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Original Article

Prevalence of Lower Urinary Tract Symptoms in Indigenous and Non-indigenous Women in Eastern Taiwan

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Background/Purpose: To investigate the prevalence of lower urinary tract symptoms (LUTS), their impact on quality of life, and their association with socioeconomic and lifestyle factors among indigenous and non-indigenous women in Eastern Taiwan.

Methods: A total of 376 indigenous women and 509 non-indigenous women aged over 18 years were interviewed concerning LUTS in the recent 6 months using International Prostate Symptom Score questionnaires.

Results: Indigenous women had a higher prevalence of one or more LUTS than non-indigenous women (44.9% *vs.* 31.2%). Indigenous women had a significantly higher prevalence of urgency (7.7% *vs.* 4.3%, $p = 0.024$), straining to void (6.1% *vs.* 3.3%, $p = 0.036$), and nocturia (37.2% *vs.* 24.8%, $p < 0.001$) than non-indigenous women. There was no significant difference in the prevalence of impaired quality of life between indigenous and non-indigenous women (33.8% *vs.* 31.2%). Lower educational level, alcohol consumption, betel quid chewing, and cigarette smoking, and not difference in race, had significant effect on a higher prevalence of bothersome LUTS in indigenous women than non-indigenous women.

Conclusion: Indigenous women with lower educational level and specific lifestyle risk factors have a higher prevalence of LUTS than non-indigenous women in Taiwan.

Key Words: indigenous women, International Prostate Symptom Score, lower urinary tract symptoms, quality of life

Lower urinary tract symptoms (LUTS) consist of storage, voiding, and post-micturition symptoms;[1] and may have a range of etiologies. The overall prevalence for different subsets of female LUTS range from 10.5% to 59.2% and increase with age.[2–6] These symptoms are becoming an important health issue because LUTS can cause physical and mental discomfort and have a negative effect on quality of life (QoL).

Epidemiologic studies have been conducted in Taiwanese women to investigate the prevalence and associated risk factors of LUTS in general

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or specific conditions, such as urinary incontinence, overactive bladder syndrome (OAB) and nocturia.[7–12] The reported prevalence of LUTS in Taiwanese women is equal to that in Western women. Previous Taiwanese studies of LUTS were limited to the non-indigenous population. Investigating the prevalence and characteristics of female LUTS among different racial groups is necessary to fully understand their etiology.[6,13,14] Indigenous people are an ethnic minority in Taiwan. In general, indigenous people have a lower socioeconomic level and a lower family income compared with non-indigenous people. Their lifestyles are also quite different. Almost 50% of indigenous people have chewed betel quid, a habit which is closely associated with obesity, cigarette smoking, and alcohol consumption.[15] The health status, including life expectancy, prevalence and mortality rate for various diseases among indigenous people is worse than in non-indigenous people.[16] The aim of this study was to determine the differences in the prevalence and characteristics of LUTS, their impact on QoL, and the relationship of LUTS to several lifestyle factors and treatment-seeking behaviors among indigenous and non-indigenous women in Eastern Taiwan.

Materials and Methods

Subject

This study was conducted in 2006 in Hualien and Taitung counties, which are located in Eastern Taiwan. According to a report by the Ministry of the Interior of Taiwan, at the end of 2006 there were 474,919 indigenous people in Taiwan, which is equal to 2.08% of the total population. Among this ethnic minority in Taiwan, 35.4% lived in the Hualien and Taitung districts where indigenous people and non-indigenous people live together at a proportion of approximately 1:3.[17] Indigenous and non-indigenous women who accompanied their family to see a doctor were the main subjects for this study. Women aged over 18 years without previous or current urological diseases and without serious medical disease in the previous 3 months were interviewed about LUTS in the past 6 months using structured questionnaires. The ability to respond clearly to the questionnaire during the interview was required for study inclusion. Demographic data including age, body weight, body height, parity, educational level, family income, betel quid chewing, alcohol consumption, and cigarette smoking were collected.

