

Risk Factors for Acute Urinary Retention in Patients With Benign Prostatic Hyperplasia From the Islamic Republic of Iran

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ABSTRACT

INTRODUCTION: Acute urinary retention (AUR) is a serious complication in patients with benign prostatic hyperplasia (BPH). Some risk factors for AUR are known. However, it is important to study patients in different geographic locations because of cultural, dietary, medical, and lifestyle differences. The purpose of the present retrospective investigation was to compare patients with BPH and without AUR to patients with BPH and AUR from the Islamic Republic of Iran on a variety of possible risk factors.

METHODS: We reviewed files of 430 adult patients with BPH who were admitted for surgery from 2003 through 2008. The examined variables were: patient age, PSA, prostate volume, previous history of AUR, anesthesia, smoking, alcohol consumption, opium addiction, diabetes mellitus, hypertension, cardiovascular disease, and other comorbid diseases. There were 270 patients (66.2%) without a history of AUR and 138 patients (33.8%) with a history of AUR. Data for the 2 patient groups were compiled and compared using chi-square, Mann-Whitney, or Fisher exact tests. Logistic regression was calculated for the variables that resulted in significant group differences.

RESULTS: Mean (SD) patient age was 68 (9) years and 72 (9) years for patients without and with AUR, respectively ($P < .003$). Patients with AUR had a significantly larger mean prostate volume of 62.8 (23) mL, compared with 48 (21) mL for patients without AUR ($P < .0001$). Significantly more patients without AUR had low PSA levels ($P < .001$). However, the largest number of patients in both groups had a PSA over 4 ng/mL (44.8% of patients without AUR; 57.2% of patients with AUR). There was no significant group difference in the number of patients consuming alcohol or the number with opium addiction, hypertension, cardiovascular disease, or other underlying diseases ($P > .05$). Significantly more patients without AUR had diabetes mellitus ($P < .001$). Significantly more patients with AUR were smokers ($P < .001$).

CONCLUSIONS: Patient age, high prostate volume, high serum PSA, and smoking were the main risk factors for AUR. These outcomes were consistent with previous research with patients from other geographic locations.

Abbreviations and Acronyms

AUR = acute urinary retention
BPH = benign prostatic hyperplasia
DM = diabetes mellitus
LUTS = lower urinary tract symptoms
MTOPS = medical therapy of prostatic symptoms
QoL = quality of life
PSA = prostate-specific antigen
TURP = transurethral resection of the prostate
TWOC = trial without catheter

KEYWORDS: Acute urinary retention; Benign prostatic hyperplasia; Prostate-specific antigen; Prostate volume; Risk factor

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common problem in aging men. If BPH is left untreated, it has a negative impact on health-related quality of life (QoL) and interferes with daily activities through bothersome lower urinary tract symptoms (LUTS). Other associated adverse events that may necessitate surgical treatment include hematuria, deterioration of bladder function, bladder stones, urinary tract infection, renal failure due to obstructive uropathy, and acute urinary retention (AUR) [1-7].

AUR is a serious complication in patients with BPH and a significant public health problem. AUR is defined as a sudden inability to initiate voiding to empty the bladder, which results in painful distension of the bladder and necessitates immediate decompression by catheterization. It may occur spontaneously in men with BPH or be precipitated by surgery, anesthesia, or ingestion of medications such as alpha-sympathomimetics and anticholinergics [2,8,9]. Thus, use of anticholinergic agents is contraindicated in men with BPH and positive postvoiding residual volume. Symptoms associated with an increased risk of AUR in men with BPH include a reduction in the force of the urinary stream, a sensation of incomplete bladder emptying, having to void again after less than 2 hours, and an enlarged prostate gland on digital rectal examination [1,10].

Management of AUR involves immediate bladder decompression by catheterization and, in most cases, prostatic surgery. Desgrandchamps et al [11] stated that a trial without catheter (TWOC) after a median of 3 days of catheterization is standard practice for AUR associated with BPH in France. Surgical intervention is generally considered the endpoint for AUR and transurethral resection of the prostate (TURP) remains the reference standard for BPH [12,13]. One failed TWOC is an indication for TURP, according to 72.8% of the urologists surveyed in the United Kingdom [13]. Pickard et al [14] showed that immediate surgery after AUR was associated with greater perioperative morbidity and a higher death rate 30 days and 90 days after surgery.

