Original Research Article

DEMOGRAPHIC IMPLICATIONS OF SERUM PROSTATE SPECIFIC ANTIGEN LEVEL DISTRIBUTION AMONG MEN IN TUDUN WADA JOS AND ITS ENVIRONS

Abstract

Background

Prostate specific antigen (PSA) is an antigen produced primarily by the ductal and acinar cells of the prostatic epithelium, as well as male periurethral glands, and usually secreted into the seminal fluid. Its primary function is the liquefaction of seminal coagulum in the human ejaculate. Increase in PSA level is a health concern and requires medical intervention. Therefore, understanding the factors that affect PSA is important.

Aim

The study was aimed to determine the impact of demographic parameters on serum PSA level among men in COCIN LCC Tudun wada Jos and its environs.

Methodology

The cross-sectional study was conducted among 50 elderly men at COCIN LCC Tudan wada, Jos City of Plateau State. Based on set criteria, subjects were selected using simple random sampling technique. Blood sample (5ml) was collected via venipuncture and the serum of the collected sample was assayed for PSA using chemiluminescence immunoassay method.

Results

Results reveal that there was a significant increase in PSA level among the subjects with increasing age group, p-value<0.05. Other demographic parameters had no significant impact on PSA level, p-value>0.05.

Conclusion

This study has shown that increase in age has an increasing effect on PSA level among elderly men living in Tudan wada, Jos.

Keywords: *age, education, prostate specific antigen (PSA), occupation, sex*

Introduction

Prostate specific antigen also referred to as kallikrein-3 (KLK3) or gamma-seminoprotein, is a glycoprotein enzyme concealed in men by the KLK3 gene (Balk *et al*., 2003). It is an antigen produced primarily by the ductal and acinar cells of the prostatic epithelium, as well as male periurethral glands, and usually secreted into the seminal fluid. Its primary function is the liquefaction of seminal coagulum in the human ejaculate (Robert et al., 1997). In addition it also contains proteins which serve as nutrient for sperm as they transit through the vagina into the fallopian tube to fertilize the ova and an enzymatic activity that function by breaking down proteins in semen ejaculated to release sperm cells from the viscous semen. In a normal physiological state prostate specific antigen is produced by cells of prostate gland in small and normal quantities at an early age of less than 40years approximately. However, in pathological

condition such as benign prostatic hyperplasia (BPH), prostate cancer and in other prostate disorders it is associated with the highest concentration of prostate specific antigen in the blood (Balk *et al*., 2003). The prostate specific antigen in circulation is predominantly bound to protease inhibitors; α-antichymotrypsin and α-macroglobulin while few exist in a free state. Disruption of physiological barriers of prostate cells by inflammation, hyperplasia or neoplasia usually results in the release and elevation of prostate specific antigen in the blood (Tchetgen and Oesterling, 1995).

Prostate cancer is a neoplastic proliferation of prostate cells (Vinay et al., 2018) which results in metastasis (to invade and spread to other parts of the body) and eventually leads to death if not properly managed. Prostate cancer is the most common form of cancer in men, which has a prevalence of 29% of cancer cases in the United States of America (Greenlee et al., 2001). Studies have shown that prostate cancer accounts for 11% of all male cancers in Nigeria and is on the increase due to lack of screening programs. Studies have also shown that prostate cancer is more common around the 5th decade of life in men. The factors associated with the pathogenesis and progression of prostate cancer are suggested to be androgens, hereditary, environment and acquired somatic mutations (Vinay et al., 2018). Prostate cancer affects not only the man with the disease but also his entire family. Family relationships play a vital role in how men cope with prostate cancer disease and decide on treatment issues (Langford et al., 1997). Mellon and Mellon (2001) found a 63% decline in overall family quality of life after a family member had been given a cancer diagnosis.

Prostate specific antigen serum assay has changed the landscape of prostate cancer detection, thereby creating a dramatic rise in the incidence and thus helps in early detection at a more curable stage with resultant decline in morbidities and mortalities associated with prostate cancer (Catalona et al., 1991). Prostate specific antigen (PSA) assay is the most commonly used investigation in the diagnosis and management of prostatic cancer.

The focus of this work is to study serum PSA level among men in COCIN LCC Tudun wada Jos and its environs, and their demographic implicat**ions.**

Materials and Methods

Study Area

The study was carried out at a worship center (COCIN) LCC Tudun Wada Jos and its environ. Tudun Wada is located in Jos North LGA of Plateau State, Nigeria.

2.2 Study Population

This study was carried out among 50 apparently healthy men who are worshipers with Church of Christ in Nations (COCIN) and its surrounding environment. The health status of each participating subject was assessed by qualified health professions.

Eligibility Criteria

Inclusion criteria

All apparently healthy elderly men 50 years and above in Tudun wada community who filled the study questionnaire and gave their consent to participate in the study were included.

