MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2025.3.46.49

OPEN ACCESS

Key Words
Men, obesity, prostate specific antigen

Corresponding Author
M. Vengatesh,
Department of General Medicine, Sree Mookambika Institute of Medical Sciences, Kanyakumari, India

Author Designation
[1]Junior Resident
[2]Professor and HOD

Received: 20th January 2025
Accepted: 12th March 2025
Published: 04th April 2025

Citation: M. Vengatesh and M.K. Suresh, 2025. Evaluation of the Impact of Obesity on Blood Levels of Prostate-Specific Antigen, Both Free and Total in a Tertiary Care Hospital. Res. J. Med. Sci., 19: 46-49, doi: 10.36478/makrjms.2025.3.46.49

Evaluation of the Impact of Obesity on Blood Levels of Prostate-Specific Antigen, Both Free and Total in a Tertiary Care Hospital

[1]M. Vengatesh and [2]M.K. Suresh
[1,2]Department of General Medicine, Sree Mookambika Institute of Medical Sciences, Kanyakumari, India

Abstract
Prostate cancer is a leading cause of death among men and is the second most common cancer worldwide. The present study assessed the effects of obesity on the serum levels of free and total prostate-specific antigen. 84 men patients in age ranged 20-60 years were enrolled. Patients were classified into four BMI groups according to the WHO BMI classification such as normal BMI (18.5-24.9), overweight (25-29.9), obese (30-34.9) and severe obesity (35-39.9). Serum tPSA and fPSA was measured by using tPSA and fPSA utilizing ELISA technique. Age group 20-40 years had 34 and 40-60 years had 50 patients. Out of 84 patients, 16 were normal, 24 were overweight and 20 were obese and 24 were severe. The mean tPSA (ng/ml) level in normal was 1.75, overweight was 1.70, obese was 1.72 and severe obese was 1.42. The mean fPSA (ng/ml) level in normal was 0.59, in overweight was 0.57, in obese was 0.51 and in severe obese was 0.46. There was no relationship between obesity and prostate specific antigen.

INTRODUCTION

Metabolic syndrome (MS) is a complex of disorders relating to metabolic abnormality, central obesity, including hypertension, dyslipidemia, insulin resistance with compensatory hyperinsulinemia and impaired glucose metabolism that rising risk of diabetes type II, and cardiovascular disease with the core of MS lies in the group or collection of these metabolic risk factors[1]. Prostate cancer is a leading cause of death among men and is the second most common cancer worldwide[2]. In China, the incidence of prostate cancer has historically remained relatively low compared to global figures, estimated at about 33,000 cases per year and anticipated to increase to 449,000 cases by 2020, with 20,000 deaths each year[3]. It has also been reported that PSA levels are negatively associated with body mass index (BMI), primarily as result of a hemodilution effect caused by increased plasma volume. These relationships can affect the validity of PSA tests in prostate cancer screening, resulting in a high false positive rate in obese patients and some controversy over the use of PSA s between obesity and prostate cancer (PCa) and other prostate diseases, which are the insulin/insulin-like growth factor (IGF)-1 axis, decreased serum testosterone and peripheral aromatization of androgen and adipokine signalling caused by inflammation[4,5]. The present study assessed the effects of obesity on the serum levels of free and total prostate-specific antigen.

MATERIALS AND METHODS

The present study comprised of 84 men patients in age ranged 20-60 years. All were enrolled with the written consent. Data related to patients such as name, age, etc. was recorded. A thorough clinical examination was performed. Weight in kgs and height in cms were recorded in all. The BMI was calculated by measuring the weight and height. The collection of 10 ml blood was done. Serum was separated and were divided into five aliquotes and stored at -20 °C until assayed. Patients were classified into four BMI groups according to the WHO BMI classification such as normal BMI (18.5-24.9), overweight (25-29.9), obese (30-34.9) and severe obesity (35-39.9). Serum tPSA and fPSA was measured by using tPSA and fPSA utilizing ELISA technique. Results thus obtained were subjected to statistical analysis. P value <0.05 was considered significant. Statistical analysis was done using the statistical package for social sciences (SPSS). Different statistical methods were used as appropriate. Mean±SD was determined for quantitative data and frequency for categorical variables. The independent t-test was performed on all continuous variables. The normal distribution data was checked before any t-test. The Chi-Square test was used to analyze group difference for categorical variables. In logistic regression models, age was adjusted for estimation of each or all the independent effects of hypertension, ischemic heart disease and diabetes mellitus. A p-value <0.05 was considered significant.

