

## Lower Urinary Tract Symptoms and Quality of Life Among Female Hemodialysis Patients in Palestine: Prevalence and Risk Factors

Faris Abushamma<sup>1,2</sup>, Amir Aghbar<sup>1,2\*</sup>, Zainab E. Douglass<sup>1</sup>, Anas Jaber<sup>1</sup>, Enas Zidan<sup>1</sup>, Zaher Nazzal<sup>1</sup>, Zakaria I. Hamdan<sup>1,3</sup>, Mahfouz Ktaifan<sup>1</sup>, Rola Abu Alwafa<sup>1</sup> & Hashim Hashim<sup>4</sup>

Received: 20<sup>th</sup> Apr. 2024, Accepted: 17<sup>th</sup> June, 2024, Published: ××××, DOI: <https://doi.org/××.××××>

Accepted Manuscript, In press

**ABSTRACT:** **Introduction:** Lower urinary tract symptoms (LUTS) are prevalent globally. Limited research has explored LUTS in hemodialysis (HD) patients, who often experience diminished quality of life (QoL). This study aims to evaluate LUTS among female HD patients, assessing the symptoms, risk factors, and impact on QoL. **Methods:** A prospective, cross-sectional study was conducted among 94 female HD patients, assessing demographics, clinical data, and LUTS using the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire. Statistical analysis examined correlations between BFLUTS, demographics, and QoL. **Results:** Among the study population, 91.5% of female HD patients experienced at least one filling symptom, the most common being nocturia (65%, n = 61). Voiding symptoms were observed in 63% of participants, with hesitancy (49%, n = 46), straining (33%, n = 31), and intermittency (45%, n = 42) being notable. Incontinence symptoms were prevalent, with urgency incontinence reported by 23% of participants (n = 22). Statistically significant correlations were found between the duration of dialysis and voiding symptoms ( $r = 0.240$ ,  $p = 0.021$ ), as well as between poor QoL and storage symptoms ( $r = 0.212$ ,  $p = 0.040$ ) and incontinence symptoms ( $r = 0.439$ ,  $p < 0.001$ ). Additionally, significant associations were found between the presence of incontinence symptoms and diabetes mellitus ( $p = 0.002$ ) and smoking ( $p = 0.042$ ). **Conclusion:** The impact of LUTS on females undergoing HD is prevalent and should be considered as a disabling syndrome. The QoL in such a cohort of patients is also affected. Thus, screening protocols should be put in place to address such problems.

**Keywords:** Lower Urinary Tract Symptoms (LUT), Hemodialysis, Quality of Life, Risk Factors, Female Patients.

### INTRODUCTION

Lower urinary tract symptoms (LUTS) are a broad category of symptoms that include storage, voiding, and incontinence symptoms [1]. LUTS is prevalent in our community, and several articles have been published to characterize this clinical syndrome [2-8]. In addition to having a major negative impact on quality of life, it also poses a substantial social and financial burden [1-3]. The management of LUTS is based on etiology and symptomatology [9]. Lifestyle changes, medication, and surgical intervention are all options available to treat LUTS and its underlying cause [1, 2, 10, 11]. A comprehensive understanding of the intricate etiology of LUTS is required for the most effective clinical evaluation and treatment strategy.

In the same field, only a few studies have shown that the predisposition to LUTS in hemodialysis (HD) patients is significant, with about one-fourth of dialysis patients suffering from various grades of LUTS, and this predisposition is independent of the modality of dialysis [12, 13]. On the other hand, LUTS has been regularly associated with a decrease in QoL in dialysis patients, related to the documented impact on the quality of sleep because of the presence of various storage symptoms [12, 14, 15]. Bladder dysfunction, commonly associated with most dialysis patients, is linked with

hypersensitivity, poor compliance, and detrusor sphincter dyssynergia [16]. This paves the way for a proposal that urodynamic assessment should be indicated before transplantation in a patient presenting with LUTS [16]. In addition, several risk factors raise the pathogenesis of LUTS, including aging, obesity, smoking, and diabetes mellitus (DM). This further complicates the diagnosis and management of LUTS in such patients with multiple comorbidities [2, 3, 9, 10].

The main objective of this study is to provide a comprehensive assessment of LUTS among female HD patients. This includes an analysis of the symptoms, types, and severity of LUTS, as well as the impact on QoL. Furthermore, this study seeks to identify and evaluate possible risk factors associated with LUTS in this group of patients. By focusing on female HD patients, this research aims to fill the existing knowledge gap and provide valuable insights for the diagnosis and management of LUTS in this specific population.

