ORIGINAL RESEARCH

Evaluation of Health-Related Quality of Life in Women with Community-Acquired Urinary Tract Infections Using the EQ-5D-3L in Saudi Arabia

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Purpose: Community-acquired urinary tract infection (CA-UTI) is a common and costly condition in females. Currently, there are no data on CA-UTI and quality of life (QoL) in Saudi Arabia. The aim of this study was to evaluate the impact of UTI and related socio-demographic characteristics on health-related quality of life (HRQoL) of Saudi females using the EuroQol 5-Dimension, 3-Level (EQ-5D-3L) instrument before and after treatment.

Patients and Methods: This was a cross-sectional questionnaire study conducted in the emergency department (ED) of a tertiary hospital over a three-month period.

Results: A total of 339 out of 524 females with a mean age of 36.2 years (SD: 9.57 years; range 19–59 years) completed both the baseline and follow-up questionnaires of the EQ-5D-3L for a response rate of 64.7%. The baseline utility index for the worst health state "33333" was −0.495 representing 1.18% of the patients, and the full health state "11111" was 1 corresponding to 30.68% of the patients. The utility index after treatment for the moderate health state "22222" was 0.524 corresponding to 0.88% of the total patients, and the full health state "11111" was 1 corresponding to 80.24% of the patients. The mean EuroQol Visual Analogue Scale (EQ-VAS) was 73 ± 26 before treatment and 87.46 ± 18.55 after treatment. The frequency of patients reporting problems in the EQ-5D dimensions of mobility, self-care, usual activities, pain/discomfort and anxiety/depression decreased following treatment (27.43% vs 0.88%, 4.42% vs 0.88%, 25.96% vs 6.78%, 61.95% vs 13.27%, 39.52% vs 15.63%, respectively; all $P < 0.001$). There were statistically significant associations between HRQoL and socio-demographic characteristics, chronic diseases, and herbal supplements.

Conclusion: Community-acquired tract infections (CA-UTIs) have a significant negative impact on the HRQoL of Saudi females with a varying effect depending on the socio-demographic characteristics and chronic diseases.

Keywords: community-acquired urinary tract infection, EQ-5D-3L, health-related quality of life, utility

Introduction

Urinary tract infections (UTIs) are a common and costly condition worldwide, affecting all ages and gender, with the highest prevalence among women.[1–3] The prevalence of community-acquired urinary tract infections (CA-UTIs) accounts for 14.6% of emergency visits among adults in Saudi Arabia and recurrent episodes among females accounts for 20.6%.[1]

Urinary tract infections represent 22% of infections in the emergency department (ED) of hospitals in Saudi Arabia.[4] CA-UTIs are most often treated with antibiotics, and overuse and inappropriate practices involving antibiotics can result

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in the development of antimicrobial resistance and increased costs.[4–6] The mean cost for CA-UTI treatment in EDs in Saudi Arabia has been estimated as $134.56± $31.34.[1]

Despite the fact that UTIs are a common health problem in EDs and primary care with clinical and economic impact,[1–3] there are limited data available regarding how UTIs affect the quality of life (QoL) of patients throughout the world. In Saudi Arabia, no information is available on the effects of CA-UTIs on health-related QoL in Saudis females. QoL indicators are strong predictors of a patient's general ability to preserve long-term health and productivity.[1,7] In this regard, health-related quality of life (HRQoL) is crucial for measuring the burden of illness and assisting physicians and policy makers to improve patient care and policy decisions.[8]

Several instruments have been implemented to measure HRQoL such as the EuroQol 5-Dimension, 3-Level questionnaire (EQ-5D-3L). The EQ-5D instrument was designed by the EuroQol Group to assess health for clinical and economic appraisal by utilizing a simple, generic and standardized HRQoL questionnaire.[9,10] The EQ-5D is a valid and reliable measure in many disease areas and is the most commonly used tool for assessing cost-utility analyses in order to appraise healthcare interventions.[10–16]

