



ORIGINAL ARTICLE

Symptom burden in patients with chronic kidney disease not requiring renal replacement therapy

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Abstract

Background: Although evidence shows that patients with end stage renal disease (ESRD) experience a high symptom burden which impacts on quality of life (QoL), less is known about patients with earlier stages of chronic kidney disease (CKD). This study aimed to explore symptom burden and potential contributing factors in patients with CKD Stage 1-5 not requiring renal replacement therapy (RRT).

Methods: Patients with CKD Stage 1-5 and not on RRT were asked to report their symptoms using the Leicester Uraemic Symptom Score (LUSS), a questionnaire which assesses the frequency and intrusiveness of 11 symptoms commonly reported by kidney patients.

Results: Symptoms were assessed in 283 CKD Stage 1-5 patients: 54% male, mean age 60.5 standard error \pm 1.0, mean eGFR 38ml/min/1.73m². Some 96% (95% confidence interval 93.2–98.0) of participants reported experiencing at least one symptom, the median reported being six. Excessive tiredness (81%;76.0–85.6), sleep disturbance (70%;64.3–75.3) and pain in bones/joints (69%;63.4–74.6) were reported most commonly. Overall, few significant associations were found between biochemical markers of disease severity and symptom burden. Men tended to report fewer symptoms than women and South Asian patients often described experiencing symptoms with a greater severity. Older patients found musculoskeletal symptoms more intrusive whereas younger patients found reduced concentration more intrusive.

Conclusions: Our findings suggest that patients with CKD stages 1–5 experience a multitude of symptoms that could potentially impact QoL. Using multidimensional tools like the LUSS, more exploration and focus could provide a greater opportunity for patient focussed symptom control from the earliest stages of CKD.

Key words: age, chronic kidney disease, ethnicity, gender, pre-dialysis, quality of life, symptom

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Introduction

Research into symptoms experienced by patients with chronic kidney disease (CKD) has tended to focus on those with end-stage renal disease on dialysis, but evidence suggests that patients with advanced CKD (Stages 4–5) who are not requiring renal replacement therapy (RRT) report similar numbers of symptoms of comparable severity [1–9]. Symptoms are often extremely debilitating and negatively impact quality of life (QoL) [10]. Reduced QoL has been shown even in early stages of CKD (i.e. Stages 1–3) [11], however little research has been carried out to assess symptom burden in patients with CKD Stages 1–5. A literature review by Almutary *et al.* in 2013 [1] included six studies that quantitatively assessed the symptoms of CKD Stage 5 patients (not on RRT), of which two were palliative care studies [5, 6, 8, 9, 12, 13]. Only two of the studies included CKD Stage 4 patients for comparison with CKD Stage 5 and similar symptom profiles were observed between the two patient groups in both studies [8, 9].

Symptom burden and QoL of dialysis patients is associated with worsened hospitalization and mortality rates [14]. In patients not on RRT, symptom and QoL assessments can be useful markers of clinical condition and disease progression [15]. Therefore, their use is recommended to aid clinical decision-making such as timing of starting dialysis [16]. Considering that the rising prevalence of CKD Stages 3–5 is currently estimated at 8.5% of the UK population, prevention strategies, informed decision-making and effective disease and symptom management are vital to maximize patient QoL and appropriately utilize finite resources in a growing CKD population [17]. Furthermore, health-care professionals often underestimate the symptom burden of their patients [18]. One potential reason for this may be the lack of association between declining renal function and patient-reported symptoms as described in the current literature [9, 19, 20]. However, this highlights the limitations of using laboratory results alone in patient assessment, and the importance of understanding and assessing symptomatology. The lack of routine and systematic symptom assessment has been formally recognized as a problem and described to the UK parliament as part of the Kidney Alliance: Delivering Excellence report in late 2013 [21]

‘Despite their importance, data on health-related QoL or symptom burden scores are not yet systematically collected or measured in UK renal centres, and this should be a focus of future activity for the UK Renal Registry. Patients with poor QoL and symptom scores must be recognised as being likely to have worse outcomes and managed appropriately.’ [21].

