

Prevalence and Predictors of Urinary Incontinence in South Indian Women: A Hospital-Based Analytical Cross-Sectional Study

Rajalakshmi subburam¹, Saijyothi Ausali², Vinyas Mayasa³, Vinod Kumar Nelson⁴,
Rajalekshmi Murugan¹, Geetha Birudala^{5*}

¹*Department of Obstetrics and Gynaecology, Saveetha Medical College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India*

²*College of Pharmacy, MNR higher education and research academy campus, MNR Nagar, Sangareddy-502294, India*

³*GITAM School of Pharmacy, GITAM University Hyderabad Campus, Rudraram, India*

⁴*Centre for Global Health Research, Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India*

⁵*Faculty of Pharmacy, Dr. M.G.R. Educational and Research Institute, Chennai, India*

Abstract

The present study assesses the prevalence of urinary incontinence and evaluates the risk elements related to QUID-derived urge and stress incontinence scores. This was a cross-sectional analysis of women attending the outpatient department and inpatient ward section of Obstetrics and Gynaecology at Saveetha Institute of Medical College Thandalam Chennai. This study included 299 women; the mean (SD) age was 54.4 years (7.7). The proportion of women with Normal and LSCS were 59.5% and 40.5%, respectively. The proportion of women drinking coffee was 74.2%, with recurrent urinary tract infection was 40.1%, with diabetes was 32.4%, with obesity was 37.8%, with a history of constipation was 70.2%, and history of pelvic surgery was 23.4%. The mean (SD) urge score among women with a normal vaginal delivery was 8.19 (2.78) and among those with LSCS was 4.57 (1.99); the difference (higher scores among women with NVD, in comparison with LSCS) was found to be statistically significant. The mean (SD) stress score among women with a normal vaginal delivery was 7.52 (2.78) and among those with LSCS was 4.26 (2.14); the difference (higher scores among women with NVD, in comparison with LSCS) was found to be statistically significant. Also, the results showed that women with coffee drinking, diabetes, hypertension, obesity, constipation, and without pelvic surgeries had significantly higher stress incontinence scores in comparison to their counterparts. The mean (SD) stress scores showed an increasing trend with age – the difference in stress scores by age groups was found to be a statistic.

Keywords: *Bladder Incontinence, Determinants, India, Prevalence, Stress Incontinence, Urge Incontinence.*

Introduction

Urinary incontinence significantly impacts the social, psychological, and overall well-being of individuals. This condition often goes unaddressed, with many women choosing not to seek medical guidance or discuss their

experiences openly, thus leading to a societal underestimation of its prevalence [1]. Numerous undisclosed cases have been uncovered through population studies in India, highlighting the necessity of understanding the risk factors specific to this population to

effectively mitigate the burden of urinary incontinence.

Limited literature exists regarding the rate, types, and causes of bladder leakage in postmenopausal women in Tamil Nadu. Previous studies have primarily focused on assessing the impact on the standard of living using little attention given to disclosing this actual frequency of the condition bladder leakage, characterized by the loss of bladder control, is associated with changes in urethral mucosa, attributed to hormonal fluctuations following menopause. Estrogen deficiency resulting from the cessation of ovarian function leads to various physiological changes, including reduced urethral mucosa thickness reduced urethral closing pressure, and abnormality in bladder and constriction muscle mechanisms, or a blend thereof [2]. Urinary incontinence manifests in three main categories: stress-induced incontinence, urge-related incontinence, and mixed urinary incontinence/mixed incontinence which combines elements of both stress fullness and urge-related incontinence. Stress incontinence, also known as sphincter dysfunction/sphincter-related issues may occur during routine tasks for example sneezing, Tussis, or physical exertion. Conversely, urge incontinence, also referred to as bladder incontinence, involves symptoms such as leakage before reaching the restroom and increased urinary frequency [3, 4].

