# Dietary Intervention with Garlic/Onion in the Treatment and Management of Prostate Disorders in a Nigerian Population

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## Abstract

*Prostate disorders currently constitute a serious public health and socio-economic problem in Nigeria and many other Nations that have an affluent culture with an ageing population. Research studies have found a strong association between diet, endocrine, genetic factors, western lifestyle and the incidence and prevalence of prostate disorders in elderly men. In this prospective study, 30 volunteer prostate patients at the Urology Clinic of Ebonyi State University Teaching Hospital, (EBSUTH), Abakaliki, Nigeria were used for the dietary intervention with garlic/onion. The initial prostate-specific antigen (PSA) of the patients were determined and based on the results they were categorized into five groups (0-10, 11-20, 21-30, 31-40, 41 and above ng/ml). Each group was given a two - weekly diet supplement of garlic/onion for a period of two months. Initial and forthnightly blood samples were analyzed for serum levels of prostate-specific antigen (PSA), follicle-stimulating hormone (FSH), Luteinizing hormone (LH), Prolactin (PRL) and testosterone (TS). The results revealed that there was significant (P<0.05) reduction in the mean PSA values of all the patients in groups three, four and five after the two-month period of intervention with garlic/onion. It was also found that the group three patients had significant (P<0.05) reduction in their mean FSH and LH values while their mean TS values increased significantly (P<0.05). These patients experienced tremendous relief and better quality of life during the intervention. The results of the study indicate that a regimen containing garlic/onion as diet supplement could be effective in the prevention and management of prostate disorders in a Nigerian population.*

**Keywords:** Prostate, Prostate-specific antigen (PSA), Follicle-stimulating hormone (FSH), Luteinizing hormone (LH) Prolactin (PRL), Testosterone, Garlic, Onion, ELISA.

## Introduction

Nutritional support for the prostate gland is an extremely important aspect of preserving the health and function of this gland and in the prevention and management of prostate disorders (Hennenfront, 1995; Pollard, 1997). Some nutrients and natural bioactive compounds (phytochemicals) available in foods, herbs and in certain supplement products have been shown to block the conversion of testosterone to dihydrotestosterone (Small, 2000). The major ones include saw palmetto (*Serenoa repens*), *Pygeum africanum*, beta-sitosterol, soy isoflavones, stinging nettle, coconut (*Cocos nucifera*), tomato (*Lycopersicum esculentum*) garlic (*Allium sativum L.*)/onion (*Allium cepa L.*) and bitter leaf (*Vernonia amygdalina*) extract. (Afzal, 2000; Barnes, 1995; Bowen *et al.,* 2002; Cohen, 2000). The regular intake of these products has been shown to be useful in the prevention and management of prostate problems (Small, 2000). Saw palmetto has been reported to work by inhibiting the enzyme $5\alpha$-reductase thereby blocking the conversion of testosterone to dihydrotestosterone in the prostate gland. It has been reported that the accumulation of dihydrotestosterone in the prostate gland stimulates prostate cells to divide and multiply at a faster rate. This results in more prostate cells, leading to prostate enlargement and other prostate problems (Pollard, 1989). As the prostate enlarges, elderly men often notice urination problems such as reduced strength of their urine stream, more frequent urination, bladder urgency, and related symptoms (Murray, 1995). The three major prostate disorders are benign prostatic hyperplasia (BPH), prostate cancer (PCA) and prostatitis (PTT). High consumption of garlic and onion has been associated with reduced rate of overall cancer (Hodge *et al,* 2004; Key *et al.,* 1997; Hsing *et al.,* 2002). The objective of this study was to determine how garlic/onion affect the serum levels of prostate-specific antigen (PSA), follicle-stimulating hormone (FSH), luteinizing hormone (LH) Prolactin (PRL) and testosterone (TS) of the prostate patients.

