



Original Article

EPIDEMIOLOGICAL ANALYSIS OF PROSTATE CANCER PREVALENCE AND RISK FACTORS IN DIFFERENT REGIONS OF KHYBER PAKHTUNKHWA

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ABSTRACT

Background: Prostate cancer is common malignancy affecting the prostate gland, the small organ about the size of a walnut that is located just below the bladder in males. It is the second most prevalent cancer to be diagnosed and the fifth leading cause of cancer-related death among men worldwide. **Objectives:** Cross-sectional epidemiological analysis aimed to investigate incidence and mortality rates of prostate cancer in distinct regions of Khyber Pakhtunkhwa, Pakistan. **Methods:** The study analyzed the prevalence and mortality rates of prostate cancer in distinct regions of Khyber Pakhtunkhwa, Pakistan. Study utilized data from national cancer registries, hospital records, and population-based surveys to gather and statistically analyze relevant information. **Results:** A total of 2,718 patients were tested for prostate cancer, out of which 250 individuals were diagnosed with the disease, yielding a prevalence rate of 9.19%. Variations in prevalence rates were observed among different districts, with Peshawar (10.02%) and Dera Ismail Khan (10.84%) exhibiting the highest rates. Age-specific analysis revealed the highest prevalence rate in the ">65" age group (19.23%). Risk factor analysis highlighted aging, genetic predisposition, obesity, dietary factors, hormonal imbalances, and exposure to chemicals and radiation as significant contributors to prostate cancer. **Conclusion:** These findings provide insights into the burden, regional disparities, age-specific patterns, and risk factors associated with prostate cancer in Khyber Pakhtunkhwa, enabling the development of targeted interventions and preventive strategies to mitigate its impact.

INTRODUCTION

Prostate cancer is a prevalent malignancy affecting the prostate gland, a small walnut-sized organ located just below the bladder in men [1]. It is the second most commonly diagnosed cancer and the 5th leading cause of cancer-related deaths among men worldwide [2]. With its significant impact on public health, understanding the nature of prostate cancer is crucial for developing effective prevention, early detection, and treatment strategies [3].

Prostate cancer typically develops when cells of prostate gland undergo abnormal changes and start to multiply uncontrollably. Over time, these cancerous cells can form tumors and may spread to other body parts, a process known as metastasis. Although exact etiology of prostate cancer remains unclear, several risk factors have been identified, including age, family history, ethnicity, and certain genetic mutations [4]. Furthermore, hormonal imbalances, dietary factors, and lifestyle choices such as smoking and obesity were also implicated in development of prostate cancer [5,7].

Presentation and progression of prostate cancer can vary widely among individuals. While some cases may remain localized within the prostate gland and grow slowly, others may be more aggressive and rapidly spread to nearby tissues and distant organs [8]. Early-stage prostate cancer may not produce noticeable symptoms, making regular screening and diagnostic tests crucial for its detection. Common symptoms that may manifest in advanced stages include urinary difficulties, blood in urine or semen, erectile dysfunction, and bone pain [9].

Prostate cancer diagnosis relies on a combination of methods, including a digital rectal examination, prostate-specific antigen blood test, and imaging studies such as ultrasound, magnetic resonance imaging, or biopsy [10,11]. Treatment options for prostate cancer depend on various factors like stage and aggressiveness of cancer, as well as the patient's overall health. They may include active surveillance, surgery, radiation therapy, hormone therapy, chemotherapy, or targeted therapy [12].

Given the significant impact of prostate cancer on men's health and quality of life, ongoing research endeavors aimed to improve our understanding of the disease and develop more effective management strategies [13]. This included investigating novel biomarkers for early detection, exploring personalized treatment approaches, and conducting clinical trials to evaluate emerging

therapies. Moreover, public health campaigns played a vital role in raising awareness about prostate cancer, promoting regular screenings, and encouraging healthy lifestyle choices [14]. In Pakistan, prostate cancer is one of the leading cancers affecting men, but there is paucity of comprehensive epidemiological studies analyzing its incidence and mortality rates at the regional level. Understanding the regional variations in prostate cancer rates is essential for developing targeted prevention and intervention strategies to reduce its burden [15].

Therefore, this study aimed to conduct an epidemiological analysis of prostate cancer incidence and mortality rates in different regions of Pakistan. By examining variations in rates across regions, we can identify high-risk areas and explore potential risk factors contributing to the disparities. The findings contributed to existing knowledge on prostate cancer in Pakistan by providing a comprehensive understanding of its regional epidemiology.

