

Does sedentary lifestyle increases the odds of prostate cancer in Pakistani men?

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ABSTRACT

Objective: To determine relationship between level of physical activity and the odds of prostate cancer among Pakistani men.

Background: Prostate cancer is the most commonly diagnosed malignancy among men in Europe and North America, however its incidence is increasing in Asia and Africa. Age adjusted incidence rate in Pakistan is though comparatively low (5.3 per 100,000), but in recent years, more cases are being reported by oncology units of most teaching hospitals in major cities in Pakistan. Although increasing age, genetic factors and race have been established as the main predictors, however influence of environmental issues and lifestyle has found to be strongly related to prostate cancer risk in developed countries. Data on prostate cancer risk among Pakistani men in relation to the level of their physical activities are scarce.

Methods: In this case control study, 195 histologically confirmed cases of adenocarcinoma of prostate were recruited from Shaukat Khanum Memorial Cancer Hospital and Institute of Nuclear Medicine and Oncology Lahore. Total of 390 Controls were randomly selected from four major teaching hospitals in Lahore and Peshawar. Data was collected using a pre-tested interview form. Odds ratio was used as the measure of strength of association computed using unconditional logistic regression.

Results: Based on an index computed using weighted scores allocated to leisure time exercise, activities at work place and household activities, only 08 (4.1%) cases and 89(22.8%) controls were classified as being highly active, where as 81(41.5%) cases and 167(42.8%) controls were categorized as moderately active. Difference was significant statistically [$\chi^2= 37.68$ at 1 df; $p<0.001$] indicating a strong relationship between level of physical activity and the risk of prostate cancer. Unadjusted odds ratio comparing the odds that cases had moderate activity with controls [OR 0.61; 95% CI. 0.42-0.88] showed a significant association ($p=0.009$). When adjusted this estimates against age, ethnicity, socio-economic status, smoking status and dietary patterns, the observed relationship persists [OR 0.28; 95% CI.0.11-0.72; $p=0.008$]. As regards highly active cases versus controls, the adjusted odds ratio was 0.05 [95% CI.0.01-0.26; $p=0.001$] indicative of protective effect of increased physical activity level against prostate cancer risk.

Conclusion: Pakistani men with sedentary lifestyle have higher odds of prostate cancer comparatively after adjustment of socioeconomic status, height, red meat consumption and smoking status.

Key words: Lifestyle, Sedentary, Exercise, Cancer, Prostate, Risk, Regression

INTRODUCTION

With an estimated worldwide incidence of 25.3 per 100,000 men and mortality of 8.1 per 100,000 men, prostate cancer is the most common cancer among males now.¹ Global burden has increased in last 30 years. Incidence is highest in black American men, intermediate in white men and lowest in Chinese and Asian men. It is estimated that slightly over 100,000 new cases are detected every year, of which one third proved to be fatal.²

Age-adjusted incidence rate in Pakistan is 5.3 per 100,000 person-years which is slightly lower than India (6.8 per 100,000 person-years)³, but higher than rates in China (3.1 per 100,000 person-years).⁴ Prostate cancer is the third commonest cancer among Pakistani men after the carcinoma of liver and oral cavity.⁴ Low incidence of this cancer in Pakistan can be explained on the basis of low life expectancy in our population as compared to developed countries, inadequate

access to PSA screening in community and lack of public awareness about the disease.⁵ There is also an issue of paucity of information about the modifiable risk factors of this malignancy in Pakistan.

Aging is the most important single factor for occurrence of prostate cancer.⁶ However, Pattern of prostate cancer incidence and mortality suggests that both genetic and racial factors contribute towards an excess risk of disease in developed countries and among individuals of African descent; nevertheless, only racial and genetic factors alone cannot explain the wide international variation in disease distribution.⁷ Environmental and life-style factors, especially trend of urbanization and change in socioeconomic status may have accrued the prostate cancer risk in developing countries. This argument has strong evidential support from number of ecological studies conducted on Japanese and other ethnic groups emigrated to United States.⁸ In Pakistan, population drift towards cities and rising poorly regulated industrialization for the last two to three decades is likely to add new risk factors or modifying the existing deleterious exposures in the community; which in turn may have contributed in growing number of reported prostate cancers in Pakistan.^{7,8}

Observations have demonstrated that men with long term physical activity have lower risk as compared to those with sedentary lifestyle. Physical activity may decrease levels of free and total testosterone, reduce obesity and enhance immune system, all of which may contribute in protecting these men from prostate cancer.⁹ However, due to variations in classifying physical activity in different epidemiological studies, many reported inconsistent results in this regard. Sedentary lifestyle can also be a disease modifying factor in presence of obesity, consumption of high saturated animal fats and reduce vegetable intake since these factors have reported to be the strong predictors of prostate cancer risk.^{10,11} Data on risk factors associated with development of carcinoma of prostate in Pakistan is sparse. Identifying modifiable factors in relation to the risk of prostate cancer among Pakistani men would help in devising preventive strategies to protect the population from this debilitating disease. The aim of this study was to determine an association between level of physical activity and the odds of prostate cancer among

Pakistani men enrolled in various hospital based cancer registries in Lahore.