Utility scores are used to quantify the severity of a patient's condition and the burden of disease state, allowing for comparisons across a wide range of disease states, people, and different treatment modalities. In addition, the utility scores can be combined with life expectancy estimates to calculate quality-adjusted life years, which is a unit of measurement for quantifying the benefits of an intervention.[15] Utility scores range from 0 to 1 on a scale with high utility (1) indicating a full health outcome, low utility demonstrating a worse health outcome, and zero representing death.[15,17,18]

Therefore, it is necessary to know the level of HRQoL of CA-UTI patients and identify factors that result in decreased or impaired HRQoL as this will help policy makers to prioritize funding and implement interventions to improve QoL. The aim of this research was to evaluate the impact of CA-UTIs and related socio-demographics on the HRQoL using the EQ-5D-3L instrument in Saudis females before and after treatment for the CA-UTIs.

Methods
Design/Setting
This was a cross-sectional questionnaire-based study performed in the ED of King Abdulaziz Medical City (KAMC) over a three-month period. KAMC is a 1505-bed university affiliated major tertiary care center in Riyadh, Saudi Arabia.

Participants
The participants of interest were females aged 18 to 59 years and had their condition diagnosed by a physician based on a history of symptoms as well as urinalysis results consistent with CA-UTIs and having at least one antibiotic prescription from the ED. Participants were excluded from the study if they were younger than 18 or older than 59 years, were pregnant, had catheter acquired urinary tract infection, vesicoureteral reflux disease, acute pyelonephritis, kidney failure, or an immunodeficiency disorder.

Data Collection
The questionnaires for the Saudi females were demonstrated in Arabic and the statement of confidentiality issues was explained on the cover page. The completion of the questionnaire was considered consent to participate in the study. Each questionnaire was completed by the participants.

The questionnaire composed of two parts as follows:

Socio-Demographic Characteristics
Socio-demographic data including age, medical history, current use of herbal supplements, education status (higher education, middle education, low education), marital status (single, married, other), employment status (employed, unemployed, student), and the patient's monthly income in Saudi Arabian Riyal (SAR).

Assessment of HRQoL
The validity and reliability of an Arabic version of the EQ-5D-3L questionnaire was determined after obtaining prior approval from the EuroQol Research Foundation.[16] The EQ-5D instrument questionnaire is comprised of two components: a description of health state (EQ-5D descriptive system) and an evaluation of health state (EQ-5D visual analogue scale (EQ-VAS)). The health state description, EuroQol 5-Dimension, 3-Level (EQ-5D-3L) consists of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels of severity scale: 1) no problems, 2) moderate problems, 3) severe or extreme problems and the participants were asked to select the statement that best describes their health status. The responses are combined to produce a five-digit number describing the respondent's health

status (ranging from 11111 to 33333): 11111 (having no problems in all dimensions or full health) and 33333 (having extreme problems in all dimensions or worst health). The EQ-5D-3L health states were converted based on the crosswalk methodology to obtain a standardized utility index (UI) score ranging from 0 (representing death) to 1 (representing full health), with negative values representing states worse than death.[14,17] The second part of the instrument is an evaluation of health state, EQ-VAS, which is a visual vertical scale ranging from "0" to "100". The participant records her health status on a vertical VAS ranging from "Best imaginable health state" (100) to "Worst imaginable health state" (0).

Statistical Analysis

Analyses were performed using SPSS statistical software (version 22; IBM, Armonk, NY, USA). Descriptive statistics such as frequency, percentage, mean ± SD, or median (range) were used for socio-demographic, illness variables, and problems at each level for each dimension of the EQ-5D-3L. Bivariate analysis using Pearson's $\chi2$ test was used for categorical variables. For all statistical tests, $P<0.05$ was considered statistically significant.

