

Is diet a risk factor for benign prostatic hyperplasia and carcinoma prostate?

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ABSTRACT

Objective: To find an association between diet and benign prostatic hyperplasia (BPH) and carcinoma prostate (CaP).

Methodology: Ninety three out of 250 subjects were selected representing the normals, BPH and CaP cases; food frequency questionnaire was duly filled. Food intake was calculated by using food guide pyramid and was categorized as low, moderate and high. In addition to common diets, we studied consumption of reused oil/ghee in our study.

Results: No association of protein, milk and milk products, cereals, fats (saturated/unsaturated/both fats, oil/ghee branded or unbranded), vegetables, fruits and smoked food/barbecue was found with BPH and CaP cases. But there was a significant association between oil/ghee reuse and BPH and CaP.

Conclusion: This study did not find an association between the common diet components and BPH and CaP cases. However a significant association was observed in case of oil/ghee reuse. So it is concluded that commonly used diet components in our setup could not be incriminated as etiological/risk factors for BPH and CaP in our community except reused oil/ghee and hence forth its consumption must be stopped.

KEY WORDS: BPH = Benign Prostatic Hyperplasia, CaP = Carcinoma prostate.

Pak J Med Sci October - December 2010 Vol. 26 No. 4 959-963

How to cite this article:

Naz Z, Anjum S. Is diet a risk factor for benign prostatic hyperplasia and carcinoma prostate?
Pak J Med Sci 2010;26(4):959-963

INTRODUCTION

Prostatic diseases like benign prostatic hyperplasia (BPH) and carcinoma of prostate (CaP) are the most common diseases of old age in males, with CaP

being the most common cancer in Pakistani men.¹ Little is known about the etiology of carcinoma of prostate, but most studies on several risk factors such as age, race, family history, androgens, estrogens and environmental influences have demonstrated positive association.²

Not many researchers on the subject have studied the role of environmental factors in the causation of CaP. Of the published data suggesting a possible role of dietary fat intake in increasing the risk of prostate cancer, a study demonstrating close correlation between average per capita fat intake and prostate cancer mortality around the world, compared Japanese and Chinese men who migrated to United States. This study found a dramatic increase in the incidence of prostatic cancer within one generation, when compared with native counterparts.³ Dietary fatty acids are thought to influence risk in a variety of ways, including altering the serum levels of sex hormones or modulating eicosanoid synthesis and

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- * Received for Publication: January 1, 2010
- * Online Received: July 8, 2010
- * Revision Received: September 2, 2010
- * Revision Accepted: September 4, 2010

affecting tumor cell proliferation; immune response, invasion and metastasis; altering the cell membrane phospholipids; affecting 5- α -reductase type-1 activity, forming free radicals from peroxidation; decreasing 1,25 D₃ levels.⁴ It seems that the consumers of animal fat suffer the greatest risk and in contrast those consuming mainly vegetable fat do not seem to have a significant extra risk of prostate cancer.⁵

Vitamin A which is required for the normal epithelial differentiation, physiological growth, visual functions and reproduction, has been reported to both increase and decrease the risk of prostate cancer. Similarly there is mixed evidence with regards to β -carotene: although most studies have suggested a protective role.⁴

Data from Schwartz *et al*⁶ showed a close inverse relationship between the geographical variation of UV radiation and the incidence of prostate cancer; the more we go towards South more will be the exposure to sun and the less cancer of prostate. The explanation presumably lies in vitamin D; that is produced by the action of sun on our skin. Vitamin D₃ inhibits cell growth both in vitro and in vivo and it has also been shown that vitamin D₃ causes rodent prostate cancer cells to differentiate into a less malignant phenotype and that the expression of the c-myc oncogene is inhibited.⁵

As the expensive treatment of BPH and CaP is a burden for any developing country like ours, it would be more cost effective, if these can be prevented without the requirement of any medication by controlling the dietary intake. This study was designed to determine the association between dietary factors and these two diseases.

METHODOLOGY

For this study 250 subjects were enrolled from out patients department of SIUT (Sindh Institute of Urology and Transplantation), Karachi. Among them, ninety three were selected. Thirty-one were normal, thirty-one were the cases of BPH and thirty-one were the cases of CaP. Age of the subjects was forty years and above.

