programmed EPI-INFO with the assistance of a computer analyst. Results obtained were expressed using tables showing means, standard deviations and range. Charts were used where necessary.

The data was subjected to linear regression. Pearson's correlation was used to assess correlation where applicable.

RESULTS

A total of 120 patients were enrolled in this study. Twenty of them had inconclusive results due to loss to follow up, as such were excluded from further analysis. Majority of the patients were farmers (61%), followed by civil servants (13%) as shown in figure 1. The mean age was 65.6±9.84 years, while the peak age group was 60-69 years.

In addition, the maximum total prostate volume was 223.82mls, though the mean total prostate volume was 72.79±44.38mls.

Also, the mean value of IPSS was 19±8.22 with a range of 3-35. Based on the different diameters of the prostate during suprapubic ultrasound estimation of prostate volume; the mean values were as follows: 5.63±1.17cm (longitudinal diameter), 4.48±0.95cm (anterior posterior diameter), 4.97±1.06cm (transverse diameter).

Severity of symptoms using the IPSS showed that most of the patients had moderate symptoms (53%) while only 7% had mild symptoms.

Furthermore, the values of the IPSS and prostate volume for the 100 patients were subjected to Pearson's correlation coefficient test. The correlation between pre-treatment IPSS and prostate volume was -0.0035 (P>0.05) implying no significance; as shown in figure 2. The correlation between the longitudinal diameter of the prostate and pre treatment IPSS was 0.0821(P>0.05) indicating no significance; as shown in figure 3. The correlation between the transverse diameter of the prostate and the pre-treatment IPSS was 0.0397(P>0.05) implying no significance; as shown in figure 4. The correlation between anterior posterior diameter of the prostate and the pre-treatment IPSS was 0.0615 (P>0.05) indicating no significance.

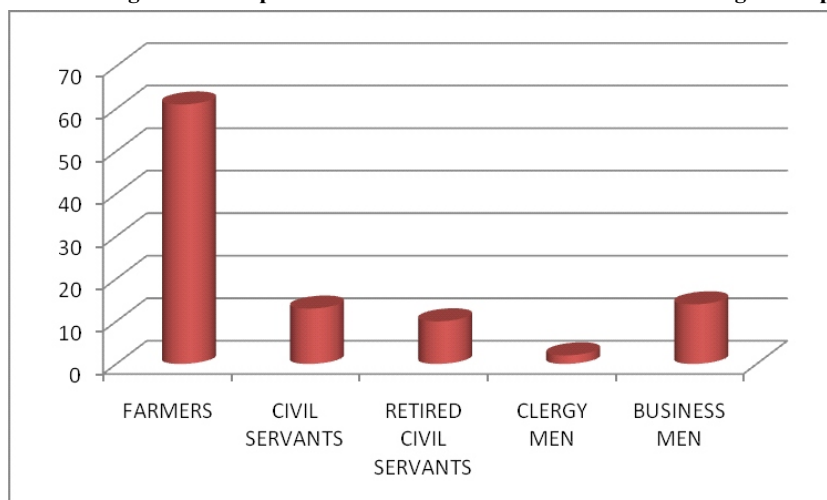**Figure 1: Occupational Distribution of 100 Patients Presenting with Bph**