Ethical Issues

The study was approved by the Institutional Review Board and the Ethical Committee at King Abdullah International Medical Research Center (KAIMRC), King Saud Bin-Abdulaziz University for Health Sciences, Riyadh (RR20/551/R). Oral informed consent and completion of the questionnaire were considered consent to participate in the study.

Patient confidentiality and privacy of information were secured by the principal investigator.

Results

A total of 339 out of 524 females completed both baseline and follow-up questionnaires for a response rate of 64.7%.

Social Demographic Characteristics

The respondents had a mean age of 36.2 years (SD: 9.57 years; range 19–59 years). Most patients were aged 40–49 years (35.69%) followed by the age groups 30–39 years (33.63%), 19–29 years (24.19%) and then 50–59 years (6.46%). The healthy respondents represented 52.21% of patients whereas 47.79% of respondents had at least one medical illness. The most

common medical illnesses were gynaecological (fibroid/ovarian cysts) representing 17.07% of the patients and diabetes mellitus representing 14.02% of patients. The use of herbal supplements during the CA-UTI episode occurred in 30.68% of patients. The majority of the female patients had a high level of educational (59%) and were employed 49.56%; 35.10% were unemployed and 15.34% were students and most of the respondents were married (71.09%), Table 1.

Table 1 Socio-Demographic Characteristics of Patients

Characteristics	N (%)
Age (years)	
Mean ± SD (range)	36.2± 9.57 (19–59) years
19–29	82 (24.19)
30–39	114 (33.63)
40–49	121 (35.69)
50–59	22 (6.49)
Medical history	
No medical history	177 (52.21)
Diabetic mellites	23 (14.02)
Gynaecology (fibroid/ovary cysts)	28 (17.07)
Irritable bowel syndrome	37 (22.56)
Hypothyroidism	31 (18.90)
Hypertension	19 (11.59)
Other	26 (15.85)
Use of herbal supplements	
No	235 (69.32)
Yes	104 (30.68)
Herbal name	
Parsley/contained Parsley	75 (72)
Other	29 (28)
Education, years	
Low education (≤9)	24 (7.08)
Middle education (12–15)	115 (33.92)
Higher education (≥16)	200 (59)
Employment status	
Student	52 (15.34)
Employed	168 (49.56)
Unemployed	119 (35.10)
Marital status	
Single	73 (21.53)
Married	241 (71.09)
Other	25 (7.37)
Female monthly income	
Less than 5000 SAR	94 (27.73)
5000 to 10,000 SAR	131 (38.64)
More than 10,000 SAR	114 (33.63)

Assessment of HRQoL
Description of Health State (EQ-5D)
Figure 1 illustrates that there was an improvement in the health state among respondents after treatment. The percentage of respondents that did not have a problem in any dimensions of the EQ-5D (perfect or full health state) increased from (30.68%) to (80.24%). The percentage of respondents that reported having problems in some dimensions of the EQ-5D decreased from (68.14%) to (19.76%). The number of respondents that reported having problems in all dimensions of the EQ-5D (worse or extreme health state) decreased from (1.18%) to none of the respondents following treatment.

As shown in Table 2, at baseline, the percentage of respondents who reported having no problems in terms of mobility, self-care, usual activities, pain or discomfort and anxiety or depression were 72.57%, 94.40%, 74.04%, 38.05%, and 60.47%, respectively.

Treatment of UTI led to a decrease in the percentage of patients reporting some problems in the dimensions of mobility (27.43% to 0.88%; P < 0.001), self-care (4.42% to 0.88%; P < 0.001), usual activities (25.96% to 6.78%; P < 0.001), pain/discomfort (61.95% to 13.27%; P < 0.0001), and anxiety/depression (39.52% to15.63%; P < 0.001). No severe problems were reported after the treatment.

