The epidemiology of erectile dysfunction and its correlates in men with chronic renal failure on hemodialysis in Londrina, southern Brazil

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Erectile dysfunction (ED) is a common condition in aging men, but little is known about the prevalence of ED in some specific groups of patients such as those with end-stage renal disease (ESRD). A cross-sectional study was conducted to determine the prevalence of ED in ESRD patients undergoing hemodialysis in two clinics of Londrina, Brazil. The prevalence and severity of ED were assessed using the International Index of Erectile Function and a single global question. The dependence of ED on independent variables was evaluated by logistic regression. Some degree of ED was found in 86.4% of our sample ($n = 118$). Complete ED was reported by 25.4% of subjects, moderate ED by 35.4%, and minimal ED by 24.6%. Subjects < 50 y old had a prevalence of moderate/complete ED of 52.6%, whereas in men ≥ 50 y old, it was 70.5%. Age, diabetes, and low income were significantly associated with ED. Although highly prevalent, only a low percentage of uremic ESRD patients on hemodialysis were being treated for ED. Our data suggest that ED is related to uremia and other comorbid conditions that often accompany ESRD.
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Introduction

Life expectancy for patients with end-stage renal disease (ESRD) has been extended as a result of improvements in dialysis therapy. This accomplishment has led to a new appreciation of problems previously ignored or not adequately addressed that affect the well-being and quality of life of patients with ESRD. One such problem is sexual dysfunction, a common feature of chronic renal failure (CRF). In this regard, erectile dysfunction (ED) is one of the most prevalent and important medical conditions because it can have a strong negative effect on a couple's life. Several studies among men with ESRD have estimated the prevalence of ED to range from 41.5% to 82%.[1–5] The etiology of ED in men with CRF is multifactorial. ED represents the sequelae of the complex neuroendocrine and metabolic changes typical of uremic syndrome. In addition, pharmacological therapy and physical and psychological stress also play an important role in the genesis of this problem.

As of July 1999, approximately 42 700 patients were undergoing chronic dialysis therapy in Brazil (Brazilian Ministry of Health), about half of whom were men. In the state of Paraná, there were 2412 patients in dialysis programs distributed among 12 clinics, two of which were in Londrina (State Secretary of Health). In view of the high prevalence of ED reported in patients with uremia, we wanted to estimate the magnitude of the problem in this group. In this study, we assessed the prevalence, severity, and correlates of ED in the male dialysis population of the city of Londrina, Paraná State, southern Brazil.

Materials and methods

Patient selection

All male patients 18 years of age or older undergoing hemodialysis therapy at two dialysis clinics in the city of Londrina, Paraná State, southern Brazil, from August to December 1999 were invited to participate in the survey. Patients with cognitive and/or

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communication deficits were excluded. All study participants provided informed written consent before enrolment. The protocol was analyzed and approved by the Institutional Review Board of the State University of Londrina.

Data collection

Information regarding patient demographics, marital status, lifestyle characteristics, satisfaction with sex life, and frequency of erections and intercourse was gathered using a standardized questionnaire. Data on comorbidities and use of medications were ascertained by chart review. All interviewers were trained and certified before data collection. Depression symptoms were assessed by the shortened (5-item) Center for Epidemiologic Studies Depression Scale (CES-D), with scores ranging from 5 to 20; a score of 14 or higher (corresponding to the upper tertile) was used to classify men as having significant depressive symptoms.[6]

Prevalence of ED was assessed with the six questions from the erectile function domain of the International Index of Erectile Function (IIEF)[7] and classified as none (IIEF: 26–30), mild (17–25), moderate (11–16), or severe (6–10). ED was also assessed by a single question derived directly from the National Institutes of Health (NIH) Consensus Conference definition[8] and described by Derby *et al*:[9] 'Using the following categories, how would you describe yourself? always/usually/sometimes/never able to get and keep an erection adequate for satisfactory sexual intercourse'. Responses were considered to represent 'no ED', 'mild ED', 'moderate ED', and 'complete ED', respectively. When the IIEF and the single question classification schemes disagreed, the more severe category of ED was assigned for the patient.

