

## ORIGINAL RESEARCH

# The prevalence of urinary incontinence following radical prostatectomy and its related factors: A national registry based study

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**Abstract:** **Introduction:** The purpose of this paper is to evaluate the prevalence and the risk factors of urinary incontinence following radical prostatectomy in Iranian population. This study is conducted based on the available data from the National Cancer Registry. **Methods:** In this retrospective study, we extracted the information of all the patients with organ-confined prostate cancer who underwent radical prostatectomy from 2010 to 2014. All the patients were interviewed face to face or via telephone to collect additional data. Urinary incontinence was evaluated by a questionnaire using the definition based on pads use. The effects of risk factors were evaluated using logistic regression models. **Results:** The details of 13,583 registered patients with prostate cancer were collected. Overall, the prevalence of urinary incontinence was estimated as 10.5% (n=1424). It is important to mention that the highest proportion of cases with urinary incontinence belonged to the age group of 71-80 years old (n=502, 35.2%), as well as patients with elementary education (n=458, 32%) or no education at all (n=333, 23.5%). Furthermore, more cases lived in urban settings (n=1159, 81.7%), one-fourth of them (n=365) smoked tobacco, and nearly 11% of them reported having been diagnosed with diabetes (n=152). The odds of having urinary incontinence increased by 20% in patients who had undergone radiotherapy as part of their treatment for prostate cancer (AOR=1.20, 95%CI: 1.07, 1.36). **Conclusion:** We estimated the prevalence of urinary incontinence after radical prostatectomy as 10.5% among prostate cancer patients. We found that having been exposed to education, having been diagnosed with diabetes, and receiving radiotherapy, are amongst the significant risk factors for urinary incontinence. We also suggested that more predictor variables should be recorded in the National Cancer Registry.

**Keywords:** Urinary; Incontinence; Cancer; Prostatectomy; Risk factor

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## 1. Introduction

Prostate cancer is the most common form of cancer in older men, and radical prostatectomy is the most common treatment for patients with prostate cancer (1-3). This type of

surgery causes some important morbidities including Urinary Incontinence (UI). Many patients with prostate cancer are diagnosed at a relatively early age, and continence would be very important for social well-being and quality of life (4, 5). Therefore, evaluating UI after surgery, its prevalence, and related factors, are an important area of discussion (6-9). The incidence rate of UI after radical prostatectomy varies from 1% to 47% in different studies, depending on the definition of incontinence and validated questionnaires to measure it (10). This problem is multifactorial in origin and is affected by various factors. These include pathologic and oncologic features of the tumour, pelvic radiotherapy, and age, as well as comorbidities such as Diabetes Mellitus (DM), smoking,

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#The both of author have the same contribution



intra-pelvic urethral length, Body Mass Index (BMI), history of surgery, and level of education (11-15). In this study we aimed to estimate the prevalence of UI after radical prostatectomy in Iranian population by using the definition based on pads use and determining the risk factors related to this issue.

## 2. Materials and Methods

This is a retrospective study conducted based on the data retrieved from the National Cancer Registry of Iran, concerning prostate cancer patients who underwent radical prostatectomy, from 2010 to 2014. Inclusion criteria was all the patients with organ-confined prostate cancer who underwent radical prostatectomy. Patients with metastatic disease, neoadjuvant treatment, history of pelvic radiotherapy, mental impairment, history of urinary function disorders, and pad use before surgery, were excluded. The demographic and clinical data of the patients were retrieved from the registry. Continence was evaluated one year after the surgery or adjuvant treatment, and was defined using no pad or one security pad for occasional dribbling during exercise. If the patient used more than one security pad during a day, he was considered as urinary incontinence (6, 10). Using a checklist, all patients were interviewed face to face or via telephone by a physician who was part of the research and was not included in the surgery team.

The study protocol was approved by the institutional board of research and committee of medical ethics. This study was conducted in accordance with the Declaration of Helsinki. Descriptive statistics were presented by mean value (standard deviation) and percentages. To estimate the odds of urinary incontinence by predictors, we used multiple logistic regression model by including age, education, area of residency, tobacco smoking status, diabetes status, and the patient's status of receiving radiotherapy. All the analyses were done by STATA version 14. Significant level was considered as 5% in all analyses.