LUTS assessment

The LUTS assessment was made using the International Prostate Symptom Score (IPSS) and Quality of Life Index (QoL-I) questionnaires. Seven items on storage (frequency, urgency, nocturia) and voiding (residual urine sensation, intermittency, slow stream, and straining to void) symptoms were graded from 0–5, representing non-symptomatic to very frequently encountered symptoms. A seven point QoL-I, from 0 being "delighted" to 6 being "terrible", was added to the questionnaires to assess the impact of urinary symptoms on the QoL.[18] An individual symptom score of ≥ 3 (half or more than half of the time) or a nocturia item score of ≥ 2 (two or more voids at night) were chosen as a threshold to classify the symptoms as bothersome and clinically relevant because a previous study showed the degree of bother and sleep disturbance increased dramatically with two or more voids at night.[19] A QoL-I ≥ 4 (mostly dissatisfied) was considered to indicate a significantly impaired QoL. Data obtained by the interviewer and from self-administered questionnaires were stratified by 20-year age groups and parity.

Data analysis

The prevalence of each bothersome LUTS and impaired QoL was also compared between indigenous and non-indigenous women. Finally, the association of drinking alcohol, betel quid chewing, cigarette smoking, education level, and family income with the prevalence of LUTS and impaired QoL were analyzed to identify potential risk factors for LUTS. The Sigmastat statistical package (Jandel Corporation, San Rafael, CA, USA) was used for data analysis. The χ^2 test and multivariate analysis were used for statistical analysis.

A p value of <0.05 was considered significant. Based on significant differences, we disclosed risk factors.

Results

A total of 376 indigenous women and 509 non-indigenousl women who met the inclusion criteria completed the structured interviewer-administered questionnaire. The demographic characteristics of these indigenous and non-indigenous women are summarized in Table 1. Analysis stratified by 20-year age subgroups revealed a similar distribution of age in indigenous women and non-indigenous women. Non-indigenous women had a higher body height and a lower body weight than indigenous women. High parity was more prevalent in indigenous women. Indigenous women had a higher prevalence of alcohol consumption, betel quid chewing, cigarette smoking, and lower educational and economic levels than non-indigenous women.

Nocturia (30.1%) was the most common LUTS among community dwelling women, followed by frequency (13.6%) and residual urine sensation

Table 1. Demographics of indigenous and non-indigenous women*

Characteristics	Non-indigenous ($n=509$)	Indigenous ($n=376$)	p
Age (yr)			0.279
<30	124 (24.4)	76 (20.2)	
30–49	257 (50.5)	186 (49.5)	
50–69	110 (21.6)	97 (25.8)	
≥70	18 (3.5)	17 (4.5)	
Body height (cm)			<0.001
140–149	22 (4.3)	54 (14.4)	
150–159	258 (50.7)	227 (60.4)	
160–169	222 (43.6)	90 (23.9)	
170–179	7 (1.4)	5 (1.3)	
Body weight (kg)			<0.001
40–49	111 (21.8)	47 (12.5)	
50–59	233 (45.8)	132 (35.1)	
60–69	109 (21.4)	114 (30.3)	
70–79	45 (8.8)	52 (13.8)	
80–89	9 (1.8)	22 (5.9)	
≥90	2 (0.4)	9 (2.4)	
Parity			<0.001
P0	180 (35.4)	61 (16.2)	
P1–2	209 (41.1)	114 (30.3)	
≥P3	120 (23.6)	201 (53.5)	
Betel quid chewing	4 (0.8)	90 (23.9)	<0.001
Alcohol drinking	17 (3.3)	120 (31.9)	<0.001
Cigarette smoking	20 (3.9)	98 (26.1)	<0.001
Education (up to senior high school)	275 (54.0)	332 (88.3)	<0.001
Monthly family income (<NT$30,000)	299 (58.7)	302 (80.3)	<0.001