MATERIAL AND METHODS

This study employed a cross-sectional design to conduct an epidemiological analysis of incidence and risk factors of prostate cancer in distinct regions of Khyber Pakhtunkhwa, including 250 patients diagnosed with prostate cancer out of 2718, from District Peshawar, Dera Ismail Khan, Mardan and Swat. During the study period, data from national cancer registries, hospital records, and population-based surveys were collected and analyzed statistically.

Incidence and data of risk factors for prostate cancer were collected from national cancer registries, capturing information on newly diagnosed cases and fatalities. Utilizing population-based surveys, such as the Pakistan Demographic and Health Survey, pertinent demographic information was gathered.

The sample population consisted of male patients diagnosed with prostate cancer within a predetermined time frame. Data from various regions of Khyber Pakhtunkhwa, representing both urban and rural areas, were included. All available information within the specified time frame was analyzed. Incidence and risk factors of prostate cancer were the most important variables. Regional disparities were analyzed in relation to demographic variables such as age, socioeconomic status, and the urban-rural divide. As potential risk factors, additional variables including family history of prostate cancer, lifestyle factors (e.g., smoking, obesity), and access to healthcare services were also investigated.

Analyses of data were conducted to

calculate incidence and risk factors rates of prostate cancer in each region using descriptive statistics. Age-specific rates and age-standardized rates using the standard population of the World Health Organization (WHO) were calculated to account for regional differences in age distribution. To assess the relationship between demographic variables and prostate cancer rates, Chi-square tests or Fisher's exact test were utilized. Geographic Information Systems and other geospatial mapping techniques were used to visualize geographical distribution of prostate cancer

RESULTS

The data on prostate cancer testing was presented, specifically the number of patients tested and the prevalence of positive cases (Figure 1). Sum of 2,718 patients were tested for prostate cancer. Among these individuals, 250 patients were found to have a positive diagnosis of prostate cancer. This indicates a prevalence rate of 9.19% within the tested population. Prevalence percentage represents the proportion of individuals who tested positive for prostate cancer out of the total patients tested. In this study, it suggests that approximately 9.19% of the tested population had prostate cancer (Table 1).

The table presents data on prostate cancer testing and prevalence rates across different districts: Peshawar, Dera Ismail Khan, Mardan, and Swat. In the study, a total of 1,017 patients were tested in Peshawar, 765 in Dera Ismail Khan, 391 in Mardan, and 545 in Swat. Among these patients, 102 in Peshawar, 83 in Dera Ismail Khan, 31 in Mardan, and 34 in Swat were found to have a positive diagnosis of prostate cancer. The prevalence rates, expressed as percentages, indicate the proportion of patients who tested positive for prostate cancer within each district. The prevalence rate in Peshawar was 10.02%, in Dera Ismail Khan it was 10.84%, in Mardan it was 7.92%, and in Swat it was 6.23%. These rates suggest variations in the occurrence of prostate cancer ($p < 0.05$) across the different districts were statistically significant (Table 2).

The data on prostate cancer testing and prevalence rates across different age groups was also recorded and analyzed statistically. The age groups are categorized as "<30," "31-45," "46-65," and ">65" years. In the study, a total of 178 patients were tested in the "<30" age group, with 4 patients found to have a positive diagnosis of prostate cancer. This indicates a prevalence rate of 2.24% within this age group. For the "31-45" age group, 746 patients were tested, and 31 patients were found to have prostate cancer,

cases.

Prior to the study, ethical sanction was obtained from the appropriate institutional review boards and ethical committees.

As a cross-sectional analysis, this research cannot establish causal relationships between prostate cancer and risk factors. In addition, potential biases, such as recall bias in survey data and underreporting in cancer registries, should be taken into account. Through validation procedures and robust statistical analyses, efforts were made to minimize these limitations.

resulting in a prevalence rate of 4.15%. In the "46-65" age group, the highest number of patients were tested, with 1,222 individuals, and 105 of them were diagnosed with prostate cancer. The prevalence rate in this age group was 8.59%. Among patients aged ">65," 572 individuals were tested, and 110 of them had a positive diagnosis of prostate cancer. This age group had the highest prevalence rate of 19.23% ($p < 0.05$) (Table 3).