MATERIALS AND METHODS

In this case control study, 195 histologically confirmed cases of adenocarcinoma of prostate aged 45 years and above were recruited from Shaukat Khanum Memorial Hospital and Institute of Nuclear Medicine and Oncology Lahore. A total of 390 subjects aged 45 years and above were randomly selected from Jinnah, Services and Mayo and Fatima Memorial Hospitals Lahore, being screened by consultant surgeons and urologists using clinical examination and Prostate specific antigen level (≤ 2.5 ng/ml). A pre-tested interview form was used to collect data of sociodemographic profile and various activities at work place, home and for recreation. Interviews were conducted face to face in hospital settings after taking informed verbal consent. Confidentiality of information was maintained by using codes for cases and controls. A combined score of physical activity was computed by giving scores to leisure time exercise (mild, moderate, strenuous), activities at work place and at household level, using a five point scale, allocating higher scores to strenuous exercise, to individuals participating in household works and active at work place. Participants were then classified in to three equal groups: mildly active, moderately active and highly active. Data on known confounding factors (age, ethnicity, fat consumption, smoking and height) were also calculated. Food frequency questionnaire for Pakistani foods was used to determine dietary pattern. Data was analyzed using SPSS version 18 software after being edited manually. Age, height and physical activity scores were described using mean \pm SD and socioeconomic status, ethnicity and residential status was presented as frequency distribution and percentages. Difference of means and proportions was calculated using t-test and Chi-square test respectively. P-value of less than 0.05 was taken as statistically significant. Odds ratio (OR) was used as measure of strength of association using unconditional logistic regression. Adjusted OR and 95% confidence interval was also computed. Wald test was used for significance testing in regression models. Formal permission was obtained from concerned hospitals to conduct the study. Approval of research project was granted by advanced Board of Studies, University of Health Sciences Lahore.

RESULTS

Mean age of cases was 69.77 ± 4.9 years and that of controls is 68.09 ± 5.5. This difference of means was statistically significant (t=3.59 at 583 df; p<0.001). On the other hand, ethnicity, which has been reported by many studies as a strong

predictor of prostate cancer risk was not found to be strongly related with odds of prostate cancer in our study [Punjabis OR 0.12 (95% CI.0.02-0.59); Muhajir OR 0.17(95% CI. 0.04-0.78); Pashtuns 0.33(0.06-1.84)].

Table 1: Level of Physical Activity Among Prostate Cancer Cases In Comparison to Control Population

Physical Activities	Cases (n=195)		Controls (n=390)		Total (n=585)		χ ² _{trend}	df	p-value
	No.	%	No.	%	No.	%			
Leisure-time Strenuous Exercise							0.19	1	0.65
Never	171	87.7	349	89.5	520	88.9			
Once a week	15	7.7	23	5.9	38	6.5			
2-3 times a week	03	1.5	08	2.1	11	1.9			
Daily	06	3.1	10	2.6	16	2.7			
Leisure-time Moderate level							13.03	1	< 0.001
Never	159	81.5	258	66.2		71.3			
Once a week	13	6.7	43	11.0	417	9.6			
2-3 times a week	19	9.7	78	20.0	56	16.6			
Daily	04	2.1	11	2.8	97	2.6			
Leisure-time Mild level Exercise							21.98	1	< 0.001
Never	86	44.1	110	28.2	196	33.5			
Once a week	26	13.3	54	13.8	80	13.7			
2-3 times a week	66	33.8	132	33.8	198	33.8			
Daily	17	8.7	94	24.1	111	19.0			
Occupational Physical Activity							40.47	1	< 0.001
Low	121	62.1	134	34.4	255	43.6			
High	74	37.9	256	65.6	330	56.4			
Physical activity Index status							37.68	1	< 0.001
Mildly active	106	54.4	134	34.4	240	41.0			
Moderately Active	81	41.5	167	42.8	248	42.4			
Highly Active	08	4.1	89	22.8	97	16.6			

χ²_{trend} (Chi-Square for trend Statistic), % Column Percentages presented

* Strenuous Exercise (Swimming, Jogging), Moderate Level Exercise (Fast Walk), Mild level (Easy walk)

** Physical Activity index was computed using weights of Leisure-time activity, Occupational activity, Household level activities)