**Data presented as n (%). P0 = no history of childbirth; P1–2 = history of 1–2 deliveries; ≥P3 = history of 3 or more deliveries.*

Table 2. The prevalence of lower urinary tract symptoms in different age groups*

Symptoms	Age group (yr)				*p*
	< 30 (*n* = 200)	30–49 (*n* = 443)	50–69 (*n* = 207)	≥ 70 (*n* = 35)	
Residual urine sensation	6.5	7.7	13.0	5.7	0.066
Frequency	14.0	12.0	16.9	11.4	0.375
Intermittency	4.0	5.2	6.3	5.7	0.779
Urgency	6.0	4.5	7.2	11.4	0.241
Slow stream	3.5	3.2	8.7	5.7	0.014†
Straining to void	3.0	3.4	8.7	2.9	0.012†
Nocturia	19.0	27.8	40.6	60.0	< 0.001†
QoL-I ≥ 4	33.0	34.3	30.0	17.1	0.167

**Data presented as %; †statistically significant. QoL-I = quality of life index.*

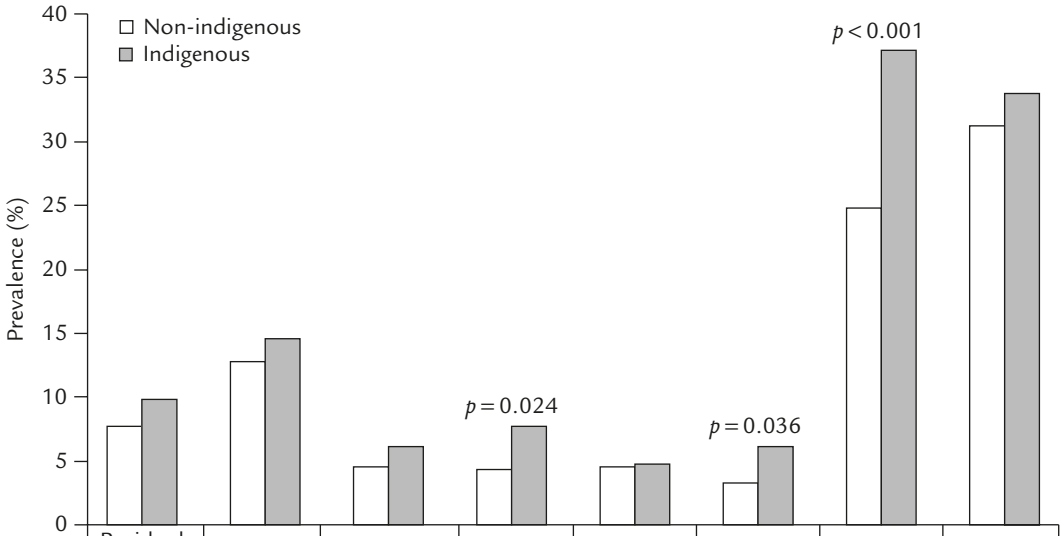
Table 3. The prevalence of lower urinary tract symptoms in different parity groups*

Symptoms	P0	P1–2	≥ P3	*p*
Residual urine sensation	12 (5.0)	31 (9.6)	33 (10.3)	0.061
Frequency	25 (10.4)	42 (13.0)	53 (16.5)	0.102
Intermittency	7 (2.9)	13 (4.0)	26 (8.1)	0.011†
Urgency	6 (2.5)	18 (5.6)	27 (8.4)	0.012†
Slow stream	9 (3.7)	17 (5.3)	15 (4.7)	0.694
Straining to void	8 (3.3)	16 (5.0)	16 (5.0)	0.575
Nocturia	46 (19.1)	85 (26.3)	135 (42.1)	< 0.001†
QoL-I ≥ 4	79 (32.8)	110 (34.1)	97 (30.2)	0.572

**Data presented as n (%); †statistically significant; P0 = no history of childbirth; P1–2 = history of 1–2 deliveries; ≥ P3 = history of 3 or more deliveries; QoL-I = quality of life index.*

