

# Prevalence, Risk Factors and Bother Associated with Lower Urinary Tract Symptoms among Young Adults in Al-Qassim, Saudi Arabia

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## Abstract

**Background:** Lower urinary tract symptoms (LUTS) are a common condition among young adults; their quality of life is significantly affected and not all of them seek medical advice. Moreover, LUTS showed a significant relationship with depression and anxiety. Previously, LUTS was primarily identified among the elderly population, however, there has been an increase in its prevalence among young adults. **Aim:** To determine the prevalence of LUTS, to identify the potential risk factors associated with LUTS, and to establish which LUTS are the most bothersome in young adults. **Material and Methods:** Questionnaire-based cross-sectional study was done at Medical College in Al-Qassim. Healthy young adults aged 19-29 years were asked to fill in the International Consultation on Incontinence Modular Questionnaire for Female/Male Lower Urinary Tract Symptoms. P values <0.05 was considered statistically significant. **Results:** LUTS was reported by 180 students 49.3% (46.4% men; 52.7% women). Urgency (27.8%) was the most common LUTS and bothersome in female while in male incomplete emptying (19.4%) was the most common LUTS and bothersome. A positive correlation was found between all symptoms and bother. A higher BMI and a higher consumption of spicy food were associated risk factors for LUTS in female while a high coffee consumption was a potential risk factor LUTS in male. **Conclusions:** LUTS is highly prevalent among young adults and most of these symptoms showed a strong positive correlation with bother. We identified some risk factors that increased the occurrence of LUTS. Also, all risk factors are avoidable and assessment of the bothersome symptoms before medical intervention in young adults will increase the quality of life of people with LUTS.

**Keywords:** Prevalence; Risk factor; Bother; LUTS

## Introduction

Lower urinary tract symptoms (LUTS) is a common condition that has been demonstrated to be a major bother among young adults; their quality of life is significantly affected and not all of them seek medical advice.<sup>[1,2]</sup> Moreover, LUTS showed a significant relationship with depression and anxiety.<sup>[3]</sup> LUTS is classified by the International Continence Society as having storage, voiding, or post-micturition symptoms.<sup>[4]</sup>

The prevalence and severity of LUTS increases with age, and in 2008, an estimated 1.9 billion LUTS cases were reported globally, and the estimated 2018 projection is 2.3 billion cases.<sup>[5,6]</sup> Research conducted in the USA, UK, and Sweden found that the prevalence of LUTS was (47.9%) in men and (52.5%) in women.<sup>[7]</sup> The prevalence of LUTS in Arab countries has only been assessed by one study in Riyadh, Saudi Arabia, on 1851 men aged >40 years. It showed that its manifestation was primarily mild (1265, 58.3%), followed by moderate (505, 27.3%) and severe (81, 4.4%).<sup>[8]</sup> Previously, LUTS was primarily identified among the elderly population, however, there has been an increase in its prevalence among young adults and (94.3%) of 159 healthy young medical students reported LUTS symptoms.<sup>[9]</sup> Another study showed that LUTS was reported in 52.7% of 146 young adults.<sup>[10]</sup> The prevalence of LUTS in

male and female young adults has not been studied, and early identification and epidemiological information on LUTS among the young age group in Saudi Arabia and globally is minimal.

Some changes associated with aging, such as incomplete voiding, change in bladder capacity, or change in estrogen levels have been reported to be associated with LUTS.<sup>[11]</sup> Further, eating regimen, fluid intake, the consumption of coffee, caffeinated diet or non-diet soda, or liquor, and the use of nicotine, antihistamines, or antidepressants have all been identified as potential risk factors for LUTS.<sup>[12,13]</sup> Therefore, the aim of this study was to determine the prevalence of LUTS, to identify the potential risk factors associated with LUTS, and to establish which LUTS are the most bothersome in young adults.

## Methods

Between February 5 and May 3, 2017, a cross-sectional study

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was conducted at the Medical College in Al-Qassim region, Saudi Arabia. A simple random sampling method was used to select participating students. All healthy young adults aged (19–29) years were included in the study.<sup>[14]</sup> Those who were (<19 or >29) years-of-age, had a history of or a present urological disease or abnormality of the urinary tract, had any neurological condition that affects the urinary system, or were pregnant or had been pregnant were excluded.

Female and male students were asked to fill in the International Consultation on Incontinence Modular Questionnaire for Female/Male Lower Urinary Tract Symptoms (ICIQ-FLUTS/MLUTS) questionnaire, which is fully validated and provides a brief and robust measure to assess the impact of urinary symptoms on the outcome. The female section included 12 items: Four questions on filling symptoms, three on voiding symptoms, and five on incontinence symptoms. The male section included 13 items: four questions on voiding symptoms, six on incontinence symptoms, one on frequency symptoms, one on urine stream strength, and one on nocturia (waking up at night to void) symptoms.<sup>[15,16]</sup>

The required sample size for 398 male students and 300 female students was calculated by the Raosoft sample size calculator with a (5%) margin of error, (95%) confidence level, and (50%) response rate.<sup>[17]</sup> The resulting calculated sample size was 197 male students and 169 female students.

All selected students rated how often they had experienced urinary symptoms during the past 4 weeks, each symptom has five possible answers: “never”, “occasionally”, “sometimes,” “most of the time”, and “always.” As (ICIQ-FLUTS/MLUTS) has no scoring system, we considered a score  $\geq 2$  (sometimes, most of the time, and always) as positive for having the symptom, as mentioned in a previous study.<sup>18</sup> Each symptom was followed by a question on how bothersome the symptom was on a score from (0 to 10), with 0 being the least bothersome and 10 being the most bothersome. We also added another questionnaire to gather information about LUTS potential risk factors that have been studied before: level of physical activity, body mass index (BMI), if they smoked, consumed coffee and/or spicy food, their water intake, and whether they urinated in a standing position.<sup>[18,19]</sup>

### Statistical analysis

SPSS version 20.0 was used for the statistical analysis. Descriptive statistics were used to characterize the prevalence of LUTS. Mean values  $\pm$  standard deviation (SD) and median values were calculated. The correlation between LUTS and the bother score and LUTS with risk factors were tested using Pearson’s correlation coefficient. The variables included in the analysis were age, gender, (ICIQ-FLUTS, ICIQ-MLUTS), and potential risk factors. A logistic regression analysis was used to determine risk factors associated with LUTS.  $P < 0.05$  was considered statistically significant.