Several threats include the growth of urinary incontinence, age-related, parity, delivery method, the background of hysterectomy, nicotine uses BMI measurement, hyperglycemia, persistent cough, irregular bowel movement medication usage, and consumption of substances like tea, caffeine, and alcohol, as well as engagement in physical activities [5-7]. Recognizing these risk factors is crucial, particularly as the likelihood of seeking assistance decreases with age and the severity of the condition. Women's decision to seek medical attention and treatment is

influenced by factors such as recognized risk factors, the availability of healthcare services, attitudes toward treatment, and the perceived necessity for intervention [8].

In the context aim of the current study is to estimate this prevalence belonging to urinary incontinence along with to determine this risk factors associated with QUID-derived urge and stress incontinence scores.

Materials and Methods

This research was an analytical study with a cross-sectional design focused on women attending the outpatient department and/or inpatient ward with a division of Obstetrics and Gynaecology in Saveetha Institute of Medical Sciences (SIMS), Thandalam, Chennai between the start of the year and March 2023. Institutional approval was granted for the study Review Board (IRB), SIMS. This assumed alignment with all pertinent ethical requirements guidelines and ensured the right and privacy of the members. Before participation, each participant provided information and documented consent after being fully briefed on the study's purpose, procedure, potential, hazards, and benefits. All women ranging from 45 to 70 years of age, attending this outpatient department in Saveetha Institute of Medical Sciences over the study period were enrolled. However, women who were not willing to provide written informed consent were excluded. The participant group is notable so, we adopted non-probability collecting samples – a convenient sampling technique – absolute listing of all participants according to the specified inclusion and exclusion criteria, we administered a purposefully designed, semi-structured, and pre-validated, questionnaire to collect patient social and demographic traits (including age), surgical history, commodities (such as diabetes, hypertension), predisposing factors (including coffee intake, parity (number of pregnancies), obesity, mode of delivery, record of recurrent urinary tract infections, history of constipation,

and menopausal status) and Quantitative Urinary Incontinence Diagnosis (QUID) questionnaire. We used trained healthcare professionals to administer the study questionnaire along with the QUID questionnaire. The QUID is a validated tool known for its reliability in quantifying both stress and urge incontinence – Cronbach's alpha values ranging between 0.76 for stress-induced urinary leakage subscale and 0.86 for urgency urinary leakage subscale [9]. Of the total six items, three Emphasize stress in continence symptoms and three urge to incontinence symptoms Each question offers six frequency-based answers, from “never to always”, scored from 0 to 5 points Stress and Urge grades, each ranging from 0 to 15 points. Literature evidence shows that stress scores more than or equal to four were linked to stress urinary incontinence and urge scores greater than or equal to six were associated with urge UI in 80% of the participants [10].

The data obtained was manually entered into Microsoft Excel organized, restructured, and processed using SPSS Descriptive results utilized frequencies and percentages for categorical variables as well as mean and median based on the outcomes of the normality data assessment using the Kolmogorov Smirnov and Shapiro Wilk test for continuous variables. To evaluate the association between continuous data, an independent sample ‘t’ test

was used. To describe the relationship between age groups this stress/urge incontinence scores, we applied one-way ANOVA with the assumption of equal variance, incorporating the Bonferroni correction to account for the increased likelihood of Type I errors due to multiple comparisons. Statistical significance was defined as $p < 0.05$.

Results

The current study encompasses 299 women participants between 45- and 70 years of age, attending the outpatient departments in Saveetha ins of Medical Sciences. The mean (SD) age and standard deviation of the women existed at 54.4 years (7.7); ranging between 45 years and 73 years. Nearly one in three women (32.4%) were between 56- and 60 years of age and one in five (20.1%) were between 61 and 65 years of age. Less than one in ten women were more than 65 years of age. The proportion of women with normal vaginal and lower segment cesarean section were 59.5% and 40.5%, respectively. In the current study, the percentage of women drinking coffee was 74.2%, with recurrent urinary tract infection was 40.1%, with diabetes was 32.4%, with hypertension was 18.7%, with obesity was 37.8%, with history of constipation was 70.2%, and history of pelvic surgery was 23.4% (Table 1).

