The prevalence of cardiovascular risk factors in male patients who have lower urinary tract symptoms

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Objectives To assess the prevalence of cardiovascular risk factors in men presenting with lower urinary tract symptoms, and their possible correlation with the severity of such symptoms.

Design Retrospective cohort study.

Setting Specialty clinic, Hong Kong.

Patients A total of 617 men presenting with lower urinary tract symptoms between April 2005 and October 2006.

Main outcome measures Presence of cardiovascular risk factors inferred from the prior and current medical and social history as well as physical examination and investigative findings, among patients with International Prostatic Symptom Scores of different severity.

Results Of 617 patients, 268 (43%) had known hypertension and 318 (52%) had a history of smoking. According to the World Health Organization criteria for Asian populations, 396 (64%) patients were considered to be overweight (body mass index ≥23 kg/m²). A total of 178 (29%) patients were either known to have or were diagnosed to have dysglycaemia during workup. For dyslipidaemia and hyperuricaemia, the corresponding figures were 331 (54%) and 191 (31%). In total, 264 (43%) patients were newly diagnosed as having dysglycaemia, dyslipidaemia, or hyperuricaemia. Logistic regression indicated that only hyperuricaemia and a smoking history were significant predictors of moderate-to-severe lower urinary tract symptoms (International Prostatic Symptom Score ≥8), with respective adjusted odds ratios of 2.20 (95% confidence interval, 1.12-4.31; P=0.022) and 2.11 (1.24-3.57, P=0.006). Patients with moderate-to-severe International Prostatic Symptom Scores had a statistically higher chance of having at least one cardiovascular risk factor during assessment (P=0.001).

Conclusions Cardiovascular risk factors were prevalent in male patients who had lower urinary tract symptoms; a large portion of these cardiovascular risk factors were not recognised until their urological consultations. Patients with moderate-to-severe lower urinary tract symptoms (International Prostatic Symptom Score ≥8) had statistically higher chances of having more cardiovascular risk factors.

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Introduction

Cardiovascular disease is one of the leading causes of non-cancer death in adults. Although advances in medicine have decreased the related mortality,[1,2] prevention is still the best approach.[3] Early interventions to combat risk factors have proved effective in decreasing both the incidence of and mortality from cardiovascular disease.[4-8] However, the well-recognised reluctance of men to seek health care is a major obstacle to the early recognition and management of such risks. Nonetheless, when men do seek medical advice, they frequently present with urological symptoms, and it is suggested that urologists can play a key role in men's overall health.[9] Hence, in April 2005 we initiated a screening programme for cardiovascular risk factors in patients presenting with lower urinary tract symptoms (LUTS). The aims of this study were to assess the prevalence of those factors in our patients, and to evaluate any correlation between them and the severity of LUTS.

下尿道症狀的病人心血管風險因素的現患率

目的 評估下尿道症狀病人心血管風險因素的現患率及與下尿道症狀嚴重性的關係。

設計 回顧隊列研究。

安排 專科門診，香港。

患者 2005年4月至2006年10月期間，617名因下尿道症狀求診的男性。

主要結果測量 國際前列腺症狀評分表顯示出不同嚴重程度的下尿道症狀病人中，從他們過往和現時的病歷紀錄，以及身體檢查和研究結果，得出心血管風險因素的現患率。

結果 617名病人中，268（43%）及318（52%）人分別有高血壓或吸煙史。根據世界衛生組織對亞洲人的準則，396（64%）名病人被歸納為超重（即體重指數≥23 kg/m²）。已知或在求診時被診斷患上血糖異常的病人有178人（29%）。已知或被診斷患上血脂異常及高尿酸分別為331人（54%）及191人（31%）。共有264（43%）名病人被新診斷患有血糖異常、血脂異常或高尿酸。回歸方程顯示只有高尿酸及吸煙史與中度至嚴重下尿道症狀（國際前列腺症狀評分表≥8）有明顯關係；校正關係比分別為2.20（95%置信區間：1.12-4.31；P=0.022）及2.11（95%置信區間：1.24-3.57；P=0.006）。患中度至嚴重下尿道症狀的病人患至少一種心血管風險因素較高（P=0.001）。