After obtaining informed consent, food frequency questionnaire was duly filled by a doctor. It contained questions for nutritional assessment which included the amount of intake and the number of times a specific food was consumed. Major food groups reviewed were proteins; milk and milk products; cereals; fats (saturated/unsaturated/both, oil/ghee branded/unbranded); vegetables and fruits. Apart from these smoked food/ barbecue and consumption of reused oil/ghee were also included.

Food guide pyramid which is a graphic representation of the number of servings from the five major food groups needed daily to form a healthful diet was used to calculate the intake of food groups. We used USDA's food guide pyramid⁷ (Figure-1) out of an option of three, i.e. Mediterranean, European and USDA's food guide pyramids. It shows number of servings to be taken per day with flexibility in food choices, making it easier for a person to eat any style of food within this frame work. It was found convenient to use for our study; as the other two pyramids illustrate proportions of foods rather than specific types and amount and also represent cultural eating patterns with limited range of food. The major difference between USDA's food guide pyramid and the other two is their distinction between animal and plant proteins.

To calculate serving amount for a month, the total number of servings of a particular group were added and then divided by the number of days,

$$\text{Serving/month} = \frac{\text{Total number of servings of a food group}}{30}$$

Chi-square test was applied to find an association and significance among the different groups.

RESULTS

Table-I shows the association of protein; milk and milk products; cereals; fats; use of branded/unbranded oil/ghee; saturated/unsaturated/both fats; vegetables; fruits; smoked food/ barbecue and oil/ghee reuse with normal, BPH and CaP cases.

Protein intake: In normal subjects (out of 31), 18 had low, 10 had moderate and 3 had high protein intake. In BPH subjects (out of 31), 11 had low, 15 had moderate and 5 had high protein intake. In CaP subjects (out of 31), 8 had low, 16 had moderate and 7 had high protein intake ($\chi^2=7.38$, $P=0.11$).

Milk and milk products intake: In normal subjects, 19 had low, 11 had moderate, and one had high intake of milk and milk products. In BPH subjects, 21 had low, 6 had moderate and four had high intake of milk and milk products. In CaP subjects, 20 had low, 8 had moderate and three had high intake of milk and milk products ($\chi^2=3.37$, $P=0.49$).

Cereal intake: All the subjects included in each of the three groups were low cereal consumers.

Fat intake: In normal subjects, 13 had low and 18 had moderate fat intake. In BPH subjects, 11 had low and 20 had moderate fat intake. In CaP subjects, 7 had low and 24 had moderate fat intake ($\chi^2=2.7$, $P=0.25$). Regarding the intake of saturated, unsaturated or both fats, in case of normals, 9 used

Table- I: Association of different types of foods with normal, Benign Prostatic Hyperplasia and Carcinoma Prostate Cases.

Types of foods		Intake	Normal (n=31)	BPH (n=31)	CaP (n=31)	Total
Proteins	Low		18 (4.6%)	11 (29.7%)	08 (21.6%)	37
	Moderate		10 (24.3%)	15 (36.6%)	16 (39%)	41
	High		03 (20%)	05 (33.3%)	07 (46.6%)	15
$\chi^2=7.38, P=0.11^*$						
Milk and Milk Products	Low		19 (31.66%)	21 (35%)	20 (33.33%)	60
	Moderate		11 (44%)	06 (24%)	08 (32%)	25
	High		01 (12.5%)	04 (50%)	03 (37.5%)	08
$\chi^2=3.37, P=0.49^*$						
Cereals	Low		31 (33.33%)	31 (33.33%)	31 (33.33%)	93
Fat	Level of fat intake	Low	13 (41.93%)	11 (35.5%)	07 (22.5%)	31
		Moderate	18 (29.03%)	20 (32.2%)	24 (38.7%)	62
$\chi^2=2.7, P=0.25^*$						
Nature	Saturated		09 (27.7%)	11 (33.33%)	13 (39.39%)	33
		Unsaturated	11 (70.74%)	08 (29.62%)	08 (29.62%)	27
		Both	11 (34.37%)	11 (34.37%)	10 (31.25%)	32
$\chi^2=1.42, P=0.84^*$						
Brand (oil/ghee)	Branded		26 (35.61%)	25 (34.24%)	22 (30.13%)	73
		Unbranded	05 (26.31%)	05 (26.31%)	09 (30.13%)	19
$\chi^2=2.01, P=0.37^*$						
Vegetables	Low		31 (34.06%)	30 (32.96%)	30 (32.96%)	91
		Moderate	—	01 (50%)	01 (50%)	02
$\chi^2=1.02, P=0.6^*$						
Fruits	Low		30 (32.60%)	31 (33.69%)	31 (33.69%)	92
		Moderate	01 (100%)	—	—	01
$\chi^2=2.02, P=0.36^*$						
Smoked food/Barbecue	Low		18 (35.29%)	18 (35.29%)	15 (29.4%)	51
		Moderate	05 (35.71%)	05 (35.71%)	04 (28.57%)	14
		High	08 (28.57%)	08 (28.57%)	12 (42.8%)	28
$\chi^2=1.64, P=0.8^*$						
Oil reuse	Yes		08 (19.51%)	16 (39.02%)	17 (41.46%)	41
		No	23 (44.23%)	15 (28.84%)	14 (26.92%)	52
$\chi^2=6.36, P=0.04^{**}$						

