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The Influence of Smoking Habits on the Incidence of Prostate Carcinoma

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Abstract

Adenocarcinoma is the most common type of prostate cancer, caused by the abnormal growth of prostate gland cells. Prostate cancer ranks as the second most common cancer in men globally and is the fifth leading cause of cancer-related deaths. Smoking is identified as a significant risk factor for prostate cancer due to carcinogens such as cadmium and polycyclic aromatic hydrocarbons, which can damage DNA and increase oxidative stress. This study used a cross-sectional design with 92 patients at Dr. Pirngadi Hospital in Medan to analyze the relationship between smoking habits and the incidence of prostate carcinoma. The results show a significant association between smoking and an increased risk of prostate cancer, with a p-value of < 0.001. The study also found a significant effect of the Brinkman Index, which measures the intensity of smoking habits, on the degree of differentiation of prostate carcinoma (p < 0.001). These findings highlight the importance of early detection and public education on the dangers of smoking in preventing prostate cancer.

Introduction

Prostate cancer is one of the most common cancers among men, particularly adenocarcinoma, which involves the abnormal growth of prostate gland cells. Globally, prostate cancer ranks as the second most common cancer in men and the fifth leading cause of cancer-related deaths. In 2021, an estimated 248,530 new cases and 34,130 deaths from prostate cancer occurred in the United States (Al-Fayez & El-Metwally, 2023).

In Indonesia, the incidence of prostate cancer is relatively lower compared to Western countries. Data shows an incidence rate of 11.6 cases per 100,000 men, with a mortality rate of 4.5 per 100,000 (IAUI, 2022). However, this trend has been increasing with more widespread PSA screening and the aging population.

Smoking has been identified as a significant risk factor for prostate cancer. Carcinogens such as cadmium and polycyclic aromatic hydrocarbons in tobacco can cause DNA damage and increase oxidative stress (Larissa, 2018; Caliri et al., 2021; Nsonwu-Anyanwu et al., 2022; Khattab et al., 2021). The International Agency for Research on Cancer (IARC) classifies over 60 compounds in tobacco as carcinogenic, many of which require metabolic activation to cause carcinogenic effects (Perdana et al., 2017; Stepanov, 2022; Riaz et al., 2023; Maiyo et al., 2023; Barupal et al., 2021).

Given these facts, understanding the relationship between smoking habits and the incidence of prostate carcinoma is essential. This study aims to explore the influence of smoking on the severity of prostate cancer, contributing to early detection and prevention efforts.

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Literature Review

Prostate Cancer

Prostate cancer, particularly adenocarcinoma, is a malignancy characterized by the uncontrolled growth of cells in the prostate gland. It is the second most common cancer in men and the fifth leading cause of cancer deaths worldwide (Siegel et al., 2019). Studies have shown that prostate cancer's incidence increases with age, with most cases diagnosed in men over 65 years old (Mescher, 2018; Cao et al., 2021; Shah et al., 2022).

Risk Factors for Smoking

Smoking is recognized as a significant risk factor for the development of prostate cancer. The carcinogens found in tobacco, such as cadmium and polycyclic aromatic hydrocarbons (PAHs), contribute to DNA damage and oxidative stress, both of which are crucial in the progression of cancer (Larissa, 2018). The IARC has classified more than 60 substances in tobacco smoke as carcinogenic, with many requiring metabolic activation to interact with DNA and induce cancer (Perdana et al., 2017; Wadgaonkar, 2024; Chaudhary et al., 2024).

Brinkman Index

The Brinkman Index is used to quantify smoking habits by multiplying the number of cigarettes smoked per day by the number of years the person has smoked (RI, 2019; Darwis & Sianipar, 2024). This index helps categorize individuals into light, moderate, or heavy smokers, providing insight into the severity of their smoking habits and the potential risk for prostate cancer.

Methods

Research Design

This study employed a descriptive-analytical approach using a cross-sectional design.

Research Location and Duration

Location: Dr. Pirngadi Hospital, Medan

Duration: April - June 2024

Population and Sample

The population of this study consists of patients diagnosed with prostate carcinoma based on histopathological examination. A simple random sampling technique was employed, with inclusion criteria of patients aged 50 years or older with complete medical records.

Data Analysis Techniques

Data were analyzed using SPSS, with Chi-square tests employed to determine the relationship between smoking habits and prostate carcinoma.

