African Journal of Urology (2018) **24**, 368–373

African Journal of Urology

Official journal of the Pan African Urological Surgeon's Association
web page of the journal

www.ees.elsevier.com/afju
www.sciencedirect.com

Female voiding dysfunctions and Urodynamics
Original article

Prevalence and risk factors for urinary and anal incontinence in Tunisian middle aged women

S. Gallas[a,b,*], **S. Frioui**[c], **H. Rabeh**[a], **M. Ben Rejeb**[d]

[a] *Physiology Laboratory, Faculty of Medicine of Monastir, University of Monastir, Tunisia*
[b] *Laboratory of Functional Explorations, Sahloul Hospital, Sousse, Tunisia*
[c] *Department of Physical Medicine and Functional Rehabilitation, Sahloul Hospital, Sousse, Tunisia*
[d] *Department of Prevention and Care Safety, Sahloul Hospital, Sousse, Tunisia*

Received 30 May 2018; received in revised form 23 July 2018; accepted 19 August 2018; Available online 23 October 2018

KEYWORDS
Prevalence;
Urinary incontinence;
Anal incontinence;
Risk factors;
Women

Abstract
Objectives: To estimate the prevalence of urinary incontinence and anal incontinence in Tunisian women and to identify their risk factors.
Subjects and methods: A cross-sectional study was conducted among 402 female doctors and nurses randomly selected from 3 large hospitals in the center of Tunisia. The prevalence of urinary incontinence and anal incontinence were measured using validated questionnaires.
Results: Overall 45.3% of women experienced incontinence (urinary incontinence or anal incontinence). The overall prevalence of urinary incontinence, anal incontinence and double incontinence were 45%, 6.3% and 6%, respectively. Factors associated with incontinence were postpartum urinary incontinence (OR 11.91, CI 4:72–30:04, P < 0.001), menopausal status (OR 11.72, CI 3:8–36:07, P < 0.001), arterial hypertension (OR 4.17, CI 1:61–10.81, P = 0.003), nurse occupation (OR 3.22, CI 1:62–6:36, P = 0.001) and constipation (OR 1.71, CI 1:02–2:87, P = 0.041). Medical help seeking was taken only by 21% of the incontinent women.
Conclusion: Forty five percent of Tunisian women suffered from urinary or anal incontinence. A primary prevention for modifiable risk factors, such as postpartum pelvic floor physiotherapy and hypertension control, should be advised to women in order to optimize their quality of life.

* Corresponding author at: Physiology Laboratory, Faculty of Medicine of Monastir, Avicenne Street, 5019, Monastir, Tunisia.
E-mail address: syrine.gallas@gmail.com (S. Gallas).
Peer review under responsibility of Pan African Urological Surgeons' Association.

https://doi.org/10.1016/j.afju.2018.08.002

Introduction

Urinary incontinence (UI) and anal incontinence (AI) are common pelvic floor disorders that may have an effect on female of all ages [1,2]. Associated embarrassment causes women reticence to report their symptoms and to seek care. Moreover, women consider, mistakingly, that incontinence is a natural consequence of aging or childbirth. Additionally, UI or AI are under-diagnosed by health-care personnel due to the mis-reporting incontinence, and so the prevalence of UI and AI in the Tunisian population is unknown.

Studies have shown a wide range of prevalence values of UI and AI depending on definition of incontinence, study populations, and data collection. The major reported associated factors include age, obesity, lifestyle, obstetric history and menopause [1,3–5].

The publications on prevalence and risk factors of UI and AI in women were performed mainly in Europe and America. Consequently, result extrapolation to our population may not be a good practice. To our knowledge no study showing incontinence prevalence in Tunisian women has to date been reported, which justifies this study and demonstrates its importance. Therefore, this study was designed to estimate the prevalence of UI and AI using validated questionnaires in a sample of middle aged Tunisian women and to identify their risk factors.