To ascertain the adequacy of dialysis for each patient, we estimated the Kt/V, defined as the dialyzer clearance of urea (K, in ml/min) multiplied by the duration of the dialysis treatment (t, in minutes) divided by the volume of distribution of urea in the body (V, in ml) using the formula $Kt/V = 1.18[-\ln(R)]$, where R is the ratio of the postdialysis to predialysis urea nitrogen levels. This approach yields a reliable estimate of the Kt/V with little systematic error.[10,11] Laboratory results for computation of the Kt/V were gathered from chart review of the previous 6 months to the interview.

Statistical analysis

Simple comparisons between subjects reporting ED in a group of patients with a potential risk factor and those without were performed using the t, χ^2, or a nonparametric test as appropriate. In the multi-variate analyses, using logistic regression, ED was dichotomized as 'none' or 'minimal' *vs* 'moderate' or 'complete'. For each independent variable, age-adjusted bivariate odds ratios (ORs) and 95% confidence intervals (CIs) were calculated; statistical significance (2-tailed P-value ≤ 0.05) was assessed by χ^2 for categorical variables and by Student's t-test and analysis of variance for continuous variables. In the multivariate logistic regression, full models were fitted, and then nonsignificant ($P > 0.1$) variables were eliminated in a stepwise backward elimination algorithm, least significant first, to determine the final model. Exceptions were made for the medical variables, which were forced into the model as being of primary interest in the study.

Results

Of 140 eligible patients, 118 (84.3%) participated in the study. Among the 22 patients excluded, 10 refused to participate, five moved, four had communication/cognitive deficits, and three received an organ transplant before an interview could be scheduled. Overall, some degree of ED was found in 86.4% of our sample. Complete ED was reported by 25.4% of subjects, moderate ED by 35.4%, and minimal ED by 24.6%. The prevalence of moderate and complete ED by age category is shown in Figure 1. The mean age (and standard deviation) of the study subjects was 48 y (13), and the range was 18–81 y. The prevalence of complete/moderate ED combined for men aged 50 y or older (70.5%) increased significantly over that for men between the ages of 18 and 49 y (52.6%) ($P = 0.046$), as shown in Table 1. Additional physical and medical characteristics of the study participants are shown in Table 2. Hypertension was the most prevalent medical condition (81.4%), followed by heart dis-
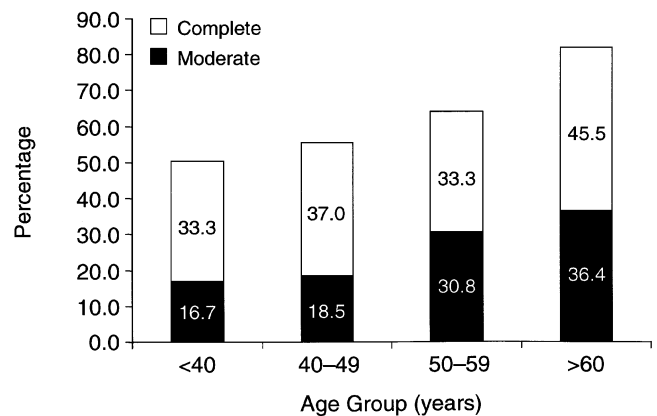

Figure 1 Prevalence of moderate and complete erectile dysfunction by age in 118 men with chronic renal failure, Londrina, Brazil, 1999.

Table 1 Association of sociodemographic characteristics with ED in 118 subjects with chronic renal failure, Londrina, Brazil, 1999

| | | Erectile dysfunction | | | |
| | | Complete/moderate | Minimal/none | | |
	n (%)	n (%)	n (%)	χ^2	P-value
Mean age, y					
< 50	57 (48.3)	30 (52.6)	27 (47.4)	3.98	0.046
≥ 50	61 (51.7)	43 (70.5)	18 (29.5)		
Status					
Married	82 (69.5)	53 (64.6)	29 (35.4)		0.58*
Single	17 (14.4)	11 (64.7)	6 (35.3)		
Widowed	15 (12.7)	7 (46.7)	8 (53.3)		
Divorced	4 (3.4)	2 (50.0)	2 (50.0)		
Education (y attending school)					
3 or less	43 (36.4)	31 (72.1)	12 (27.9)		0.35*
4–7	35 (29.7)	20 (57.1)	15 (42.8)		
8–11	28 (23.7)	16 (57.1)	12 (42.8)		
12 or more	12 (10.2)	6 (50.0)	6 (50.0)		
Religious affiliation					
No	9 (7.6)	5 (55.5)	4 (44.5)		0.47*
Yes	109 (92.4)	68 (62.4)	41 (37.6)		
Catholic	84 (71.8)	50 (59.5)	34 (40.5)		
Protestant	19 (16.2)	15 (78.9)	4 (21.0)		
Other	6 (5.1)	3 (50.0)	3 (50.0)		