### MATERIAL AND METHODS

#### Study design

A prospective, cross-sectional study investigated LUTS and its impact on the QoL among HD female patients.

1 Department of Medicine, College of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine.

2 Department of Urology, An-Najah National University Hospital, Nablus, Palestine.

\* Corresponding Author: [amir.aghbar@najah.edu](mailto:amir.aghbar@najah.edu)

3 Department of Nephrology, An-Najah National University Hospital, Nablus, Palestine.

4 Bristol Urological Institute, North Bristol NHS Trust, Bristol, United Kingdom.

## Study Setting

This study was conducted at three dialysis centers throughout the West Bank of Palestine, specifically in Nablus, Jenin, and Tulkarem. The data collection period was from October 2021 until January 2022.

## Study population and sampling

All female patients undergoing HD were asked to complete the questionnaire. Based on the expected population during the research period and a 50% response distribution, the required sample size was approximately 90, ensuring a 95% confidence level with a 5% margin of error.

## Inclusion and exclusion criteria

Inclusion criteria comprised female patients undergoing HD aged over 18 years with a minimum duration of dialysis exceeding 12 months. Exclusion criteria encompassed individuals with symptomatic urinary tract infection (UTI), pre-existing urinary tract abnormalities, and those presenting with zero urine output.

## Data collection

The first part of the questionnaire elicited information on patients' demographics and clinical data. This included age, body mass index (BMI), smoking, the presence of DM, and duration of dialysis in months, divided into <24 months and ≥24 months. The amount of urine was also measured. We categorized the patients into two age groups: <60 and ≥60.

In the second part, we used the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire, which is an instrument created by Jackson et al. in 1996 and used to assess a wide range of urinary symptoms [17, 18]. The Arabic version of the questionnaire was prepared and evaluated by a group of experts in urology and biostatisticians. The clarity of the questionnaire was pre-tested in a pilot study of 15 patients. This questionnaire was chosen because it is one of the most practical ways to assess the impact of LUTS on the QoL in female patients. The questions asked participants to rate how strongly they agreed with each statement using a score from "0" to "3" or "0" to "4". BFLUTS questionnaire assesses five domains as follows: filling domain (4 questions, score range 0–15), voiding

domain (3 questions, score range 0–12), incontinence domain (5 questions, score range 0–20), sexual function (2 questions, score range 0–6), and QoL (5 questions, score range 0–18). There are nineteen questions, with a total score ranging from 0 to 71. The higher the score, the more severe the symptoms. The primary outcome was LUTS and QoL. The questionnaire was interview-based, and researchers recorded participants' responses.

## Ethical considerations

Before commencing the study, ethical clearance was sought from An-Najah National University's Institutional Review Board (IRB) and NNUH to access the necessary data. The study adhered to the principles outlined in the Helsinki Declaration. The patients gave verbal informed consent. Participants were informed that their data would be encrypted and anonymized.

## Statistical Analysis

Statistical analysis was performed using the IBM Statistical Package for Social Sciences program (SPSS) (version 21). Categorical variables were expressed as absolute frequency (percentage), and continuous variables were described as medians and interquartile ranges. The data were normalized using the Kolmogorov test. A Pearson correlation analysis was conducted to measure the correlation between BFLUTS, demographics, and QoL. Mann-Whitney U-test test was used to evaluate the differences between continuous variables. P values < 0.05 were considered statistically significant.

## RESULTS

### Patients' Demographics and Clinical Characteristics

Of the study population, 94 HD patients completed and returned the questionnaire. Patients more than 60 years of age made up the highest proportion of participants (53%). Forty-two patients (45%) were classified as having an obesity range BMI. Fifty-one patients (54%) were on dialysis for over 24 months. Fifty-eight patients reported having type 2 diabetes (62%), and only 11 patients (12%) were smokers. The median amount of urine output was 120 ml (5-500). (Table 1) shows the demographic and clinical characteristics of the participants.