Figure 2: Scatter Plot of Prostate Volume and Pre-Treatment International Prostate Symptom Score in 100 Patients with Bph
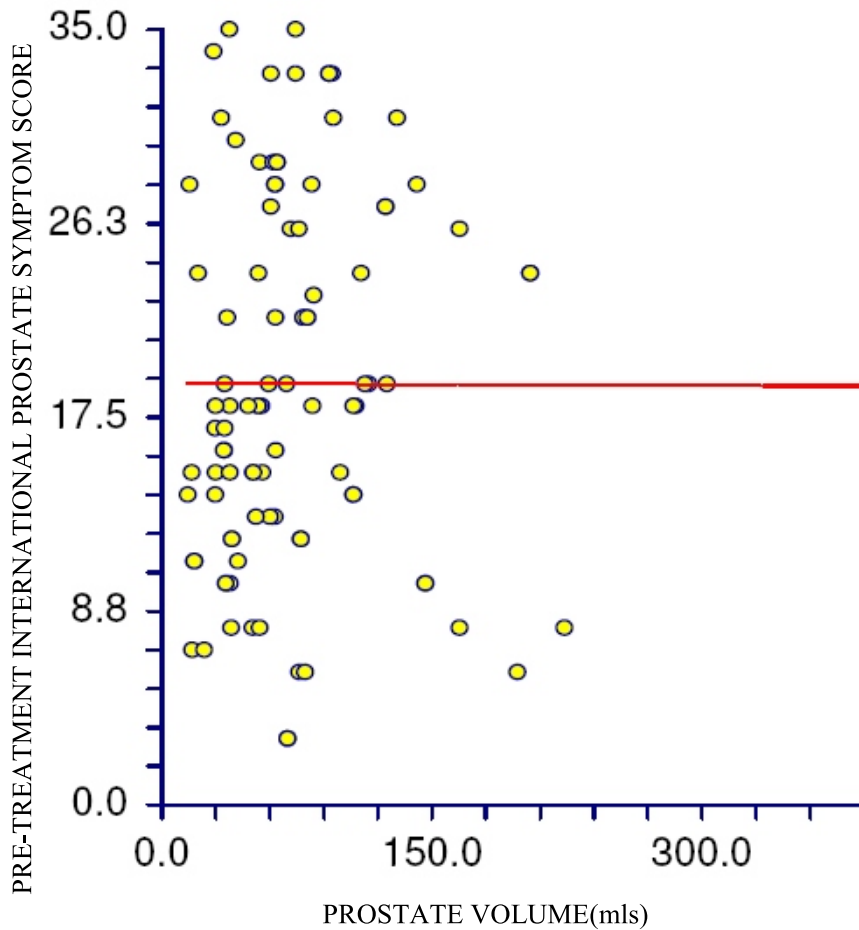