Therefore, more research is required into the symptoms of CKD (throughout all stages) to appreciate the patterns and associations and to inform effective assessment, management and treatment of patients.

Furthermore, few studies have assessed symptom burden using a multidimensional tool to measure the prevalence, frequency and severity of symptoms reported by CKD patients [1]. Only one previous study included patients not on RRT with CKD Stages 4–5 and assessed symptom burden using a multidimensional tool [2]. The Leicester Uraemic Symptom Score (LUSS) is a symptom assessment tool that was originally designed by a renal clinician using observations of common symptoms reported by patients to use informally with dialysis patients. The LUSS has proved useful and sensitive to change in CKD patients not on RRT as an outcome measure to assess symptoms in exercise intervention studies [22]. The LUSS assesses symptom burden by asking patients to rate the frequency and intrusiveness of 11 symptoms (Table 1).

Table 1. Symptoms assessed as part of the LUSS

LUSS symptoms
Itching
Sleep disturbance
Loss of appetite
Excessive tiredness
Pain in bones/joints
Poor concentration/mental alertness
Impotence/lack of sex drive
Loss of muscle strength/power
Shortness of breath
Muscle spasm/stiffness
Restless legs

This study aimed to explore symptom burden and potential contributing factors in patients with CKD Stages 1–5 not requiring RRT using the LUSS.

Materials and methods

Study design

This cross-sectional study explored patient symptom burden using a self-completed questionnaire assessment.

Setting and participants

Between July 2013 and August 2014, a convenience sample of adult patients attending outpatient clinics at the Leicester General Hospital were enrolled by researchers while waiting for appointments. All patients aged 18 years or over who were not currently requiring RRT and were able to communicate with the researchers (or with an interpreter) were eligible for inclusion. Patients willing to take part in the study were given the option to complete the symptom questionnaire and demographics questions anonymously, or to supplement this with consent to access of their relevant computerized medical records. This study was sponsored by the University Hospitals of Leicester NHS Trust (UHL) and approved by the East Midlands Research Ethics Committee – Derby (Ref 13/EM/0155) and UHL Research and Development (Ref 11247).

Information from medical records

For those who consented to their medical records being accessed, the most recently recorded blood test results were obtained from the electronic renal patient record. This included creatinine, bicarbonate, urea, albumin and calculated estimated glomerular filtration rate levels. All information was coded, anonymized and entered into the study database.

Symptom assessment

The LUSS was used for symptom assessment. The LUSS assesses the frequency (how often a patient experienced a symptom) and intrusiveness (how much a symptom affects a patient's life) of 11 symptoms, which are shown in Table 1. Frequency was assessed using the following response options: ‘Never’, ‘Less than once a week’, ‘1–2 times a week’, ‘Several times a week’ and ‘Every day’, scored from 0 to 4. Intrusiveness was assessed with options of: ‘Not applicable’, ‘Not at all intrusive’, ‘Slightly intrusive’, ‘Quite intrusive’, ‘Very intrusive’ and ‘Extremely intrusive’, scored from

Table 2. Demographic characteristics and comorbid health conditions of participants by symptom reporting

