Estimation of prostate specific antigen in metabolic syndrome- a study in south Indian male population

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Abstract

Introduction: The main aim of our study was to assess the role of prostate specific antigen in Indian males and to determine its correlation with insulin resistance in metabolic syndrome.
Materials and Methods: For this study, 62 male subjects of 40-65 years having metabolic syndrome were selected. Body mass index, fasting blood sugar, serum prostate specific antigen, serum fasting insulin and insulin resistance were analyzed using multivariate regression analysis and Annova test.
Results and Conclusion: There was no statistically significant difference between body mass index and prostate specific antigen, body mass index and insulin resistance, prostate specific antigen and triglyceride, prostate specific antigen and high density lipoprotein, and prostate specific antigen and fasting blood sugar.

Keywords: Body mass index, Insulin resistance and Obesity, Prostate specific antigen.

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Introduction

Metabolic syndrome is a cluster of risk factors associated with increased risk of cardiovascular disease and diabetes mellitus.[1] Metabolic syndrome is present if three or more of the following five criteria are met like- Waist circumference over 40 inches (men), Blood pressure over 130/85 mmHg, Fasting triglyceride (TG) level over 150 mg/dl, high-density lipoprotein (HDL) cholesterol level less than 40 mg/dl (men) and Fasting blood sugar over 100 mg/dl.[2] The main complication of metabolic syndrome is cardiovascular disease[3] but there is increased incidence of prostate cancer in these patients.[3,4] Metabolic syndrome is also associated with other disorders like nonalcoholic fatty liver disease, Polycystic ovarian syndrome, Obstructive sleep apnea, lipodystrophy and micro vascular disease.[5]

Prostate cancer is the most common cancer in elderly patients above 50 years of age in India and worldwide. For the diagnosis of prostate cancer, commonly used parameter for evaluation is prostate specific antigen. Prostate specific antigen (PSA) is a protease that is produced by secretory epithelial cells lining the prostate ducts[6] in response to androgen receptor activation. Normal levels of PSA in males is < 4ng/ml. Interactions between body adiposity and steroid hormone metabolism, the inflammatory response, or insulin regulation, are sufficient to affect PSA expression. Prostate specific antigen levels are affected by many factors that may be unrelated to prostate disease, including age and race.[7] The association between metabolic syndrome and prostate cancer may be due to changes in Insulin and Insulin like growth factor-I, Insulin like Growth Factor Binding Proteins, sex hormones like Testosterone and sex hormone binding globulins.[4,8]

Insulin resistance can be defined as a state in which normal amounts of insulin produce a suboptimal biological response. As the degree of insulin resistance increases, impaired glucose tolerance occurs and eventually causes diabetes.[9] Higher insulin resistance has been observed to contribute to a lower serum PSA concentration, which may lead to delayed prostate cancer diagnosis among individuals with metabolic syndrome.[10,11]Body mass index (BMI) or Quetelet index is a value derived from weight and height of an individual. It is defined as the body mass divided by the square of the body height, and is universally expressed in units of kg/m^2.[9,12] Few studies show association between dermographic and life style characteristics with PSA concentrations in healthy men[13] and some studies show that age and low BMI are associated with higher PSA levels.[14-16]

As far as our knowledge is concerned, no study has been conducted in Indian males to report an association of metabolic syndrome, insulin resistance with prostate specific antigen levels. The present study is done to evaluate prostate specific antigen, fasting insulin levels, insulin resistance, BMI and lipid profile in metabolic syndrome patients and to study the

correlation between PSA levels and metabolic syndrome.

