

Alcohol, tobacco. Occupation and the risk of Benign prostatic hyperplasia

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World Journal of Advanced Research and Reviews, 2024, 24(03), 1411–1418

Publication history: Received on 02 November 2024; revised on 11 December 2024; accepted on 13 December 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.24.3.3796>

Abstract

Background: Benign prostatic hyperplasia (BPH) is a hyperplastic process of the fibromuscular stromal and glandular epithelial elements of the periurethral prostate. Aging and the presence of the male hormones are the two established risk factors for the development of BPH. It is thought there could be roles for other factors.

Aim: To evaluate the role of alcohol, tobacco, and occupation in BPH.

Method: Using an interpreter-administered questionnaire we obtained history of occupation, tobacco and alcohol use from male volunteers in a community-based study, in Port Harcourt. We determined prostate volume with the formula $\text{length} \times \text{weight} \times \text{height} \times 0.52 \text{ cm}$ using Mindray DP2200 3.5 MHz curvilinear USS probe and classified prostate as normal, mildly, moderately and severely enlarged. Digital rectal examination (DRE), serum PSA (Acubind Elisa kit, Monobind INC, USA) and histopathology were used to rule out prostate cancer. Units of alcohol consumed was determined from the formula $\text{Percentage} \times \text{Volume} \div 1000$, quantity of tobacco used was expressed in Pack-year, and occupation was classified based on associated physical activity. Linear regression statistics with Odds Ratio was used to determine the strength of association of these risk factors and BPH.

Result: Individuals whose occupation involved low physical activity had higher percentage of moderately or severely enlarged prostate, alcohol had negligible negative association, smoking had no association with BPH

Conclusion: Smoking had no association with prostate enlargement, moderate alcohol consumption appeared protective against prostate enlargement and participants whose occupation involved above average physical exertion had smaller prostates.

Keywords: Alcohol; Tobacco; Occupation; Risks-factors; BPH.

1. Introduction

Benign Prostatic Hyperplasia (BPH) is a non-malignant growth of the prostatic tissue which has a predilection for older men [1] In this condition there is pathological enlargement of the prostate gland brought about by stromal or epithelial cell proliferation [2]

BPH is believed to be a result of the direct influence of androgen hormones on the prostate gland but could be associated with a wide variety of risk factors including dietary, environmental, genetic and lifestyle characteristics [1,3]

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It is a condition with worldwide distribution which prevalence has been said to be increasing. While Eastern Europe and Central America are said to be the regions with the highest prevalence, in Sub-Saharan Africa there has been a reported increase from 126000 cases in 2000, to 227,000 in 2019[4,5]. In Nigeria about 25% of all males have been reported to have BPH[6].

Benign prostatic hyperplasia threatens men's health and results in Disability Life Years in men 60 years and above; it's a common cause of lower urinary tract symptoms (LUTS) in older men worldwide[4,5] and this together with other accompanying urological comorbidities consequently lead to sepsis, irreversible damage of the bladder, renal failure or even death[5,6]

Among elderly men, BPH is a significant drain on economic resources with global medical costs for the condition put at about 73.8 billion USD annually[5]. This financial burden is exacerbated by limited healthcare resources available to manage chronic conditions in low- and middle-income countries like Nigeria.

An investigation into influence of factors such as alcohol consumption, smoking and occupation is an important step in providing a strategy to reduce the morbidity, reduced quality of life and mortality associated with BPH.

2. Material and methods

This was a community based observational study involving two communities in a local government area in Rivers State, a major part of the oil rich Niger Delta region of Nigeria. The communities were selected by random sampling of the 17 communities that make up the local government area. Sample size was calculated to be 1,050.

The study population are apparently normal males, 40years and above, not diagnosed of or undergoing any treatment for prostate cancer.