Characteristic	All patients (N = 283) (%)	<6 symptoms (N = 155) (%)	≥6 symptoms (N = 128) (%)	P-value ^a
Gender				
Male	54.0	62.5	47.1	0.01
Female	46.0	37.5	52.9	
Age ± standard error, years	60.5 ± 1.0	59.8 ± 1.5	61.1 ± 1.4	0.53
Ethnicity				
White	71.0	72.0	70.3	0.77
South Asian	21.2	19.5	22.6	
Other	7.8	8.6	7.1	
CKD stage ^b				
Stage 1	10.7	13.8	8.3	0.52
Stage 2	11.5	12.8	10.4	
Stage 3	27.8	28.4	27.2	
Stage 4	37.2	33.9	40.0	
Stage 5	12.8	11.0	14.4	
Time attending clinic ^b				
<1 year	27.3	32.3	23.2	0.06
1–2 years	18.8	18.1	19.4	
3–5 years	19.5	22.8	16.8	
5+ years	34.4	26.8	40.7	
Comorbid health conditions				
Diabetes: Type 1	2.6	2.7	2.5	0.65
Type 2	21.8	19.6	23.8	0.63
Other	0.4	0.9	0.0	0.05
Hypertension	68.5	67.0	69.9	0.82
Ischaemic heart disease	14.5	9.8	18.9	0.70
Stroke/TIA	3.9	3.6	4.1	0.51
Peripheral vascular disease	6.0	5.4	6.6	0.33
Asthma/COPD	10.3	11.6	9.0	0.36
Musculoskeletal disorders	15.8	13.4	18.0	0.83
Neurological disorder	1.7	0.89	2.46	
Mental ill-health	10.3	10.7	9.8	

^aChi-squared P-value for categorical variables; two-sample t-test for continuous variables.

^bPercentages exclude missing values for CKD stage (n = 49), time attending clinic (n = 1) and comorbid health conditions (n = 48 for hypertension; n = 49 for diabetes, ischaemic heart disease, peripheral vascular disease, asthma/COPD, musculoskeletal disorders, neurological disorders and mental ill-health; n = 50 for stroke/TIA).

TIA, transient ischaemic attack; COPD, chronic obstructive pulmonary disease.

0 to 5. Space was also given for patients to write and rate any additional symptoms. Demographic questions were added to the questionnaire and ascertained the gender, age, ethnicity, comorbidities and time attending the clinic.

Statistical methods

The demographic characteristics and comorbid health conditions were described and compared in patients reporting ≥6 and <6 symptoms, using the chi-squared test for categorical variables (gender, ethnicity, CKD stage and time attending clinic) and two-sample t-test for continuous variables (age). P-values in Table 2 refer to the comparison between patients <6 and those with ≥6 symptoms.

Symptoms were described and the total number of symptoms reported by CKD stage was plotted, with 95% confidence intervals.

Biochemical markers of disease severity were analysed in two ways: serum creatinine and blood urea nitrogen were treated as continuous variables, and serum bicarbonate and albumin categorized into normal and 'abnormal' levels (i.e. bicarbonate <21 mEq/L and albumin <40 g/L).

The relationship between intrusiveness of symptoms, creatinine and urea was studied using bivariate and multivariate ordered logistic regression models, adjusted for age, gender and/or ethnic

group where significantly associated with the outcome variable. Because ordinal logistic regression assumes proportional odds, this assumption was tested using a likelihood ratio test and Brant test. Where either of these tests was violated, generalized ordered logistic regression models for ordinal outcome variables were fitted using the 'gologit2' command in Stata [23]. Generalized ordered logistic regression takes account of ordering, but relaxes the proportional odds assumption in that larger values in the outcome variable are assumed to be 'higher', but the actual values are irrelevant [23]. Estimated coefficients were transformed into relative odds ratios for ease of interpretation.

The relationship between abnormal bicarbonate, abnormal albumin levels and intrusiveness of symptoms was investigated using logistic regression modelling, adjusting for age, gender and/or ethnic group where significantly associated with the outcome variable. Linearity of intrusiveness of symptoms was evaluated using the Box-Tidwell test [24].

Results

Participant characteristics

A total of 356 patients were approached in the clinic waiting room and the study was explained to them. Of these, 283

