

Prevalence of Urinary Incontinence and Possible Associated Etiological Risk Factors in Saudi Women

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Authors' contributions

This work was carried out in collaboration among all authors. Author SFAB did the supervision of data collection, obtaining the ethical approval, review and editing manuscript from draft to final submission of the manuscript. Author RAA conceived of the presented idea, literature review, data collection and statistical analysis of the manuscript. Author RIH did the interpretation of results and manuscript preparation to the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Importance: Urinary incontinence (UI) is a frequent condition among women worldwide. It has a significant impact on physical, social, and interpersonal interaction.

Objectives: To investigate the prevalence of different types of urinary incontinence and possible associated etiological risk factors in Saudi women.

Study Design: This cross-sectional questionnaire-based study was made through an online and hard copy questionnaire on Saudi women aged between 20 to 55 years from January 2021 to March 2021. Eligible women complete 3 Incontinence Questions (3IQ) that identify if they had UI. Subsequently, a standard questionnaire was completed to know the demographic profile, obstetric history, medical diseases, and social factors to assess etiological risk factors. The obtained data were collected and analyzed.

Results: The prevalence of UI was 45.2% among Saudi women. The incontinence type was mostly urge incontinence, followed by stress incontinence and other causes. Risk factors for UI among participants were age >30 years, obesity, married women, parity ≥ 3 , previous

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episiotomy, history of 3rd or 4th-degree perineal tear (patients usually informed about these complications in postnatal clinic); history of recurrent urinary tract infections; history of childhood nocturnal enuresis; chronic constipation and history of depression. Meanwhile, mode of delivery, chronic cough, smoking, and regular exercise were not associated with the occurrence of UI.

Conclusions: Female UI is a public health issue with medical and social ramifications. More research is needed to appropriately address the UI burden in Saudi Arabia and help plan future healthcare strategies.

Keywords: Epidemiology; prevalence; questionnaires; Saudi women; childbirth; urinary incontinence; risk factors; quality of life.

1. INTRODUCTION

Urinary Incontinence (UI) is defined as “a condition in which involuntary loss of urine is objectively demonstrable and has social and hygiene problems” [1]. Estimating the prevalence of UI in the general population remains challenging, although national and international research suggests that UI prevalence rates in women differ according to different geographical areas for example: Eastern Asian and Pacific region: 25.6% , South Asia: 14.2% , Europe and Central Asia: 32.2% , Middle East and North Africa: 37.3%,Sub-Saharan region: 4.6% and Latin America: 28.8% .This variety reflects not only the heterogeneity of UI definitions, evaluation instruments, and target population but also these variations in the UI prevalence rates indicating that the region's diverse cultures and ethnicities have an impact on the results [2]. In Saudi women, UI prevalence ranges from 30 to 41.4% [3,4], which is roughly in the middle of the range. Prevalence peaks in the childbearing age group (up to 40%) and increases in the elderly (up to 50%) [3].On the other hand ,a study showed that young and middle-aged people are the most affected due to presence of urinary microbe in catheterized cultures of urine sample and prevalence of urinary incontinence decreases with age [5].

According to WHO (ICOPE guidelines; 2017) The prevalence of urinary incontinence reported in population-based studies ranges from 9.9% to 36.1% and is twice as high in older women as in older men. Urinary incontinence has a profound impact on the quality of life of older people, their subjective health status, levels of depression and need for care.

There are two types of UI: stress incontinence and urge incontinence. The two types often coexist and are termed mixed incontinence [6]. Stress UI is defined as urine leakage through the

urethra due to weakness in urethral support which aggravated by raised intra-abdominal pressure caused by activities such as laughing, coughing, or sneezing. The urethra is maintained by the levator ani muscles, which are connected to the anterior vaginal wall's endopelvic fascia. Damage to the fascia-muscle link, a lack of nerve supply to the muscle, or direct muscle damage can all affect continence [7]. This incontinence type is most common in women, accounting for up to 65% percent of all UI.

Urge UI is described as involuntary leaking of urine accompanied by a sudden urge to urinate and a failure to reach the bathroom promptly. It is one of the signs of an overactive bladder, along with urgency, nocturia, and frequency. Urge UI affects roughly one-third of patients [3].