Using an interpreter administered questionnaire, social and behavioral characteristics of the respondents such as present and past history of cigarette and alcohol consumption, duration and amount consumed in a day were obtained. Unit of alcohol consumed by a respondent was determined from Percentage content x Volume divided by 1000. Amount of cigarette used was determined from sticks/day divided by 20 x number of years and expressed in pack years. We determined prostate volume with ultrasound scan using a Mindray DP2200 3.5 MHz curvilinear probe using the formula $\text{length} \times \text{width} \times \text{height} \times 0.52 \text{ cm}$ and classified prostate as normal ($\leq 30\text{cm}^3$), mildly enlarged ($31\text{-}45\text{cm}^3$), moderately enlarged ($46\text{-}75\text{cm}^3$) and severely enlarged ($\geq 75\text{cm}^3$). Digital rectal examination(DRE) and serum PSA (using Acubind Elisa kit, Monobind INC, USA) were carried out. All respondents with serum PSA greater than 4ng/ml and digital rectal examination finding of hard, nodular or asymmetrical prostate had prostate biopsy and histopathology to rule out prostate cancer. Occupation was stratified into those requiring less than 50% physical exertion and those requiring more than 50% physical exertion.

The data analysis was done using Statistical Package for Social Sciences (SPSS) version 25. The data was summarized using Mean and standard deviation for continuous variables, while frequencies and percentages was used for categorical variables and presented in tables and bar charts. The chi-square test was used to assess the distribution of prostate volume and alcohol consumption, tobacco consumption and type of occupation. Logistic regression statistics with Odds Ratio was used to determine the strength of association of these risk factors and prostate size. All analysis was done at a 95% confidence level and a p-value less than 0.05 was considered statistically significant.

3. Results

754 men participated in the study. Age ranged from 40 to 81 years. 29.4% had normal prostate, 30.8% had mildly enlarged, 32.6% moderately enlarged and 7.2% severely enlarged prostate.

0.8% had current history of smoking, but 34.8% had smoked in the past. 6.1% smoked cigarette for less than 1 year but 78.6% smoked for between 1year and 10years. Only 0.8% had smoked for 40years and above.

9.8% take alcohol at present and 51.1% had taken alcohol in the past. 41.1% had taken between 1 to 10 units of alcohol daily.

Unskilled laborers were 13.6% and Self-employed individuals including traders were 39% bringing total percentage of those with above average physical activity to 52.6%. Civil and public servants including skilled workers were 43.8% and retired civil servants were 3.6% bringing the occupation with below average physical activity to 47.4%.

Distribution of behavioral history against prostate size showed that there is no significant difference in smoking status across the three groups, with only 0.7% of those with moderately/severely enlarged prostate, 0.9% of those with mildly enlarged prostate, and 0.9% of normal individuals being smokers. The vast majority in each group are non-smokers (99.3%, 99.1%, and 99.1%, respectively). The Chi-square test shows no significant association ($p = 0.050$).

A notable difference is observed in alcohol consumption. Among those with normal prostate levels, 14.4% consume alcohol, compared to 8.0% with moderate/severe enlargement and 7.8% with mild enlargement. This indicates a significant association between alcohol consumption and prostate levels ($p = 0.012$).

The distribution of prostate enlargement by occupation showed that among persons that have occupations with little/no physical exertion, 39.9% had moderate/severely enlarged prostate, 31.6% had mildly enlarged prostate, while 28.5% had normal size prostate. Among persons with above average physical exertion 39.6% had moderate/severely enlarged prostate, 30.1% had mildly enlarged prostate, while 30.3% had normal size prostate. The chi-square analysis showed no statistically significant differences in the distribution of prostate sizes by occupation (chi-square = 0.74, $p = 0.862$).

Regression analysis of the risk factors and prostate size showed there is no significant difference between smokers and non-smokers ($p = 0.746$). The odds ratio (0.7) with a wide confidence interval (0.1 to 4.1) indicates no or uncertain association. Alcohol consumers have a lower proportion of moderate/severe enlargement (32.4%) compared to non-consumers (40.6%). This difference is not statistically significant ($p = 0.173$), with an odds ratio of 0.7 and narrow confidence interval (0.4 to 1.1), suggesting a weak association with enlarged prostate. Individuals that have jobs requiring little or no physical exertion have a slightly higher proportion of moderate/severe enlargement (33.0%) compared to those with job that require above average physical exertion (30.8%) [$X = 0.10$, $p = 0.748$; OS 1.1; CI 0.7-1.6].

