

## Prostate Cancer: Review on Risk Factors

\***Emmanuel Ifeanyi Obeagu<sup>1</sup>, Esther U. Alum<sup>2,3</sup>, Getrude Uzoma Obeagu<sup>4</sup>  
and Okechukwu Paul-Chima Ugwu<sup>2</sup>**

**<sup>1</sup>Department of Medical Laboratory Science, Kampala International University, Uganda.**

**<sup>2</sup>Department of Publication and Extension, Kampala International University, Uganda.**

**<sup>3</sup>Department of Biochemistry, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.**

**<sup>4</sup>School of Nursing Science, Kampala International University, Uganda.**

**<sup>1</sup>ORCID0000-0002-4538-0161**

**<sup>1</sup>Email:emmanuelobeagu@yahoo.com**

---

### ABSTRACT

Prostate cancer is a common malignancy in men and the worldwide burden of this disease is rising. Lifestyle modifications such as smoking cessation, exercise, and weight control offer opportunities to reduce the risk of developing prostate cancer. Early detection of prostate cancer by prostate-specific antigen (PSA) screening is controversial, but changes in the PSA threshold, frequency of screening, and the use of other biomarkers have the potential to minimize the overdiagnosis associated with PSA screening. Several new biomarkers for individuals with raised PSA concentrations or those diagnosed with prostate cancer are likely to identify individuals who can be spared aggressive treatment. Several pharmacological agents such as 5 $\alpha$ -reductase inhibitors and aspirin could prevent development of prostate cancer. In this Review, we discuss the present evidence and research questions regarding prevention, early detection of prostate cancer, and management of men either at high risk of prostate cancer or diagnosed with low-grade prostate cancer.

**Keywords;** prostate, prostate cancer, cancer, risk factors, PSA

---

### INTRODUCTION

Prostate cancer is a common malignancy in men, and its incidence continues to rise in many countries [1-2]. Screening for, and management of, early prostate cancer is one of the most challenging and controversial issues in medicine [3-4]. Work is in progress to assess new tests that might be offered either as part of primary screening, or for the triage of men with high PSA concentrations, and we discuss these tests in detail [5-6]. Management strategies for low-grade cancers and for men with high PSA concentrations but negative biopsies are discussed [7-8].

#### Early Detection and Risk Factors of Prostate Cancer

##### Early Detection

Prostate cancer is unique among the potentially lethal human malignancies in the wide discrepancy between the high prevalence of histologic changes recognizable as cancer and the much lower prevalence of the clinical disease

©Obeagu *et al.*, 2023

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

[9]. Despite the availability of effective tests for early detection and of effective treatment for cancers so detected, the diagnosis usually is not established until the tumor is locally advanced or metastatic [9]. Yet, physicians hesitate to use these tests for fear that many cancers found would be latent, of little threat to the life or health of the host, and treatment could introduce inappropriate morbidity. Latent or “clinically unimportant” cancers can be distinguished from those that are clinically important by the larger volume, higher grade, and greater invasiveness of the latter. The available tests can detect only those cancers large enough to be palpable, visible on ultrasound, or capable of elevating the serum level of prostate-specific antigen. Such cancers are clinically important and should be treated for cure if the life expectancy of the patient is sufficiently long and the morbidity rate of therapy is low. Early detection programs yield a lower, yet still substantial, cancer detection rate in younger men, and there is a greater likelihood for detection of organ confined disease in this age range. Younger men have the longest projected life expectancy and, therefore, the most to gain from early prostate cancer detection. Using the tests that are available today may widen the window of opportunity so that treatment indeed becomes possible in those for whom it is necessary [9].

### **Risk Factors of Prostate Cancer**

**External exposure** Both ionizing radiation and ultraviolet radiation from sun exposure have been linked to prostate cancer, but confirmation of this link and more detailed risk estimates are needed. Increased risk in individuals exposed to cadmium has been reported, but high exposure is rare, and as such the risk is small with a negligible effect on public health [10]. Risk for prostate cancer might be increased in men with a history of urinary tract infections. There is evidence for a role for *Trichomonas vaginalis*, but evidence for other agents such as human papillomavirus and cytomegalovirus is weak. Infections might affect the risk for prostate cancer by causing chronic intraprostatic inflammation, and pathological studies show that inflammation could be involved in the development of prostate cancer. The role of urinary tract infections and chronic inflammation in the development of prostate cancer is uncertain and more research is needed.