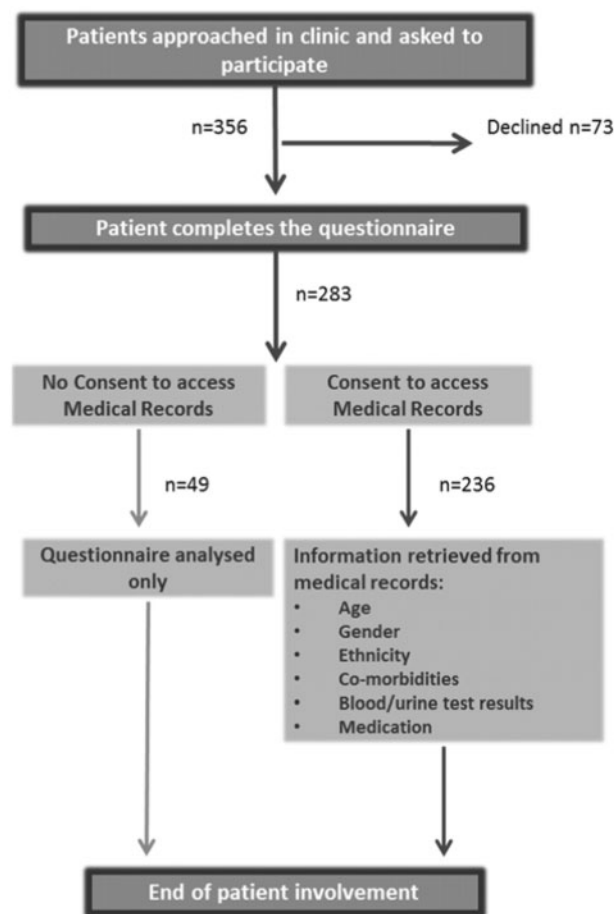


Fig. 1. Flow chart of patient recruitment and involvement.

patients agreed to complete the questionnaire and the majority (236) also gave consent for access to their medical records for further information. This included details about recorded comorbidities and prescribed medications, and the most recent results of commonly measured biochemical markers. The process is illustrated in Figure 1.

The participant demographics are presented in Table 2. Just over half of participants were men and the majority (71%) were white. The mean age was 61 years old. Comorbid health conditions were common in this population: over two-thirds (69%) had hypertension, 25% had diabetes (22% type 2), 16% had musculoskeletal problems and 16% had ischaemic heart disease.

We compared the patients in our study with 8414 nephrology patients seen in 2013 and found that participants in this study were generally younger (mean age average 61 vs 64 years old; t -test $P = 0.005$), and were more likely to be of South Asian or other ethnic origin (11% vs 21% South Asian; and 3% vs 8% Other; $\chi^2 P < 0.001$). The gender distribution of participants was relatively similar among participants and other general nephrology patients (51% vs 54% male; $\chi^2 P = 0.33$).

Symptoms reported

The vast majority of patients ($N = 272$; 96%) reported at least one symptom, with only 11 (4%) patients describing no symptoms at all. The median number of symptoms reported was 6 (interquartile range 3–8). Men ($P = 0.01$) were more likely to report fewer than six symptoms than women.

Table 3 shows the symptoms reported and their frequency/intrusiveness. Excessive tiredness was the symptom reported most often [$n = 224$; 81% (76.0–85.6)], on average (median) several times per week. This was followed by sleep disturbance [$n = 196$; 70% (64.3–75.3)], occurring on average (median) 1–2 times per week, and pain in the bones or joints [$n = 191$; 69% (63.4–74.6)], occurring on average less than once per week.

The median numbers of symptoms by CKD stage are shown in Figure 2. There was a moderate trend in the number of symptoms by CKD stage (non-parametric test for trend $P = 0.03$).

Relationship between reporting of symptoms, their intrusiveness and biochemical markers of disease severity

The relationships between reporting of symptoms, their intrusiveness and biomarkers of disease severity are shown in Table 4.

A total of 7 of the 11 symptoms were found to be associated with creatinine and/or urea levels. These symptoms were: itching (creatinine and urea); loss of appetite (creatinine and urea); excessive tiredness (creatinine only); pain in bones/joints (albumin only); poor concentration/mental alertness (urea only); impotence/lack of sex drive (urea only); and muscle spasms/stiffness (creatinine and urea).