*Estimated by Fisher Exact Test.

ease (25.4%), diabetes (22.0%), and depression (16.9%). Accordingly, the most common medications used by our patients were antihypertensive

Table 2 Physical characteristics and self-reported medical conditions of 118 subjects with chronic renal failure on hemodialysis, Londrina, Brazil, 1999

Physical measures	Mean ± (s.d.)	Median (quartiles)
Age (y)	48 ± (13)	50 (39–57)
Height (m)	1.7 ± (0.10)	1.7 (1.6–1.7)
Weight (kg)	67.0 ± (12.4)	67 (58–110)
Body mass index (kg/m²)	23.1 ± (3.50)	22.8 (21.1–24.6)

Medical conditions	n (%)	Median duration, y (quartiles)
Hypertension	96 (81.4)	6 (3–10)
Heart disease	30 (25.4)	4 (1–9)
Diabetes	26 (22.0)	15 (6–20)
Depression	20 (16.9)	2 (0.5–2.5)
Gastrointestinal or duodenal ulcer	17 (14.4)	11 (3–20)

Medications	n (%)
Antihypertensive agents	92 (78.0)
Cardiac agents	25 (21.2)
Hypoglycemic agents	17 (14.4)
Cimetidine	11 (9.3)
Antidepressive agents	6 (5.1)

Etiology of chronic renal failure	n (%)
Hypertensive nephropathy	50 (42.4)
Chronic glomerulonephritis	26 (22.0)
Diabetes mellitus	20 (16.9)
Polycystic kidney disease	6 (5.1)
Chronic pyelonephritis	4 (3.4)
Other	12 (10.2)

(78%), cardiac (21.2%), and hypoglycemic agents (14.4%). The etiology of CRF in the majority of our patients was hypertensive nephropathy (42.4%), followed by chronic glomerulonephritis (22.0%), and diabetes mellitus (16.9%), as shown in Table 2.

Most patients were married (69.5%), had < 3 y of education (36.4%), and reported some religious affiliation (92.4%), as shown in Table 1. None of these characteristics were significantly associated with ED; nevertheless, the data suggest that attainment of education is inversely related to ED.

Table 3 summarizes data on the potential association of medical and socioeconomic characteristics and ED. The patients had been under dialysis therapy for a median of 3 y. ED was not correlated to duration of dialysis. Hematocrit was significantly higher in subjects without ED (32.1%) compared with those with complete ED (27.5%) ($P = 0.04$). Sixty-nine of the patients (58.5%) presented a Kt/V index > 1.3, indicating adequate dialysis, and only 13 (11.0%) showed an index value < 1.0, indicating underdialysis.[12] Adequacy of dialysis, as measured by the Kt/V index, was not associated with ED in our data. There was an inverse relationship between median family monthly income and the prevalence of ED; patients without erectile complaints reported a median monthly family income of US$ 421, whereas those with complete ED reported half that much (US$ 210)($P = 0.016$).

Certain medical conditions, including diabetes and heart disease, were significantly associated with ED (Table 4). Patients with hypertension seemed to have a higher prevalence of ED, but the increase was not statistically significant. Although a diagnosis of depression was not found to be related to ED,

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Table 3 Association of medical characteristics and income with ED in 118 subjects with uremia, Londrina, Brazil, 1999

