

## RESEARCH COMMUNICATION

# A Case Control Study on Prostate Cancer in Delhi

Brijbhushan Tyagi\*, Nalliah Manoharan, Vinod Raina

### Abstract

Prostate cancer is one of the first five leading site of cancers in Delhi. The incidence rate is higher in North India compared to South India and it is rapidly increasing. A population based case-control study on prostate cases was therefore carried out in Delhi to identify potential risk factors. Cases were each matched with two controls. Past smoking and current alcohol consumption significantly increased the risk of prostate cancer. No statistically significant association was found with family history of cancer or prostate cancer. The risk of prostate cancer declined with increasing dietary consumption of tea, citrus fruits and melon. A statistically significant marginal increase in the odds ratio was observed with the consumption of eggs, fish and sunflower oil. Though an increased risk of prostate cancer was evident among vasectomised men, the association was not statistically significant.

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### Introduction

Prostate cancer remains one of the most prevalent and least understood of all human malignancies. Pathologic evidence suggest that neoplastic changes of the prostate epithelium begin early in man's adult life, but do not become clinically evident or relevant until decades later. Some patients live out their life with prostate cancer remaining stable for decades without treatment. In other cases, the cancer grows aggressively, responds poorly to therapy and cause death within a year. The natural history of this enigmatic disease is heterogeneous ranging from a benign and in due course to one that rapidly progress causing significant morbidity and mortality (Scardino, 2000; Wei and Uzzo, 2002).

The incidence of Prostate cancer and its mortality rates are remarkably different in diverse geographic regions and among various racial ethnic population; with by far the highest rate in North America and the lowest in Asia (Hsing et al., 2000; Quinn et al., 2002).

The estimates of Global cancer incidence in 2002 shows that the Prostate cancer become the fifth most common cancer in the world and second most common cancer in men. (11.7% of new cancer cases overall; 19% in developed countries and 5.3% in developing countries) (Parkin et al., 2004).

The rates in India are less than one tenth of the rates seen in the USA and one fifth of the rates seen in UK, but are increasing rapidly particularly in Delhi, Mumbai and Bangalore. It is also one of the ten leading sites of cancer in these places and a statistically significant increasing trend in the rates has also been observed.

Epidemiological studies conducted in developed

countries suggested that several factors related to environment as well as genetic play an important role in the development of prostate cancer. In most instances the evidence is fragmentary or inconsistent (Standard et al., 1998) (e.g. certain occupational exposures, sexually transmitted infectious agents, sexual activity level, history of benign prostatic hyperplasia, vasectomy, androgenic hormones, weight or obesity, cigarette smoking, alcohol consumption and vitamin D, vitamin E and selenium intake etc.)

There have been some reports in medical literature suggesting an increased risk of prostate cancer in patients with vasectomy. Some studies from West have shown a relationship between vasectomy and the prostate cancer. The relative risk of prostate cancer was reported to be higher in patients in whom vasectomy was performed at a younger age. This elevated risk persisted after adjusting for diet, level of physical activities, smoking, alcohol consumption, educational status, body mass index and geographical area of residence. Other studies did not find any elevation in the risk of prostate cancer in persons who had undergone vasectomy compared to those who had not had the procedure. Bombay Population based cancer registry carried out a hospital based case control study on prostate cancer. A small increased in risk was noted in vasectomised patients which was not statistically significant.

In India vasectomy is a common method of family planning. Therefore there is a need to study its health consequences in general and in particular any risk of development of prostate cancer. So a case-control study was conducted in Delhi to assess the risk factors for prostate cancer among the residents of Delhi with special

*Delhi Cancer Registry, Dr. B.R.A. Institute Rotary Cancer Hospital, All India Institute of Medical Sciences, New Delhi, India*

\*For Correspondence: *btyagi51@yahoo.co.in*

emphasis on the risk of development of prostate cancer after vasectomy.

## Material and Methods

The data for the study was derived from the cases of prostate cancer diagnosed and registered by the Delhi Population based cancer registry during the period of 1st January 1998 to 31st December 2000. All the patients were residents of Delhi who had microscopic proof of diagnosis. For each case two healthy male controls were taken from the resident general population of Delhi. One control was the healthy neighborhood and the second was the healthy relative of the patients. Two controls were chosen for each case to ensure sufficient power for the study. Controls were matched to cases by +/-5 years of age. A neighborhood is defined as the neighbor residing in the same building or in the same residential complex or in the same locality.