結論 下尿道症狀病人普遍有心血管風險因素，而且大部分心血管風險因素在會診時才被發現。患中度至嚴重下尿道症狀的病人（國際前列腺症狀評分表≥8）有較高機會有較多的心血管風險因素。

Patients and methods

Male patients who presented with LUTS to our urology unit from April 2005 to October 2006 were included in the study. All the patients were subjected to comprehensive assessments that included the following:

1. Detailed history of LUTS and other urological symptoms;

2. Medical history, with particular attention to previous cardiovascular diseases and metabolic disorders such as diabetes mellitus, hypertension, dyslipidaemia, etc;

3. Smoking history: non-smoker, current smoker, or ex-smoker;

4. Physical examination, including the assessment of body weight, height, body mass index (BMI), blood pressure, and digital rectal examination;

5. International Prostatic Symptom Score (IPSS), uroflowmetry, and post-void residual urine for the assessment of LUTS;

6. Blood laboratory examination: renal function tests and fasting plasma glucose, urate and lipid profiles;

7. Mid-stream urine for microscopy and culture; and

8. Plain abdominal radiography.

The information from these assessments was prospectively added to a computer database.

The cardiovascular risk factors selected for evaluation included: history of smoking (to determine whether the patient was currently a smoker or had ceased smoking during assessment), being overweight, and having hypertension, dysglycaemia, dyslipidaemia or hyperuricaemia.[10-12] In line with the World Health Organization (WHO) expert consultation on the appropriate BMI for Asian populations, patients were classified as overweight if their BMI was greater than 23 kg/m².[13] The diagnosis of hypertension was based on a self-reporting system. Dysglycaemia was defined as the patient having a history of diabetes mellitus, or a fasting plasma glucose level of 6.1 mmol/L or higher.[10] The reference levels for plasma high-density lipoprotein–cholesterol (HDL-cholesterol) and low-density lipoprotein–cholesterol (LDL-cholesterol) were defined in line with the findings of the National Cholesterol Education Program Expert Panel on Detection, Evaluation And Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III).[10] Hyperuricaemia was defined as a fasting plasma urate level of greater than 0.43 mmol/L, based on a local laboratory reference range.

Statistical analysis

All of the results were expressed as means, standard deviations (SDs), medians, or percentages as appropriate. Chi squared tests followed by logistic regression analysis were used to assess associations between the cardiovascular risk factors and the proportion of patients with moderate-to-severe IPSS as well as to assess the correlation of LUTS severity (mild symptoms vs moderate-to-severe symptoms) with the number of risk factors present. A two-tailed P value of <0.05 was used to assess statistical significance. We performed the statistical analysis with the Statistical Package for the Social Sciences (Windows version 14.0; SPSS Inc, Chicago [IL], US).

Results

We assessed 617 male patients in our clinic during the study period. Their mean age was 65.4 (range, 39-94) years. Table 1 shows the IPSS symptom severity distribution according to age and prostate size. The IPSS was stratified into mild (0-7), moderate-to-severe (≥8); 11% of patients were in the mild category, and 89% in the moderate-to-severe category. The overall mean and median prostate sizes of the patients (as determined by digital rectal examination) were

TABLE 1. Distribution of symptom severity according to age and prostate size

	Mild LUTS (IPSS ≤7)*	Moderate-to-severe LUTS (IPSS ≥8)	Overall
Age			
Mean (SD, range)	64.8 (11.9; 42-92)	65.5 (10.1; 39-94)	65.4 (10.3; 39-94)
<50	7 (10%)	33 (6%)	40 (6%)
50-59	18 (26%)	129 (24%)	147 (24%)
60-69	19 (28%)	194 (35%)	213 (35%)
70-79	18 (26%)	146 (27%)	164 (27%)
≥80	7 (10%)	46 (8%)	53 (9%)
Overall	69 (11%)	548 (89%)	617 (100%)
Prostate size (mL)			
Mean	37.2	36.3	36.4
Median	35.0	35.0	35.0