As shown in Figure 2, the baseline for the health state ranged from "11111" to "33333". The full health state "11111" was represented in 30.68% of the patients and the worst health state "33333" was represented in 1.18% of the patients. After treatment, the health state ranged from "11111" to "22222". The full health state "11111" was represented in 80.24% of patients and the moderate

health state "22222" was represented in 0.88% of patients. Treatment of CA-UTI increased the percentage of patients reporting health states "11111" (30.68% to 80.24%; P < 0.001) and "11222" (1.77% to 5.31%%; P < 0.001). There was a decrease in the percentage of patients who reported health states "11121" (14.75% to 4.13%; P < 0.001), "11122" (12.68% to 2.95%, P < 0.001), and "11221" (1.77% to 0%, P < 0.001).

The baseline utility index for the worst health state "33333" was - 0.495 representing 1.18% of the total patients and 1 for the full health state "11111" corresponding to 30.68% of the total patients. The utility index after treatment for the moderate health state "22222" was 0.524 corresponding to 0.88% of the total patients and 1 for the full health state "11111" corresponding to 80.24% of the total patients.

Evaluation of Health State (EQ-VAS)
Health was assessed using the EQ-VAS at two times: baseline VAS (first time was before treatment) and second VAS (after treatment). This assessment showed that, in general, the respondents tended towards a gain in quality of life after treatment. The baseline mean EQ-VAS was 73 ± 26 and after treatment the mean EQ-VAS was 87.46 ± 18.55.

Relationship Between HRQoL and Socio-Demographic Characteristics
Table 3 presents the association between HRQoL and socio-demographic characteristics before and after treatment based on univariate analyses. The baseline frequencies of the moderate to severe health state were significantly higher in older females (86.4%), females with a history of medical disease
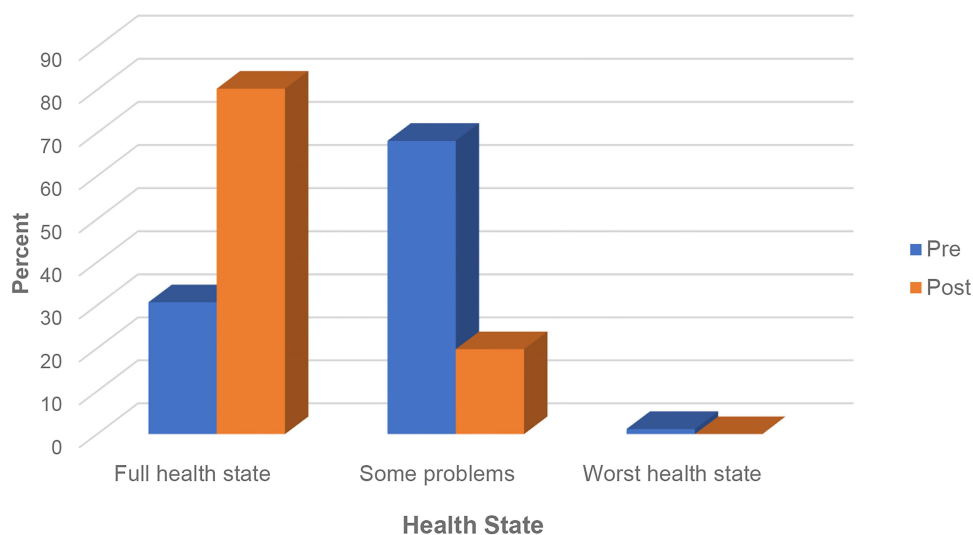

Figure 1 Health state pre- and post-treatment.

