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Prevalence and impacts of male urinary incontinence on quality of life, mental health, work limitation, and health care seeking in China, Taiwan, and South Korea (LUTS Asia): Results from a cross-sectional, population-based study

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Purpose: Male urinary incontinence (UI) is a global health issue associated with bothersome symptoms which affect daily life. This study aims to evaluate the prevalence of male UI in China, Taiwan, and South Korea and to determine if UI is an independent risk factor affecting the health-related quality of life (HRQoL), mental health, work limitations, and healthcare seeking behavior.

Materials and Methods: A *post-hoc* analysis was conducted on the LUTS Asia database which was collated from a cross-sectional, population-based internet survey in China, Taiwan, and South Korea. Prevalence of male UI was assessed, and the effect on HRQoL, Hospital Anxiety and Depression Scale (HADS) depression and anxiety scores, work performance, and healthcare seeking behaviors was determined using univariate and multivariate analyses.

Results: A total of 4,076 male participants were surveyed. Prevalence of male UI was 17.3%. UI adversely affected the HRQoL in both physical and mental domains. Both multivariate and univariate analyses showed that male UI could be correlated with a negative effect on the HADS anxiety and depression scores. Multivariate analysis suggested that work difficulties were correlated to the presence of UI. Up to 28% of participants who reported urge UI only did not adopt any management measures.

Conclusions: UI is common in men over 40 years and adversely impacts HRQoL. It is an independent risk factor for anxiety and depression and may cause significant work limitations. Despite these negative effects, many men still do not seek any intervention.

Keywords: Health care seeking behavior; Male genitourinary diseases; Mental health; Quality of life; Work performance

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INTRODUCTION

Urinary incontinence (UI) or involuntary leaking of urine is a commonly encountered health issue which has a significant negative impact on the physical, mental, emotional, social and economic wellbeing of a patient [1,2]. The International Continence Society (ICS) classifies the condition as stress urinary incontinence (SUI) and urge urinary incontinence (UUI), among other types. SUI is the complaint of involuntary loss of urine on effort, physical exertion including sporting activities, or on sneezing or coughing. UUI is defined as involuntary leakage of urine associated with a sensation of a sudden, compelling desire to void. The condition occurs due to weakness of the pelvic floor muscles that support the urethra or the urinary sphincter muscles that control the release of urine [3].

The prevalence of UI is considerably lower in men (3%–11%) compared to women (3%–17%). Though incontinence increases with age in males as well, severe UI in the 7th and 8th decade of life is still about half of that in women [4]. UUI accounts for 40% to 80% of cases, followed by mixed UI (MUI) seen in 10% to 30% of cases. A significant contributing factor to UUI incontinence in males is bladder outlet obstruction leading to bladder overactivity. Isolated stress incontinence is responsible for only about 10% of cases and is mainly attributed to prostate surgery, trauma, or neurological injury [4]. Incontinence in men is associated with bothersome lower urinary symptoms, decreased quality of life (QoL), depression and interrupted sleep due to nocturia [5].

The prevalence and impact of male incontinence (including urge incontinence, stress incontinence, overflow incontinence, and mixed incontinence) on QoL, mental health and workplace limitations have rarely been investigated through large scale studies. In the few population-based studies that have been done, there are variations in symptom definitions, with few studies using the ICS recommended definitions [6]. The Epidemiology of Lower Urinary Tract Symptoms (EpiLUTS) study published in 2009 was a large cohort study conducted in US, UK, and Sweden that provided comprehensive data correlating lower urinary tract symptoms (LUTS) to various aspects of QoL [7]. It provided a separate analysis of SUI only for mental health factors (depression and anxiety) but did not offer a correlation of the physical aspects of health-related quality of life (HRQoL) with UI [7]. Likewise, other large-scale studies involving patients with LUTS, such as the Epidemiology Urinary Incontinence and Comorbidities (EPIC) study released in 2006 [8], have not provided a separate analysis based on UI types.

The LUTS Asia study (NCT02618421) was a cross-sectional, population-based study of LUTS in Taiwan, China, and South Korea consisting of 8,284 male and female participants. Our study is a *post-hoc* analysis of the male cohort of the LUTS Asia study database to gain insights into the impact of male UI on QoL, mental health, work limitation, and healthcare seeking behaviors [6]. A significant advantage of the LUTS Asia database is that confounding factors such as age, diabetes, hypertension, and hyperlipidemia (Tables 1, 2) can be controlled.

Our analysis included 4,076 men comprising 49% of the total LUTS Asia database. The aim of the study was to determine whether UI in men is an independent predictor for changes in HRQoL in both the physical and mental domains, work difficulties, and healthcare seeking behaviors.

We present the following article in accordance with the STROBE reporting checklist.

MATERIALS AND METHODS

1. Study design

The LUTS Asia study was a cross-sectional, population-based, internet-administered survey conducted between 2nd June 2015 and 20th July 2015 among men and women aged at least 40 years in China, Taiwan, and South Korea. Due to the survey's text-only, web-based mode of administration, the other relevant inclusion criterion was the ability to access the Internet, to use a computer and to read the local language. The study excluded pregnant females and patients with urinary tract infection within the preceding month [6].