* LUTS denotes lower urinary tract symptoms, and IPSS International Prostatic Symptom Score

TABLE 2. Overall distribution of body mass index (BMI) according to symptom severity

BMI (kg/m²)	Overall		Mild LUTS (IPSS ≤7)*		Moderate-to-severe LUTS (IPSS ≥8)	
	Group	Cumulative	Group	Cumulative	Group	Cumulative
Mean (SD, range)	24.1 (3.2, 15.4-33.8)		23.6 (3.3, 16.4-31.7)		24.1 (3.2, 15.4-33.8)	
BMI group						
<23.00	221 (36%)	221 (36%)	30 (44%)	30 (44%)	191 (34%)	191 (35%)
23.00-24.99	165 (27%)	386 (63%)	16 (23%)	46 (67%)	149 (27%)	340 (62%)
25.00-27.49	149 (24%)	535 (87%)	16 (23%)	62 (90%)	133 (24%)	473 (86%)
27.50-29.99	55 (9%)	590 (96%)	3 (4%)	65 (94%)	52 (10%)	525 (96%)
≥30.00	27 (4%)	617 (100%)	4 (6%)	69 (100%)	23 (4%)	548 (100%)

* LUTS denotes lower urinary tract symptoms, and IPSS International Prostatic Symptom Score

36.4 mL and 35.0 mL, respectively (SD, 9.6 mL; range, 20-100 mL). Respective mean and median prostate sizes for patients with mild symptoms were 37.2 mL and 35.0 mL, and the corresponding values for those with moderate-to-severe symptoms were 36.3 mL and 35.0 mL. There was no statistically significant difference between the means of the two groups (P=0.5).

Among these patients, 84 (14%) were smokers, 234 (38%) were ex-smokers, and 299 (48%) were non-smokers. Ischaemic heart disease affected 44 (7%) patients, and cerebrovascular disease affected 34 (6%) patients. There was a known history of hypertension in 268 (43%) patients. Patient numbers with known diabetes, dyslipidaemia, and hyperuricaemia were 105 (17%), 96 (16%), and 30 (5%), respectively.

As shown in Table 2, the mean BMI was 24.1 kg/m² (range, 15.4-33.8 kg/m²). According to the WHO criteria for Asian populations, 396 (64%) patients were regarded as overweight (BMI ≥23 kg/m²) and 231 (37%) as obese (BMI ≥25 kg/m²).

A total of 153 (25%) of the patients had elevated fasting plasma sugar levels. Moreover, 117 (19%)

TABLE 3. Patient numbers with known and newly diagnosed dysglycaemia, dyslipidaemia, and hyperuricaemia

	Known	Newly diagnosed	Known + newly diagnosed	Total
Dysglycaemia	105 (17%)	73 (12%)	155 (25%)	178 (29%)
Dyslipidaemia	96 (16%)	235 (38%)	321 (52%)	331 (54%)
Hyperuricaemia	30 (5%)	161 (26%)	175 (28%)	191 (31%)

had elevated fasting triglyceride, and 231 (37%) had elevated fasting LDL-cholesterol levels, whilst 62 (10%) had low fasting HDL-cholesterol. Table 3 shows that 178 (29%) of the patients had either a known history of dysglycaemia or were diagnosed during workup. Similarly, known or diagnosed dyslipidaemia was encountered in 331 (54%) and hyperuricaemia in 191 (31%) patients. In total, 264 (43%) of them were newly diagnosed as having dysglycaemia, dyslipidaemia, or hyperuricaemia.

