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Original Article

Cigarette Smoking, Alcohol Consumption, and the Risk of Prostate Cancer- A Retrospective Analysis of Prostate Cancer Patients in Southern Nigeria

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Abstract

Background: Tobacco contains harmful carcinogens that have been associated with cancers. Some studies have associated tobacco smoking with prostate cancer (PCa). The relationship between alcohol consumption as a risk factor for prostate cancer has been debated. Some studies associated alcohol consumption with increased risk of PCa, associating alcohol consumption with higher-grade cancers and poorer prognosis. Other studies have found a minimal relationship with PCa, with some even suggesting that alcohol consumption may even be protective. This study evaluates the association between smoking and alcohol consumption in prostate cancer patients.

Methodology: This is a retrospective study on one hundred and fifty-two patients diagnosed with prostate cancer with a known history of both smoking and or alcohol consumption managed over a 9year period from January 2012 to December 2020 from three Urology referrals hospitals. Patients with incomplete history were excluded. Their data such as age, a history of cigarette smoking, prostate-specific antigen level, prostate biopsy histopathology reports, and Gleason's grade were extracted. This was coded into Microsoft Excel and analyzed with SPSS version 20. The results were analyzed and presented in tables and charts.

Results: One hundred and thirty-five patients had a premorbid history of smoking and alcohol consumption with a mean age of 69 years and a modal age in the 70–79-year age group. Fifty-three (39.3%) of the patients had a history of cigarette smoking, ninety-four (69.6%) had a history of alcohol consumption. In comparison, fifty-one (37.8%) had a history of cigarette smoking and alcohol consumption. The high-risk Gleason's 8-10 prostate cancer was commoner among smokers than nonsmokers. There was no statistically significant association between cigarette smoking and alcohol consumption alone and combined with PCa.

Conclusion: The high-risk Gleason's 8-10 prostate cancer was commoner among smokers than nonsmokers. There was no statistically significant association between cigarette smoking and alcohol consumption and the risk of prostate cancer.

Keywords: Prostate Cancer, Cigarette Smoking, Alcohol, Gleason Score.

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Introduction

Tobacco smoke contains many chemicals known to be harmful to both active and passive smokers. [1,2] There are more than 7,000 chemical agents in cigarette smoke. At least 250 of them can be detrimental, 70 of which are known to be carcinogenic. [12,3] Some studies have suggested that cigarette smoking leads to increased risk, higher grades, and stages of prostate cancer with a higher risk of recurrence and mortality in patients with the disease.[4] The relationship between alcohol consumption as a risk factor for prostate cancer (PCa) is equivocal. Some studies associated alcohol consumption with higher-grade prostate cancer and poorer prognosis. Other studies found a minimal or no relationship with Pca, with some suggesting that alcohol consumption was protective. [5,6] This study aims to evaluate the association between smoking and alcohol among a population of prostate cancer patients living in southern Nigeria.

Methods

This is a retrospective study on one hundred and fifty-two patients diagnosed with prostate cancer with a known history of both tobacco smoking and or alcohol consumption that was managed over a 9-year period from January 2012 to January 2021 from three Urology referrals hospitals. University of Port Harcourt Teaching Hospital; Sophia Hospital; and Rosivylle Clinic and Urology Centre, all in Rivers, Nigeria. Patients with incomplete history were excluded. Their data such as age, history of cigarette smoking, prostate-specific antigen level, prostate biopsy histopathology reports, and Gleason's grade were extracted. Gleason's grade was categorized into low risk (6), intermediate grade (7) and high grade (8-10). This was coded into Microsoft Excel and analyzed with SPSS version 20. The results were analyzed and presented in tables and charts.

Results

There were one hundred and fifty-two patients who had a premorbid history of smoking and alcohol consumption with a mean age of 69years and a modal age in the 70–79-year range. Fifty-three (39.3%) of the patients had a history of cigarette smoking, while ninety-four (69.6%) had a history of alcohol consumption. Fifty-one (37.8%) had a history of cigarette smoking and alcohol consumption. The high-risk Gleason's 8-10 prostate cancer was more common among cigarette smokers and those who consumed alcohol than nonsmokers. There was no statistically significant association between cigarette smoking (0.778, r= 0.055), alcohol consumption alone (p=0.395, r=0.087) or combined smoking and alcohol consumption (p=0.879, r=0.046) with prostate cancer.