As the study was of a survey format, it was not deemed necessary to submit for ethics committee review. However, the principles of the Declaration of Helsinki were observed and the study was performed in compliance with the Good Clinical Practice guidelines. All patients had to provide their informed consent prior to participating in the study.

Standard survey techniques were used for the male cohort of the study. The underlying LUTS Asia respondent body consisted of individuals who were approached via pre-validated consumer survey panels that deployed e-mail invitations randomized to recipients representing the target population, with respect to age, sex, and socioeconomic factors. Proprietary algorithms and browser finger-printing technology involving IP address recognition were used to block the same person from responding multiple times to the survey by using different user credentials (avoiding the need to analyze log file data) and for anyone proceeding too fast through the survey (completion time less than 30% of the median length of the survey). Checking for contradictory answers was completed by healthcare analysts' post-data

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Table 1. Demographic data

Total participants (n=4,076)	No UI (n=3,369)	UUI only (n=222)	SUI only (n=206)	Mixed UI (n=278)
Age (y)				
40–44	665 (19.7)	32 (14.4)	29 (14.1)	31 (11.2)
45–49	656 (19.5)	35 (15.8)	21 (10.2)	39 (14.0)
50–54	571 (16.9)	33 (14.9)	29 (14.1)	26 (9.4)
55–59	468 (13.9)	30 (13.5)	24 (11.7)	44 (15.8)
≥60	1,010 (30.0)	92 (41.4)	103 (50.0)	139 (50.0)
Education				
High school or less	868 (25.8)	48 (21.6)	63 (30.6)	62 (22.3)
Some college	671 (19.9)	40 (18.0)	53 (25.7)	71 (25.5)
College graduate	1,516 (45.0)	116 (52.3)	84 (40.8)	130 (46.8)
Postgraduate	313 (9.3)	18 (8.1)	6 (2.9)	15 (5.4)
Marital status				
Single	277 (8.2)	16 (7.2)	5 (2.4)	9 (3.2)
Divorced	106 (3.1)	5 (2.3)	3 (1.5)	3 (1.1)
Married/living with partner	2,892 (85.8)	194 (87.4)	189 (91.7)	264 (95.0)
Widow/widower	68 (2.0)	8 (3.6)	9 (4.4)	3 (1.1)
Prefer not to answer	28 (0.8)	0 (0.0)	1 (0.5)	0 (0.0)
Work status				
Working, full-time	2,389 (70.9)	134 (60.4)	116 (56.3)	153 (55.0)
Retired	613 (18.2)	50 (22.5)	69 (33.5)	102 (36.7)
Homemaker	27 (0.8)	0 (0.0)	3 (1.5)	0 (0.0)
Working, part-time	155 (4.6)	20 (9.0)	8 (3.9)	18 (6.5)
Other	71 (2.1)	7 (3.2)	4 (1.9)	2 (0.7)
Unemployed	48 (1.4)	3 (1.4)	0 (0.0)	1 (0.4)
Other work for pay	58 (1.7)	5 (2.3)	1 (0.5)	1 (0.4)
Permanently disabled/cannot work due to ill health	6 (0.2)	3 (1.4)	4 (1.9)	1 (0.4)
Student	2 (0.1)	1 (0.5)	1 (0.5)	0 (0.0)

Values are presented as number (%).
UI, urinary incontinence; UUI, urge urinary incontinence; SUI, stress urinary incontinence.

collection to ensure validity of responses. Additional quality checks and survey management were described by Chapple et al. [6].

The survey instruments used included the International Prostate Symptom Score-Voiding (IPSS-V), Patient Perception of Bladder Condition (PPBC) score, Work Limitation Questionnaire-8 items (WLQ), generic health-related quality of life 12-item short-form survey version 2 (HRQoL-SF12v2), Hospital Anxiety and Depression Scale (HADS) and Overactive Bladder Symptom Score (OABSS).

2. Objectives

The primary objective of the study was to assess the prevalence of UI in males and its impact on the HRQoL, mental health and work limitations. The study evaluated if frequency of UI was an independent predictor for changes in HRQoL, HADS, WLQ score, and healthcare seeking behaviors. The secondary objective was to determine the effect of UI type on health seeking behaviors.

The independent variables were defined as follows: within the questionnaire UUI and SUI were defined based on a score of 2 to 5, in the order of increasing frequency from "a few times a month" to "many times a day", for question 30 (Urgency incontinence: Over the past month, did you leak urine in connection with a sudden need to rush to urinate?) and question 31 (SUI: Over the past month, did you leak urine in connection with any of the following situations [laughing, sneezing, coughing, exercising, lifting heavy objects]?). The subparts of questions 30 and 31 probed respondents about the degree of bother in connection with the occurrence of urine leakage (Supplementary Files 1, 2). MUI was defined as having both UUI and SUI. Endpoints measured were HRQoL physical health domain, HRQoL mental health domain, HADS anxiety score ≥8, HADS depression score ≥8, and difficulty in working in ≥50% of time (Supplementary File 3).