The frequency of various risk factors associated with prostate cancer was expressed as percentages. 75% cases were attributed to aging. This indicated that advancing age is a significant risk factor for developing prostate cancer. Approximately 40% of the cases were linked to genetic predisposition. This suggested that individuals with a family history of prostate cancer had increased risk of developing the disease. About 25% of the cases were associated with obesity. This implied that being overweight or obese contributed to development of prostate cancer. Approximately 20% of the cases were attributed to a high fat and low fiber diet. This suggested that dietary factors, specifically consuming a diet high in fat and low in fiber, increased the risk of prostate cancer. Hormonal factors were identified in 30% of the cases. This indicated that imbalances in hormones, such as elevated levels of certain hormones or hormonal changes, contributed to the development of prostate cancer. Around 35% of the cases were associated with exposure to chemicals and radiations. This suggested that exposure to certain chemicals or radiation increased the risk of prostate cancer. These findings highlighted the multifactorial nature of prostate cancer, with multiple risk factors playing a role in its development. It is important to note that these percentages represented the frequency of risk factors observed in the study population and may vary in different populations or settings. Understanding these risk factors can help inform preventive measures and targeted interventions for reducing the incidence of

prostate cancer (Figure 2).

Table 1: Overall prevalence of prostate cancer in Khyber Pakhtunkhwa

S. No	Total patients tested for prostate cancer	Patients found positive	Prevalence (%)
1	2718	250	9.19

Table 2: District-wise prevalence of prostate cancer in Khyber Pakhtunkhwa

Districts	Peshawar	Dera Ismail Khan	Mardan	Swat
Patients tested	1017	765	391	545
Patients found positive	102	83	31	34
Prevalence (%)	10.02	10.84	7.92	6.23
F-value	472.954			
p-value	0.00001* (significant at p<0.05)			

Table 3: Age-wise prevalence of prostate cancer in Khyber Pakhtunkhwa

Age-groups (years)	Patients tested	Patients found positive	Prevalence (%)	p-value
<30	178	4	2.24	0.00001* (significant at p<0.05)
31-45	746	31	4.15	
46-65	1222	105	8.59	
>65	572	110	19.23	

Figure 1: Anatomical configuration and cross sectional view of prostate cancer

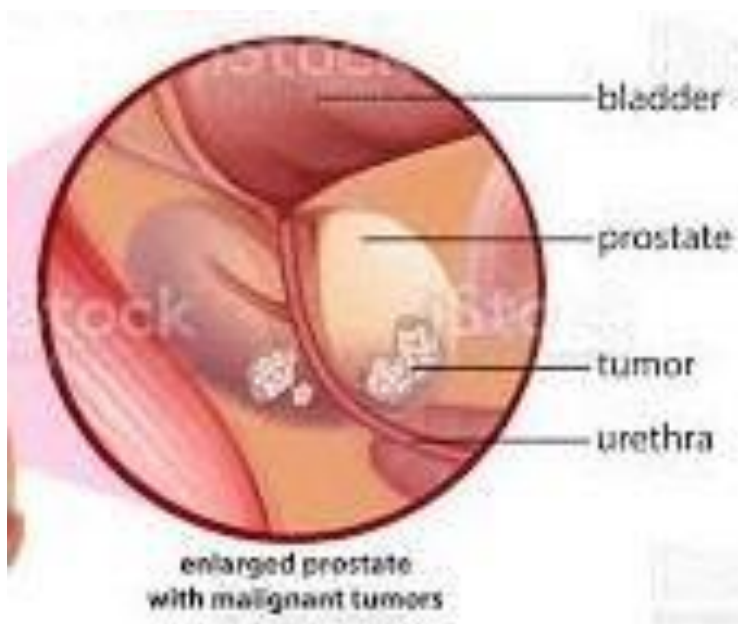
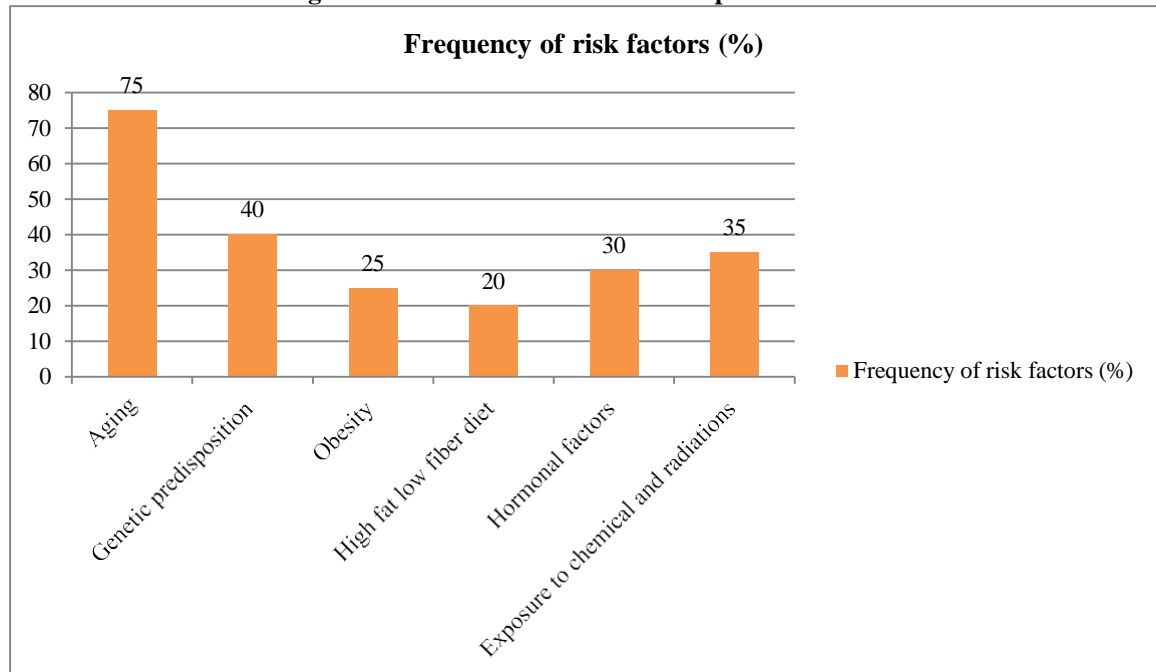