### Ethical consideration and confidentiality

The study was approved by the local research ethics committee from the regional research ethics committee, and was registered

at the national committee of Bio & Med Ethics (Registration No. H-04-Q-001). Written informed consent was obtained from all participants.

## Results

One male had a history of urological disease and was excluded from the study, leaving 196 males and 169 females who accepted to participate in our study. LUTS was reported by 180 students (49.3%), of which 46.4% were male and 52.7% were female. The median age was 22.47 years for females and 22.36 years for males. (ICIQ-FLUTS/MLUTS) results are presented in Tables 1 and 2, while micturition frequency, nocturia, and urine stream strength were not included in the tables because of differing responses. Nocturia once a night was reported by 68 females (40.2%) and 63 males (32%), twice a night by 20 females (11.2%) and 10 males (5.1%), three times by two females (1.2%) and seven males (3.6%), and four times by one female (0.6%) and no males. In terms of micturition frequency, 140 females (82.8%) and 159 (81.1%) males voided 1–6 times a day, 19 females (11.2%) and 30 males (15.2%) voided 7–8 times a day, six females (3.6%) and six males (3.1%) voided 9–10 times a day, one female (0.6%) and one male (0.5%) voided 11–12 times a day, and three females (1.8%) and no males voided  $\geq 13$  times a day. A total of 162 (82.7%) of the 196 males reported normal urine stream strength, 25 (12.8%) reported an occasionally reduced stream, 7 (3.6%) reported that it was sometime reduced, and only 2 (1%) reported a reduced urine stream strength most of the time. Of all the respondents, 13 females (7.7%) and 35 males (17.9%) had no symptoms at all, i.e., they answered “never” to every question.

For females, urgency at least sometimes was reported by 47 respondents (27.8%) and was the most common specific LUTS followed by bladder pain (28, 16.6%). For males, incomplete emptying was reported by 38 respondents (19.4%) and was the most common specific LUTS followed by straining and intermittency (28, 14.3%).

The bothersome ICIQ-FLUTS/MLUTS scores for each symptom are presented in Tables 3 and 4. Females reported that urgency (mean score 1.90) was the greatest cause of symptom discomfort, while males reported that incomplete emptying (mean score 1.80) was the greatest cause of symptom discomfort. Also, females showed significantly higher scores for most LUTS compared to males. A positive correlation was found between all symptoms and bother [Table 5]. A strong correlation ( $>0.7$ ) was found in females for urgency, bladder pain, straining, intermittency, unexplained urinary incontinence, and nocturnal enuresis, while in males it was found for hesitancy, straining, strength of stream, intermittency, incomplete emptying, urgency, urge incontinence, unexplained incontinence, nocturnal enuresis, and post-micturition dribble.

Bivariate correlations showed that bladder pain was positively correlated with heavy smoking but was inversely associated with a high level of physical activity and a high BMI [Tables 6 and 7]. Frequency was positively correlated with a high consumption of spicy food. Nocturia was positively correlated with a high BMI. Intermittency and straining were inversely associated with a high coffee consumption. Urge urinary incontinence

**Table 1: Results of ICIQ-FLUTS questionnaire, expressed as frequency of occurrence.**

	Urgency	Bladder pain	Hesitancy	Straining	Intermittency	Urge incontinence	Stress incontinence	Unexplained incontinence	Nocturnal enuresis
Total	169 (100%)	169(100%)	169 (100%)	169 (100%)	169 (100%)	169 (100%)	169 (100%)	169 (100%)	169 (100%)
0 (Never)	57 (33.7%)	128 (75.7%)	127 (75.1%)	139 (82.2%)	114 (67.5%)	139(82%)	133 (78.7%)	163 (96.4%)	165 (97.6%)
1 (Occasionally)	65 (38.5%)	13 (7.7%)	30 (17.8%)	21 (12.4%)	39 (23.1%)	22 (13.0%)	29 (17.2%)	5 (3.0%)	2 (1.2%)
2 (Sometimes)	41 (24.3%)	28 (16.6%)	8 (4.7%)	9 (5.3%)	13 (7.7%)	5 (3.0%)	6 (3.6%)	0 (.0%)	0 (.0%)
3 (Most of times)	5 (3.0%)	0 (.0%)	2 (1.2%)	0 (.0%)	2 (1.2%)	3 (1.8%)	1 (.6%)	0 (.0%)	0 (.0%)
4 (All of time)	1 (.6%)	0 (.0%)	2 (1.2%)	0 (.0%)	1 (.6%)	0 (.0%)	0 (.0%)	1 (.6%)	2 (1.2%)
≥2	47 (27.8%)	28 (16.6%)	12 (7.1%)	9 (5.3%)	16 (9.5%)	8 (4.7%)	7 (4.1%)	1 (.6%)	2 (1.2%)
<2	122 (72.2%)	141 (83.4%)	157 (92.9%)	160 (94.7%)	153 (90.5%)	159 (94.1%)	162 (95.9%)	168 (99.4%)	167 (98.8%)
Mean (SD)	0.98(0.869)	0.41(0.759)	0.36(0.735)	0.23(0.535)	0.44(0.739)	0.35(1.119)	0.26(0.549)	0.05(0.349)	0.06(0.446)

SD, standard deviation.