Table 1 Distribution of prostate size

Prostate Size	Frequency	Percent (%)
Severely enlarged	54	7.2
Moderately enlarged	246	32.6
Mildly enlarged	232	30.8
Normal	222	29.4
Total	754	100.0

Table 2 Social Behavioral pattern of patients

Item	Frequency (n=754)	Percent (%)
Previously Smoking		
YES	262	34.8
NO	492	65.3
Amount of Cigarette (packs per year)		
0	678	90.0
1 – 10	54	7.2
11 – 20	8	1.1
21 – 30	4	0.5

Item	Frequency (n=754)	Percent (%)
31 - 40	6	0.8
≥40	4	0.5
Duration of smoking (years) (n=262)		
<1	16	6.1
1-10	206	78.6
11-20	24	9.2
21-30	12	4.6
31-40	2	0.8
41-50	2	0.8
Currently Smoking		
YES	6	0.8
NO	748	99.2
Previous History of Alcohol		
YES	434	57.6
NO	320	42.4
Unit of alcohol consumed		
None	366	48.5
1 - 10	310	41.1
11 - 20	58	7.7
21 - 30	14	1.9
31 - 40	4	.5
41 - 50	2	.3
Beer		
Yes	112	14.9
No	642	85.2
Spirit		
Yes	106	14.1
No	648	85.9
Wine		
Yes	36	4.8
No	718	95.2
Currently Drinking Alcohol		
Yes	74	9.8
No	680	90.2

Table 3 Distribution of occupation of participants

Occupation		
Unskilled workers	102	13.6
Civil/public servants	331	43.8
Retired civil servants	27	3.6
Self-employed/traders	294	39.0
	754	100.0

Table 4 Distribution of Behavioral and occupational history with prostate size.

Risk Factors	Moderately/severely enlarged n=300(%)	Mildly enlarged n =232(%)	Normal n=222(%)	Chi-square (p-value)
Smoking:				
Yes	2(0.7)	2(0.9)	2(0.9)	7.80(0.050)
No	298(99.3)	230(99.1)	220(99.1)	
Alcohol:				
Yes	24(8.0)	18(7.8)	32(14.4)	3.20(0.361)
No	276(92.0)	214(92.2)	190(85.6)	
Occupation:				
Low/no physical activity	143(39.9)	113(31.6)	102(28.5)	358(100.0)
Above average physical activity	157(39.6)	119(30.1)	120(30.3)	0.764(0.862)

Table 5 Regression analysis of the Risk Factors with Prostate size

Risk factors	Moderately/severely enlarged	Mildly enlarged/normal	Total	Chi square (p-value)	Odds ratio (95% confidence interval)
Smoking					
Yes	2(33.3)	4(66.7)	6(100)	0.10(0.746)	0.7(0.1-4-1)
No	298(39.8)		748(100.0)		
Alcohol					
Yes	24(32.4)	50(67.6)	74(100.0)	1.85(0.173)	0.7(0.4-1.1)
No			680(100.0)		
Occupation					
Little/no exertion	143(39.9)	215(60.1)	358(100.0)	0.10(0.7483)	1.1(0.7-1.6)
>50% exertion	157(39.6)	239(60.4)	396(100.0)		

4. Discussion

The prevalence of moderate and severe enlargement of the prostate was found to be 39.8% among men in this study. This is lower than the value of 57.4% found among men in Obio/Akpor Local Government Area of Rivers State Nigeria in another study [7]. It is however more than the value of 29.2% found in a study in neighboring Bayelsa State and the overall average for Nigeria which is 25% [6,8]. It was within the range of 10-69% that have been reported among men in Sub-Saharan Africa [5]. This wide range is most likely due to the various study methods, diagnostic criteria, diagnostic equipment and demography involved. The value of this present study is comparable to value of about 37% found in a study in China and about 33% in United States [4,9]. This suggests that the prevalence of BPH is significant among men in Rivers State and comparable to what occurs in most part of the world.

