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PROSTATE CANCER: PREVENTION, RISK FACTORS, PATHOPHYSIOLOGY

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ABSTRACT

Prostate cancer is the most common cancer and the second leading cause of cancer among men globally, prostate cancer usually grows very slowly. Prostate cancer is marked by uncontrolled growth of cells in the prostate gland. Prostate cancer diagnoses are made in symptomatic men. Prostate cancer should be suspected in men over 50 years old presenting with lower urinary tract symptoms, visible haematuria or erectile dysfunction. Genetic abnormalities can take part the disease, Men who have a first degree relative with prostate cancer have twice the risk of developing prostate cancer. Some medications also contribute the disease, there are some links between prostate cancer and medications, medical procedures and medical conditions.

Keywords: *Cancer, prostate cancer, prevention, risk factors, pathophysiology*

Introduction

Prostate cancer is the second most common cancer diagnosed in men globally, after lung cancer, despite relatively high survival rates for men with prostate cancer, more than 300,000 prostate Cancer deaths occurred in 2012 worldwide. Age and family history are key risk factors for prostate cancer, and black men have a higher risk of prostate cancer incidence and death compared to men from white or Asian backgrounds [1-5].

The majority of cases of prostate cancer are diagnosed in men from western countries in the America and Europe, and this has largely been driven by the introduction of prostate-specific antigen (PSA) for prostate cancer detection in the 1990s. The widespread use of PSA has proven controversial as the evidence for benefit as a screening test in asymptomatic men is still subject to debate, and PSA is prone to false positives and false negatives in men with symptoms suggestive of a possible diagnosis of prostate cancer [6-9].

Prostate cancer diagnoses are made in symptomatic men. Prostate cancer should be suspected in men over 50 years old presenting with lower urinary tract symptoms (LUTS), visible haematuria or erectile dysfunction. LUTS are also a common presenting symptom of benign conditions affecting the prostate, such as benign prostatic hyperplasia (BPH) and prostatitis, creating a diagnostic challenge. There no strong evidence of association between the severity of LUTS and the likelihood of prostate cancer or the stage at diagnosis [10].

Digital rectal examination (DRE) is recommended in many countries alongside PSA to aid decision-making about referral for diagnostic testing.

Prostate cancer

Prostate cancer is a disease characterized by uncontrolled growth of cells with In the prostate Prostate cancer

is the second most frequent malignancy (after lung cancer) in men worldwide counting 1,276,106 new cases and causing 358,989 deaths 3.8% of all deaths caused by cancer in men. In 2018 [11]. The incidence and mortality of prostate cancer worldwide correlate with increasing age with the average age at the time of diagnosis being 66 years. Of note, for African-American men, the incidence rates are higher when compared to the White men, with 158.3 new cases diagnosed per 100,000 men and their mortality is approximately twice as White men [12]. Diet and physical activity play an important role in prostate cancer development and progression. Dietary factors are mainly associated with the observed worldwide and ethnic differences in the incidence rates of prostate cancer [13].

Prostate was first described by Venetian anatomist Nicolo Massa in 1536, and illustrated by Flemish anatomist Andreas Vesalius in 1538, prostate cancer was not identified until 1853 [14]. Prostrate cancer was initially considered a rare disease, probably because of shorter life expectancies and poorer detection methods in 19thcentury. The first treatments of cancer were surgeries to relieve urinary obstruction [15]. Removal of the entire gland (perineal prosectomy) was first performed in 1904 by Hugh H.Young at John Hopkins Hospital [16]

Pathophysiology of prostate gland

The prostate gland is a part of the male reproductive system that helps to make and store seminal fluid. In adult men, a typical prostate is 3 centimetres long and weighs about 20 grams [17]. Because of its location, prostate disease often affect urination, ejaculation, and rarely defecation. The prostate contains many small glands which make 20 percent of the fluid constituting semen [18]. In prostate cancer, the cells of these

prostate glands mutate into cancer cells. The prostate glands require male hormones, known as androgens, to work properly. Androgens include testosterone, which is made in the testes, dehydroepiandrosterone, made in the adrenal glands; and dihydrotestosterone, which is converted from testosterone within the prostate itself. Androgens are also responsible for secondary sex characteristics such as facial hair and increased muscle mass. Prostate cancer is classified as an adenocarcinoma, or glandular cancer, that begins when normal semen screening prostate gland cells mutate into cancer cells. The region of prostate gland where the adenocarcinoma is most common is the peripheral zone. Initially, small clumps of cancer cells remain confined to otherwise normal prostate glands, a condition known as carcinoma in situ or prostate intraepithelial neoplasia. Although there is no proof that PIN is a precursor, it is closely associated with cancer.

