Short Research Article

THE SIGNIFICANCE OF SERUM SELENIUM LEVEL IN PROSTATIC DISEASES, COMPARING PROSTATE CANCER VERSUS BENIGN PROSTATE HYPERPLASIA

**ABSTRACT**

Prostate cancer (PCa) is the most common cancer among men and also a significant cause of mortality. Over one million new cases were diagnosed in 2020 and over 300,000 deaths from prostate cancer were recorded in the same year. Trace metals like Selenium have also been studied with respect to prostate cancer. The effect of selenium on angiogenesis, cell death, androgen receptor signaling has been a subject of research. We are comparing the serum Selenium (Se) levels of patients diagnosed with prostate cancer versus those diagnosed with Benign Prostate Hyperplasia (BPH).

A total of 81 patients who gave their consent, and had lower urinary tract symptoms were recruited over a 6 months period. 40 patients had Benign prostate enlargement while 41 patients had prostate cancer. Blood samples were collected and analyzed for Se using Atomic absorption spectrophotometer.

The mean age of respondents in this study was 60(9) and 62(9) for BPH and PCa respectively. The mean BMI was 25.81 (2.04). The mean PSA of the BPH and PCa groups were 2(1) and 18(5) respectively P <0.001. The serum selenium level for those with BPH was 0.17 (0.07) , while that for those with PCa was 0.14 (0.07) with a p-value of 0.073.

In this study we found that serum Se was lower in patient with PCa compared with controls(BPH) but this difference was not statistically significant. The role of Se in prostate diseases and indeed prostate cancer still requires further research.

**Key words**

*Selenium, Prostate cancer, Benign prostate hyperplasia*

**INTRODUCTION**

Prostate cancer is the most common cancer among men and also a significant cause of mortality. Over one million new cases were diagnosed in 2020 and over 300,000 deaths from prostate cancer were recorded in the same year.1 The aetiology of most cancers and in this case prostate cancer is a still a subject of debate and has been linked to some risk factors including, genetics, race, environmental factors, diet and lots more.2,3 A towering challenge in the management of prostate cancer, is to identify, control or modify factors that may prevent or affect disease progression of prostate cancer. Literature is replete with research on studies alluding to life style modifications that altered the prostate cancer progression.4-7

Trace metals like selenium have also been studied with respect to prostate cancer. The effect of selenium on angiogenesis, cell death, androgen receptor signaling.8,9 Selenium (Se) has been documented to be preventive for prostate cancer. The risk of aggressive or advanced prostate cancer reduces by 10% for every 10ng/ml increase in plasma Se 10,11 but the doses to achieve response or ideal range of intake for optimum risk reduction has not been estimated. 12,13.

Studies have found increase in the incidence of prostate cancer in the African population14 therefore the need to identify factors that may affect this disease is necessary. We are comparing the serum selenium level of patients diagnosed with prostate cancer versus those with Benign Prostate Hyperplasia (BPH).

**METHODOLOGY**

This is a prospective study of patients who presented with bladder outlet obstruction (BOO) and had prostate biopsy. It was carried out in the University of Port Harcourt teaching Hospital (UPTH) and Gbeye hospital. The centers attended to patients with urological conditions. A total of 81 patients over a 6 months period were included in the study. All patients presented with symptoms suggestive of prostate cancer or biochemical/ radiological evidence indicating prostate cancer had prostate biopsy done. In one arm were those who were confirmed to have PCa and there were 41 patients, their blood samples were collected for Se level analysis. 40 patients who had histological diagnosis of benign disease either from tru-cut prostate biopsy or analysis of tissue from prostatectomy were also included in the other arm of the study. Their blood samples were also collected for Se level analysis.

Se level was analyzed using Atomic Absorption Spectrophotometer (AAS), which works by the sample being aspirated into the flame and atomized once, ASS light beam goes through the flame into a monochromator and unto a detector that measures the amount of light absorbed. Elements have their own absorptive wave lengths. The wave length for Se is 196.0nm. The quantity of energy of Se wave length absorbed determines the level of Se in each patient plasma.

The patients’ biodata, Prostate specific antigen (PSA) and Se levels were recorded and collated using Microsoft Excel 2016 version (Microsoft Corporation, Redmond, WA, USA), and they were subjected to analysis using SPSS version 20.