All the interviews for the cases and controls were conducted in Hindi by well trained Social Investigators using a structured questionnaire. There was no refusal in answering the questions.

The questionnaire included information on socio demographic factors, medical history, general life style habits such as smoking, alcohol consumption, family planning practices, family history of prostate cancer and frequency of intake of selected dietary items that were commonly consumed among Delhi population. (either daily or weekly or monthly or rarely). The food items that were evaluated as potential risk factors for prostate cancer included beef, meat, chicken, green vegetables, bread, rice, wheat, milk, coffee, tea, bear, other liquors, carrot, citric fruits etc.,. Standard measurements were used to elicit information about the quantity of food items consumed. The measurement used were Katori (a bowl contains 200gms of food items), teaspoon, tablespoon, cup and glasses.

All the cases were interviewed as soon as they were diagnosed, either in hospital itself or in their home. The same interviewer interviewed both the cases and controls.

The data collected by social investigators were compiled and quality and validity check were also performed for consistency of the information collected.

Frequencies were obtained for all variables and cross tabulation for each potential risk factors versus case control status were made. Chi-square test or Fisher's exact test were used for comparison of categorical variables between the two groups. The effect of different parameters on the risk of prostate cancer was estimated by unadjusted conditional odds ratios and corresponding 95% confidence interval.

## Results

During the study period 1998-2000, a total of 750 prostate cancers were registered by Delhi PBCR. Among them, 624 cases had microscopic confirmation of diagnosis. After excluding the non microscopically proven cases an attempt has been made to include all the 624 cases into our study. Out of these, 321 cases were

excluded from the study due to migration, non willingness to participate in the study or non cooperation etc.

So finally a total number 303 microscopically confirmed cases along with two age matched control for each subject (606 controls) entered the study. The mean age of cases and controls were 69.7 years and 65.6 years respectively. Demographic and baseline characteristics of the study participants are presented and compared in Table 1. The cases of prostate cancer tended to be older than control. The cases and controls were similar with respect to marital status, family history of cancer, family history of prostate cancer and vasectomy. The proportion of men with alcohol consumption in cases were higher than control and the association was statistically significant ( $p=0.001$ ).

The relation between family planning practices and prostate cancer risk are shown in Table 2. The odds ratios for any method of contraception and use of condoms are not significant. Though a little increase risk of prostate

**Table 1. Comparison of Demographic and Baseline Characteristics of Patients in Both Groups**

Characteristic	Controls (n=606)		Cases (n=303)		P-value
	No.	%	No.	%	
Age					
< 50	15	2.5	4	1.3	
50-54	38	6.3	11	3.6	
55-59	74	12.2	23	7.6	
60-64	145	23.9	44	14.5	
65-69	132	21.8	64	21.1	
70-74	123	20.3	69	22.8	
75-79	54	8.9	46	15.2	
80-85	25	4.1	28	9.2	
85 & above	0	0.0	14	4.6	0.000
Mean	65.6		69.7		
Marital Staus					
Single	3	0.5	2	0.7	
Married	603	99.5	301	99.3	0.554
Family history of cancer					
No	593	97.9	293	96.7	
Yes	13	2.1	10	3.3	0.296
Family history of prostate cancer					
No	604	99.7	299	98.7	
Yes	2	0.3	4	1.3	0.099
Alcohol consmption					
No	463	76.4	201	66.3	
Yes	143	23.6	102	33.7	0.001
Vasectomy					
No	532	87.8	258	85.1	
Yes	74	12.2	45	14.9	0.266

**Table 2. Family Planning Practices and Risk of Prostate Cancer**

Characteristic	Control	Cases	OR	95% C.I	P-value
Any method of contraception					
No	422	223	1		
Yes	184	80	0.82	(0.60-1.12)	0.216
Use of condoms					
No	599	301	1		
Yes	7	2	0.54	(0.10-2.79)	0.459
Vasectomy					
No	532	258	1		
Yes	74	45	1.25	(0.84-1.86)	0.270

