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Epidemiologic Study of Female Urinary Incontinence in South Khorasan, Iran

Majid Zare-Bidaki[1], Mohammad Nadjafi Semnani[2]*, Ali Nadjafi Semnani[3], Nahid Ghanbarzadeh[4]*

1. *Infectious Diseases Research Center, Birjand University of Medical Sciences, Birjand, Iran*
2. *Department of Urology, School of Medicine, Birjand University of Medical Sciences, Birjand, Iran*
3. *Department of General Surgery, School of Medicine, Zahedan University of Medical Sciences, Zahedan, Iran*
4. *Department of Gynecology and Obstetrics, School of Medicine, Birjand University of Medical Sciences, Birjand, Iran*

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Corresponding Information:
Mohammad Nadjafi Semnani,
Department of Urology, School of Medicine, Birjand University of Medical Sciences, Birjand, Iran

Nahid Ghanbarzadeh
Department of Gynecology and Obstetrics, School of Medicine, Birjand University of Medical Sciences, Birjand, Iran
Email: nghanbarzadeh@gmail.com

ABSTRACT

Background & Objective: Urinary incontinence (UI) is a common disease that affects millions of people throughout their lives. It is reported that UI has a considerable economic burden on patients and communities. The aim of this study was to find out the prevalence of urinary incontinence (UI) and its related factors among women living in Birjand city, Iran.

Materials & Methods: A cross-sectional study from September 2020 to December 2020 was conducted on women 15 to 70 years living in nine areas of Birjand city. Data were gathered by researcher-made questionnaire and in-person interviews about demographic, obstetrics, and UI (stress, urge, and overflow UI) characteristics. Chi-square test was applied to analyze differences between women with and without UI about risk factors.

Results: Of 3028 women (mean age 32.70±11.49 years), 828 (27.3%) reported to have UI. The rate of stress, urge, and mixed UI was 18.1%, 3.4%, and 5.9%, respectively. All types of UI were associated with age, education, BMI, chronic cough / dyspnea, constipation, diabetes mellitus, and smoking.

Conclusion: Women should be continuously educated by health care providers on the risk factors and activities which can reduce their risk for UI. Further studies on women across the country may help decision makers to measure the regional burden of disease and to plan population-level interventions.

Keywords: Epidemiologic Study, Risk factor, Urinary Incontinence, Women

Introduction

Urinary incontinence (UI) is a common disease that affects millions of people throughout their lives. It is reported that UI has a considerable economic burden on patients and communities. There is a need to improve awareness of UI in the universal public health and clinical management programs to focus attention on its need for early diagnosis and management **(1)**. A systematic review by Karin *et al.* indicated that the overall prevalence of UI (stress or mixed UI) estimated in studies ranged from 2.6% to 14.2% in American men and from 8.9% to 36.3% in American women **(2)**. The surveys based on population have shown different prevalence rates for urge UI ranging from 1.8% to 30.5% in European populations, 1.7% to 36.4% in American residents, and 1.5% to 15.2% in Asians, with the prevalence depending on age and gender **(1)**. The prevalence of urinary infections rises with increasing age among both genders **(3-5)**. With the aging population in the United States, it is estimated that by 2022, the rate of urge UI will increase to more than 23%, and the rate of stress UI will rise to more than 24% **(6)**. Research shows that 348 million people experienced a urinary infection type around the world in 2008, and this number is expected to increase to 423 million by the year 2018. Urinary infection is most prevalent in women, and the consequent challenges of this disease are highest in developing countries of Asia, Africa, and South America. Overall 250 million women were influenced by UI in 2008 in developing countries, and this number is expected to rise to more than 303 million by 2022 **(6)**. The effect of this disorder is considerably higher in middle-aged and older women **(7)**.

Researchers believe that UI is caused by several physical and behavioral factors and can generate substantial social and emotional issues. They have

shown that women with urge and stress UI also express a lower quality of life and less sexual and marital satisfaction than the average population **(8)**. Studies on Iranian women with UI showed that affected patients had impaired mental health and quality of life. Studies also have suggested that healthcare professionals should consider the psychological effects of UI and evaluate the mental health of patients along with their medical treatments **(9)**.