**Table 2: Results of ICIQ-MLUTS questionnaire, expressed as frequency of occurrence.**

	Hesitancy straining	Intermittency	Incomplete emptying	urgency	Urge incontinence	Stress incontinence	Unexplained incontinence	Nocturnal enuresis	Post micturition dripping
Total	196 (100%)	196 (100%)	196 (100%)	196 (100%)	196 (100%)	196 (100%)	196 (100%)	196 (100%)	196 (100%)
0 (Never)	123 (62.8%)	125 (63.8%)	124 (63.3%)	111 (56.6%)	114 (58.2%)	188 (95.9%)	186 (94.9%)	182 (92.9%)	190 (96.9%)
1 (Occasionally)	46 (23.5%)	43 (21.9%)	44 (22.4%)	47 (24.0%)	59 (30.1%)	6 (3.1%)	8 (4.1%)	7 (3.6%)	4 (2.0%)
2 (Sometimes)	23 (11.7%)	24 (12.2%)	19 (9.7%)	28 (14.3%)	17 (8.7%)	2 (1.0%)	2 (1.0%)	6 (3.1%)	1 (0.5%)
3 (Most of times)	4 (2.0%)	4 (2.0%)	4 (2.0%)	8 (4.1%)	5 (2.6%)	0 (.0%)	0 (.0%)	1 (0.5%)	0 (0.0%)
4 (All of time)	0 (.0%)	0 (.0%)	5 (2.6%)	2 (1.0%)	1 (0.5%)	0 (.0%)	0 (.0%)	0 (0.0%)	1 (0.5%)
≥2	27 (13.8%)	28 (14.3%)	28 (14.3%)	38 (19.4%)	23 (11.7%)	2 (1.0%)	2 (1.0%)	7 (3.6%)	2 (1.0%)
<2	169 (86.2%)	168 (85.7%)	168 (85.7%)	158 (80.6%)	173 (88.3%)	194 (99.0)	194 (99.0%)	189 (96.4%)	194 (99.0%)
Mean (SD)	0.53 (0.781)	0.53 (0.787)	0.58 (0.933)	0.69 (0.934)	0.57 (0.797)	0.06 (0.280)	0.11 (0.439)	0.05 (0.347)	0.46 (0.896)

SD: Standard Deviation.

**Table 3: Bother scores for females measured using ICIQ-FLUTS questionnaire.**

Bother score	Nocturia	Urgency	Bladder pain	Frequency	Hesitancy	Straining	Intermittency	Frequency of incontinence	Urge incontinence	Stress incontinence	Unexplained incontinence	Nocturnal enuresis
0	91 (53.80%)	66 (39.10%)	131 (77.50%)	107 (63.30%)	135 (79.9%)	144 (85.2%)	120 (71.00%)	144 (85.2%)	142 (84.0%)	138 (81.70%)	165 (97.6%)	165 (97.6%)
1	29 (17.2%)	34 (20.1%)	7 (4.1%)	13 (7.7%)	13 (7.7%)	4 (2.4%)	15 (8.9%)	7 (4.1%)	7 (4.1%)	12 (7.1%)	1 (.6%)	0 (.0%)
2	17 (10.1%)	16 (9.5%)	4 (2.4%)	23 (13.6%)	9 (5.3%)	7 (4.1%)	12 (7.1%)	4 (2.4%)	1 (.6%)	5 (3.0%)	0 (.0%)	1 (.6%)
3	9 (5.3%)	21 (12.4%)	9 (5.3%)	9 (5.3%)	5 (3.0%)	6 (3.6%)	9 (5.3%)	4 (2.4%)	5 (3.0%)	5 (3.0%)	0 (.0%)	1 (.6%)
4	9 (5.3%)	12 (7.1%)	6 (3.6%)	6 (3.6%)	4 (2.4%)	7 (4.1%)	6 (3.6%)	2 (1.2%)	4 (2.4%)	1 (.6%)	1 (.6%)	0 (0%)
5	1 (.6%)	2 (1.2%)	5 (3.0%)	4 (2.4%)	0 (.0%)	0 (.0%)	5 (3.0%)	1 (0.6%)	2 (1.2%)	2 (1.2%)	1 (.6%)	0 (0%)
6	2 (1.2%)	5 (3.0%)	1 (.6%)	3 (1.8%)	0 (.0%)	0 (.0%)	0 (.0%)	1 (0.6%)	3 (1.8%)	1 (.6%)	0 (.0%)	0 (0%)
7	2 (1.2%)	4 (2.4%)	4 (2.4%)	0 (.0%)	1 (.6%)	0 (.0%)	0 (.0%)	2 (1.2%)	2 (1.2%)	0 (.0%)	0 (.0%)	0 (0%)
8	5 (3.0%)	6 (3.6%)	1 (.6%)	0 (.0%)	1 (.6%)	1 (.6%)	1 (.6%)	0 (.0%)	1 (.6%)	1 (.6%)	0 (.0%)	0 (0%)
9	1 (.6%)	2 (1.2%)	1 (.6%)	3 (1.8%)	0 (.0%)	0 (.0%)	0 (.0%)	1 (0.6%)	1 (.6%)	1 (.6%)	0 (.0%)	0 (0%)
10	3 (1.8%)	1 (.6%)	0 (.0%)	1 (.6%)	1 (.6%)	0 (.0%)	1 (.6%)	3 (1.8%)	1 (.6%)	3 (1.8%)	1 (.6%)	2 (1.2%)
>0	78 (46%)	103 (60%)	38 (22.4%)	62 (36.6%)	34 (20%)	25 (14.7%)	49 (29%)	25 (14.8%)	27 (16%)	31 (18.3%)	4 (2.4%)	4 (2.4%)
Mean (SD)	1.4 -2.3	1.9 -2.367	0.84 -1.862	1.09 -1.937	0.51 -1.393	0.43 -1.173	0.79 -1.589	0.59 -1.847	0.64 -1.811	0.62 -1.826	0.12 -0.912	0.15 -1.116

SD: Standard Deviation.