Individuals with raised creatinine levels were more likely to report itching, loss of appetite, muscle spasms/stiffness and excessive tiredness. The first three of these symptoms were also reported to be more intrusive in this group but, conversely, excessive tiredness was reported to be less intrusive. Urea levels followed a similar pattern: people with raised urea levels were more likely to report itching, loss of appetite, muscle spasms/stiffness and impotence/lack of sex drive. The latter three symptoms were also reported to be more intrusive in this group. However, people with raised urea levels tended to find symptoms of concentration/mental alertness less intrusive than those with lower levels. Similarly, people with abnormal albumin levels tended to find their pain in bones/joints less intrusive than those with normal levels.

Relationship between reporting of symptoms, their intrusiveness and demographic characteristics

Compared with women, men were less likely to report nearly all of the symptoms and, if they did report symptoms, they were less likely to find them intrusive. Older individuals were more likely to report pain in the bones/joints and loss of muscle strength and to report that they were intrusive symptoms; conversely, younger individuals were more likely to report lack of concentration/mental alertness and to report that this symptom was intrusive.

Compared with white or 'other' ethnic groups, individuals of South Asian origin were more likely to report intrusive pain in the bones/joints, but were less likely to report any problems with impotence/lack of sex drive. Adults from 'other ethnic' groups, the majority of whom (77%) were of Black African or Black Caribbean origin, were less likely to report itching and sleep disturbance but, if they were present, were more likely to find them intrusive. They were also more likely to report that poor concentration/mental alertness was an intrusive symptom.

Table 3. Symptoms^a reported, their frequency and intrusiveness (N = 283)

Symptom	Frequency (%)	Intrusiveness (%)		
Itching	Never	51.6	N/A	47.7
	Less than once per week	17.0	Not at all	10.3
	1-2 times per week	7.8	Slightly	17.3
	Several times per week	7.4	Quite	7.8
	Every day	12.7	Very	4.2
	-		Extremely	4.6
	Missing data	3.5	Missing data	8.1
Sleep disturbance	Never	34.3	N/A	30.0
	Less than once per week	9.9	Not at all	9.5
	1-2 times per week	10.6	Slightly	21.2
	Several times per week	11.7	Quite	9.2
	Every day	31.5	Very	12.7
	-		Extremely	10.6
	Missing data	2.1	Missing data	6.7
Loss of appetite	Never	61.1	N/A	55.1
	Less than once per week	12.4	Not at all	10.3
	1-2 times per week	6.4	Slightly	12.7
	Several times per week	7.1	Quite	5.3
	Every day	8.8	Very	4.2
	-		Extremely	1.8
	Missing data	4.2	Missing data	10.6
Excessive tiredness	Never	21.9	N/A	19.1
	Less than once per week	9.9	Not at all	9.2
	1-2 times per week	16.6	Slightly	22.6
	Several times per week	17.3	Quite	18.0
	Every day	31.8	Very	13.4
	-		Extremely	8.8
	Missing data	2.5	Missing data	8.8
Pain in bones/joints	Never	34.6	N/A	31.1
	Less than once per week	14.8	Not at all	8.5
	1-2 times per week	7.4	Slightly	18.7
	Several times per week	10.6	Quite	10.6
	Every day	29.3	Very	14.8
	-		Extremely	7.4
	Missing data	3.2	Missing data	8.8
Poor concentration/mental alertness	Never	55.1	N/A	52.7
	Less than once per week	12.4	Not at all	6.7
	1-2 times per week	10.6	Slightly	15.6
	Several times per week	7.4	Quite	6.7
	Every day	9.2	Very	5.3
	-		Extremely	2.5
	Missing data	5.3	Missing data	10.6
Impotence/lack of sex drive	Never	44.5	N/A	58.0
	Less than once per week	6.4	Not at all	6.7
	1-2 times per week	3.9	Slightly	5.0
	Several times per week	3.9	Quite	5.3
	Every day	13.1	Very	4.2
	-		Extremely	4.6
	Missing data	28.3	Missing data	16.3
Loss of muscle strength/power	Never	41.0	N/A	36.4
	Less than once per week	10.3	Not at all	6.7
	1-2 times per week	9.5	Slightly	19.4
	Several times per week	9.2	Quite	9.5
	Every day	24.0	Very	11.7
	-		Extremely	7.1
	Missing data	6.0	Missing data	9.2
Shortness of breath	Never	39.6	N/A	34.6
	Less than once per week	11.3	Not at all	7.8
	1-2 times per week	10.3	Slightly	19.8
	Several times per week	12.7	Quite	11.0
	Every day	23.0	Very	9.9
	-		Extremely	7.4