Table 4 lists the prevalence of cardiovascular risk factors in these patients. In our univariate analysis, a history of smoking and a diagnosis of

TABLE 4. Cardiovascular risk factors according to different lower urinary tract symptom (LUTS) severity

	Overall	Mild LUTS (IPSS ≤7)*	Moderate-to-severe LUTS (IPSS ≥8)	P value (Chi squared)	Adjusted odds ratio (95% confidence interval)
Smoking status					
Never smoked	299 (48%)	44 (64%)	255 (47%)	0.007	2.11 (1.24-3.57)
Smoked	318 (52%)	25 (36%)	293 (53%)		
Body mass index					
Not overweight	221 (36%)	30 (43%)	191 (35%)	0.172	NA†
Overweight	396 (64%)	39 (57%)	357 (65%)		
History of hypertension					
Yes	268 (43%)	24 (35%)	244 (45%)	0.121	NA†
No	349 (57%)	45 (63%)	304 (55%)		
Dyslipidaemia					
Yes	331 (54%)	39 (57%)	292 (53%)	0.611	NA†
No	286 (46%)	30 (43%)	256 (47%)		
Dysglycaemia					
Yes	178 (29%)	21 (30%)	157 (29%)	0.758	NA†
No	439 (71%)	48 (70%)	391 (71%)		
Hyperuricaemia					
Yes	175 (28%)	12 (17%)	163 (30%)	0.031	2.20 (1.12-4.31)
No	442 (72%)	57 (83%)	385 (70%)		

* IPSS denotes International Prostatic Symptom Score
† Dropped during logistic regression analysis

TABLE 5. Different numbers of risk factors (including smoking, being overweight, and having hypertension, dysglycaemia, dyslipidaemia, hyperuricaemia) according to mean prostate size (by digital rectal examination) and severity of lower urinary tract symptoms (LUTS)

Risk factors	Overall	Mean prostate size (mL)	Mild LUTS (IPSS ≤7)*	Moderate-to-severe LUTS (IPSS ≥8)
0	87 (14%)	34.8	19 (28%)	68 (12%)
1	126 (20%)	35.6	9 (13%)	117 (21%)
2	173 (28%)	35.6	17 (25%)	156 (28%)
3	147 (24%)	37.0	18 (26%)	129 (24%)
4	63 (10%)	40.2	6 (9%)	57 (10%)
5	21 (3%)	35.6	0	21 (4%)
6	0	0	0	0
Total	**617**	**36.4**	**69**	**548**

* IPSS denotes International Prostatic Symptom Score

hyperuricaemia were associated with moderate-to-severe IPSS values (P=0.007 and 0.031 respectively). Multivariate analysis revealed similar results, with an adjusted odds ratio of 2.20 (95% CI, 1.12-4.31; P=0.022) for the association between moderate-to-severe LUTS and hyperuricaemia, and 2.11 (95% CI, 1.24-3.57; P=0.006) for that between moderate-to-severe LUTS and smoking. Table 5 lists the distribution of patients and the mean prostate size with different numbers of risk factors. No correlation was noted between the mean prostate size and the number of risk factors. Table 6 illustrates that patients with moderate-to-severe IPSSs had a higher chance of having at least one cardiovascular risk factor during assessment (P=0.001).

Discussion

We found a very high level of risk from cardiovascular disease in our patients. Our results show that 530 (86%) of the 617 patients had at least one such risk factor, of which about half (264 or 50%) were diagnosed as having dyslipidaemia, dysglycaemia, or hyperuricaemia during the urological workup. Patients with moderate-to-severe as opposed to mild IPSSs had a significantly higher chance of having at

least one cardiovascular risk factor.