Materials and Methods

The following study was conducted in the Department of Biochemistry and General Medicine of Saveetha Medical College and Hospital. 62 Male subjects of 40-65 years having metabolic syndrome were chosen on the basis of three of the following five criteria like- Waist circumference over 40 inches, Blood pressure over 130/85 mmHg, Fasting triglyceride (TG) level over 150 mg/dl, high-density lipoprotein (HDL) cholesterol level less than 40 mg/dl (men) and Fasting blood sugar over 100 mg/dl. A detailed clinical history was taken and general examination was done for all these cases. Subjects with medical history of prostatitis and prostate cancer, those having history of prostate surgery or having clinical symptoms of urinary tract infection were excluded from the study. Individuals with symptomatic ischemic heart disease or symptomatic peripheral neuropathy and those taking any antidiabetic, antihypertensive, antihyperlipedemic drugs were also excluded from the study.

Informed consent was obtained from all the subjects before the procedure. 5ml of whole blood was collected and samples were processed within 24 hours. Ethical clearance certificate was obtained for the study. The data were analyzed using multivariate regression analysis and Annova test. Fasting blood sugar was measured by Glucose oxidase- Peroxidase method (GOD-POD). Serum Prostate Specific Antigen was measured using the chemiluminescent enzyme immunoassay method. Serum fasting insulin was measured using enzyme kit method by automated analyser. Insulin resistance was calculated by Homeostatic model assessment method (HOMA), using formula.[11] Fasting glucose (mg/dl) X Fasting Insulin (mIU/L)

Results

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Standard deviation
BMI	62	25.20	30.80	27.2871	1.31666
IR (HOMA)	62	.22	66.67	4.0115	10.14376
PSA (ng/ml)	62	.01	7.26	2.0525	1.72809
TG (mg/dl)	62	54.00	326.00	169.5645	63.68741
HDL (mg/dl)	62	19.00	82.00	38.1290	9.17853
Valid n (list wise)	62				

Table 2: One Sample Test

	T	Df	Sig (2-tailed)	Mean difference	95% Confidence Interval of the Difference	
					Lower	Upper
BMI	163.184	61	.000		26.9527	27.6215

Test value = 0

Table 3: Statistics

	BMI	IR (HOMA)
n Valid	62	62
Missing	0	0
Mean	27.2871	4.0115
Median	27.1500	1.9900
Standard deviation	1.31666	10.14376
Range	5.60	66.45
Minimum	25.20	.22
Maximum	30.80	66.67

Table 4: Correlations

		AGE	FBS (mg/dl)	TG (mg/dl)	HDL (mg/dl)	Insulin (Miu/ml)	WC (cms)	BMI	IR (Homa)
AGE	Pearson correlation	1	-.237	-.054	-.037	-.073	-.196	-.044	-.087
	Sig. (2-tailed)		.064	.675	.775	.575	.126	.735	.502
	n	62	62	62	62	62	62	62	62
FBS (mg/dl)	Pearson correlation	-.237	1	.002	.250*	.049	.251*	.099	.123
	Sig. (2-tailed)	.064		.990	.050	.705	.049	.443	.340
	n	62	62	62	62	62	62	62	62
TG (mg/dl)	Pearson correlation	-.054	.002	1	-.035	-.080	-.125	-.086	-.077
	Sig. (2-tailed)	.675	.990		.787	.536	.333	.509	.553
	n	62	62	62	62	62	62	62	62
HDL (mg/dl)	Pearson correlation	-.037	.250*	-.035	1	.155	.072	-.111	.158
	Sig. (2-tailed)	.775	.050	.787		.228	.580	.392	.219
	n	62	62	62	62	62	62	62	62
Insulin (Miu/ml)	Pearson correlation	-.073	.049	-.080	.155	1	.155	.070	.991**
	Sig. (2-tailed)	.575	.705	.536	.228		.230	.591	.000
	n	62	62	62	62	62	62	62	62
WC (cms)	Pearson correlation	-.196	.251*	-.125	.072	.155	1	.297*	.153
	Sig. (2-tailed)	.126	.049	.333	.580	.230		.019	.234
	n	62	62	62	62	62	62	62	62
BMI	Pearson correlation	-.044	.099	-.086	-.111	.070	.297*	1	.083
	Sig. (2-tailed)	.735	.443	.509	.392	.591	.019		.520
	n	62	62	62	62	62	62	62	62
IR (HOMA)	Pearson correlation	-.087	.123	-.077	.158	.991**	.153	.083	1
	Sig. (2-tailed)	.502	.340	.553	.219	.000	.234	.520	
	n	62	62	62	62	62	62	62	62

