AASCIT Journal of Health
2015; 2(2): 7-12
Published online May 10, 2015 (http://www.aascit.org/journal/health)

Keywords
Benign Prostatic Hyperplasia,
Dietary Factors,
Food Frequency Questionnaire,
Fatty Acids

Received: April 14, 2015
Revised: April 27, 2015
Accepted: April 28, 2015

Dietary Factors and Prostate Benign Hyperplasia in Western Algeria

Abdelkrim Berroukche[1, 2, *], Malika Bendahmane[1], Kadda Hachem[3], Kaddour Ziani[3], Abdelkrim Badreddine Kandouci[1]

[1]Research Laboratory of Environment and Health (RLEH), Faculty of Medicine, University Hospital - Complex (UHC), Sidi-Bel-Abbes, Algeria
[2]Research laboratory of Water Sources and Environment, Department of Biology, Faculty of Sciences, Tahar Moulay University, Saida, Algeria
[3]Department of Biology, Faculty of Sciences, Tahar Moulay University, Saida, Algeria

Email address
kerroum1967@yahoo.fr (A. Berroukche)

Citation
Abdelkrim Berroukche, Malika Bendahmane, Kadda Hachem, Kaddour Ziani, Abdelkrim Badreddine Kandouci. Dietary Factors and Prostate Benign Hyperplasia in Western Algeria. *AASCIT Journal of Health.* Vol. 2, No. 2, 2015, pp. 7-12.

Abstract
Background. Benign prostatic hyperplasia (BPH) is the most common prostate disease in elderly men. A few risk factors have been established for BPH. Aim of this study is to assess the association between dietary factors and BPH. Methods. A retrospective study was performed in Western Algeria during 2006-2012. A total of 320 cases, with histological BPH confirmed, and 320 controls old over 50 years were included in this study. A food frequency questionnaire was used to assess patients' dietary habits. The odds ratio (ORs) and 95 % confidence intervals (CIs) were estimated by conditional multiple logistic regression models. Results. A significant positive association of more frequent intakes with an increasing BPH risk was found for red meat (OR 2.4 for the greatest versus lowest quartile), milk (OR 1.9), dairy products (OR 2.0). Inverse associations were observed for fish (OR 0.8), olive oil (OR 0.6), tomato (OR 0.8), green tee (OR 0.7) and coffee (OR 0.6). Conclusion. The results of this study suggest a role for dietary habits on the risk of BPH. a diet rich in fatty acids that may have a disadvantage effect in Algerian population.

1. Introduction

Benign prostatic hyperplasia (BPH) is a major problem of public health and common among men older than 50 years [1]. Little is known about its risk factors, including diet and other lifestyle habits [2]. Age appears to have an important role in the development of BPH, and some studies [3] have attributed this association to androgens and growth factors, related to age. Few studies have examined the associations of socio demographic factors with BPH (eg, education, anthropometric factors, physical activity and tobacco smoking). A few studies have suggested the importance of polyunsaturated fatty acids. Higher intakes of meat [4], milk and dairy products [4,5] were associated with a greater risk of BPH while vegetables and fruit has been reported to have a protective effect against BPH [4]. It should be noted a lower prevalence of BPH among Asian populations, and suggesting a potential role for environmental and lifestyle factors [6]. Because of the lack of studies between dietary factors and the risk of BPH among men in African countries, we aimed to assess a possible association of diet with BPH in population of patients recruited in two hospitals of western Algeria.

2. Materials and Methods

The study was performed in western Algeria from January 2006 to December 2012. Among a total of 375 incident patients, who had a confirmed histological BPH, 55 patients could not participate in this study. The final group consisted of 320 BPH cases. Hundred ninety six cases were obtained from the Department of Urology of Sidi-bel-Abbes University Hospital Center (UHC) and 124 cases from the Department of Urology of Saida Hospital. The age range was 50–74 years. During the same period, a total of 320 controls were selected from the departments of respiratory diseases, ophthalmology and dermatology of the same hospitals as the cases. Controls were matched to cases in frequency of 1:1 by age (± 5 years). The distribution of controls by disease category was as follows: asthma (41.7%), cataract (50.2%) and dermatosis (8.1%). Exclusion criteria for controls were having other prostatic diseases or malignant tumours, being under dietary restriction and patients in critical conditions. This study was approved by the scientific committee of Research Laboratory of Environment and Health (RLEH) of Sidi-Bel-Abbes UHC. Informed consent was given by all subjects. Epidemiological and dietary data were obtained using a standard questionnaire. Dietary information was obtained by a quantitative history approach in which subjects were asked about their usual frequency of intake and portion size of a list of 20 main food items including beverages, representative of usual diet of the Algerian population. The technique was similar to the one used by Czopp and Serfati, in 2007 **[7]**, although somewhat modified and adapted to suit the Algerian diet. This questionnaire was not previously validated but was studied regarding its reproducibility. For each food item, the patient indicated mean intake frequency and the amount consumed over the past year or the year prior to onset of symptoms. For a more adequate evaluation of quantities consumed, we have used in interview photographs of food items in different portion sizes of known quantity. As measurements of consumption, standard cups, spoons and slices were used. The following food groups were analyzed in this study:

– red meat, i.e. beef and lamb;
– fish, i.e. sardine;
– milk;
– dairy foods, i.e. cheese, butter and ice cream;
– olive oil;
– dry vegetables, i.e. beans and lentils;
– green-yellow vegetables, i.e. tomato and cauliflower;
– fruits, i.e. grenade and dates;
– beverages, i.e. green tea, coffee and soft beverages (soda water and lemonade).

Descriptive statistics were calculated using SPSS 11.5 package. Groups of cases and controls were described by their number, mean, median and standard deviation (SD). The characteristics of cases were compared to those of controls using the chi-square ($\chi 2$) or Students t-test. Adjusted odds ratios (ORs) and 95 % confidence intervals (CI) of foods and beverages for BPH were calculated by conditional logistic regression models with adjustment for tobacco smoking and total energy intake. P-value < 0.05 was considered statistically significant. Because some controls were selected from patients with smoking related diseases, such as cataracts and respiratory diseases, we adjusted for tobacco smoking in the analyses. Energy adjustment was performed by a logistic regression model that used total energy as a confounding factor. To facilitate statistical analysis, food items and beverage intakes were classified into quartiles on the basis of their distribution among control subjects. The lowest quartile, with an OR of 1.00, was the reference quartile throughout the analysis.

3. Results

Table 1. *sic and demographic characteristics of BPH cases and controls.*

Variables	Cases n = 320)	Controls n = 320)	P-value
Age (years) ean (± SD)	70 ± 8.7	69.1 ± 6.4	0.08
Median	70	69	
Residence, n (%) rban	212 (66.2)	226 (70.6)	
Rural	108 (33.8)	94 (29.4)	0.12
Education, n (%)			
No scolarity	74 (23.1)	68 (21.2)	
Primary	156 (48.7)	120 (37.5)	
Secondary	42 (13.1)	78 (24.3)	
University	48 (15.1)	54 (17.0)	0.4
Occupational activity, n (%)			
Work at office	206 (64.3)	182 (56.8)	
Manual work	114 (35.7)	138 (43.2)	0.03
Tobacco smoking, n (%)			
Non smoker	110 (35,8)	68 (40)	
Former smoker	124 (43,4)	114 (35,6)	
Smoker	86 (20,8)	78 (24,4)	0,75

Sociodemographic characteristics of two groups of patients and controls are described in Table 1. There is no significant difference between cases and controls (*P-value* > 0.05). Cases were not much older than controls (70 *vs.* 69.1 years). Cases, lived more frequently inside towns of Sidi-Bel-Abbes and Saida, were more frequently urban residents (66.2 %).

Most cases had a low level of education, particularly in the primary level with a rate of 48.7 %. Although these differences were not statistically significant (*P-value* > 0.05), cases were less educated than controls. For the type of occupational activity, cases show a high rate in the type of work that's office work and they worked more at office than controls (64.3 *vs.* 56.8 %) (*P-value* < 0.05).

Adjusted Odds ratios (ORs) of BPH for groups of fats are shown in Table 2. In conditional logistic regression models with terms of total energy intake and tobacco smoking as confounding factors, intake in the uppermost quartile was compared with the bottom quartile. These foods (red meat, fish, milk and dairy products) were selected because they were related to the previous research that suggested fats might be associated with BPH. As shown in Table 2, consumption of fish and olive oil was associated with decreased risk of BPH but no significantly (*P-value* > 0.05). ORs of the fourth vs. first quartile and 95 % CI were 0.8 (0.1 –1.7) for fish and 0.6 (0.1 – 1.2) for olive oil. Consumption of red meat was significantly associated with increased risk (OR of the fourth vs. first quartile was 2.4, 95 % CI 1.1 – 3.7) (*P-value* < 0.01). Total energy intake and consumption of milk showed a modest increase in risk. ORs of the fourth vs. first quartile were 1.6 (0.5-2.9) for total energy intake and 1.9 (1.2-2.3) for milk. When dairy products were examined, there was also positive association that's highly significant with increased risk of BPH (OR 2.0, 95 % CI 1.1-3.7) (*P-value* < 0.001*)*.