Patients and methods

This cross-sectional study was conducted among female doctors and nurses randomly selected from 3 large hospitals– Sahloul Hospital, Taher Sfar Hospital and Fattouma Bourguiba Hospital — in the center of Tunisia. Pregnancy, recent delivery (<6 months), neurological disease, acute or chronic kidney disease or cognitive disorders were exclusion criteria. The study protocol was approved by Ethics Committee of Sahloul Hospital, Tunisia (3150617).

The required sample size for the study was calculated using an estimated prevalence of 46% with a margin of error of ±5% and power estimated at 90%, among middle aged women [1]. The optimum sample size was 390. We increased the sample size by 10% to account for non-respondents.

The study questionnaire was developed in French following review of the literature. Women who accept to participate in the study were requested to complete an anonymous self-report questionnaire. The questionnaire contains information about demographic characteristics, personal habits, medical and surgical history, gynecological and obstetric history, presence of recurrent tract urinary infections, evaluation of health status and current medications. The questionnaire contains specific sections to identify UI, AI and constipation.

The BMI is calculated as weight of the subject divided by height squared (weight/height^2). This index classifies the nutritional status of the subject into 4 categories: underweight <18.5 kg/m^2, normal 18.5–24.9 kg/m^2, overweight 25.0–29.9 kg/m^2 and obese ≥30 kg/m^2.

Assessment of urinary incontinence

UI was performed using the USP Questionnaire (urinary symptom profile) [6] that measures frequency, prevalence, and perceived cause of UI, and its impact on every-day life. This is a validated questionnaire with 13 items to assess stress UI, urge UI and dysuria. Each question is scored from 0 to 3 providing a maximal score of 9, 21 and 9 for stress UI, urge UI and dysuria respectively. Composite score of 1 or higher for items 1a–1c classifies woman as having stress UI, 1 or higher for items 2–4,4b, 5–7 classifies woman as having urge UI, 1 or higher for items 8–10 classifies woman as having dysuria. Women with the combination of stress and urge UI were diagnosed as having mixed UI.

Assessment of anal incontinence

The Wexner score was used to assess AI [7]. It includes five questions that are scored on a scale from zero to four: frequency of incontinence to gas, to liquid and to solid, the use of pad, and lifestyle changes. This score ranges from 0 for normal continence to 20 for total incontinence. AI was defined as having a Wexner score greater or equal to 5.

Assessment of constipation

Constipation was assessed using the Knowles-Eccersley-Scott-Symptom (KESS) score [8]. The Kess score is composed of 11 questions and it range from 0 (no symptoms) to 39 (high symptom severity). Constipation was defined as having a Kess score greater to 10.

Data analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) (version 10.0, SPSS Inc, USA). Distributions of continuous variables are expressed as means or median ± SD and qualitative data are presented as frequencies. Comparison of these variables was ensured through appropriate statistical tests and the conditions of validity (Student t test, Chi 2 test, and Mann Whitney U test). To identify factors associated independently with UI, and/or AI, a multivariate analysis by binary logistic regression step down Hosmer and Lemeshow was undertaken. The variables included in the initial model were retained following the univariate analysis with statistical significance $p \leq 0.2$. This threshold was chosen to avoid potential confounding factors. A Spearman correlation study between these variables was performed in order to avoid the phenomenon of multicollinearity. The p value was considered significant if it is less than or equal to 0.05.

Results

In present study, 440 participants were included. Of them, 402 responded to questionnaire. Response rate was 93.5%. The mean age of the participants was 36.8 ± 8.32 years (range, 23–60 y). In this study, 58% were overweight or obese and 78% of women were married. Eighty percent were nurses, 18% had regular physical activity and 71% have insufficient income (Table 1). Constipation and systemic arterial hypertension were the most common medical condition. The most digestive or uro-gynecologic surgeries were cholecystectomy (n = 8, 2%), hemorrhoidectomy (n = 5, 1.2%), hysterectomy (n = 3, 0.7%) and cystocele (n = 2, 0.5%). Nearly 68% were parous and 57.7% of women reported at least one vaginal delivery; mean age of first delivery was 26 ± 4 years and mean delivery number was 2.0 ± 0.9.

