RESEARCH ARTICLE

Risk Factors of Prostate Cancer: a Case-control Study in Faisalabad, Pakistan

Muhammad Naeem Bashir[1]*, Muhammad Riaz Ahmad[2], Akram Malik[3]

Abstract

Background: Prostate cancer is the third most commonly diagnosed cancer among males in Pakistan but very little is known about risk factors among the Pakistani population. Therefore a hospital-based, case-control study was carried out in Faisalabad to identify potential risk factors. Materials and Methods: This study was based on 140 prostate cancer cases and 280 normal controls. Logistic regression was used to estimate odds ratios and 95% confidence intervals for odds ratios to assess the relationship between prostate cancer and different risk factors. Results: Family history of prostate cancer, age, smoking, obesity, consumption of red meat and frequent use of fat items significantly increased the prostate cancer risk (odds ratios and 95% confidence intervals of: 7.32; 1.79-29.8; 16.9, 5.60-50.8; 2.47, 1.17-5.18; 5.79, 2.66-12.6; 2.71, 1.07-6.91; and 3.39, 1.47-7.83, respectively. On the other hand, more consumption of fruit, fluid intake and better lifestyle (physical activity) significantly reduced the risk of developing prostate cancer with odd ratios and corresponding 95% confidence intervals of: 0.27, 0.11-0.61; 0.05, 0.02-0.12; and 0.28, 0.13- 0.58. Conclusions: The results of the present study suggested that age, family history of prostate cancer, smoking, obesity, fluid intake, frequent use of fat items, consumption of fruits and better lifestyle might be associated with prostate cancer among Pakistani males.

Keywords: Prostate cancer - risk factors - age - family history - odds ratio - Pakistan

Asian Pac J Cancer Prev, **15 (23)**, 10237-10240

Introduction

Prostate cancer is the most frequently diagnosed malignancy among males in developed countries (Jemal et al., 2011). The assessments of Global cancer incidence in 2002 shows that the prostate cancer become the fifth most common diagnosed cancer in the world and second most common cancer in males (Parkin et al., 2004). Prostate cancer is the second leading cancer among Americans. It is estimated that about 233,000 new cases of prostate cancer will be diagnosed in the United States in 2014 which is 27% of all the malignancies among males and the estimated number of deaths will be almost 29,480. A man's life time risk of prostate cancer is one out of seven (Siegel et al., 2014). Like other countries of the world it is very common in Pakistan. It is the third most commonly diagnosed cancer in males with a ratio of almost 7% of all malignancies (Ahmad et al., 2009).

In general, all men over 50 years are at risk of the development of prostate cancer. However different diseases like prostate cancer have different risk factors. Family history of prostate cancer, old age, obesity, alcohol consumption and smoking were important risk factors of this disease (Hosseni et al., 2010). Prostate cancer is a disease of elderly men. In the United States more than 70% of all the prostate cancer patients were mostly more than 65 years and very rare cases were observed among men less than 50 years old, but after the age of 50 years, the incidence and mortality rates showed a sharp increase. Family history of prostate cancer is considered to be a major risk factor for this disease. The men having affected father or brother with prostate cancer had double risk of developing this disease and the risk was further increased, if a lot of first degree relatives were history of prostate cancer (Crawford, 2003).

More consumption of fats, especially red meat and dairy products was observed to increase the risk of prostate cancer (Wolk, 2005; Pourmand et al., 2007). On the other hand, risk of prostate cancer was inversely associated with more consumption of fruit and vegetables (Jian et al., 2005; Tyagi et al., 2010). Very little is known about risk factors of prostate cancer in Pakistani population, so it has encouraged us to carry out this case control study for better understanding of the disease.

Materials and Methods

This is a hospital-based case control study, conducted in three major hospitals of Faisalabad (Pakistan) during September, 2012 to August, 2013. The selected hospitals were Punjab Medical College Allied hospital, Madina Teaching Hospital and PINUM Cancer hospital, Faisalabad. The study was based on 140 histologically confirmed cases of prostate cancer and 280 normal controls. All the cases and controls were interviewed face to face in the hospitals using the structured questionnaire.