Table 1: Age distribution of prostate cancer patients.

Variables	N	%
Age group (years)		
40-49	2	1.5
50-59	17	12.6
60-69	46	34.1
70-79	52	38.5
80-89	14	10.4
>90	4	3.0
Total	**135**	**100.0**

Table 2: Frequency distribution of cigarette smoking and alcohol consumption among prostate cancer patients.

Variables	N	%
History of Smoking		
No	82	60.7
Yes	53	39.3
History of Alcohol intake		
No	41	30.4
Yes	94	69.6
History of both smoking and alcohol intake		
No	84	62.2
Yes	51	37.8
Total	**135**	**100.0**

Table 3: Association between Gleason score, cigarette smoking, and alcohol consumption among prostate cancer patients

Variables	Grade (Gleason's score)			P-value
	Well-differentiated (6)	Moderately differentiated (7)	Poorly differentiated (8-10)	
	N %	N %	N %	
Age group				
40-49	0 (.0)	1 (6.3)	1 (1.1)	
50-59	4 (16.7)	2 (12.5)	11 (11.6)	
60-69	9 (37.5)	6 (37.5)	31 (32.6)	0.764
70-79	10 (41.7)	5 (31.3)	37 (38.9)	(r=0.139)
80-89	1 (4.2)	2 (12.5)	11 (11.6)	
>90	0 (.0)	0 (.0)	4 (4.2)	
History of smoking				
No	16 (66.7)	10 (62.5)	56 (58.9)	0.778
Yes	8 (33.3)	6 (37.5)	39 (41.1)	(r= 0.055)
History of alcohol intake				
No	10 (41.7)	5 (31.3)	26 (27.4)	0.395
Yes	14 (58.3)	11 (68.8)	69 (72.6)	(r=0.087)
History of both smoking and alcohol intake				
No	16 (66.7)	10 (62.5)	58 (61.1)	0.879
Yes	8 (33.3)	6 (37.5)	37 (38.9)	(r=0.046)

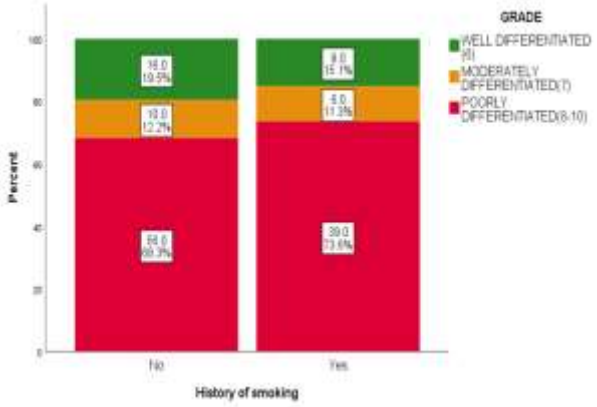

Figure 1: Gleason score distribution in prostate cancer patients who smoked cigarettes

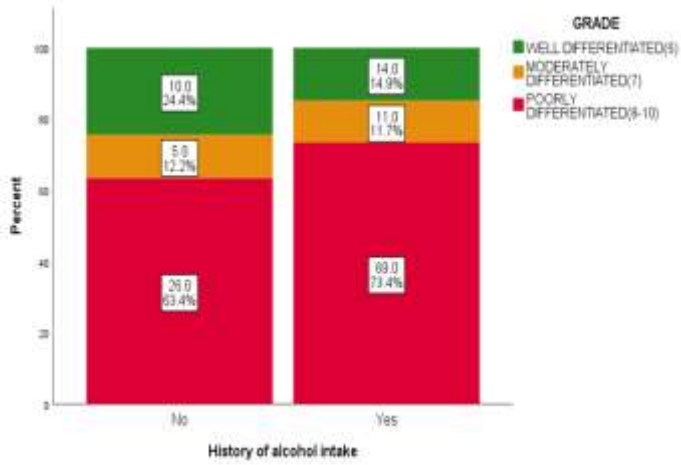

Figure 2: Gleason score distribution in prostate cancer patients who take alcohol and those who do not.