In one study of the natural history of BPH, the risk of AUR was 1.6% at 5 years for men aged 40-49 years and 10% for men aged 70-79 years; the risk increased to 1 in 3 patients with BPH longer than 10 years [2,5]. The risk of recurrent AUR has been reported as 76%-83% in men with diagnosed BPH without the use of alpha blockers after the first episode of AUR [3].

The primary goal of therapy for BPH to improve the patient's QoL by reducing symptoms and the risk of AUR and by providing BPH-related surgery, when needed [4,15,16]. Multiple

controlled studies have been done to evaluate the risk factors of AUR. Age is a strong independent risk factor [1,15,17]. BPH disease is mostly associated with prostate enlargement (volume > 30 mL) [18]. As BPH disease progresses, it is often associated with decreased urinary flow, worsened urinary symptoms, long-term complications (notably, AUR), and the need for surgery [18]. Other major risk factors for AUR include a history of prior AUR, high symptom scores, high prostate-specific antigen (PSA), large prostate size, intravesical prostatic protrusion, and high residual urine and low peak urine flow rate following a TWOC; such risk factors may require nonconservative treatment [5,7,8,12,15,19-21]. Other factors such as smoking habits, hypertension, preexisting atherosclerotic coronary vascular disease, and a previous history of general anesthesia may lead to AUR via probable prostatic infarction [2]. Tuncel et al [2] investigated the role of prostatic infarction, prostatic inflammation, and prostate morphology in the etiology of AUR. Only prostatic inflammation was an important contributing factor for AUR. AUR risk was 3.03 times higher in patients with prostatic inflammation (95% CI, 1.28-7.15; $P = .01$).

Because of the high prevalence of BPH and its effect on the patient's QoL, additional research is needed to better predict the risk factors of AUR. Cultural, dietary, medical, and lifestyle differences make it important to study patients in different geographic locations. The purpose of the present retrospective investigation was to compare patients with BPH and without AUR to patients with BPH and AUR from the Islamic Republic of Iran on a variety of possible risk factors.

METHODS

The protocol for this retrospective research project was approved by the ethics committee of the authors' institution. The procedures conform with the provisions of the Declaration of Helsinki (as revised in Tokyo, 2004). The database came from the Guilan University of Medical Science, Rasht, Islamic Republic of Iran.

Procedures

We reviewed files of 430 adult patients with BPH who were admitted for surgery from 2003 through 2008. Patients with prostate cancer or neurogenic bladder (confirmed by urodynamic studies) were excluded. All patients with BPH and LUTS were taking tamsulosin and finasteride prior to surgery. None of the patients with BPH and urinary retention had a previous history of anticholinergic use.

The examined variables were: patient age, PSA, prostate volume, previous history of AUR, anesthesia, smoking, alcohol

consumption, opium addiction, diabetes mellitus (DM), hypertension, cardiovascular disease, and other comorbid diseases. Of the total 430 patients, 408 patients had complete data for all variables and were included in the investigation.

The 408 patients were divided into 2 groups: group 1 consisted of 270 patients (66.2%) without a history of AUR; group 2 consisted of 138 patients (33.8%) with history of AUR. The data for the 2 groups were compiled and compared using chi-square, Mann-Whitney, or Fisher exact tests. A probability level < .05 was considered statistically significant. Logistic regression was calculated for the variables that showed significant group differences. Data were analyzed with SPSS version 15 statistical software (Chicago, IL, USA).

RESULTS

Age. The mean (standard deviation) age was 68 (9) years for the patients in group 1 (without a history of AUR) and 72 (9) years for the patients in group 2 (with a history of AUR). The Mann-Whitney test showed a significant group difference ($P < .003$); the patients with AUR were significantly older than the patients without AUR.