*[1]Government Municipal Degree College, [3]Urology Department, Madina Teaching Hospital, [2]Government Postgraduate College, Jaranwala, Faisalabad, Pakistan *For correspondence: naeembashir7@gmail.com*

Table 1. Characteristics of Cases and Controls for Different Factors

Factor	Characteristics	Cases	%	Controls	%
Total		140		280	
Age (in years)	Less than 55 years	7	5	129	46.1
	55 years & above	133	95	151	53.9
	Mean age	70 years		57 years	
Education	Illiterate	88	62.9	86	30.7
	Literate	52	37.1	194	69.3
Marital status	Single	3	2.1	3	1
	Married	137	97.1	277	99
Residential area	Urban	38	27.1	121	43.2
	Rural	102	72.9	159	56.8
Family history of cancer	No	129	92.1	275	98.2
	Yes	11	7.9	5	1.8
Family history prostate of cancer	No	115	82.1	273	97.5
	Yes	25	17.9	7	2.5
Lifestyle	Sedentary	98	70	117	41.8
	Normal	42	30	163	58.2
Smoking	No	33	23.6	165	58.9
	Yes	107	76.4	115	41.1
Obesity	No	66	47.1	225	80
	Yes	74	52.9	55	20
Fluid consumption	Less than 7 glasses	113	80.7	96	34.3
	7 or more glasses	27	19.3	184	65.7
Red meat(no of days)	Low (0 to 1 day)	94	67.1	242	86.4
	Normal(2 to 4 days)	46	32.9	38	13.6
	Excessive(5 to 7 days)	0	0	0	0
Fats (no of days)	Low (0 to 2 days)	89	63.6	220	78.6
	Normal(3 to 5 days)	51	36.4	60	21.4
	Excessive(6 to 7 days)	0	0	0	0
Use of fruit (no of days)	Low (0 to 2 days)	120	85.7	104	37.1
	Normal(3 to 5 days)	20	14.3	176	62.9
	Excessive(6 to 7 days)	0	0	0	0

The questionnaire included information about socio demographic factors (age, marital status, residence), lifestyle habits such as alcohol consumption, smoking and physical activities (exercise, sports), detailed medical history and family history of prostate cancer, history of vasectomy, fluid consumption and usual eating habits such as red meat, fats items and use of fruits. Alcohol drinking and history of vasectomy were not reported by any participant due to Muslim country.

Lifestyle of the participants was taken as ordinal variable having three categories, sedentary, normal and active lifestyle. A sedentary lifestyle means that the person has no leisure time for exercise, sports and physical active hobbies. A normal lifestyle is a lifestyle in which up to 40 minutes are consumed for exercise and such other physical activity, while active lifestyle has more than 40 minutes for leisure time for exercise and sports. BMI was calculated on the basis of height and weight as weight/height^2 (kg/m^2).

The response variable was binary and the explanatory variables were categories as nominal, ordinal and quantitative type. In descriptive analysis bivariate tables were used for explaining the count of each potential risk factor for both cases and controls. In analytical approach, the binary logistic regression model was applied to estimate the odds ratios and 95% confidence interval for odd ratios to evaluate the association of significant risk factors of prostate cancer by using SPSS version 16.0 software. The goodness of fit for the model was assessed by Omnibus and Hosmer-Lemeshow test. A variable is considered to be statistically significant if P-value is less than 0.05.

Table 2. Correct Classification and Misclassification of Subjects

Observed		Predicted Prostate Cancer		Percentage Correct
		No	Yes	
Prostate Cancer	No	261	19	93.2
	Yes	21	119	85
Overall Percentage				90.5

Results

This study was based on 420 individuals, including140 confirmed cases of prostate cancer and 280 controls. Table 1 shows the characteristics of cases and controls with respect to different risk factors. The mean age of cases and controls was 70 years and 57 years respectively. Age could not be matched because there were less male persons who visited the hospitals in older age as controls than cases. Mean age difference between the cases (70 years) and control (57 years) were distinct, which is due to the fact that prostate cancer is the disease of an elderly age. The prostate cancer was found to be more frequent in the age of 65 year or more. The number of prostate cancer cases of age 65 years and above was 105 (75%). Marital status was similar in both cases and controls, but the literacy rate was almost two times less among the

