RELATIONSHIP BETWEEN OBESITY, PSA, AND PROSTATE VOLUME IN PATIENTS WITH BPH WITHOUT URINARY RETENTION

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ABSTRACT

Objective: *To study the relationship between obesity, prostate specific antigen (PSA) level, and prostate volume in patients with benign prostate hyperplasia (BPH) without urinary retention.* ***Material & Method:*** *Twenty two BPH patients without urinary retention were enrolled in this study. Patients were classified into 2 groups based on body mass index (BMI). The first group consisted of 11 patients with obesity (BMI ≥ 27 kg/m^2), the second group consisted of 11 non obese patients (BMI < 27 kg/m^2). Each patient underwent measurement of PSA, prostate volume and hematocrit. We performed tests for correlation between all variables in both groups.* ***Results:*** *From correlation testing there was a significant relationship between obesity and PSA. With increasing BMI, a lower PSA level was observed (p < 0,05). There was no significant relationship between prostate volume and hematocrit (p > 0,05).* ***Conclusion:*** *There is a significant negative correlation between obesity and PSA in BPH patients without urinary retention.*

Keywords: *Obesity, BPH, PSA, prostate volume, hematocrit.*

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INTRODUCTION

In the last decade, the percentage of individuals with obesity has increased in many countries. This trend is observed in most countries in Europe and North America, and in some countries in South America and Asia. The prevalence of obesity varies between countries. In the United States, the percentage of total population with obesity is approximately 20%. In the UK, Poland, and Germany the percentage is more than 15%, while in Sweden it is 8% for adults and 4% for children.[1]

Excessive body weight is associated with various diseases, particularly cardiovascular disease, type 2 diabetes mellitus, obstructive sleep apnea, some types of cancer, and osteoarthritis, resulting in reduced life expectancy. The combination of excessive calorie intake, less physical activity, and genetics explains many cases of obesity. Obesity is a common problem in the elderly. Approximately 50% of individuals aged over 50 years are overweight and body weight tends to increase with age.[2]

Some studies suggested a relationship between obesity and the Prostate Specific Antigen (PSA). Lionel et al (2007) concluded that higher Body Mass Index (BMI) was associated with lower serum PSA. This may be attributed to the process of hemodilution, due to a higher plasma volume in obese individuals.[3] Partin et al (2007) stated that PSA concentration in obese males is lower than that in non-obese males, although the total amount of PSA in both groups were the same.[3] This relationship is also supported by research by Choi et al (2006) and Ho et al (2009) who examined relationship between obesity and PSA in healthy Korean males.[4,5]

Kazuhiro et al (2009) stated that hemodilution may explain the observed low PSA levels in men with higher BMI. This is demonstrated by low level of hematocrit that is significantly associated with lower PSA levels in patients with higher BMI.[6]

Several studies also showed positive relationship between obesity and prostate volume. Prostate volume is higher in obese individuals than in non-obese patients with benign prostatic hyperplasia (BPH). Etiology was focused on the role of sex steroid hormones, the androgens and estrogens, which stimulate prostate growth, through aromatization leading to changes in testosterone and estrogen balance within prostate tissue, contributing to the development of BPH. Xieab et al (2007), based on research conducted in Chinese males, showed that in obese Chinese males, the prostate volume was higher than that in the non-obese.[7,8]

Controversy on differing results, levels of PSA and prostate volume in obese and non-obese patients and the effect of hemodilution as indicated by low levels of hematocrit, encouraged the authors to examine the relationship between obesity, PSA and prostate volume in BPH patients without urine retention in Indonesia, especially in Surabaya.

OBJECTIVE

To prove relationship between obesity with PSA, hematocrit, and prostate volume in BPH patients without urine retention.

MATERIAL & METHOD

This study was an observational analytic study, conducted from September 2009 to February 2010.

The population of this study was BPH patients without urine retention treated in the Urology Clinic, Soetomo Hospital. Samples in this study were divided into 2 groups, BPH patients who were obese and patients with BPH who were not obese. The number of patients in each group was 11. Patient data collected were age, body mass index, prostate volume, hematocrit, and PSA.

Criteria for inclusion in this study were male patients, who had been diagnosed with BPH without urine retention and with age more than 40 years old, because the incidence of BPH begins at that age.

The exclusion criteria were LUTS caused by factors other than BPH, history of previous surgery, urine retention, prostate cancer, received pharmacologic therapy which may reduce prostate volume, and prostatitis.

Data were analyzed descriptively and analytically. Prior to hypothesis testing, normality of data distribution was assessed. The relationship between obesity with PSA, hematocrit, and prostate volume were tested using test for correlation.

RESULTS

Table 1 shows the description data of BPH patients, including age, body mass index, prostate volume, hematocrit, and PSA.

Table 1. Data description.

Group	Statistics	Age	BMI	Prostate volume	PSA	Hematocrit
Obese	N	11	11	11	11	11
	Mean	61,6	31,70	33,71	1,61	41,73
	Median	62,4	31,18	31,30	1,70	40,90
	Std. Deviation	4,1	3,45	11,28	1,08	1,79
	Range	13,0	9,79	37,90	3,50	6,00
	Minimum	56,0	27,21	21,00	0,40	40,00
	Maximum	69,0	37,00	58,90	3,90	46,00
	N	11	11	11	11	11
	Mean	61,6	23,28	31,16	6,17	41,49
	Median	63,0	23,73	27,40	6,40	40,50
	Std. Deviation	5,4	2,67	11,65	3,91	1,57
	Range	19,0	8,66	32,48	11,20	4,20
	Minimum	50,0	17,90	21,52	1,10	39,80
	Maximum	69,0	26,56	54,00	12,30	44,00
Homogeneity test		Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous
Comp test (sig)		1,000	0,001	0,608	0,003	0,736
Notes		Not Sig	Not Sig	Not Sig	Not Sig	Not Sig

Table 2. Normality test data.