(8.6%). The prevalence rates of urgency, intermittency, slow stream, and straining to void were 5.8%, 5.2%, 4.6%, and 4.5%, respectively. In the overall group, 286 (32.3%) women were mostly dissatisfied with their QoL (QoL-I ≥ 4). The prevalence rates of slow stream, straining to void and nocturia significantly increased with aging (Table 2). Nocturia was the most common LUTS in each stratified age group and had a strongly significant correlation with aging ($p < 0.001$). There was no association of impaired QoL with increasing age in the overall group. Table 3 shows the association of parity with the prevalence of LUTS in the overall group. Intermittency, urgency, and nocturia were significantly more prevalent with increasing parity. However, an impaired QoL was not associated with parity in the overall group.

The prevalence rates of individual bothersome LUTS and impaired QoL in indigenous and non-indigenous women are shown in the Figure. The prevalence of each individual symptom was higher in indigenous women than in non-indigenous women. The most prevalent LUTS in indigenous and non-indigenous women were nocturia (37.2% *vs.* 24.8%), frequency (14.6% *vs.* 12.8%), and residual urine sensation (9.8% *vs.* 7.7%). This order of prevalence was the same as the overall group. Significantly higher prevalence of urgency (7.7% *vs.* 4.3%, $p = 0.024$), straining to void (6.1% *vs.* 3.3%, $p = 0.036$), and nocturia (37.2% *vs.* 24.8%, $p < 0.001$) were found in indigenous woman than in non-indigenous women. The prevalence of impaired QoL was not significantly different between two groups (33.8% *vs.* 31.2%, $p = 0.425$).



	Residual urine sensation	Frequency	Intermittency	Urgency	Slow stream	Straining to void	Nocturia	QoL-I ≥ 4
Non-indigenous	7.7%	12.8%	4.5%	4.3%	4.5%	3.3%	24.8%	31.2%
Indigenous	9.8%	14.6%	6.1%	7.7%	4.8%	6.1%	37.2%	33.8%

Figure. Prevalence of bothersome lower urinary tract symptoms and impaired quality of life in indigenous and non-indigenous/women. Impaired quality of life defined as the quality of life index ≥ 4. QoL-I = quality of life index.

The overall prevalence of one or more bothersome LUTS was 37.1%. Indigenous women had a higher incidence of one or more bothersome LUTS than non-indigenous women (44.9% *vs.* 31.2%). Nineteen percent of indigenous women and 16.3% of non-indigenous women had visited a doctor for a urinary problem. Thirty-one percent of indigenous women and 18.7% of non-indigenous women reported having considered visiting a doctor for bothersome urinary symptoms.

Table 4 shows the multivariate analysis of putative risk factors such as race, education level, family income, alcohol consumption, betel quid chewing, and cigarette smoking in relation to LUTS. Lower educational level was associated with a significantly higher prevalence of residual urine sensation, urgency, and nocturia. Alcohol consumption was a potential risk factor for frequency, slow stream, and nocturia. Intermittency occurred significantly more frequently in women who chewed betel quid. Cigarette smoking also had an effect on LUTS, with those women that smoked reporting a significant effect on the prevalence of straining to void. The result showed that race and family income were not significantly related with LUTS.

Discussion

The prevalence of LUTS varies depending on population demographics and research methodology. The IPSS is a non-specific instrument used to measure the severity of LUTS, which may have a range of etiologies. The IPSS includes a QoL-I to assess the impact of urinary symptoms on the QoL. Several studies have shown that the IPSS is not specific for sex in the assessment of urological well-being.[3,4,9,18] An interview-based prevalence survey similar to the present study in South Australia included 1686 women aged over 18 years from metropolitan and rural communities.[4] The respondents completed IPSS questionnaires and were asked about the presence or absence of "troublesome symptoms" but were not asked to grade symptom severity. They found that the prevalence of one or more troublesome LUTS was 39% (662/1686) with no differences between rural