**Table 4: Bother scores for males measured using ICIQ-MLUTS questionnaire.**

Bother score	Hesitancy	Straining	Strength of urine	Intermittency	Incomplete emptying	Urgency	Urge incontinence	Stress incontinence	Unexplained incontinence	Natural enuresis	Post micturition dripping	frequency	nocturia
0	139 (70.9%)	148 (75.5%)	163 (83.2%)	140 -71.40%	117 (59.7%)	131 (66.8%)	188 -95.90%	186 -94.90%	187 -95.40%	190 (96.9%)	152 -77.60%	159 (81.1%)	139 (70.9%)
1	11 (5.6%)	8 (4.1%)	6 (3.1%)	14 (7.1%)	12 (6.1%)	15 (7.7%)	1 (.5%)	3 (1.5%)	2 (1.0%)	0 (.0%)	7 (3.6%)	8 (4.1%)	11 (5.6%)
2	10 (5.1%)	9 (4.6%)	9 (4.6%)	10 (5.1%)	13 (6.6%)	14 (7.1%)	3 (1.5%)	2 (1.0%)	1 (.5%)	1 (.5%)	4 (2.0%)	6 (3.1%)	17 (8.7%)
3	10 (5.1%)	9 (4.6%)	5 (2.6%)	16 (8.2%)	7 (3.6%)	15 (7.7%)	2 (1.0%)	2 (1.0%)	0 (.0%)	1 (.5%)	6 (3.1%)	8 (4.1%)	8 (4.1%)
4	8 (4.1%)	4 (2.0%)	1 (.5%)	4 (2.0%)	10 (5.1%)	3 (1.5%)	0 (.0%)	1 (.5%)	0 (.0%)	2 (1.0%)	2 (1.0%)	1 (.5%)	5 (2.6%)
5	8 (4.1%)	5 (2.6%)	5 (2.6%)	4 (2.0%)	10 (5.1%)	5 (2.6%)	0 (.0%)	0 (.0%)	2 (1.0%)	0 (.0%)	2 (1.0%)	7 (3.6%)	5 (2.6%)
6	2 (1.0%)	5 (2.6%)	2 (1.0%)	2 (1.0%)	8 (4.1%)	6 (3.1%)	0 (.0%)	0 (.0%)	2 (1.0%)	0 (.0%)	1 (.5%)	1 (.5%)	3 (1.5%)
7	4 (2.0%)	3 (1.5%)	1 (.5%)	1 (.5%)	8 (4.1%)	5 (2.6%)	2 (1.0%)	1 (.5%)	1 (.5%)	0 (.0%)	5 (2.6%)	3 (1.5%)	3 (1.5%)
8	0 (.0%)	2 (1.0%)	2 (1.0%)	1 (.5%)	3 (1.5%)	1 (.5%)	0 (.0%)	0 (.0%)	0 (.0%)	0 (.0%)	7 (3.6%)	2 (1.0%)	3 (1.5%)
9	1 (0.5%)	3 (1.5%)	1 (.5%)	3 (1.5%)	4 (2.0%)	0 (.0%)	0 (.0%)	1 (.5%)	0 (.0%)	1 (.5%)	2 (1.0%)	0 (.0%)	1 (.5%)
10	3 (1.5%)	0 (.0%)	1 (.5%)	1 (.5%)	4 (2.0%)	1 (.5%)	0 (.0%)	0 (.0%)	1 (.5%)	1 (.5%)	8 (4.1%)	1 (.5%)	1 (.5%)
>0	57	48	33	56	79	65	8	10	9	6	44	37	57
Mean (SD)	1.08 -2.135	0.96 -2.065	0.62 -1.728	0.93 -1.923	1.8 -2.771	1.09 -1.988	0.14 -0.802	0.17 -0.932	0.22 -1.171	0.16 -1.064	1.26 -2.811	0.69 -1.771	1 -2.01

SD: Standard Deviation.

**Table 5: Correlation between LUTS and bother in females and males.**

LUTS (female)	Correlation	LUTS (male)	Correlation
Nocturia	Pearson's r .636 p value <0.01	Hesitancy	Pearson's r .817 p value <0.01
Urgency	Pearson's r .705 p value <0.01	Straining	Pearson's r .701 p value <0.01
Bladder pain	Pearson's r .825 p value <0.01	Strength of stream	Pearson's r .782 p value <0.01
Frequency	Pearson's r .480 p value <0.01	Intermittency	Pearson's r .709 p value <0.01
Hesitancy	Pearson's r .588 p value <0.01	Incomplete emptying	Pearson's r .804 p value <0.01
Straining	Pearson's r .839 p value <0.01	Urgency	Pearson's r .750 p value <0.01
Intermittency	Pearson's r .826 p value <0.01	Urge UI	Pearson's r .867 p value <0.01
Urge UI	Pearson's r .358 p value <0.01	Stress UI	Pearson's r .688 p value <0.01
Frequency of UI	Pearson's r .699 p value <0.01	Unexplained UI	Pearson's r .740 p value <0.01
Stress UI	Pearson's r .695 p value <0.01	Nocturnal enuresis	Pearson's r .838 p value <0.01
Unexplained UI	Pearson's r .914 p value <0.01	Post micturition dribble	Pearson's r .871 p value <0.01
Nocturnal enuresis	Pearson's r .999 p value <0.01	Frequency	Pearson's r .561 p value <0.01
			Pearson's r .670 p value <0.01