Table 2. Baseline comorbidities and symptoms

Variable	No UI (n=3,369)	UUI only (n=222)	SUI only (n=206)	Mixed UI (n=278)
Age (y)	53.46±9.14	55.81±9.61	56.88±9.70	57.33±9.44
Diabetes	361 (10.7)	41 (18.5)	51 (24.8)	113 (40.6)
Hypertension	1,095 (32.5)	99 (44.6)	100 (48.5)	167 (60.1)
Cardiac disease	202 (6.0)	33 (14.9)	29 (14.1)	58 (20.9)
Hyperlipidemia	1,019 (30.2)	91 (41.0)	76 (36.9)	144 (51.8)
Neurological disorder	52 (1.5)	11 (5.0)	6 (2.9)	33 (11.9)
Height (cm)	170.54±6.10	169.76±5.81	169.55±7.71	170.55±5.98
Weight (kg)	70.38±10.76	68.91±11.72	68.13±10.43	69.57±9.59
Body mass index (kg/m^2)	24.17±3.34	23.86±3.56	23.74±3.55	23.93±3.36
Smoking	1,184 (35.1)	108 (48.6)	92 (44.7)	169 (60.8)
Alcohol	1,013 (30.1)	100 (45.0)	64 (31.1)	156 (56.1)
IPSS, incomplete emptying	0.92±1.24	2.29±1.52	1.91±1.29	2.56±1.24
IPSS, frequency	0.99±1.19	2.37±1.32	1.91±1.17	2.58±1.27
IPSS, intermittency	0.61±1.03	1.96±1.49	1.62±1.24	2.47±1.25
IPSS, urgency	0.46±0.84	2.10±1.34	1.49±1.18	2.37±1.25
IPSS, weak stream	0.71±1.18	2.05±1.52	1.66±1.37	2.51±1.34
IPSS, straining	0.51±0.95	1.82±1.48	1.56±1.33	2.36±1.30
IPSS, nocturia	1.18±1.20	2.04±1.29	1.99±1.24	2.64±1.28
IPSS, total	5.38±5.46	14.62±6.95	12.15±6.3	17.48±6.85
IPSS, voiding score	1.83±2.71	5.82±3.79	4.85±3.42	7.33±3.37
ICS, splitting/spraying	0.79±1.13	1.88±1.45	1.68±1.31	2.44±1.30
ICS, hesitancy	0.52±0.89	1.62±1.40	1.45±1.30	2.21±1.28
ICS, terminal dribble	0.94±1.22	2.47±1.47	1.96±1.37	2.77±1.21
ICS, urgency with a fear of leaking	0.33±0.70	1.95±1.30	1.41±1.26	2.49±1.14
ICS, urgency incontinence	1±0	2.46±0.67	1±0	2.61±0.72
OABSS	1.96±1.76	5.52±2.30	4.59±2.43	7.07±2.56
Generic HRQoL-SF12	36.75±6.08	31.17±6.59	29.28±5.60	27.00±5.48
HADS, anxiety score	4.55±3.45	7.21±3.70	7.46±3.01	8.94±3.47
HADS, depression score	5.06±3.54	7.46±3.63	7.52±3.02	8.79±3.59
IIEF (male only)	16.55±7.38	12.91±7.24	12.19±6.56	12.07±5.54

Values are presented as mean±standard deviation or number (%).
UI, urinary incontinence; UUI, urge urinary incontinence; SUI, stress urinary incontinence; IPSS, International Prostate Symptom Score; ICS, International Continence Society; OABSS, Overactive Bladder Symptom Score; HRQoL-SF12, health-related quality of life 12-item short-form survey; HADS, Hospital Anxiety and Depression Scale; IIEF, International Index of Erectile Function.

3. Statistical analyses

Multivariate and univariate logistic regression models were used to demonstrate the impact of UI on QoL, work productivity, and mental health. Pharmacologic and non-pharmacologic treatment seeking behaviours were delineated with descriptive analysis.

The influence of important risk factors (age, marital status, diabetes, hypertension, cardiac disease, hyperlipidaemia, neurological disorder, height, weight, body mass index [BMI], smoking, alcohol, PPBC, IPSS, OABSS) and SUI on the HADS depression score and the HADS anxiety score was also correlated using logistic regression models. The effect on work limitation (WLQ) of various risk factors (hypertension, cardiac disease, hyperlipidaemia, neurologic disorder, BMI, smoking, alcohol, IPSS-V score) and SUI, was likewise analysed with multivariate logistic regression models.

RESULTS

A total of 4,076 male participants in the LUTS Asia database were analyzed, of which 3,369 (82.7%) had no UI, 222 (5.4%) had only UUI, 206 (5.1%) had only SUI and 278 (6.8%) had MUI (Table 1).

