

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 the seminal coagulum in the human ejaculate. An increase in the PSA level is a health concern and requires medical intervention. Therefore, understanding the factors that affect the PSA is important.

Aim

The study was aimed at determining the impact of demographic parameters on serum PSA level among men in the Church of Christ in Nations (COCIN) LCC Tudun Wada Jos and its environment.

Methodology

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

Results

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

Conclusion

This study has shown that an increase in age has a corresponding rising impact on the PSA level among elderly men living in Tudun 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 [1]. 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 the

seminal coagulum in the human ejaculate [2]. In addition, it also contains proteins which serve as nutrient for the sperm as they transit through the vagina into the fallopian tube to fertilize the ova and 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 a pathological condition such as benign prostatic hyperplasia (BPH), prostate cancer and other prostate disorders, it is associated with the highest concentration of prostate-specific antigen in the blood [1]. 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 leads to the release and elevation of prostate-specific antigen in the blood [3].

Prostate cancer is a neoplastic proliferation of prostate cells [4], which gives rise to metastasis (invasion and spread to other parts of the body), and eventually 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 [5]. Studies have shown that prostate cancer accounts for 11% of all male cancers in Nigeria and is on the rise due to the 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 [4]. 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 [6]. Mellon and Mellon [7] found a 63% decline in the 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 helping in early detection at a more curable stage with a resultant decline in morbidities and mortalities associated with prostate cancer [8]. Prostate-specific antigen (PSA) assay is the most commonly used investigation in prostatic cancer diagnosis and management.

The focus of this research is to study the serum PSA level among men in the Church of Christ in Nations (COCIN) LCC Tudun Wada Jos and its environments and their demographic implications.

Materials and Methods

Study Area

The research was carried out at a worship center the Church of Christ in Nations (COCIN) LCC Tudun Wada Jos and its environment. Tudun Wada is located in Jos North LGA of Plateau State, Nigeria.

2.2 Study Population

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

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 research 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 also excluded from the study.

Selection Method

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

Sample Collection and Preparation

Five (5mls) of whole venous blood were collected from the antecubital fossa aseptically using a sterile needle and syringe through venipuncture. The blood samples were 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°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 *et al.* [11].

Procedure

Samples were dispensed by adding 300ul of serum into the sample bottles and loaded into the sample tray. Test samples were loaded and tagged with their sample identity. The reagent was loaded and a reagent scan was performed, equally loaded the calibrators were also loaded and scanned. Procell, clean cell, water reservoir and waste system were checked to ensure the volume was enough for the analysis. Cobas e-411 was then allowed to compute and to attain the working

temperature of 18-22⁰C. Normal control and high control were loaded and quality control was performed. Tests were assigned and run, results were generated within 15mins.

Statistical Analysis

The data generated were subjected to statistical analysis using SPSS software version 26 [13]. Mean and standard deviation of the results were ascertained, one-way analysis of variants (ANOVA) and T-test were used to compare the PSA mean values among, and between demographic parameters respectively. $P \leq 0.05$ were considered statistically significant.

3.0 Results

Table 1 represents the data of the demographic characteristics (age groups, level of education, occupation, marital status, knowledge of prostate cancer, previous screening of PSA, frequency of intercourse per week, and last had sex) of each participant. The figures were expressed in percentages for each feature.

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 the 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 the PSA level among selected demographic characteristics such as age group, education, occupation, marital status, knowledge of prostate cancer, previous screening for the PSA, the frequency of intercourse per week, last had sex and exercise. Of all of these demographic parameters studied, only the age group was shown to have a significant difference in the 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 the 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 the serum PSA level above 4ng/ml. Primary and tertiary level of education had the highest percentage (10%) of subjects with the serum PSA above 4ng/ml. Among occupation classification, civil servants had the highest percentage (16%) of subjects with a serum PSA level above the cut-off value. Based on knowledge of the PSA cancer classification, the group without knowledge had the highest percentage (14%) of subjects with a serum PSA level above the cut-off value (>4ng/ml). Based on previous screening for the PSA classification, the group with no history of the PSA screening had the highest percentage (10%) of subjects with a serum PSA level above the cut-off value (>4ng/ml). Based on the frequency of intercourse per week classification, the group with a frequency of one intercourse per week had the highest percentage (10%) of subjects with a 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 a serum PSA level above the cut-off value (>4ng/ml). Based on exercise classification, exercisers had the highest percentage (16%) of subjects with a 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 the 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 Balk [1] 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, which is in accordance with the article published by Stanley et al. [14].

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 the PSA, the frequency of intercourse per week, last had sex and exercise.

From the statistical analysis, the mean serum PSA levels increase progressively with the advancement in age as shown in table 2. This is in agreement with the report of the American cancer society [12]. This association between the PSA levels and age could be attributed to a decrease in physical activities with age progression.

Although there was no significant difference in the PSA levels among other demographic parameters, similar result patterns were observed among related demographic parameters. Considering knowledge-based characteristics such as the education and knowledge of prostate cancer, a drop in PSA level was noticed as its awareness increased. In the education demographic parameter, there was a steady decline in the PSA level from the primary level of education to the tertiary level of education. A similar pattern was seen among those who are informed or had knowledge of prostate cancer. This report is in agreement with the research conducted by Ilic [15] in 2013 on educating men about prostate cancer in work place. Ilic [15] noted three areas such as poor knowledge of prostate cancer, its screening, and treatment as some of the factors sponsoring the rise in cases of the disease among men. This would also suggest that eliminating, or minimizing these factors would reduce PSA levels in men. Therefore, as people get informed, the risk of developing prostate cancer reduces.

Considering physical activity-related characteristics, the same pattern was observed. The physical activity-related characteristics are age group and exercise. It was observed that increased physical activity led to lower PSA levels. 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 elevation in the PSA level. This pattern was supported by the PSA distribution between exercisers and non-exercisers. Exercisers had low PSA level than non-exercisers. This may imply that physical activity has an impact on the PSA level in elderly men as reported by Shephard [16].

There were inconsistent patterns in sex lifestyle. The demographic characteristics that described sexual activity or lifestyle were the frequency of intercourse, last had sex and marital status. Although the frequency of intercourse resulted in a decline in the 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. Widowers were also reported to have lower PSA level compared to the married men. This scenario of

inconsistency in sexual activities as contributing to a decline in prostate cancer was reported by Patricio [17] to be inconclusive, as well as having little evidence.

Conclusion

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

Consent/Ethical Approval:

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

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