	Mean ± s.d.	Median (quartile)	P-value*
Duration of dialytic therapy by ED category, y			
None	6.13 ± 6.5	3.0 (2.0−11.5)	0.33
Minimal	4.15 ± 5.1	2.0 (0.0−8.0)	
Moderate	4.67 ± 4.8	3.0 (1.0−7.0)	
Complete	4.67 ± 7.5	2.0 (0.0−6.0)	
Hematocrit			
None	30.3 ± 4.7	32.1 (26.4−33.9)	0.04
Minimal	28.1 ± 5.7	26.6 (24.4−30.5)	
Moderate	26.8 ± 3.9	25.4 (24.0−30.1)	
Complete	28.2 ± 4.5	27.5 (25.4−30.9)	
Kt/V index			
None	1.29 ± 0.2	1.33 (1.2−1.5)	0.24
Minimal	1.29 ± 0.2	1.28 (1.1−1.4)	
Moderate	1.30 ± 0.3	1.38 (1.1−1.5)	
Complete	1.51 ± 0.6	1.41 (1.3−1.5)	
Family (monthly income in US$)			
None	873 ± 1041	421 (291−696)	0.02
Minimal	694 ± 721	337 (247−843)	
Moderate	485 ± 896	264 (146−470)	
Complete	490 ± 672	211 (141−461)	

*Estimated by Kruskal-Wallis one-way analysis of variance.
ED = erectile dysfunction.

patients with significant depressive symptoms, as measured by the CES-D scale, had a prevalence of 74.4% for complete/moderate ED compared with 55.7% among those without significant depressive symptoms ($P = 0.05$). Our data suggest that use of erythropoietin was associated with a lower probability of ED, but this was not significant. More than three-quarters of the patients were receiving some medication that has been implicated as being associated with ED; the most common drugs

Table 4 Association of self-reported medical conditions and lifestyle characteristics with ED in 118 subjects with uremia, Londrina, Brazil, 1999

		Erectile dysfunction				
	n (%)	Complete/moderate n (%)	Minimal/none n (%)	Prevalence ratio (95% confidence interval)	χ^2	P-value
Diabetes						
No	92 (78.0)	51 (55.4)	41 (44.6)	1.0		
Yes	26 (22.0)	22 (84.6)	4 (15.4)	1.53 (1.19−1.95)	7.32	0.007
Hypertension						
No	22 (18.6)	12 (54.5)	10 (45.5)	1.0		
Yes	96 (81.4)	61 (63.5)	35 (36.5)	1.16 (0.77−1.76)	0.61	0.43
Heart disease ($n = 117$)						
No	87 (74.4)	49 (56.3)	38 (43.7)	1.0		
Yes	30 (25.6)	23 (76.6)	7 (23.4)	1.36 (1.04−1.78)	3.90	0.05
Gastrointestinal or duodenal ulcer						
No	101 (85.6)	63 (62.4)	38 (37.6)	1.0		
Yes	17 (14.4)	10 (58.8)	7 (41.2)	0.94 (0.62−1.44)	0.08	0.78
Depression						
No	98 (83.1)	59 (60.2)	39 (39.8)	1.0		
Yes	20 (16.9)	14 (70.0)	6 (30.0)	1.16 (0.84−1.62)	0.68	0.41
Erythropoietin use ($n = 114$)						
No	29 (25.4)	21 (72.4)	8 (27.6)	1.0		
Yes	85 (74.6)	50 (58.8)	35 (41.2)	0.81 (0.61−1.08)	1.70	0.19
Presence of depression symptoms						
No/mild	79 (66.9)	44 (55.7)	35 (44.3)	1.0		
Significant	39 (33.1)	29 (74.4)	10 (25.6)	1.3 (1.02−1.75)	5.35	0.05
Smoking (ever)						
No	43 (36.4)	25 (58.1)	18 (41.8)	1.0		
Yes	75 (63.6)	48 (64.0)	27 (36.0)	1.10 (0.81−1.49)	0.40	0.53
Alcohol consumption						
No	93 (78.8)	59 (63.4)	34 (36.6)	1.0		
Yes	25 (21.2)	14 (56.0)	11 (44.0)	0.88 (0.60−1.29)	0.46	0.50

Table 5 Sexual activity and satisfaction according to category of ED in 118 subjects with chronic renal failure, Londrina, Brazil, 1999