Risk factors for UI include advanced age, high parity, repeated vaginal deliveries, pelvic surgery, obesity, depression, diabetes mellitus, chronic respiratory difficulties, constipation, long-term coughing, and increased dietary caffeine [8]. Both UI and its symptoms substantially affect quality of life and have significant personal and social cost implications [9-11]. Despite these consequences, only a tiny percentage of women seek medical assistance or share their problems with their spouses or families [12,13].

This research studied the prevalence of different types of UI (stress, urge, and mixed) and possible etiological risk factors in Saudi women.

2. MATERIALS AND METHODS

This cross-sectional survey was conducted from January 1st to March 31st, 2021, using an online (Google Form) questionnaire and a print copy that was distributed randomly at malls to allow speedy data collection both were in (Arabic and English versions). The questionnaire was first translated into Arabic and then reverse translated

by a third party to ensure correctness. The questions on the translated questionnaire were checked on ten women to ensure that they were appropriately translated and understood. The consent form provided the research title, study goal, definition of urine incontinence, age range, and permission to participate. A total of 270 women, ranging in age from 20 to 55, signed the consent form and anonymously participated in the study. The sample size was determined using a 95 percent confidence interval, a 5% margin of error, and the population size of 1000. Then, eligible women completed 3 Incontinence Questions (3IQ) used to identify disease prevalence. The first question of 3IQ contains incontinence presence in the past three months (Appendices 1 and 2). If they answered NO, they will not be able to complete the Questionnaire and only who answered yes will be able to complete it. Of 270 women, 133 women had UI and 137 did not. The second question is about incontinence types, and the third question establishes which incontinence type occurs most often [14]. Subsequently, a standard questionnaire was completed for both groups to determine the demographic profile of patients and their obstetric history, medical diseases, and social factors to assess etiological risk factors (Appendices 1 and 2). All responses were collected in Excel sheet then to SPSS for statistical analysis.

IBM SPSS Statistics for Windows version 23 was used to analyze the data (IBM SPSS, IBM Corp., Armonk, NY, USA). Numbers and percentages were used to represent categorical variables. The Pearson's Chi-Square test for categorical data was used to compare factors between women with and without UI. The associated risk factors were investigated using binary and multiple logistic regression analysis. A P value of < 0.05 was considered statistically significant for all studies.

3. RESULTS

In this study, the most common type of UI was urge incontinence as observed in (Fig. 1).

Total of 133 women had UI (45.2%) and 137 did not (54.8%). Women who self-reported as incontinent were more likely to be older than 30, obese, had more than 3 children, more likely to have an episiotomy and complicated perineal tear. Women with incontinence were more likely to have a history of childhood nocturnal enuresis, be diabetic, depressed, constipated, and had recurrent urinary tract infections. History of smoking, chronic cough and regular exercise were not statistically significant. History of hysterectomy was reported only in women with UI (3.5%) (Table 1 and Fig. 2).The binary and multiple logistic regression analyses are shown in (Table 2).

Table 1. Risk factors of UI

Risk factors	Total (n= 270)	Women with UI (n=133, 45.2%)	Women without UI (n=137, 54.8%)	P- Value
Age groups				0.0001
From 20-30 years	82 (32.8%)	6 (5.3%)	76 (56.6%)	
From >30 years	168 (67.2%)	107 (94.7%)	61 (44.5%)	
Body mass index (kg/m²)				0.0001
Normal weight	130 (53.2%)	16 (14.2%)	117 (85.4%)	
Obese	117 (46.8%)	97 (85.8%)	20 (14.6%)	
Marital status				0.0001
Single	91 (36.4%)	4 (3.5%)	87 (63.5%)	
Married	159 (63.6%)	109 (96.5%)	50 (36.5%)	
Parity				0.0001
< 3	50 (20.0%)	10 (8.8%)	40 (29.2%)	
≥ 3	102 (40.9%)	99 (87.6%)	3 (2.2%)	
Not applicable	98 (39.2%)	4 (3.5%)	94 (68.8%)	
Mode of delivery				0.0001
Normal delivery	88 (35.2%)	67 (59.3%)	21 (15.3%)	
Caesarean section	24 (9.5%)	8 (5.3%)	16(13.1%)	
Both	40 (16.0%)	36 (31.9%)	4 (2.9%)	
Not applicable	98 (39.2%)	4 (3.5%)	94 (68.6%)	