(continued)

Table 3. (continued)

Symptom	Frequency (%)		Intrusiveness (%)	
Muscle spasm/stiffness	Missing data	3.2	Missing data	9.5
	Never	42.1	N/A	38.9
	Less than once per week	12.7	Not at all	9.2
	1–2 times per week	10.3	Slightly	18.4
	Several times per week	14.5	Quite	9.9
	Every day	16.3	Very	8.5
Restless legs			Extremely	5.0
	Missing data	4.2	Missing data	10.3
	Never	48.4	N/A	44.9
	Less than once per week	13.8	Not at all	11.0
	1–2 times per week	7.4	Slightly	13.1
	Several times per week	12.4	Quite	8.1
	Every day	15.2	Very	7.8
	–		Extremely	5.7
	Missing data	2.8	Missing data	9.5

^aA total of 142 (50%) individuals reported other symptoms. Symptoms varied, but were most commonly frequent urination/nocturia ($n=51$), pain ($n=27$), back pain ($n=10$), feeling cold ($n=21$), cramps ($n=13$) and nausea ($n=10$).

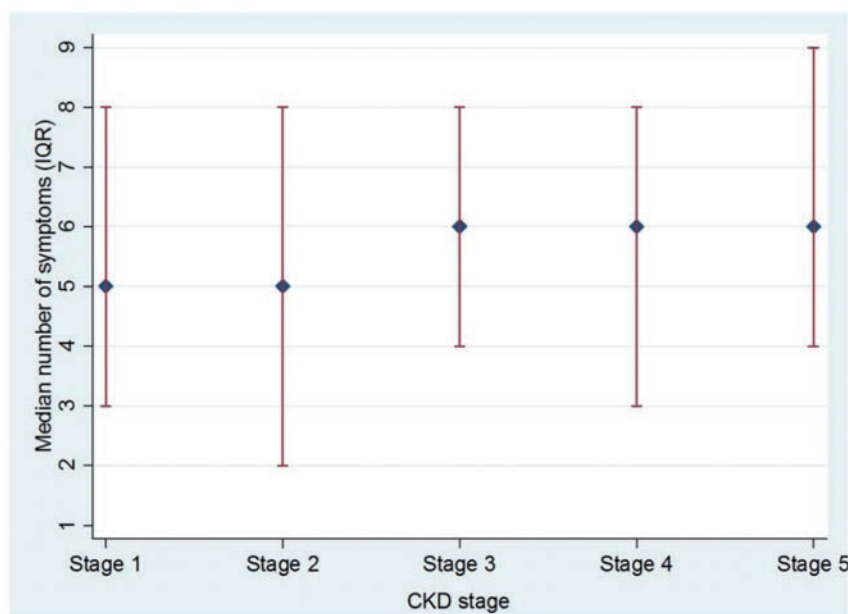


Fig. 2. Median number of kidney symptoms reported in general nephrology patients by stage of CKD. IQR, interquartile range; $n=49$ adults with unknown CKD stage excluded. Non-parametric test for trend for the ranks across ordered groups (extension of Wilcoxon rank-sum test) $P=0.03$.

Discussion

CKD patients experience a reduced QoL even in early disease stages and symptom burden is a major contributing factor [11]. Understanding the symptomatology of this patient group and gaining more insight into the pathophysiological processes could inform clinical management and improve patient QoL. This study explored the symptom burden of patients with CKD Stages 1–5 (not on RRT) in addition to the relationships between the reported symptoms and patient characteristics and biochemical results. We believe that this is the first study that assesses symptom burden in CKD patients Stages 1–5, as previous papers have focused on patients either on dialysis or with CKD Stages 4–5 [1, 2, 8, 9].

