

Case–control study of risk factors for prostate cancer

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Summary One hundred and one patients with histologically confirmed prostate cancer and 202 hospital controls individually matched by age (± 2 years), hospital admittance and place of residence, were interviewed during the period 1990–94 in two towns in central Serbia (Yugoslavia). In an analysis using multivariate logistic regression, the following factors were significantly related to prostate cancer: (1) occupational physical activity during the year preceding the disease [odds ratio (OR)=3.87, 95% confidence interval (95% CI)=2.09–7.16]; (2) occupational exposure to asbestos, steel, dyes and lacquers, bitumen, pitch, iron, nickel, lead, fertilizer and certain other agents (OR=2.13, 95% CI=1.05–4.32); (3) nephrolithiasis (OR=4.52, 95% CI=1.34–15.30); (4) 'other' diseases in medical history such as chronic bronchitis, chronic rheumatic diseases, hypertension, cardiomyopathy, diabetes mellitus, renal diseases, eye diseases and tuberculosis (OR=3.14, 95% CI=1.56–6.33); (5) a greater number (≥ 3) of brothers (OR=2.08, 95% CI=1.35–3.22); and (6) greater numbers (≥ 8) of sexual partners (OR=2.24, 95% CI=1.13–4.44). Marital status, age at first marriage, educational level, age at first sexual intercourse, frequency of sexual intercourse, venereal diseases, tonsillectomy, appendectomy, hernia inguinale and hydrocele, anthropometric characteristics, smoking history, sport and recreational activities and family history of prostatic neoplasms were not found to be independently related to prostate cancer.

Keywords: prostate cancer; epidemiology; risk factors

Prostate cancer is one of the commonest cancers in men, although there are great international and ethnic variations in incidence and mortality (Jensen *et al.*, 1990; Muir *et al.*, 1991). During the period 1969–90 in central Serbia (Yugoslavia), prostate cancer mortality was the fourth highest in rank among all malignant tumours.

Hormonal, sexual, occupational, genetic, dietary and other factors have been suggested as aetiological factors, but relevant epidemiological findings have not been consistent in these respects.

The aim of the present study was to examine several factors that have been suggested to be associated with prostate cancer development.

Materials and methods

Cases consisted of incident prostate cancers diagnosed between January 1990 and December 1994 in two towns in central Serbia (Kragujevac and Cuprija). Out of 141 patients with histologically confirmed clinical prostate cancer, 12 persons could not be interviewed as they gave incorrect addresses, nine patients refused to participate, ten patients could not be interviewed because of their ill-health and nine patients had died. The final group consisted of 101 prostate cancer patients.

For each case two hospital controls were chosen among patients confirmed as having neither prostate cancer nor other prostate diseases. Those with other malignancies were also excluded. All selected controls were interviewed; no one refused to participate. The most frequent diagnosis among the controls were injuries, asthma, pneumonia, peptic ulcer and cholecystitis. Cases and controls were individually matched by age (± 2 years), hospital admittance and place of residence.

During the interview, information was recorded on marital

history, educational and occupational histories, sexual activities, smoking habits, medical history (personal and family) and on some anthropometric characteristics. Data about diet were also collected, but are not reported in this paper. The interviews were usually conducted in the hospital (on admission, after operation or after control examination), but occasionally elsewhere.