RESULTS AND DISCUSSIONS

Table I: Distribution of Patients

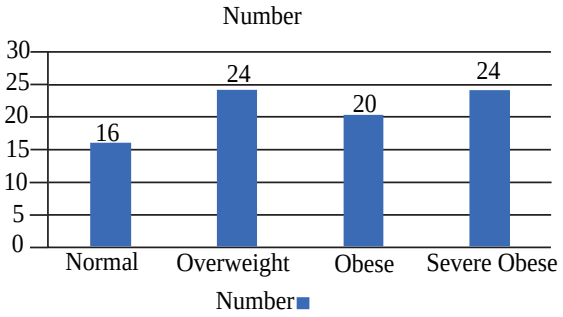
Age group (years)	Number	P value
20-40	34	0.05
40-60	50	

(Table I) shows that age group 20-40 years had 34 and 40-60 years had 50 patients. The difference was significant (P<0.05).

Table II: Distribution Based on BMI

BMI	Number	P value
Normal	16	0.15
Overweight	24	
Obese	20	
Severe obese	24	

(Table II), (graph I) shows that out of 84 patients, 16 were normal, 24 were overweight and 20 were obese and 24 were severe obese. The difference was significant (P<0.05).

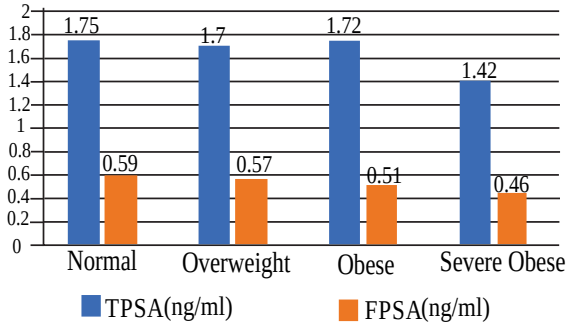


Graph I: Distribution Based on BMI

Table III: Assessment of tPSA and fPSA Based on BMI

Parameters	Normal	Overweight	Obese	Severe obese	P value
tPSA (ng/ml)	1.75	1.70	1.72	1.42	0.15
fPSA (ng/ml)	0.59	0.57	0.51	0.46	0.13

(Table III, graph II) shows that mean tPSA (ng/ml) level in normal was 1.75, overweight was 1.70, obese was 1.72 and severe obese was 1.42. The mean fPSA (ng/ml) level in normal was 0.59, in overweight was 0.57, in obese was 0.51 and in severe obese was 0.46. The difference was non-significant (P>0.05).



Graph II: Assessment of tPSA and fPSA Based on BMI

The incidence of obesity has increased from 1 in six adults to 1 in three adults in the last two decades. Indeed, obesity is considered as the main risk factor to develop deleterious associated pathologies as liver diseases, type II diabetes, prostate cancer and coronary heart diseases. Prostate-specific antigen (PSA) is a commonly used tumour marker in the screening of prostate cancer. There is a link between sex hormones and prostate growth. Several studies showed that a BMI ≥40 kg/m2 was linked with a >50% increase in cancer death-rate across a wide range of malignancies, including PCa. Serum PSA can be measured in two types, either total conjugated (conjugated to other proteins) or free PSA (non-conjugated)[6]. The percentage of free PSA tends to increase in benign prostatic hypertrophy compared with prostate cancer and the increasing size of the prostate correlates with an increase in the percentage of free PSA[7]. The present study assessed the effects of obesity on the serum levels of free and total prostate-specific antigen. In present study, age group 20-40 years had 34 and 40-60 years had 50 patients. Zhang[8] in their study patients were grouped by BMI (normal=22.9, overweight=23-27.4, obeseX27.5 kg/m2). PSA parameters of density (PSAD), PSA serum level and PSA increasing rate per year (PSAR) were calculated per BMI and age groups (30-40, 41-59, 60-85 years). Off, 35,632 Chinese men surveyed, 13,084 were analyzed, including 13.44% obese, 57.44% overweight and 29.12% normal weight, according to BMI., 25.84% were centrally (abdominally) obese according to WC. BMI and WC were negatively associated with all PSA parameters, except PSAD and PSAR and independent of FBG and PV (Po0.05) in an age-adjusted model. Obesity was associated with lower PSA in Chinese men. Therefore, an individual's BMI and WC should be considered when PSA is used to screen for prostate cancer. We observed that out of 84 patients, 16 were normal, 24 were overweight and 20 were obese and 24 were severe obese. Abd[9] assessed the relationship between obesity and prostatic markers (total prostatic specific antigen (tPSA) and free prostatic specific antigen (fPSA)on 127 men aged ≥40 years at The Department of Urology at Al-Ramadi Teaching Hospital. The age range of the participants of the study was between 40-80 year. The number of men with normal BMI was 26 (20.47%), 47 men were overweight (37%), 33 men were obese (25.98%) and finally, 21 men were severely obese (16.53%). The mean of parameters total and free prostate-specific antigen (tPSA, fPSA), in the study, were (mean±SD) (1.683± 0.563) ng/ml, (0.537±0.189) ng/ml, respectively. There are no significant relationships between BMI, tPSA and fPSA, at P≤0.05 in a sample of Iraqi men. We found that the mean tPSA (ng/ml) level in normal was 1.75, overweight was 1.70, obese was 1.72 and severe obese was 1.42. The mean fPSA (ng/ml) level in normal was 0.59, in overweight was 0.57, in obese was 0.51 and in severe obese was 0.46.Some researchers have recommended a hemodilution hypothesis for the association between BMI and PSA levels, which suggests that obesity increases plasma volume and hemodilution, thus reducing the circulating PSA levels[10]. This hypothesis is based on the premise that blood PSA concentration is a function of plasma volume, as well as PSA expression and PSA leakage into the circulatory tract. Another study suggest that PSA is influenced by steroid hormone levels, referred to as the "steroid hormone metabolism hypothesis"[11]. It is also highly likely that obesity influences PSA level through multiple pathways. Obesity could potentially alter the levels of multiple hormones and growth factors (e.g., testosterone, estrogen, leptin, insulin and IGF-1) with competing effects on prostate growth and size. For obese individuals, a high amount of adipose tissue could improve aromatase activity to make cyclic estrogen levels increase. This result may be due to regulation via androgens and estradiol from adipose tissues[12].