Table 4. Multivariate analysis of putative risk factors in relation to lower urinary tract symptoms*

Symptoms	Race	Low education†	Low family income‡	Alcohol intake	Betel quid chewing	Cigarette smoking
Residual urine sensation	0.748	0.024 (1.959)	0.737	0.669	0.341	0.299
Frequency	0.990	0.988	0.768	0.046 (1.630)	0.697	0.279
Intermittency	0.473	0.220	0.365	0.932	<0.001 (4.151)	0.060
Urgency	0.249	0.007 (3.026)	0.319	0.662	0.433	0.344
Slow stream	0.490	0.106	0.470	0.044 (2.089)	0.190	0.509
Straining to void	0.213	0.304	0.728	0.343	0.422	0.011 (2.517)
Nocturia	0.374	<0.001 (2.470)	0.242	0.001 (1.933)	0.536	0.354

**Data presented as p or p (odds ratio); †up to senior high school; ‡less than NT$ 30,000/month.*

and metropolitan respondents. The most common troublesome symptoms in their study were nocturia (17%) and frequency (18.4%). Yu et al used the IPSS questionnaire to investigate the prevalence of voiding symptoms in 583 women undergoing a health examination in Taipei, the capital of Taiwan.[9] In their study, the prevalence of each bothersome LUTS (defined by the same threshold as in the present study, i.e. an individual symptom score ≥3, except nocturia ≥2) was similar to that of the overall group in the present study, including frequency (13.9%), nocturia (32.8%), weak stream (5.4%), incomplete emptying (7.2%), urgency (7.0%), hesitancy (1.8%), and intermittency (4.8%). The prevalence of impaired QoL in healthy women in this metropolitan area of Taiwan was 17%. Comparison with the present study, in which the 886 participants came from Eastern Taiwan, a rural or mountain district, our study suggests that the prevalence of LUTS is similar in rural and metropolitan populations in Taiwan. The most prevalent bothersome LUTS in Taiwanese women are nocturia and frequency, which is similar to those in South Australia.[4]

In the present study, slow stream, straining to void, and nocturia were significantly more prevalent with aging. The prevalence rates of slow stream and straining to void in each age group ranged from 2.9% to 8.7%, which are comparatively lower than the other LUTS. These results suggest that obstructive symptoms are relatively rare in women, but increase with aging. In the elderly population, impairment of detrusor contractility is a contributory cause of obstructive symptoms.[9]

The present study found that intermittency, urgency, and nocturia were significantly more prevalent with increasing parity. These findings support a previous hypothesis that weak pelvic floor muscles play a role in inducing OAB.[7] Pregnancy and increasing parity has been shown to cause damage to the pelvic floor and surrounding structures, which may be responsible for lower urinary tract dysfunction.[20]

Interestingly, nocturia was the predominant LUTS in the present study. We found that nocturia was not only the most prevalent symptom in each age-stratified group, but was also strongly associated with aging and parity, and was significantly more prevalent in indigenous women. These findings are in agreement with previous reports that the prevalence of nocturia is more common in parous women and shows a linear increase with age, occurring in more than 50% of women 80 years of age or older.[20,21] In the

present study, nocturia was reported by 60.0% of women aged 70 years or older and 42.1% of women with more than three deliveries. In a study of 850 patients (18 years or older) with symptoms of OAB and nocturia, Weiss et al found that in younger patients with OAB, decreased nocturnal bladder capacity had a greater role in the pathogenesis of nocturia symptoms, whereas in older patients, increased nocturnal urine output had a greater role.[22] Age-related differences in the pathogenesis of nocturia may be the reason why nocturia was the most prevalent LUTS across age groups in the present study. Previous studies have shown that nocturia is a common and bothersome complaint[5] and often regarded as the most troublesome of all urinary symptoms.[23] The EPIC study,[2] a population-based, cross sectional survey of adults aged 18 years or older that was conducted in Canada, Germany, Italy, Sweden, and the United Kingdom using computer-assisted telephone interviews, showed that nocturia (≥ 1 episodes/night) was the most prevalent LUTS (54.5%) in women. When nocturia was defined as two or more nocturnal micturitions per night instead of one or more, the prevalence of nocturia was 24.0% in women in the EPIC study. In the present study, the prevalence rate of nocturia (≥ 2 episodes/night) in non-indigenous women was 24.8%, which is consistent with the results of the EPIC study. However, the prevalence rate of nocturia (≥ 2 episodes/night) was significantly higher in indigenous (37.2%) than in non-indigenous women in the present study. This finding suggests that some predisposing risk factors for nocturia exist among indigenous women.