Cardiovascular disease is one of the leading causes of non-cancer death in adult males. Although better management of ischaemic heart disease, heart failure, and stroke has significantly improved patient outcomes, prevention is still the best approach to minimising the morbidity and mortality of these conditions.[3,14,15] The identification of risk factors for cardiovascular disease with subsequent modification is the mainstay of primary prevention.[4-8]

The fact that men under-use the health care systems[9,16] probably accounts for the higher risk they face compared to females and their higher morbidity and mortality from a variety of individual diseases.[17,18] The common barriers to health care advice that men face include personal concepts of traditional male social roles, and the systemic barriers they encounter in relation to time and ease of access.[16] Yet this situation could be resolved by influencing individual behaviour or modifying health care services to more easily suit the 'average' man.[19]

As urological symptoms are among the most common for which men seek medical advice, physicians managing these problems (in primary care or as specialists) have the opportunity to actively promote their general health. Other evidence indicates cardiovascular risk factors are closely related to LUTS. Although such studies have mainly assessed the relationship in either asymptomatic populations or those recruited by health surveys,[20-23] our cohort comprised male patients who presented with symptomatic voiding problems.

In our symptomatic population, the prevalence of cardiovascular risk factors was higher than that reported in previous studies, with more than 85% of patients having at least one cardiovascular risk factor during assessment. Among latter, about half were not known to have that risk factor before their consultations. Despite this 'skewed' population, we still noted an association between symptom severity and cardiovascular risk factors. This in itself shows that urological consultation can provide an effective means of screening for cardiovascular risk factors in males with LUTS, especially those with moderate-to-severe symptoms.

Our multivariate analysis revealed that both smoking and hyperuricaemia were significant predictors of moderate-to-severe LUTS. Smoking is a well-documented factor related to the severity of LUTS,[20,21] but we are the first to report the association with hyperuricaemia. As hyperuricaemia is increasingly recognised as an important cardiovascular risk factor,[11,12] awareness of its possible relationship with LUTS may help to improve the management of both conditions.

TABLE 6. The relationship between the International Prostatic Symptom Score (IPSS) and number of risk factors

IPSS	Risk factor=0	Risk factor ≥1	P value
Mild	19 (28%)	50 (72%)	0.001
Moderate-to-severe	68 (12%)	480 (88%)	

The one cardiovascular risk factor we recorded that could limit the generalisability of our findings is hypertension. Given the limitations of our clinical setting, we could not take repeated measurements of blood pressure over time.[24] Hence, only those who presented with a known history of hypertension were labelled as having it. This could have underestimated the overall incidence of hypertension in our population.

The underlying mechanism for the association of cardiovascular risk factors and LUTS is still unknown. There was a report suggesting that these risk factors correlated with prostate size,[25] possibly related to increased production of growth factors secondary to hypoxia induced by vascular damage.[26] However, we did not observe any correlation between prostate size with either the severity of LUTS or the number of cardiovascular risk factors. As we used digital rectal examination to estimate the size of the prostate, our estimates might not be very accurate. Further studies to overcome this challenge may be helpful.

Keeping in mind the need to improve men's responsiveness to health care, primary care physicians and urologists should consider the broader picture when treating patients with erectile or other sexual dysfunction. In fact, erectile dysfunction is regarded as an early sign of endothelial dysfunction,[27,28] and a significant proportion of patients with such symptoms later develop cardiovascular disease.[29] To broaden perspectives still further, physicians should deliver advice on matters such as diet, alcohol, or substance consumption, and regular physical activity, whenever they are consulted by male patients. This also extends to appropriate advice about prostate cancer screening. With a view to improving attitudes toward better health care among men, physicians should play a more active role whenever they can.

Conclusions

Cardiovascular risk factors were prevalent in our male patients suffering from LUTS; a large proportion of the prevailing cardiovascular risk factors were unknown before the urological consultation. Comprehensive medical screening should be considered for all such patients, especially those with moderate-to-severe LUTS. Subsequent medical advice and lifestyle modification may be beneficial to the overall health of these patients, and to men in general.

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