Table 1 Characteristics of the participants and comparison of potential risk factors between women with and without incontinence by bivariate analysis.

Characteristics of the study population	Number of women (%) (n = 402)	Continent (n = 220)	Incontinent (n = 182)			p-value
			Only UI (n = 157)	Only AI (n = 1)	DI (n = 24)	
Age:						
• <40	275 (68.4)	164 (74.5)	101(64.3)	1	9 (37.5)	**0.004**
• ≥40	127 (31.6)	56 (25.5)	56 (35.7)	0	15 (62.5)	
BMI (Kg/m^2)						
• Low-normal	169 (42)	109 (49.5)	52 (33.1)	1	7 (29.2)	**0.001**
• Overweight-obesity	233 (58)	111 (50.5)	105 (66.9)	0	17 (70.8)	
Marital status						
• Single	76 (18.9)	55 (25)	21 (13.4)	0 (0)	0 (0)	**0.001**
• Married-divorced-widowed	326 (81.1)	165 (75)	136 (86.6)	1 (100)	24 (100)	
Occupation:						
• Nurse	321 (80%)	166 (75.5)	25 (15.9)	0	22 (91.7)	**0.016**
• Physician	81 (20%)	54 (24.5)	132 (84.1)	1	2 (8.3)	
Regular physical activity	73 (18.2)	49 (22.3)	20 (12.7)	0	4 (16.7)	**0.019**
Income						
• Sufficient	117 (29.1)	64 (29.1)	39 (24.8)	0	14 (58.3)	**0.000**
• Insufficient	285 (70.9)	156 (70.9)	118 (75.2)	1	10 (41.7)	
History of clinical conditions:						
Diabetes	31 (7.7)	6 (2.7)	21 (13.4)	0	4 (16.7)	**0.000**
Arterial blood hypertension	49 (12.2)	9 (4.1)	28 (17.8)	0	12 (50)	**0.000**
Constipation	114 (28.4)	52 (23.6)	54 (34.4)	1	7 (6.1)	**0.021**
Depression	21 (5.2)	15 (6.8)	6 (3.8)	0	0 (0)	0.114
Cardiac problem	15 (3.7)	6 (2.7)	7 (4.5)	0	2 (8.3)	0.243
Respiratory problem	10 (2.5)	4 (1.8)	6 (3.8)	0	0 (0)	0.531
Parity						
• Nulliparous	131 (32.6)	92 (41.8)	39 (24.8)	0	0	**0.000**
• Parous	271 (67.4)	128 (58.2)	118 (75.2)	1	24 (100)	
Age at first delivery	26 ± 4	27.26 ± 3.55	26.57 ± 4.54	27 ± 3.55	25.67 ± 4.02	0.08
Mean parity	2.04 ± 0.9	1.87 ± 0.9	2.15 ± 1.05	2 ± 0.9	2.38 ± 0.77	**0.006**
Mode of delivery:						
• Vaginal delivery	232 (57.7)	107 (48.6)	101 (64.3)	1	23 (95.8)	**0.000**
• Cesarean section	76 (18.9)	36 (16.4)	37 (23.6)	0	3 (12.5)	0.152
Abortion	152 (37.8)	71 (32.3)	67 (42.7)	0	14 (58.3)	**0.012**
Obstetric tears	64 (15.9)	23 (10.5)	31 (19.7)	0	10 (41.7)	**0.001**
Birth weight >4000 g	42 (10.4)	14 (6.4)	25 (15.9)	0	3 (12.5)	**0.003**
Postpartum urinary incontinence	52 (12.9)	7 (3.2)	35 (22.3)	1	9 (37.5)	**0.000**
Postpartum anal incontinence	9 (2.2)	2 (0.9)	5 (3.2)	0	2 (8.3)	0.085
Oral contraceptive	40 (10)	20 (9.1)	20 (12.7)	0	0 (0)	0.527
Menopausal	44 (10.9)	5 (2.3)	31 (19.7)	0	8 (33.3)	**0.000**
Medical advice sought for incontinence	38 (9.5)	–	26 (16.5)	0	12 (50)	0.732
Self perception of health:						
• Excellent-very good-good	370 (92)	219 (99.5)	136 (86.6)	1 (100)	14 (58.3)	**0.000**
• Fair-poor	32 (8)	1 (0.5)	21 (13.4)	0	10 (41.7)	

P-values indicate the statistical differences between the incontinent and the continent subjects.
UI, urinary incontinence; AI, anal incontinence; DI, double incontinence.