Previous AUR episodes. In the group with AUR, 76 patients had prior episodes and 62 patients had no prior episodes of AUR. In the group without AUR, 126 patients had prior episodes and 144 patients had no prior episodes of AUR. The chi-square analysis revealed no significant group difference ($P = .108$).

Table 1. Prostate-Specific Antigen Levels for Patients With and Without Acute Urinary Retention (N = 408).

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Serum PSA, ng/mL	Patients Without AUR		Patients With AUR	
	n	% n	n	% n
0-1.0	4	1.5	8	5.8
1.1-1.5	4	1.5	4	2.9
1.6-2.0	23	8.5	4	2.9
2.1-2.5	59	21.9	6	4.3
2.6-3.0	14	5.2	12	8.7
3.1-3.5	4	1.5	9	6.5
3.6-4.0	41	15.2	16	11.6
> 4.0	121	44.8	79	57.2
Total	270		138	

Prostate volume. On the basis of ultrasonographic findings, the mean (SD) prostate volume was 48 (21) mL in group 1 and 62.8 (23) mL in group 2. The Mann-Whitney test showed a significant group difference ($P < .0001$); the patients with AUR had a significantly larger mean prostate size.

PSA level. Patients were divided into 8 subgroups, based on PSA levels. The results are contained in Table 1. There was a significant group difference in PSA levels ($\chi^2_7 = 47.41$, $P < .001$). More patients without AUR had low PSA levels. However, the largest number of patients in both groups had a PSA over 4 ng/mL (44.8% of patients without AUR; 57.2% of patients with AUR).

Other variables. None of the patients had a previous history of anesthesia. The results of other variables of hypertension, cardiovascular disease, alcohol consumption, opium addiction, DM, smoking, and other underlying diseases are contained in Table 2. There was no significant group difference in the number of patients with hypertension, cardiovascular disease, alcohol consumption, opium addiction, or other underlying diseases ($P > .05$). The duration of DM was less than 5 years for all patients. There was a significant group difference in the number of patients with DM ($\chi^2_1 = 10.73$, $P < .001$); more patients without AUR had DM. There was a significant group difference in the number of patients who were smokers ($\chi^2_1 = 14.87$, $P < .001$); more patients with AUR were smokers. Finally, the most frequent comorbid diseases in all patients included inguinal hernia, hyperlipidemia, renal stone, gastrointestinal disease, and chronic obstructive pulmonary disease (COPD).

Logistic regression. Logistic regression was calculated for the 4 variables that showed significant group differences: serum PSA, prostate volume, smoking, and DM. The results indicated that a 1 ng/mL rise in serum PSA level could increase the risk of AUR 1.13 times and a 1 mL rise in prostate volume could increase the risk of AUR 1.02 times. The risk of AUR for smokers was 3.341 times more than for nonsmokers. DM had a negative association with AUR incidence (odds ratio: 0.363). The risk of AUR for patients without DM was 2.7 times more than for patients with DM.

DISCUSSION

The purpose of the present study was to evaluate AUR risk factors in patients with BPH. Results of previous studies have indicated that the most frequent risk factors for AUR are those associated with the prostate (eg, prostate volume, serum PSA level) and the patient's age.

Table 2. Number of Patients With and Without Acute Urinary Retention and Hypertension, Cardiovascular Disease, Alcohol Consumption, Opium Addiction, Diabetes Mellitus, Smoking, and Comorbid Diseases (N = 408).

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Variable	Patients Without AUR		Patients With AUR		P
	n	% n	n	% n	
Hypertension					
No	215	79.6	107	77.5	.642
Yes	55	20.4	31	22.5	
Cardiovascular disease					
No	254	94.1	123	89.1	.075
Yes	16	5.9	15	10.9	
Alcohol consumption					
No	262	97.0	136	98.6	.506
Yes	8	3.0	2	1.4	
Opium addiction					
No	237	87.8	120	87.0	.812
Yes	33	12.2	18	13.0	
Diabetes mellitus					
No	217	88.4	128	92.8	< .001
Yes	53	19.6	10	7.2	
Smoking					
No	198	73.3	75	54.3	< .001
Yes	72	26.7	63	45.7	
Comorbid disease					
No	129	47.8	62	44.9	.585
Yes	141	52.2	76	55.1	
Total	270		138		