Groups	Variables	Kolmogorov smirnov	Sig.	Notes
BPH group with obesity	BMI	0,497	0,966	Normal
	Prostate volume	0,676	0,751	Normal
	PSA	0,593	0,873	Normal
	Hematocrit	0,747	0,632	Normal
BPH group non-obesity	BMI	0,608	0,853	Normal
	Prostate volume	0,888	0,412	Normal
	PSA	0,561	0,912	Normal
	Hematocrit	0,931	0,352	Normal

Table 3. Correlation test of all variables in obese and non obese BPH patients.

Variables	Correlation	Prostate volume	PSA	Hematocrit
BMI	Pearson	0,018	-0,626*	0,144
	Sig.	0,936	0,002	0,523
Prostate volume	Pearson		0,066	0,191
	Sig.		0,770	0,395
PSA	Pearson			0,240
	Sig.			0,282

Comparative test for two independent samples showed no difference in BMI and PSA between obese and non-obese BPH patients with a significance level of 0,05. Results also showed that BMI was higher in the obese group, whereas PSA was higher in the non-obese group. Prostate volume and hematocrit did not differ significantly.

Table 2 shows that the variables BMI, prostate volume, PSA and hematocrit in both groups, BPH with obesity and non-obesity had normal distribution. Due to the normality of data distribution, the statistical test used was that of Pearson's.

The results of correlation test of all variables in obese and non-obese BPH patients (N = 22) is presented in Table 3.

Table 3 shows that there was no significant relationship between BMI and prostate volume with correlation values of 0,018 and the level of significance of 0,936 ($p > 0,05$). Positive correlation indicates BMI increases as prostate volume rises.

There was significant relationship of BMI with PSA with a correlation value of -0,626 and the level of significance of 0,002 ($p < 0,05$). Negative correlation indicates the BMI increases as PSA levels decrease (Table 3).

There was no significant relationship of BMI with hematocrit with correlation value of 0,144 and the level of significance of 0,523 ($p > 0,05$). Positive correlation indicates the more the BMI increases, the more the prostate volume rises (Table 3).

DISCUSSION

In testing the relationship between BMI and PSA, the results of this study indicated that there was a significant relationship ($p < 0,05$) between obesity and PSA, in which the higher the BMI increases, the lower the value of PSA levels in BPH patients without urine retention.

The results of this study showed similar results to a study by Lionel et al (2007) reporting a relationship

between higher BMI with lower PSA levels, which relate to higher plasma volume in obese patients, giving rise to two effects of hemodilution on PSA level. Obese males are estimated to have a higher plasma volume than non-obese, causing hemodilution effect on PSA levels. Increased plasma volume in obese males is derived from the calculation of estimated plasma volume which is the product between body weight (BW), height (BH) and the coefficient of 1,67; therefore heavier weight results in more plasma volume. This underlies the hypothesis of the effect of hemodilution.[3]

Similar results were also obtained in studies conducted by Choi et al (2006), who concluded that there is a relationship between obesity and lower PSA in healthy Korean males.[4]

The results of this study showed different results from the results of research conducted by Stephen et al (2006) who found no significant relationship between BMI and PSA in prostate cancer patients.[9] Different results of this study may be due to different sample populations, where the population sample used were prostate cancer patients, while this study involved BPH patients and excluded patients with prostate cancer. Another reason is the smaller samples, causing difficulty to see any relationship.

In testing the relationship between hematocrit levels and obesity, we found no relationship between obesity and hematocrit levels ($p > 0,05$). Therefore, we did not find the effect of hemodilution that explain the relationship between obesity and low levels of hematocrit.

Our results differed from a study by Kazuhiro (2009), who found a significant relationship between low levels of hematocrit with low levels of PSA in healthy male patients with higher BMI.[6] Possible reasons are different sample population or variation in patient condition which affect hemodilution and hematocrit levels.

This study showed no significant relationship ($p > 0,05$) between prostate volume and obesity. This result is similar to a study by Meigs et al (2001) at the Massachusetts Male Aging Study and Loeb et al (2007) who found no relationship between BMI and high prostate volume in radical prostatectomy patients.[10,11]

The result of this study was different from some previous ones. Parsons et al (2006) stated that obesity is a risk factor for BPH. The etiology was focused on aromatization process leading to changes in testosterone and estrogen balance in prostate tissue which contribute to the development of BPH.[7] Xiab et al (2007) concluded that obese Chinese males had higher prostate volume than non-obese subjects.[8] This difference was probably due to the measurement to calculate the different prostate volume, which in this study using TAUS, whereas previous studies used TRUS, although a study by Sutapa et al (2006) found no significant difference in outcome between the use of TRUS and TAUS.[12]

So far, results of research on the relationship between obesity and prostate volume have shown inconsistent results. Some researchers suggested a correlation between BMI and BPH, while others did not. To answer whether there is a relationship between obesity and prostate volume need further research.

CONCLUSION

Obesity has significant relationship with low levels of PSA in BPH patients without urine retention, while it has no significant relationship with prostate volume and the decrease in hematocrit in patients with BPH without urine retention.

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