	Erectile dysfunction			
	None (n = 16)	Minimal (n = 29)	Moderate (n = 43)	Complete (n = 30)
No sexual activity within last 6 months (%)	3	18	28	73
Sexual activity (median frequency/month)[a]	8	8	4	0
Full erection (median frequency/month)	12	8	4	0
Awaken with erection (median frequency/month)	14	10	8	0
Trouble getting erection (%)[a]	0	20	58	88
Trouble keeping erection (%)[a]	0	12	35	86
Satisfaction with frequency of activity (%)	73	56	42	16
Satisfaction with sex life[b]	4.2	3.5	2.7	1.9
Satisfaction with partner[b]	4.7	3.6	3.1	1.8
Partner satisfaction[b]	4.5	4.3	3.5	2.6

[a]Among those reporting some sexual activity within last 6 months.
[b]Mean on scale from 1 (extremely dissatisfied) through 5 (extremely satisfied).

included antihypertensives (78%), cimetidine (9.3%), and tricyclic antidepressants (5.5%). However, none were significantly associated with ED. Smoking and alcohol consumption did not affect the prevalence of ED.

In the multivariate analysis, age was a strong predictor of ED (OR = 1.04; 95% CI, 1.01–1.08) for each year increment in age. Diabetes was the only medical condition that remained significantly associated with ED (OR = 4.8; 95% CI, 1.2–18.3). Men reporting a monthly income below the median value for this sample (US$ 315) were more likely to present with ED (OR = 3.2; 95% CI, 1.3–7.9). A Kt/V index < 1.34 (median for this variable in our sample) was inversely associated with ED (OR = 0.4; 95% CI, 0.2–0.9).

Table 5 shows how our ascertainment of ED relates to other questions. ED was reflected as higher frequency of difficulty to get and/or maintain an erection during intercourse, lower monthly rates of sexual activity and erection, and lower satisfaction with sex life and partner.

Two thirds of our study subjects reported they would feel comfortable discussing ED with a physician or other healthcare worker, an additional 14% said they would feel neither comfortable nor uncomfortable, and only 18.6% would feel uncomfortable discussing ED (Table 6). Moreover, the percentage of subjects who would feel uncomfortable discussing ED did not change significantly when individuals with complete/moderate ED were compared with those without (19.2% and 17.8%, respectively). Of the patients with complete/moderate ED, 89% said they would tell their doctors about ED symptoms even if they were not asked about it, as did 82.2% of patients with minimal/no ED. Nevertheless, only 9.6% of the patients with complete/moderate ED and 6.7% of those with minimal/no ED reported previous treatment of ED.

Table 6 Attitude toward diagnosis of ED in 118 subjects with end-stage renal disease, Londrina, Brazil, 1999

		Erectile dysfunction			
If you ever had a problem getting and keeping an erection	n (%)	Complete/moderate n (%)	Minimal/none n (%)	χ^2	P-value
How comfortable would you feel discussing this problem with your doctor or any health professional?					
Very uncomfortable/uncomfortable	22 (18.6)	14 (19.2)	8 (17.8)	0.47	0.79
Neither comfortable nor uncomfortable	16 (13.6)	11 (15.1)	5 (11.1)		
Comfortable/very comfortable	80 (67.8)	48 (65.7)	32 (71.1)		
Would you tell your doctor or any health professional about it even if he/she did not ask you about it?					
Yes	102 (86.4)	65 (89.0)	37 (82.2)	1.1	0.29
No	16 (13.6)	8 (11.0)	8 (17.8)		
Have you ever been treated for a problem related to getting and keeping an erection?					
Yes	10 (8.5)	7 (9.6)	3 (6.7)		0.74*
No	108 (91.5)	66 (90.4)	42 (93.3)		

*Estimated by Fisher Exact Test.

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Discussion

This study confirms the high prevalence of ED among men with ESRD undergoing dialysis. Our data estimate of some degree of ED (81.4%) and of complete/moderate ED (60.2%) is consistent with previous estimates from studies performed elsewhere.[1–5] ED should be considered a major health concern in this population. In fact, considering that self-reports about ED, especially in face-to-face interviews, are subject to under-reporting biases arising from personal concerns about social stigmatization, the true prevalence of ED in our population is likely to be even higher. Perceived lack of privacy during interviews could also have resulted in under-reporting. It is unlikely, however, that this bias played a large role in our study because all interviews were performed without interruptions in a secluded, private environment.