*Non-significant, **P < 0.05

Key: BPH = Benign prostatic hyperplasia, CaP = Carcinoma Prostate

saturated fats and 11 used unsaturated fat while 11 used both; in BPH cases, 11 used saturated fat, 8 used unsaturated fat and 11 used both, whereas in CaP cases, 13 used saturated fat, 8 used unsaturated fat and 10 used both ($\chi^2=1.42, P=0.84$). In normal subjects, 26 used branded and 5 used unbranded oil/ghee; in BPH subjects, 25 used branded oil/ghee and 5 used unbranded oil/ghee, whereas in CaP subjects, 22 used branded and 9 used unbranded oil/ghee ($\chi^2=2.01, P=0.37$).

Vegetable intake: In normal subjects, all 31 consumed low vegetable diet. In BPH subjects, 30 consumed low and one had moderate vegetable diet. In CaP subjects, 30 had low vegetable intake and one had moderate vegetable intake ($\chi^2=1.02, P=0.6$).

Fruit intake: In case of normal subjects, 30 had low fruit intake, while one had moderate fruit intake. In BPH and CaP subjects, all had low fruit intake ($\chi^2=2.02, P=0.36$).

Smoked food/Barbecue intake: In case of normal subjects, 18 had low, 5 had moderate and 8 had high smoked food/barbecue intake. In BPH subjects, 18 had low, 5 had moderate and 8 had high smoked food/barbecue intake. In CaP subjects, 15 had low, 4 had moderate and 12 had high smoked food/barbecue intake ($\chi^2=1.64, P=0.8$).

Reuse of Oil/Ghee: In normal subjects, 08 had reused oil/ghee whereas 23 did not. In BPH subjects, 16 had reused oil/ghee and 15 did not. In CaP subjects, 17 had reused oil/ghee and 14 did not ($\chi^2=6.36, P=0.04$).

Statistical analysis showed non-significant results in case of protein; milk and milk products; cereals; fats; use of saturated/ unsaturated/ both fats; branded/unbranded oil/ghee; vegetables; fruits and smoked food/ barbecue, whereas, significant results were found in oil/ghee reuse group.

DISCUSSION

In a developing country like Pakistan, disease prevention should be the mainstay of health care management, as the economy and general population cannot afford the expensive treatment of prostatic or other diseases. The majority of tertiary care hospitals, where cost-effectiveness is a major issue, are neither well geared, nor have enough advanced equipment and resources, to adequately treat and manage the ever increasing patient load. Hence, research on possible etiological and risk modifying factors, including dietary factors that may lead to BPH and CaP needs to be encouraged.

This study focused on dietary factors and studied them in various groups. In case of protein group, the present study failed to find an association between meat and prostate carcinoma. Similar were the findings by Philips and Snowdon.⁸ The reason for this similarity between the present study and that of Philip and Snowdon is probably that the later study involved Adventist individuals whose dietary habits considerably matched with the dietary habits of our studied population. However, Mills *et al*⁹ found a suggestive relationship between reported consumption of meat, poultry or fish as a composite variable and prostate cancer risk. The difference may be related to their consideration of the total calorie intake; whereas in our case we have taken into account the quantity and actual number of servings. Moreover, their study population consisted of non-Hispanic whites, whose life style and eating habits are much different than the population we studied.