**Table (1):** Demographic and clinical characteristics of study participants (n=94).

Background and clinical characteristics	Frequency (%)	Median (Q1-Q3)
Age in years		
<60	44 (46.8%)	60 (18-83)
≥60	50 (53.2%)	
Body mass index		
Underweight (<18.5)	5 (5.3%)	28.667 (15.31-47.75)
Normal (18.5–24.9)	28 (30.4%)	
Overweight (25–29.9)	17 (18.5%)	
Obese (>30)	42 (44.7%)	
Duration of Dialysis in months		
<24	43(45.7%)	24 (0.5-144)
≥24	51(54.3%)	
Smoking		
Yes	11 (11.7%)	
No	83 (88.3%)	
Diabetes mellitus type 2		
Yes	58 (61.7%)	
No	36 (38.3%)	
Amount of urine in ml		120 (5-500)

**BFLUTS subdomains: Storage, Voiding, Incontinence, and QoL domains**

Tables 2,3,4, and 5 show the frequency of each symptom in the BFLUTS subdomain among female HD patients. Over half of surveyed HD patients reported having nocturia and urgency (n = 61; 65%, n=49; 52%, respectively). In addition, 31 (33%) patients mentioned experiencing bladder pain, and 27 (29%) mentioned frequency. Moreover, 91.5% of HD patients had at least one filling symptom. (Table 2).

The voiding symptoms were observed to be hesitancy (46%), straining (31%), and intermittency (42%). At least one voiding symptom was present in 63% of people with HD (Table 3).

In terms of incontinence, urgency incontinence affected 22 (23%), stress incontinence 38 (40%), overflow incontinence 4 (4%) and nocturnal enuresis 9 (10%). Incontinence symptoms had a median score of 3 [1-16]. (Table 4).

Regarding QoL, 26 (28%) of patients reported changing outer clothing during the day due to urinary symptoms, while 27 (29%) demonstrated an overall impact of urinary symptoms on their life quality. The median QoL score was 1.00 [0-15]. (Table 5)

**Table (2):** Frequency of filling symptoms among HD female patients (n=94).

Filling symptoms	Frequency (%)	Median (Q1-Q3)
Nocturia		
Yes	61 (64.9%)	
No	33 (35.1%)	
Urgency		
Yes	49 (52.1%)	
No	45 (47.9%)	
Bladder Pain		
Yes	31 (33.0%)	
No	63 (67.0%)	
Daytime frequency		
Yes	27 (28.7%)	
No	67 (71.3%)	
Filling symptoms score		3 (1-11)
At least one filling symptom	86 (91.5%)	

**Table (3):** Frequency of voiding symptoms among HD female patients (n=94).

Voiding symptoms	Frequency (%)	Median (Q1-Q3)
Hesitancy		
Yes	46 (48.9%)	
No	48 (51.1%)	
Straining		
Yes	31 (33.0%)	
No	63 (67.0%)	
Intermittency		
Yes	42 (44.7%)	
No	52 (55.3%)	
Voiding symptoms score		4 (1-12)
At least one voiding symptom	59 (62.8%)	

**Table (4):** Frequency of incontinence symptoms among HD female patients (n=94).

Incontinence symptoms	Frequency (%)	Median (Q1-Q3)
Urgency Incontinence		
Yes	22 (23.4%)	
No	72 (76.6%)	
Urine Leakage frequency		
Yes	23 (24.5%)	
No	71 (75.5%)	
Stress Incontinence		
Yes	38 (40.4%)	
No	56 (59.6%)	
Overflow Incontinence		
Yes	4 (4.3%)	
No	90 (95.7%)	
Nocturnal Enuresis		
Yes	9 (9.6%)	
No	85 (90.4%)	
Incontinence symptoms score		3 (1-16)
At least one incontinence symptom	46 (51.1%)	

**Table (5):** Quality of life among HD female patients (n=94).

Quality of life	Frequency (%)	Median (Q1-Q3)
Changing outer clothing during the day due to urine leakage		
Yes	26 (27.7%)	
No	68 (72.3%)	
Reducing the amount of drunken fluid to improve urinary symptoms		
Yes	14 (14.9%)	
No	80 (85.1%)	
Effect of urinary symptoms on daily performance		
Yes	19 (20.2%)	
No	75 (79.8%)	
Avoidance of places and situations where a toilet is not nearby		
Yes	24 (25.5%)	
No	70 (74.5%)	
Overall effect of urinary symptoms on life quality		
Yes	27 (28.7%)	
No	67 (71.3%)	
Quality of life score		1.00 (0-15)

**Correlation Between BFLUTS Subdomains and Patients' Demographics**

Duration of dialysis was positively and significantly correlated with voiding symptoms ( $r = 0.240, p = 0.021$ ). There was a positive and significant correlation between poor QoL and the presence of storage and incontinence symptoms ( $r = 0.212$ ;

$p = 0.040, r = 0.439; p < 0.001$ , respectively). Age and BMI did not correlate with any of the BFLUTS subdomains. Further analysis showed statistical significance between the presence of incontinence symptoms and DM type 2 or being a smoker ( $p$ -value = .002; 0.042, respectively). The results of the correlational analysis are shown in (Tables 6 and 7).