## Materials and Methods

30 volunteer prostate patients at the Urology Clinic of Ebonyi State University Teaching Hospital, (EBSUTH), Abakaliki, Nigeria were used for this study. The initial prostate-specific antigen (PSA) serum values of these patients were determined and based on the results, they were divided into five groups (0-10, 11-20, 21-30, 31-40, 41 and above ng/ml) for the dietary intervention with garlic/onion. Each patient was given three small raw garlic seeds (approx. wt = 8.0g) and one medium size onion (approx. wt = 104g) once daily at two-weekly intervals for a period of two months. On the last day of each intervention period, the serum levels of the parameters were determined. The initial values of each parameter served as an internal control for each patient because the use of external controls for each group would have introduced a further complication.

Table 1: PSA and Hormone values after two – weekly intervention with garlic/onion for group one patients (PSA = 0 – 10 ng/ml)

| S/no | Age | Initial values | | | | | Values after garlic/onion intervention | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PSA | FSH | LH | PRL | TS | PSA | FSH | LH | PRL | TS |
| 1 | 56 | 8.6 | 10.2 | 7.2 | 22.1 | 5.4 | 5.6 | 9.1 | 6.4 | 16.4 | 6.5 |
| 2 | 78 | 6.8 | 11.5 | 18.0 | 7.1 | 6.8 | 5.3 | 9.7 | 3.6 | 9.7 | 6.4 |
| 3 | 57 | 9.2 | 7.7 | 19.4 | 6.1 | 12.3 | 8.4 | 7.0 | 14.0 | 5.0 | 12.9 |
| 4 | 69 | 5.5 | 11.4 | 14.2 | 9.4 | 2.6 | 4.6 | 10.0 | 13.1 | 8.0 | 4.9 |
| 5 | 42 | 5.0 | 10.1 | 15.0 | 12.1 | 12.6 | 4.6 | 9.1 | 13.8 | 9.8 | 13.4 |
| 6 | 60 | 6.0 | 11.8 | 14.0 | 8.1 | 4.6 | 5.5 | 9.7 | 12.8 | 6.9 | 6.4 |
| 7 | 69 | 9.5 | 10.7 | 14.9 | 2.0 | 3.8 | 8.4 | 8.2 | 12.1 | 1.2 | 5.4 |
| 8 | 44 | 2.0 | 13.4 | 4.7 | 2.6 | 2.0 | 1.8 | 13.0 | 4.5 | 4.0 | 2.8 |

Table 2: PSA and Hormone values after two – weekly intervention with garlic/onion for group two patients (PSA = 11 – 20 ng/ml)

| S/no | Age | Initial values | | | | | Values after garlic/onion intervention | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PSA | FSH | LH | PRL | TS | PSA | FSH | LH | PRL | TS |
| 1 | 50 | 12.5 | 12.5 | 14.0 | 16.6 | 10.0 | 12.0 | 10.4 | 12.2 | 14.4 | 10.8 |
| 2 | 60 | 13.5 | 18.3 | 24.3 | 6.9 | 1.5 | 12.8 | 16.4 | 22.2 | 6.4 | 2.0 |
| 3 | 74 | 10.5 | 12.1 | 13.8 | 6.8 | 12.3 | 10.0 | 10.2 | 12.1 | 6.4 | 12.4 |
| 4 | 55 | 11.0 | 15.6 | 20.7 | 8.1 | 0.3 | 10.5 | 14.4 | 19.6 | 7.8 | 1.9 |
| 5 | 55 | 14.5 | 7.5 | 5.4 | 19.1 | 4.6 | 14.0 | 7.1 | 5.0 | 18.2 | 4.8 |
| 6 | 40 | 10.5 | 11.9 | 4.7 | 7.0 | 2.9 | 10.0 | 10.7 | 4.0 | 6.8 | 3.0 |
| 7 | 57 | 14.5 | 6.5 | 9.1 | 56 | 2.3 | 14.0 | 6.2 | 8.9 | 33.0 | 2.5 |
| 8 | 60 | 18.0 | 12.8 | 14.2 | 8.8 | 4.2 | 10.7 | 4.0 | 13.8 | 8.0 | 4.8 |