1. Overall prevalence

Prevalence of UI in males was 17.3%. Majority of the patients with UI were married or living with partners indicating that there was no impact on marital relations. The per-

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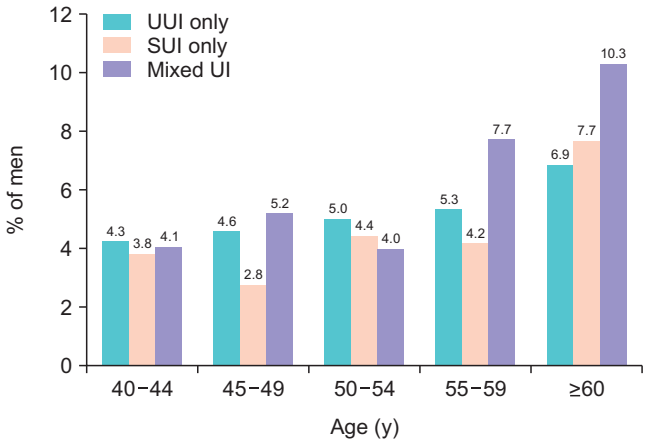

Fig. 1. Age-wise prevalence of urinary incontinence in males. UUI, urge urinary incontinence; SUI, stress urinary incontinence; UI, urinary incontinence.

centage of patients working full time was lower in patients with UUI (60.4%), SUI (56.3%), and MUI (55.0%) compared to individuals who did not have UI (70.9%) (Table 1).

Prevalence increased from 12.2% in men 40 to 44 years of age to 17.3% in men aged 55 to 59. In men ≥60 years of age prevalence was highest at 24.9%, with MUI being the most prevalent (10.3%), followed by SUI only (7.7%), and UUI only (6.9%) (Fig. 1).

Male UI is more prevalent in people with diabetes, high blood pressure, cardiac disease, hyperlipidemia, and neurological disorder (Table 2). Besides, men with MUI showed higher incidence of diabetes, hypertension, and smoking than UUI only and SUI only.

There was no prominent difference in IPSS, ICS, HADS related parameters among men with no UI, UUI only, SUI only, and MUI (Table 2).

2. Impact on health-related quality of life and mental health

The study results demonstrated that HRQoL, in both the physical and mental domains, was significantly affected by UI (Table 3). The average transformed SF12 score for the physical health domain decreased from 71 for men without UI to 58 in men reporting UUI only, 52 in SUI only, 44 in MUI, and 51 in men with any UI. Average transformed SF12 score for the mental health domain decreased from 40 for men without UI to 32 in men reporting UUI only, 29 in SUI only, 25 in MUI, and 28 in men with any UI (Fig. 2). Based on the univariate logistic regression analysis, age, being married, having co-morbid conditions (diabetes, hypertension, cardiac diseases, hyperlipidemia, and neurological disorder), smoking, and consuming alcohol were associated with higher likelihood of anxiety and depression as measured by HADS scores (Table 4). The results of multivariate analyses, however, indicated fewer factors with significant influence on anxiety and depression scores, i.e., hypertension, neurological disorder, smoking, PPBC score, and IPSS-V score. Age was a significant factor with respect to anxiety, but not depression (Table 4).

3. Impact on work limitation

Multivariate analysis suggested variables having significant impact on men's ability to perform work included the presence of diabetes, hypertension, hyperlipidemia, cardiac disease, neurological disorders, smoking, alcohol use, PPBC, IPSS-V score, OABSS, UUI, SUI, and daily SUI. UI significantly impacted work limitation across WLQ measures (Table 5).

4. Trigger factors for stress urinary incontinence

The role of various trigger factors in SUI is illustrated in Fig. 3. The percentage of patients experiencing SUI symptoms many times a day, daily, a few times a week, or a few times a month was evaluated for each of the five trigger factors: sneezing, coughing, exercising, laughing, and lifting heavy objects. Sneezing and coughing were the most prominent triggers of incontinence in males, with a prevalence of 5.9% and 4.8%, respectively. Laughing, exercising, and lifting heavy objects played minor roles, with prevalence of 2.2%, 3.9%, and 3.4%, respectively.

5. Management approaches

Utilization of prescription medications varied from 48% in MUI, to 42% in UUI only, and 38% in SUI only. Meanwhile, 18% of men with no UI used prescription medications for their symptoms. Other management approaches such as physical therapy were used by 17% of men with UUI only and 42% of men with MUI. A similar trend was observed for "limiting intake of fluids" as well as "self-treatment." Notably, up to 28% of participants who reported UUI only did not adopt any treatment/management approach (Fig. 4).

DISCUSSION

The results of this *post-hoc* analysis in 4,076 men with LUTS in Taiwan, China, and South Korea demonstrated that UI is common in men greater than 40 years of age, and is associated with reduced QoL in both the physical and mental health domains. The analysis also showed that UI was an independent risk factor for anxiety and depression and could negatively impact work performance.

Table 3. Linear regression analysis showing variables independently associated with HRQoL in physical and mental health domains