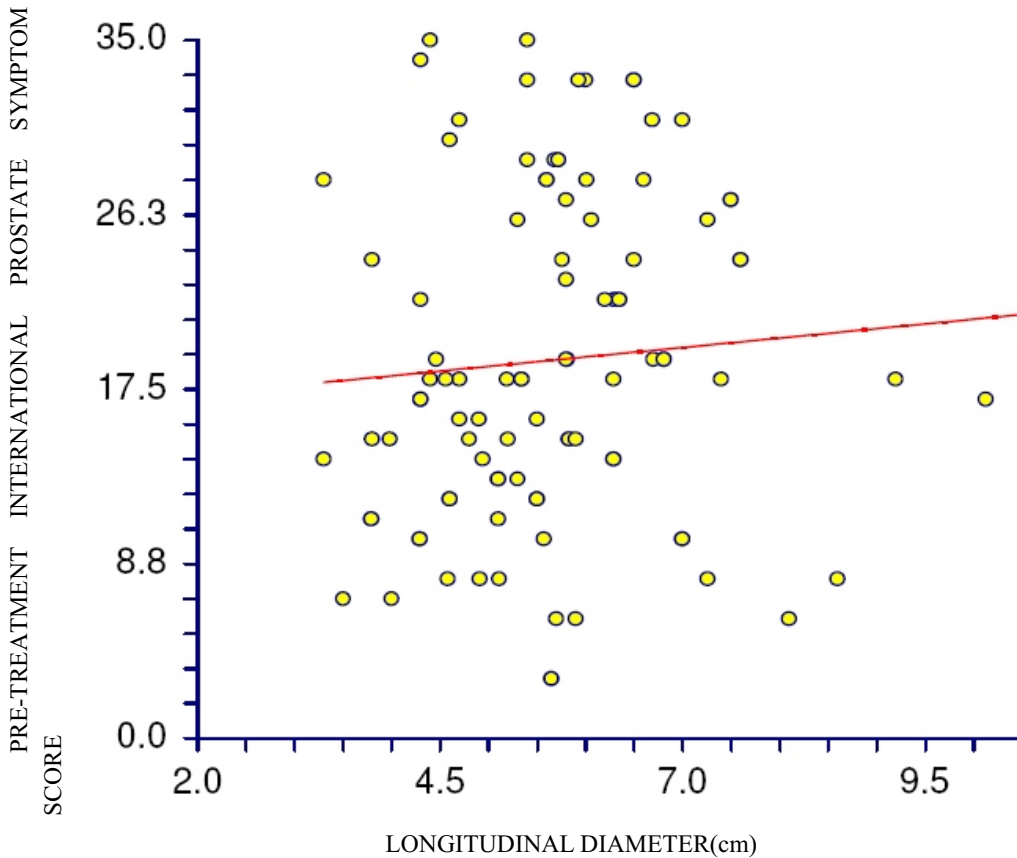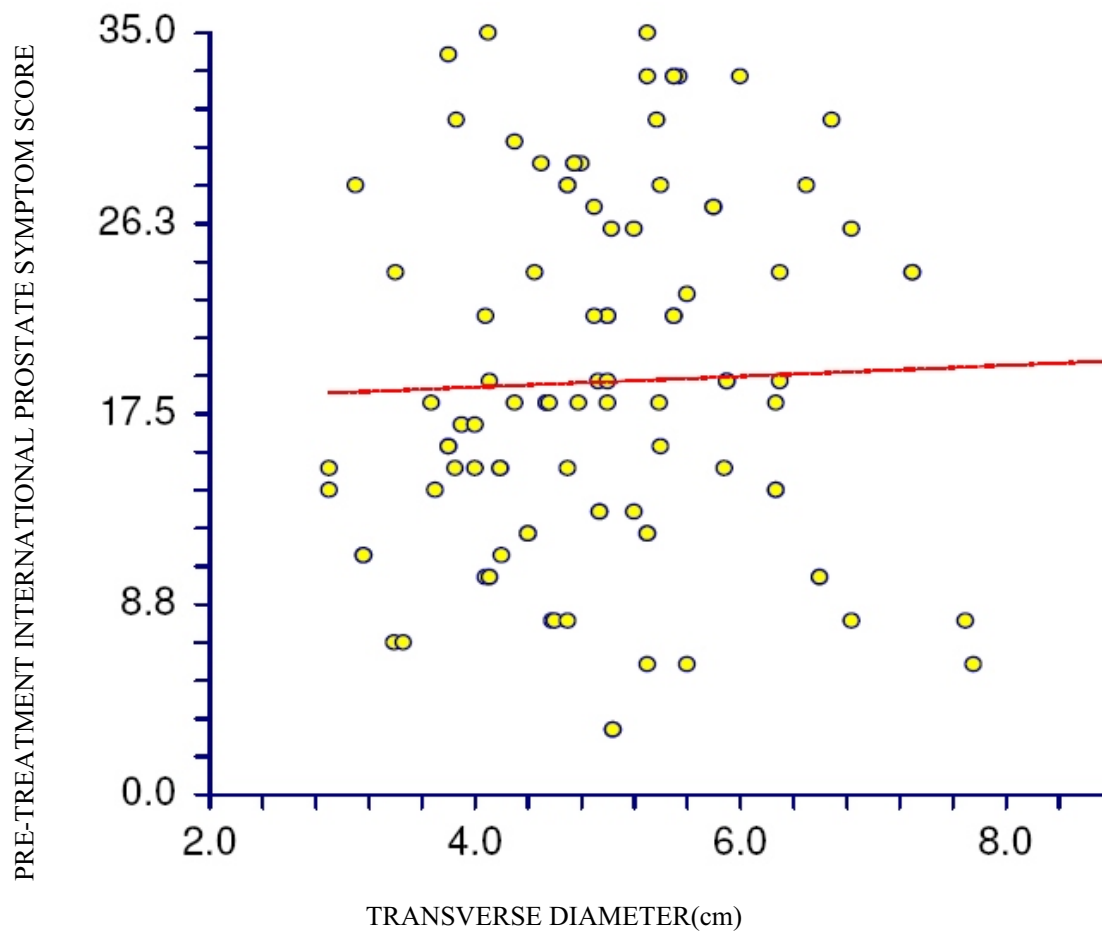**Figure 3: Scatter Plot of Pre-Treatment IPSS and Longitudinal Diameter**