**Dietary factors:** The role of high-fat diets, red meat consumption, and dairy products in prostate cancer development. Protective dietary components the impact of fruits, vegetables, and certain micronutrients on prostate cancer risk [11].

**Obesity and physical activity:** The relationship between body mass index (BMI), physical activity levels, and prostate cancer incidence.

**Occupational hazards:** The influence of occupation-related exposures, such as heavy metals, pesticides, and industrial chemicals, on prostate cancer risk.

**Environmental factors:** The potential impact of air pollution, radiation exposure, and endocrine-disrupting chemicals on prostate cancer development.

**Chronic inflammation and prostate cancer:** The link between pro-inflammatory conditions (e.g., prostatitis) and prostate cancer initiation and progression.

**Inflammatory markers and prostate cancer risk:** C-reactive protein (CRP), interleukin-6 (IL-6), and other markers as potential predictors of prostate cancer development.

**Gene-environment interactions:** How genetic variants may modify the effect of environmental factors on prostate cancer risk.

**Gene expression and environmental exposures:** The influence of environmental factors on gene expression patterns in prostate cancer. Epigenetic modifications: The role of DNA methylation, histone modifications, and non-coding RNAs in prostate cancer development [12].

**Microbiome** the potential impact of the gut and prostate microbiome on prostate cancer risk and progression. **Exposome** Comprehensive assessment of the cumulative environmental exposures throughout a person's lifetime and their association with prostate cancer

**Smoking:** Smoking is associated with a moderate increase in the risk for prostate cancer. This association is much stronger, and the increase more pronounced, for aggressive or fatal cancers, particularly in current or heavy smokers who could have double or more risk as non-smokers. Current smokers are at a higher risk of prostate cancer-specific mortality and recurrence than non-smokers and past smokers. The stronger association with aggressive cancers suggests that smoking might play a part in the promotion of metastatic spread [13].

**Diet, weight, and physical activity** Increased body-mass index is associated with an increase in advanced prostate cancer but a decrease in localized disease, which could explain the conflicting findings in early reports. Analysis of the Prostate Cancer Prevention Trial (PCPT) showed similar findings. Although no clear links with specific dietary factors have been established, red meat, dairy protein, dietary fat, and coffee have been mentioned as factors.

Sedentary lifestyle has been linked to high PSA concentrations in one large survey, and a meta-analysis of 19 cohort and 24 case-control studies reported a small inverse relationship between physical activity and prostate cancer risk. Endogenous hormones Prospective epidemiological studies have investigated the role of endogenous hormones in prostate cancer. A pooled analysis of individual patient data from 18 studies found no significant associations with sex hormones, but more data are needed to examine the relation with high grade cancer. For insulin-like growth factors (IGF), a pooled analysis of individual patient data from 12 studies showed a significant positive association between circulating IGF-I and prostate cancer risk more data are needed for IGF-II and IGF-binding proteins [14].

### CONCLUSION

Evidence is still uncertain for several of the modifiable prostate cancer risk factors. However, lifestyle modifications like smoking cessation and exercise can decrease the risk of developing prostate cancer. 5 $\alpha$ -reductase inhibitors, although associated with an increased number of high-grade prostate cancers, reduce overall prostate cancer burden. In absence of any detrimental effect on survival, these agents can be cost-effective in prostate cancer prevention. Several other pharmacological agents, e.g., aspirin appear promising and need further evaluation in clinical trials; many such trials are already underway. While PSA screening remains a controversial topic, overdiagnosis associated with PSA screening can be minimized by one or several modifications like changes in the PSA threshold, frequency of screening, and addition of other biomarkers like Kallikrein panel, free-PSA. Prospective evaluation of these should remain among top research priorities. The role of newer biomarkers like urinary PCA3<sup>i</sup> and TMPRSS2-ERG assays also appears promising and needs further evaluation in screening setting. Similarly, newer methods to distinguish aggressive prostate cancers from indolent cancers diagnosed during screening are needed and biomarkers like Ki67, CCP or imaging methods like mp-MRI need further prospective evaluation so that these can be incorporated in management algorithms to minimize overtreatment.