**Table (6):** Correlations Between BFLUTS, Demographics, and QoL.

		BFLUTS-FS (Storage)	BFLUTS-VS (Voiding)	BFLUTS-IS (Incontinence)
Age	Pearson Correlation	-0.072	0.010	0.050
	p-value	0.490	0.925	0.630
BMI	Pearson Correlation	-0.099	0.030	-0.017
	p-value	0.346	0.780	0.869
Duration of dialysis	Pearson Correlation	-0.097	0.240	-0.181
	p-value	0.356	0.021	0.082
BFLUTS-QoL	Pearson Correlation	0.212	0.026	0.439
	p-value	0.040	0.807	<0.001

The bold values indicate p-value < 0.05  
Abbreviations: FS, Filling symptoms; VS, Voiding symptoms; IS, Incontinence symptoms; QoL, Quality of life.

**Table (7):** Correlations Between BFLUTS and Demographics.

	BFLUTS-FS (Storage) Median (Q1-Q3)	BFLUTS-VS (Voiding) Median (Q1-Q3)	BFLUTS-IS (Incontinence) Median (Q1-Q3)
Smoking			
Yes	2 (1-3)	3 (0-4)	0 (0-0)
No	3 (1-5)	2 (0-5)	1 (0-3)
p-value a	0.336	0.904	0.042
Marital status			
Married	3 (2-4.75)	2.5 (0-4)	0 (0-3)
Single b	3 (1-5.25)	2 (0-6.25)	1 (0-3.25)
p-value a	0.906	0.809	0.735
Diabetes mellitus type 2			
Yes	3 (1.75-5)	3 (0-5)	2 (0-4)
No	3 (1-4)	1 (0-4.75)	0 (0-1.75)
p-value a	0.364	0.689	0.002

The bold values indicate p-value < 0.05  
a Statistical significance values calculated using Mann-Whitney U-test.  
b Single include widowed, divorced and unmarried patients.

**DISCUSSION**

Storage symptoms were notably prevalent among female HD patients in our study, with 91.5% of the cohort experiencing at least one filling symptom, with the most common symptom being nocturia (65%). According to earlier research, nocturia is common in people with chronic kidney disease (CKD), and the severity of the condition worsens as it advances in stage [19]. Beyond merely creating discomfort, its effects might adversely

affect sleep patterns and quality of life, exacerbating the difficult circumstances this susceptible patient group faces [20-22]. Notably, anxiety and depression are common in people with HD, and they have been linked to nocturia [22-24]. In addition, persons with reduced renal function frequently experience nocturnal polyuria, a disorder characterized by increased urine production at night [25, 26]. It's important to distinguish between nocturia and nocturnal polyuria since they have distinct pathophysiological mechanisms and treatment modalities [27].

At least one voiding symptom was reported by 63% of our cohort. This percentage is significantly lower than in males having HD because males typically present with additional risk factors for bladder outlet obstruction, which exacerbates voiding symptoms [28]. Patients on regular HD frequently experience bladder dysfunction [16], which is why some experts advise urodynamics and voiding cystography for eligible patients before renal transplantation [29, 30]. This could be useful in identifying frequent problems that people with HD have, such as poor bladder compliance, underactive bladder, and increased voiding pressure [29, 31]. Additionally, it has been suggested that uroflowmetry is a useful tool for evaluating patients who have voiding symptoms [32].

Over 50% of adult females experience urinary incontinence at some point in their lives [8, 33]. Moreover, research indicates that persons with CKD frequently experience urgency incontinence [34]. In our study, urgency incontinence was identified in 23% of study participants. There are several risk factors associated with the high frequency of urinary incontinence in females, including medication use, childbearing, chronic medical disorders, hormonal fluctuations, and other pelvic conditions [35]. This has an additional detrimental effect on QoL by posing financial, psychological, and physical challenges [33].