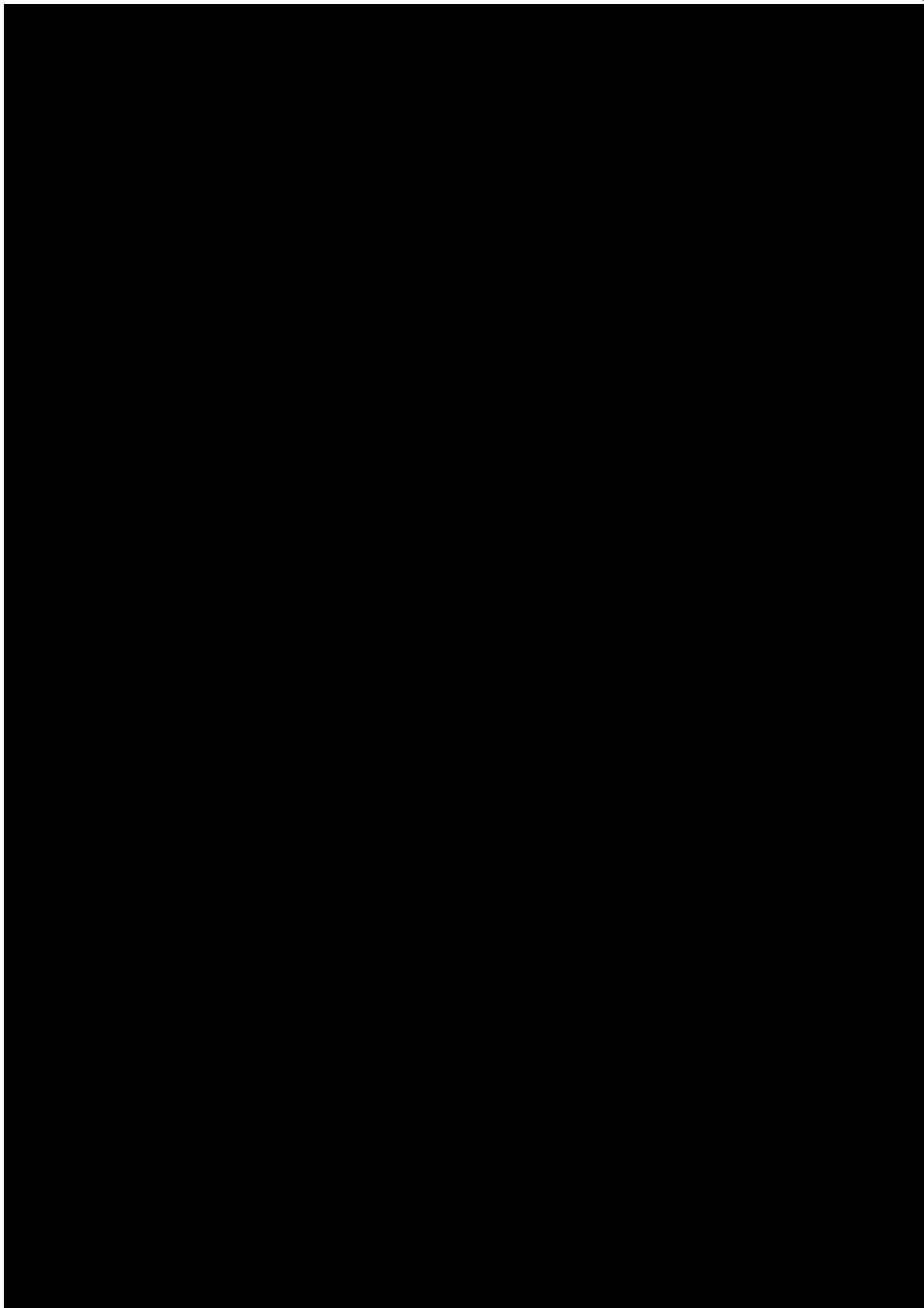
In the statistical analysis, univariate and multivariate logistic regression methods were applied. For all calculations an SPSS computer program was used.

Results

One hundred and one patients and 202 controls were matched according to age, hospital admittance and place of residence. The mean age of cases was 70.5 (standard deviation, s.d. 10.46) and 71.50 (s.d. 7.69) for controls. About half the participants (48%) lived in urban areas and half (52%) in rural areas. Both cases and controls had lived over 50 years in their present area of residence.

In the univariate logistic regression analysis, neither marital status nor age at first marriage was associated with prostate cancer. Only one control had never been married, and the mean age at first marriage was about 22 years for all participants. Cases and controls did not differ in educational level or in the main categories of occupation. Significant differences were found for certain occupational exposure (exposure to asbestos, steel, dyes and lacquer, bitumen, pitch, iron, nickel, lead, fertilizer and so on) ($P=0.012$) and for occupational physical activity during the year preceding the disease ($P=0.000$) (Table I). Cases and controls did not differ in their occupational physical activities during the second, third or fifth decades nor in their sport and recreational activities.

Age at first sexual intercourse was similar for cases and controls. Having eight or more sexual partners was reported by 24.9% of cases and 12.9% of controls ($P=0.011$). Having sexual intercourse seven or more times per week was more frequently reported by cases for the third decade (the difference was not significant) and for the fifth decade of their life ($P=0.001$). During the year preceding the disease,



(about 19 years). The number of brothers was significantly greater in cases compared with controls ($P=0.002$). There was no difference in the number of sons.

More cases (17.8%) than controls (4.0%) had family members with prostate cancer ($P=0.002$), this malignant tumour being the most frequent in fathers of both cases and controls (Table V).

All variables that according to univariate analysis were related to prostate cancer at a significant level of ≤ 0.10 were included in the multivariate logistic regression model. According to multivariate analysis the following factors were significantly related to prostate cancer: occupational physical activity during the year preceding the disease, specific occupational exposure, nephrolithiasis, 'other diseases', greater number (≥ 3) of brothers and greater number (≥ 8) of sexual partners (Table VI). Independent significant relationship of these variables with prostate cancer remained after control for dietary factors.

Discussion

Two major hypotheses of prostate cancer aetiology have been suggested: sexual transmission by an infectious agent and hormonal stimulation of prostatic tissue by testosterone. A number of investigations have compared cases and controls with regard to sexual factors (Nomura and Kolonel, 1991). Certain studies found that prostate cancer patients became sexually active at an earlier age (Honda *et al.*, 1988), and had more sexual partners (Krain, 1973; Steel, 1971), had higher frequency of sexual intercourse or venereal disease (Honda *et al.*, 1988; Ross *et al.*, 1987), or a higher fertility (Armenian *et al.*, 1975). In the present study, having eight or more sexual partners showed an association with prostate cancer; only four cases reported a history of venereal disease, but this variable was not independently related to prostate cancer. More sexual partners and a history of venereal disease support the infectious agent hypotheses rather than other components of sexual activity.

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