Table 2. Characteristics of women with UI

Risk factors	Women with UI	Odds ratio (95% CI)	P-Value
Age groups			0.0001
From 20-30 years	6 (5.3%)	Reference	
From > 30 years	107 (94.7%)	2.553 (2.071-3.147)	
Body mass index (kg/m²)			0.0001
Normal weight	18 (14.2%)	Reference	
Obese	97 (85.8%)	5.146 (3.436-7.708)	
Marital status			0.0001
Single	9 (8.0%)	Reference	
Married	104 (92.0%)	3.040 (2.407-3.841)	
Parity			0.0001
< 3	10 (8.8%)	Reference	
≥ 3	99 (87.6%)	27.200 (8.845-83.648)	
Mode of delivery			
Normal delivery	58 (51.3%)	Reference	
Caesarean section	15 (13.3%)	1.94 (0.837-3.891)	0.132
Both	30 (26.5%)	0.730 (0.369-1.487)	0.386
Episiotomy			0.0001
Yes	55 (48.7%)	1.657 (1.272-2.157)	
No	58 (51.3%)	Reference	
History of third or fourth-degree perinatal tear			0.0001
Yes	19 (16.8%)	2.457 (2.103-2.871)	
No	94 (83.2%)	Reference	
History of recurrent urinary tract infection			0.0001
Yes	34 (30.1%)	1.811 (1.410-2.326)	
No	79 (69.9%)	Reference	
History of diabetes mellitus			0.0001
Yes	24 (21.2%)	2.227 (1.807-2.745)	
No	89 (78.8%)	Reference	
History of chronic cough			0.873
Yes	8 (7.1%)	1.044 (0.619-1.763)	
No	105 (92.9%)	Reference	
History of childhood nocturnal enuresis			0.0001
Yes	27 (23.9%)	2.393 (1.973-2.901)	
No	86 (76.1%)	Reference	
History of chronic constipation			0.039
Yes	23 (20.4%)	1.471 (1.094-1.979)	
No	90 (79.8%)	Reference	
History of depression			0.009
Yes	18 (15.9%)	1.705 (1.278-2.275)	
No	95 (84.1%)	Reference	
History of hysterectomy			0.087
Yes	4 (3.5%)	2.257 (1.962-2.596)	
No	106 (96.5%)	Reference	
History of smoking			0.176
Yes	22 (19.5%)	1.308 (0.953-1.795)	
No	91 (80.5%)	Reference	
History of regular exercise			0.244
Yes	18 (15.9%)	0.777 (0.523-1.154)	
No	95 (84.1%)	Reference	