In this study no association of milk and its products was found with BPH and CaP cases. The results of few studies that we were able to find relevant to this dietary group^{10,11} do not match with ours. The reasons probably being racial and climatic influences, apart from difference in the methods used for recording dietary habits.

Cereals decrease the absorption of harmful nutrients by decreasing their gut transit time and are thus thought to have a protective role. In our study, analysis of cereal group was not satisfactorily possible because all the groups belonged to the category of low cereal intake. According to Palmer¹² whole gram



Figure-1: The Food Guide Pyramid

Key: o Fat (naturally occurring and added), V (Sugars (added)). These symbols show fat & added sugars in food. Ref: US Department of Agriculture. The food guide pyramid. Human Nutrition Information Service 1992. (Publication HG 252).⁷

or grain cereal should be included in the diet as this practice reduces the risk of cancer.

There was no association of fat group with BPH and CaP cases and our findings match with the study of Hanash *et al*¹³ whose study was based on typical Saudi diet, which is rich in saturated fat content. Kroes *et al*¹⁴ and Simopoulos¹⁵ found that dietary fat had no influence on the incidence of prostate cancer in animal models. Graham¹⁶, Kolonel *et al*¹⁷ and Mettlin *et al*¹⁰ found positive associations of CaP and fat intake.

Regarding the vegetable group Moyad and Lowe¹¹ have reported the positive impact of vegetables on BPH. This could be because the patients were asked to select one of the given eight options regarding the frequency of intake, which is a different method of data collection than the one we employed. The controls in this study were not completely free from any other disease and they considered the dietary pattern of their respective community only based on the ethnic distribution of risk factors. Our study on the other hand is broad based as SIUT is one of the few renal transplant and kidney diseases centers in Pakistan and receives patients from different regions of this country. Another study by Graham¹⁶ found increase in prostate cancer with increased intake of cruciferous vegetables whereas Mills *et al*⁹ found strong protective effect of vegetables. In general scientific opinion vegetable consumption has not been strongly associated with prostate cancer risk in animal model.¹⁸

Our study failed to demonstrate an association of fruit intake with BPH and CaP and similar report

was given by Poon and McVary.¹⁹ Graham¹⁶ found increase in CaP with increased fiber intake, but the effect was more pronounced and statistically significant in older age group. Mills *et al*⁹ have demonstrated strong protective effects of fruits with increased intake.

In our study, smoked food/ barbecue was also not found to be associated with BPH and CaP cases. According to Palmer¹² barbecue /smoked food is highly mutagenic. Boyle *et al*⁴ have reported that meat produces carcinogens and heterocyclic amines when cooked at high temperatures and also produces polycyclic hydrocarbons when grilled over flames. The reason for not finding any such association in our study could be that the sample size was too small. Moreover, the practice of smoked food/barbecue consumption in our community is not a regular feature and is restricted to only festive occasions possibly due to economic factors. Even if some people do enjoy such foods, more frequently, the quantity consumed is low to moderate.

This study did find significant association between the consumption of reused oil/ghee and BPH and CaP cases ($P = 0.04$). The possible reason may be that when oil/ghee is kept in open air and repeatedly heated and cooled in metal containers, the oxidation of hydrocarbons results in the formation of harmful components, which may include free radicals and other carcinogens. We were not able to find any other study which could support this finding.

The non-significant association of other risk factors with BPH and CaP cases in our study, does not preclude association, but may be due to the small number of subjects recruited for the study. It is concluded that commonly used diet components in our setup could not be incriminated as etiological/risk factors for BPH and CaP in our community except reused oil/ghee and hence forth its consumption must be stopped.

It is recommended that since CaP is the first leading cause of cancer deaths in Pakistani males, bigger studies be conducted to better highlight associations between environmental factors and prostate disease and nutrition awareness education should be included as an integral component in the public health education programs in the developing world.

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