UI: Urinary Incontinence

**Table 6: Correlation between LUTS and risk factors in males.**

LUTS		Exercise	BMI	Smoking	coffee	Spicy food	Water intake	urinating in standing position
Hesitancy	Pearson's r	0.008	0.044	0.129	0.044	-.110-	-.003-	0.085
	P value	0.916	0.538	0.072	0.537	0.127	0.972	0.239
Straining	Pearson's r	0.032	-.005-	0.096	0.066	-.089-	-.053-	0.109
	P value	0.658	0.941	0.183	0.357	0.217	0.462	0.128
Strength of stream	Pearson's r	-.054-	0.055	-.074-	0.12	0.012	-.022-	0.027
	P value	0.45	0.446	0.3	0.093	0.863	0.764	0.711
Intermittency	Pearson's r	-.095-	-.138-	0.087	0.017	-.078-	-.074-	0.029
	P value	0.188	0.055	0.228	0.811	0.275	0.301	0.69
Incomplete emptying	Pearson's r	-.018-	0.005	-.016-	0.096	0.003	-.073-	0.006
	P value	0.807	0.94	0.818	0.18	0.97	0.31	0.931
Urgency	Pearson's r	-.004-	-.010-	-.039-	0.078	-.052-	-.039-	-.073-
	P value	0.954	0.89	0.587	0.277	0.467	0.586	0.307
Urge UI	Pearson's r	-.004-	-.079-	-.075-	0.12	-.022-	-.114-	-.117-
	P value	0.956	0.273	0.294	0.093	0.756	0.112	0.104
Stress UI	Pearson's r	-.008-	-.062-	0.012	0.088	0.04	0.024	-.082-
	P value	0.914	0.386	0.863	0.22	0.579	0.737	0.251
Unexplained UI	Pearson's r	0.056	-.016-	0.087	0.077	-.057-	0.057	-.113-
	P value	0.434	0.82	0.225	0.281	0.426	0.431	0.116
Nocturnal enuresis	Pearson's r	0.104	-.006-	-.018-	0.107	0.036	0.083	-.014-
	P value	0.146	0.932	0.804	0.134	0.621	0.249	0.846
Post micturition dribble	Pearson's r	0.047	-.022-	0.082	0.175	0.043	-.074-	0.043
	P value	0.517	0.765	0.251	0.014	0.554	0.3	0.552
Frequency	Pearson's r	0.031	0.059	0.025	0.065	-.127-	0.079	-.029-
	P value	0.664	0.413	0.727	0.367	0.076	0.268	0.682
Nocturia	Pearson's r	0.014	-.003-	-.011-	0.113	-.041-	-.024-	-.101-
	P value	0.846	0.963	0.876	0.116	0.569	0.74	0.159

**Table 7: Correlations between LUTS and risk factors in females.**

LUTS		Exercise	BMI	Smoking	Coffee	Spicy food	Water intake	Uri urinating in standing position
Bladder pain	Pearson's r	-.196-	-.185-	.164	.027	.132	-.073-	-.009-
	P value	.010	.016	.033	.725	.087	.344	.903
Frequency	Pearson's r	-.074-	.009	-.051-	.051	.157	.082	-.082-
	P value	.339	.905	.511	.507	.041	.292	.290
Urgency	Pearson's r	-.063-	.032	-.049-	.068	-.107-	.001	.073
	P value	.414	.683	.527	.382	.165	.990	.345
Nocturia	Pearson's r	-.050-	.199	-.064-	.127	-.098-	-.043-	.028
	P value	.521	.009	.409	.100	.204	.575	.719
Hesitancy	Pearson's r	-.083-	-.060-	-.065-	-.120-	-.106-	.026	-.035-
	P value	.282	.436	.400	.121	.170	.739	.649
Straining	Pearson's r	-.050-	-.119-	.110	-.222-	-.032-	-.021-	-.065-
	P value	.521	.123	.155	.004	.678	.789	.399
Intermittency	Pearson's r	.033	-.005-	-.081-	-.257-	-.026-	.044	-.056-
	P value	.673	.944	.295	.001	.736	.568	.472
Urge UI	Pearson's r	.196	.111	-.042-	-.089-	.186	.033	.041
	P value	.011	.150	.587	.250	.016	.668	.599
Frequency of UI	Pearson's r	.047	-.017-	-.051-	-.036-	.062	-.053-	.156
	P value	.540	.829	.509	.644	.421	.493	.042
Stress UI	Pearson's r	-.049-	-.083-	-.064-	.005	.074	-.034-	.175
	P value	.527	.281	.408	.952	.338	.664	.023
Unexplained UI	Pearson's r	.077	.057	-.021-	-.005-	.017	-.042-	-.013-
	P value	.317	.459	.791	.945	.829	.591	.869
Nocturnal enuresis	Pearson's r	.205	.265	-.018-	.074	.145	.222	-.014-
	P value	.008	.001	.817	.341	.060	.004	.856

BMI: Body Mass Index, UI: Urinary Incontinence.

was positively correlated with a high level of physical activity and high consumption of spicy food. Stress incontinence and incontinence frequency were positively correlated with urination in a standing position. Nocturnal enuresis was positively correlated with a high level of physical activity, a high BMI, and high water intake. Post-micturition dribble was positively correlated with a high coffee consumption.

The results of a logistic regression analysis are outlined in Tables 8 and 9. In females, a higher BMI was an associated risk factor for nocturia. A higher consumption of spicy food was an associated risk factor for bladder pain, whereas a higher level of physical activity and higher BMI decreased the risk of developing bladder pain. Moreover, the risk of developing frequency was decreased by a higher level of physical activity. The risk of developing straining and intermittency were decreased by a high coffee consumption, while in males, a high coffee consumption was a potential risk factor for urge urinary incontinence.