Based on an index computed using weighted scores allocated to leisure time exercise level, activities at work place and household activities, only 08 (4.1%) cases and 89(22.8%) controls were reported to spent highly active lifestyle, where as 81(41.5%) cases and 167(42.8%) controls were moderately active. This difference was significant statistically [χ²= 37.68 at 1 df; p<0.001] indicating a strong relationship between level of physical activity and the risk of prostate cancer (table1). Unadjusted odds ratio comparing the odds that cases had moderate activity with controls [OR

0.61; 95% CI. 0.42-0.88] showed a significant association (p=0.009). When adjusted this estimates against age, ethnicity, socio-economic status, smoking status and dietary patterns, the observed relationship persists [OR 0.28; 95% CI.0.11-0.72; p=0.008]. As regards highly active cases versus controls, the adjusted odds ratio was 0.05 [95% CI.0.01-0.26; p=0.001] indicating that higher level physical activity is a strong predictor for the risk of prostate cancer(table 2). Majority of cases (87.7%) and controls (89.5%) reported that they never participated in strenuous level activities

for most of their life. On the other hand, only 15 (7.7%) cases and 23(5.9%) controls described such activity as once a week and 06(3.1%) cases versus 10(2.6%) controls as their daily routine. Moreover, the difference of proportions of these categories was found statistically insignificant [$\chi^2_{trend} = 0.19$ at 1 df; $p=0.65$] indicating lack of relationship between strenuous exercise and prostate cancer. This finding was reinforced by adjusted odds ratio for daily [OR 0.52; 95% CI.0.05- 4.86; $p=0.57$] and once a week [OR 0.29; 95% CI. 0.06-1.30; $p=0.10$] categories.

Number of controls reported active at work place 256(65.6%) was considerably more than the cases 74 (37.9%) and this difference was statistically significant [$\chi^2=40.47$ at 1 df; $p<0.001$]. The unadjusted odds ratio comparing the odds that

cases had been active at work place compared to controls was 0.32 (95% CI.0.22-0.45; $p<0.001$), whereas when adjusted for age, ethnicity, socio-economic status and dietary patterns this estimates reduced almost to half [OR 0.17; 95% CI. 0.07-0.43; $p<0.001$] illustrating a strong association between being active at work place and reduction in odds of prostate cancer. Putting physical activity with other potential confounding factors in regression model, it was found that individuals with age more than 45 years age (OR 1.08; CI. 1.10-1.18), Ex-smoker (OR 7.27; CI.2.30-22.98) and those who consume red meat for more than once a week (OR.6.62;CI.2.21-19.48) also have higher odds of prostate cancer alongside sedentary lifestyle.

Table 2: Risk of Prostate Cancer In Relation to Physical Activity

Characteristics	UNADJUSTED ESTIAMTES			ADJUSTED ESTIMATES *		
	Odds ratio	95% CI.	p-value	Adjusted Odd ratio	95% CI.	p-value
Leisure-time Strenuous Exercise	1	Reference		1	Reference	
Never	1.33	0.67 –	0.40	0.29	0.06 -1.30	0.10
Once a week	0.76	2.61	0.69	0.58	0.07 - 4.34	0.60
2-3 times a week	1.22	0.20 - 2.92	0.69	0.52	0.05 - 4.86	0.57
Daily		0.43 – 3.42				
Leisure-time Moderate level	1	Reference		1	Reference	
Never	0.49	0.25 -0.94	0.03	0.27	0.07 -1.02	0.05
Once a week	0.39	0.23- 0.67	0.001	0.48	0.17 -1.34	0.16
2-3 times a week	0.59	0.18 -1.88	0.37	0.63	0.03-11.98	0.76
Daily						
Leisure-time Mild level Exercise	1	Reference		1	Reference	
Never	0.61	0.35 –	0.08	0.72	0.22 - 2.37	0.60
Once a week	0.63	1.06	0.03	0.14	0.04 - 0.42	0.001
2-3 times a week	0.23	0.42 –	<0.001	0.12	0.02 - 0.53	0.005
Daily		0.96 0.12 -0.41				
Occupational Physical Activity	1	Reference		1	Reference	
Low	0.32	0.22 - 0.45	<0.001	0.17	0.07 – 0.43	<0.001
High						
Physical activity Index status	1	Reference		1	Reference	
Mildly active	0.61	0.42 –	0.009	0.28	0.11 -0.72	0.008
Moderately Active	0.11	0.88	<0.001	0.05	0.01 -0.26	0.001
Highly Active		0.05 – 0.24				

* Adjusted for age, ethnicity, Socio-economic status, Smoking status, consumption of fats, yogurt, Red Meat and vegetables.

