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UROLOGY-ORIGINAL PAPER

Assessment of female sexual function and quality of life in predialysis, peritoneal dialysis, hemodialysis, and renal transplant patients

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Abstract
Introduction Chronic renal failure (CRF) and renal replacement treatments have a negative effect on sexual function and quality of life (QoL). The literature on female sexual dysfunction (FSD) in patients with CRF is limited. The aim of this study is to compare the sexual function and QoL in predialysis (PreD), dialysis, and transplant patients.
Materials and methods A total of 106 women including 21 PreD, 45 dialysis, 20 renal transplantation (Tx), and 20 control patients were enrolled in the study. The Female Sexual Function Index (FSFI) and SF-36 scales were used to assess all patients, and demographic and clinical variables were documented. The FSFI and QoL scale scores were compared among the groups.
Results The rates of FSD were 50, 81, 66.7, 75, and 50% in the control, PreD, peritoneal dialysis (PD), hemodialysis (HD) and Tx patients respectively. Total FSFI scores for desire, arousal and orgasm scores in the PreD group were significantly lower than those in Tx and control patients ($P < 0.05$). Physical components of QoL in CRF patients were significantly worse than in the control group ($P < 0.0001$). On logistic regression analysis, age, glucose and creatinine were significantly associated with FSD.
Conclusion This preliminary study documented that Tx is the most effective way to retain good sexual function in women, and a diagnosis of FSD should be made routinely in CRF patients.

Keywords Sexual function · Female · Quality of life · Renal failure · Renal transplantation · Dialysis

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Introduction

Sexual dysfunction can have a major impact on quality of life (QoL) and is a highly prevalent health problem, affecting 22 to 93% of women, with variations according to age groups. Impaired sexual function can have damaging effects on the confidence, sense of wholeness, social relation and marital status of women [1]. Chronic renal failure (CRF) and dialysis have a negative effect on sexual function and QoL. Sexual dysfunction is common in female patients with CRF and incidence estimates run from 9% before starting dialysis to 60–70% in women on chronic dialysis [2]. More than 50% of women on chronic dialysis complain of decreased libido and reduced ability to reach orgasm, with the consequence of a marked decline in

the frequency of intercourse. Despite the focus on QoL in women with CRF, literature concerning female sexual dysfunction (FSD) is limited and its risk factors in this population are not well documented.

The aim of this study is to search whether the type of renal replacement treatment, such as peritoneal dialysis, hemodialysis or renal transplantation, influences the incidence of FSD, and compare the QoL and sexual function in uremic women before the dialysis, chronic dialysis, and transplantation with a control group using the 36-item short-form health survey (SF-36) and the Female Sexual Function Index (FSFI) questionnaires. We also identified the demographic and clinical variables associated with sexual function in these women.

Materials and methods

A total of 106 female patients, including 21 predialysis (PreD), 21 peritoneal dialysis (PD), 24 hemodialysis (HD), 20 renal transplantation (Tx), and 20 control patients were enrolled in this study. The PreD group consisted of randomly chosen patients who were undergoing conservative treatment with serum creatinine >2 mg/dl. Renal transplantation had performed at least 6 months previously in the transplanted group. Healthy female volunteers were recruited as control patients in this survey. The study was carried out in accordance with Good Clinical Practice and the Declaration of Helsinki. The study protocol was approved by the local ethics committee of the hospital and informed consent was obtained from all patients.

The data include demographic characteristics (age, number of children, educational level, occupational status, chronic diseases, previous pelvic surgery, menstrual status, medications that adversely affect sexual function, and neurological and psychological disorders) and clinical variables (body mass index, blood pressure, glucose, creatinine, hemoglobin, cholesterol, low density lipoprotein, high density lipoprotein, follicle-stimulating hormone, luteinizing hormone, prolactin, estradiol, and testosterone) were assessed in all groups. Information on the patient's characteristics was documented from the medical records, and blood samples were taken before dialysis. Patients were excluded if they were under 18 years of age, had been on chronic dialysis for less than 6 months, if they had any major psychiatric diseases, and if they were not competent enough to give their informed consent.