**Table 3. Life Style Factors and Risk of Prostate Cancer**

Characteristic	Control	Cases	OR	95% C.I	P-value
Bidi smoking					
No	528	274	1		
Current	71	25	0.64	(0.38-1.08)	0.092
Past	7	4	0.91	(0.22-3.76)	0.895
Cigarette with filter					
No	469	210	1		
Current	128	75	1.35	(0.96-1.91)	0.086
Past	9	18	5.16	(2.13-12.51)	<0.001
Cigarette without filter					
No	595	296	1		
Current	11	7	1.36	(0.47-3.99)	0.572
Drinking habit					
No	463	201	1		
Current	140	99	1.76	(1.26-2.46)	<0.001
Past	3	3	2.35	(0.47-11.74)	0.298
Wine					
No	592	294	1		
Yes	14	9	1.44	(0.52-4.01)	0.481
Beer					
No	600	296	1		
Yes	6	7	2.55	(0.80-8.15)	0.114
Whisky					
No	468	203	1		

**Table 4. Family History of Cancer and Risk of Prostate Cancer**

Characteristic	Control	Cases	OR	95% C.I	P-value
Family history of cancer					
No	593	293	1		
Yes	13	10	1.61	(0.67-3.85)	0.284
Family history of prostate cancer					
No	604	299	1		
Yes	2	4	4	(0.73-21.84)	0.109

cancer among the vasectomised men (OR: 1.25, 95% CI: 0.84-1.86, P=0.270) were observed, the association was not statistically significant.

The data in Table 3 indicate the prostate cancer risk associated with life style factors like smoking and drinking. The OR of current and past filter cigarette smoker had higher risk for development of prostate cancer but the association was statistically significant only in the case of past smokers (OR: 5.16, 95% CI: 2.13-12.51, P<0.001). Current drinkers also have a statistically significant increased risk for prostate cancer (OR: 1.76, 95% CI: 1.26-2.46, P<0.001). The past drinking habit also has a higher OR for prostate cancer but the association was not statistically significant. Although beer and whisky has increased the risk of prostate cancer, only the whisky drinking had a statistically significant association for prostate cancer (OR: 1.78, 95% CI: 1.28-2.47, P<0.001).

No statistically significant association was found between prostate cancer and family history of cancer and family history of prostate cancer (Table 4).

Various dietary items that were commonly consumed were evaluated. Selected dietary items and their relationship with prostate cancer are presented in Table 5. The risk of prostate cancer declined with increasing

**Table 5. Selected Dietary Variables and Risk of Prostate Cancer**

Characteristic	Control	Cases	OR	95% C.I	P-value
Tea					
No	13	14	1		
Yes	593	289	0.45	(0.21-0.97)	0.043
Egg					
No	294	123	1		
Yes	312	180	1.49	(1.09-2.04)	0.013
Chicken					
No	343	156	1		
Yes	263	147	1.29	(0.95-1.75)	0.108
Mutton					
No	417	192	1		
Yes	189	111	1.39	(0.99-1.96)	0.058
Fish					
No	474	221	1		
Yes	132	82	1.45	(1.01-2.09)	0.046
Pulses					
No	3	1	1		
Yes	603	302	1.69	(1.35-21.13)	0.685
Orange					
No	2	6	1		
Yes	604	297	0.17	(0.03-0.83)	0.028
Melon					
No	37	32	1		
Yes	569	271	0.48	(0.27-0.84)	0.010
Sunflower oil					
No	514	243	1		
Yes	92	60	1.63	(1.05-2.55)	0.031
Other oil					
No	241	106	1		
Yes	365	197	1.55	(1.02-2.37)	0.041
Vitamins					
No	538	252	1		
Yes	68	51	1.75	(1.13-2.7)	0.012

dietary consumption of tea (OR=0.45, CI=0.21-0.97), citrus fruits (OR: 0.17, CI: 0.03-0.83, P=0.028) and melon (OR: 0.48, CI: 0.27-0.84, P=0.010). A statistically significant marginal increase in odds ratio was observed with the consumption egg (OR: 1.49, 95% CI: 1.09-2.04, P=0.013), fish (OR: 1.45, 95% CI: 1.01-2.09, P=0.046), sunflower oil (OR: 1.63, 95% CI: 1.05-2.55, P=0.031), other oil (OR: 1.55, 95% CI: 1.02-2.37, P=0.041) and vitamins (OR: 1.75, 95% CI: 1.13-2.7, P=0.012).