Patient age. In men diagnosed with BPH, some studies have found that the risk of urinary retention increases with age [1,17]. A population-based study [5] reported that AUR was rare in men younger than 60 years old and the risk of AUR was 8 times greater for men aged 70-79 years than for men in their fourth decade. Men in their 50s were 6 times less likely to have AUR than men in their 70s. These authors calculated *person-years*, defined as the number of years times the number of persons who were affected by AUR. The incidence of AUR increased from 3.0/1,000 person-years for 40-49 year-old men to 34.7/1,000 person-years for 70-79 year-old men with moderate to severe symptoms (AUA index score > 7). For men with an AUA symptom score of 0-7 (none or mild LUTS) the incidence of AUR increased from 0.4/1,000 person-years for men who were 45-49 years old to 7.9/1,000 person-years for men who were 70-83 years old. Meigs et al [10] found that incidence rates increased from 3.3/1,000 person-years for men who were 45-49 years old to 11.3/1,000 person-years for men who were 70-83 years old among patients with a symptom score of 8-35 (moderate

or severe LUTS). In another study [2], AUR was commonly seen in 70-79 year-old patients and the mean age was significantly higher in a group with AUR than a group without AUR. These results were similar to those of the present study, where the mean age of the patients with AUR was significantly higher than the mean age of patients without AUR ($P < .003$). The risk for AUR with advanced age may be expected because aging is accompanied by reduced strength of the detrusor muscle. Nonetheless, in the opinion of many urologists and according to the results of the medical therapy of prostatic symptoms (MTOPS) study [21], age is only a minor risk factor for disease progression and other variables are important contributors.

Previous history of AUR. Prior AUR seems to be a major risk factor for AUR relapse [8]. Emberton et al [22] reported that during treatment, one of the most important predictors of AUR was prior AUR (hazard ratio 6.35; 95% CI 2.31 to 17.40; $P < 0.01$). In contrast, previous history of AUR was not a significant risk factor for the patients with AUR in the present study. It is possible

that episodes of AUR that occurred a long time ago were not reported by the patient or that the number of patients with prior episodes was not sufficient to affect significant results.

Prostate volume. Prostate size (>20 mL) seems to be a major risk factor for AUR relapse [8]. It is hypothesized that this occurs because transition zone hyperplasia causes compression and anatomical obstruction of the urethra. In the MTOPS study [21], prostate volume of 31 mL or more was predictive of an increased risk of AUR in participants treated with a placebo ($P < .0001$); these results have been discussed by other authors [9,16]. In the Olmsted County (USA) study [5], the risk of AUR was 3 times greater for men with a prostate volume > 30 mL when compared with a prostate volume of < 30 mL. Similar results were found by Marks et al [18]. Marberger et al [19] showed that the incidence rate of AUR was significantly higher in patients with prostate volume ≥ 40 mL (4.2%) than patients with prostate volume < 40 mL (1.6%). These findings are discussed by other authors [23,24]. Roehrborn et al [25] conducted a 4-year investigation of patients with BPH and found that the risk of AUR ranged from 8.9% to 22% in patients treated with placebo when the data were stratified by increasing prostate volume. They concluded that prostate volume is a powerful predictor of the risk of AUR in patients with BPH. In another study, Roehrborn et al [26] observed that prostate volume was a strong predictor of AUR in men treated with placebo for LUTS and clinically diagnosed BPH who were screened for prostate cancer. Furthermore, Tuncel et al [2] found no statistically significant difference in prostate volume between a group of patients with AUR and a group of patients with LUTS, although the group with AUR had a (nonsignificant) numerically higher prostate volume. In the present study, patients with AUR had a significantly higher mean prostate volume ($P < .0001$), which is consistent with the findings in previous investigations.