Table 2. *Adjusted Odds ratios (ORs) and 95% CI of fat intakes for BPH.*

Variables	Cases (n = 320)	Controls (n = 320)	OR	95 % CI	*P-value*
Total energy intake (kcal/day) ≤ 1520	80	76	1		
1521-1810	72	114	0.4	0.4-1.1	
1811-2250	88	74	1.3	0.6-2.4	
>2250	80	56	1.6	0.5-2.9	0.4
Red meat (gr/day) < 25.1	54	52	1		
25.1-65.2	74	64	1.3	0.3-2.1	
65.2-110.8	130	170	0.7	0.2-0.8	
> 110.8	62	34	2.4	1.1-3.7	< 0.01
Fish (gr/day) < 35.3	146	140	1		
35.3-65.7	90	94	1.1	0.4-1.6	
65.7-121.4	50	44	1.3	0.3-2.2	
> 121.4	34	42	0.8	0.1-1.7	0.8
Milk (ml / day) < 20	84	90	1		
20-100	62	98	0.5	0.3-0.8	
100-200	56	42	1.6	0.8-2.4	
>200	118	90	1.9	1.2-2.3	0.2
Dairy products (gr / day) < 7.3	74	76	1		
7.3-100	94	108	0.6	0.3-1.3	
100-200	72	94	0.9	0.2-1.5	
> 200	80	42	2.0	1.1-3.7	< 0.001
Olive oil (gr / day) < 7.3	104	104	1		
7.3-50.2	121	90	1.4	0.8-2.4	
50.3-100	54	66	0.7	0.2-1.4	
>100	40	60	0.6	0.1-1.2	0.03

ORs and 95% CI were calculated by conditional logistic regression models with adjustment for total energy intake and tobacco smoking.

ORs for green-yellow vegetable, dry vegetable and fruit intakes are shown in Table 3. Inverse associations with risk of BPH were observed for green- yellow vegetables (tomatoes and cauliflower), dry vegetables (beans and lentils) and fruits (grenade and dates). A modest decreased risk was found in the highest quartile for tomato with OR of 0.8 (95 % CI 0.3-1.3) (*P-value* = 0.06). Whereas consumption of cauliflower was significantly associated with decreased risk with OR of 0.6 (95 % CI 0.1 – 1.1) (*P-value* < 0.01). Similarly, dry vegetables showed a negative association with the risk of BPH. This protective association was not significant (*P-value* = 0.6) with OR of 0.7 and 95 % CI (0.1 – 1.5). With increasing intake of fruits, the risk of BPH tended moderately to decrease. ORs were 0.5 (95 % CI 0.1-1.6) (*P- value* = 0.1) for grenade and 1.1 (95 % CI 0.3 – 1.4) (P-value = *0.22*) for dates.

Table 3. *Adjusted Odds ratios (ORs) and 95% CI of green-yellow vegetable, dry vegetable and fruit intakes for BPH.*

Variables	Cases (n = 320)	Controls (n = 320)	OR	95 % CI	*P-value*
Green –yellow Vegetables Tomato (gr / day)					
< 27.6	68	66	1		
27.6-43.9	116	88	1.6	0.7-2.3	
44-100.0	86	96	0.7	0.4-1.5	
> 100.0 Cauliflower (gr /day)	50	70	0.8	0.3-1.3	0.06
< 20.4	46	44	1		
20.4-62.7	134	92	1.9	1.2-2.7	
62.8-100	76	84	0.8	0.2-1.4	
>100	64	100	0.6	0.1-1.1	< 0.01
Dry vegetables Beans and lentils (gr/day)					
< 14.2	92	88	1		
14.2-27.6	70	54	1.4	0.6-2.8	
27.7-42.8	36	42	1.2	0.3-2.1	
> 42.8	122	136	0.7	0.1-1.5	0.6
Fruits Grenade (gr / day) < 21.4	72	80	1		
21.4-64.2	102	80	1.1	0.9-2.3	
64.3-107	90	80	1.3	0.4-1.7	
> 107.1 Dates (gr /day)	56	80	0.5	0.1-1.6	0.1
< 30.7	88	86	1		
30.7-62.1	84	74	1.3	0.6-2.0	
62.2-100.0	78	82	0.7	0.4-1.6	
> 100.0	70	78	1.1	0.3-1.4	0.22

ORs and 95% CI were calculated by conditional logistic regression models with adjustment for total energy intake and tobacco smoking.