The current study highlights the negative effects of LUTS on quality of life by demonstrating its frequency among female patients undergoing HD. There is a noticeable relationship between this effect and diabetes mellitus, incontinence, smoking behaviors, and the duration of dialysis. Previous studies have already demonstrated that patients with HD frequently have lower quality of life, sleep difficulties, a higher incidence of depression, and a high frequency of frailty among these patient groups [24, 36, 37]. The development of LUTS intensifies these difficulties and jeopardizes the quality of life of those suffering from HD even more.

### Strengths and Limitations

The study's strengths lie in its prospective design, using a validated questionnaire, and inclusion of various demographic and clinical variables. Furthermore, including multiple dialysis centers across the West Bank enhances the study's generalizability, while its focus on female HD patients fills a notable gap in the literature. Furthermore, the statistical analysis conducted to explore correlations between LUTS, demographic factors, and QoL strengthens the validity of the findings. However, limitations such as the cross-sectional design limit the ability to establish a causality relationship and potential bias from self-reported data. The small sample size and the absence of a control group are additional limitations. Other confounding variables not addressed in this study could influence study results.

### CONCLUSION

This study highlights the significant prevalence of LUTS among female HD patients and their detrimental impact on QoL. The correlation between LUTS, duration of dialysis, comorbidities like DM, and lifestyle factors highlights the multifactorial nature of LUTS in this population. Addressing LUTS in female HD patients through tailored interventions, including targeted medical management and lifestyle modifications, is essential for improving their QoL and overall health outcomes. Future research is needed for further assessment of LUTS in HD patients and assess interventional strategies which would help QoL.

## RECOMMENDATIONS

Future research should focus on longitudinal studies to understand LUTS's long-term impact on female HD patients' quality of life. Comparative studies evaluating different management approaches are also needed to optimize care delivery. Collaborative efforts between researchers and healthcare providers are essential for developing evidence-based strategies to improve female HD patients with LUTS quality of life and overall health outcomes.

### Availability of data and materials

The data and materials used in this research are available upon request from the corresponding author. Detailed methodologies and supplementary materials can also be provided as needed.

### Author contributions

All authors made significant contributions to the study's conception and design. They have approved the final version for publication, agreed to submit it to this journal, and accepted responsibility for all aspects of the work.

### Conflict of interest

There is no conflict of interest to declare.

### Funding

This research did not receive any kind of funds.

### Acknowledgments

I would like to express my gratitude to Dr. Sa'ed Zyoud, Clinical Research Center of An-Najah National University Hospital, for his continuous help and support.

## REFERENCES

- 1) Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, Van Kerrebroeck P, Victor A, Wein A. The standardisation of terminology in lower urinary tract function: report from the standardisation subcommittee of the International Continence Society. *Urology*. 2003;61(1):37-49.
- 2) Xu Z, Elrashidy RA, Li B, Liu G. Oxidative Stress: A Putative Link Between Lower Urinary Tract Symptoms and Aging and Major Chronic Diseases. *Front Med (Lausanne)*. 2022;9:812967.
- 3) Qasrawi H, Tabouni M, Almansour SW, Ghannam M, Abdalhaq A, Abushamma F, Koni AA, Zyoud SH. An evaluation of lower urinary tract symptoms in diabetic patients: a cross-sectional study. *BMC Urol*. 2022;22(1):178.
- 4) Abushamma F, Nassar N, Najjar SO, Hijaze SM, Koni A, Zyoud SH, Aghbar A, Hanbali R, Hashim H. Lower Urinary Tract Symptoms Among Females with Rheumatoid Arthritis: A Prospective Cross-Sectional Study. *Int J Gen Med*. 2021;14:8427-35.
- 5) Saffarini JH, Ahmad QT, Samara AM, Jabri DS, Saffarini ZH, Banijaber YM, Jaradat A, Abushamma F, Zyoud SeH. Assessment of lower urinary tract symptoms during pregnancy: an observational cross-sectional study from Palestine. *BMC Pregnancy and Childbirth*. 2021;21(1):84.
- 6) Ahmad QT, Saffarini JH, Samara AM, Jabri DS, Saffarini ZH, Banijaber YM, Jaradat A, Abushamma F, Zyoud SeH. The impact of lower urinary tract symptoms on the quality of life during pregnancy: a cross-sectional study from Palestine. *BMC Urology*. 2020;20(1):191.
- 7) Abushamma F, Abu Alwafa R, Shbaita S, Aghbar A, Zyoud SH, Hashim H. The correlation between academic stress, overactive bladder syndrome (OAB) and quality of life among healthy university students: A cross-sectional study. *Urologia*. 2024;3915603231225632.
- 8) Abushamma F, Mansour A, Nassar R, Badran H, Alwafa RA, Ktaifan M, Sa'ed HZ, Sa'ed HZ. Prevalence, Risk Factors, and Impact on Quality of Life Due to Urinary Incontinence Among Palestinian Women: A Cross-Sectional Study. *Cureus*. 2024;16(4).
- 9) Harlow BL, Bavendam TG, Palmer MH, Brubaker L, Burgio KL, Lukacz ES, Miller JM, Mueller ER, Newman DK, Rickey LM, Sutcliffe S, Simons-Morton D. The Prevention of Lower Urinary Tract Symptoms (PLUS) Research Consortium: A Transdisciplinary