Linear regression for HRQoL	Physical health domain				Mental health domain			
	Univariate analysis		Multivariate		Univariate analysis		Multivariate	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Age (numerical)	-0.478 (-0.543 to -0.413)	<0.001			-0.184 (-0.226 to -0.142)	<0.001		
Age (>60 y)	-8.635 (-9.970 to -7.300)	<0.001	-3.888 (-5.024 to -2.751)	<0.001	-3.823 (-4.681 to -2.965)	<0.001	-1.149 (-1.914 to -0.384)	0.003
Married	-1.416 (-3.664 to 0.833)	0.217			0.084 (-1.347 to 1.515)	0.908		
Diabetes	-15.580 (-17.299 to -13.862)	<0.001	-6.099 (-7.615 to -4.583)	<0.001	-7.519 (-8.630 to -6.408)	<0.001	-2.177 (-3.198 to -1.157)	<0.001
Hypertension	-9.959 (-11.209 to -8.709)	<0.001	-3.705 (-4.829 to -2.580)	<0.001	-4.473 (-5.280 to -3.666)	<0.001	-1.195 (-1.952 to -0.438)	0.002
Cardiac disease	-15.435 (-17.676 to -13.195)	<0.001	-6.177 (-8.096 to -4.257)	<0.001	-8.109 (-9.544 to -6.673)	<0.001	-3.097 (-4.389 to -1.805)	<0.001
Hyperlipidemia	-6.616 (-7.916 to -5.316)	<0.001	-1.255 (-2.384 to -0.126)	0.029	-2.964 (-3.796 to -2.131)	<0.001	-0.135 (-0.895 to 0.625)	0.727
Neurological disorder	-21.435 (-25.325 to -17.544)	<0.001	-9.234 (-12.520 to -5.947)	<0.001	-13.710 (-16.180 to -11.230)	<0.001	-7.304 (-9.516 to -5.092)	<0.001
Height (numerical)	0.246 (0.146 to 0.345)	<0.001			0.160 (0.096 to 0.223)	<0.001		
Weight (numerical)	0.029 (-0.029 to 0.086)	0.324			0.044 (0.007 to 0.080)	0.018		
BMI (numerical)	-0.172 (-0.356 to 0.011)	0.066	-0.126 (-0.279 to -0.027)	0.107	-0.024 (-0.140 to 0.093)	0.692	-0.036 (-0.139 to 0.067)	0.490
Smoking	-4.847 (-6.108 to -3.585)	<0.001	-1.488 (-2.563 to -0.413)	0.007	-2.889 (-3.693 to -2.086)	<0.001	-0.915 (-1.638 to -0.191)	0.013
Alcohol	-3.264 (-4.575 to -1.952)	<0.001	1.213 (0.100 to 2.327)	0.033	-1.920 (-2.754 to -1.085)	<0.001	0.605 (-0.144 to 1.355)	0.114
PPBC	-9.135 (-9.630 to -8.639)	<0.001	-5.051 (-5.704 to -4.399)	<0.001	-5.276 (-5.600 to -4.952)	<0.001	-2.982 (-3.421 to -2.543)	<0.001
IPSS-V score	-2.651 (-2.818 to -2.484)	<0.001	-0.670 (-0.878 to -0.462)	<0.001	-1.517 (-1.625 to -1.408)	<0.001	-0.389 (-0.529 to -0.249)	<0.001
OABSS (numerical)	-4.428 (-4.641 to -4.215)	<0.001			-2.580 (-2.720 to -2.441)	<0.001		
UUI	-21.857 (-23.612 to -20.101)	<0.001	-2.252 (-4.160 to -0.343)	0.021	-12.897 (-14.025 to -11.769)	<0.001	-1.524 (-2.809 to -0.240)	0.020
SUI	-24.538 (-26.289 to -22.786)	<0.001	-8.591 (-10.465 to -6.717)	<0.001	-14.690 (-15.816 to -13.564)	<0.001	-5.963 (-7.224 to -4.701)	<0.001
Daily SUI	-26.198 (-32.134 to -20.263)	<0.001			-16.619 (-20.394 to -12.843)	<0.001		

HRQoL, health-related quality of life; CI, confidence interval; BMI, body mass index; PPBC, Patient Perception of Bladder Condition; IPSS-V, International Prostate Symptom Score-Voiding; OABSS, Overactive Bladder Symptom Score; UUI, urge urinary incontinence; SUI, stress urinary incontinence.

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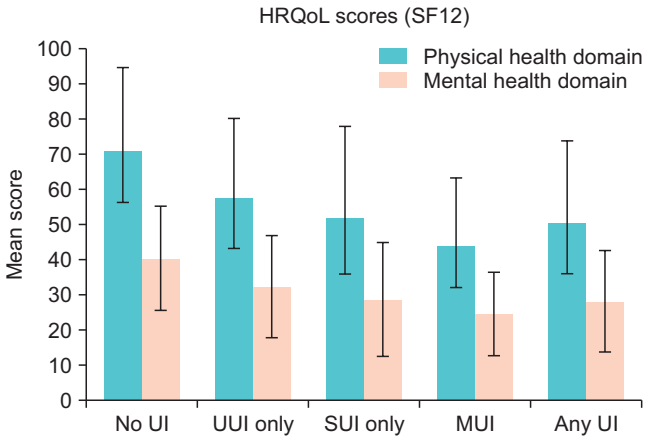

Fig. 2. Impact of urinary incontinence on HRQoL. HRQoL, health-related quality of life; UI, urinary incontinence; UUI, urge urinary incontinence; SUI, stress urinary incontinence; MUI, mixed urinary incontinence; SF12, 12-item short-form survey.