Table 3: PSA and Hormone values after two – weekly intervention with garlic/onion for group three patients (PSA = 21 – 30 ng/ml)

| S/no | Age | Initial values | | | | | Values after garlic/onion intervention | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PSA | FSH | LH | PRL | TS | PSA | FSH | LH | PRL | TS |
| 1 | 55 | 21.0 | 15.8 | 8.9 | 10.2 | 4.7 | 5.7 | 9.1 | 2.6 | 8.9 | 10.2 |
| 2 | 65 | 22.5 | 17.4 | 23.7 | 14.1 | 5.3 | 17.8 | 7.6 | 2.8 | 8.2 | 10.1 |
| 3 | 60 | 21.5 | 20.6 | 24.3 | 16.8 | 4.6 | 6.5 | 13.6 | 10.0 | 10.0 | 6.3 |
| 4 | 65 | 21.0 | 31.9 | 24.4 | 8.9 | 4.4 | 4.8 | 10.1 | 10.2 | 10.2 | 8.5 |

Table 4: PSA and Hormone values after two – weekly intervention with garlic/onion for group four patients (PSA = 31 – 40 ng/ml)

| S/no | Age | Initial values | | | | | Values after garlic/onion intervention | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PSA | FSH | LH | PRL | TS | PSA | FSH | LH | PRL | TS |
| 1 | 77 | 31.0 | 20.4 | 22.2 | 9.8 | 2.0 | 14.9 | 14.4 | 14.2 | 6.8 | 5.2 |
| 2 | 62 | 32.0 | 9.0 | 7.0 | 8.2 | 5.2 | 17.7 | 7.4 | 6.5 | 6.4 | 6.1 |
| 3 | 60 | 30.5 | 20.8 | 18.2 | 14.8 | 2.1 | 17.5 | 12.2 | 12.1 | 8.0 | 4.8 |
| 4 | 65 | 32.5 | 21.5 | 21.3 | 8.2 | 1.5 | 17.6 | 14.2 | 12.1 | 5.9 | 2.6 |

Table 5: PSA and Hormone values after two – weekly intervention with garlic/onion for group five patients (PSA ≥ 41 ng/ml)

| S/no | Age | Initial values | | | | | Values after garlic/onion intervention | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PSA | FSH | LH | PRL | TS | PSA | FSH | LH | PRL | TS |
| 1 | 73 | 46.0 | 15.1 | 16.4 | 8.5 | 5.6 | 12.5 | 10.0 | 8.1 | 6.4 | 6.2 |
| 2 | 70 | 41.0 | 20.8 | 18.0 | 15.6 | 1.7 | 10.5 | 16.0 | 12.1 | 13.2 | 5.1 |
| 3 | 72 | 73.0 | 18.3 | 15.1 | 13.8 | 2.6 | 16.8 | 13.4 | 12.8 | 10.4 | 5.0 |
| 4 | 52 | 66.5 | 10.0 | 11.9 | 5.8 | 9.8 | 19.5 | 9.0 | 9.6 | 4.4 | 10.3 |
| 5 | 57 | 66.0 | 10.1 | 6.8 | 10.8 | 2.0 | 20.5 | 7.6 | 2.2 | 8.6 | 5.2 |
| 6 | 74 | 66.0 | 19.1 | 14.0 | 9.6 | 1.9 | 19.8 | 12.8 | 12.0 | 7.1 | 3.7 |

The values of the serum factors were determined by the method of enzyme-linked immunosorbent assay (ELISA) (Stowel et al., 1991; Frankel et al., 1982). Five milliliters of blood was collected from the patients in each case using the standard venipunture techniques and the serum was separated from the red cells immediately after collection by centrifugation at 2000g for five minutes. The assay procedure was carried out and the optical density was then read using a microtiter plate reader at 450 nm for each serum factor. The mean absorbance value ($A_{450}$) for set of reference standards and patients' samples was determined for each serum factor.

