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Original Research Article

Is There Any Significant Difference in Prostate Volume among Diabetic and Non-Diabetic Men Diagnosed with Benign Prostatic Hyperplasia?

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Abstract

Benign prostatic hyperplasia (BPH) is a non-malignant proliferation of prostatic cells resulting in glandular and stromal enlargement. It afflicts men in their advancing years resulting in lower urinary tract symptoms and alteration of quality of life (Qol). Diabetic patients seem to have larger prostate volumes than non-diabetic counterparts and this has formed an area of intense research interest. The aim of this work was to answer the research question: whether there is any significant difference in prostate volume between diabetic and non-diabetic men diagnosed with BPH. ***Materials and Methods*:** We retrospectively studied one hundred and thirty two (132) patients over a period of one year between October 2022 and September 2023 who presented in our Urology clinic for evaluation. Information were retrieved from their case notes and entered into a proforma. Data generated were analysed and used for this study. ***Results***: Out of the 132 patients, diabetic men were 36(27.3%) while non-diabetics were 96 (72.7%). Mean overall age was 62.61±8.83 years, mean prostate volume was 59.53±45.50m/s and there was a significant mean difference in prostate volume between diabetic and non-diabetic populations (P=0.027). ***Conclusion****:* The research concluded that prostate volume in diabetic patients was higher than prostate volume in non-diabetic BPH patients.

Keywords: Diabetes mellitus, non-diabetes mellitus, prostate volume, Benign prostate hyperplasia.

INTRODUCTION

BPH is a non-malignant enlargement of the prostate characterized by increase in the number of both the epithelial and stromal cells. It is most prevalent in men in their advancing years. The cause is unknown and the pathogenesis is not fully understood; however, age, testosterone level, cellular inflammation, changes in cell signaling and family history are recognized risk factors [1]. Moreover, androgen independent risk factors for the development of BPH have been well studied and includes insulin, insulin like growth factor-1 (IGF-1), diabetes mellitus and obesity [2]. Diabetes mellitus (DM) is a metabolic disorder associated with disruption of insulin mechanism and hyperinsulinaemia. Both DM and BPH are highly prevalent in the older populations and some researchers suggest a causal relationship [3, 4]. DM is associated with hyperinsulinaemia and alongside with raised serum IGF-1 are involved in prostatic cell growth [5]. Sarma *et al*., reported a positive correlation between type 2 DM and prostate volume [6]. Prostate volume can be determined by digital rectal examination (DRE), trans-abdominal ultrasound scan, trans-rectal ultrasound scan (TRUS), computed tomography and magnetic resonance imaging. DRE is a simple, cost effective and non-invasive means of prostate volume measurement although it is a crude tool and fraught with errors. However a study in this centre reported that PV estimated by DRE correlated significantly with PV measured with TRUS (r = .750, PV=0.000) [7]. This can explain why surgeons in some Sub-Saharan Africa where imaging studies are not readily available rely on DRE for PV estimation [8], but researchers had long documented the superiority of imaging studies in PV estimation over DRE [9]. The value of PV in the management of patients with BPH cannot be over emphasized as it plays a vital role in the choice of treatment and monitoring of treatment outcome. In this study, we used TRUS measurement known as the criterion standard for the measurement of prostrate size [10] and set out to compare PV in DM and non-DM patients diagnosed with BPH.

MATERIALS AND METHODS

This was a retrospective study conducted in the Urology clinic of our facility between October 2022 and September 2023. All patients were recruited on their clinic visits and their case notes were reviewed to document their biodata, clinical, laboratory and imaging results into a prepared proforma. Exclusion criteria included enlarged prostates suspicious of prostate cancer (Pca) on DRE, biopsy reports of Pca, urethral and bladder cancers. Diabetics were recruited based on their medical history and laboratory results of raised fasting blood sugar (FBS) $\geq$ 126mg/dl.

Measurements: Eligible patients' case notes were coded to avoid duplication of information on next visit. One hundred and thirty-two (132) patients were finally selected who also had TRUS results.

Statistical Analysis: Data were extracted from the proforma and entered into a statistical package for social sciences (SPSS) version 20.0 software and analyzed. All continuous variables were analyzed for means and standard deviation while frequency table was constructed for categorical variables. Independent T-test was used to compare means of variables while Pearson correlation was used to test the extent of linear relationship between variables. Statistical significance was put at $P<0.05$.

RESULTS

Table 1 shows that the mean age of all men in the study was 62.61±8.83 years while the mean PSA and PV was 3.41±2.96ng/ml and 59.53±45.50mls respectively. Mean FBS was 5.40±1.81 mmol/l. In table 2, men in their 6th decade of life formed the majority. Prevalence of DM was 27.3%, PSA in the range of 0–4ng/ml were more in number and more men had PV between 30 – 50mls. The mean difference in age was statistically significant between DM and non-DM patients (P=0.027) whereas no significant difference in means was observed in PSA between DM and DM men (P>0.05). Mean FBS was significantly different between the two groups (P=0.005). In table 4, age and PV correlated positively (P=0.000) same for PSA and PV (P=0.000).