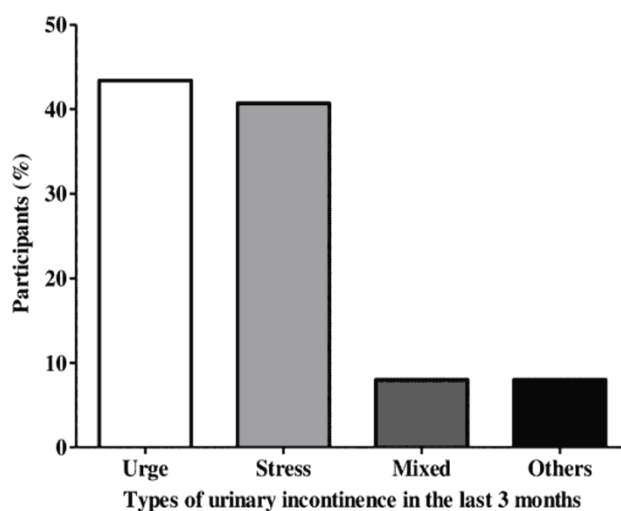


Fig. 1. Urinary incontinence in participants

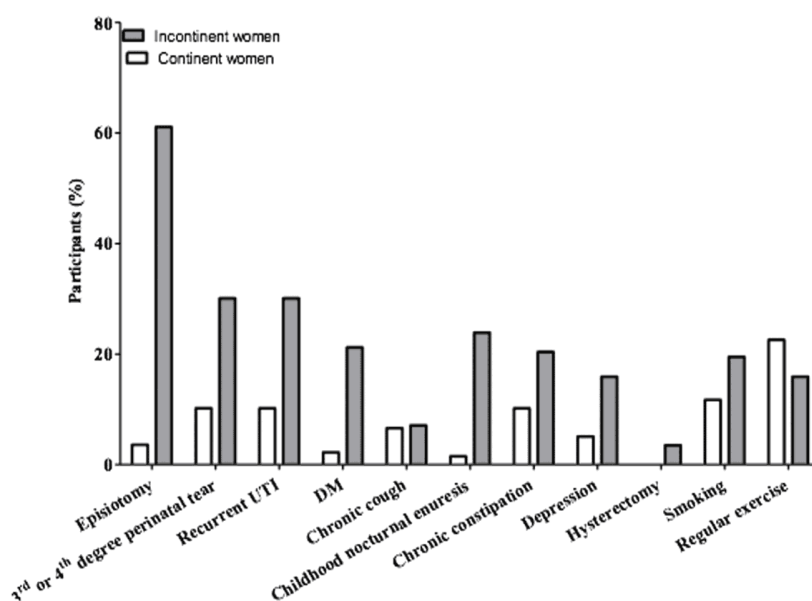


Fig. 2. Continent and incontinent among Women

4. DISCUSSION

Although UI is frequent among Saudi women, few women seek medical care, this issue caused by lack of knowledge and understanding of incontinence as a disease decrease the help seeking behavior in the patients. Within the Saudi community, avoidance to consult a male physician was one of the reasons for not asking medical advice [4].

Of the 270 women in this study, 133 (45.2%) had UI. Similar prevalence was found in Jeddah [4]

and Jazan Dayili study which was conducted in Jazan (KSA) [15]. However, lower prevalence was found in Riyadh [16].

In this study, the most common type of UI during the last three months was urge incontinence (43.4%), then stress incontinence (40.7%), mixed incontinence (8.0%), and other causes (8.0%). Similarly, Agarwal and Agarwal [1], reported that urge UI was the most common type by 38%. This was in contrast to other studies in the Gulf region [11], which revealed that the most frequent type of UI was stress incontinence by (50%) [16] and

(36%) [4] , respectively. This might be due to the difference in the population studied, definition of UI and questionnaires used.

In this study, most women with UI were > 30 years old. Agarwal and Agarwal [1], reported that about 60% of UI cases were in those < 50 years. Another study also reported that the characteristics of Saudi women with UI in Jazan included age \geq 50 years (66.3%) [15]. Moreover, in the United States, 25% of women aged 30-39 years and 50% of those aged 50-90 years had urine leakage [17]. This result could be partially explained by a decline in contractility, progressive loss of muscle tone, changes in hormonal stimulation, and repeated injuries during vaginal deliveries [18].

Regarding BMI and obesity [15], Ahmed et al. found that the majority of obese females (71.3%) had UI, but the majority of those who were normal or overweight (76.5%) did not. Panugthong et al. [19] reported obesity as a risk factor of UI, and Subak et al. [20] found that losing 5%-10% of body weight led to decreased UI. Possible reasons could be excess body weight increases abdominal pressure. This in turn increases bladder pressure and mobility of the urethra, resulting in stress incontinence.

In married women, the frequency of UI was significantly higher than those who are not married. This could be associated with obstetric etiologies. Parity in UI patients was mostly \geq 3. Our results showed that UI was more common in women with a parity > 3, which were in line with previous studies [17,21]. Additionally [15], Ahmed et al. indicated that multi-parity was linked to UI prevalence, with 55.3% percent of females who had more than three times delivery suffering from UI, compared to 37.6% of females with less than three times suffering from UI . However, research from Qatar [22] did not report a clear relationship between parity and UI.

Regarding mode of delivery, Our results demonstrate that delivery type was not a significant risk factor for UI, similar to Kuh et al. [23] and other two studies [22,23]. However [15], Ahmed et al. indicated that cesarean delivery was linked to UI, with 65.5% of women with a cesarean delivery having UI, Vaginal delivery was less common among UI patients (38.3%). On the other hand, Melville et al. [17] found that a history of CS only was associated with decreased odds of having UI. Other studies reported that multiple vaginal deliveries increase

the risk of developing UI [4,8,24,25], possibly because of damage to vital muscles or nerves.

In term of recurrent urinary tract infections as a risk factor, there was an association between urinary incontinence and recurrent urinary tract infection [26]. A possible explanation could be irritation of bladder mucosa by colonization of bacteria leading to urge incontinence specifically in elderly women.