Table 3. Association between different Factors and Prostate Cancer Risk in Logistic Regression Model

Factors	β	S.E.	Wald	Sig.	(OR)	95%CI	
						Lower	Upper
Age	2.825	0.562	25.224	0.000	16.862	5.599	50.781
Lifestyle	-1.277	0.375	11.602	0.001	0.279	0.134	0.582
Family history of prostate cancer	1.991	0.717	7.179	0.005	7.324	1.798	29.841
Smoking	0.904	0.378	5.724	0.017	2.470	1.178	5.179
Obesity (BMI> 25)	1.757	0.396	19.721	0.000	5.793	2.668	12.579
Fluid intake	-2.948	0.401	53.967	0.000	0.052	0.024	0.115
Consumption of red meat	0.998	0.477	4.375	0.036	2.713	1.065	6.914
Fat item consumption	1.223	0.426	8.224	0.004	3.396	1.473	7.831
Use of fruit	-1.318	0.42	9.855	0.002	0.268	0.118	0.61

cases as compared to controls. The cases and controls were almost similar with respect to education, marital status, residential area and family history of cancer. The proportion of men with family history of prostate cancer was higher in cases than controls. The proportion of men with history of smoking and obese men (BMI>25) was higher in cases. The proportion of men using frequently red meat and fat items was higher in cases than controls. On the other hand consumption of fruit was lower in cases than controls.

From Table 2, it was observed that out of 280 controls 261 (93.2%) were correctly predicted as controls while out of 140 cases of prostate cancer 119 (85%) were correctly predicted as cases. The overall numbers (percentages) of correctly classified and misclassified of subjects were 380 (90.5%) and 40 (9.5%), respectively. The percentage of correct classification was very high, which means that the fitted model is adequate.

Table 3 shows the relationship between different risk factors and prostate cancer in terms of odd ratios and 95% confidence intervals of odd ratios. In this multivariate analysis, we observed that age particularly 55 years and above had an almost 17-fold greater risk for prostate cancer as compared to age less than 55 years (OR: 16.862, CI: 5.599-50.781, p=0.000)

Family history of prostate cancer was strongly associated with the increase in risk of prostate cancer (OR: 7.324, 95% CI: 1.798-29.841, p=0.005). Obese men with BMI greater than 25 had more than five-fold enhanced risk of prostate cancer (OR: 5.793, 95% CI: 2.668- 12.579, p=0.000).

Smoking was associated with the increase risk of prostate cancer (OR: 2.470, 95%CI: 1.178-5.179, p=0.017). Consumption of red meat and fat items were also positively associated with elevated risk of prostate cancer.

On the other hand, the risk of prostate cancer tends to be decreased with frequent use of fluid intake (OR: 0.052, 95%CI: 0.024-0.115, p=0.000). The risk of prostate cancer was also declined with increasing consumption of fruit. Better lifestyle (moderate physical activity) was also observed to be inversely associated with prostate cancer risk.

Discussion

Prostate cancer is very common cancer among males in Pakistan like other countries of the world. During 1998-2002, prostate cancer was the fourth common cancer among men in Karachi (Pakistan) with an age standardized incidence rate was 10.1 per 100,000 men while mean ages of the cases were 67.4 years (Bhurgri et al., 2009). This is similar to Asia- Pacific region (9.9 per 100,000) but much lower than the whole world (32.8 per 100,000) (Baade et al., 2013). The incidence and mortality rates of prostate cancer are remarkably different in various geographic regions with highest rate in northern America and the lowest in Asia (Hsing et al., 2000). The incidence rate per 100,000 is 119.9 in northern America, 35.5 in southern Europe, 17.3 in eastern Europe, 10.9 in western Asia and 7 in east Asia (Parkin et al., 2004). In this study, some probable risk factors (age, smoking, family history of prostate cancer, lifestyle, diet, and etc.) were evaluated and compared with other studies from all over the world.