45.3% of women were incontinent which was defined as having UI or AI. The prevalence of only UI was 39.1%. Only AI was reported by one woman (0.3%). The prevalence of double incontinence, defined as UI and AI, was 6%.

The overall prevalence of UI was 45%. Among these women, 40.3% had urge UI, 24.6% had stress UI, and 19.9% had mixed UI. Means scores for urge and stress incontinence were 2.0 ± 3.2 and 0.5 ± 1.2 respectively.

Table 2 Frequency of flatal, liquid and solid stool incontinence, use of protective pad, and impact on quality of life.

	Never	Rarely	Sometimes	Usually	Always
Solid stool incontinence	97	2	0.8	0	0.2
Liquid stool incontinence	93.8	4.5	1.5	0.2	0
Flatal incontinence	90.3	3.2	3.3	2	1.2
Pad use	96.3	3	0.5	0.2	0
Lifestyle restriction	92	0.5	2.5	4.3	0.7

Table 3 Multivariate logistic regression analysis of factors associated with any incontinence.

	OR	95% IC	p value
Occupation			
Doctor	1.00	[1.629–6.364]	0.001
Nurse	3.220		
Arterial blood hypertension			
No	1.00	[1.614–10.813]	0.003
Yes	4.177		
Postpartum urinary incontinence			
No	1.00	[4.725–30.040]	0.000
Yes	11.914		
Constipation			
No	1.00	[1.022–2.877]	0.041
Yes	1.714		
Menopausal status			
No	1.00	[3.807–36.079]	0.000
Yes	11.721		

OR, odds ratio; CI, confidence interval.

The overall prevalence of AI was 6.2%. As summarized in Table 2, flatal incontinence (9.7%) was more prevalent than liquid stool incontinence (6.2%) and solid stool incontinence (3%). Among these incontinent women, 3.7% used pads and lifestyle was altered for 8%. Women who reported at least one episode of incontinence per month were: 6.5% for flatulence, 1.7% for liquid stool and 1% for solid stool.

Table 1 summarizes characteristics of the entire population and compares the risk factors by univariate analysis women with and without incontinence. Women in the incontinent group were predominantly aged less than 40 years, overweight or obese, married, nurses, rarely having regular physical activity and with insufficient income. Among the studied comorbidities, diabetes, arterial blood hypertension and constipation were frequent in incontinent women. Incontinence was more prevalent in the parous women (52.8%) than in the nulliparous women (29.8%). The other obstetric and gynecologic factors associated with incontinence were vaginal delivery, abortion, forceps, episiotomy, obstetric tears, birth weight >4000 g, postpartum UI and menopausal status.

The result of multivariate logistic regression analysis of the potential risk factors for incontinence is presented in Table 3. The statistically significant predictors of incontinence were postpartum UI (OR 11.91, CI 4:72–30:04, $P < 0.001$), menopausal status (OR 11.72, CI 3:8–36:07, $P < 0.001$), arterial hypertension (OR 4.17, CI 1:61–10.81, $P = 0.003$), nurse occupation (OR 3.22, CI 1:62–6:36, $P = 0.001$) and constipation (OR 1.71, CI 1:02–2:87, $P = 0.041$). Only 21% of the incontinent women have sought medical advice. Health care was particularly observed in women with double incontinence. The reasons reported for the lack of medical advice were embarrassment and thinking that incontinence is a natural consequence of aging or childbirth.