ORs of beverage intakes are shown in Table 4. Consumption of green tea and coffee showed a negative association with risk of BPH, but were not significant (*P-value* > 0.05). ORs and CI 95 % were 0.7 (0.2 – 1.6) for green tea and 0.6 (0.1 – 1.5) for coffee. Soft drinks were significantly associated with increased risk of prostate cancer (*P-value* = 0.01). OR and CI 95% of the highest quartile were 1.7 (1.2 – 2.5).

Table 4. *Adjusted Odds ratios (ORs) and 95 % CI of beverage intakes for BPH.*

Variables	Cases (n = 320)	Controls (n = 320)	OR	95 % CI	*P-value*
Green tea (cups / day) ≤ 1	84	82	1		
2-3	114	90	1.5	0.7-2.3	
4-6	86	92	0.8	0.3 -1.5	
> 6	36	56	0.7	0.2-1.6	0.06
Coffee (cups / day) ≤ 1	110	112	1		
2-3	168	152	1.4	0.3-2.1	
> 3	42	56	0.6	0.1-1.5	0.1
Soft drinks (cups / days) ≤ 1	112	108	1		
2- 3	34	58	0.7	0.1-1.1	
4- 5	72	84	0.9	0.4-1.6	
> 5	102	70	1.7	1.2-2.5	0.01

ORs and 95% CI were calculated by conditional logistic regression models with adjustment for total energy intake and tobacco smoking.

4. Discussion

The results of our work, based on a large case-control study performed on BPH, provide an overview of the correlations of BPH with food habits in North Africa. Even in the absence of any definite associations, our results suggest that diet has a role in the risk of BPH. Results of the present study suggested that the prevalence of BPH in Algerian men might be related to higher intake of poly-unsaturated fatty acids found mainly in red meat, milk and dairy products. Recently, Algerian men have a tendency to eat frozen red meat and other foods high in fat imported from industrialized countries. This may expose population at high risk of BPH. An increased risk of BPH was found in relation to red meat, milk and dairy products consumption. An inverse association, although not statistically significant, was observed for fish and olive oil intakes. In a cohort study of American men with Japanese ancestry living in Hawaii, 846 cases of surgically treated BPH were identified during 19 years of follow-up [8]. Many foods were investigated, but only beef intake appeared to be important. The elevated relative risks for beef were statistically insignificant, although there was a trend across tertiles of intake [8] ($P < 0.05$). No association with animal foods was reported in the Greek case- control study [9]. However, in that study, an inverse association, although not statistically significant, was observed for red meat intake [9]. The poly-unsaturated fatty acid composition (linoleic and linolenic acids) of the diet influenced the levels of endogenous cholesterol, which is involved in the synthesis of steroid hormones, and associated

with BPH risk [9,10]. The difference between our results and those of previous studies [9] may have been because of different correlates of linoleic, linolenic, and other polyunsaturated fatty acid consumption in different populations, but also because of bias or random variation, given the moderate association in all studies. The role of fatty acids in BPH needs further investigation and clarification. A role for dairy products in the development of BPH appears feasible, given results some studies [4,5]. Increased dairy product intake has been consistently reported as a risk factor for prostate cancer, possibly through increased serum calcium levels suppressing vitamin D production [11], or an adverse effect from the fat content of dairy products. The results, in our study, suggest that a dietary pattern characterized by a high intake of green-yellow and dry vegetables, and fruits confers a lower risk of BPH or protective role against this disease. A decreasing risk of BPH for high consumptions of yellow and green vegetables was reported by a small Italian case-control study [9]. Two studies investigated diet and BPH risk in men of Asian ancestry. An early Japanese case-control study of 100 BPH cases reported increased risk ratios ($P < 0.05$) for irregular intakes of green and yellow vegetables [4] (relative risk 3.91). The largest reduction in risk was for green-yellow vegetables, implying that carotenoids might play a role in preventing prostate enlargement. However, other vegetables also had significant effects, suggesting that other factors present in vegetables, or their combinations, might be protective [12]. Similarly inconsistent findings have been observed for fruit consumption. No association between total fruit consumption and BPH was observed in data of this previous study, while the Greek case-control study [13] found a protective effect for fruit consumption. This may be related to flavonoids or other micronutrients present in citrus fruit [14] but also represents a specific indicator of a favorable diet for BPH. In this study, green tea and coffee intakes showed no significant reduction in the risk of BPH. Australian epidemiological study has shown prostate cancer preventive effects of epigallocatechin-3-gallate (EGCG), a molecule present in green tea [13]. Inconsistent findings have also been shown in previous studies [15] on the role of coffee on BPH risk. Our study results showed a positive association of coffee with BPH. Coffee contains many biologically active compounds, including caffeine and phenolic acids, which have potent antioxidant activity and can affect glucose metabolism and sex hormone levels. Because of these biological activities, coffee may be associated with a reduced risk of prostate cancer [16].