Age is considered to be the strongest determinant factor for prostate cancer in our study, which has been recently shown in an Indian study (Ganish et al., 2011). The incidence of prostate cancer increases with age, particularly over the age of 60 years (Pourmand et al., 2007).

The present study has shown significant increase of developing prostate cancer among men with a family history of prostate cancer. Many studies have evaluated an increased risk of developing prostate cancer for males with a family history of prostate cancer (Meister et al., 2002; Giovainnucci at al., 2007; Kicinski et al., 2011). Men with a family history of prostate cancer had 1.5 to 4 times more chances of developing prostate cancer as compared to without family history (Negri et al., 2005). Furthermore, the majority (63.8%) of early onset prostate cancer incidences reported a positive family history of prostate cancer and more than 40% having a definite first degree affected relatives (Lange et al., 2012).

In this study, smoking was observed to be positively significant. Tyagi et al. (2010) investigated that smoking had almost 5 times higher risk of developing prostate cancer as compared to non-smokers. Many other studies have also found positive association between smoking and prostate cancer (Gong et al., 2008; Huncharek et al., 2010; Algota et al., 2011).

Our study shows that obesity and prostate cancer were directly related to each other. Giovannucci et al. (2007) observed in their study that taller height and higher BMI (obese men) were positively associated with fatal prostate cancer.

In this study, the use of fats items and red meat

consumption was considered to be positively associated with prostate cancer risk. Pourmand et al. (2007) investigated that the risk of prostate cancer was significantly higher with increasing consumption of fats. These results are also supported by Lee et al. (1998) and Wolk (2005). Sonuda et al. (2004) also found that the consumption of red meat was positively associated with prostate cancer risk.

In this study it was observed that better lifestyle (physical activity) was inversely related with prostate cancer risk. Tori and Matheson (2004) investigated that the average risk of developing prostate cancer was 10-30% reduced with exercise/ normal lifestyle. Fluid intake was investigated to be negatively significant. It states that a person, who consumes 7 or more glasses of fluid (water or any other type of liquid) per day, had almost 94% protection against prostate cancer. Jian et al. (2004) investigated that increasing frequency, duration and quantity of green tea consumption reduced the risk of prostate cancer.

In the present study, more consumption of fruit was considered to be negatively associated with prostate cancer risk. Tyagi et al. (2010) observed in their study that frequent use of citrus fruits and melon reduced the risk of prostate cancer. Many other studies reported that consumption of fruits and vegetables were inversely associated with prostate cancer risk (Kolonel et al., 2000; Jian et al., 2005).

In conclusion, the case control study revealed that age, family history of prostate cancer, smoking, obesity and more consumption of fats items could be considered as potential risk factors for prostate cancer in Pakistani males. Moreover, better lifestyle, fluid intake and frequent use of fruits were found to have protective effect against prostate cancer.

Acknowledgements

We are thankful to Professor Dr. Safdar Hassan Sial, Head of Urology Department and Professor Dr. Ijez Hussain , Head of Oncology Department, Punjab Medical College Allied Hospital and Dr. Rafshan, PINUM Cancer Hospital, Faisalabad for the help they rendered to us in the collection of data. We are also grateful to all subjects and their relatives for their cooperation.

References

Ahmad Z, Qureshi A, Idrees R, Aftab K (2009). Prostatic carcinoma: a Pakistani perspective. *Asian Pac J Cancer Prev*, **10**, 323-4.

Algota AM, Stratton SP, Moore JR, et al (2011). Association of obesity and smoking with PSA and PSA velocity in men with prostate cancer. *Am J Men's Health*, **5**, 272-8.

Andersson SW, Baron J, Bergstrom R, et al (1996). Lifestyle factors and prostate cancer risk: a case-control study in Sweden. *Cancer Epidemiol, Biomarkers Prev*, **5**, 509-13.

Baade PD, Youlden DR, Cramb SM, Dunn J, Gardinar RA (2013). Epidemiology of prostate cancer in the Asia-pacific region. *Prostate Int*, **1**, 47-58.

Bhurgri Y, Kayani N, Pervez S, et al (2009). Incidence and trends of prostate cancer in Karachi South, 1995-2002. *Asian Pac J Cancer Prev*, **10**, 45-8.