All the women were asked to complete both the FSFI and SF-36 questionnaires by themselves. A nurse was ready to help if the patient could not understand the questions. FSD was evaluated with the Turkish validated version of the FSFI. The Turkish version of the FSFI had previously proved to be reliable and valid in the Turkish population (Cronbach $\alpha = 0.95$) [1]. The FSFI assessed sexual function status or sexual problems during the previous 4 weeks. According to the FSFI, sexual function domains consisted of sexual desire, arousal, lubrication, orgasm, satisfaction, and pain during sexual intercourse. For each of the six domains a score was calculated and the total score ranged between 2 and 36. A total score of more than 25 was considered "normal female sexual function" and a total score of less than 25 was considered to constitute "FSD" [1].

The validated Turkish version of the SF-36 is a common questionnaire including 36 questions that evaluate eight aspects of QoL: physical functioning (PF), role limitations as a result of physical problems (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role limitations as a result of emotional problems (RE), mental health (MH), as well as two summary scores, a physical component summary score (PCS), and a mental component summary score (MCS). Each of the eight domains is scored out of 100, with higher scores indicating better functioning. The MCS and PCS scores are standardized to a mean of 50, with scores above and below 50 indicating above and below average functioning respectively [3, 4].

The FSFI and SF-36 scale scores of the CRF patients and the control group were compared. NCSS statistical computer software (2007; NCSS, Kaysville, UT, USA) was used to perform all statistical calculations. Differences among the groups were analyzed using the Chi-squared and Mann–Whitney U tests. When the groups were unequal and nonparametric, the data were analyzed using the Kruskal–Wallis test and then Dunn's method for pair-wise comparison. We used Pearson's correlation test to determine the effect of the variables of the SF-36 on the FSFI. We used logistic regression to determine the effect of risk factors on FSD. Differences were considered significant at $P < 0.05$.

Results

The demographic and clinical characteristics of the groups are shown in Tables 1 and 2.

Female sexual dysfunction

The rate of FSD was 50% in control group, 81% in PreD, 66.7% in PD, 75% in HD, and 50% in Tx patients. Table 3 shows the FSFI scores and compares the control and PreD, PD, HD, and Tx groups. The control group had higher mean scores than the PreD group in all parameters except lubrication and pain ($P < 0.05$). There was a statistical difference between the Tx and PreD groups in the scale score of total, desire, arousal, and orgasm ($P < 0.05$). Regarding desire and orgasm in the HD patients, no differences between the control and HD women were found in any scale score ($P > 0.05$). The mean score for desire was lower in the HD group than in Tx patients ($P < 0.05$).

Table 1 Demographic characteristics of the groups included in the study

	Control	PreD	PD	HD	Tx
Patients (number)	20	21	21	24	20
Age (mean ± SD)	32.75 ± 8.42	48.19 ± 8.68	45.19 ± 8.92	43.08 ± 12.44	36.45 ± 8.55
Children (number ± SD)	1.9 ± 1.45	2.57 ± 1.54	2.62 ± 1.16	1.79 ± 1.35	1.45 ± 1.23
Education (%)					
None	10	33.3	23.8	20.8	25
Primary school	65	52.4	71.4	62.5	70
High school	10	9.5	4.8	12.5	5
University	15	4.8	0	4.2	0
Occupational status (%)					
Unemployed	60	85.7	85.7	91.7	80
Employed	40	14.3	14.3	8.3	20
Chronic diseases (%)					
Absent	100	28.6	42.9	62.5	65
Present	0	71.4	57.1	37.5	35
Pelvic surgery (%)					
Absent	90	71.4	90.5	79.2	75
Present	10	28.6	9.5	20.8	25
Neurological disorders (%)					
Absent	95	90.5	85.7	87.5	95
Present	5	9.5	14.3	12.5	5
Psychological disorders (%)					
Absent	100	95.2	81	87.5	100
Present	0	4.8	19	12.5	0
Medications (%)[a]					
No	95	38.1	57.1	75.0	5
Yes	5	61.9	42.9	25.0	95
Menstruation status (%)					
Menopause	5	61.9	42.9	41.7	15
Normal	80	38.1	33.3	37.5	60
Abnormal	15	0	23.8	20.8	25