1. Overall prevalence

Prevalence of UI in our study is higher than other studies in the West which report a 3% to 11% prevalence of UI in men [4]. The EPIC study which surveyed 19,165 participants from a cross-section of population from Canada, Germany, Italy, Sweden, and UK reported a prevalence of 5.4% in men [8]. Other studies have reported prevalence of moderate to severe LUTS in men over 40 years to be 16.2% in Korea, 19.2% in France, 20.7% in Netherlands, 25.1% in UK, 38% in USA, and 56% in Japan [9]. An overall prevalence of UI of 7.4% was observed in a small study of 451 Portuguese men over age 40, conducted by telephone interviews [10]. Another survey involving 5,297 non-institutionalized men in the US demonstrated a prevalence of 4.5% for moderate/severe UI, and prevalence increased noticeably with age from 0.7% in men 20 to 34 years old, to 16.0% in men 75 years or older [11]. A survey in men from France, England, Korea, and Netherlands reported incidence of UI ranging from 8% to 23% in the four countries; however, the variations were attributed to cultural disparities rather than actual differences [5].

The main reasons for higher prevalence rates shown in our study may be attributed to the features of directly worded questions in the questionnaire and higher privacy protection conferred by online surveys compared with personal or telephonic interviews. The former might have motivated the respondents to answer the questionnaire more candidly and without reservation.

2. Health-related quality of life

UI affects various spheres of a patient's life impairing daily life at home, workplace, exercise, and sports. As the problem is regarded a social taboo in many cultures, it results in social isolation [12]. Few studies separate out the effects of UI on QoL, especially in the physical domain. One smaller study of 519 Chinese men showed that those males suffering from UI had reduced QoL compared with continent men when measured by using SF12v2 score for both physical and mental health domain [13].

Other large studies have also documented this significant difference in HRQoL in terms of the type of UI. In a secondary analysis of the EpiLUTS database, the researchers used the Overactive Bladder Questionnaire Short Form (OAB-q SF) HRQoL scores to determine the impact of UI on HRQoL. Men and women with SUI only had the highest HRQoL while patients with MUI and UI plus other incontinence had lowest HRQoL [7,14].

3. Mental and emotional health

Symptoms of UI have a psychological impact involving loss of self-esteem, feelings of embarrassment, sadness, irritability and apathy. Men in particular tend to find it more difficult to verbalize and share the problem with friends and family. Stigmatization of the problem in society further aggravates its impact on mental health [12]. Our analysis using the HADS tool indicated that UI was an independent factor for anxiety and depression in men. There are few comparable studies about the topic of mental and emotional health in Asian men with UI. A study evaluating 10,723 male workers in the French national power company, aged between 57 to 67 years, showed similar results [15]. Men with UI showed poorer result and impaired QoL in each Nottingham Health Profile dimension: energy, pain, physical mobility, sleep, emotional reactions, and social isolation than men who were continent [15]. The secondary analyses of the EpiLUTS database showed that men with MUI had the highest rate of clinically material anxiety (47.2%) and depression (42.1%) [7]. Declining mental health outcomes were observed in MUI and SUI and other incontinence subgroups in all genders compared to other UI subgroups [7].

4. Work limitations

The results of our study demonstrate that UI results in considerable limitations to work functioning. Other large studies of Asians with LUTS have not provided a separate analysis of relationships between UI and the quality of working state. A study in 1,843 Korean men reported a significantly lower level of general health status and worse work productivity in participants with at least one LUTS compared with those without LUTS [16]. Studies evaluating the impact of UI on work report that men and women with overactive bladder symptoms are more likely to worry about

Table 4. Logistic regression analysis showing independent variables associated with HADS anxiety and depression scores

Logistic regression for HADS score ≥8	HADS anxiety				HADS depression			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	Coefficient (95% CI)[a]	p-value	Coefficient (95% CI)[a]	p-value	Coefficient (95% CI)[a]	p-value	Coefficient (95% CI)[a]	p-value
Age (numerical)	1.005 (0.998–1.013)	0.156			1.022 (1.015–1.030)	<0.001		
Age (>60 y)	1.150 (0.987–1.341)	0.073	0.736 (0.615–0.881)	0.001	1.475 (1.277–1.703)	<0.001	1.043 (0.885–1.228)	0.616
Married	1.035 (0.799–1.340)	0.796			0.690 (0.547–0.870)	0.002		
Diabetes	2.010 (1.667–2.422)	<0.001	1.018 (0.814–1.274)	0.876	2.065 (1.722–2.476)	<0.001	1.113 (0.901–1.374)	0.320
Hypertension	1.877 (1.626–2.167)	<0.001	1.427 (1.202–1.693)	<0.001	1.972 (1.719–2.262)	<0.001	1.470 (1.253–1.725)	<0.001
Cardiac disease	2.090 (1.652–2.644)	<0.001	1.192 (0.900–1.577)	0.220	2.069 (1.643–2.606)	<0.001	1.185 (0.907–1.547)	0.213
Hyperlipidemia	1.362 (1.175–1.577)	<0.001	0.861 (0.722–1.027)	0.097	1.496 (1.300–1.720)	<0.001	1.028 (0.873–1.209)	0.744
Neurological disorder	5.468 (3.628–8.242)	<0.001	3.587 (2.246–5.727)	<0.001	5.550 (3.623–8.504)	<0.001	3.532 (2.209–5.648)	<0.001
Height (numerical)	0.998 (0.987–1.010)	0.757			0.984 (0.974–0.995)	0.003		
Weight (numerical)	0.995 (0.989–1.002)	0.169			0.993 (0.986–0.999)	0.021		
BMI (numerical)	0.987 (0.966–1.008)	0.222	0.988 (0.964–1.012)	0.322	0.990 (0.970–1.010)	0.333	0.988 (0.965–1.010)	0.279
Smoking	1.618 (1.402–1.866)	<0.001	1.202 (1.018–1.419)	0.030	1.445 (1.261–1.656)	<0.001	1.182 (1.012–1.382)	0.035
Alcohol	1.652 (1.427–1.911)	<0.001	1.153 (0.972–1.366)	0.102	1.305 (1.134–1.502)	<0.001	0.913 (0.777–1.075)	0.275
PPBC	2.064 (1.928–2.210)	<0.001	1.424 (1.298–1.562)	<0.001	1.920 (1.798–2.050)	<0.001	1.360 (1.244–1.487)	<0.001
IPSS-V score	1.266 (1.239–1.294)	<0.001	1.134 (1.101–1.167)	<0.001	1.251 (1.224–1.278)	<0.001	1.139 (1.107–1.171)	<0.001
OABSS (numerical)	1.409 (1.365–1.454)	<0.001			1.356 (1.316–1.397)	<0.001		
UUI	5.187 (4.269–6.303)	<0.001	1.288 (0.999–1.660)	0.051	3.863 (3.187–4.683)	<0.001	1.024 (0.795–1.317)	0.856
SUI	5.250 (4.309–6.398)	<0.001	1.719 (1.339–2.207)	<0.001	4.082 (3.356–4.965)	<0.001	1.388 (1.084–1.776)	0.009
Daily SUI	6.386 (3.367–12.112)	<0.001			7.611 (3.781–15.32)	<0.001		