Recognized risk factors for UI in women, such as BMI, weight change, age, and parity, have been influential in the incidence of UI and its remission or both **(10)**. Several studies have confirmed that pelvic floor dysfunction after vaginal delivery increases the risk of UI compared with abdominal delivery. But it is unclear whether or not instrumental delivery is an added risk factor. Likewise, multiparity, episiotomy, being overweight, and old age may also affect UI development **(11, 12)**.

UI in adult women can be classified into three main types as follows: 1) Stress UI (spontaneous leakage of urine with actions such as sneezing, coughing, and lifting); 2) Urge UI (involuntary leakage of urine with a sudden need or urge to pass urine); and 3) Overflow UI (unintentional loss of urine accompanying with over-distention of the bladder); however, most patients present with a mixed type of incontinence **(13-15)**.

The risk factors of UI and its prevalence are associated with the economy and standards of living of the states. As the result, the researchers should consider these factors to help the healthcare providers in designing effective interventions to reduce the unfavorable consequences of UI on the quality of life in affected women and their families **(16)**. Thus, this study aimed to ascertain the prevalence of UI and its related factors among women of Birjand city, the center of Sothern Khorasan province of Iran.

Materials and Methods

This cross-sectional study was approved by Ethical Committee on Research in Birjand University Medical Sciences (IR.BUMS.REC.1399.413). The study was accomplished on a stratified sampling of women 15 to 70 years of age in Birjand between September 2020 and December 2020. We chose all contributors randomly. To do this, we applied systematic sampling from the comprehensive record list of women overseen by the health centers and were enlisted from nine regions of the city served by nine health centers, all affiliated with Birjand University of Medical Sciences. The predictable prevalence of the UI was assumed 30% (0.3) **(17)**, and its desired precision (d) was 2%, then the least sample size was calculated to be 2017. We asked 3050 females either at their home or in the health centers, of whom 3028 (99.3%) were happy (verbal and written) to participate in the study and filled a structured questionnaire. The inclusion criteria consisted of all women aged between 15 and 70 years, who were not antenatal or postnatal mothers, the women who had not delivered within the last six months and the women who willingly filled the informed consent form. All the patients also answered to some demographic and clinical questions using a questionnaire. We deeply respected the privacy of all participants by using an anonymous questionnaire. The purpose of the survey was explained for all contributors who encountered the inclusion criteria and were content to participate in the study. Then, participants were requested to complete a researcher-made questionnaire answering questions about their demographic factors, obstetric and UI characteristics. Moreover, the data also was collected by in-person interviews.

We initially designed a questionnaire based on literature review on UI and related factors in women. The validity and reliability of this investigator-made questionnaire was determined before data gathering. To approve the validity, the content validity scheme was used, and to verify the reliability, Cronbach's alpha test was done. The questionnaire's content validity was checked by a group of specialists, including a gynecologist, a social medicine specialist, and an academic nurse. The questionnaire was initially tested on 30 women as a pilot study and the data was reliable with a Cronbach's alpha of 0.89. All main demographic characteristics, including age, marital status, educational level, occupational status, and BMI were assessed in all contributors. The obstetric characteristics, such as, the number of pregnancies, dyspareunia, history of cesarean, menopause status, number of deliveries, maternal age at first birth, and hysterectomy history were included. Moreover, some risk factors related to health, including medical histories, such as kidney or bladder surgery, renal disease, either stone or infection, urinary tract infection, chronic cough and dyspnea, smoking and caffeine intake were also assessed in our study. To check if contributors had UI, we asked them this question: “Do you have any spontaneous leakage of urine during the day?" Answering "yes" categorized them as having UI, and answering "No", considered them as not having UI. We also provided some questions to determine if they had stress, urge and oroverflow incontinence. We asked them if they leak urine during coughing, lifting, sneezing, or engaging in physical activities. We also asked them if they experience some vigorous and sudden urge to force them leak before reaching the toilet?" Finally, for urge UI, we asked them if they have an involuntary loss of urine related to over-distention. No clinical examination or urodynamic testing was done on contributors.

All statistical analyses was done by using SPSS software, version 21 (SPSS Inc., Chicago, Ill., USA). By using measures of distribution, the prevalence of UI was determined. The Chi-square test was used to assess differences in demographic and obstetrical features and other health risk factors among all participants. For all

statistical tests, P-value<0.05 was considered as significant.