## 3. Results

The data collected on 13583 registered patients with prostate cancer from 2010 to 2014, were used in this study (average response rate=35%). Overall, the prevalence of urinary incontinence was estimated as 10.5% (n=1424). The highest proportion of the cases belonged to the age group of 71-80 years old (n=502, 35.2%), while the lowest proportion of the cases aged less than 50 years (n=36, 2.5%). In terms of the patients' level of education, most cases had elementary education (n=458, 32%) or no education at all (n=333, 23.5%), while the proportion of cases with postgraduate degrees (e.g. master or doctorate degrees) was the lowest (n=68, 4.8%). More cases lived in urban settings (n=1159, 81.7%), and one-fourth

of the cases (n=365) smoked tobacco. Furthermore, nearly 11% of the cases with prostate cancer reported having also been diagnosed with diabetes (n=152). The results of the final logistic regression model showed that the odds of having urinary incontinence increased with age. Compared to age groups below 50, the odds of having urinary incontinence non-significantly increased by 3% (Adjusted Odds Ratio (AOR)=1.03, 95%CI:0.68, 1.57), 1% (AOR=1.01, 95%CI:0.67, 1.50), 6% (AOR= 1.06, 95%CI: 0.72,1.58), and 9%, (AOR=1.09, 95%CI:0.73, 1.62) in the age groups of 51-60, 61-70, 71-80, and above 80 years old, respectively.

When compared to cases with elementary education, the odds of having urinary incontinence significantly increased by 51% (AOR= 1.27, 1.79) in cases with diploma or associate degrees, 28% (AOR=1.28, 95%CI:1.02, 1.61) in cases with Bachelor degrees, and 58% (AOR=1.58, 95%CI:1.17, 2.14) in cases with postgraduate degrees. The odds of having urinary incontinence also increased by nearly two and a half times (AOR=2.42, 95%CI: 1.95,3.00) in patients who reported having being diagnosed with diabetes. Moreover, the odds of having urinary incontinence increased by 20% in patients who had undergone radiotherapy as part of their treatment for prostate cancer (AOR=1.20, 95%CI: 1.07,1.36). (Table 2)

## 4. Discussion

Evaluation of UI after radical prostatectomy is an important issue that has a direct impact on the patient's lifestyle. In this study, we aimed to report the prevalence of UI after radical prostatectomy in Iranian population and to evaluate the risk factors for which the data was available.

The prevalence of UI is variable and is based on the definition of UI after radical prostatectomy. We defined urinary continence as using no pad or one security pad per day after one year from the surgery. By this definition, the data showed that 10.5% of the patients reported urinary continence. Sacco et al, compared the effect of three definitions on the rate of continence; 1) no or occasional pad use; 2) at least one pad used daily for occasional dribbling; and 3) at least one pad used daily. The authors showed that after 24 months of follow-up, 83%, 92.3% and 93.4% of the patients reported urinary continence according to the corresponding urinary continence definitions, respectively (10). In a prospective multicenter study by Holze et al, 390 patients were evaluated for UI after radical prostatectomy. After 12 months of follow-up, 68% of the patients reported continence (using 0 pads), while 32% of the patients reported having used at least one pad per day (6).

Gallo et al, evaluated 90 patients who underwent radical prostatectomy with nerve sparing technique. They reported that depending on the number of vesico-urethral alignment sutures, the prevalence of continence ranged between 95.8%

**Table 1:** Distribution of general characteristics of the cases according to presence of urinary incontinence, 2010-2014

Variable	Total (%)	Incontinence		P-Value
		Yes, n=1424 (10.5%)	No, n=12159 (89.5%)	
<b>Age group</b>				
<50	417(3)	36 (2.5)	381 (3.1)	0.019
51-60	1724(12.7)	170 (11.9)	1554 (12.7)	
61-70	3700(27.2)	354 (24.8)	3346 (27.5)	
71-80	4684(34.5)	502 (35.2)	4182 (34.4)	
+80	3051(22.4)	361 (25.3)	2690 (22.1)	
<b>Education</b>				
Illiterate	1598(24.5)	333(23.5)	1265(24.8)	<0.001
Elementary	2421(37.2)	458(32.4)	1963(38.5)	
Below high-school diploma	565(8.6)	120(8.4)	445(8.7)	
Associate degree	1139(17.5)	308(21.7)	831(16.3)	
Bachelor degree	539(8.3)	127(8.9)	412(8.0)	
Master/Doctorate degree	245(3.7)	68(4.8)	177(3.4)	
<b>Residence area</b>				
Urban	5238(80)	1159(81.7)	4079(79.5)	0.061
Rural	1307(19.9)	258(18.2)	1049(20.4)	
<b>Tobacco smoking</b>				
No	11982(88.2)	1068(75)	10914(89.7)	<0.0001
Yes	1601(11.8)	356(25)	1245(10.2)	
<b>Diabetes</b>				
No	13195(97.1)	1272(89.3)	11923(98)	<0.0001
Yes	388(2.8)	152(10.6)	236(1.9)	
<b>Radiotherapy</b>				
No	11056	841 (7.61)	10215 (92.39)	<0.0001
Yes	2527	583 (23.07)	1944 (76.93)	