CONCLUSION

Authors found that there was no relationship between obesity and prostate specific antigen.

REFERENCES

1. Hegarty N.J., J.M. Fitzpatrick, J.P. Richie, P.T. Scardino, R.W. deVere White, F.H. Schorder and D.S. Coffey., 1999. Future prospects in prostate cancer. The Prostate, Vol. 40: 10.1002/(sici)1097-0045(19990901)40:4<261::aid-pros8>3.0.co.,2-h.
2. Chia S.E., W.K. Lau, C. Cheng, C.M. Chin, J. Tan and S.K. Ho., 2007. Prostate-specific antigen levels among Chinese, Malays and Indians in Singapore from a community-based study. Asian Pac J Cancer Prev 8: 375-378.
3. Choi H., J. Park, B. Cho, K. Son, Y. Yoo and H. Kwon., 2011. The illusion of prostate-specific antigen decline in patients with metabolic syndrome and insulin resistance. BJU Int., Vol. 108: 10.1111/j.1464-410X.2011.10225.x.
4. Naito M., Y. Asai, A. Mori, Y. Fukada, M. Kuwabara and S. Katase, *et al.,* 2012. Association of obesity and diabetes with serum prostate-specific antigen levels in Japanese males. Nagoya J Med Sci., 74: 285-292.
5. Qu X., Z. Huang, X. Meng, X. Zhang, L. Dong and X. Zhao., 2014. Prostate volume correlates with diabetes in elderly benign prostatic hyperplAsia patients. Int. Urol. Nephrology, Vol. 46: 10.1007/s11255-013-0555-3.

6. Benson M.C., I.S. Whang, A. Pantuck, K. Ring, S.A. Kaplan, C.A. Olsson and W.H. Cooner., 1992. Prostate Specific Antigen Density: A Means of Distinguishing Benign Prostatic Hypertrophy and Prostate Cancer. J. Urol., Vol. 147: 10.1016/s0022-5347(17)37393-7.
7. Gordon-Larsen P., H. Wang and B.M. Popkin., 2014. Overweight dynamics in Chinese children and adults. Obesity Rev., Vol. 15: 10.1111/obr.12121.
8. Zhang J., M. Ma, X. Nan and B. Sheng., 2016. Obesity inversely correlates with prostate-specific antigen levels in a population with normal screening results of prostate cancer in northwestern China. Braz. J. Med. Bio. Res., Vol. 49. 10.1590/1414-431x20165272.
9. Abd D.Z. and D.R. Saeed., 2020. Effects of Obesity On The Serum Levels Of Free And Total Prostate-Specific Antigen In A Sample Of Iraqi Men. European Journal of Molecular and Clinical Medicine., 7: 142-148.
10. Fowke J.H. and C.E. Matthews., 2010. PSA and body composition by dual X-Ray absorptiometry (DXA) in NHANES. The Prostate, Vol. 70: 10.1002/pros.21039.
11. Skolarus T.A., K.Y. Wolin and R.L. Grubb., 2007. The effect of body mass index on PSA levels and the development, screening and treatment of prostate cancer. Nat. Clin. Pract. Urol., Vol. 4: 10.1038/ncpuro0944.
12. Castro-Fernández C., A. Olivares, D. Söderlund, J.C. López-Alvarenga and E. Zambrano *et al.,* 2000. A Preponderance of Circulating Basic Isoforms Is Associated with Decreased Plasma Half-Life and Biological to Immunological Ratio of Gonadotropin-Releasing Hormone-Releasable Luteinizing Hormone in Obese Men1. The J. Clin. Endocrinol. and Metab.,Vol. 85: 10.1210/jcem.85.12.7041.