The smoking habits of the respondents in this study was found to have no significant association with the occurrence of benign prostatic hypertrophy. This is similar to the finding of a study done among Chinese men where it was concluded that smoking had no influence on development of BPH [10]. This study differs from a study in Ethiopia where BPH was found to be associated with smoking and a study in United states where current smoking of more than 35 sticks of cigarette a day was positively associated with BPH [5,11]. Another American study suggested that former heavy smokers had higher risk of BPH [9]. The lack of significance of cigarette smoking in this study may be due to lower prevalence of smoking habit in this part of the world. More so, this study was carried among predominantly Christian community where smoking is seen as a vice. Further studies need to be done to decisively conclude on the relationship between tobacco smoking and BPH.

In this study, 14.4% of those with normal prostate consume alcohol, 8% of those with moderate/severe enlargement consume alcohol. Alcohol consumption was therefore suggested to have a protective effect against Benign prostatic hypertrophy. This is contrary to a study in China that found no relationship between alcohol consumption and BPH [10]. However, several studies found that the risk of BPH is reduced by alcohol consumption like a study by Jan and Kim et al in Korea and the National Health and Nutrition Examination Survey (NHANES) in United States [2,12]. The exact mechanism by which alcohol reduces the risk of BPH is not known but it is postulated that blood estrogen level increases with alcohol thus reducing the risk of BPH.

The examination of occupation and its association with BPH showed that individuals that have jobs requiring little or no physical exertion have a slightly higher proportion of moderate/severe enlargement compared to those with job that require above average physical exertion. However, this difference is not statistically significant ($p = 0.748$), probably because of inadequate sample size but the odds ratio (1.1) with a narrow confidence interval of 0.7 to 1.6 indicates individuals that have jobs requiring little or no physical exertion are 1.1 times more likely to have enlarged prostate. This is similar to conclusions reached by studies in Greece, Italy, Korea and America where being involved in a job with high physical activity conferred significant protection against BPH [13, 14,15,12]. This is however different from conclusions reached following a large clinical trial in United States [16]. In this American study, physical activity did not confer protection against BPH but only to nocturia experienced by those with BPH. Occupations with significant physical exertion have been suggested to offer protection against BPH due a probable benefit from physical activity. Physical activity has been proposed to protect against BPH and LUTS by several possible mechanisms including reducing body size, lowering sympathetic nervous system activity and lowering levels of systemic inflammation [16].

The conclusions reached in this study may have differed from others due to different diagnostic criteria used. A good number of the studies based their diagnosis of BPH on only clinical presence of lower urinary tract symptoms, some on finding of enlarge prostate on ultrasound scan. We based our diagnosis of BPH in this study on histological demonstration of stromal and epithelial hyperplasia. There is need to use standardized diagnostic criteria for BPH for the purpose of research.

5. Conclusion

There is no significant differences in smoking status across the various degrees of prostate gland enlargement; there is significant inverse association between alcohol consumption and prostate size, moderate alcohol consumption being protective against prostate enlargement; individuals with jobs requiring little or no physical exertion have slightly higher tendency to develop enlarge prostate. Men should be educated on the benefits of physical activity.

It is recommended that universal diagnostic criteria be decided for BPH and adopted by researchers to allow for comparability of studies. More research ought to be done on causal factors associated with BPH

Compliance with ethical standards

Acknowledgments

The authors wish to acknowledge the role played by management of Jose Vital Hospital Ltd who provided us with the basic equipment for the collection of data such as ultrasound scan machine and uroflow. The staff of Jose Vital Hospital also assisted us with data collection.

Disclosure of conflict of interest

The authors declare there was no conflict of interest among the authors in this study.

Statement of ethical approval

We obtained ethical approval from all relevant authorities before the commencement of this study.

Statement of informed consent

We obtained consent from all individuals who participated in the study.

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