Figure 4: Scatter Plot of Pre-Treatment IPSS and Transverse Diameter

DISCUSSION.

The pathophysiology of clinical BPH has been attributed to bladder outlet obstruction secondary to prostatic enlargement.[13] This hypothesis has been supported by cross-sectional population studies demonstrating that the prevalence of microscopic hyperplasia, prostatic enlargement and symptomatic clinical BPH are age dependent[14]. Several investigators have recently examined the correlations between total prostate volume versus AUA symptom score and peak flow rate; the findings that there was no correlation seem to be consistent[15].This study determined the correlation between IPSS and prostate volume in African men with benign prostatic hyperplasia.

The age of the patients in this study ranged from 45-85 years with the mean age of 65.6±9.84years. The peak incidence of prostatic hypertrophy was in the seventh decade of life. This finding agreed with that of Ibinaye[16], Movsas[17] and Amaku et al[18].

Most of the patients were farmers (61%) who only presented for medical care when the symptoms were bothersome evidenced by a low percentage of patients presenting with mild symptoms (7%). The value of the mean prostate volume (72.79±44.3mls) in this study

differed from a similar study on the determination of prostate volume done by Ibinaye[16] on Nigerian men (46.62±21.56mls). This difference may be attributed to numerical bias; more patients were enrolled in our study compared to theirs. However, when compared to prostate volume values obtained in Europe and America in which a range of 30.3±9.8 to 49.0±26.9 mls was obtained, [19] there was significant difference which could be explained by the late presentation of Africans to the clinic compared to the Caucasians.

Furthermore, there was no correlation between IPSS and prostate volume in this study. A review of similar studies in different parts of the globe has reproduced similar results. Kaplan et al[20] in his study demonstrated a weak correlation between IPSS and prostate volume. This is supported by studies done by Yang et al[15]. It implied that reliance on IPSS in determination of significant prostate enlargement must be deemphasized. Effort should be made to establish significant enlargement of the prostate by transabdominal ultrasound if available. In areas where ultrasounds are unavailable one should rely on clinical findings.

In addition, the different diameters of the prostate were compared with IPSS to determine if there was any

correlation. However, no strong correlation was established between the different diameters of the prostate and IPSS. The result agreed with Tack Lee's[19] study, who compared the different dimensions of the prostate and prostate symptoms.

The correlations between the single-dimensional characteristics of the prostate and the symptoms remained the subjects of ongoing discussions. Many studies done considered the relationship between prostate volume and symptom scores. Based on their findings they concluded that there were weak correlations between the two[19] However, these studies lacked dimensional considerations, causing one to reconsider those results.

Based on the findings from the study and similar studies, one concluded that there was no strong relationship between the different dimensions of the prostate and international prostate symptom score.

Moreover, several studies have been done to assess the reliability of abdominal ultrasound in estimating prostate volume and they demonstrated reliability [21]. A local study conducted by Ibinaye et al[16] at UCH Ibadan also demonstrated that abdominal ultrasound correlated well with trans rectal ultrasound in the measurement of prostate volume.

Separate studies where prostate volume estimated by transabdominal ultrasound was compared with the actual prostate size following prostatectomy, showed significant correlation[22, 23]. It could conclusively be adduced that transabdominal ultrasound is reliable in the estimation of prostate volume.

CONCLUSION

This study has shown that there is no significant relationship between international prostate symptom score and prostate volume in Africans. This is same with similar studies done in other parts of the world.

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