Among men on dialysis, we found ED to be an age-dependent disorder with a prevalence of 52.6% at age younger than 50 y and 70.5% at 50 y of age or older. Prior studies have shown similar relationships between ED and aging, either in healthy populations[13–18] or in patients seeking medical treatments.[19–22] Although a decline in erectile function may be part of aging, the prevalence of moderate/complete ED observed in our uremic patients is much higher than reported in another study of ED prevalence in the general population in Brazil (11% and 27% in men younger than 50 y or 50 y or older, respectively).[23] It is not evident whether this increased frequency of ED can be ascribed to uremia itself or to the long-standing chronic illness and disability as well as the high frequency of known correlates of ED such as hypertension.

High educational attainment seemed to be negatively associated with erection problems; 50% of men attending 12 or more years of school presented with complete/moderate ED compared with 72.1% of those with ≤ 3 y of education. However, this difference was not statistically significant. Nevertheless, family monthly income, another surrogate marker of socioeconomic status, was inversely related to ED. Higher rates of ED among men with lower socioeconomic status may be secondary to limited access to healthcare in this group, leading to higher rates of comorbidities associated with ED and/or less adequate treatment of uremia itself or related medical conditions.

Our results showed a correlation between low hematocrit and severity of ED. It might be argued that anemia could participate in the etiology of erectile problems in men with ESRD because it worsens the poor general condition and asthenia in those patients. Our data also suggested a protective effect of erythropoietin use in our male patients with ESRD. Sobh et al have reported that treatment with erythropoietin could improve sexual potency in uremic patients undergoing chronic hemodialysis therapy.[24] It is likely that the overall improvement in well-being accomplished by the correction of anemia plays an important role in this response. Some studies have shown that erythropoietin therapy can lead to normalization of the pituitary–gonadal feedback mechanism, with reduced plasma concentrations of luteinizing and follicle-stimulating hormones and increases in plasma testosterone levels.[25,26] Reductions in elevated plasma prolactin levels have been observed in patients treated with recombinant erythropoietin and undergoing hemodialysis.[27] However, it is not clear whether these endocrinologic changes are solely the result of correction of the anemia or a direct effect of erythropoietin.

In our sample, men with adequate dialysis, particularly those with a Kt/V index > 1.34, had a higher likelihood of presenting with ED. Rosas et al have not found any significant association between Kt/V index and prevalence of ED in their study population.[5] Our finding suggests that hemodialysis may also remove compounds from the serum that are important for adequate erectile function, or a high Kt/V index may simply be a marker of patients with more severe disease who are receiving a more careful dialysis treatment. Further studies are needed to clarify these issues.

Erectile disturbances in men with ESRD are primarily organic in nature and are related to uremia as well as the other comorbid conditions that frequently accompany CRF.[2–5] Diabetes is a well-recognized illness associated with ED. In our study, the prevalence of moderate/complete ED was 1.5 times greater in subjects with diabetes than in those without diabetes. Prior studies have repeatedly shown a high prevalence of ED associated with diabetes, with estimates ranging from 35% to 75%.[28–30] We found 84.6% of our male patients with diabetes to have ED. It is controversial which aspect of diabetes is the direct cause of impotence; vascular disease is most frequently cited.[31] In addition, autonomic neuropathy, gonadal dysfunction, and impaired neurogenic and endothelium-mediated relaxation of penile smooth muscle are also implicated in patients with diabetes and ED.[32,33]

In our data, cardiovascular disease was found to be associated with ED. Several studies have demonstrated an association of impotence and vascular disease in patients with coronary heart disease,[22] cerebrovascular accidents,[34] and peripheral vascular disease.[35] Rodger et al reported that arteriogenic impotence accounted for 11% of men with ED undergoing dialysis.[36] It may be argued that vascular compromise present in cardiovascular disease shares common determinants with vascular impairment of the erectile mechanism seen in patients with ESRD. Although our results suggest a higher prevalence of ED among uremic patients with hypertension, this

difference did not reach statistical significance. More than three-quarters of our patients had hypertension; thus, this uneven distribution might have decreased the statistical power in our study to find a significant difference.