and 100%, after one year from the surgery (16). 93.2% of the patients who underwent radical prostatectomy using inter and intra-fascial nerve-sparing technique, achieved total continence after one year, in the study conducted by Stolzenburg et al (17). Rajah et al, reported 80% continence in 322 patients after 12 months from surgery, using the Bi-directional continuous anastomotic suture technique (18). Van Kampen et al, found continence proportion of 88% and 98% after 6 months and one year of retro pubic radical prostatectomy, respectively (19). Kim et al, reported continence proportion of 79.9% after robotic-assisted laparoscopic radical prostatectomy in 452 patients with prostate cancer (20). Simforoosh et al, reported 90% continence after 3 months of follow-up, using the sutureless vesico-urethral alignment technique (21). These previous works have shown that the applied surgical technique would be one of the predictors of urinary continence after radical prostatectomy. In this study, the data was extracted from the National Cancer Registry system of the Ministry of Health (MOH), on which no specific surgical approach was recorded.

Many studies have shown that radiotherapy after radical prostatectomy is associated with higher rates of genitourinary events (22, 23). Petroski et al, in evaluation of 129 patients who underwent adjuvant radiotherapy for prostate cancer after radical prostatectomy, concluded that urinary

continence was further impaired after radiotherapy (23). Contrary to that, Fontaine et al, concluded that radiotherapy after radical prostatectomy seems to be safe and does not worsen continence status in patients. After radiotherapy of 17 continent patients, only one patient complained of stress incontinence, and the rest had no change in urinary status (24). In a non-randomized prospective questionnaire-based study in patients who underwent retro-pubic radical prostatectomy, Hofmann et al, found that adjuvant radiotherapy had a temporary effect on urinary continence at 4 months, but not at 8 to 12 months (25). In a retrospective study of 105 patients who received post-operative radiotherapy, Formenti et al, found that radiotherapy did not have a significant impact on the recovery rate of urinary continence after the surgery (26). In this study, we found a significant relationship between adjuvant radiotherapy after radical prostatectomy and urinary incontinence. There is conflicting information about the impact of age on the recovery rate of urinary continence after radical prostatectomy. In evaluation of 94 consecutive patients who underwent radical prostatectomy, Egawa et al, found that age <70 years at the time of surgery was associated with a greater probability of urinary incontinence (27). After 12 months of follow-up, Talcott et al, reported 91% continence in patients under 65 years of age, and 85% continence in those aged more than 65 (28).



**Table 2:** Results of the univariate and multivariate logistic Regression models for urinary incontinence, 2010-2014

Predictor	Category	Unadjusted model			Adjusted model		
		Odds Ratio	95%CI	P-Value	Odds Ratio	95%CI	P-Value
Age	<50	Reference					
	51-60	1.15	0.79, 1.68	0.446	1.03	0.68, 1.57	0.869
	61-70	1.11	0.78, 1.60	0.537	1.01	0.67, 1.50	0.953
	71-80	1.27	0.89, 1.81	0.185	1.06	0.72, 1.58	0.744
	+80	1.42	0.99, 2.03	0.055	1.09	0.73, 1.62	0.669
Education	Elementary	Reference					
	Illiterate	1.12	0.96, 1.32	0.134	1.16	0.99, 1.37	0.059
	Below high-school diploma	1.15	0.92, 1.44	0.209	1.13	0.90, 1.42	0.284
	Diploma/Associate degree	1.58	1.34, 1.87	<0.0001	1.51	1.27, 1.79	<0.0001
	Bachelor degree	1.32	1.05, 1.65	0.015	1.28	1.02, 1.61	0.032
	Master/Doctorate degree	1.64	1.22, 2.21	0.001	1.58	1.17, 2.14	0.003
Residence area	Rural	Reference					
	Urban	1.15	0.99, 1.34	0.061	0.96	0.81, 1.13	0.654
Tobacco smoking	No	Reference					
	Yes	2.92	2.55, 3.33	<0.0001	1.06	0.92, 1.21	0.396
Diabetes	No	Reference					
	Yes	6.03	4.88, 7.46	<0.0001	2.42	1.95, 3.00	<0.0001
Radiotherapy	No	Reference					
	Yes	3.64	3.24, 4.09	0.000	1.20	1.07, 1.36	0.002