### REFERENCES

1. Ahiara CO, Onyeakolam IF, Nwosu DC, Ikaraoha IC, Nwadike CN, Obeagu EI. Evaluation Of Some Heavy Metals in Prostate Cancer Patients in Enugu. *Madonna University journal of Medicine and Health Sciences* ISSN: 2814-3035. 2022 Mar 2;2(1):123-33.
2. Obeagu EI, Awil MA, Obeagu GU. Prostate Cancer: Prevention, Risk Factors, Pathophysiology. *Journal of Bio Innovation*, 2023; 12 (2): 437-442.
3. Obeagu EI, Amilo GI, Obeagu GU, Ugwuja SE, Agbo EA. Evaluation of impact of level of prostate specific antigen on haematological parameters of men in Owerri, Nigeria. *J Biomed Sci Appl*. 2017;1(1):3.
4. Ozims S, Agu G, Amah H, Eberendu IF, Obioma-Elemba JE, Ihekaire DE, Akujobia AU, Obasi CC, Ibanga IE, Anokwuru CO, Nwobodo EI. Prevalence of Prostate Enlargement among Males > 50 Years of Age Who were Treated at Abia State University Teaching Hospital, Aba from 2010-2014. *International Journal of Research Studies in Medical and Health Sciences*. 2018;3(1):1-7.
5. Nnatuanya IN, Obeagu EI, Nwakulite A, Hezekiah CA. Evaluation of C-Reactive Proteins in Benign Prostatic Hyperplasia (BPH) Subjects. *Madonna University journal of Medicine and Health Sciences*. 2022;2(1):239-48.
6. Ofor IB, Obeagu EI, Ochei KC, Odo M. Evaluation of Superoxide Dismutase, Glutathione, Vitamins C, E and Trace Element Status in Prostate Cancer Patients in Orlu Teaching Hospital, Imo State. *International Journal of Current Research in Chemistry and Pharmaceutical Sciences*. 2016;3(2):29-44.
7. Obeagu EI, Babar Q, Vincent CCN, Anyanwu CO, Uduchi IO. Advances In Therapeutic Strategies of Immunotherapy in Cancer Treatment. *World Journal of Pharmacy and Pharmaceutical Sciences*, 2021; 10 (8): 2144-2164.
8. Scardino PT, Weaver R, M'Liss AH. Early detection of prostate cancer. *Human pathology*. 1992 Mar 1;23(3):211-22.
9. Parsa N. Environmental factors inducing human cancers. *Iranian journal of public health*. 2012;41(11):1.
10. Key TJ, Schatzkin A, Willett WC, Allen NE, Spencer EA, Travis RC. Diet, nutrition and the prevention of cancer. *Public health nutrition*. 2004 Feb;7(1a):187-200.
11. Lian Y, Meng L, Ding P, Sang M. Epigenetic regulation of MAGE family in human cancer progression- DNA methylation, histone modification, and non-coding RNAs. *Clinical epigenetics*. 2018 Dec;10:1-1.
12. Zu K, Giovannucci E. Smoking and aggressive prostate cancer: a review of the epidemiologic evidence. *Cancer causes & control*. 2009 Dec;20:1799-810.
13. Wu AH, Yu MC. Tea, hormone-related cancers and endogenous hormone levels. *Molecular nutrition & food research*. 2006 Feb;50(2):160-9.

©Obeagu *et al.*, 2023

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

14. Ebugosi Richard Sonny Achara Ngozi Immaculate and Ugwu Okechukwu Paul-Chima (2023). Prostate Specific Antigen Levels on Prostate Disorders in South-East Nigeria. *IAA Journal of Scientific Research*, 10(1): 74-76.

**Emmanuel Ifeanyi Obeagu, Esther U. Alum, Getrude Uzoma Obeagu and Okechukwu Paul-Chima Ugwu(2023). Prostate Cancer: Review on Risk Factors. *Eurasian Experiment Journal of Public Health*, 4(1):4-7**