Self-report of a diagnosis of depression was not associated with ED in our sample. However, the presence of depression symptoms as measured by the CES-D scale was found to be associated with ED. Primary depression may negatively affect sexual function; therefore, it has been suggested that depression may play an important role in the etiology of ED in uremic patients. Shabsigh *et al* have reported a higher incidence of depressive symptoms among men with ED compared with age-matched controls.[37] In another study in men with CRF, Procci *et al* did not find an association between the presence or absence of depression and measures of sexual function, such as ability to develop an erection as determined by nocturnal penile tumescence testing.[2] Rodger *et al* also reported that symptoms of depression were not significantly increased in impotent patients with ESRD.[36] Nevertheless, it is conceivable that depressed individuals with ESRD may have reduced libido, decreased frequency of intercourse, and impotence. Conversely, a man who has experienced a recent pattern of ED may be expected to be anxious and depressed.

A surprisingly high proportion of study participants with moderate/complete ED (90.4%) have never been treated for this problem. It is unlikely that the reason they have not received therapy for ED is discomfort discussing this problem with their healthcare professionals because more than 80% of the study subjects reported feeling either neutral or comfortable discussing this issue. Moreover, 90% of the patients said they would tell their doctor about ED even if she/he did not ask about it. Therefore, further studies are needed to investigate the lack of treatment for ED in this population of men with CRF.

Conclusion

Erectile dysfunction is a highly prevalent problem in men with ESRD, with considerable impact on their quality of life. This problem is primarily organic in nature and is related to uremia and other comorbid conditions that often accompany CRF. Our results showed strong evidence that only a low percentage of uremic patients with ED are currently being treated for this problem. As life expectancy for these patients continues to improve and given the availability of oral medication for ED, physicians and other health professionals are urged to acknowledge the high prevalence of erection problems in men with ESRD and proactively question all patients with ESRD regarding their sexual function.

This will improve the recognition of this condition among these patients, which can lead to adequate treatment and improved quality of life.

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References

1 Sherman FP. Impotence in patients with chronic renal failure on dialysis: its frequency and etiology. *Fertil Steril* 1975; **26**: 221–223.

2 Procci WR, Goldstein DA, Adelstein J, Massry SG. Sexual dysfunction in the male patient with uremia: a reappraisal. *Kidney Int* 1981; **19**: 317–323.

3 Breza J, Reznicek J, Pribylincova V, Zvara P. Erectile dysfunctions in patients treated with hemodialysis and kidney transplantation. *Bratisl Lek Listy* 1993; **94**: 489–493.

4 Palmer BF. Sexual dysfunction in uremia. *J Am Soc Nephrol* 1999; **10**: 1381–1388.

5 Rosas SE *et al.* Prevalence and determinants of erectile dysfunction in hemodialysis patients. *Kidney Int* 2001; **59**: 2259–2266.

6 Weissman MM *et al.* Assessing depressive symptoms in five psychiatric populations: a validation study. *Am J Epidemiol* 1977; **106**: 203–214.

7 Rosen RC *et al.* The International Index of Erectile Function: a multidimensional scale for erectile dysfunction assessment. *Urology* 1997; **49**: 822–830.

8 National Institutes of Health Consensus Development Panel on Impotence. Impotence. *JAMA* 1993; **270**: 83–90.

9 Derby CA *et al.* Measurement of erectile dysfunction in population-based studies: the use of a single question self-assessment in the Massachusetts Male Aging Study. *Int J Impot Res* 2000; **12**: 197–204.

10 Daugirdas JT. Rapid methods for estimating Kt/V: three formulas compared. *ASAIO Trans* 1990; **36**: M362.

11 Daugirdas JT. Second generation logarithmic estimates of single-pool variable volume Kt/V: an analysis of error. *J Am Soc Nephrol* 1993; **4**: 1205.

12 NKF-DOQI Clinical Practice Guidelines for Hemodialysis Adequacy. III. Blood urea nitrogen (BUN) sampling. *Am J Kidney Dis* 1997; **30**(Suppl 2): S38.