Table 1: Mean and Standard deviation of variables:

Variable	Mean ±Std	Median	Min	Max
Age (Years)	62.61±8.83	62.50	43	82
PSA(ng/ml)	3.41±2.96	2.30	0.10	13.50
PV(mls)	59.53±4.550	45.50	14.4	313.32
FBS(mmol/l)	5.40±1.81	5.00	3.20	17.30

Table 2: Frequency Table

Age categories (years)	Frequency(n)	Percent (%)	Cumulative percent (%)
40 – 49	5	3.8	3.8
50 – 59	51	38.5	42.4
60 – 69	42	31.8	74.2
70 – 79	29	22.0	98.2
80 – 89	5	3.8	100.0
Total	132	100.0	
Diabetic status:			
DM	36	27.3	27.3
Non-DM	96	72.7	100.0
	132	100.0	
PSA Categories (ng/ml):			
0 – 4	95	74.2	74.2
>4 – 10	27	21.1	95.3
>10	6	4.7	100.0
Total	132	100.0	
Prostate Volume(mls) Categories:			
<30	24	18.2	18.2
30 – 50	58	43.9	62.1
>50	50	37.9	100.0
Total	132	100.0	

Table 3: Independent T-test for variables

	DM/Non-DM	Mean± std	T-Statistics
Age	DM	65.58±8.86	
	Non-DM	61.32±8.45	t =2.54, p=0.012*
PV	DM	79.39± 67.93	
	Non-DM	52.15±33.33	t =2.30, p=0.027*
PSA	DM	3.47±2.80	
	Non-DM	3.40±3.04	t =.112, p>0.05
FBS	DM	6.39±2.75	
	Non-DM	4.93±0.80	t =2.977, p=0.005*

*** Statistically significant level at P<0.05**

Table 4: Correlation of Variables

Age/PV:	r =0.389,	P=0.000*
PV/PSA:	r =0.399,	P=0.000*
Age/PSA:	r =0.154,	P=0.082

***Statistically significant level at P<0.05**

DISCUSSION

There has been a growing interest in research regarding prostate volumes among diabetic and non-diabetic men managed for BPH. Prostate volume in BPH patients generally impact on management techniques visa-vis minimally invasive means with smaller prostates (<75mls) and open surgical techniques for larger PV (> 75mls); although this is relative [11]. Researchers proposed based on their works that PV in DM are usually larger than their non-DM counterparts. Hammarsten *et al*., [12] in 1998 were the earliest proponents of this theory and was followed by reports by several researchers in their independent works [6, 13-16]. Parts of their explanations is that DM is one of the components of the metabolic syndrome characterized by hyperglycaemia and insulin resistance. Hyperinsulinaemia is noted to activate IGF signals, causes hormonal changes and increases conversion of testosterone to dihydrotestosterone a process involved in prostate cell metabolism and growth. Despite this assertion, a lot more researchers have found no difference in PV between DM and non-DM BPH patients [17, 18]. This difference in results could be due to the population studied, the study design and measurements. The latter group used trans-abdominal ultrasound scan to measure PV which has a wide margin of error compared to TRUS measurements.

In our study, PV in DM were larger than those without DM with a statistical significant level (P=0.027) (Table 3). We utilized TRUS for the measurements in line with those who previously documented same results. The mean age of our men was 62.61±8.83 years in agreement with previous reports in this centre [19]. BPH is a disease of the middle aged and elderly men. Furthermore, the age of patients correlated with PV (P=0.000) meaning that as a man ages, the PV also increases. This is a recognized fact. Diabetic population was also older with a significant statistical difference (P=0.012). This may be due to the population studied which captures men in their advancing years due to prostate pathology as opposed to studying a general population of men with or without diabetes mellitus. Other parameters associated with PV was also evaluated. Mean PSA was 3.41±2.9 ng/ml and between the two groups, there was no significant mean difference (P>0.05). Similar result was obtained in a previous work in this centre [19]. Other works demonstrated higher PSA levels in DM patients [20, 21]. In their profile, they included patients with PSA in excess of 7.0ng/ml who were also biopsy negative for malignancy. We think that must have created the marked difference. Our mean threshold PSA was quite low for which the mean statistical difference may not be apparent. PSA correlated significantly with PV (r=.399, P=0.000). This shows that PSA is dependent on PV since the later forms the mass of cells that produce PSA. Mean FBS was higher in diabetics with a statistical significant level (P=0.005). FBS is an index of diagnosis of DM.

CONCLUSION

In this study, diabetic patients have higher PV than their non-diabetic counterparts and this was confirmed in other international research works. Those who reported variant results may be contributed by the population studied, study design and their tools of measurements.

Authors Contribution:

EAU: Substantial contributions to conception and design, Acquisition of data, Drafting the article, revising it critically for important intellectual content, data analysis and Final approval of the version to be published.

IUE: Substantial contributions to conception and design, revising it critically for important intellectual content and final approval of the version to be published.

AJU: Substantial contributions to conception and design, revising it critically for important intellectual content and final approval of the version to be published.

Conflict of Interest: No

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