The vast majority of patients (96%) reported at least one symptom and we found a moderate association between the

number of symptoms reported and worsening CKD stage. When symptoms were analysed individually, excessive tiredness was reported most commonly, followed by sleep disturbance and pain in the bones or joints. Our findings showed similarities to observations in two previous studies including CKD Stage 4 patients, as overviewed in the 2013 literature review by Almutary et al. [1]. The most commonly reported physical symptoms were weakness (75%), poor mobility (75%), poor appetite (58%), pain (56%), pruritus (56%) and dyspnoea (49%) in one study [8] and fatigue or lack of energy (78%), dry skin (53%), difficulty sleeping (44%), pruritus (44%), and bone or joint pain (39%) in the other study [9]. As similar symptoms have been reported by patients with CKD Stages 1–5 in this study and in patients with CKD 4–5 in other studies [8, 9], this suggests that symptom assessment is appropriate and relevant even in early stages of the

Table 4. Relationship between intrusiveness of symptoms, creatinine and urea levels (markers of disease severity)

Symptom	N	Proportional odds assumption held		Proportional odds assumption violated									
		OR	P	N/A vs (NI, SI, QI, VI, EI)		(N/A, NI) vs (SI, QI, VI, EI)		(N/A, NI, SI) vs (QI, VI, EI)		(N/A, NI, SI, QI) vs (VI, EI)		(N/A, NI, SI, QI, VI) vs EI	
Itching ^a													
Creatinine	217			1.004	0.001	1.003	0.002	1.003	0.02	0.999	0.85	1.008	0.02
Urea	217			1.052	0.004	1.051	0.004	1.050	0.03	1.013	0.72	1.118	0.13
Sleep disturbance ^a													
Creatinine	223			1.001	0.40	1.001	0.45	1.001	0.54	1.000	0.98	1.000	0.95
Urea	223			1.024	0.24	1.010	0.56	1.006	0.72	0.995	0.81	0.988	0.67
Loss of appetite ^b													
Creatinine	213	1.002	0.04										
Urea	213	1.041	0.01										
Excessive tiredness ^b													
Creatinine	215			1.003	0.02	1.002	0.13	1.000	0.96	0.999	0.24	0.995	0.02
Urea	215	1.008	0.55										
Pain in bones/joints ^c													
Creatinine	218			0.999	0.25	0.999	0.29	0.998	0.09	1.002	0.27	1.001	0.67
Urea	218			0.970	0.09	0.988	0.51	0.967	0.09	0.995	0.84	0.970	0.50
Poor concentration/mental alertness ^c													
Creatinine	210			1.000	0.74	1.001	0.24	0.997	0.13	0.995	0.15	0.983	0.15
Urea	210			1.015	0.40	1.024	0.19	0.961	0.12	0.861	0.03	0.587	0.10
Impotence/lack of sex drive ^d													
Creatinine	199	1.002	0.11										
Urea	199	1.043	0.02										
Loss of muscle strength/power ^e													
Creatinine	215			1.001	0.43	0.999	0.45	1.000	0.69	0.999	0.36	0.999	0.69
Urea	215			1.026	0.17	1.016	0.37	1.005	0.79	0.991	0.73	0.972	0.49
Shortness of breath													
Creatinine	213	1.001	0.37										
Urea	213	1.019	0.20										
Muscle spasm/stiffness ^b													
Creatinine	212	1.002	0.04										
Urea	212	1.036	0.02										
Restless legs													
Creatinine	214	1.000	1.00										
Urea	214	0.995	0.76										

N, number of patients; OR, odds ratio; P, P-value; N/A, not applicable (i.e. no symptoms); NI, not at all intrusive, SI, slightly intrusive; QI, quite intrusive; VI, very intrusive; EI, extremely intrusive.

^aAdjusted for gender and ethnicity.

^bAdjusted for gender only.

^cAdjusted for age, gender and ethnicity.

^dAdjusted for ethnicity only.