Diabetes mellitus is a major negative independent risk factor. Neurologic problems from diabetes can result in detrusor instability and urge incontinence. Karen et al. [27] found that DM was linked to a 50% higher risk of urge incontinence in postmenopausal women .Present study supports such a study.

Psychological health might also influence the occurrence of urinary incontinence. Zorn et al [28] hypothesized that depression associated with decreased serotonin activity may predispose to urge incontinence, because descending serotonin pathways from the brain stem reduce bladder contractions. Therefore, depression and idiopathic urge incontinence were strongly linked together according to our findings and previous studies [29,30].

Episiotomy was more common in women with UI than those without UI. History of 3rd and 4th degree perineal tear was more common in women with UI. This result could be due to repetitive injury of pelvic floor muscles and denervation during childbirth [29] .

A few studies have investigated the relationship between childhood nocturnal enuresis (NE) and urinary incontinence [31]. In a study involving 990 women, Yarnell et al [32] found that women with history of NE after the ages of 5 and 9 years had a higher relative chance of developing urinary incontinence. Moreover, women with a history of NE at the age of six years, during the day or several nights per week, were more likely to have severe UI and urge symptoms, according to Kuh et al. [23]. In addition, adult urge incontinence was more than 2-fold linked with childhood daytime incontinence and nocturnal enuresis [31]. Our study collaborates their results.

5. CONCLUSIONS

The present study showed that the prevalence of UI among Saudi women was 45.2%. The

incontinence types were mostly urge, followed by stress and other types.

Female UI is a public health issue with medical and social ramifications. More research is needed to appropriately address the UI burden in Saudi Arabia and help plan future healthcare strategies.

6. LIMITATIONS

The limitations of this study were that our results regarding UI diagnosis and its types were based only on a questionnaire, and participants did not undergo a physical examination. Assessment of the effects of UI on quality of life was also was not assessed in the study.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Agarwal BK, Agarwal N, B.K. and N: Agarwal. Urinary incontinence: prevalence, risk factors, impact on quality of life and treatment seeking behaviour among middle aged women. *Int Surg J.* 2017;6(6):1953-8. DOI: 10.18203/2349-2902.isj20172131.
2. Mostafaei H, Sadeghi-Bazargani H, Hajebrahimi S, Salehi-Pourmehr H, Ghojzadeh M, Onur R et al. Prevalence of female urinary incontinence in the Developing World: A systematic review and meta-analysis—A Report from the Developing World Committee of the International Continence Society and Iranian Research Center for Evidence Based Medicine. *Neurourol Urodyn.* 2020;39(4):1063-86. DOI: 10.1002/nau.24342
3. Bakarman MA, Al-Ghamdi SS. The effect of urinary incontinence on quality of life of women at childbearing age in Jeddah, Saudi Arabia. *Glob J Health Sci.* 2015;8(2):281-7. DOI: 10.5539/gjhs.v8n2p281.
4. Al-Badr A, Brasha H, Al-Raddadi R, Noorwali F, Ross S. Prevalence of urinary incontinence among Saudi women. *Int J Gynaecol Obstet.* 2012;117(2):160-3. DOI: 10.1016/j.ijgo.2011.12.014
5. Govender Y, Gabriel I, Minassian V, Fichorova R. The current evidence on the association between the urinary microbiome and urinary incontinence in women. *Front Cell Infect Microbiol.* 2019;9:133. DOI: 10.3389/fcimb.2019.00133
6. Million E, Vexlard E, Lognos B, Cayrac M. Urinary incontinence as a marker of temporality in women: a qualitative study. *Climacteric.* 2021;24(6):605-11. DOI: 10.1080/13697137.2021.1915272.
7. DeLancey JOL. The pathophysiology of stress urinary incontinence in women and its implications for surgical treatment. *World J Urol.* 1997;15(5):268-74. DOI: 10.1007/BF02202011
8. Kirss F, Lang K, Toompere K, Veerus P. Prevalence and risk factors of urinary incontinence among Estonian postmenopausal women. *SpringerPlus.* 2013;2:524. DOI: 10.1186/2193-1801-2-524.
9. Subak LL, Brubaker L, Chai TC, Creasman JM, Diokno AC, Goode PS et al. High costs of urinary incontinence among women electing surgery to treat stress incontinence. *Obstet Gynecol.* 2008;111(4):899-907. DOI: 10.1097/AOG.0b013e31816a1e12.
10. Ganz ML, Smalarz AM, Krupski TL, Anger JT, Hu JC, Wittrup-Jensen KU et al. Economic costs of overactive bladder in the United States. *Urology.* 2010;75(3). DOI: 10.1016/j.urology.2009.06.096.
11. Hammad FT. Prevalence, social impact and help-seeking behaviour among women with urinary incontinence in the Gulf countries: A systematic review. *Eur J Obstet Gynecol Reprod Biol.* 2021;266:150-6.