Lower educational and economic level in indigenous people were closely associated with betel quid chewing, alcohol consumption and cigarette smoking.[15] Betel quid chewing has been claimed to produce a sense of well-being, euphoria, a warm sensation of the body, sweating, salivation, palpitation, heightened alertness, and increased capacity to work. These effects suggest that betel quid chewing affects predominantly the central and autonomic nervous systems.[24] Based on the significant differences in sociocultural level and lifestyle between indigenous people and non-indigenous people, we tried to clarify the potential risk for LUTS associated with factors such smoking, alcohol consumption, betel quid chewing, education, and socioeconomic status. The results showed that lower educational level, alcohol consumption, betel quid chewing, and cigarette smoking, but not racial difference were associated with a higher prevalence of bothersome LUTS in indigenous women than in non-indigenous women. Definite mechanisms to explain the correlation between cigarette smoking, alcohol consumption, and betel quid chewing with LUTS remain to be identified. A population-based study to evaluate putative risk factors for LUTS in African-American men found that current and former smokers and those with heavy alcohol consumption were at increased risk of moderate to severe LUTS, including obstructive symptoms,[25] which is in accordance with the results of this present study in Taiwanese women.

This study found no significant differences in the impact of QoL among different groups including indigenous women and non-indigenous women, age-stratified groups and parity-stratified groups. These results may be due to bias from different attitudes on the interpretation of the impact on QoL by indigenous women and non-indigenous women. However, our data also indicated that more indigenous women felt like visiting a doctor for bothersome LUTS, which is in accordance with the higher prevalence of bothersome LUTS in indigenous women than in non-indigenous women.

Following our previous study regarding male subjects,[26] we have completed the epidemiological evaluation of LUTS in both sexes in the Eastern Taiwan. As was also seen in this study, nocturia was the most common LUTS in indigenous and non-indigenous men. The prevalence of moderate LUTS (IPSS > 8) increased with age in men overall. Significantly higher prevalence of frequency (11.7% *vs.* 7.2%, $p = 0.044$) and nocturia (31.1% *vs.* 19.8%, $p = 0.002$) were found in indigenous than non-indigenous men. There was no significant difference in the prevalence of moderate

LUTS (12.8% *vs.* 8.8%, $p=0.220$) or impaired QoL (24.3% *vs.* 19.9%, $p=0.088$) between indigenous and non-indigenous men. The higher prevalence of frequency and nocturia in indigenous men was associated with significantly lower educational and economic levels, which were also associated with a higher prevalence of alcohol consumption, betel quid chewing, and cigarette smoking. Because indigenous men and women have similar habits and socioeconomic levels, the higher prevalence of bothersome LUTS are somewhat similar between sexes, which further reflects the need for health education in this minority population.

In conclusion, nocturia was the most common bothersome LUTS in community dwelling indigenous and non-indigenous women in Taiwan. Lower educational level, alcohol consumption, betel quid chewing, and cigarette smoking, but not racial difference, are associated with a higher prevalence of bothersome LUTS in indigenous than in non-indigenous women. This community survey provides informative findings about the prevalence of LUTS in different ethnic populations living in Eastern Taiwan and suggests establishing a biopsychosocial system to reduce the negative impact of LUTS in this minority population.

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