Standard curves were plotted using the mean absorbance obtained from each reference standard against their concentrations in their respective units. For each serum factor, the mean absorbance values for each specimen were used to determine the corresponding concentrations of the parameter from the standard curve. The statistical analyses of the results were carried out using SPSS 11.0 for windows as described by Greenlee et al. (2001).

## Results

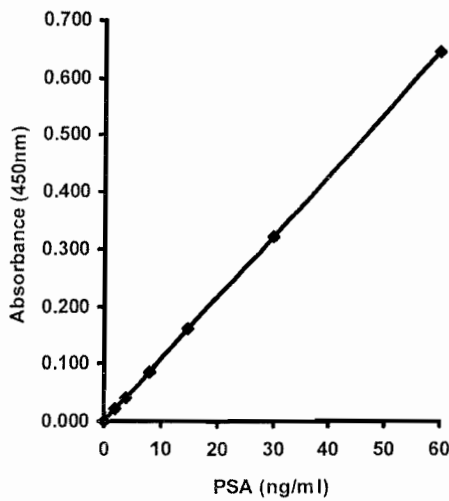The results inn tables 1 – 5 show that there was significant (P<0.05) reduction in the mean PSA,

Fig. 1: Standard Curve for PSA.
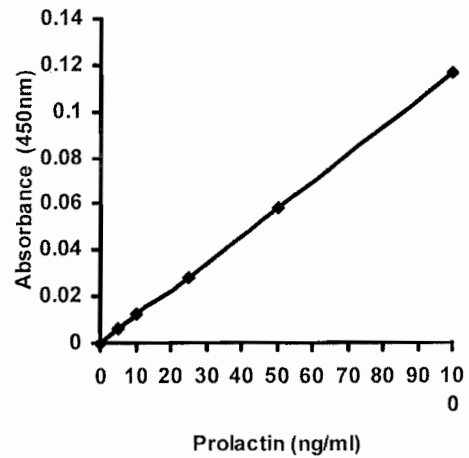


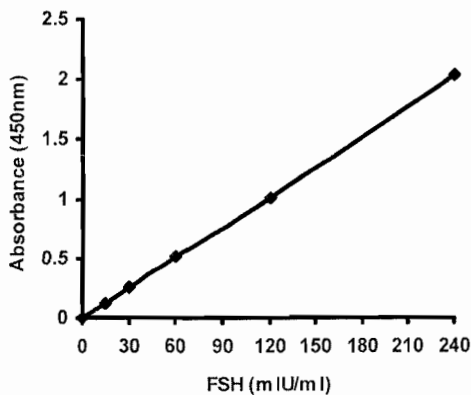Fig. 2:  Standard Curve for FSH.
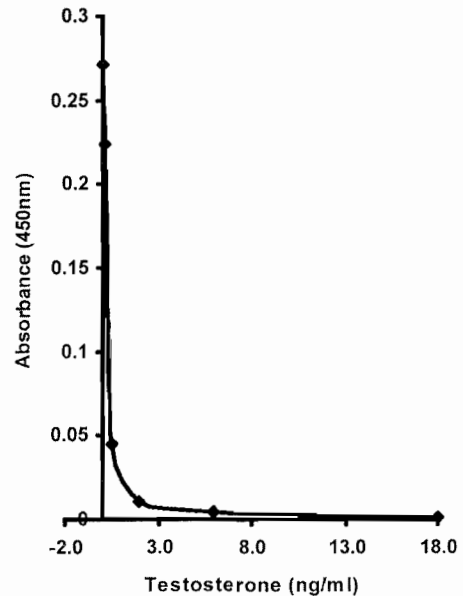


Fig. 3:  Standard Curve for LH.