- DOI: 10.1016/j.ejogrb.2021.10.005.
12. Pakgohar M, Sabetghadam S, Vasegh Rahimparvar SF, Kazemnejad A. Quality of life (QoL) and help-seeking in postmenopausal women with urinary incontinence (UI): A population based study. *Arch Gerontol Geriatr.* 2014;59(2):403-7. DOI: 10.1016/j.archger.2014.07.004.
 13. Strickland R. Reasons for not seeking care for urinary incontinence in older community-dwelling women: a contemporary review. *Urol Nurs.* 2014; 34(2):63-8. DOI: 10.7257/1053-816X.2014.34.2.63.
 14. Brown JS, Bradley CS, Subak LL, Richter HE, Kraus SR, Brubaker L. The sensitivity and specificity of a simple test to distinguish between urge and stress urinary incontinence. *Ann Intern Med.* 2006;144(10):2006144, 715-723. DOI: 10.7326/0003-4819-144-10-200605160-00005.
 15. DAA Y, Mohammed SMA, I. RIM, I. N. B.: Urinary incontinence in healthy. *Urinary Incontinence in Healthy Saudi women. Egypt J Hosp Med.* 2017;69(7):2890-6. DOI: 10.12816/0042583.
 16. Altaweel W, Alharbi M. Urinary incontinence: prevalence, risk factors, and impact on health related quality of life in Saudi women. *Neurourol Urodyn.* 2012;31(5):642-5. DOI: 10.1002/nau.22201.
 17. Melville JL, Katon W, Delaney K, Newton K. Urinary incontinence in US women: a population-based study. *Arch Intern Med.* 2005;165(5):537-42. DOI: 10.1001/archinte.165.5.537.
 18. Lubner KM. The definition, prevalence, and risk factors for stress urinary incontinence. *Rev Urol.* 2004;6;Suppl 3:S3-9.
 19. Panugthong P, Chulyamitporn T, Tanapat Y. Prevalence and risk factors of urinary incontinence in Thai menopausal women at Phramongkutklao Hospital. *J Med Assoc Thai.* 2005;3;Suppl 3:25-30.
 20. Subak LL, Johnson C, Whitcomb E, Boban D, Saxton J, Brown JS. Does weight loss improve incontinence in moderately obese women? *Int Urogynecol J Pelvic Floor Dysfunct.* 2002;13(1):40-3. DOI: 10.1007/s001920200008.
 21. Rizk DE, Shaheen H, Thomas LD, Dunn E, Hassan MY. The prevalence and determinants of health care-seeking behavior for urinary incontinence in United Arab Emirates women. *Int Urogynecol J Pelvic Floor Dysfunct.* 1999;10(3):160-5. DOI: 10.1007/s0019200500038.
 22. Ghafouri A, Alnaimi AR, Alhothi HM, Alroubi I, Alrayashi M, Molhim NA et al. Urinary incontinence in Qatar: A study of the prevalence, risk factors and impact on quality of life. *Arab J Urol.* 2014;12(4):269-74. DOI: 10.1016/j.aju.2014.08.002.
 23. Kuh D, Cardozo L, Hardy R. Urinary incontinence in middle aged women: childhood enuresis and other lifetime risk factors in a British prospective cohort. *J Epidemiol Community Health.* 1999;53(8):453-8. DOI: 10.1136/jech.53.8.453.
 24. Cerruto MA, D'Elia C, Aloisi A, Fabrello M, Artibani W. Prevalence, incidence and obstetric factors' impact on female urinary incontinence in Europe: a systematic review. *Urol Int.* 2013;90(1):1-9. DOI: 10.1159/000339929.
 25. Swanson JG, Kaczorowski J, Skelly J, Finkelstein M. Urinary incontinence: common problem among women over 45. *Can Fam Physician.* 2005;51:84-5.
 26. Moore EE, Jackson SL, Boyko EJ, Scholes D, Fihn SD. Urinary incontinence and urinary tract infection: temporal relationships in postmenopausal women. *Obstet Gynecol.* 2008;111(2 Pt 1):317-23. DOI: 10.1097/AOG.0b013e318160d64a.
 27. Lifford KL, Curhan GCH, Hu FB, Barbieri RL, Grodstein F. F: type 2 diabetes mellitus and risk of developing urinary incontinence. *J Am Geriatr Soc.* 2005;53(11):1851-7. DOI: 10.1111/j.1532-5415.2005.53565.x.
 28. ZORN BH, Montgomery H, Pieper K, Gray M, Steers WD. Urinary incontinence and depression. *J Urol.* 1999;162(1):82-4. DOI: 10.1097/00005392-199907000-00020.
 29. Lim YM, Lee SR, Choi EJ, Jeong K, Chung HW. Urinary incontinence is strongly associated with depression in middle-aged and older Korean women: data from the Korean longitudinal study of ageing. *Eur J Obstet Gynecol Reprod Biol.* 2018;220:69-73. DOI: 10.1016/j.ejogrb.2017.11.017.
 30. Cheng S, Lin D, Hu T, Cao L, Liao H, Mou X et al.. Hu. Association of urinary incontinence and depression or anxiety: a meta-analysis. *J Int Med Res.* 2020;48(6):300060520931348-10.