Results

Totally, 3028 women participated in our study. The mean age was 32.70±11.49 (range: 15-70) years and 64.6% of participants recruited for the study were under the age of 35 years. Tables 1 and 2 summarize the demographic characteristics and medical history of participants. A large number of participants were married (91%) and housewives (84.7%). More than half of the women who participated in the study had a low education level (illiterate, primary school, and middle school = 56.1%) and found to have an overweight BMI (51.2%). About 14.2% of women were nulligravid, and 53.6% had 1-3 pregnancies. About 17.9% of participants were nulliparous, and 53.9% had 1-3 deliveries. Age at first childbirth in more than half of women (51%) was 20 years and below. A history of cesarean delivery was seen in 17.7% of the subjects.

Of the 3028 participants, 828 (27.3%) reported that they have UI and 2200 (72.7%) denied having UI. The frequency of participated women with stress, urge, and stress/urge UI was 547 (18.1%), 102 (3.4%), and 179 (5.9%), respectively.

Multivariate logistic regression analysis (see Tables 3 and 4) shows significant differences in demographic and obstetrical characteristics and medical history of women with and without UI (stress and urge UI).

Urinary Incontinence and Demographic Characteristics

As shown in Table 3, the participants with UI were mostly those in the age groups of 35-44 years (OR=1.65, 95%CI: 1.25-2.17, *P*<0.001), 45-54 (OR=1.91, 95%CI: 1.34-2.72, *P*<0.001), and 55-64 (OR=2.60, 95%CI: 1.58-4.30, *P*<0.001). Also, women who had guidance school education compared to the other education levels (OR=1.63, 95%CI: 1.11-2.38, *P*=0.01) and obesity (OR=1.53, 95%CI: 1.01-2.34, *P*=0.05) were significantly associated with UI.

Stress UI had a relatively higher rate in women in the age groups of 35-44 years (OR=1.67, 95%CI: 1.26-2.21, *P*<0.001), 45-54 years (OR=1.78, 95%CI: 1.25-2.52, *P*=0.001), and 55-64 years (OR=2.24, 95%CI: 1.40-3.60, *P*=0.001). The rate of stress UI among obese women (32%) was the highest compared to the other BMI categories (OR=1.53, 95%CI: 1.01-2.34, *P*=0.04) (Table 4).

There were important relations between urge UI and some demographic factors, including age and BMI. This type of incontinence was seen more among women in 45-54 years (OR=1.87, 95%CI: 1.02-3.43, *P*=0.04) and 55-64 years (OR=2.31, 95%CI: 1.09-4.89, P=0.03) compared to the other age categories, and also among obese BMI category (OR=2.07, 95%CI: 1.19-3.61, *P*=0.01) (Table 4).

Urinary Incontinence and Obstetric Factors

The results in Table 4 show that urge UI was significantly associated with the gravidity number of three (OR=3.06, 95%CI: 1.44-6.48, *P*=0.004), four (OR=2.47, 95%CI: 1.11-5.51, *P*=0.03), and five (OR=2.69, 95%CI: 1.17-6.15, *P*=0.02).

Urinary Incontinence and Other Health-related Factors

Table 3 illustrates the association between UI and other health related factors including a history of chronic cough and dyspnea [frequently (OR=2.11, 95%CI: 1.49-2.98, *P*<0.001) or occasionally (OR=2.30, 95%CI: 1.68-3.11, *P*<0.001)], constipation [frequently (OR=1.63, 95%CI: 1.17-2.26, *P*=0.004) or occasionally (OR=1.81, 95%CI: 1.45-2.26, *P*<0.001)], diabetes mellitus (OR=3.23, 95%CI: 1.49-7.01, *P*=0.003), and cigarette smoking (OR=1.91, 95%CI: 1.15-3.17, *P*=0.01) (Table 3). These factors remained significant in both stress and urge UI (Table 4).