Table 1. Baseline Characteristics of the Study Population

Parameters		Frequency	Percentage
Age (in years)	45-50	57	19.1
	51-55	58	19.4
	56-60	97	32.4
	61-65	60	20.1
	>65	27	9.0
Drinking coffee	Present	222	74.2
	Absent	77	25.8
Recurrent UTI	Present	120	40.1
	Absent	179	59.9
Diabetes	Present	91	32.4
	Absent	202	67.6

Hypertension	Present	56	18.7
	Absent	243	81.3
Obesity	Present	113	37.8
	Absent	186	62.2
Constipation	Present	210	70.2
	Absent	89	29.8
Pelvic surgery	Present	70	23.4
	Absent	229	76.6
Mode of delivery	NVD	178	59.5
	LSCS	121	40.5
UTI, Urinary tract infection; NVD, Normal vaginal delivery; LSCS, Lower segment cesarean section			

Distribution of Women by QUID Scale Responses

The distribution of QUID scale responses shows that women leak urine (even small drops) or wet oneself/pads/undergarments – 33.4% often and 26.4% rarely while undressing to use toilet; 30.8% once in a while and 25.1%

rarely had strong/uncomfortable need to urinate; 45.2% often and 26.4% rarely had to rush to toilet to urinate; 27.1% once in a while and 26.8% rarely during cough; 39.1% often and 23.1% rarely while bending down; and 33.1% rarely and 32.8% once in a while walking or exercise (Table 2).

Table 2. Distribution of Study Population, by QUID Scale

	None		Rarely		Once in a while		Often		Most of the time		Always	
	N	%	N	%	N	%	N	%	N	%	N	%
While undressing to use toilet?	0	0.0	79	26.4	62	20.7	100	33.4	58	19.4	0	0.0
Strong and uncomfortable need to urinate?	17	5.7	75	25.1	92	30.8	69	23.1	46	15.4	0	0.0
Rush to toilet to urinate?	22	7.4	79	26.4	55	18.4	135	45.2	8	2.7	0	0.0
During cough?	0	0.0	80	26.8	81	27.1	73	24.4	65	21.7	0	0.0
Bending down?	39	13.0	69	23.1	74	24.7	117	39.1	0	0.0	0	0.0
Walk/Exercise?	22	7.4	99	33.1	98	32.8	49	16.4	31	10.4	0	0.0

Comparison of Urge and Stress Scores, by Study Variables

The mean (SD) urge score among women with normal vaginal delivery was 8.19 (2.78) and among those with LSCS was 4.57 (1.99); the difference (higher scores among women with NVD, in comparison with LSCS) was found to be statistically significant (MD 3.62; *t* value 12.32). Similarly, the results showed that

women with coffee drinking (MD 0.84; t value 2.39), with diabetes (MD 1.76; t value 4.84), with hypertension (MD 2.71; t value 6.36), with obesity (MD 2.19; t value 6.39), with constipation (MD 5.37; t value 23.25), and without pelvic surgeries (MD -3.70; t value -10.32) had significantly ($p<0.05$) higher urge incontinence scores in comparison to their counterparts (Table 3).

Table 3. Comparison of Urge Scores, by Study Variables

		Urge scores		MD	t Value	p Value
		Mean	SD			
Type of delivery	NVD	8.19	2.78	3.62	12.32	<0.001
	LSCS	4.57	1.99			
Coffee intake	Present	6.45	2.97	0.84	2.39	0.018
	Absent	5.51	3.01			
Diabetes	Present	7.92	2.62	1.76	4.84	<0.001
	Absent	6.15	3.09			
Hypertension	Present	8.93	2.25	2.71	6.36	<0.001
	Absent	6.22	2.99			
Obesity	Present	8.09	2.33	2.19	6.39	<0.001
	Absent	5.89	3.15			
Constipation	Present	8.32	2.09	5.37	23.25	<0.001
	Absent	2.95	0.92			
Pelvic surgery	Present	3.88	1.75	-3.70	-10.32	<0.001
	Absent	7.59	2.84			