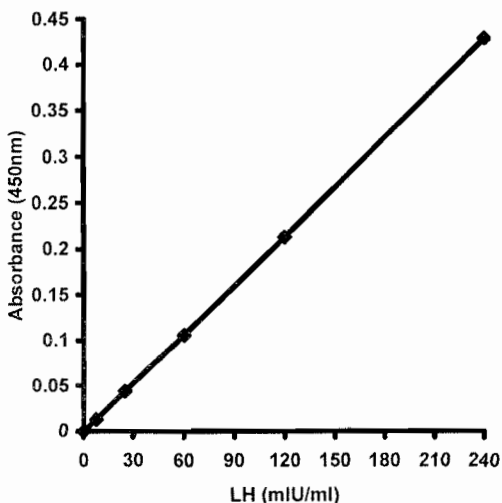
Fig. 4: Standard Curve for Prolactin.



Fig. 5: Standard Curve for Testosterone.

FSH and LH values of all the patients in group three. There was a significant ($P<0.05$) increase in the mean TS values of these group three patients. All the patients in groups four and five had significant ($P<0.05$) reduction in the mean PSA values after the intervention with the garlic/onion.

The normal ranges of the serum factors in males are as follows: - PSA = 0 – 4 ng/ml; FSH = 8 – 20 mIU/ml; LH = 0 – 21 mIU/ml; PRL = 1 – 20 ng.ml; TS = 3 – 10 ng/ml (Fig. 1 - 5).

## Discussion

Out of the 30 patients who completed the study, those within the age bracket of 60-69 were highest

in number while those within the age of 40-49 were least in number. This observation is consistent with a previous report that age is one of the clearly defined factors in the etiology of prostate disorders (Moore, 1944). In recent years a number of specific nutrients available in foods, herbs and certain supplement products have been identified that are linked to prostate disorders (Hennenfront, 1995). Garlic and onion are *allium* vegetables that have been shown to be rich in flavonoids and organosulfur compounds that have anti-cancer properties (Key *et al.*, 1997). A study reported a reduced risk of prostate cancer when subjects consumed garlic at least twice weekly (Key *et al.*, 1997). The serum factors, PSA, FSH, LH PRL and TS were chosen for analysis during the intervention with the garlic/onion because they have been found to be closely linked with prostate pathologies (Oseterling, 1991, Hudson *et al.*, 1989; Farnsworth *et al.*, 1981; Femini and Barelt-Connor, 1998). Prostate-specific antigen is a biochemical marker currently used for early detection of prostate disorders (Bartsch *et al.*, 2002). After the two-month intervention with the garlic/onion as a diet supplement, there was significant (P<0.05) reduction in the mean PSA values of all the patients in groups three, four and five. The group three patients had significant (P<0.05) reduction in their mean FSH and LH values while their mean TS values increased significantly (P<0.05) after the intervention with the garlic/onion. These results were readily reproducible. These patients experienced tremendous relief and better quality of life during the intervention.

**Conclusion:** This prospective study showed that the two-month intervention with the garlic/onion as diet supplement had significant (P<0.05) positive effects on the serum factors (PSA, FSH, LH, PRL and TS) of the patients. All the patients had significant (P<0.05) reduction in both their daytime and nighttime frequency of urination and they all had their other urination problems remarkably reduced during the intervention. All the patients experienced remarkable improvement and better quality of life during the intervention. We, therefore, recommend that healthy men above 50 and those already having prostate problems should start taking a regimen containing garlic/onion as a diet supplement together with their usual balanced diets for the prevention and management of prostate problems. The determination of the mechanism of action of garlic/onion on the serum factors is an area for further research.

### References

Afzal, M. (2000): Garlic and its medicinal potential. *Inflammopharmacology.* 8: 123-148

Barnes, S. (1995): Rational for the use of genistein-containing soy matrices in chemoprevention trials for breast and prostate cancer. *J. Cell. Biochem. Suppl.* 22:181-187.