About health status, almost a large majority of those suffering from incontinence perceived their health fair or poor (97%).

Discussion

In our study, population, 45.3% of the women were incontinent with 39% reported only UI, 0.3% reported only AI and 6% reported double incontinence. It is difficult to confront the results of our study since published studies incontinence in Tunisia are lacking.

Urinary incontinence

In our study, the overall prevalence of UI was 45% (181 women). Most studies reported a prevalence of any UI in the range of 13%–50% [2]. This variability of prevalence could be explained by the differences in the definitions used for UI, data collection methods, the participants' response rates and/or the populations studied. The first definition of UI by the International Continence Society (ICS) was "the involuntary loss of urine objectively demonstrated and constituting a social and hygiene problem" [9]. This definition had been difficult to apply in epidemiological studies, but the new one "complaint of any involuntary leakage of urine" [10] seemed to be more practical in the epidemiological studies.

The most frequent type of UI recorded in the present study was urge UI (40.3%). However, other studies have reported stress UI as being the most common type [1,3,4,11,12]. Studies reported that recurrent tract urinary infections are one of the commonest causes of urge UI [9]. In the present study, only one woman had this problem. However, this may be explained by potential effect of race or ethnicity on incontinence. It was suggested that African women have different urethral sphincter structure and function compared with whites [13].

Anal incontinence

Prevalence rates of AI vary widely depending on definitions of AI used, the age and characteristics of the study population. Some studies have included incontinence to flatus to define AI. Others use the term fecal incontinence to include only involuntary leakage of solid or liquid stool. In our study, we have opted for the first definition. The prevalence of AI has been reported to vary between 2.2–24% [2]. These prevalence seem somewhat higher than those we report (0.3%). However, if we include all women with AI, our prevalence becomes comparable (6.2%). Flatal incontinence was more frequent than solid incontinence, with about 3 times as many women reporting leakage of gas. The prevalence of solid stool incontinence (3%) and liquid stool incontinence (6.2%) are compatible with findings from several studies on anal incontinence when compared within the same age group [5,12].

Double incontinence

The prevalence for combined UI and AI was 6% in our study. This finding is in line with the results of Lawrence et al. [3] and Santos and Santos [11] who reported a prevalence of double incontinence of 4% and 5% respectively.

Analysis of risk factors in our study revealed that postpartum UI was significantly associated with the occurrence of incontinence. It was reported that both UI and AI in the immediate postpartum period can be predispose to incontinence in later life [14,16]. In two studies, MacArthur et al. revealed that 43% and 76,4% of the women who reported UI three months after birth, were still incontinent twelve years later [15,16].

Studies indicate UI and AI prevalence's were greater after vaginal delivery compared with cesarean section [15,17]. Furthermore, persistent postpartum UI and AI are less frequent in women with only cesarean sections compared to women with only spontaneous vagi-

nal births. According to the results of our bivariate analysis, vaginal delivery was significantly associated with incontinence but it did not persist one in our multivariate analysis perhaps in part because the small sample size. However, studies have shown that the major risk factors were not linked to childbirth but rather to aging, obesity and bowel movement frequency [14,16].

Another finding of the present study was a significant relationship between menopausal status and the risk of incontinence. It has been advocated that estrogen play an important role in continence mechanism since estrogen receptors have expressed in the urethra, bladder, vagina and pelvic floor [2]. Thus hormonal deficiency due to menopause may cause pelvic floor disorders. The role of menopause and estrogen loss in incontinence is still controversial. Several studies have demonstrated that the risk of incontinence increased among postmenopausal women compared to pre-menopausal [3,18,19]. Other authors could not show the alleged interference of menopause in the genesis of incontinence [20,21]. Furthermore, it is difficult to assess the independent effects of menopause and aging on the development or worsening of incontinence.

Our data revealed a positive association between incontinence and the occurrence of arterial hypertension and constipation. These results are similar to other published studies [2,21–23]. In this study, we found an association between UI in pregnancy and constipation ($P < 0.001$). The results of our study are parallel to the reports in the literature. The role of arterial hypertension in the development of UI was attributed to side effects of anti-hypertensive treatment. Diuretics can cause polyuria, urgency and increase urinary frequency.