Table 2 Numbers and Proportions Reporting Levels Within EQ-5D Dimensions: Pre- and Post-Treatment

	Mobility		Self-Care		Unusual Activity		Pain/Discomfort		Anxiety/Depression	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Level I	246 (72.57)	336 (99.12)	320 (94.40)	336 (99.12)	251 (74.04)	316 (93.22)	129 (38.05)	294 (86.73)	205 (60.47)	286 (84.37)
Level II	85 (25.07)	3 (0.88)	14 (4.13)	3 (0.88)	66 (19.47)	23 (6.78)	152 (44.84)	45 (13.27)	113 (33.33)	53 (15.63)
Level III	8 (2.36)	0	5 (1.47)	0	22 (6.49)	0	58 (17.11)	0	21 (6.19)	0
Total	399 (100)	399 (100)	399 (100)	399 (100)	399 (100)	399 (100)	399 (100)	399 (100)	399 (100)	399 (100)
Reporting some problems	93 (27.43)	3 (0.88)	15 (4.42)	3 (0.88)	88 (25.96)	23 (6.78)	210 (61.95)	45 (13.27)	134 (39.52)	53 (15.63)
Change in numbers reporting problems	−90		−12		−65		−165		−81	
% Change reporting problems	96.8		80		73.9		78.6		60.5	

Notes: Level I, no problems; Level II, moderate problems; Level III, extreme problems; Total, Results are for those who responded to both the pre- and post-treatment questionnaire; Some problems = levels 2 and 3.

(85%), females who reported having a gynaecological disease (96.4%), and diabetic females (95.7%) (all P < 0.001). A significantly higher frequency was also reported among herbal supplement users compared to those who did not receive herbal supplements (87.5% vs 61.3%; P = 0.001). After treatment, the moderate to severe health state was significantly higher in females with a history of medical disease (28.4%), females who reported having a gynaecological disease (39.3%), diabetes mellitus (34.8%), or older females (31.8%) (all P <0.001).

Discussion

This was the first study to measure HRQoL among Saudi females in the kingdom of Saudi Arabia with CA-UTI utilizing the EuroQol instrument (EQ-5D-3L). In the present study, the implementation of the EQ-5D was straightforward, and the response rate over the three-month interval was 64.7%. The results of the questionnaire provide a descriptive view of the patients' HRQoL and allow for a direct calculation of Health Utility Values (HUVs). HUVs are key variables in economic decision models and are used in cost–utility analyses for the direct calculation of quality-adjusted life years (QALYs) and the costs associated with medical treatment of CA-UTI.[15,18]

The values of health states differ from equivalent values depending on the measure and method of valuation.[19] Quality of life is a broad concept that is affected by multiple parameters other than the patient's health status. These parameters include the level of independence, social setting, psychological state, and medical
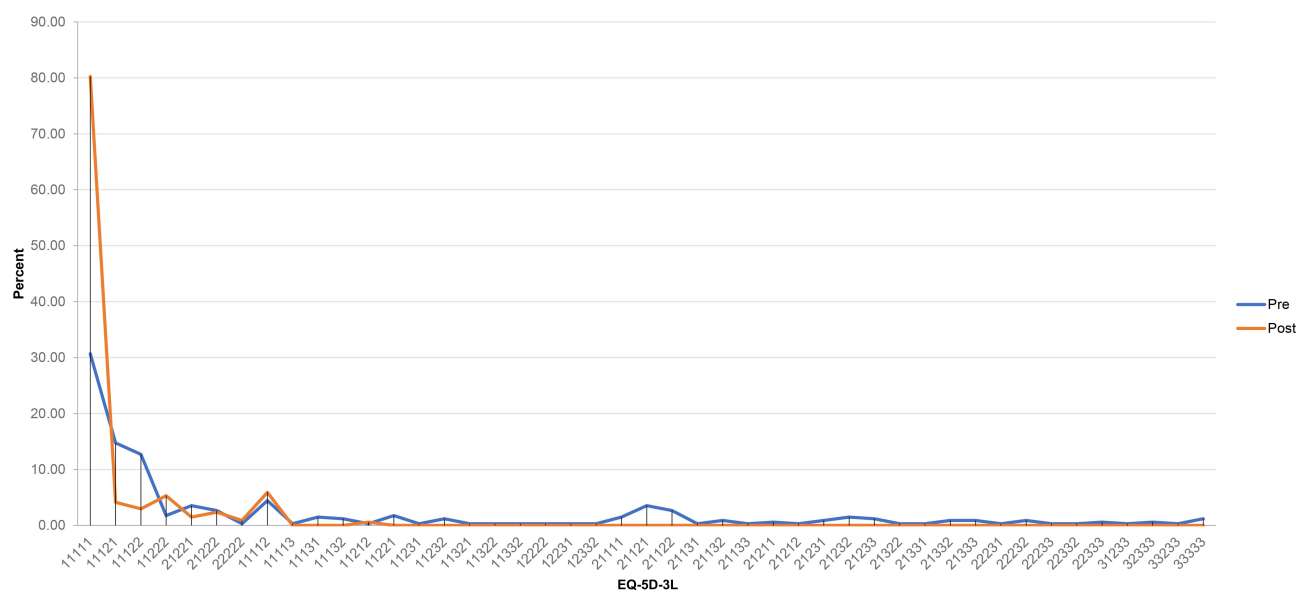