PreD, predialysis; PD, peritoneal dialysis; HD, hemodialysis; Tx, renal transplant

[a] Medications that adversely affect sexual function

Table 2 Clinical characteristics of the groups included in the study

	Control	PreD	PD	HD	Tx
Patients (number)	20	21	21	24	20
BMI (mean)	23.45 ± 3.61	27.89 ± 6.39	26.95 ± 3.83	22.72 ± 4.14	25.84 ± 3.18
Systolic BP (mmHg)	108.5 ± 11.37	130.95 ± 21.66	122.86 ± 30.02	122.71 ± 24.45	119.5 ± 17.61
Diastolic BP (mmHg)	63.5 ± 8.13	78.1 ± 13.65	75.67 ± 15.98	73.75 ± 14.39	73.5 ± 11.37
Glucose (mg/dl)	84.25 ± 20.71	107.1 ± 23.8	118.05 ± 39.78	118.04 ± 54.24	92.32 ± 16.65
Creatinine (mg/dl)	0.72 ± 0.1	2.39 ± 0.24	10.41 ± 1.62	7.76 ± 2.12	1.27 ± 0.42
Hemoglobin (g/dl)	13.4 ± 1.7	11.68 ± 1.69	10.99 ± 1.85	10.31 ± 1.06	12.1 ± 1.94
Cholesterol (mg/dl)	154.55 ± 34.12	201.35 ± 43.54	167.45 ± 39.25	162.95 ± 40.28	210.25 ± 44.03
LDL (mg/dl)	61.35 ± 14.18	120.06 ± 29.8	68.86 ± 24.08	87.73 ± 40.13	118.41 ± 28.49
HDL (mg/dl)	56.25 ± 9.46	55.61 ± 15.15	46.76 ± 17.24	57.16 ± 35.87	53.83 ± 16.9
FSH (mIU/ml)	5.94 ± 5.84	48.61 ± 46.6	52.11 ± 70.01	64.52 ± 80.91	6.24 ± 5.29
LH (mIU/ml)	7.33 ± 4.29	33.62 ± 29.03	48.01 ± 54.3	48.52 ± 46.78	11.57 ± 12.12
PRL (mIU/ml)	13.01 ± 7.48	13.33 ± 7.84	95.45 ± 21.63	57.02 ± 53.38	36.79 ± 56.35
Estradiol (pg/ml)	89.51 ± 60.25	46.02 ± 64.52	81.04 ± 65.39	101.8 ± 40.36	187.29 ± 42.45
Testosterone (ng/dl)	0.46 ± 0.22	0.48 ± 0.23	0.94 ± 1.01	0.41 ± 0.34	0.19 ± 0.18

PreD, predialysis; PD, peritoneal dialysis; HD, hemodialysis; Tx, renal transplant; BMI, body mass index; BP, blood pressure; LDL, low density lipoprotein; HDL, high density lipoprotein; FSH, follicle-stimulating hormone; LH, luteinizing hormone; PRL, prolactin

Table 3 The Female Sexual Function Index (FSFI) scores and comparison of control, predialysis, dialysis, and transplant patients

	Control	PreD	PD	HD	Tx	*P* value*
Total	24.13 ± 4.63	13.03 ± 10.81[b]	17.39 ± 11.39	16.3 ± 9.72	22.66 ± 11.01[d]	**0.004**
Desire	3.54 ± 0.93[a]	2.31 ± 1.28[b]	2.49 ± 1.14	2.1 ± 1.11[c]	3.39 ± 1.17[d]	**0.0001**
Arousal	3.32 ± 0.95	1.71 ± 1.82[b]	2.26 ± 1.79	2.38 ± 1.77	3.3 ± 1.97[d]	**0.017**
Lubrication	4.46 ± 0.79	2.34 ± 2.41	3.03 ± 2.58	3.2 ± 2.38	4.02 ± 2.21	0.11
Orgasm	4.31 ± 1.12[a]	1.87 ± 2.02[b]	2.55 ± 2.31	2.42 ± 1.89	3.77 ± 2.18[d]	**0.0001**
Satisfaction	4.47 ± 1.05	2.4 ± 1.69[b]	3.09 ± 2.06	3.12 ± 1.56	3.93 ± 1.95	**0.004**
Pain	4.24 ± 1.36	2.5 ± 2.5	4.01 ± 2.67	3.05 ± 2.4	4.3 ± 2.39	0.056