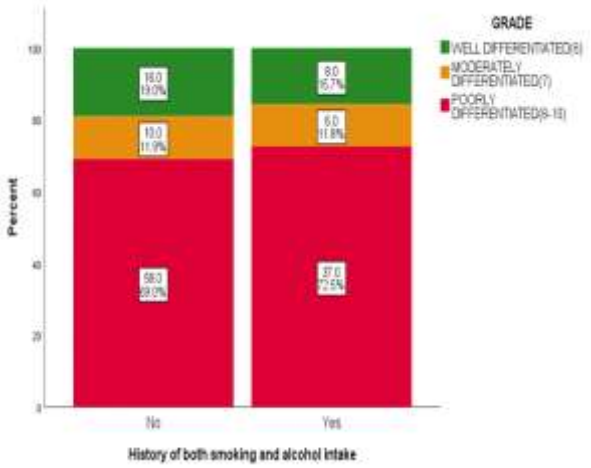

Figure 3: Gleason score distribution in prostate cancer patients who take both alcohol and smoked cigarettes.

Discussion

There are more than 7,000 chemical agents in cigarette smoke, of which at least 250 are harmful. Of this number, 70, including nitrosamines, polycyclic aromatic hydrocarbons, and volatile organics, are known to be carcinogenic.[1,2,5,7] Cigarette smoking is the leading cause of preventable death in the United States 480,000 premature deaths each year.[1] About 36% are from cancers associated with cigarette smoking.[1] Tobacco smoking is the leading risk factor associated with lung cancer, the commonest cause of cancer death.[1,7]

The chemical substances in cigarette smoke are harmful to almost every organ in the human body. They have been associated with the pathogenesis of several cancers, including cancers of the oesophagus, larynx, mouth, throat, kidney, bladder, liver, pancreas, stomach, cervix, colon, and rectum, as well as leukemia. [2,8] The increased risk of cancers from cigarette smoking is also observed among passive exposures to cigarette smoke, amplifying the public health consequences of tobacco smoking.[9]

In our study, the mean age of the PCa patients with a history of smoking and or alcohol consumption was 69.37years. The youngest patient was 48years and the oldest was 107 years. The age group with the highest frequency of prostate cancer was the 70-79 year followed by the 60–69-year group with fifty-two (38.5%) and forty-six (34.1%), respectively. This is similar to an earlier study done by Ekeke et al. in which the mean age was 69.9year even though the study did not differentiate smokers from non-smokers.[10]

Eighty-two (60.7%) of the patients had no history of tobacco smoking, while fifty-three (39.3%) had a history of tobacco smoking. The association and correlation analysis test did not indicate any relationship between cigarette smoking and prostate cancer. Unlike lung cancer, where the risk from tobacco smoking is clear-cut, there are diverging reports from research on the association of tobacco with prostate cancer. Some cohort studies have documented a 2 - 3 times higher risk in smokers who take more than a pack per day compared with nonsmokers. [11-14] However, several studies in western countries have not found a relationship between smoking and the incidence of prostate cancer.

Genetic and hormonal factors may play a role in the observed association of smoking with prostate cancer. It has been noticed that male smokers tend to have higher levels of circulating sex hormones which could contribute to cancer progression. [15,16] A meta-analysis of 24 cohort studies showed a modest association between tobacco smoking and prostate cancer.[15] Another study using a family-based case-control design of 439 prostate cancer cases and 479 brother controls found no main effects for smoking.[16]

Polymorphisms in genes involved with the metabolism of polycyclic aromatic hydrocarbons (PAHs), one of the carcinogenic chemicals of cigarette smoke,[9] may affect cancer initiation and progression17though a dose-response relationship has not been established.[18]