Exclusion criteria

All elderly men who have known cases of prostate cancer and those who did not give their consent for the study were excluded. In addition; all men who were below 50 years of age were excluded from the study.

Selection Method

Subjects were selected using a simple random sampling technique described by Fyneface *et al*. [9,10]

Sample Collection and Preparation

Five (5mls) of whole venous Blood was collected from the antecubital fossa aseptically using sterile needle and syringe through venipuncture. The blood samples was collected into plain tubes and labeled appropriately with the participants' names and laboratory numbers. The samples were allowed to clot and later retracted and centrifuged at 3000rpm for 5 minutes to obtain serum which was then separated from the red blood cells and stored in a cryovial at -20^{o}C for five (5) days, temperature was maintained using external digital freezer thermometer and observed daily until it was analyzed.

Laboratory Method

The chemiluminescence immunoassay method was used for this study as described by Jolly (2016) et al.

Procedure

Samples were dispensed by adding 300ul of serum into the sample cups and loaded in the sample tray. Test samples were loaded and tagged with their sample identity. The reagent was loaded and a reagent scan performed, equally loaded the calibrators were also loaded and scanned. Procell, cleancell, water reservoir and waste system were checked to ensure the volume were enough for the analysis. Cobas e-411 was then allowed to booth and to attain working temperature of 18-22^{0}C. Normal control and high control were loaded and quality control performed. Tests were assigned and run, results were generated within 15mins.

Statistical Analysis

The data generated was subjected to statistical analysis using SPSS software version 26. Mean and standard deviation of the results were ascertained, one-way analysis of variants (ANOVA) and T-test were used to compare PSA mean values among and between demographic parameters respectively. $P \leq 0.05$ were considered statistically significant.

3.0 Results

Table 1: Demographic characteristics of participants

Demographic characteristics	Number (%)
Age groups (years)	
50-59	36(72)
60-69	7(14)
70-79	5(10)
≥80	2(4)
Level of education	
Informal	0(0)
Primary	15(30)
Secondary	7(14)
Tertiary	28(56)
Occupation	
Artisan	3(6)
Civil servant	34(68)
Business	8(16)
Self-employed	5(10)
Marital status	
Married	48(96)
Divorced	0(0)
Widowers	2(4)
Knowledge of prostate cancer	
Yes	24(48)
No	26(52)
Previous screening for PSA	
Yes	1(2)
No	49(98)
Frequency of intercourse per week	
Nil	17(34)
Once	17(34)
Twice	5(10)
Thrice	11(22)
Last had sex	
<1week ago	10(20)
2-4weeks ago	21(42)
1-3months ago	16(32)
>1year ago	3(6)

Table 2 compares serum PSA level among selected demographic characteristics such as age group, education, occupation, marital status, knowledge of prostate cancer, previous screening for PSA, frequency of intercourse per week, last had sex and exercise. Of all of these demographic parameters studied, only age group was showed to have significant difference in serum PSA levels, p-value=0.00. Other parameters showed no significant difference, p-value>0.05

Table 2: Mean serum PSA levels of apparently healthy men based on demographic characteristics

Demographic characteristics	Mean(ng/ml)	SD	P
Age group (Years)			
50-59	2.10	2.40	0.00
60-69	6.15	12.64	
70-79	3.87	2.00	
≥80	60.12	56.41	
Education			
Primary	11.92	26.14	0.11
Secondary	2.37	2.36	
Tertiary	2.24	2.52	
Occupation			
Artisan	1.79	1.82	0.91
Civil servant	5.86	17.67	
Business	2.36	2.19	
Self-employed	6.91	8.26	
Marital status			
Married	5.33	15.10	0.70
Widowers	1.20	0.30	
Knowledge of prostate cancer			
Yes	2.26	2.60	0.19
No	7.85	20.20	
Previous screening for PSA			
Yes	7.19		0.89
No	5.12	14.96	
Frequency of intercourse per week			
Nil	9.63	24.67	0.50
Once	3.54	5.10	
Twice	2.08	2.95	
Thrice	2.17	1.69	
Last had sex			
<1week ago	4.17	5.89	0.97
2-4weeks ago	7.06	21.47	

1-3month	3.67	8.39	
>1year ago	3.89	4.67	
Exercise			
Yes	3.59	6.27	0.34
No	7.73	22.81	

Table 3 shows the percentage of subjects with PSA level above the cut-off value based on certain demographic characteristics. The age group of 50-59 years had the highest percentage (12%) of subjects with serum PSA level above 4ng/ml. Primary and tertiary level of education had the highest percentage (10%) of subjects with serum PSA above 4ng/ml. Among occupation classification, civil servants had the highest percentage (16%) of subjects with serum PSA level above the cut-off value. Based on knowledge of PSA cancer classification, the group without knowledge had the highest percentage (14%) of subjects with serum PSA level above the cut-off value (>4ng/ml). Based on previous screening for PSA classification, the group with no history of PSA screening had the highest percentage (10%) of subjects with serum PSA level above the cut-off value (>4ng/ml). Based on frequency of intercourse per week classification, the group with a frequency of one intercourse per week had the highest percentage (10%) of subjects with serum PSA level above the cut-off value (>4ng/ml). Based on last had sex classification, the group that last had sex 2-4 weeks ago had the highest percentage (12%) of subjects with serum PSA level above the cut-off value (>4ng/ml). Based on exercise classification, exercisers had the highest percentage (16%) of subjects with serum PSA level above the cut-off value (>4ng/ml).