Significance of bold = to emphasize statistical significance ($P < 0.05$)
PreD, predialysis; PD, peritoneal dialysis; HD, hemodialysis; Tx, renal transplant

* Comparison of groups using the Kruskal–Wallis test

[a] Control versus hemodialysis

[b] Predialysis versus control

[c] Hemodialysis versus renal transplant

[d] Renal transplant versus predialysis using Dunn's method for pair-wise comparison ($P < 0.05$)

SF-36

Table 4 lists SF-36 scale scores and comparisons of the groups. Statistically significant differences was found for PCS scores between the control group with Tx, PreD and dialysis patients ($P < 0.0001$). The Dunn's analysis method was performed to test the differences between groups; it revealed that HD patients had significantly lower scores in the domains of physical function and general health than control patients ($P < 0.05$). There was a statistical difference between both PD and PreD and the control group in the scale score for general health. A similar statistical difference was also observed between PD and Tx patients ($P < 0.05$). The PCS score of PD patients was lower than that of the control group ($P < 0.05$).

Table 4 SF-36 scale scores and a comparison of control, predialysis, dialysis, and transplant patients

	Control	PreD	PD	HD	Tx	*P* value*
Role physical	81.25 ± 37.06[a]	54.76 ± 45.84	39.29 ± 45.81	58.33 ± 39.47	60 ± 42.46	**0.033**
Physical function	86.11 ± 20.11[a]	68.52 ± 28.94	56.61 ± 20.98	62.27 ± 23.68[d]	77.78 ± 17.66	**0.0001**
Bodily pain	16.67 ± 23.22[a]	32.28 ± 20.46	45.5 ± 31.01	28.24 ± 31.42	32.78 ± 26.36	**0.019**
General health	67 ± 24.94[a]	40.24 ± 21.94[b]	32.86 ± 22.28[c]	37.08 ± 20.69[d]	54.25 ± 22.78	**0.0001**
Vitality	69.25 ± 25.61[a]	51.43 ± 23.57	47.62 ± 23.54	58.75 ± 24.37	67 ± 23.97	**0.016**
Social function	83.13 ± 21.18	75.6 ± 25.46	63.69 ± 25.59	68.75 ± 26.83	64.38 ± 35.42	0.12
Role emotional	65 ± 39.7	65.08 ± 40.11	41.27 ± 42.04	51.39 ± 40.5	53.33 ± 43.8	0.281
Mental health	69.4 ± 18.23	60.19 ± 23.68	58.67 ± 20.57	69.5 ± 24.4	61.2 ± 20.4	0.23
PCS	59.65 ± 9.85[a]	48.66 ± 9.18	43.23 ± 9.79	47.41 ± 10.18	53.3 ± 9.97	**0.0001**
MCS	53.8 ± 10.29	47.33 ± 12.13	44.52 ± 10.88	50.16 ± 12.61	49.45 ± 12.5	0.131

Significance of bold = to emphasize statistical significance ($P < 0.05$)
PreD, predialysis; PD, peritoneal dialysis; HD, hemodialysis; Tx, renal transplant; PCS, physical component summary; MCS, mental component summary

*Comparison between control patients and other groups using the Kruskal–Wallis test

[a] Control versus peritoneal dialysis

[b] Predialysis versus control

[c] Peritoneal dialysis versus renal transplant

[d] Hemodialysis versus control and using Dunn's method for pair-wise comparison ($P < 0.05$)

Table 5 Pearson correlation coefficients to determine the effect of the SF-36 scales on FSFI