^eAdjusted for age and ethnicity.

The bold figures in this table denote statistically significant relationships between symptoms and markers of disease severity.

disease. In addition, the lack of a consistent relationship between symptoms and CKD stage highlights that it is difficult to predict symptomatology from renal function alone as found in other research studies [9, 19, 20]. As a major contributing factor to QoL, focusing on reducing symptom burden by incorporating symptom assessment into clinical management and research in patients could address the issue of reduced QoL from earlier stages of CKD progression [11].

Symptom reporting appeared to be related to certain demographic characteristics of the participants. Comparisons by gender showed that men were less likely to report symptoms and described them as less intrusive when they did report them. Differences observed between ethnic groups included South Asian patients tending to report more symptoms. Age comparisons showed variations in the intrusiveness of symptoms

reported, with the older patients finding pain in the bones or joints and muscle weakness and younger people describing loss of concentration as more intrusive, respectively. While the odds ratios were small, we did observe statistically reliable associations between biochemical markers of disease burden and symptom severity. This is broadly consistent with other studies [8, 9, 19].

Demographic characteristics need to be considered when interpreting the symptom reporting. Additionally, the relationship between the frequency and severity of reported symptoms need to be evaluated to better understand the impact on the individual patient. This requires a multidimensional approach. Further understanding and awareness of the factors and contributors to symptom burden has the potential to aid future clinical management.

There are limitations to the study. First, our patients were recruited from one centre and so may not reflect the general symptom burden of other CKD patients. Furthermore, the study sample comprised a relatively small number of patients and a relatively large number of statistical tests, increasing the likelihood of finding statistically significant results by chance alone. Although this cross-sectional study design provided a means of assessing reported symptoms over a range of CKD stages, we were unable to determine true associations between comorbidities and other possible confounding factors. In addition, although the convenience sampling method provided data from CKD Stages 1–5 patients, each CKD stage was not equally represented. Finally, the LUSS is an informally developed multidimensional tool that assesses the frequency and intrusiveness of 11 symptoms, and is currently not validated. Although it has been found useful previously when assessing symptoms [22], no information is available on whether it is an appropriate measure of symptoms in the CKD Stages 1–5 population or if it includes the relevant symptoms. Work and improvements on the content, validity and design are required to use it as a tool in further research.

As the number of patients with CKD rises, it will become increasingly important to direct patient management services and research effectively. Exploration into the symptom burden of the CKD population is vital to addressing the patient experience and gaining further understanding of the disease. This study explored the impact of earlier disease stages and showed that patients report symptoms in CKD Stages 1–5. Symptom burden is multifactorial and subjective in nature and in this study we showed that factors including gender, ethnicity, age and disease severity may contribute to reported symptomatology. Therefore, it is difficult to use serological results in isolation as a predictor of patient well-being.

Practical implications

The LUSS has proven to be useful in the assessment of the range, frequency and severity of symptoms reported by CKD patients. As shown within this manuscript, symptoms may vary. Our findings suggest that symptoms may change with disease progression and assessment of symptoms should be incorporated into clinical management and research even in the early stages of CKD. This research explores the symptoms that patients with CKD Stages 1–5 experience to further inform the development of an appropriate symptom assessment tool. International guidelines recommend that the presence of symptoms attributable to kidney failure be taken into account when timing the initiation of RRT [16]. However, no validated symptom questionnaire is widely accepted to assess disease progression and variety by patient group, and for assessment. This area has been highlighted for future development [21]. The LUSS may provide a useful, multidimensional tool for measuring patient symptom burden and further work has been undertaken to improve and validate the measure.

In conclusion, it is well understood that patients in the later stages of CKD requiring RRT and also those treated conservatively experience a wide range of symptoms, and therefore have reduced QoL [1–9]. Our findings suggest that patients with CKD Stages 1–5 suffer from a multitude of symptoms. Using multidimensional tools like the LUSS, more exploration and focus should be given to address symptom burden at an earlier stage in our growing CKD population.

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Conflict of interest statement

None declared.

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