**RESULTS**

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TABLE 1: Age and BMI of study population

| **Characteristic** | **N = 81** |
| --- | --- |
| **Age** | 60 (9) |
| **BMI** | 25.81 (2.04) |
| **BMI CATEGORY** |  |
| Normal weight | 27 (33%) |
| Obese | 2 (3%) |
| Overweight | 52 (64%) |

## Table 2: selenium and Prostate specific antigen in both groups

| **Characteristic** | **control** N = 401 | **PCa** N = 411 | **p-value**2 |
| --- | --- | --- | --- |
| **Se** | 0.17 (0.07) | 0.14 (0.07) | 0.073 |
| **PSA** | 2 (1) | 18 (5) |  <0.001 |

**DISCUSSION**

The burden of prostatic diseases is a global concern, especially in African population where disease morbidity and mortality has been recorded to be higher.15 There are several studies that aim to identify risk factors of prostate cancer. There are myriads of research that provide persuasive reports on the role of non-genetic factors in the aetiology of PCa3,16,17

The influence of selenium in the prevention, prognostication and treatment of prostate cancers has been a subject of research with varying outcomes.18,19.

The mean age of respondents in this study was 60(9) for BPH and 62(9) for the PCa group, there was not statistically significant difference between both groups. This agrees with prior studies of patients with prostatic diseases done in the same geographical area3,16. The mean BMI was 25.81 (2.04). Most of the study population were overweight, only three percent (3%) were obese. Obesity has been associated with PCa,3 so the low number of obese respondents reduces the influence of obesity as a confounding factor in this study.

In our study, most of the study subject population 49(60%) were urban dwellers. Those in developed countries and cities (urban) have been demonstrated to have a higher risk for prostate cancer.3 The mean PSA for respondents in both groups were compared and found to be statistically significant P < 0.001. The significant difference in PSA of both study groups show that the group with PCa had a higher risk for prostate cancer compared to those who had BPH.

Se is incorporated into proteinlike selenium binding proteins 1 (SBP-1) and selenium binding proteins 2 (SBP-2). The role of these proteins is not well established but there is evidence to show that high nuclear levels of SBP-1 was associated with lower tumor grade.20 Se supplementation has been found to act synergistically when combined with chemotherapy and radiotherapy for prostate cancer treatment 21. Se supplementation has also been shown to reduces the post radiotherapy diarrhea that occurs following treatment of prostate cancer. These indicate that Se may be beneficial in the prognosticating and even treatment of patients with PCa.

Se level for patient with PCa was 0.14 (0.07) which was lower than that for people with BPH 0.17 (0.07). This difference was however not statistically significant with a p value of 0.073. This agrees with Dhillhon et al 19, in their study they reported lower Se levels in patients with PCa versus the controls (BPH). A weak evidence of the positive effect of Se on PCa has also been recorded in other studis.20,21 Cui et al 22 also reported low Se in patients with prostate cancer compared to the control group just as we found in this study. This may be due to the effective scavenging of reactive nitrogen oxide by selenium and it’s anti-inflammatory activity24,22. There is also data to suggest that Selenium reduces cell multiplication and reduced cell cycle progression by the reduction of cyclin in PCa cell lines.22 These go to say that Selenium plays a role in cancer PCa though our study has not shown significant difference when comparing PCa and BPH

There are studies that analyzed the impact of selenium intake in the development to PCa with opposing outcomes, The Nutritional Prevention of Cancer (NPC) trial25 after Se supplementation showed reduced risk for prostate cancer in patients who initially had low Se level.24 while the SELECT trial 26 showed Selenium supplementation at 200 micro grams did not reduce the risk of prostate cancer. The disparity in outcomes of these studies may be because the NPC trial considered patients with low Se as opposed to the SELECT. In our study we did not consider Se supplementation because these were patients presenting with clinical symptoms that needed some form of treatment.

**CONCLUSION**

In this study we found that serum Se was lower in patient with PCa compared with controls (BPH) but this difference was not statistically significant. The role of Se in prostate diseases and indeed prostate cancer still requires further research to determine its role, this will also help identify those who will benefit from Se supplementation, dose and duration of supplementation required. This is particularly important in West-Africa where the burden of prostate cancer is high.

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