

Literature review

Impact of Physical Activity on Prostate Cancer Incidence

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Abstract: Prostate cancer is a leading cancer in men, with its incidence varying among different countries and ethnic groups. The introduction of serum prostate-specific antigen (PSA) testing has led to increased early detection rates, particularly in high Human Development Index (HDI) countries. Several extrinsic or modifiable factors have been implicated in the development of prostate cancer. Diet, including high meat and dairy consumption, alcohol intake, and dietary supplements, has shown inconsistent associations. Obesity has emerged as a significant risk factor for prostate cancer and can worsen prognosis and treatment outcomes. Conversely, consumption of fish and fish oil has been associated with a lower incidence and mortality rate of prostate cancer.

The relationship between physical activity and prostate cancer risk has been extensively studied, yielding mixed results. While physical activity has consistently shown protective effects against other cancers, its association with prostate cancer risk is less clear. Some studies suggest a potential benefit, particularly with vigorous physical activity, while others find no significant association. However, physical activity has demonstrated positive effects on survival rates and disease progression among men already diagnosed with prostate cancer.

Keywords: prostate cancer, risk factors, physical activity, prevention, survival rate.

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Introduction

The incidence of most types of cancers is much higher in countries with very high Human Development Index (HDI) when compared to countries with low HDI, and prostate cancer is no exception ¹. Globally lung cancer remains the most common cancer in men followed by prostate cancer ², however, in developed nations like US prostate cancer is the most commonly diagnosed cancer in men ³. Epidemiological studies show a considerable difference in the incidence of prostate cancer among various geo locations and ethnic groups, thus necessitating the study of multiple risk factors ⁴. It also underlines the importance of lifestyle factors like diet and physical activity in cancer development or prevention along with genetics or ethnicity ⁵.

One of the reasons for the higher incidence of prostate cancer in high HDI countries could be an early diagnosis. Epidemiological studies indicate a sharp rise in prostate cancer incidence after the introduction of serum prostate-specific antigen (PSA) testing in the western world. PSA has enabled detection of latent prostate cancer resulting in a sharp rise in prostate cancer detection since the mid-1980s ^{6,7}. Early detection of prostate cancer in the western world may also explain lower mortality rates when compared to low HDI nations ⁸.



Despite the importance of PSA in the early detection of prostate cancer, it is still not a tool for mass screening^{9,10}. Moreover, early aggressive treatment remains controversial, though radical prostatectomy may help. Nonetheless, early detection may help in both clinical decision making and prolonging survival of the patient¹¹. Early detection of prostate cancer results in high 10-year survival rate¹².

Understanding risk factors of Prostate cancer

PSA cannot be used for mass screening due to its low specificity and risk of over-treatment, thus understanding risk factors for the development of prostate cancer may help in risk assessment and early recognition of prostate cancer¹³. Despite the high incidence rate of prostate cancer, little progress has been made in understanding the risk factors. At present familial history, age, and genetics remain as the only widely accepted risk factors for prostate cancer, since all these factors are non-modifiable, they have little practical importance in disease prevention and management. This necessitates the importance of identifying the modifiable risk factors or lifestyle factors that may help prevent the disease¹⁴.

Numerous researches into the development of various cancers suggest that intrinsic factors play a minor role in comparison to extrinsic factors. There is enough evidence to propose that intrinsic factors only contribute 10-30% to the risk of cancer development. Whereas, extrinsic factors heavily influence the risk of cancer development¹⁵. Numerous extrinsic or modifiable factors are known to be implicated in the development of prostate cancer, and their understanding may help estimate the lifetime risk of developing the disease, take preventive measures, and manage the condition more effectively. Although, data regarding extrinsic risk factors are not always consistent. Among the preventive factors physical activity, intake of cruciferous vegetables, tomatoes and soy seem to be significant¹⁶.

Several factors that increase the risk of developing prostate cancer has been identified. It is possible that diet high in meat products and dairy products may increase the risk. Studies regarding the role of alcohol in prostate cancer development mostly remain inconclusive. Similarly, various dietary supplements have failed to show a protective effect. Smoking shows a weak association with higher risk of prostate cancer though it may increase mortality among those diagnosed with cancer¹⁴.

Obesity seems not only to increase the risk of prostate cancer, but it may also worsen the prognosis of those already diagnosed with prostate cancer. It appears that individuals with higher BMI are at greater risk of developing an aggressive form of prostate cancer, higher risk of failure of radical prostatectomy, and radiotherapy. Obesity also reduces the efficacy of androgen-deprivation therapy in prostate cancer. Thus, obesity also makes treating prostate cancer more difficult. On the other hand, weight reduction may slow down the disease progress¹⁷.

Consumption of fish and fish oil has also been subject to lots of research in recent times. One of the crucial evidence comes from the systemic review that indicated a small reduction in prostate cancer incidence among those who consumed fish in higher amounts. In the study, 5777 cases were compared to 9805 control subjects. Research not only demonstrated a lower risk of prostate cancer associated with fish consumption but significantly lower mortality rate (63%), thus providing strong evidence in favor of fish consumption¹⁸.