Figure 2 Health-related quality of life measured using the EQ-5D-3L scale.

Table 3 Association Between Overall Health-Related Quality of Life Pre- and Post-Treatment and Other Sample Characteristics

Characteristics	Pre-Treatment			Post -Treatment		
	Perfect Health n,%	Moderate n,%	P- value	Perfect Health n,%	Moderate n,%	P- value
Age Category			0.0001*			0.0001*
19–29	45 (54.9)	37 (45.1)		74 (90.2)	8 (9.8)	
30–39	33 (28.9)	81 (71.1)		100 (87.7)	14 (12.3)	
40–49	23 (19)	98 (81)		83 (68.6)	38 (31.4)	
50–59	3 (13.6)	19 (86.4)		15 (68.2)	7 (31.8)	
Is Medical history			0.0001*			0.0001*
No	80 (45.2)	97 (54.8)		158 (88.1)	21 (11.9)	
Yes	24 (14.8)	138 (85.2)		116 (71.6)	46 (28.4)	
Medical history			0.0001*			0.0001*
Diabetic mellitus	1 (4.3)	22 (95.7)		15 (65.2)	8 (34.8)	
Gynaecology (fibroid/ovary cysts)	1 (3.6)	27 (96.4)		17 (60.7)	11 (39.3)	
Irritable bowel syndrome	8 (21.6)	29 (78.4)		32 (86.5)	5 (13.5)	
Hypothyroidism	6 (19.4)	25 (80.6)		23 (74.2)	8 (25.8)	
Hypertension	1 (5.3)	18 (94.7)		13 (68.4)	6 (31.6)	
Other	7 (26.9)	19 (73.1)				
Use of herbal supplements			0.0001*			0.057
No	91 (38.7)	144 (61.3)		195 (83)	40 (17)	
Yes	13 (12.5)	91 (87.5)		77 (74)	27 (26)	
Herbal name			0.0001*			0.114
Parsley	10 (13.3)	65 (86.7)		54 (72)	21 (28)	
Other	3 (10.3)	26 (89.7)				
Employment status			0.001*			0.079
Student	24 (54.5)	20 (45.5)		39 (88.6)	5 (11.4)	
Employed	42 (25)	126 (75)		127 (75.6)	41 (24.4)	
Unemployed	38 (29.9)	89 (70.1)		106 (83.5)	21 (16.5)	
Marital status			0.026*			0.857
Single	32 (43.8)	41 (56.2)		59 (80.8)	14 (19.2)	
Married	65 (27)	176 (73)		194 (80.5)	47 (19.5)	
Other	7 (28)	18 (72)		19 (76)	6 (24)	

Note: *Pearson Chi-squared test significant at α = 0.05.

history.[19,20] In the current study, the baseline health status of females with CA-UTI ranged from "33333" to "11111" for values −0.495 to 1 and ranged from "22222" to "11111" for values 0.524 to 1 after treatment. The mean EQ-VAS was 73 ± 26 at baseline and 87.46 ± 18.55 after treatment.