SD, Standard deviation; MD, Mean deviation; NVD, Normal vaginal delivery; LSCS, Lower segment cesarean section

The mean (SD) stress score among women with normal vaginal delivery was 7.52 (2.78) and among those with LSCS was 4.26 (2.14); the difference (higher scores among women with NVD, in comparison with LSCS) was found to be statistically significant (MD 3.25; t value 10.88). Similarly, the results showed that women with coffee drinking (MD 0.94; t value

2.39), with diabetes (MD 2.20; t value 6.31), with hypertension (MD 2.38; t value 5.63), with obesity (MD 2.61; t value 6.78), with constipation (MD 4.92; t value 19.71), and without pelvic surgeries (MD -3.36; t value -9.31) had significantly ($p < 0.05$) higher stress incontinence scores in comparison to their counterparts (Table 4).

Table 4. Comparison of Stress Scores, by Study Variables

		Stress scores		MD	t Value	p Value
		Mean	SD			
Type of delivery	NVD	7.52	2.78	3.25	10.88	<0.001
	LSCS	4.26	2.14			
Coffee intake	Present	6.45	2.97	0.94	2.39	0.018
	Absent	5.51	3.01			
Diabetes	Present	7.69	2.77	2.20	6.31	<0.001
	Absent	5.49	2.85			
Hypertension	Present	8.14	2.69	2.38	5.63	<0.001
	Absent	5.76	2.89			
Obesity	Present	7.61	2.49	2.61	6.78	<0.001
	Absent	5.35	2.97			
Constipation	Present	7.67	2.19	4.92	19.71	<0.001
	Absent	2.74	1.32			
Pelvic surgery	Present	3.62	1.72	-3.36	-9.31	<0.001
	Absent	6.99	2.86			

Association between Age and Stress/Urge Scores

The mean (SD) stress scores showed an increasing trend with age – from 4.41 (2.68) among women of age 45 to 50 years; 4.41 (2.56) among women of age 51 to 55 years; 7.42 (1.36) among women of age 56 to 60 years; 8.08 (2.69) among women 61 to 65 years; and 11.00 (0.00) among elderly women more than 65 years of age. The difference in

stress scores by age group was determined to be statistically significant ($p < 0.05$) (Table 5).

The average (SD) urge scores showed an increasing trend – from 4.35 (2.07) among women of age 45 to 50 years; 4.95 (2.20) among women of age 51 to 55 years; 8.53 (1.55) among women of age 56 to 60 years; 9.04 (2.74) among women 61 to 65 years; and 11.00 (0.00) among women over the 65 years of age. The difference in urge scores by age groups was determined to be statistically significant ($p < 0.05$) (Table 5).

Table 5. Tests of Association for Stress and Urge Scores, by Age

Age	N	M	SD	F value	p Value	Post Hoc
Stress scores						
45-50	109	4.41	2.68	53.42	<0.001	1 vs 3-5 2 vs 3-5 2 vs 5 4 vs 5
51-55	41	4.41	2.56			
56-60	83	7.42	1.36			
61-65	51	8.08	2.69			
>65	15	11.00	0.00			
Urge scores						
45-50	109	4.35	2.07	93.41	<0.001	1 vs 3-5 2 vs 3-5 2 vs 5 4 vs 5
51-55	41	4.95	2.20			
56-60	83	8.53	1.55			
61-65	51	9.04	2.74			
>65	15	11.00	0.00			

Stress, Urge Along Mixed Incontinence as Categorical Variables

In the present study, a total of 166 women (55.5%) had stress incontinence, 178 women (59.5%) had urge incontinence, and 166 women (55.5%) had mixed incontinence (Figure 1). The results showed that increasing parity (more than two), history of normal vaginal delivery, coffee intake, presence of recurrent existence of

urinary tract infections of diabetes hypertension, obesity, irregular bowel movements, along with absence along with pelvic surgeries occurred as significant predictors of stress, urge, and mixed continence. Also, increasing frequency in response to QUID showed a statistically significant association with anxiety, impulse, and combined incontinence ($p < 0.05$).