- DOI: 10.1177/0300060520931348.
31. Gurbuz A, Karateke A, Kabaca C. Enuresis in childhood, and urinary and fecal incontinence in adult life: do they share a common cause? *BJU Int.* 2005;95(7): 1058-62.
DOI: 10.1111/j.1464-410X.2005.05466.x
32. Yarnell JW, Voyle GJ, Sweetnam PM, Milbank J, Richards CJ, Stephenson TP. Factors associated with urinary incontinence in women. *J Epidemiol Community Health.* 1982;36(1):58-63.
DOI: 10.1136/jech.36.1.58

APPENDICES

Appendices 1 and 2

Risk factors				
Demographic factors				
Age	20-30 YEARS	>30 YEARS		
BMI	Normal weight	Obese		
Marital status	Single	Married		
Obstetric history				
Parity	<3	>3		
Mode of delivery	Cesarean delivery	Vaginal delivery	Both Vaginal delivery +cesarean section	Not applicable
Episiotomy	YES	NO		
3 rd and 4 th perineal tear after delivery	YES	NO		
Medical diseases				
History of Repeated Urinary tract infections	YES	NO		
Diabetes	YES	NO		
Chronic cough	YES	NO		
Childhood Enuresis	YES	NO		
Chronic constipation	YES	NO		
depression	YES	NO		
History of hysterectomy	YES	NO		
Social factors				
Smoking	YES	NO		
Exercise	YES	NO		

Appendix 13A. The 3 Incontinence Questions (3IQ)

1. During the last three months, have you leaked urine (even a small amount)?
 Yes No → Questionnaire completed.
2. During the last three months, did you leak urine (check all that apply):
 - a. When you were performing some physical activity, such as coughing, sneezing, lifting, or exercise?
 - b. When you had the urge or feeling that you needed to empty your bladder, but you could not get to the toilet fast enough?
 - c. Without physical activity and without a sense of urgency?
3. During the last three months, did you leak urine most often (check only one):
 - a. When you are performing some physical activities, such as coughing, sneezing, lifting, or exercise?
 - b. When you had the urge or feeling that you needed to empty your bladder, but you could not get to the toilet fast enough?
 - c. Without physical activity or a sense of urgency?
 - d. About equally as often with physical activities as with a sense of urgency?

Definitions of the type of urinary incontinence are based on responses to Question 3	
Response to question 3	Type of incontinence
a. Most often with physical activity	Stress only or stress predominant
b. Most often with the urge to empty the bladder	Urge only or urge predominant
c. Without physical activity or sense of urgency	Other cause only or other cause predominant
d. About equally with physical activity and sense of urgency	Mixed

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