Bartsch, G.; Rittmaster, R.S. and Klocker, H. (2002): Dihydrotes-tosterone and the concept of 5-alpha-reductase inhibition in human benign prostatic hyperplasia. *World J. Urol 19:413-425.*

Bowen P.; Chen L.; Stacewicz – sapuntzakis M.; Duncan C.; Sharifi R. and Ghosh L. (2002). Tomato sauce supplementation and prostate cancer. Lycopene accumulation and modulation of biomarkers of carcinogenesis. *Experimental Biology and Medicine* 227 (10): 886 – 893.

Cohen J.H.; Kristal A.R. and Stanford J.L. (2000). Fruit and vegetable intakes and prostate cancer risk. *Journal of the National Cancer Institute* 92 (1): 61 – 68.

Farnsworth, W.E. ; Slaanwhite, W.R. Sharma. M; Oseko, F.; Brown. J.R.; Gonder, M.J. and Cartagena, R. (1981): Interaction of prolactin and testosterone in the human prostate. *Urol. Res* 9: 79-88.

Fenimi R.L. and Barrett-Connor E. (1998): Sex hormones and age: a cross-sectional study of testosterone and estradiol and their bioavailable fractions in community-dwelling men. *Am. J. Epidemiol* 147 (8): 750–4.

Frankel, A.E; Rouse R, V.; Wang M.C.; Chu, T.M. and Herzenberg, L.A. (1982): Monoclonal antibodies to a human prostate antigen. *Cancer Res.* 42 3714-3728.

Greenlee, R.T.; Hill-Hanmon, M.B; Murray, T. and Thun, M. (2001): Cancer Statistics. CA Cancer. *J. Clin* 51: 15-36.

Hennenfront, B. (1995): Nutritional support for the prostate gland *American prostate society Quarterly* 3:9

Hodge A.M.; English D.R.; McCredie M.R.; Severi G.; Boyle P. and Hopper J.L. (2004): Foods, nutrients and prostate cancer. *Cancer control* 15 (1): 11 – 20.

Hsing A. N.; Chokkalingam A.P.; Gao Y.T.; Madigan W.P.; Deng H. and Gridley G. (2002). Allium vegetables and risk of prostate cancer: a population based study. *Journal of the National Cancer Institute,* 94 (21), 1648 – 1651.

Hudson, M.A.; Batinson, R.R. and Catalona, W.J. (1989): Clinical use of prostate-specific antigen in patients with prostate cancer. *J. Urol* 142: 1011-1017.

Key, T. J.A.; Silcocks, P.B.; Davey, G.K.; Appleby, P.N. and Bishop, D.T. (1997): A case-control Study of diet and prostate cancer. *Br. J. Cancer* 76: 678-687

Murray, M (1995): Preserving the health and functions of the prostate gland *The Healing power of herbs. (2nd edition) Prima publishing, Maryland, USA:* 306-313.

Oesterling, J.E. (1991): Prostate-Specific antigen: a critical assessment of most powerful tumor marker for adenocarcinoma of the prostate. *J. Urol. 145: 907-923.*

Pollard, M. (1997): Influence of Isoflavones in soy protein isolates on development of induced-prostate related cancers in L-W rats. *Nutr and Cancer,* 28:1:41-45.

Pollard, M. (1989): Prevention and treatment of experimental prostatic cancer in Lobound-Wister rats: Effects of estradiol, dihydrotestosterone and castration. *Prostate,* 15:95-103.

Small, E.J. (2000): Prospective trial of the herbal supplement PC-SPES in patients with progressive prostate cancer. *J. Clinical oncology.* 18:3595-3603.

Stowel, L.I.; Sharman, I.E. and Harmel, K. (1991): An Enzyme-linked Immunosorbent Assay (ELISA) for prostate-specific antigen. *Forensic Science Intern.* 50: 125 – 138.