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ALTERATIONS IN ANTIOXIDANT VITAMINS IN PROSTATE CANCER PATIENTS

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ABSTRACT

Antioxidant vitamins C and E in prostate cancer patients were studied. The study comprised fifty prostate cancer patients and fifty apparently healthy men as case control. Levels of vitamin C were significantly decreased (P≤0.05) in prostate cancer patients (0.63 ± 0.21mg/dl) when compared to the case control (1.45 ± 0.26mg/dl). Also, level of vitamin E was significantly decreased (P≤0.05) in prostate cancer patients (0.80 ± 0.10mg/dl) when compared to the apparently healthy men (1.65 ± 0.14mg/dl). In prostate cancer patients, there is an increase in the production of reactive oxygen species (ROS) leading to oxidative damage hence regular supplementation of natural antioxidants such as fruits may be beneficial in preventing complications.

INTRODUCTION

Prostate cancer is a malignant tumour (carcinoma) of the prostate gland, a common form of cancer in elderly men. In most men, it progresses slowly over many years and gives symptoms similar to those of benign enlargement of the prostate [1].

Before it was possible to test for prostate specific antigen (PSA), the tumor had often invaded locally, spreading to regional lymph nodes and metastasize to bone before clinical presentation.

Prostate cancer is the 6th most common cancer in the world [2]. It is characterized by its very sharply rising age-specific incidence curve [3]. In England and Wales, about 50% of cases occur in men above 75 years of age. The disease is extremely rare in men under 45 years of age [4]. The incidence differs widely among populations and is highest in North America. Some registries reporting age standardised rates ten times greater than those reported from Japan while European countries tend to have intermediate rates [5, 6, and 7]. The incidence of prostate cancer in Nigeria has been variously quoted [8].

The prostate is a nut shaped gland located below the neck of the bladder and surrounds the urethra. It has a middle lobe and is covered by a thin membrane called capsules which produces prostate specific antigen (PSA) which is a tumour blood marker used in assessing prostate cancer risk. Prostate cancer is very aggressive and has a high probability of spreading to bones of the pelvis, ribs and vertebrae. Common symptoms associated with prostate cancer include difficulty or pain with urination, inability to urinate, frequent urination during the night, dribbling of urine, feeling a sense of urgency to urinate frequently, blood in urine, a feeling that the bladder is not empty after urination, pain or burning sensation with urination, constant pain in the lower back, pelvis, or upper thighs, bone pain.

However, several risk factors such as age, race, family, history, hormone level and environmental

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influences are suspected of playing roles.

A paradox in metabolism is that while a vast majority of complex life on earth requires oxygen for its existence, oxygen is a highly reactive molecule that damages living organism by producing reactive oxygen species. Consequently, organisms contain a complex network of antioxidant metabolites and enzymes that work together to prevent oxidative damage to cellular components such as deoxyribonucleic acid (DNA), proteins and lipids. In general, antioxidant systems either prevent these reactive species from being formed or remove them before they can damage vital components of the cell [9]. However, since reactive oxygen species do have useful functions in cells such as redox signalling, marking foreign invaders for the immune system which allows for the determination of the tissue to be destroyed. The function of antioxidant system is not to remove oxidants entirely but instead to keep them at an optimum level.

The reactive oxygen species produced in cells include hydrogen peroxide (H_2O_2), hypochlorous acid (HOCl) and free radicals such as hydroxyl radical (OH) and superoxide anion (O_2). The hydroxyl radical is particularly unstable and will react rapidly and non-specifically with most biological molecules. This specie is produced from hydrogen peroxide in metal-catalysed redox reactions such as fenten reaction. These oxidants can damage cells by starting chemical chain reactions such as oxidising DNA or proteins [1]. Damage to DNA can cause mutations and possibly cancer, if not reversed by DNA repair mechanism [5] while damage to proteins causes enzyme inhibition, denaturation and protein degradation.

Antioxidants neutralise free radicals as the natural byproduct of normal cell processes. In humans, the most common form of free radicals is oxygen which when electrically charged tries to steal electrons from other molecules causing DNA damage. Antioxidants are often described as ‘’mopping up’’ free radicals meaning that they neutralise the electrical charge and prevent the taking of electrons by free radicals from other molecules.

Accumulation of free radicals is a common cause of cancer, for instance prostate cancer and therefore effort towards the proper management and prevention of prostate cancer and its implication should include a routine laboratory estimation of antioxidant status which is a potential risk factor of prostate cancer complications. Hence, the levels of vitamins C and E were assessed.

MATERIALS AND METHOD

Subjects

50 confirmed prostrate cancer patients (males) aged 50-65 years with PSA level of greater than 4.0ng/ml were selected for the study. Diabetic and those with systemic diseases were excluded. 50 Apparently normal subjects (males) with PSA level less than 3.0ng/l served as control. Informed consent was obtained from all the subjects verbally.

Sample Collection

Five milliliters of blood was drawn from the cubital median vein of the subjects into into plain tube and heparinized tube. The sample in plain tube was spun in a Wisperfuge (model 684) centrifuge at 1000g for 10minutes and the serum collected into a clean dry bijou bottle

Biochemical assay

Vitamins Analysis

Plasma vitamin C was assayed by the 2, 4-nitrophenyl hydrazine method described by Tietz [10]. The vitamin E was done by the method of Tietz [11] in which vitamin E caused the reduction of ferric to ferrous ion which then forms a red complex with α-α dipyridyl. Vitamin C and E were measured at 520nm using spectrophotometer.

Statistical analysis

All values were expressed as mean ±standard deviation. The student t-test was used to calculate the significant differences at $P<0.05$.

Result

Parameter Tested	Control Test	Prostrate Cancer
Vitamin C (mg/dl)	1.45±0.26	0.63±0.21*
Vitamin E (mg/dl)	1.65±0.14	0.80±0.81*

The table above shows the mean and the standard deviation of antioxidant vitamin C levels in prostate cancer patients and apparently healthy men. There was a significant decrease in vitamin C ($P\leq0.05$) in prostate cancer patients (0.63 ± 0.21) when compared to the case control (1.45 ± 0.26).

The level of vitamin E was significantly decreased ($P\leq0.05$) in prostate cancer patients (0.80±0.10) when compared to the apparently healthy men (1.65±0.14).

DISCUSSION

In this study, vitamin C and vitamin E were significantly decreased as they are highly effective antioxidants that act to lessen oxidative stress caused by reactive oxygen species or free radicals produced by metabolic processes promoting carcinogenesis by damaging DNA. This is in agreement with the work of Nnodim and Emejul [1]. Vitamin C and vitamin E with the potentiality of altering the genotoxic effects of ROS [12] increases their activity in cancer patients because there is an increased production of reactive oxygen metabolites thereby reducing their plasma or serum level

and if not supplemented may cause hemorrhage, anemia, decreased iron metabolism and accumulation of metha moglobin inside erythrocytes [13] In conclusion, vitamin C and E due to their antioxidant activity reduce the risk of cancer. The study shows that the mean value of vitamin C and vitamin E concentration decreased significantly ($P \leq 0.05$) in the test group when compared with the control groups. A reduction in the amount of antioxidant level of vitamin C and E is due to oxidative stress consuming more antioxidant vitamins just to maintain redox balance. It is recommended that cancer patients be placed on fresh fruits and vegetables as they are the major sources of vitamins and this could reduce the risk of this cancer being malignant.

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