Table 3: Distribution of participants based on serum PSA >established normal range

Demographic characteristics	N	Number(%) with PSA levels >4ng/ml	Mean PSA (ng/ml)
Age group (years)			
50-59	36	6(12)	6.99
60-69	7	1(2)	34.70
70-79	5	2(4)	5.88
80+	2	2(4)	60.12
Total	50	11(22)	18.96
Level of education			
Primary	15	5(10)	33.03
Secondary	7	1(2)	7.19
Tertiary	28	5(10)	7.24
Total	50	11(22)	18.96
Occupation			
Artisans	3	0(0)	0.00
Civil servants	34	8(16)	21.45
Business	8	1(2)	7.33
Self Employed	5	2(4)	14.83
Total	50	11(22)	18.96

Knowledge of prostate cancer			
Yes	24	4(8)	7.66
No	26	7(14)	25.42
Total	50	11(22)	18.96
Previous screening for PSA			
Yes	1	1(2)	7.19
No	49	10(20)	20.14
Total	50	11(22)	18.96
Frequency of intercourse per week			
Nil	17	4(8)	36.88
Once	17	5(10)	9.52
Twice	5	1(2)	7.33
Thrice	11	1(2)	6.14
Total	50	11(22)	18.96
Last had sex			
<1week ago	10	2(4)	13.19
2-4weeks ago	21	6(12)	22.39
1-3months	16	2(4)	20.36
>1year ago	3	1(2)	7.19
Total	50	11(22)	18.96
Exercise			
Yes	31	8(16)	10.13
No	19	3(6)	42.52
Total	50	11(22)	18.96

Discussion

This research work was carried out to evaluate serum prostate specific antigen (PSA) levels among apparently healthy men in COCIN LCC Tudun wada and its environs. A total number of fifty men were screened, eleven (22%) out of fifty participants had serum PSA levels higher than the established normal range and thirty nine (78%) participants had serum PSA levels within the normal range. For early detection of prostate cancer, prostate specific antigen measurement is an indispensable step in the diagnosis of the disease. Prostate specific antigen measurement is also used for monitoring prostate cancer treatment as documented by a Balk and his research team in 2003. They also reported that it plays a vital role in mitigating the dreaded burden of prostate cancer in the world.

The implications of demographic characteristics were studied in relation to their serum PSA levels. The demographic variables studied include age group, level of education, occupation, knowledge of prostate cancer, previous screening for PSA, frequency of intercourse per week, last had sex and exercise.

From the statistical analysis, the mean serum PSA levels increases progressively with the advancement in age as shown in table 2. This is in agreement with the report of American cancer

society (2016). This association between PSA levels and age could be attributed to decrease in physical activities with age progression.

Although there was no significant difference in the PSA levels among other demographic parameters but there were some share result pattern observed among related demographic parameters. Considering knowledge based characteristics such as education and knowledge of prostate cancer, there was an observed decline in PSA level as knowledge increased. In education demographic parameter, there was a steady decline in PSA level from primary level of education to tertiary level of education. Similar pattern was observed between those who are informed or had knowledge of prostate cancer. As people get informed, the risk of developing prostate cancer reduces.

Considering physical activity related characteristics, similar pattern was observed. The physical activity related characteristics are age group and exercise. It was observed that increased physical activity led to decrease in PSA level. It is generally known that there is an inverse relationship between age and physical activity, so as the subjects increase in age, there was a steady increase in PSA level. This pattern was supported by PSA distribution between exercisers and non-exercisers. Exercisers had low PSA level than non-exercisers. This may imply that physical activity has an impact in PSA level in elderly men.

There were inconsistent patterns in sex lifestyle. The demographic characteristics that described sexual activity or lifestyle were frequency of intercourse, last had sex and marital status. Although frequency of intercourse resulted to a decline in PSA level among elderly men, there were inconsistent patterns in last-had-sex and marital status as subjects who had not had sex for more than a year had lower PSA level than those with lower timeframe and widowers were reported to have lower PSA level compared to the married men.

Conclusion

This study has shown that age impacts on PSA level among elderly men in COCIN LCC Tudun Wada such that the older they were, the higher their PSA level. The study has also pointed the attention of researchers to future research area on possible implication of education and physical activity on PSA levels following repeated patterns.

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