Figure 2: Risk factors associated with prostate cancer



DISCUSSION

This study aimed to conduct an epidemiological analysis of the incidence and risk factors of prostate cancer in different regions of Khyber Pakhtunkhwa. Results provided important insights into the prevalence, regional disparities, age-specific rates, and risk factors associated with prostate cancer in this population.

Prevalence rate of this cancer within the tested population was found to be 9.19%. This indicates that approximately 9.19% of the individuals tested in this study had prostate cancer. When examining the prevalence rates across different districts, variations were observed. Peshawar had the highest prevalence rate at 10.02%, followed by Dera Ismail Khan at 10.84%, Mardan at 7.92%, and Swat at 6.23%. These differences in prevalence rates between districts were statistically significant, highlighting regional disparities in prostate cancer occurrence ($p < 0.05$).

Age-specific rates of prostate cancer were also analyzed in this study. The highest prevalence rate was observed in the ">65" age group, with a rate of 19.23%. This finding suggests that older individuals are at a significantly higher risk of developing prostate cancer [16]. Prevalence rates were lower in younger age groups, with rates of 2.24% in the "<30" group, 4.15% in the "31-45" group, and 8.59% in the "46-65" group. These results emphasize the age-related nature of prostate cancer incidence [17].

The study identified several risk factors associated with prostate cancer. Aging was found to be the most significant risk factor, accounting for 75% of the cases. This

highlights the importance of age as a contributing factor to the development of prostate cancer. Genetic predisposition was linked to approximately 40% of the cases, indicating that individuals with a family history of prostate cancer may have an increased risk. Other risk factors included obesity (25% of cases), high fat and low fiber diet (20% of cases), hormonal factors (30% of cases), and exposure to chemicals and radiations (35% of cases). These findings emphasize the multifactorial nature of prostate cancer, with multiple risk factors interacting to influence its development [18].

It is important to acknowledge the limitations of this study. As a cross-sectional analysis, causal relationships between prostate cancer and risk factors cannot be established. Additionally, potential biases such as recall bias in survey data and underreporting in cancer registries should be considered. However, efforts were made to minimize these limitations through validation procedures and robust statistical analyses [19].

The study had significant implications for prostate cancer prevention and intervention strategies. Understanding the regional disparities, age-specific rates, and risk factors associated with prostate cancer can guide targeted interventions and preventive measures. Efforts should be directed towards raising awareness about the importance of early detection and regular screening, especially among older individuals. Promoting a healthy lifestyle that includes a balanced diet, regular physical activity, and weight management can help mitigate some of the risk factors associated with prostate cancer [20].

CONCLUSION

This cross-sectional epidemiological analysis of prostate cancer in distinct regions of Khyber Pakhtunkhwa has provided valuable insights into the prevalence, regional disparities, age-specific rates, and risk factors associated with the disease. The study revealed a prevalence rate of 9.19% within the tested population, indicating a substantial burden of prostate cancer. Significant variations in prevalence rates were observed across different districts, highlighting the need for targeted interventions. Age was identified as a significant risk factor, with the highest prevalence rate in the ">65" age group (19.23%). Genetic predisposition, obesity, dietary factors, hormonal factors, and exposure to chemicals and radiations were also identified as important risk factors. These findings contributed to our understanding of prostate cancer in this population and informed preventive measures and interventions to reduce its incidence and mortality rates.

CONFLICT OF INTEREST

None.

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