In our study, most incontinent women (85%) were nurses. Furthermore, the risk of incontinence occurred in a nurse was multiplied by 3.2. Some reasons may clarify this higher risk of incontinence among the nurse group in comparison to the physician group. First reason is the socio-economic status of nurses, i.e. lower education and lower income. Several studies reported a negative association between socio-economic status and incontinence [10]. Second, obesity and constipation were more prevalent in nurses. This group also has work activities that required more physical effort. All these features, by increasing intra-abdominal pressure, may contribute to damaging the pelvic floor musculature and nerve supply leading to problems with incontinence [23].

In the present study, we were surprised by the low proportion of incontinent women who sought medical advice (21%), despite that participants were health professionals. Although the negative impact of both UI and AI on general health status, studies generally report low rates of women seeking medical advice worldwide. Our participants explain their reticence to report their symptom by the same factors reported in literature.

Strengths and limitations

As far as we know, this study is the first to report detailed data on the prevalence of urinary and AI in Tunisian women. Despite, all the participants were health professionals, it give important information on a uniform group of women. Therefore, extrapolation to entire general population has to be performed with caution.

The sample size and the chosen age are limiting factors in our study. In future research, larger representative sample is needed to give more information on a wider range of ages.

Another limitation of our study was the self-reported questionnaires and there were no clinical examinations; however, questions from validated instruments were used to assess the presence of incontinence. Our cross-sectional study provides limited evidence of causation, since the temporal association of the putative risk factor and the onset of incontinence cannot be assessed. Despite these limitations, this study provides valuable insights into risk factors predicting incontinence among middle aged women in Tunisia.

Conclusion

Forty five percent of Tunisian women suffered from UI or AI. The significant factors associated with incontinence were postpartum UI, menopausal status, arterial hypertension, nurse occupation and constipation. Given that incontinence is significantly under-reported, clinicians must be aware of diagnosing and managing this bothersome condition. However, a primary prevention for modifiable risk factors, such as postpartum pelvic floor physiotherapy and hypertension control, should be advised to women in order to optimize their quality of life.

Conflict of interests

No.

Ethical committee approval

Ethics Committee of Sahloul Hospital, Tunisia, Number: 3150617.

Source of funding

No funding.

Authors' contributions

Conception and design of the work: Syrine Gallas, Samia Frioui, Mohamed Ben Rejeb.

Data collection: Hatem Rabeh.

Data analysis and interpretation: Syrine Gallas, Hatem Rabeh, Mohamed Ben Rejeb.

Drafting the article: Syrine Gallas.

Critical revision of the article: Samia Frioui, Hatem Rabeh, Mohamed Ben Rejeb.

Final approval of the version to be published: Syrine Gallas, Hatem Rabeh, Mohamed Ben Rejeb, Samia Frioui.

Consent from the patient

Obtained.

References

[1] MacLennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. BJOG Int J Obstet Gynaecol 2000;107:1460–70.