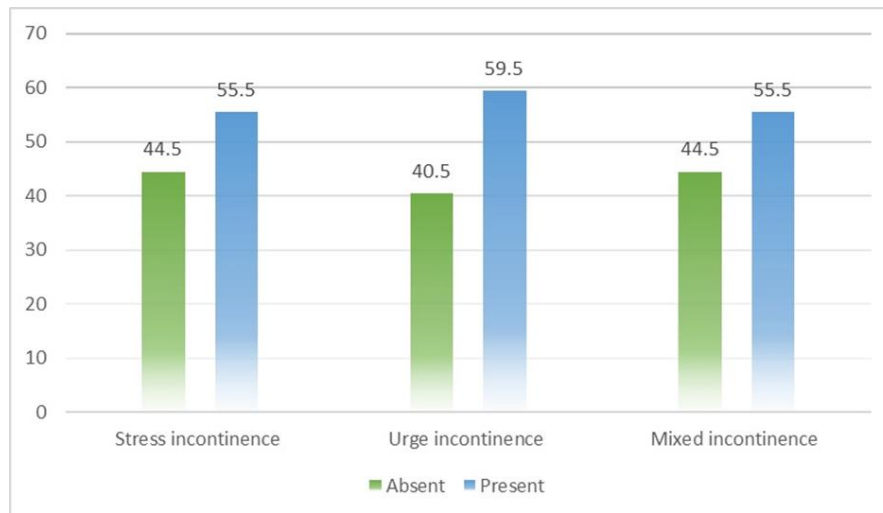


Figure 1. Prevalence of Stress, Urge, and Mixed Incontinence

Discussion

The present study was conducted among women aged 45 to 70 years attending this outpatient clinic and/or admitted patient ward section of Obstetrics and Gynaecology in Saveetha Institute of Medical Sciences to establish the distribution of bladder leakage and contributing factors with QUID-derived urge and stress incontinence scores. The findings reveal a considerable burden of urinary incontinence in this population, with notable proportions experiencing leakage and related symptoms. The typical age of the participants, 54.4 periods, aligns with previous research indicating that urinary incontinence becomes more prevalent with age, peaking in the postmenopausal period due to hormonal changes and pelvic floor muscle weakening [11]. This age distribution underscores the importance of addressing bladder leakage as a major health concern among middle-aged and elderly women. This prevalence belonging to the bladder leakage risk factors identified in the study, such as coffee consumption, background of frequent urinary tract infections, diabetes, hypertension, obesity, history of constipation, and pelvic surgery, corroborates existing literature [12-16]. These findings highlight the multi-factorial nature of urinary incontinence, influenced by both lifestyle and medical factors. For instance, the correlation between

coffee consumption and urinary incontinence might be attributed to caffeine's diuretic effect exacerbating bladder irritability and urgency

The distribution of responses on the QUID scale provides a nuanced understanding relating to the frequency and intensity of the bladder leakage signs experienced by participants. This high proportion of women reporting leakage while undressing or bending down, rushing to the toilet, and experiencing strong urges to urinate has a considerable impact on daily functioning and living standards [18]. These findings underscore the need for comprehensive assessment and management strategies tailored to individual symptom profiles. The utilization of the QUID scale in the study enhances the comparability of findings with existing literature, contributing to the standardization of urinary incontinence assessment tools. The QUID scale's demonstrated reliability and validity make it a valuable tool for both clinical practice and research settings [19].