## Discussion

Cancer of the prostate is the third most frequently diagnosed cancer among men in Delhi accounting for about 6.3% of all malignancies (Raina et al., 2009). The annual age adjusted (world population) incidence rate of prostate cancer in Delhi was 9.4 per 100,000 which is higher than South-East Asia (7.0) and Northern Africa (5.8) but lower than Northern America (119.9), Southern Europe (35.5) and Eastern Europe (17.3) and Western Asia (10.9) (Parkin et al., 2004). In this study some potential risk factors for prostate cancers were evaluated.

Our study has shown a non statistically significant increase in the risk of developing prostate cancer among men with a family history of prostate cancer. Many studies have reported an increased risk developing prostate

cancer for men with a family history of prostate cancer (Haas and Sakr, 1997; Meister et al., 2002; Chen et al., 2003). Men with a family history of prostate cancer are at increased risk of developing prostate cancer from 1.5 to 4 times more than the general population (Haas and Sakr, 1997; Negri et al., 2005). Nevertheless, two studies (Deneo-Pellegrini et al., 1999; Schuurman et al., 1999) have shown no correlation between prostate cancer and positive family history of prostate cancer.

No increase in risk for prostate cancer was found for any method of contraception practices and use of condoms. Though a marginal increase in the odds were found for vasectomy in our study, the association was not statistically significant. Many other studies also have not found any association between the risk of prostate cancer and vasectomy (Guess et al., 1990; Skegg, 1993; Rosenberg et al., 1994; Zhu et al., 1996; Deonotoni et al., 1997; Bernaldelgado et al., 1998).

The present study has shown a non significant relationship between current cigarette smoking with or without filter. A statistically significant increase in the risk of prostate cancer was found for past filter cigarette smoker. Current drinking habit also increased the risk of prostate cancer. A statistically significant positive association was found between the prostate cancer and whisky drinking. The effects of smoking and alcohol consumption on the epidemiology of prostate cancer are inconclusive and difficult to interpret (Pienta and Esper, 1993; Haas and Sakr, 1997). Hsing and colleagues (1990) have shown a relative risk of 1.8 for smoking. Coughlin et al (1996) observed in their study that the risk of developing prostate cancer was 1.21 to 1.45 fold increased among men with history of smoking. Some studies reported relation between alcoholic consumption and risk of prostate cancer (Hayes et al., 1996; Sesso et al., 2001). But many studies failed to find any association among smoking status, alcohol consumption and risk of prostate cancer development (Fincham et al., 1996; Hickey et al., 2001; Crispo et al., 2004; Hodge et al., 2004).

The role of diet in the etiology of prostate cancer has been evaluated in our study. In our study consumption tea found to be a protective factor. Some epidemiological observations have also suggested that people who consume tea regularly have a lower risk of prostate cancer (Heilbrun et al., 1986; Severson et al., 1989). Second the incidence of prostate cancer in China, a population that consumes green tea on regular basis, is the lowest in the world (Gupta et al., 1999). In one study, tea consumption showed an increase in prostate cancer risk. Many other studies showed no association between tea consumption and prostate cancer.

Our study shown that consumption egg and fish significantly increased risk of prostate cancer. In a prospective study conducted in Japan, fish intake was significantly associated with an increased risk of prostate cancer; men who consumed fish more than four times per week had an increased risk of developing prostate cancer compared with men who ate less than twice per week (Allen et al., 2004). However many other studies have also shown that consumption of fish decreased the risk of prostate cancer. A non significant increase in the risk

of prostate cancer for chicken and meat was found in our study. A prospective study -the Physician's Health Study (Gann et al., 1994) also found an association between red meat intake and the risk of prostate cancer, but this was not statistically significant which is consistent with our study. Consumption of meat is positively associated with prostate cancer in some studies (Giovannucci et al., 1993; Sonoda et al., 2004).

In the present study, consumption of fruits like orange and melon shown a statistically significant decrease in the risk of prostate cancer. A non statistically significant decrease in the risk of prostate cancer was found for most of the fruits and vegetable included in our study (data not shown). Increased intake of fruits and vegetable has been associated with a reduced risk of prostate cancer in some studies (Gann et al., 1999; Kolonel et al., 2000; Jian et al., 2005). Various studies also reported an increased risk of prostate cancer associated with fruit intake.

In conclusion, the main limitation of this study is the recall bias. There are problems of reliability of information concerning the distant past which the subject may forget to recall.

Nevertheless, the case-control study revealed that cigarette smoking, alcohol consumption and dietary items like meat and fish to be considered as potential risk factors for prostate cancer. No significant association was found between vasectomy and prostate cancer.

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