[2] Sung VW, Hampton BS. Epidemiology of pelvic floor dysfunction. Obstet Gynecol Clin North Am 2009;36:421–43.
[3] Lawrence JM, Lukacz ES, Nager CW, Hsu JW, Luber KM. Prevalence and co-occurrence of pelvic floor disorders in community-dwelling women. Obstet Gynecol 2008;111:678–85.
[4] Kepenekci I, Keskinkilic B, Akinsu F, Cakir P, Elhan AH, Erkek AB, et al. Prevalence of pelvic floor disorders in the female population and the impact of age, mode of delivery, and parity. Dis Colon Rectum 2011;54:85–94.
[5] Wu JM, Vaughan CP, Goode PS, Redden DT, Burgio KL, Richter HE, et al. Prevalence and trends of symptomatic pelvic floor disorders in U.S. women. Obstet Gynecol 2014;123:141–8.
[6] Haab F, Richard F, Amarenco G, Coloby P, Arnould B, Benmedjahed K, et al. Comprehensive evaluation of bladder and urethral dysfunction symptoms: development and psychometric validation of the Urinary Symptom Profile (USP) questionnaire. Urology 2008;71:646–56.
[7] Jorge JM, Wexner SD. Etiology and management of fecal incontinence. Dis Colon Rectum 1993;36:77–97.
[8] Knowles CH, Eccersley J, Scott M, Walker SM, Reeves B, Lunniss PJ. Linear discriminant analysis of symptoms in patients with chronic constipation: validation of a new scoring system (KESS). Dis Colon Rectum 2000;43:1419–26.
[9] Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology in lower urinary tract function: report from the standardisation sub-committee of the International Continence Society. Urology 2003;61:37–49.
[10] Abrams P, Andersson KE, Birder L, Brubaker L, Cardozo L, Chapple C, et al. Fourth international consultation on incontinence recommendations of the international scientific committee: evaluation and treatment of urinary incontinence, pelvic organ prolapse, and fecal incontinence. Neurourol Urodyn 2010;29:213–40.
[11] Santos CR, Santos VL. Prevalence of self-reported double incontinence in the urban population of a Brazilian city. Neurourol Urodyn 2011;30:1473–9.
[12] Slieker-ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Prevalence of double incontinence, risks and influence on quality of life in a general female population. Neurourol Urodyn 2010;29:545–50.
[13] Howard D, Davies PS, DeLancey JO, Small Y. Differences in perineal lacerations in black and white primiparas. Obstet Gynecol 2000;96:622–4.
[14] Viktrup L, Rortveit G, Lose G. Risk of stress urinary incontinence twelve years after the first pregnancy and delivery. Obstet Gynecol 2006;108:248–54.
[15] MacArthur C, Wilson D, Herbison P, Lancashire RJ, Hagen S, Toozs-Hobson P, et al. Urinary incontinence persisting after childbirth: extent, delivery history, and effects in a 12-year longitudinal cohort study. BJOG Int J Obstet Gynaecol 2016;123:1022–9.
[16] Macarthur C, Wilson D, Herbison P, Lancashire RJ, Hagen S, Toozs-Hobson P, et al. Faecal incontinence persisting after childbirth: a 12 year longitudinal study. BJOG Int J Obstet Gynaecol 2013;120:169–78.
[17] Gyhagen M, Bullarbo M, Nielsen TF, Milsom I. Faecal incontinence 20 years after one birth: a comparison between vaginal delivery and caesarean section. Int Urogynecol J 2014;25:1411–8.
[18] El-Azab AS, Mohamed EM, Sabra HI. The prevalence and risk factors of urinary incontinence and its influence on the quality of life among Egyptian women. Neurourol Urodyn 2007;26:783–8.
[19] Varma MG, Brown JS, Creasman JM, Thom DH, Van Den Eeden SK, Beattie MS, et al. Fecal incontinence in females older than aged 40 years: who is at risk? Dis Colon Rectum 2006;49:841–51.
[20] Botlero R, Davis SR, Urquhart DM, Shortreed S, Bell RJ. Age-specific prevalence of, and factors associated with, different types of urinary incontinence in community-dwelling Australian women assessed with a validated questionnaire. Maturitas 2009;62:134–9.
[21] Reigota RB, Pedro AO, de Souza Santos Machado V, Costa-Paiva L, Pinto-Neto AM. Prevalence of urinary incontinence and its association with multimorbidity in women aged 50 years or older: a population-based study. Neurourol Urodyn 2016;35:62–8.
[22] Ng KS, Sivakumaran Y, Nassar N, Gladman MA. Fecal incontinence: community prevalence and associated factors—a systematic review. Dis Colon Rectum 2015;58:1194–209.
[23] Matthews CA, Whitehead WE, Townsend MK, Grodstein F. Risk factors for urinary, fecal, or dual incontinence in the Nurses' Health Study. Obstet Gynecol 2013;122:539–45.