Table 1. Demographic characteristics of participated women

Variables		n (%)
Age (year)		
	≤25	961 (31.7%)
	26-34	996 (32.9%)
	35-44	593 (19.6%)
	45-54	301 (9.9%)
	45-64	117 (3.9%)
	≥64	60 (2%)
Marital status		
	Married	2755 (91%)
	Single	273 (9%)
Level of education		
	Illiterate	394 (13%)
	Primary school	845 (27.9%)
	Guidance school	459 (15.2%)
	High school	714 (23.6%)

Variables		n (%)
	University	616 (20.3%)
BMI		
	Underweight	351 (11.6%)
	Normal	785 (25.9%)
	Overweight	1551 (51.2%)
	Obese	341 (11.3%)
Occupation		
	House wife	2566 (84.7%)
	Employee	366 (12.1%)
	Worker	96 (3.2%)

Table 2. **Reproductive, gynecology, and other medical history**

Variables	n (%)
Number of Gravidity/Parity	
0	431 (14.2%) / 543 (17.9%)
1	665 (22%) / 711 (23.5%)
2	562 (18.6%) / 533 (17.6%)
3	393 (13%) / 388 (12.8%)
4	291 (9.6%) / 281 (9.3%)
5	232 (7.7%) / 196 (6.5%)
6	141 (4.7%) / 138 (4.6%)
7-8	165 (5.4%) / 147 (4.9%)
>8	148 (4.9%) / 91 (3%)
Age at first childbirth (year)	
≤20	1222 (51%)
21-33	1150 (48%)
>33	26 (1%)
Gynecology history	
Dyspareunia	622 (20.5%)
Menopause	289 (9.5%)
Cesarean delivery	535 (17.7%)
Hysterectomy	63 (2.1%)
Colporrhaphy	60 (2%)
Past medical history	
Surgery	827 (27.3%)
Kidney or bladder surgery	37 (1.2%)
Renal disease	226 (7.5%)
UTI in the last year	713 (23.5%)
Chronic cough or dyspnea	437 (14.4%)

Table 3. **Multivariate logistic regression odds ratios for any urinary incontinence**

	UI		
	n (%)	OR (95%CI)	P-value
Age (year)			
≤25	193 (20.1%)	1	-
26-34	226 (22.7%)	1.01 (0.79-1.30)	0.91
35-44	216 (36.4%)	1.65 (1.25-2.17)	<0.001
45-54	118 (39.2%)	1.91 (1.34-2.72)	<0.001
55-64	51 (43.6%)	2.60 (1.58-4.30)	<0.001
>64	24 (40%)	1.91 (0.98-3.70)	0.06
Level of education			
Illiterate	134 (34%)	1	-
Primary school	221 (26.2%)	1.06 (0.76-1.47)	0.74
Guidance school	158 (34.4%)	1.63 (1.11-2.38)	0.01
High school	170 (23.8%)	1.24 (0.87-1.78)	0.24
University	145 (23.5%)	0.95 (0.64-1.40)	0.78

	UI		
BMI			
Underweight	126 (35.9%)	1	-
Normal	203 (25.9%)	0.87 (0.64-1.19)	0.38
Overweight	380 (24.5%)	0.83 (0.66-1.11)	0.20
Obese	119 (34.9%)	1.53 (1.01-2.34)	0.05
History of chronic cough and dyspnea			
No	636 (24.5%)	1	-
Often	82 (44.1%)	2.11 (1.49-2.98)	<0.001
Occasionally	110 (43.8%)	2.30 (1.68-3.11)	<0.001
Constipation			
No	507 (23.5%)	1	-
Often	86 (35.7%)	1.63 (1.17-2.26)	0.004
Occasionally	235 (37.1%)	1.81 (1.45-2.26)	<0.001
Diabetes Mellitus			
No	805 (26.9%)	1	-
Yes	23 (63.9%)	3.23 (1.49-7.01)	0.003
Smoking			
No	788 (26.7%)	1	-
Yes	40 (51.3%)	1.91 (1.15-3.17)	0.01

Table 4. **Multivariate logistic regression odds ratios for stress and urge urinary incontinence**