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Annova

		Sum of squares	df	Mean square	F	Sig.
AGE	Between groups	3569.935	60	59.499	7.437	.285
	Within groups	8.000	1	8.000		
	Total	3577.935	61			
FBS	Between groups	182336.419	60	3038.940	.377	.891

(mg/dl)	Within groups	8064.500	1	8064.500		
	Total	190400.919	61			
TG (mg/dl)	Between groups	245621.242	60	4093.687	2.274	.490
	Within groups	1800.000	1	1800.000		
	Total	247421.242	61			
HDL (mg/dl)	Between groups	5054.468	60	84.241	.997	.679
	Within groups	84.500	1	84.500		
	Total	5138.968	61			
INSULIN(mIU /ml)	Between groups	30973.582	60	516.226	46.738	.116
	Within groups	11.045	1	11.045		
	Total	30984.627	61			
WC(cms)	Between groups	715.935	60	11.932	.663	.776
	Within groups	18.000	1	18.000		
	Total	733.935	61			
BMI	Between groups	103.330	60	1.722	.712	.759
	Within groups	2.420	1	2.420		
	Total	105.750	61			
IR (HOMA)	Between groups	6275.676	60	104.595	108.270	.076
	Within groups	.966	1	.966		
	Total	6276.642	61			

Discussion

The mean and standard deviation of body mass index of the subjects is 27.2871 and 1.31666, for insulin resistance is 4.0115 and 10.14376, for prostate specific antigen is 2.0525 and 1.72809, for triglyceride is 169.5645 and 63.68741, for high density lipoprotein is 38.1290 and 9.17853 respectively. The 95% confidence interval of the difference for BMI by one sample test is 26.9527 (lower) and 27.6215 (upper).Table 4 shows the correlations of different parameters with each other. Table 5 shows the level of significance of different parameters by ANNOVA test.

In the present study, which was conducted in south Indian male population, we did not observe any statistical significant difference between body mass index and insulin resistance, body mass index and prostate specific antigen. There was no statistical significant difference between the various parameters like age, fasting blood sugar, triglyceride, high density lipoprotein and insulin levels. Our study supports the studies, which showed that there is no statistical significant difference between body mass index and prostate specific antigen levels.[17-19] But some studies have showed that body mass index is inversely associated with prostate specific antigen levels.[20,21]

Few studies suggested that metabolic syndrome was not associated with prostate specific antigen levels in a screened population and this lack of association may reflect the heterogeneous relationship between each metabolic risk factor and serum prostate specific antigen.[22] In men, obesity is associated with lower testosterone and sex hormone binding globulin and higher estrogen blood concentrations[23,24] and these endocrine differences may affect the production of prostate specific antigen.[25] Central obesity leads to insulin resistance.[26] Adipose tissue secretes Adipocytokines and these substances can induce insulin resistance.[27] The serum prostate specific antigen level may be influenced by many factors such as age, BMI, prostate volume and prostate disease.[19,28] Some studies reported negative association between BMI, HDL and fasting blood glucose with serum PSA levels.[29] Whereas few studies demonstrated that patients with central obesity, high systolic blood pressure by diastolic blood pressure, high triglyceride, low HDL-C and high fasting blood glucose had a significantly higher serum prostate specific antigen levels than in patients without these conditions.[27]

The main limitation of our study is that fewer subjects of metabolic syndrome were included. The subjects were all healthy. In our study, prostate weight and volumes of the subjects were not measured, which will affect the prostate specific antigen levels. Even prostate biopsy was not done to exclude prostate cancer. So, further studies are required to show which component of metabolic syndrome is more associated with serum prostate specific antigen levels.

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Conflict of Interest
Declared none

Compliance with Ethical Standards
Nil

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