## Discussion

LUTS has been demonstrated to affect people of a young age, nulliparous females, and non-sexually active people.<sup>[10]</sup> In our study, LUTS symptoms were found to be present in almost half of all female and male medical students. The prevalence of LUTS was more common in females (52.7%) than in males. Similarly, Zalina et al. conducted a study on 146 female medical students and found the same LUTS percentage prevalence (52.7%) among females.<sup>10</sup> On the other hand, similar to our results, Coyne et al. reported a prevalence of at least one LUTS; “sometimes” was more commonly reported in females (76.3%) than in males (72.3%).<sup>[7]</sup>

In our study, the most reported symptoms in males were “at least sometimes” incomplete emptying followed by intermittency and straining. On the other hand, in a Nigerian study by Ojewola et al., nocturia was the single most common symptom in males (38.4%), while straining was the least common at 13.4%.<sup>[20]</sup> The female respondents in our study reported urgency “at least sometimes” and it was the most common symptom (27.8%). Likewise, as reported by Zalina et al., 50.7% of females experienced urgency.<sup>[10]</sup> The low prevalence of LUTS amongst our sample compared to other studies may be due to our representative lower-age group, as it is a known that LUTS prevalence increases with age.<sup>[7,8,18]</sup>

In our study, the least common symptom in both males and females was nocturnal enuresis, which is in accordance with the results from multiple studies.<sup>[9,18]</sup> Zalina et al. added that urinary incontinence was a key symptom in females (34.9%).<sup>[10]</sup> Urinary incontinence was divided into urge, stress, and unexplained incontinence. Females were shown to be more susceptible to urinary incontinence than males, which is in accordance with the results reported by Coyne et al.<sup>[7]</sup> The fact that after only 16 females and 11 males reported any type of urinary incontinence in our study might mean that our data are less likely to be representative of the prevalence of urinary incontinence type in the population as a whole.

In our study, nocturia once and twice a night was more common

in females, but males were more likely to have nocturia three times a night and only one female (0.6%) reported nocturia four or more times a night. In the same way, Zumurbas et al., reported that females were more likely to have nocturia than males.<sup>[21]</sup> Perhaps the fact that our study included males and females aged between (19 and 29) years explains the sex difference. While Zumurbas et al. reported that nocturia increased with age in males, no linear correlation with age was observed for females.<sup>[21]</sup> Most male and female students in this study described almost all LUTS as bothersome. We also found that the most frequently reported bothersome symptoms in both females and males were urgency and incomplete emptying, respectively, which is in contrast to other study.<sup>[18]</sup> Coyne et al. and Agarwal et al. reported urgency as the most prevalent bothersome symptom in females and both sexes, respectively.<sup>[2,7]</sup> The mildest symptom in males was nocturnal enuresis, which may be accredited to the fact that only two males reported at least sometimes in our sample. Nevertheless, in other studies, nocturnal enuresis was the most bothersome symptom even though it was the least prevalent.<sup>[18]</sup> Similarly, in the epidemiology of LUTS study by Coyne et al., incontinence during sexual activity showed the lowest percentage of prevalence but it was reported more often as the most bothersome symptom.<sup>[7]</sup> In females, the mildest symptom was unexplained urinary incontinence, which was also amongst the least prevalent symptoms in our study. Conversely, in a study by Wang et al., nocturia was the most common LUTS but it was the least bothersome for both sexes.<sup>[18]</sup> The overall bothersome scores for most LUTS were higher for females than males which are in contrast to the findings of Agarwal et al. who reported that the bother distribution was comparable in both genders.<sup>[2]</sup> For all LUTS in our study, a positive correlation was found between symptoms and bother. A strong correlation with nocturnal enuresis was found in females and post-micturition dribble in males. Likewise, Hendrikje et al. conducted a study on young women and they also found that all questions had a positive correlation between symptoms and bother.<sup>[9]</sup> The strongest correlation reported by Hendrikje et al. was for bladder pain and urgency urinary incontinence.<sup>[9]</sup> LUTS was associated with great distress, and this clearly supports the requirement for an assessment tool for symptom distress in hospitals and primary health care facilities for the early identification of symptoms that require medical intervention. In our study, we evaluated smoking, coffee consumption, a high BMI, spicy food consumption, urination in a standing position, and a high water intake as potential risk factors for LUTS. In bivariate correlations, interestingly the participants who consumed excess amounts of coffee and tea were less likely to develop intermittency or straining symptoms. This finding is in contrast to that reported by Maserejian et al. who found that a greater coffee intake at baseline increased the likelihood of LUTS progression in males.<sup>[22]</sup> At the same time in females, an increased coffee intake was associated with a higher likelihood of progression of LUTS, specifically urgency. In accordance with other studies, smoking was indeed positively correlated with bladder pain.<sup>[18,23,24]</sup> Joseph et al. found that both current and former smokers were more likely to develop LUTS.<sup>[23]</sup> Another intriguing phenomenon was reported by Maserejian et al. and Wang et al., that the odds of developing LUTS in females who smoke was much higher than that in males.<sup>[18,24]</sup> This