The observed higher urge and stress incontinence scores among women with normal vaginal delivery (NVD) compared to those with lower segment cesarean section (LSCS) align with previous research highlighting the significance of childbirth regarding pelvic floor dysfunction [20, 21]. NVD is associated with greater trauma to the pelvic floor muscles and

nerves, predisposing women to urinary incontinence [22]. Similarly, the significant associations between coffee consumption, diabetes, hypertension, obesity, constipation, and higher urge and stress incontinence scores underscore the multi-factorial nature of urinary incontinence [23-25]. These analyses emphasize the importance of addressing modifiable risk factors, such as lifestyle habits and chronic conditions, in urinary incontinence management and prevention strategies.

The increasing trend in stress and urge incontinence scores with advancing age is consistent with the known age-related changes in pelvic floor structure and function [16]. Hormonal changes during menopause, along with age-related muscle weakness and connective tissue laxity, contribute to the higher prevalence and severity of urinary incontinence among older women [26]. These findings highlight the need for age-specific interventions and tailored approaches to urinary incontinence management across the lifespan. The significant associations between age and stress/urge incontinence scores further underscore the impact of aging on urinary incontinence severity. The progressive increase in incontinence scores with age highlights the cumulative effect of age-related changes on pelvic floor function [27]. These discoveries bring to light the importance of early identification and intervention to diminish the severity of urinary incontinence upon quality of life along with total well-being in elder women. This significant predictor identified within the evaluation aligns with existing literature on urinary incontinence risk factors [28-30]. Increasing parity, history of normal vaginal delivery, and absence of pelvic surgeries are well-established.

Conclusion

These high-frequency rates of Stress incontinence underscore this significant burden regarding this condition in the studied population, affecting more than half of the participants. The study identified several significant predictors of stress, urge, and mixed incontinence, including increasing parity, history of normal vaginal delivery, coffee intake, presence of recurrent urinary tract infections, diabetes, hypertension, obesity, constipation, and absence of pelvic surgeries. These findings highlight the multi-factorial nature of urinary incontinence and the importance of addressing both obstetric and lifestyle-related risk factors in prevention and management strategies. Furthermore, our study showed a statistically Substantial correlation between increasing frequency belonging to incontinence symptoms along with stress, urge, and mixed incontinence, emphasizing the clinical relevance of symptom severity in urinary incontinence diagnosis and classification. These findings have significant consequences for clinical settings highlighting the requirement for comprehensive assessment and specialized interventions for women with urinary bladder incontinence. A holistic approach that addresses modifiable risk factors, provides tailored lifestyle recommendations and incorporates offers Pelvic floor strengthening pharmacological and alternatively surgical interventions when appropriate can optimize outcomes and enhance the well-being of impacted women.

Conflict of Interest

Authors declare no conflict of interest to this work.

Acknowledgement

The authors thank Saveetha Medical College and Hospital for providing the necessary facilities to complete the work.