- Approach Toward Promoting Bladder Health and Preventing Lower Urinary Tract Symptoms in Women Across the Life Course. *J Womens Health (Larchmt)*. 2018;27(3):283-9.
- 10] Plata M, Bravo-Balado A, Robledo D, Trujillo CG, Caicedo JI, Cataño JG, Arenas J, Rondón M, Londoño D. Prevalence of lower urinary tract symptoms and overactive bladder in men and women over 18 years old: The Colombian overactive bladder and lower urinary tract symptoms (COBaLT) study. *Neurourol Urodyn*. 2019;38(1):200-7.
  - 11] Kupelian V, Rosen RC, Link CL, McVary KT, Aiyer LP, Mollon P, Kaplan SA, McKinlay JB. Association of urological symptoms and chronic illness in men and women: contributions of symptom severity and duration--results from the BACH Survey. *J Urol*. 2009;181(2):694-700.
  - 12] Ando T, Kamegawa T, Shin T, Mimata H. Lower urinary tract symptoms impair the quality of life in maintenance hemodialysis patients. *Renal Replacement Therapy*. 2019;5(1):35.
  - 13] Wu MY, Chang SJ, Hung SC, Chiang IN. Lower urinary tract symptoms are frequent in dialysis patients. *Perit Dial Int*. 2011;31(1):99-102.
  - 14] Pawar YS, Gattani VS, Chaudhari KS, Chheda B, Vankudre AJ. Impact of Hemodialysis on Sleep Disorders in Patients With End-Stage Renal Disease in a Tertiary Care Academic Hospital. *Cureus*. 2023;15(8):e44416.
  - 15] Perl J, Unruh ML, Chan CT. Sleep disorders in end-stage renal disease: 'Markers of inadequate dialysis'? *Kidney Int*. 2006;70(10):1687-93.
  - 16] Zermann DH, Löffler U, Reichelt O, Wunderlich H, Wilhelm S, Schubert J. Bladder dysfunction and end stage renal disease. *Int Urol Nephrol*. 2003;35(1):93-7.
  - 17] Jackson S, Donovan J, Brookes S, Eckford S, Swithinbank L, Abrams P. The Bristol Female Lower Urinary Tract Symptoms questionnaire: development and psychometric testing. *Br J Urol*. 1996;77(6):805-12.
  - 18] . El Atrash G, Ali MH, Abdelwahab HA, Abdelreheem LA, Shamaa M. The assessment of sexual dysfunction in Egyptian women with lower urinary tract symptoms. *Arab J Urol*. 2014;12(3):234-8.
  - 19] Wu MY, Wu YL, Hsu YH, Lin YF, Fan YC, Lin YC, Chang SJ. Risks of nocturia in patients with chronic kidney disease--do the metabolic syndrome and its components matter? *J Urol*. 2012;188(6):2269-73.
  - 20] Ancoli-Israel S, Bliwise DL, Nørgaard JP. The effect of nocturia on sleep. *Sleep Med Rev*. 2011;15(2):91-7.
  - 21] Hafner M, Andersson FL, Burtea T, van Stolk C, Whitmore M, Yerushalmi E, Troxel WM. Assessing the burden of nocturia in the workplace: the associations between nocturnal voiding, subjective well-being, work engagement and productivity. *J Med Econ*. 2020;23(9):994-1003.
  - 22] Breyer BN, Shindel AW, Erickson BA, Blaschko SD, Steers WD, Rosen RC. The association of depression, anxiety and nocturia: a systematic review. *J Urol*. 2013;190(3):953-7.
  - 23] King-Wing Ma T, Kam-Tao Li P. Depression in dialysis patients. *Nephrology (Carlton)*. 2016;21(8):639-46.
  - 24] Alencar SBV, de Lima FM, Dias LDA, Dias VDA, Lessa AC, Bezerra JM, Apolinário JF, de Petribu KC. Depression and quality of life in older adults on hemodialysis. *Braz J Psychiatry*. 2020;42(2):195-200.