**Table 8: The results of a logistic regression analysis in men.**

LUTS/RISK FACTOR	High level of physical activity			High BMI			Heavy Smoking			High coffee consumption			High consumption of spicy food			High amount of water intake			Urination in standing position		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Nocturia	0.989	.74-1.316	>0.05	1.137	.794-1.627	>0.05	1.002	.680-1.476	>0.05	1.002	.0724-1.388	>0.05	.829	.582-1.182	>0.05	1.035	.753-1.423	>0.05	.854	.667-1.095	>0.05
Urgency	0.976	.732-1.300	>0.05	.106	.505-1068	>0.05	.943	.634-1.401	>0.05	1.286	.920-1.798	>0.05	.841	.591-1.198	>0.05	.814	.591-1.124	>0.05	.986	.779-1.279	>0.05
Frequency	0.964	.669-1.388	>0.05	1.037	.665-1.616	>0.05	1.189	.748-1.890	>0.05	1.307	.849-2.013	>0.05	.728	.468-1.132	>0.05	1.329	.882-2.004	>0.05	.964	.705-1.318	>0.05
hesitancy	1.014	.756-1.361	>0.05	.886	.609-1.287	>0.05	1.368	.929-2.016	>0.05	1.216	.865-1.711	>0.05	.719	.499-1.037	>0.05	.908	.652-1.264	>0.05	1.239	.956-1.605	>0.05
straining	1.075	.799-1.445	>0.05	.882	.604-1.287	>0.05	1.424	.965-2.101	>0.05	1.341	.945-1.904	>0.05	.822	.571-1.183	>0.05	.861	.616-1.202	>0.05	1.283	.987-1.668	>0.05
Intermittency	0.877	.651-1.184	>0.05	.807	.479-1.043	>0.05	1.474	.997-2.178	>0.05	1.261	.891-1.783	>0.05	.770	.533-1.112	>0.05	.933	.668-1.301	>0.05	1.108	.857-1.433	>0.05
Urge UI	1.079	.495-2.350	>0.05	.218	.043-1.115	>0.05	.000	.000	>0.05	4.770	1.042-21.833	<0.05	1.003	.400-2.512	>0.05	.414	.157-1.093	>0.05	.549	.277-1.088	>0.05
Stress UI	0.841	.434-1.628	>0.05	.578	.218-1.528	>0.05	.910	.324-2.555	>0.05	1.717	.687-4.288	>0.05	1.397	.614-3.178	>0.05	1.190	.578-2.450	>0.05	.811	.475-1.382	>0.05
Unexplained UI	1.028	.587-1.800	>0.05	.864	.418-1.784	>0.05	1.265	.637-2.511	>0.05	1.305	.655-2.598	>0.05	.856	.443-1.657	>0.05	1.344	.722-2.504	>0.05	.700	.430-1.140	>0.05
Nocturnal enuresis	1.19	.505-2.804	>0.05	1.329	.498-3.550	>0.05	1.308	.463-3.699	>0.05	2.323	.583-9.253	>0.05	.959	.365-2.523	>0.05	1.316	.534-3.243	>0.05	.669	.312-1.436	>0.05
Incomplete emptying	1.104	.832-1.466	>0.05	.840	.584-1.209	>0.05	1.121	.764-1.646	>0.05	1.273	.915-1.770	>0.05	1.024	.723-1.452	>0.05	.884	.644-1.214	>0.05	.1027	.803-1.131	>0.05
Strength of stream	1.023	.706-1.482	>0.05	.910	.567-1.462	>0.05	.683	.345-1.352	>0.05	1.531	.957-2.450	>0.05	.979	.622-1.540	>0.05	.900	.593-1.368	>0.05	1.183	.856-1.634	>0.05
Post micturition dribble	1.015	.737-1.399	>0.05	.988	.660-1.480	>0.05	1.152	.757-1.752	>0.05	1.458	.981-2.168	>0.05	1.102	.754-1.631	>0.05	.898	.628-1.283	>0.05	1.053	.798-1.389	>0.05

UI: Urinary Incontinence; OR: Odds Ratio; CI: Confidence Interval.

**Table 9: The results of a logistic regression analysis in women.**

LUTS/RISK FACTOR	High level of physical activity			High BMI			Heavy Smoking			High coffee consumption			High consumption of spicy food			High amount of water intake			Urination in standing position		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Nocturia	.691	.401-1.191	>0.05	2.236	1.331-3.755	<0.05	0.537	0.159-1.815	>0.05	1.395	.836-2.329	>0.05	.799	.466-1.368	>0.05	.892	.541-1.469	>0.05	.716	.283-1.814	>0.05
Urgency	1.010	.719-1.419	>0.05	1.012	.683-1.500	>0.05	.515	.148-1.798	>0.05	1.158	.838-1.601	>0.05	.833	.582-1.191	>0.05	1.001	.700-1.430	>0.05	1.009	.522-1.952	>0.05
Bladder pain	.604	.377-.969	<0.05	.459	.248-.852	<0.05	2.789	.770-10.097	>0.05	1.064	.722-1.566	>0.05	1.616	1.057-2.471	<0.05	1.232	.813-1.867	>0.05	1.043	.442-2.460	>0.05
Frequency	.603	.368-.989	<0.05	1.006	.603-1.678	>0.05	0	0	>0.05	.946	.620-1.443	>0.05	1.589	.971-2.601	>0.05	1.448	.938-2.235	>0.05	.588	.172-2.017	>0.05
hesitancy	1.133	.519-1.133	>0.05	1.052	.685-1.617	>0.05	.000	.000	>0.05	.771	.541-1.098	>0.05	1.142	.764-1.707	>0.05	1.166	.793-1.714	>0.05	.728	.300-1.770	>0.05
straining	.925	.596-1.434	>0.05	.719	.405-1.275	>0.05	3.153	.850-11.697	>0.05	.571	.382-.855	<0.05	1.129	.724-1.759	>0.05	1.072	.671-1.713	>0.05	.598	.147-2.430	>0.05
Intermittency	1.123	.801-1.573	>0.05	.997	.669-1.486	>0.05	.000	.000	>0.05	.676	.486-.942	<0.05	>0.05	.739-1.554	>0.05	.994	.690-1.430	>0.05	.810	.379-1.734	>0.05
urge	1.308	.876-1.954	>0.05	1.072	.673-1.709	>0.05	.000	.000	>0.05	.975	.648-1.468	>0.05	1.481	.927-2.366	>0.05	.859	.546-1.352	>0.05	1.492	.764-2.914	>0.05
Frequency of UI	1.232	.808-1.878	>0.05	.931	.555-1.562	>0.05	.000	.000	>0.05	.748	.493-1.136	>0.05	1.248	.773-2.015	>0.05	.974	.601-1.581	>0.05	1.843	.939-3.617	>0.05
Stress UI	.833	.545-1.275	>0.05	.768	.461-1.279	>0.05	.000	.000	>0.05	1.022	.690-1.512	>0.05	1.299	.838-2.014	>0.05	1.146	.754-1.742	>0.05	2.391	1.232-4.641	>0.05
Unexplained UI	1.674	.774-3.623	>0.05	1.452	.609-3.462	>0.05	.000	.000	>0.05	.558	.236-1.318	>0.05	1.160	.444-3.030	>0.05	.742	.262-2.099	>0.05	1.298	.265-6.348	>0.05
Nocturnal enuresis	.746	.246-2.262	>0.05	2.025	.564-7.272	>0.05	.000	.000	>0.05	.519	.154-1.750	>0.05	4.602	.681-31.114	>0.05	4.923	.787-30.814	>0.05	2.765	.438-17.441	>0.05