DISCUSSION

Etiology of prostate cancer is still not fully understood. There are consistent reports that prostate cancer is more among men aged 60 and above and those with positive family history of disease, however, these factors do not explain the whole variation in its occurrence. Change of lifestyle and urbanization might contribute in increased risk as indicated by many studies in developed countries.¹² Yet, published findings are inconsistent. Current study found a strong association between level of physical activity and higher odds among those with sedentary lifestyle. Men exercising regularly for at least once a week and also active at their work place had lower odds of prostate cancer than men with more sedentary lifestyle. This effect has also followed a dose-response relationship such that with increasing activity level, odds of prostate cancer reduce. There is a biological plausible explanation of the demonstrated relationship also been suggested. Higher level of physical activity may reduce the quantities of free and total testosterone, reduce obesity and enhance immune mechanism,¹³ which collectively would contribute towards prostate cancer protection. Similar relationship was also reported by studies by Friedenreic et al.¹⁴ Andersson et al.¹⁵, Metcalfe¹⁶ and Nilsen et al¹⁷. Nevertheless, since activity levels are also affected by total number of energy intake and other dietary influences and like in current study, effect of physical activity was found to be modified by height, some other studies found the evidence for the observed association inconclusive. Findings of this study should also be interpreted considering its design and methodological limitations. Being a case control design, the study might have limited power to detect association, especially regarding association with dietary exposures. There may be difficulties of recall bias in responses about income level, cigarette smoking; nevertheless, every measure was adopted to ensure the quality of data.

CONCLUSION

Pakistani men with sedentary lifestyle have higher odds of prostate cancer comparatively. Level of physical activity has a dose-response relationship with odds of prostate cancer occurrence, such that the individuals with higher level of physical activity have lower odds of prostate cancer proportionately.

Conflict of Interest: We declare no conflict of interest during this study.

REFERENCES

1. Boyle P, Levin B. World Cancer Report. International Agency for Research on cancer (IARC); 2008.
2. Hsing AW, Chokkalingam AP. Prostate cancer Epidemiology. *Frontiers in Bioscience*. 2006; 11: 1388-1413.
3. Mehrabi S, Rasti M. Normal serum prostate specific antigen levels in men in Yasuj province, Islamic Republic of Iran. *Eastern Mediterranean Health Journal*. 2007 Oct; 5(13): 1190-1194.
4. Kolonel LN. Fat, meat, and prostate cancer. *Epidemiol Rev*. 2001; 23:72-81.
5. Kristal AR, Lampe JW. Brassica vegetables and prostate cancer risk: a review of the epidemiological evidence. *Nutr Cancer*. 2002; 42:1-9.
6. Pourmand G, Salem S, Mehraei A. The risk factors of prostate cancer: A multi-centric case-control study in Iran. *Asian Pacific J Cancer Prev*. 2007; 8: 422-428.
7. Rohrmann S, Linseisen J, Key TJ. Alcohol consumption and the risk for prostate cancer in the European prospective investigation into cancer and nutrition. *Cancer Epidemiol Biomarkers Prev*. 2008; 17:1282-7.
8. Yeole BB. Trends in prostate cancer incidence in India. *Asian Pacific J Cancer Prev*. 2008; 9:141-4.
9. Platz EA, Leitzmann MF, Rifai N, Kantoff PW, Chen YC, Stampfer MJ, Giovannucci E. Sex steroid hormones and the androgen receptor gene CAG repeat and subsequent risk of prostate cancer in the prostate-specific antigen. *Cancer Epidemiol Biomarkers Prev*. 2005; 14:1262-1269.
10. Kristal AR, Lampe JW. Brassica vegetables and prostate cancer risk: a review of the epidemiological evidence. *Nutr Cancer*. 2002; 42:1-9.
11. Bhurgri Y, Kayani N, Pervez S, Ahmed R. Incidence and Trends of Prostate Cancer in Karachi South, '1995- 2002' *Asian Pacific Journal of Cancer Prevention*. 2009; 10-12.
12. Damber JE, Aus G. Prostate cancer. *Lancet*. 2008; 371:1710-21.
13. Lichtenstein P, Holm NV, Verkasalo A. Environmental and heritable factors in

- causation of cancer—analyses of cohorts of twins from Sweden, Denmark and Finland; *N Eng J Med.* 2000; 343: 78-85.
14. Friedenreic CM, Thune I. A review of physical activity and prostate cancer risk. *Cancer Causes Control.* 2001;12:461–475.
 15. Andersson SO, Baron J, Bergstrom R. Lifestyle factors and prostate cancer risk: a case control study in Sweden. *Cancer Epidemiol Biomarkers Prev.* 1996; 5, 509-513.
 16. Metcalfe C, Patel B, Evans S. The risk of prostate cancer amongst south Asian men in southern England: the PROCESS cohort study. *BJU Int.* 2008.
 17. Nilsen TL, Johnsen R, Vatten LJ. Socio-economic and lifestyle factors associated with the risk of prostate cancer. *British Journal of cancer.* 2000;82(7): 1358-1363.