Relation of physical activity with prostate cancer development

Physical activity and its relationship to risk of developing prostate cancer sometime in life require specific consideration as it is now well-established fact that lack of physical activity has lots to do with epidemics of non-communicable diseases. Increased physical activity can reduce the risk of obesity, diabetes, and had a modulating effect on the endocrine system. Therefore, it would be safe to hypothesize that it may help prevent prostate cancer. Although earlier studies have failed to produce a consistent result, nonetheless, most seem to show a certain degree of benefit in cancer prevention.

Earlier studies have been more consistent in establishing the benefit of physical activity in non-prostate cancers. A cohort study has found a much lower risk of developing cancer among the elite athletes in Finland when compared with a general male population in the country¹⁹. Epidemiological studies indicate that physical activity may reduce the risk of colon cancer by as much as 30-40%. It seems that 30-60 minutes of moderate or vigorous physical activity a day is enough to reduce the risk. Similarly, studies indicate that physically active individuals are 20-30% less probable to develop breast cancer when compare to physically inactive individuals. There are fewer studies regarding the benefit of physical activity in preventing lung cancer and prostate cancer. Nonetheless, most seem to favor physical activity for preventing these cancers²⁰.

Further, it seems that physical activity during a young life may have a long-term protective role against various types of cancers. Thus, in a cohort study of 31,158 Finnish men born in 1958 and followed up to 2014, it was found that higher BMI was associated with greater risk of cancer. Even those with a healthy weight but with poor physical conditioning were at higher risk than those with normal weight and good physical conditioning. And those with higher body weight and poor physical conditioning were at the most significant risk. It means that good physical conditioning during early adulthood may have long term protective role against various cancers^{21(p158)}.

In the Iowa 65+ rural health study, 1050 men aged 65 to 101 years of age were followed for ten years, and out of them 71 developed prostate cancer. The study took smoking, BMI, and physical activity into consideration and found the relative risk for cigarettes smoking 2.9 (RR=2.9) when smoking more than 20 cigarettes a day in comparison to non-smokers, RR = 1.7 for BMI greater than 27.8 kg/m² when compared with BMI lower than 23.5. In the study, physical activity was also found to be an independent risk factor for prostate cancer with RR = 1.9 for a high level of inactivity. Thus, the study concluded smoking, overweight, and physical inactivity are independent risk factors for the development of prostate cancer in later life²².

In another study, 452 prostate cancer cases were identified and classified into five categories of physical activity. Researchers found a negative association between the proportion of life spend doing sedentary work and prostate cancer risk. Investigators found this negative association to be dose-dependent, unrelated to ethnicity and socio-economic status, nutritional risk factors, or job associated chemical exposures. Results were less consistent for young men in comparison to older men. Although the study was inconclusive, nonetheless, it did suggest that physical activity may help reduce the risk of prostate cancer²³.

One of the more extensive studies on the subject has been regarding the evaluation of the risk of prostate cancer among physically less active health professionals. In the study, 47,542 health professionals aged 40-75 were assessed for physical activity. The study also calculated the vigorousness of physical activity among the subjects by calculating weekly metabolic equivalents (METs) score. 1,362 cases of prostate cancer were identified between 1986 and Jan 1994. The study did not find any relation between the incidence of prostate cancer and physical activity. However, it found lower risk among those with the highest category of vigorous physical activity. Although, the study failed to show that physical activity may reduce the incidence of prostate cancer, but it did prove the protective effect of highly vigorous physical activity, thus warranting further studies²⁴. Similar findings were confirmed in a study by Sormunen et al. when data for the perceived physical workload (PPWL) for 239,835 cases were compared with 1,199,175 control subjects. In the study physical activity only marginally and statistically insignificantly reduced the prostate cancer risk (0.90 hazard ratio from lowest to highest PPWL). Nonetheless, the study indicated that physical activity significantly decreased the risk of invasive prostate cancer²⁵.

Interestingly enough, studies are quite consistent when it comes to estimating the benefits of physical activity in those already diagnosed with prostate cancer. It seems that even moderate physical activity like brisk walking on a regular basis may significantly delay the



progression of prostate cancer among men already diagnosed with prostate cancer, and it may also help to keep cancer localized²⁶. Physical activity may meaningfully increase survival rate with vigorous physical activity. One of the studies indicates that those who walked briskly for more than 90 minutes a week had a 46% lower risk of all-cause mortality when compared to those involved in low-level physical activity. Similarly, men doing vigorous physical activity for more than 3 hours a week had 61% lower risk of all-cause mortality when living with prostate cancer^{27,28}. Additionally, supervised physical activity may also be used to reduce the toxicity of prostate cancer therapy, improve social and mental functioning, thus influencing positively on the quality of life²⁹.

Conclusion

Although studies regarding the beneficial effect of physical activity in preventing prostate cancer remain inconclusive, nonetheless, most seem to indicate some benefit thus necessitating further investigation. Most studies seem to show that physical activity may improve survival rate, help inhibit prostate cancer, make it less aggressive, prevent it from spreading. Further, it should be understood that physical activity has many other health benefits like helping normalize metabolism, blood pressure, body weight, sleep quality, mood, which finally reduces the risk of various oncological conditions. There is no doubt that physical activity will help prevent prostate cancer to a certain extent, what remains controversial is the degree of benefit of physical activity in disease prevention. Besides, the benefit of physical activity in those already diagnosed with prostate cancer must not be neglected.

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