HADS, Hospital Anxiety and Depression Scale; CI, confidence interval; BMI, body mass index; PPBC, Patient Perception of Bladder Condition; IPSS-V, International Prostate Symptom Score-Voiding; OABSS, Overactive Bladder Symptom Score; UUI, urge urinary incontinence; SUI, stress urinary incontinence.

[a]:≤1 is negative effect; >1 is positive effect on HADS ≥8.

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Table 5. Logistic regression analysis showing impact of independent variables on work performance

Logistic regression for work difficulty in ≥50% of the time	Start working		Continue working		Concentrate on working		Interact with people		Complete the work		Number of significant impacts
	Coefficient[a]	p-value	Coefficient[a]	p-value	Coefficient[a]	p-value	Coefficient[a]	p-value	Coefficient[a]	p-value	
Age (numerical)	1.006	0.258	0.992	0.016	1.018	<0.001	1.017	0.003	1.009	0.114	2
Age (>60 y)	1.094	0.415	0.865	0.047	1.407	0.001	1.356	0.008	1.265	0.032	1
Married	1.353	0.157	1.171	0.209	1.091	0.637	1.085	0.699	1.185	0.408	0
Diabetes	3.586	<0.001	1.309	0.004	3.193	<0.001	3.779	<0.001	2.989	<0.001	5
Hypertension	2.001	<0.001	1.029	0.676	1.529	<0.001	1.686	<0.001	1.615	<0.001	4
Cardiac disease	3.393	<0.001	1.599	<0.001	2.727	<0.001	3.033	<0.001	2.676	<0.001	5
Hyperlipidemia	1.722	<0.001	1.227	0.003	1.342	0.003	1.243	0.052	1.270	0.024	3
Neurological disorder	6.130	<0.001	1.632	0.016	6.017	<0.001	7.553	<0.001	4.116	<0.001	4
Height	1.006	0.470	1.015	0.006	1.005	0.524	0.988	0.165	1.005	0.536	0
Weight	1.001	0.793	1.005	0.092	0.993	0.101	0.990	0.060	0.998	0.630	0
BMI	0.999	0.950	1.004	0.657	0.972	0.051	0.980	0.229	0.991	0.555	0
Smoking	1.597	<0.001	1.136	0.060	1.779	<0.001	1.756	<0.001	1.560	<0.001	4
Alcohol	1.853	<0.001	1.331	<0.001	1.737	<0.001	1.581	<0.001	1.701	<0.001	5
PPBC	2.333	<0.001	1.240	<0.001	2.166	<0.001	2.117	<0.001	2.034	<0.001	5
IPSS-V score	1.297	<0.001	1.083	<0.001	1.300	<0.001	1.276	<0.001	1.264	<0.001	5
OABSS (numerical)	1.602	<0.001	1.101	<0.001	1.540	<0.001	1.548	<0.001	1.494	<0.001	5
UUI	8.858	<0.001	2.029	<0.001	7.512	<0.001	8.329	<0.001	6.889	<0.001	5
SUI	11.320	<0.001	1.624	<0.001	9.218	<0.001	10.651	<0.001	8.173	<0.001	5
Daily SUI	59.918	<0.001	4.794	<0.001	17.881	<0.001	28.258	<0.001	31.125	<0.001	5

HADS, Hospital Anxiety and Depression Scale; BMI, body mass index; PPBC, Patient Perception of Bladder Condition; IPSS-V, International Prostate Symptom Score-Voiding; OABSS, Overactive Bladder Symptom Score; UUI, urge urinary incontinence; SUI, stress urinary incontinence.