5. Conclusion

Although the results of this study are consistent with other studies, BPH risk in this study does not appear to be strongly associated with food intakes. But even as, our results suggest a role for dietary habits on the risk of BPH. In particular, a diet rich in fatty acids may have a disadvantage effect. Research is limited by the methodological problems. Additional investigations would be useful to confirm the results of the present study.

Acknowledgement

The authors thank the members of research laboratory of environment and health of Sidi-Bel- Abbes UHC. The authors thank doctors for their great contribution during interviews with patients, as the medical staff who helped in identifying and contacting patients and finally all men who agreed to participate in this study.

References

[1] Andersson SO, Rashidkhani B, Karlberg L, Wolk A, Johansson JE. Prevalence of lower urinary tract symptoms in men aged 45–79 years: a population-based study of 40 000 Swedish men. BJU Int 2004, 94: 327–331.

[2] Suzuki S, Platz EA, Kawachi I, Willett WC, Giovannucci E. Intakes of energy and macronutrients and the risk of benign prostatic hyperplasia. Am J Clin Nutr 2002, 75: 689–697.

[3] Signorello LB, Tzonou A, Lagiou P, Samoli E, Zavitsanos X, Trichopoulos D. The epidemiology of benign prostatic hyperplasia: a study in Greece. BJU Int 1999, 84: 286–291.

[4] Araki H, Watanabe H, Mishina T, Nakao M. High-risk group for benign prostatic hypertrophy. Prostate 1983, 4 : 253–264.

[5] Lagiou P, Wuu J, Trichopoulou A, Hsieh C, Adami H, Trichopoulos D. Diet and benign prostatic hyperplasia: a study in Greece. *Urology* 1999, 54 : 284–290.

[6] Denis L, Morton MS, and Griffiths K. Diet and its preventive role in prostatic disease. Eur Urol 1999, 35: 377–387.

[7] Czopp A, Serfati M. Enquête sur l'alimentation des étudiants. Accessed 2007 June 5, http://www.siumpps.univparis5. Fr.

[8] Chyou PH, Nomura AMY, Stemmermann GN, Hankin JH. A prospective study of alcohol, diet, and other lifestyle factors in relation to obstructive uropathy. Prostate 1993, 22: 253–264.

[9] Bravi F, Bosetti C, Dalmaso L, Talamini R, Montella M, Negri E. Food groups and risk of benign prostatic hyperplasia. Urology 2006, 67: 73–79.

[10] Dorgan JF, Judd JT, Longcope C, Brown C, Schatzkin A, Clevidence BA. Effects of dietary fat and fiber on plasma and urine androgens and estrogens in men: a controlled feeding study. Am J Clin Nutr 1996, 64: 850–855.

[11] Wolk A. Diet, lifestyle and risk of prostate cancer. Acta Oncologica 2005, 44: 277–281.

[12] Ambrosini GL, De Klerk NH, Mackerras D, Leavy J, Fritschi L. Dietary patterns and surgically treated benign prostatic hyperplasia: a case control study in Western Australia. BJU International 2007, 101: 853-860.

[13] Doumerc N. Thé vert et cancer de prostate. Actualité du Moment 2006, 2: 11–13.

[14] Bosetti C, Micelotta S, Dal Maso L, Talamini R, Montella M, Negri E. Food groups and risk of prostate cancer in Italy. Int J Cancer 2004, 110: 424–428.

[15] Gass R. Benign prostatic hyperplasia: the opposite effects of alcohol and coffee intake. BJU Int 2002, 90: 649–654.

[16] Wilson KM, Kasperzyk JL, Rider JR, Kenfield S, van Dam RM, Stampfer MJ. Coffee consumption and prostate cancer risk and progression in the health professionals follow-up study. J Natl Cancer Inst 2011, 103: 1–9.