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Original Research Article

Correlation of body mass index with serum total PSA, total testosterone and prostatic volume in a sample of men

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ABSTRACT

Introduction: The prevalence of both obesity and prostate cancer are increasing worldwide.
Aim: The aim of this study was to correlate BMI with serum total PSA, serum total testosterone and prostatic volume.
Material and methods: This study was conducted on 100 consecutive male patients aged ≥50 years old recruited from the Urogenital Surgery outpatient clinic. Exclusion criteria were history of previously diagnosed or treated cancer prostate, the use of 5-α-reductase inhibitors and patients with serum PSA ≥10 ng/mL.
Results and discussion: The mean age of patients was 57.5 ± 5.4 years (range: 50–72). The mean BMI was 33.1 ± 6.5 kg/m^2, (range: 23.7–51.3). The mean serum PSA was 4.1 ± 0.8 ng/mL (range: 0.9–5.4). The mean serum testosterone was 4.6 ± 2.2 nmol/L (range: 0.8–9.8). The mean prostate volume was 54 ± 14 cm^3 (range: 19–90). Higher BMI was significantly associated with a lower serum PSA, testosterone and higher prostate volume ($P < 0.05$ for all factors).
Conclusions: Patients with higher body mass index are more liable to have lower serum total PSA, lower serum total testosterone and higher prostate volume. Obesity may be associated with hormonal independent growth of prostatic tissues.

1. Introduction

The prevalence of both obesity and prostate cancer are increasing worldwide. Recently, there has been an interest in the relationship between obesity and the biology of cancers, including prostate cancer.[1] A study showed that a body mass index (BMI) >40 kg/m^2 was associated with a more than 50% increase in cancer mortality across a wide range of malignancies, including prostate cancer.[2]

We believe that to understand the relationship of obesity and prostate cancer, we should, at first, study the correlation

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with parameters affecting prostatic growth. So; the aim of this study was to correlate BMI with serum total PSA, serum total testosterone and prostatic volume.

2. Aim

The aim of this study was to correlate BMI with serum total PSA, serum total testosterone and prostatic volume.

3. Material and methods

This study was conducted on 100 consecutive male patients aged ≥50 years old recruited from the Urogenital Surgery outpatient clinic. Exclusion criteria were history of previously diagnosed or treated cancer prostate, the use of 5-α-reductase inhibitors and patients with serum PSA ≥10 ng/mL.

Determination of the body mass index was performed using Mosteller's formula.[3] Venous blood (4 mL from each patient) was withdrawn under standard aseptic technique. Serum was separated for determination of both PSA and serum testosterone levels. Serum samples were aliquot and stored at −20 °C until assayed. Quantitative determination of serum total PSA and serum total testosterone was done using electro-chemiluminescence immunoassay.[4,5] prostate volume was measured using ellipsoid formula. Data were analyzed using SPSS software package version 18.0.

4. Results

The mean age of patients was 57.5 ± 5.4 years (range: 50–72). The mean BMI was 33.1 ± 6.5 kg/m^2, (range: 23.7–51.3 kg/m^2). No cases were underweight, 8 cases (8%) were of normal BMI (18–24.9 kg/m^2). Other 30 cases (30%), 22 cases (22%) and 40 cases (40%) were overweight, obese and morbidly obese, respectively.

The mean serum PSA was 4.1 ± 0.8 ng/mL (range; 0.9–5.4 ng/mL). The mean serum testosterone was 4.6 ± 2.2 nmol/L (range: 0.8–9.8 nmol/L). The mean prostate volume was 54 ± 14 cm^3 (range: 19–90 cm^3).

Table 1 shows the analytical correlations between BMI and the determined variables. Figs. 1–3 represent scatter charts for all the patients, showing the negative correlation between BMI and both PSA and testosterone, and the positive correlation with prostate volume.

5. Discussion

The mean PSA value in the present study was 4.1 ± 0.8 ng/mL which is identical to Hanash et al. study[6] that showed a mean PSA among Saudi population to be 4.1 compared to PSA of 2.7 in western population. Kehinde et al.[7] reported the mean PSA values among Kuwaitis of 4.79 ng/mL. In Hekal study in Mansoura (2010),[8] the mean PSA value was 5.8 ng/mL. They also reported that in obese and severely obese patients, the mean PSA was 3.8 ng/mL and 2.1 ng/mL respectively, with evident inverse relationship of obesity to PSA. The current study showed a mean PSA of 4.04 ng/mL and 3.35 ng/mL for obese and severely obese patients respectively, which is slightly higher than Hekal study. We could also identify an inverse relationship of BMI to PSA.

In 2010, a group of Korean investigators searched the effect of BMI on PSA and prostate volume.[9] The study included 10,380 healthy men who received routine comprehensive health evaluations from March 2004 to June 2009. BMI was found to be negatively associated with PSA and positively associated with prostate volume. Similarly, Price et al.[10] studied the relationship between BMI, PSA and digital rectal examination findings among participants in a prostate cancer screening clinic.

Table 1 – Relationship between BMI and the mean prostate volume, PSA, and serum testosterone levels among patients.

	Body Mass Index (BMI)				Significance of change
	Normal	Overweight	Obese	Severe obesity	
Prostate volume (cm^3)					
Range	18.8–76.7	24.6–81.1	29.9–85.3	55.2–90.3	F = 10.348
Mean	**50.125**	**53.032**	**55.481**	**61.130**	P = 0.0001*
SD	18.316	13.106	15.343	5.874	
Median	53.090	53.600	55.010	60.150	
PSA (ng/mL)					
Range	0.90–5.40	3.60–5.10	3.30–5.20	1.50–4.10	F = 8.031
Mean	**4.36**	**4.24**	**4.04**	**3.35**	P = 0.0001*
SD	1.083	0.489	0.592	1.236	
Median	4.55	4.20	4.10	3.90	
Testosterone (nmol/L)					
Range	1.09–9.79	1.85–9.52	1.81–9.39	0.83–7.21	F = 5.071
Mean	**5.085**	**4.812**	**4.722**	**4.328**	P = 0.005*
SD	2.201	3.142	1.947	2.612	
Median	5.84	4.55	4.38	2.86	

F – Anova test, P – Probability, SD – Standard Deviation, P is significant at P ≤ 0.05.
* Significant value.