Result and Discussion

Respondent Characteristics

Table 1. Respondent Age Characteristics

Variable	Min	Max	Mean	SD
Age	52	91	67.68	8.55

The average age of respondents in this study was 67.68 years, with a range from 52 to 91 years. The standard deviation of 8.55 indicates moderate variation in age. This finding aligns with the fact that prostate cancer is more commonly diagnosed in older men (Siegel et al., 2019).

Distribution of BMI, Smoking Habits, and Prostate Carcinoma

Table 2. Distribution of BMI, Smoking Habits, and Prostate Carcinoma

Variable	n	%
BMI		
Underweight	3	3.3
Normal	49	53.3
Obesity	15	16.3
Overweight	25	27.2
Smoking Habits		
Non-smokers	33	35.9
Light smokers	8	8.7
Moderate smokers	19	20.7
Heavy smokers	32	34.8

The distribution of BMI shows that the majority of respondents had a normal BMI (53.3%), with only a small percentage being underweight (3.3%). Regarding smoking habits, 64.2% of respondents were smokers, with the highest proportion being heavy smokers (34.8%). In terms of histopathological severity, most respondents (53.3%) had moderately differentiated prostate cancer, while 43.5% were diagnosed with poorly differentiated carcinoma. These findings support the hypothesis that heavy smoking habits exacerbate the severity of prostate cancer (Larissa, 2018).

Relationship Between Smoking Habits and Prostate Carcinoma

Table 3. Relationship Between Smoking Habits and Prostate Carcinoma

Smoking Habit	Well Differentiated	Moderately Differentiated	Poorly Differentiated	Total	p-value
Non-smokers	3%	97%	0%	33	
Light smokers	12.2%	87.5%	0%	8	
Moderate smokers	5.3%	47.4%	47.4%	19	
Heavy smokers	0%	3.1%	96.9%	32	<0.001

The analysis of the relationship between smoking habits and the differentiation level of prostate cancer shows that 96.9% of respondents with heavy smoking habits had poorly differentiated prostate cancer. In contrast, the majority of non-smokers (97%) had moderately differentiated carcinoma. The Chi-square test resulted in a p-value of <0.001, indicating a significant relationship between smoking and the severity of prostate cancer. These findings strengthen the results of Al-Fayez & El-Metwally (2023), which suggest that smoking increases the risk of prostate cancer through oxidative stress and DNA damage mechanisms.

The results of this study demonstrate a significant relationship between smoking habits and the occurrence of prostate carcinoma ($p < 0.001$). The majority of respondents who were heavy smokers had a higher incidence of poorly differentiated prostate cancer, emphasizing the detrimental impact of smoking on prostate cancer progression.

These findings support the research by Larissa (2018), which also found an association between smoking and the degree of histopathological differentiation of prostate cancer. Larissa's study, conducted using a cross-sectional design at Dr. H. Abdul Moeloek Hospital, indicated that heavy smokers are at a significantly higher risk for developing prostate cancer with worse differentiation.

Moreover, Al-Fayez & El-Metwally (2023) identified that carcinogens in smoking, such as cadmium, contribute to the formation of reactive oxygen species (ROS), which induce DNA damage, thus worsening the progression of prostate cancer in heavy smokers.

The study by Perdana et al. (2017) also suggested that smoking interacts with other lifestyle factors, such as diet and physical activity, influencing the risk of prostate cancer metastasis.

Comparing these findings with the research by Ikbal (2023), which highlighted the dominance of factors such as age and family history, this study focused more specifically on smoking as a primary risk factor. Ikbal's research reported that smokers were more likely to have abnormal PSA levels, although this relationship was influenced by other variables such as BMI and genetic mutations.

In conclusion, smoking has a significant impact on the severity of prostate carcinoma, but variations in the results of different studies suggest the need for further research exploring the interaction between smoking and other risk factors, such as genetics and lifestyle.

Conclusion

This study demonstrates a significant relationship between smoking habits and the incidence of prostate carcinoma (Larissa, 2018). The majority of respondents were smokers, with most having moderately differentiated or poorly differentiated carcinoma.

Recommendations

There is a need for educational programs to reduce smoking habits, especially in older men. Future research should consider additional variables such as alcohol consumption and dietary habits.

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