Among patients with confirmed prostate cancer, many studies demonstrated that cigarette smokers have a dose-dependent up to two times higher mortality rates compared to non-smokers.[17-19] Other studies have found that in addition to the increased risk and mortality, cigarette smoking leads to higher grades and stages, and has been associated with recurrence.[20,21] In our study, we also observed that even though the high Gleason's score (8-10) prostate cancer was commonest in both smokers and

nonsmokers, it was more frequent among smokers (73.8%) compared to non-smokers (68.3%)[Figures 1,2&3] and there was no statistically significant association between smoking and the grade of prostate cancer (p=0.523, r=0.055).

The impact of smoking on disease progression was not considered in this study. It has been noted by some, that smoking causes increased mortality in patients diagnosed with PCa and that the observation of lower Prostate-specific antigen (PSA) in patients who smoke tobacco could lead to a delay in the diagnosis.[22] Several studies indicated that treatment with external beam radiation, androgen deprivation therapy, and radical prostatectomy lead to poorer outcomes in smokers when compared to non-smokers.[23-25] Elevated total and free testosterone have been found in smokers have been postulated as a possible reason for their disease progression since androgens stimulate prostate cancer growth.[26-28] Other reasons include the presence of carcinogens like nitrosamines and cadmium.11,29 Nicotine in tobacco also enhances angiogenesis, tumour growth, and proliferation.[30,31]

Alcohol intake has been linked to several cancers such as breast and liver cancers. Like smoking, there are varied observations on the aetiological role of alcohol on the risk of developing prostate cancer. [32,33] In this study, even though about 61% of prostate cancer patients take alcohol, we found no statistically significant association (p=0.395, r=0.087) between alcohol intake and prostate cancer. In addition, we also noted that the poor grade, high-Gleason's score prostate cancers was the commoner among patients who take alcohol too, as was the case with cigarette smoking. We found no statistically significant relationship between alcohol use on the Gleason's grade of prostate cancer. Some reports show that there is no evidence of an association between alcohol intake and prostate cancer even when alcohol is consumed in large amounts. [34,35] In a study by McGregor et al [36] there was no association between the lifetime intake of alcohol with the development of low-grade or high-grade prostate cancer. Some studies even noted an inverse relationship between the consumption of alcohol and prostate cancer.[37]

There are reports that early-life alcohol exposure increases the risk for prostate cancer. [38,39] This increased risk may be due to higher cumulative intake of alcohol or specific early-life time windows of susceptibility of the prostate to the carcinogenic properties of alcohol.[40]

The mechanism by which alcohol induces carcinogenesis is unclear but some human carcinogens like ethanol, acetaldehyde, and formaldehyde are found in alcoholic beverages.[41] These carcinogens may act through an ethanol-inducible cytochrome P450 enzyme.[42] In mice, a prostate cytosolic xanthine oxidase can bioactivate ethanol to acetaldehyde and free radicals,43 Acetaldehyde induces point mutations during cell culture.44 Alcohol can alter sex hormone-binding globulin, in so doing altering total and free testosterone levels. The effect of this on the cause of prostate cancer is still unclear. [44,45]

In our study, we also consider the effects of combined consumption of alcohol and smoking. Fifty-two of the patients both take alcohol and smoke cigarettes and we observed that among these, thirty-seven (72.5%) had high Gleason's score PCa. No statistically significant association with prostate cancer was observed (P=0.879, r=0.046) Some studies have associated combined heavy drinking and cigarette smoking with increased risk of cancers of the aerodigestive structures such as the pharynx and larynx.[46,47] With prostate cancer, however, there is a paucity of research on the relationship between combined consumption of alcohol and cigarettes.

Conclusion

The high-risk Gleason's 8-10 prostate cancer was commoner among smokers than nonsmokers. There was no statistically significant association between cigarette smoking and alcohol consumption.

Limitations

Our study did not consider the pack year of cigarettes smoked nor quantify the amount of alcohol consumed. We did not also consider those who had stopped smoking at some point in their lives.

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Conflict of interest: None

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