References

- [1]. Singh, U., Agarwal, P., Verma, M. L., Dalela, D., Singh, N., & Shankhwar, P. 2013, Prevalence and risk factors of urinary incontinence in Indian women: A hospital-based survey. *Indian Journal of Urology*, 29(1), 31–36.
- [2]. Peyrat, L., Haillet, O., Bruyere, F., Boutin, J. M., Bertrand, P., & Lanson, Y. 2002, Prevalence and risk factors of urinary incontinence in young and middle-aged women. *BJU International*, 89(1), 61–66.
- [3]. Tsakiris, P., Oelke, M., & Michel, M. C. 2008, Drug-Induced Urinary Incontinence. *Drugs & Aging*, 25(7), 541–549. <https://doi.org/10.2165/00002512-200825070-00001>.
- [4]. Sakondhavit, C., Choosuan, C., Kaewrudee, S., Soontrapa, S., & Louanka, K. 2007, Prevalence and risk factors of urinary incontinence in Khon Kaen menopausal women. *Journal of the Medical Association of Thailand Chotmaihet Thangphaet*, 90(12), 2553–2558.
- [5]. Danforth, K. N., Townsend, M. K., Lifford, K., Curhan, G. C., Resnick, N. M., & Grodstein, F. 2006, Risk Factors for Urinary Incontinence among Middle-aged Women. *American Journal of Obstetrics and Gynecology*, 194(2), 339–345. <https://doi.org/10.1016/j.ajog.2005.07.051>.
- [6]. Ajith, A. K., Rekha, A., Duttagupta, S., Murali, V., Ramakrishnan, D., & Krishnapillai, V. 2019, Prevalence and Factors of Urinary Incontinence among Postmenopausal Women Attending the Obstetrics and Gynecology Outpatient Service in a Tertiary Health Care Center in Kochi, Kerala. *Indian Journal of Community Medicine: Official Publication of the Indian Association for the Prevention of Social Medicine*, 44(Suppl 1), S30–S33.
- [7]. Markland, A. D., Richter, H. E., Fwu, C.-W., Eggers, P., & Kusek, J. W. 2011, Prevalence and Trends of Urinary Incontinence in Adults in the United States, 2001 to 2008. *The Journal of Urology*, 186(2), 589–593. <https://doi.org/10.1016/j.juro.2011.03.114>.
- [8]. Huang, K. 2016, Health Care-Seeking Behaviors among Women Suffering from Urinary Incontinence. *Journal of Yoga & Physical Therapy*, 6. [invalid URL removed].
- [9]. Brandt, F., Solomayer, E.-F., & Sklavounos, P. 2021, Psychometric properties of the German-language questionnaire for urinary incontinence diagnosis (QUID) in women with urinary incontinence. *Archives of Gynecology and Obstetrics*, 304(5), 1233–1242. <https://doi.org/10.1007/s00404-021-06167-8>.
- [10]. Bradley, C. S., et al. 2010, The Questionnaire for Urinary Incontinence Diagnosis (QUID): Validity and Responsiveness.
- [11]. Irwin, D. E., Abrams, P., Cartwright, R., deLancey, J. O., Kopp, Z. S., & Patrick, D. L. 2011, Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. *BJU International*, 101(3), 1202–1210. <https://doi.org/10.1111/j.1464-410X.2010.09993.x>.
- [12]. Townsend, M. K., Gousse, A. V., Laughlin, G. A., Wasserman, M., Liu, H., & Aragia, M. 2007, Incidence and Remission of Urinary Incontinence in Middle-aged Women. *American Journal of Obstetrics and Gynecology*, 197(2), 167.e1–167.e5.
- [13]. Hannestad, Y. S., Rortveit, G., Daltveit, A. K., & Hunskaar, S. 2003, Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. *BJOG: An International Journal of Obstetrics and Gynaecology*, 110(3), 247–254.
- [14]. Liu, B., Wang, L., Huang, S. S., Wu, Q., & Wu, D. L. 2014, Prevalence and risk factors of urinary incontinence among Chinese women in Shanghai. *International Journal of Clinical and Experimental Medicine*, 7(3), 686–696.
- [15]. Abrams, P., Cardozo, L., Fall, M., Griffiths, D., Kontsevaya, L., & Moore, D. 2003, The standardisation of terminology in lower urinary tract function: report from the standardisation subcommittee of the International Continence Society. *Urology*, 61(1), 37–49.
- [16]. Diokno, A. C., Burgio, K. L., Arnold, E. P., Hunskaar, S., Mallett, V. T., & Herzog, A. R. 2000, Epidemiology and Natural History of Urinary Incontinence. *Reviews in Urology [Online]*. <https://doi.org/10.1007/s001920070021>.