[a]:≤1 is negative effect; >1 is positive effect on HADS ≥8.

interrupting meetings and that symptoms play a role in decisions regarding work locations and hours. Furthermore, men and women with OAB were more likely to report absenteeism and reduced work productivity compared to controls [17]. The impact of UI on work performance has been scarcely studied due to lack of relevant surveys and difficulties in evaluating work productivity in elderly.

5. Healthcare seeking behavior

Surveys demonstrate that men are hesitant to consult their doctors for symptoms related to UI globally. Rates for seeking healthcare vary widely ranging from 4.4% in US, 18% in UK, 22.2% in African-Americans, and 38.2% in Spain [9]. Healthcare seeking behaviors are known to be affected by the severity of LUTS and the degree of symptom bother. Perception of urinary symptoms being a part of normal aging process, embarrassment over a condition perceived to affect mainly women, cultural taboos, accessibility to healthcare and economic constraints are possibly factors affecting healthcare seeking behaviors. Although UI has major effects on QoL, physical and mental health and work functioning, in this analysis, our study revealed that up to 28% of male patients with UI did not seek intervention of any type. According to a Danish population-based study surveying the relationship between healthcare-seeking and bothersome LUTS, among the 23,240 participants, nocturia was the most frequently experienced LUTS (49.8%) but less often reported as bothersome (34.2%) whereas incontinence was most often described as bothersome (64.1%). Only about one-third of the men reporting a bothersome LUTS reached out to their physician [18]. In another study, men seeking consultation with a physician for LUTS was associated with age, total IPSS score, QoL and duration of symptoms, and the symptoms associated with a clear motivation for seeking consultation were nocturia and straining [9].

Strengths of this study include large sample size and the use of validated tools. Online surveys have the limitation of being accessible to only computer-literate population and being biased towards individuals of higher socioeconomic status.

Fig. 3. Frequency-distribution of triggers for stress urinary incontinence.

CONCLUSIONS

UI is common in men at least 40 years of age and has a

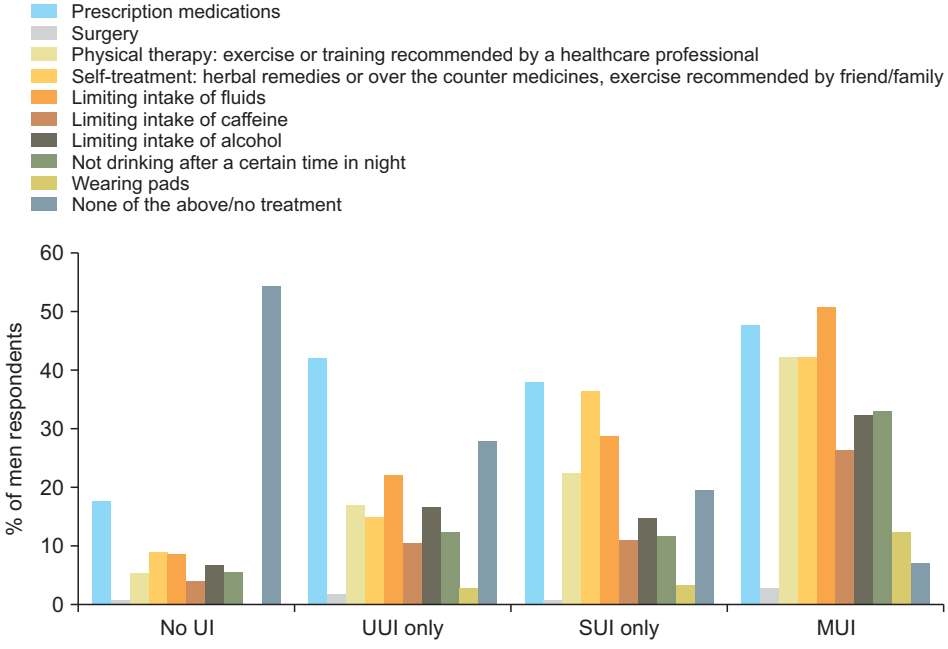

Fig. 4. Impact of type of UI on healthcare seeking behaviors. UI, urinary incontinence; UUI, urge urinary incontinence; SUI, stress urinary incontinence; MUI, mixed urinary incontinence.

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negative impact on QoL in both physical and mental health domains. Along with some other urinary dysfunctions, it is an independent risk factor for anxiety and depression and may cause significant reduction in work productivity. Despite these unfavorable effects, many men still do not seek pharmacologic or nonpharmacologic treatments for UI and other LUTS that might improve their condition.

CONFLICTS OF INTEREST

The corresponding author Dr. PM Chow has completed The Author Submission Requirement Form on behalf of each coauthor and the Form is being submitted with the manuscript. Dr. PM Chow received a general research grant from Astellas Pharma Singapore Pte. Ltd. The other authors declare no conflicts of interest.

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AUTHORS' CONTRIBUTIONS

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SUPPLEMENTARY MATERIALS

Supplementary materials can be found via https://doi.org/10.4111/icu.20210259.

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