	Stress UI			Urge UI		
	n (%)	**OR (95%CI)**	**P-value**	**n (%)**	**OR (95%CI)**	**P-value**
Age (year)						
≤25	162 (16.9%)	1	-	64 (6.7%)	1	-
26-34	205 (20.6%)	1.05 (0.81-1.36)	0.70	64 (6.4%)	0.73 (0.46-1.14)	0.16
35-44	197 (33.2%)	1.67 (1.26-2.21)	<0.001	62 (10.5%)	0.90 (0.52-1.56)	0.70
45-54	102 (33.9%)	1.78 (1.25-2.52)	0.001	54 (17.9%)	1.87 (1.02-3.43)	0.04
55-64	43 (36.8%)	2.24 (1.40-3.60)	0.001	26 (22.2%)	2.31 (1.09-4.89)	0.03
>64	17 (28.3%)	1.23 (0.64-2.38)	0.53	11 (18.3%)	1.62 (0.64-4.11)	0.30
BMI						
Underweight	109 (31.1%)	1	-	46 (13.1%)	1	-
Normal	170 (21.7%)	0.85 (0.61-1.17)	0.32	72 (9.2%)	1.03 (0.65-1.63)	0.89
Overweight	338 (21.8%)	0.89 (0.66-1.20)	0.43	124 (8%)	0.89 (0.58-1.37)	0.60
Obese	109 (32%)	1.53 (1.01-2.34)	0.04	39 (11.4%)	2.07 (1.19-3.61)	0.01
History of chronic cough and dyspnea						
No	552 (21.3%)	1	-	212 (8.2%)	1	-
Often	76 (40.9%)	2.28 (1.62-3.24)	<0.001	31 (16.7%)	1.40 (0.87-2.27)	0.17
Occasionally	98 (39%)	2.26 (1.65-3.11)	<0.001	38 (15.1%)	1.74 (1.12-2.66)	0.01
Constipation						
No	444 (20.6%	1	-	166 (7.7%)	1	-
Often	70 (29%)	1.44 (1.02-2.03)	0.04	39 (16.2%)	2.09 (1.35-3.22)	0.001
Occasionally	212 (33.4%)	1.81 (1.44-2.27)	<0.001	76 (12%)	1.49 (1.07-2.06)	0.02
Diabetes Mellitus						
No	708 (23.7%)	1	-	267 (8.9%)	1	-
Yes	18 (50%)	2.41 (1.14-5.09)	0.02	14 (38.9%)	4.33 (1.99-9.43)	<0.001
Smoking						
No	689 (23.4%)	1	-	-	-	-
Yes	37 (47.4%)	2.18 (1.32-3.61)	0.002	-	-	-
Gravidity						
0	-	-	-	17 (3.9%)	1	-
1	-	-	-	51 (7.7%)	1.80 (0.91-3.58)	0.09
2	-	-	-	32 (5.7%)	1.24 (0.58-2.66)	0.58
3	-	-	-	46 (11.7%)	3.06 (1.44-6.48)	0.004
4	-	-	-	37 (12.7%)	2.47 (1.11-5.51)	0.03
5	-	-	-	34 (14.7%)	2.69 (1.17-6.15)	0.02

	Stress UI			Urge UI		
6	-	-	-	15 (10.6%)	1.68 (0.65-4.35)	0.29
7-8	-	-	-	22 (13.3%)	1.74 (0.71-4.31)	0.23
>8	-	-	-	27 (18.2%)	1.85 (0.74-4.64)	0.19

Discussion

Our study demonstrated that about one-third (27.3%) of Iranian women living in Birjand had UI, and stress and urge incontinence were the most prevalent types. Overall, the UI was associated with age, education, BMI, chronic cough/dyspnea, constipation, diabetes mellitus, and smoking. Almost all of these factors remained independently associated with stress or urge UI subtypes.