13 Mulligan T, Retchin SM, Chinchilli VM, Bettinger CB. The role of aging and chronic disease in sexual dysfunction. *J Am Geriatrics Soc* 1988; **36**: 520–524.

14 Diokno AC, Brown MB, Herzog AR. Sexual function in the elderly. *Arch Intern Med* 1990; **150**: 197–200.

15 Feldman HA *et al.* Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study. *J Urol* 1994; **151**: 54–61.

16 Laumann EO, Paik AMA, Rosen RC. Sexual dysfunction in the United States: prevalence and predictors. *JAMA* 1999; **281**: 537–544.

17 Braun M *et al.* Epidemiology of erectile dysfunction: results of the 'Cologne Male Survey'. *Int J Impot Res* 2000; **12**: 305–311.

18 Ansong KS *et al.* Epidemiology of erectile dysfunction. A community-based study in rural New York state. *Ann Epidemiol* 2000; **10**: 293–296.

19 Modebe O. Erectile failure among medical clinic patients. *Afr J Med Med Sci* 1990; **19**: 259–264.

20 Lester E, Grant AJ, Woodroffe FJ. Impotence in diabetic and non-diabetic hospital outpatients. *Br Med J* 1980; **3**: 354–355.

21 Bansal S. Sexual dysfunction in hypertensive men. A critical review of the literature. *Hypertension* 1988; **12**: 1–10.

22 Wabrek AJ, Burchell RC. Male sexual dysfunction associated with coronary heart disease. *Arch Sex Behav* 1980; **9**: 59.

23 Moreira ED Jr *et al.* Prevalence and correlates of erectile dysfunction: results of the Brazilian study of sexual behavior (BSSB). *Urology* 2001; **58**: 583–588.

24 Sobh MA, Hamid AA, Atta MG, Refaie AF. Effect of erythropoietin on sexual potency in chronic hemodialysis patients. *Scand J Urol Nephrol* 1991; **26**: 181–185.

25 Kokot F *et al.* Function of endocrine organs in hemodialyzed patients of long-term erythropoietin therapy. *Artif Organs* 1995; **19**: 428–435.

26 Schaefer F *et al.* Changes in the kinetics and biopotency of luteinizing hormone in hemodialyzed men during treatment with recombinant human erythropoietin. *J Am Soc Nephrol* 1994; **5**: 1208–1215.

27 Schaefer RM *et al.* Improved sexual function in hemodialysis patients on recombinant erythropoietin: a possible role for prolactin. *Clin Nephrol* 1989; **31**: 1–5.

28 Kayigil O, Atahan O, Metin A. Multifactorial evaluation of diabetic erectile dysfunction. *Int Urol Nephrol* 1996; **28**: 717.

29 Klein R *et al.* Prevalence of self-reported erectile dysfunction in people with long-term IDDM. *Diabetes Care* 1996; **19**: 135–141.

30 Fedele D *et al.* Erectile dysfunction in type 1 and type 2 diabetics in Italy. On behalf of Gruppo Italiano Studio Deficit Erettile nei Diabetici. *Int J Epidemiol* 2001; **29**: 524–531.

31 Jevtich MJ, Edson M, Jarman WD, Herrera HH. Vascular factor in erectile failure among diabetics. *Urology* 1982; **19**: 163.

32 Whitehead ED, Klyde BJ. Diabetes-related impotence in the elderly. *Clin Geriat Med* 1990; **6**: 771.

33 Saenz de Tejada I *et al.* Impaired neurogenic and endothelium-mediated relaxation of penile smooth muscle from diabetic men with impotence. *New Engl J Med* 1989; **320**: 1025.

34 Agarwal A, Jain DC. Male sexual dysfunction after stroke. *J Assoc Physicians India* 1989; **37**: 505.

35 Ruzbarsky V, Michal V. Morphologic changes in the arterial bed of the penis with aging. Relationship to the pathogenesis of impotence. *Invest Urol* 1977; **15**: 194.

36 Rodger RSC *et al.* Prevalence and pathogenesis of impotence in one hundred uremic men. *Uremia Invest* 1985; **8**: 89–96.

37 Shabsigh R *et al.* Increased incidence of depressive symptoms in men with erectile dysfunction. *Urology* 1998; **52**: 848–852.