Crawford ED (2003). Epidemiology of prostate cancer. *Urology*, **62**, 3-12.

Ferlay J, Bray F, Pisani P, Parkin DM (2004). Cancer incidence, mortality and prevalence worldwide, version 2.0: IARC cancer base No.5. Lyon IARC press.

Ganesh B, Saoba SL, Sarade MN, Pinjari SV (2011). Risk factors for prostate cancer: an hospital-based case-control study from Mumbai, India. *Indian J Urol*, **27**, 345-50.

Giovannucci E, Liu Y, Platz EA, Stampfer M, Willett WC (2007). Risk factors for prostate cancer incidence and progression in the health professional's follow-up study. *Int J Cancer*, **121**, 1571-8.

Gong Z, Agalliu I, Lin DW, Stanford JL, Kristal AR (2008). Cigarette smoking and prostate cancer-specific mortality following diagnosis in middle-aged men. *Cancer Cause Control*, **19**, 25-31.

Hosseini M, SeyedAlinaghi S, Mahmoudi M, McFarland W (2010). A case-control study of risk factors for prostate cancer in Iran. *Acta Med Iran*, **48**, 61-6.

Hsing AW, Deng J, Sesterhenn IA, et al (2000). Body size and prostate cancer: a population-based case-control study in China. *Cancer Epidemiol Biomarkers Prev*, **9**, 133-41.

Huncharek M, Haddock KS, Reid R, Kupelnick B (2010). Smoking as a risk factor for prostate cancer: a meta-analysis of 24 prospective cohort studies. *Am J Public Health*, **100**, 693-701.

Jeml A, Bray F, Center MM, Ferlay J, Ward E, Forman D (2011). Global cancer statistics. *CA Cancer J Clin*, **61**, 69-90.

Jian L, Xie LP, Lee AH, Binns CW (2004). Protective effect of green tea against prostate cancer: a case-control study in Southeast China. *Int J Cancer*, **108**, 130-5.

Kicinski M, Vangronsveld J, Nawrot TS (2011). An epidemiological reappraisal of the familal aggregation of prostate cancer: a meta-analysis. *Plos One*, **6**, 27130.

Kolonel LN, Hankin JH, Whittemore AS, et al (2000). Vegetables, fruits, legumes and prostate cancer: a multiethnic case-control study. *Cancer Epidemiol Biomarkers Prev*, **9**, 795-99.

Lange EM, Salinas CA, Zuhlke KA, et al (2012). Early onset prostate cancer has a significant genetic component. *Prostate*, **72**, 147-56.

Lee MM, Wang RT, Hsing AW, Gu FL, Wang T, Spitz M (1998). Case-control study of diet and prostate cancer in China. *Cancer Cause Control*, **9**, 545-52.

Meister K, Morgan JW, Beeles TA (2002). Risk factors for prostate cancer. *Am Counci Sci Health*, **4**, 25-31.

Negri E, Pelucchi C, Talamini R (2005). Family history of cancer and the risk of prostate cancer and benign prostatic hyperplasia. *Int J Cancer*, **114**, 648-52.

Parkin D M, Brays F, Ferlay J (2004). Global cancer statistics. *Cancer J Clin*, **55**, 74-108.

Pourmand G, Salem S, Mehrsai A, et al (2007). The risk factors of prostate cancer: a multicentric case-control study in Iran. *Asian Pac J Cancer Prev*, **8**, 422-8.

Siegel R, Ma J, Zou Z, Jemal A (2014). Cancer statistics. *Cancer J Clin*, **64**, 9-29.

Sonada T, Nagata Y, Mori M (2004). A case-control study of diet and prostate cancer in Japan: possible effect of traditional Japanese diet. *Cancer Society*, **95**, 238.

Tori DC, Matheson GO (2004). Exercise and prostate cancer. *Sports Med,* **34**, 363-9.

Tyagi B, Manoharm N, Raina V (2010). A case control study on prostate cancer in Delhi. *Asian Pac J Cancer Prev*, **11**, 397-401.

Wolk A (2005). Diet, Lifestyle and risk of prostate cancer. *Acta Oncologia*, **44**, 277-81.