UI: Urinary Incontinence; OR: Odds Ratio; CI: Confidence Interval.

comparison was not conveyed in our sample, possibly because few females in the Qassim region are smokers. Smoking was also commonly reported to increase the risk of urgency and frequency.<sup>[24]</sup> The consequences of smoking may be attributable to an exaggeration of irritative urinary symptoms or a nicotine-associated elevation of testosterone serum levels. Smoking affects bladder wall strength and detrusor instability in women more frequently than in men, making storage symptoms more predominant in smoking women.<sup>[18,24]</sup> Moreover, the previously mentioned bladder pain was more common in participants with a low BMI and those who had a low exercise level. In support of our results, Maserejian et al. found that a low physical activity was associated with a 2–3 times higher odds of LUTS development.<sup>[24]</sup> This is because, in theory, physical activity may protect against LUTS development in both males and females by reducing resting sympathetic muscle tone, decreasing inflammatory reactions systemically, and changing metabolic syndrome-related hormonal factors.<sup>[24]</sup> Low exercise levels will ultimately lead to weight gain and thus a higher BMI, which has been shown in our study to also increase the risk of nocturia. Unlike our results, Wang et al. did not find a significant correlation between a high BMI and increased risk for LUTS.<sup>[18]</sup> Since there is an explained mechanism as to why a high BMI increases LUTS risk, the previous finding was odd. It is understandable that excess body weight increases abdominal pressure during physical activity or defecation, in turn, increasing bladder pressure and urethral mobility, leading to LUTS.<sup>[18,25]</sup> Frequency was more common with the consumption of spicy foods. Also, urge urinary incontinence was exaggerated by the consumption of spicy foods in addition to high exercise levels. Stress and frequency of urinary incontinence were both worsened by urination in a standing position. This finding may be explained by Amjadi et al., who found that uroflowmetry readings were affected by the position of urination in men; the standing position showed the lowest reading rendering the residual urinary volume high.<sup>[26]</sup> However, they did not find a significant correlation, however this may be a clue as to why a standing position increases frequency and stress urinary incontinence. Nocturnal enuresis, although not very prevalent in our study, showed the most positive correlations with a high exercise level, high BMI, and high water intake. Post-micturition dribble was positively correlated with excess coffee or tea consumption. The results of a logistic regression showed that in females, a high BMI was associated risk factors for nocturia. In addition, the consumption of spicy foods as a risk factor has been mentioned numerous times as anecdotal evidence, but reports of this factor were scarce in the literature. A questionnaire-based study by Shorter et al. showed an association between an increased consumption of spicy food and exaggerated bladder pain.<sup>[27]</sup> In the same manner, in our study the consumption of spicy foods increased the risk of bladder pain. On the other hand, in males, coffee was a potential risk factor for urge urinary incontinence, which was also reported by Shorter et al. and Maserejian et al., who reported that certain types of foods or beverages irritated the bladder. The most common investigated were caffeinated and carbonated or acidic beverages. It is possible that components in these types of beverages have direct effects on the bladder and systemic effects that could contribute to LUTS, both after the immediate consumption and over prolonged periods with habitual intake.<sup>[22,27]</sup> The effect of

caffeine along with other beverages was proven through an experiment on rodents who showed increased bladder pressure and detrusor muscle contraction following caffeine intake.<sup>[28]</sup> Of all of the mentioned risk factors, a high BMI and the consumption of spicy foods and coffee are potentially modifiable conditions through lifestyle interventions. Therefore, these interventions can be of great value in preventing or treating LUTS. Moreover, in our study, exercise and a high BMI protected against the development of bladder pain. Also, exercise decreased the risk of developing frequency. However, coffee or tea consumption decreased the risk of developing straining and intermittency while in other symptoms they were a potential risk factor, which suggests that individuals who consume coffee have a risk of developing urge urinary incontinence, but on other hand they also have some protection against developing straining and intermittency. Therefore, efforts are needed to increase public awareness regarding these symptoms.

There are some limitations to our study. As a cross sectional study, there was no follow up with LUTS individuals. Also, having LUTS was based on self-reporting, not a clinical diagnosis or investigation. The study also focused on medical students, a small sample size that may not be representative of the general population. Furthermore, information on the students who did not participate was unavailable, which probably led to non-response bias.

## Conclusion

Our study shows that LUTS is highly prevalent among the young age group and most of these symptoms showed a strong positive correlation with bother. However, there was a difference in symptom frequency and discomfort between sexes. We identified some risk factors that increased the occurrence of some LUTS. However, we need to conduct a future prospective study with a large sample size among the among general population to elucidate this. Also, all risk factors that were associated with LUTS are avoidable so this need to be addressed in future public awareness programs. The presentation of LUTS among the general population and availability of early screening methods to determine any pathology of the lower urinary tract and assessment of the bothersome symptoms before medical intervention in young adults will increase the quality of life of people with LUTS.

## Conflict of Interest

All authors disclose that there was no conflict of interest.

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