  - 25] Fukuda M, Motokawa M, Miyagi S, Sengo K, Muramatsu W, Kato N, Usami T, Yoshida A, Kimura G. Polynocturia in chronic kidney disease is related to natriuresis rather than to water diuresis. *Nephrol Dial Transplant*. 2006;21(8):2172-7.
  - 26] Takezawa K, Kuribayashi S, Okada K, Sekii Y, Inagaki Y, Fukuhara S, Kiuchi H, Abe T, Fujita K, Uemura M, Imamura R, Nonomura N. Decreased renal function increases the nighttime urine volume rate by carryover of salt excretion to the nighttime. *Sci Rep*. 2021;11(1):10587.
  - 27] Weiss JP, Everaert K. Management of Nocturia and Nocturnal Polyuria. *Urology*. 2019;133s:24-33.
  - 28] Rule AD, Jacobson DJ, Roberts RO, Girman CJ, McGree ME, Lieber MM, Jacobsen SJ. The association between benign prostatic hyperplasia and chronic kidney disease in community-dwelling men. *Kidney Int*. 2005;67(6):2376-82.
  - 29] Antoniewicz AA, Zapala Ł, Bogucki A, Matecki R. The standard of urological consultation of patients qualified for renal transplant - a review. *Cent European J Urol*. 2015;68(3):376-82.
  - 30] Chmura A, Borkowski A, Radziszewski P, Kwiatkowski A, Rowiński W. Significance of urodynamic assessment of lower urinary tract in dialysis patients before renal transplantation. *Transplant Proc*. 2007;39(9):2733-5.
  - 31] Lopez Pereira P, Jaureguizar E, Martinez Urrutia MJ, Meseguer C, Navarro M. Does treatment of bladder dysfunction prior to renal transplant improve outcome in patients with posterior urethral valves? *Pediatr Transplant*. 2000;4(2):118-22.
  - 32] Singla S, Garg R, Singla A, Sharma S, Singh J, Sethi P. Experience with uroflowmetry in evaluation of lower urinary tract symptoms in patients with benign prostatic hyperplasia. *J Clin Diagn Res*. 2014;8(4):Nc01-3.
  - 33] Sussman RD, Syan R, Brucker BM. Guideline of guidelines: urinary incontinence in women. *BJU Int*. 2020;125(5):638-55.
  - 34] Patel M, Vellanki K, Leehey DJ, Bansal VK, Brubaker L, Flanigan R, Koval J, Wadhwa A, Balasubramanian N, Sandhu J, Kramer H. Urinary incontinence and diuretic avoidance among adults with chronic kidney disease. *International Urology and Nephrology*. 2016;48(8):1321-6.
  - 35] Vaughan CP, Markland AD. Urinary Incontinence in Women. *Ann Intern Med*. 2020;172(3):Itc17-itc32.
  - 36] Wang R, Tang C, Chen X, Zhu C, Feng W, Li P, Lu C. Poor sleep and reduced quality of life were associated with symptom distress in patients receiving maintenance hemodialysis. *Health Qual Life Outcomes*. 2016;14(1):125.
  - 37] Garcia-Canton C, Rodenas A, Lopez-Aperador C, Rivero Y, Anton G, Monzon T, Diaz N, Vega N, Loro JF, Santana A, Esparza N. Frailty in hemodialysis and prediction of poor short-term outcome: mortality, hospitalization and visits to hospital emergency services. *Ren Fail*. 2019;41(1):567-75.

The Palestinian Medical and Pharmaceutical Journal (Pal. Med. Pharm. J.) © 2024 by An-Najah University, Nablus,

Palestine is licensed under CC BY-NC 4.0 