- [17]. Coyne, K. S., Kvasz, M., Ireland, A. M., Milsom, I., Kopp, Z. S., & Chapple, C. R. 2012, Urinary Incontinence and its Relationship to Mental Health and Health-Related Quality of Life in Men and Women in Sweden,¹ the United Kingdom, and the United States. *European Urology*, 61(1), 88–95. ²<https://doi.org/10.1016/j.eururo.2011.07.049>.
- [18]. Coyne, K. S., et al. 2009, The burden of lower urinary tract symptoms: evaluating the effect of LUTS on health-related quality of life, anxiety and depression: EpiLUTS. *BJU International*, 103(Suppl 3), 4–11.
- [19]. Handa, V. L., Blomquist, J. L., McDermott, K. C., Friedman, S., & Muñoz, A. 2012, Pelvic floor disorders after vaginal birth: effect of episiotomy, perineal laceration, and operative birth. *Obstetrics and Gynecology*, 119(2 Pt 1), 233–239. <https://doi.org/10.1097/AOG.0b013e318240df4f>.
- [20]. Sultan, A. H., Kamm, M. A., Hudson, C. N., Thomas, J. M., & Bartram, C. I. 1993, Anal-Sphincter Disruption during Vaginal Delivery. *New England Journal of Medicine*, 329(26), 1905–1911.
- [21]. Wu, J. M., et al. 2014, Prevalence and Trends of Symptomatic Pelvic Floor Disorders in U.S. Women. *Obstetrics and Gynecology*, 123(1), 141–148.
- [22]. Gleason, J. L., Richter, H. E., Redden, D. T., Goode, P. S., Burgio, K. L., & Markland, A. D. 2013, Caffeine and urinary incontinence in US women. *International Urogynecology Journal*, 24(2), 295–302.
- [23]. Brown, J. S., Vittinghoff, E., Lin, F., Nyberg, L. M., Kusek, J. W., & Kanaya, A. M. 2006, Prevalence and Risk Factors for Urinary Incontinence in Women With Type 2 Diabetes and Impaired Fasting Glucose. *Diabetes Care*, 29(6), 1307–1312.
- [24]. Jackson, S. L., Scholes, D., Boyko, E. J., Abraham, L., & Fihn, S. D. 2006, Predictors of urinary incontinence in a prospective cohort of postmenopausal women. *Obstetrics and Gynecology*, 108(4), 855–862.
- [25]. Haylen, B. T., et al. 2010, An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *International Urogynecology Journal*, 21(1), 5–26. <https://doi.org/10.1007/s00192-009-0976-9>.
- [26]. Rogers, R. G., Ninivaggio, C., Gallagher, K., Borders, A. N., Qualls, C., & Leeman, L. M. 2017, Pelvic floor symptoms and quality of life changes during first pregnancy: a prospective cohort study. *International Urogynecology Journal*, 28(11), 1701–1707.
- [27]. Minassian, V. A., Stewart, W. F., & Wood, G. C. 2008, Urinary incontinence in women: variation in prevalence estimates and risk factors. *Obstetrics and Gynecology*, 111(2 Pt 1), 324–331.
- [28]. Hannestad, Y. S., Rortveit, G., Sandvik, H., Hunskaar, S., & Norwegian EPINCONT study. Epidemiology of Incontinence in the County of Nord-Trøndelag 2000, A community-based epidemiological survey of female urinary incontinence: the Norwegian EPINCONT study. Epidemiology of Incontinence in the County of Nord-Trøndelag. *Journal of Clinical Epidemiology*, 53(11), 1150–1157. [https://doi.org/10.1016/s0895-4356\(00\)00232-8](https://doi.org/10.1016/s0895-4356(00)00232-8).
- [29]. Nygaard, I., et al. 2008, Prevalence of symptomatic pelvic floor disorders in US women. *JAMA*, 300(11), 1311–1316. <https://doi.org/10.1001/jama.300.11.1311>.
- [30]. Lukacz, E. S., Lawrence, J. M., Contreras, R., Nager, C. W., & Luber, K. M. 2006, Parity, mode of delivery, and pelvic floor disorders. *Obstetrics and Gynecology*, 107(6), 1253–1260. <https://doi.org/10.1097/01.AOG.0000218096.54169.34>.