PSA. PSA levels influence the incidence of AUR. Roehrborn et al [27] reported that the cumulative incidence of spontaneous AUR for participants treated with a placebo increases dramatically with serum PSA levels above approximately 1.3 ng/mL. Although the cumulative risk for all patients was approximately 4% (1 in 25 men) over 4 years, it reached 9% (nearly 1 in 10 men) for patients with PSA > 4.0 ng/mL at baseline. Risk of AUR ranged from 7.8% [PSA < 1.4 ng/mL (lowest tertile)] to 19.9% [PSA > 3.3 ng/mL (highest tertile)] over 4 years for patients treated with placebo who were stratified by increasing level of serum PSA. The authors concluded that serum PSA was a powerful predictor of the risk of AUR in BPH. When spontaneous versus precipitated AUR was examined, no major difference in PSA was found [18,26]. Tuncel et al [2] found that the median serum PSA level was significantly higher in a group of patients with AUR when compared with a group of patients with LUTS; these

authors concluded that high serum PSA level was an important risk factor for AUR. In the MTOPS study [21], PSA ≥ 1.6 ng/mL in participants treated with a placebo predicted an increased risk of AUR ($P = .0009$). Marberger et al [19] observed that the 2-year incidence of spontaneous AUR was 3.9% for patients with PSA ≥ 1.4 ng/mL, compared with an incidence of 0.5% for patients with PSA < 1.4 ng/mL at baseline. Emberton et al [22] also found that PSA ≥ 3.3 ng/mL was associated with an increased risk of AUR, but concluded that it was weaker than other risk factors. The results of the present study showed that a 1 ng/mL increase in serum PSA level could increase the risk of AUR 1.13 times. There was a statistically significant difference in PSA levels for patients with and without AUA ($P < .0001$). According to our results and those of other studies, PSA is an important risk factor for urinary retention in patients with BPH. However, it should be noted that PSA is a dependent predictor because of the positive association between PSA level and prostate volume or the weight of the prostate gland.

Other risk factors. Some risk factors for AUR may be due to prostatic infarction. Jacobsen et al [5] concluded that general anesthesia has a precipitating role in a large proportion of cases of AUR. Another study [2] did not find any association between general anesthesia and prostatic infarction. Strachan et al [28] showed an association between prostatic infarction, smoking, preexisting cardiovascular disease, and prolonged operative hypotension. However, Milord et al [29] found no significant relationship between history of diabetes, hypertension, atherosclerotic coronary vascular disease, recent surgery, and prostate infarction after prostate needle biopsy. In the Tuncel et al study [2], smoking habit ratios were the same in the both groups, but preexisting cardiovascular disease and previous history of general anesthesia ratios were significantly higher in patients with AUR. However, when the association between AUR and risk factors such as smoking habits, preexisting cardiovascular disease, and previous history of anesthesia was assessed by multivariate logistic regression analysis, these 3 factors were not significant. The authors stated that prostatic infarction did not seem to be an important risk factor for AUR. Anjum et al [30] concluded that prostatic infarction had no role in the etiology of AUR due to BPH. We did not find any significant group differences for the variables of preexisting hypertension, cardiovascular disease, alcohol consumption, opium addiction, or other comorbidities in the present study. The group with AUR had a significantly larger number of smokers ($P < .0001$), and the risk of AUR for smokers was 3.341 times more than for nonsmokers. Smoking accelerates atherosclerosis in pelvic vessels and results in hypoxia in pelvic organs. Reduction in bladder perfusion may lead to detrusor muscle dysfunction and increased risk of urinary retention. Finally, DM was present in significantly more patients without

AUR in the present study ($P < .001$). This result may be due to early referral of diabetic patients for follow-up and a small number of patients with diabetes and urinary retention in our study. Duration of diabetes in our patients was < 5 years, and patients with confirmed neurogenic bladder (commonly associated with DM) were excluded from the study.

CONCLUSIONS

The risk factors for AUR for patients in the present study were consistent with those presented in previous research with patients from other geographic locations. Patient age, high prostate volume, and high serum PSA seem to be major risk factors. The results of the present study also indicate that smoking puts the patient at increased risk.

Conflict of Interest: none declared.

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