On the contrary, Catalona et al, reported no correlation between patients' age and the recovery of continence, in a study of 784 consecutive patients with prostate cancer (29). Stanford et al, found a relationship between older age groups and urge urinary incontinence after 24 months of follow-up with patients who underwent radical prostatectomy (30). We showed that the proportion of urinary incontinence increased consistently with age, while the highest proportion of UI belonged to the age group of 71-80 years old. The observed trend of UI according to age could be due to the irreversible changes following the aging of bladder, such as increase of collagen fibers in the bladder wall, reducing bladder capacity and bladder contractility, which can affect bladder function and cause urinary symptoms in older patients. Despite surgical improvements in this field, urinary incontinence is an important issue requiring further research and scientific discussion. One of the important morbidities that affects post-surgical urinary continence is diabetes mellitus (31, 32). Diabetes can cause cystopathy due to impaired bladder sensation, sphincter dysfunction due to innervation disruption of the pelvis, and symptoms such as urgency, nocturia and incontinence (33). Teber et al, evaluated the effect of diabetes on continence in 2071 patients with prostate cancer who underwent radical prostatectomy. Diabetes mellitus and its duration were two independent factors for post-surgical incontinence. Both early continence (earlier than 3 months) and late continence (12 and 24 months afterwards)

were affected by diabetes (34). Urine incontinence after the surgery depends on the severity and duration of diabetes (35). However, we only had data about the presence of diabetes in our study subjects, and we did not have access to data related to the severity and/or duration of their conditions.

One of the most important causes of UI after radical prostatectomy is bladder neck contracture. Many microvascular disease-related conditions such as ischemic heart disease, hypertension, and diabetes, can cause bladder neck stricture and subsequently lead to UI. Furthermore, Cigarette smoking is one of the most important risk factors for this health condition and can affect continence after surgery (36-38). Prodromos et al, in a retrospective review on 467 patients who underwent radical prostatectomy, found that cigarette smoking is a strong predictor of subsequent bladder neck stricture (39). In our study we also found that patients with UI smoked more cigarette than the others.

In this study, we found that most of the cases with post-surgical UI had elementary education or no education at all. The effect of education on urinary continence can be due to the impact of education on one's ability to fully understand and comprehend the various aspects of this condition. Castillo Borges, in a study about post-radical prostatectomy UI, evaluated 337 patients who underwent retro-pubic radical prostatectomy. They collected sociodemographic variables as well as continence status over the course of treat-

ment. Then, they contacted the patients by phone to ask them about the continence status of their last appointment. They found a discrepancy between medical reports and patients' perceptions in 42% of the subjects. The discrepancy was significantly higher in black men and patients with lower levels of schooling ( $p = 0.004$  and  $0.043$ , respectively) (40).

These studies have shown that UI occurrence after radical prostatectomy can vary greatly depending on many factors, such as the definition of UI, the method of surgery, and patient characteristics. The main aim of this study was to estimate the proportion of UI after radical prostatectomy in a large population of Iranian prostate cancer patients, based on the National Cancer Registry. The estimated proportion of 10.5% of post-surgical UI is plausible, and comparable with similar studies. Despite our analysis of the factors discussed above, we did not have access to adequate data concerning some other factors which may contribute to the occurrence of UI after surgery. Pathologic data of the tumor, prostate volume, intra pelvic urethral length, and BMI are some of these predictors. Therefore, we suggest that collection of such data be integrated into the National Cancer Registry system in the future.

## 5. Conclusion

In this study, we estimated the prevalence of urinary incontinence after radical prostatectomy to be 10.5% among Iranian prostate cancer patients. This finding is important since urinary incontinence is regarded as a contributor to a patient's social well-being and quality of life. Having evaluated the risk factors for urinary incontinence, we found that having been exposed to education, having been diagnosed with diabetes, and receiving radiotherapy, are amongst the significant risk factors for urinary incontinence. We also suggested that more predictor variables should be recorded in the National Cancer registry.

## 6. Appendix

### 6.1. Acknowledgements

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### 6.2. Author contribution

All the authors have the same contribution.

### 6.3. Funding/Support

None.

## 6.4. Conflict of interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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