Ahmadi *et al.* **(18)** performed a study to estimate UI among women aging 40 years and above, from 800 women residing in Tehran, Iran. The prevalence of UI according to their results was reported to be 38.4%, and women with a positive history of osteoarthritis, chronic cough, any surgery, ruptures during delivery, and no regular exercise were significantly at a higher risk for UI. They suggested that due to the comparably high prevalence of UI among middle-aged women and its consequences on their quality of life, strategies about medical education, prevention and management, and research programs should be applied **(18)**. Another study conducted by Eftekhar *et al.* **(19)** in Tehran, Iran, investigated the prevalence of stress UI among 1000 primiparous women four months after childbirth and also assessed the relationship between postpartum stress UI and type of delivery additional to other obstetric factors. They found that the prevalence of postpartum stress UI was 14.1%, and it was remarkably associated with the type of delivery. The prevalence of stress UI was 15.9% after vaginal delivery, 10.7% after elective cesarean section (CS), and 25% after CS performed for obstructed labor. Even though the rate of stress UI after spontaneous vaginal delivery and CS performed for obstructed labor was similar, the elective cesarean section was linked with a considerably lower prevalence of postpartum stress UI (P=0.01). Besides, they indicated that an increased rate of stress UI was significantly related to a maternal BMI higher than 30 before pregnancy and fetal weight above 3000 g (P<0.05) **(19)**. Hantoushzadeh *et al.* **(20)** studied the prevalence of mild stress UI one year postpartum in a cohort study on 618 primiparous women in Tehran. They showed that the type of delivery had an important impact on the development of stress UI at 40 days, three and six months after childbirth in patients with and without a history of UI before pregnancy. They found that the type of delivery had a remarkable effect on the persistence of stress UI up to 6 months after delivery, while pre-pregnancy stress UI showed that effect up to one year **(20)**. Another Iranian study by Sobhgol and Charandabee **(17)** in Tabriz was carried out to determine the risk factors for urge, stress, mixed UI, and overactive bladder (OAB) on 330 women aged 15-49 years. They found that the hazard of all UI and overactive bladder types increased with age, BMI, genital hiatus diameter, and constipation. Stress and urge UI were associated with posterior pelvic organ prolapse. All UI types were seen more among women with vaginal delivery, and BMI and pelvic inflammatory disease were foreseers of overactive bladder. The study showed that pelvic muscle strength could be a predictor of stress UI, and vaginal length was linked with mixed UI. The authors suggested that ideal BMI, a healthy approach to lifestyle, the treatment of constipation and pelvic organ prolapse, and increasing pelvic floor muscle strength could be protective actions against UI and overactive bladder **(17)**. Torkestani *et al.* **(21)** performed a case-control study in women with and without UI in Tehran. In their bivariate and multivariate analyses, they showed that increased age and BMI were risk factors of UI. Furthermore, significant associations between UI and delivery type, gravidity, parity, episiotomy, type of CS (elective or emergency) rectocele, cystocele, and chronic constipation were found in the bivariate analysis. They proposed that CS can decrease the rate of UI in women **(21)**.

The diversity of prevalence in different studies result from differences in UI definitions (such as frequency and severity), the used question and answer formats (such as yes/no vs. Likert scale), the demographic features studied in the populations (such as age); and investigation type (such as face-to-face interview, mail survey, telephone survey, or internet survey) **(2, 22)**. However, females are at a high risk of UI largely because of the pelvic floor damage caused by pregnancy and the process of childbirth. Pregnancy causes anatomical and hormonal changes by nature, which may damage pelvic floor muscle-strength. Vaginal delivery can extend the impact of pregnancy so that it can increase the risk of UI. Also, the pelvic floor's muscles and nerves, which control the urine flow, may hypothetically be impaired during the delivery **(23-26)**. Some studies showed that a childbirth process with a large fetus and methods assisted by instruments could result in significant trauma to the muscles and nerves of pelvic floor, significantly decreasing perineal floor strength **(27)**. Hence, the key factors that increase the risk of UI development in women are too much stretching, multiple deliveries, and other conditions causing repeated stretching and trauma to the pelvic floor structures **(28, 29)**. However, studies indicated that multiple factors synergistically add to UI development, such as obstetrical and gynecological factors, genetics, and social wellness **(29)**. The other factors include obesity, age, and menopause. Some other elements such as lower standards of living, unbalanced nutrition (causing reduced tissue tensile strength), anemia, and constant physical heavy work are suggested to be related to UI. However, these features may be diverse in different settings **(28)**. The harmful impact of

BMI on UI has been explained as the continuous weight on the pelvic tissues which can lead to constant strain, stretching, and weakness of the pelvic tissues such as muscles and nerves **(30, 31)**.

Conclusion

The findings of this study indicated that UI among women had affected a large population in our society. Moreover, its rate is similar to what was reported from in developing countries (28.7%) **(28)** or other Iranian studies (38.4%) (18). Therefore, it is still influencing women's health and requires public health interventions to prevent and treat this condition. It is noted that some low-cost self-directed interferences such as exercises for pelvic floor muscle strengthening can help women in improving symptoms and quickening their treatment process **(16)**. Women involved or at risk of UI should be continuously trained by health care providers on the risk factors and activities which can reduce their risk for UI. Further studies on women across the country may help health managers and decision-makers measure the regional burden of disease and plan population-level interventions.

Acknowledgments

The study was approved by research ethic committee of the Birjand University of Medical Sciences. All participants gave verbal consent and signed an informed consent before the enrollment.

Conflict of Interest

All authors have no conflict of interest.

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