There is no direct comparison between the current study and previous studies due to the differences in the methodology and instrument. There were several studies that estimated utilities of CA-UTI among females using different instruments to measure HRQoL and in the previous studies the baseline utilities were significantly low with scores ranging from 0.3 to 0.65 with improvements after treatment ranging from 0.8 to 0.99.[19,21,22] The overall

improvement of QoL ranged from 78% to 95%, which was similar to the current study.[19,23–25]

In the current study, the overall general health status of the majority of females showed clinically significant improvements in HRQoL, as measured by the EQ-5D-3L instrument, may be due to the fact that most of the CA-UTIs were mild and easily resolved with appropriate antibiotic treatment. The current study indicates that UTIs severely affect HRQoL and contributes to depression, decreased mobility activity, report pain, restriction of work and school, and bed rest, which affects quality of life and has economic impacts.

Pain/discomfort was the most frequently reported complaint followed by anxiety/depression, whereas self-care

problems were the least frequently reported, which is similar to other studies.[7,19] In the current study, the quality of life was affected by socio-demographic characteristics such as older age, employment status, and marital status. These findings were consistent with previous studies.[26] Older age was associated with poor HRQoL, similar to previous studies in other countries.[19,26] However, some studies have reported that most diseases have an equally strong impact on HRQoL and all age groups suffer from some chronic conditions having the same impact on QoL.[27] Employed females had significantly higher health state than unemployed females, which may be due to the work environment. Some studies reported that employment impacts patients' HRQoL.[26,27] The association between HRQoL and chronic diseases has been confirmed by many previous studies measured by different instruments and consistent with a QoL study of diabetic patients conducted in Saudi Arabia.[7,26,27]

Gynaecology diseases had a high impact on the health state probably due to anatomical and functional characteristics of females resulting in female patients having a relatively high percentage of UTIs compared to male patients.[1]

In the current study, approximately 30.68% of the females used herbal supplements to treat UTIs during the study. Several strategies have used different prophylactic or treatment strategies for the treatment of UTI, such as altered diets, increased water intake, in taurine acidification using ascorbic acid, and dietary or supplemental cranberry; however, the evidence base for the efficacy of many of these strategies is weak or entirely lacking.[28,29] The European Association of Urology recommends OM-89 as a prophylactic strategy in urology infections with the highest evidence level and recommendation grade.[28]

This study indicates that in this female patient population, QoL is mainly influenced by CA-UTI with QoL showing a decrease in the results analysis of EQ-5D and EQ-VAS with age, employment, chronic disease, and marriage. The EQ-5D instrument is a tool used to measure general health status and is a sensitive and valid approach for monitoring changes in QoL and patient outcomes in Saudi females with CA-UTI.

Limitations
The current study has some limitations. First, it was conducted in only the ED setting of KAMC, which does not represent all hospital settings; thus, the findings cannot be generalized. Second, only females between the ages of 18 to 59 years were investigated in the study, which might produce some

bias, especially when participants over 50 years of age had a lower response than the other age groups. Third, this was a short cross-sectional study over a three-month period with a response rate of 64.7% that did not represent all of the population. Finally, the measurement of health status using the EQ-5D instrument may have resulted in over- or under-estimation of QoL of females with UTIs because the patients self-assessed their quality of health and may have selected a high level. Multicentre prospective studies are recommended for the accurate measurement of HRQoL of CA-UTIs among the Saudi population.

Conclusion
CA-UTIs have a significant negative impact on females' HRQoL with a varying effect based on socio-demographic characteristics and chronic diseases. Identifying the health status of Saudi females with CA-UTIs and recognizing the factors that are significantly associated with HRQoL could support and help clinicians and health policymakers make effective and efficient strategies for the improvement and monitoring of patient outcomes in the future.

Acknowledgments

Disclosure
The author reports no conflicts of interest in this work.

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