Risk factors for prostate cancer

A complete understanding of the causes of prostate cancer remains elusive. The primary risk factors are obesity, age and family history. Prostate cancer is very uncommon in men younger than 45, but becomes more common with advancing age. The average age at the time diagnosis is 70. Men who have first-degree family members with prostate cancer appear to have double the risk of getting disease compared to men without prostate cancer in the family. Men with high blood pressure are more likely to develop prostate cancer. There is a small increased risk of prostate cancer associated with lack of exercise [19].

Role of genetics

Genetic background may contribute to prostate cancer risk, as suggested by associations with race, family, and specific gene variants. Men who have a

first degree relative with prostate cancer have twice the risk of developing prostate cancer, and those with two first degree relatives affected have a fivefold greater risk compared with men with no family history. In the United States, prostate cancer more commonly affects black men than white or Hispanic men, and is also more deadly in black men. In contrast, the incidence and mortality rates for Hispanic men are one third lower than non-Hispanic whites. Studies of twins in Scandinavia suggest that 40% of prostate cancer risk can be explained by inherited factors [20].

No single gene is responsible for prostate cancer; many different genes have been implicated. Mutations in BRCA1 and BRCA2, important risk factors for ovarian cancer and breast cancer in women, have also been implicated in prostate cancer. Other linked genes include the Hereditary Prostate cancer gene 1 (HPC1), the androgen receptor, and the vitamin D receptor Tmprss2-ETS gene family fusion, specifically Tmprss2-ERG or Tmprss2-ETV1/4 promotes cancer growth [21].

Diet and prostate cancer

Some dietary factors have been associated with prostate cancer the evidence is still tentative. Evidence support little role for dietary fruits and vegetables in prostate cancer occurrence.

Red meat and processed meat also to have little effect in human studies. Higher meat consumption has been associated with a higher risk in some studies. Lower blood levels of vitamin D may increase the risk of developing prostate cancer. Folic acid supplements have no effect on the risk of developing prostate cancer [22].

Medication and Infection

There are some links between prostate cancer and medications, medical

procedures and medical conditions. Use of the cholesterol-lowering drugs known as the statins may decrease prostate cancer risk [23].

Infection or inflammation of the prostate (prostatitis) may increase the chance for prostate cancer while another study shows infection may help prevent prostate cancer by increasing blood to the area. In particular infection with sexually transmitted infections chlamydia, gonorrhoea, or syphilis seems increase risk [24].

An association with gonorrhoea has been found, but a mechanism for which for this relationship has not been identified. Finally, obesity and elevated blood levels of testosterone may increase the risk for prostate cancer. There is an association between vasectomy and prostate cancer [25].

Prostate cancer and Sexual activity

Sexual case-control studies have shown that having many lifetime sexual partners or starting sexual activity early in life substantially increases the risk of prostate cancer [24].

While the available evidence is weak, tentative results suggest that frequent ejaculation may decrease the risk of prostate cancer. A study over eight years, showed that those that ejaculated most frequently (over 21 times per month on average) were less likely to get prostate cancer. The results were broadly similar to the findings of a smaller Australian study [26].

Prevention of prostate Cancer

The data on the relationship of diet and prostate cancer is poor. In the light of this the rate of prostate cancer is linked to the consumption of the western diet [27]. There is little if any evidence to support as association between trans-fat and carbohydrate intake and risk of prostate cancer. Evidence regarding the role of omega-3 fatty acids in preventing

prostate cancer does not suggest that they reduce the risk of prostate cancer, although addition research is needed. Vitamin supplements appear to have no effect and some even may increase the risk. High calcium intake has been linked to advanced prostate cancer

Consuming fish may lower prostate cancer deaths but does not appear to affect its occurrence. Vegetarian diet, and foods containing lycopene and selenium have lower rates of prostate cancer [28].

Diet rich in cruciferous vegetables, legumes, soy, bean and vigorous exercise may be associated with lower risk of advanced prostate cancer [27].

Conclusion

Prostate cancer presents a number of challenges for primary care clinicians. Many men with prostate cancer are asymptomatic until the tumour has progressed, and common symptoms have significant crossover with benign conditions affecting the prostate. The disease is highly prevalent with a relatively lower mortality rate, necessitating the search for ways to identify clinically significant prostate cancer requiring invasive treatment to improve survival. There are currently no widely available tests or strategies that have strong evidence for differentiating between clinically significant and clinically insignificant prostate cancer. Current diagnostic

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