SF-36/FSFI	Total	Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain
Role physical	0.38*	0.295*	0.377*	0.329*	0.434*	0.409*	0.243**
Physical function	0.374*	0.301*	0.333*	0.349*	0.388*	0.39*	0.272*
Bodily pain	−0.31*	−0.172	−0.294*	−0.302*	−0.298*	−0.25**	−0.309*
General health	0.353*	0.277*	0.378*	0.29*	0.39*	0.364*	0.257*
Vitality	0.32*	0.178	0.311*	0.295*	0.344*	0.343*	0.246**
Social function	0.255*	0.111	0.255*	0.252*	0.209**	0.286*	0.246**
Role emotional	0.242**	0.112	0.226**	0.217**	0.277*	0.26*	0.21**
Mental health	0.145	0.004	0.196**	0.129	0.159	0.166	0.108

P values for the correlation: * $P < 0.01$; ** $P < 0.05$

Correlation of SF-36 with FSFI scores

The effect of variables of the SF-36 on the FSFI was determined by Pearson's correlation test, and the correlations are shown in Table 5. The variables of the SF-36 demonstrated negative (BP), and positive, significant correlations with the total FSFI scale, except for mental health ($P < 0.05$).

SF-36 variables

The comparison of SF-36 variables between groups with and without FSD showed statistically significant differences except for the mental health criterion ($P < 0.01$; Table 6). Logistic regression analysis demonstrated that only role physical was found to be independently and significantly associated with FSD.

Demographic variables

Table 7 compares the demographic characteristics in patients with and without FSD. Age, number of children, and occupational status were significantly related to FSD ($P < 0.05$). Logistic regression analysis showed age to be the only variable that was independently and significantly associated with FSD.

Table 6 Comparison of SF-36 variables with sexual function

	FSD	NSF	*P* value*
Role physical	46.74 ± 44.95	80.41 ± 30.7	0.0001**
Physical function	63.69 ± 25.27	81.23 ± 18.9	0.001
Bodily pain	36.23 ± 28.18	21.62 ± 25.52	0.01
General health	39.71 ± 24.3	57.03 ± 23.64	0.0001
Vitality	52.75 ± 26.33	69.59 ± 18.69	0.001
Social function	65.04 ± 27.17	82.09 ± 25.44	0.001
Role emotional	47.34 ± 41.78	69.37 ± 37.17	0.007
Mental health	61.22 ± 23.86	68.97 ± 16.5	0.116

FSD, female sexual dysfunction; NSF, normal sexual function

* Differences were analyzed using the Mann–Whitney *U* test

** Significant with logistic regression analysis ($\beta = 0.019$, $P = 0.002$)

Clinical variables

The clinical variables associated with FSD are shown in Table 8. Among the laboratory results, the values of both glucose and creatinine were significantly higher in the patients with FSD than in the patients with normal sexual function ($P < 0.05$).

Discussion

Based on the National Health and Social Life Survey scores of 1,749 women, the prevalence of FSD was reported to be 43% in the United States [5]. In two recent studies, the prevalence of FSD was found to be

Table 7 Comparison of demographic variables between patients with FSD and those with normal sexual function

	FSD	NSF	*P* value*
Age (mean + SD)	43.71 ± 11.28	36.84 ± 9.03	0.003**
Children (number + SD)	2.29 ± 1.34	1.65 ± 1.44	0.032
Education (%)			
None	27.5	13.5	
Primary school	59.4	73	0.187
High school	10.1	5.4	
University	2.9	8.1	
Occupational status (%)			
Unemployed	87	70.3	0.036
Employed	13	29.7	
Chronic diseases (%)			
Absent	53.6	70.3	0.096
Present	46.4	29.7	
Pelvic surgery (%)			
Absent	79.7	83.8	0.609
Present	20.3	16.2	
Neurological disorders (%)			
Absent	87	97.3	0.83
Present	13	2.7	
Psychological disorders (%)			
Absent	91.3	94.6	0.541
Present	8.7	5.4	
Medications (%)			
No	49.3	64.9	0.124
Yes	50.7	35.1	
Menstruation status (%)			
Menopause	40.6	21.6	0.140
Normal	43.5	59.5	
Abnormal	15.9	18.9	

FSD, female sexual dysfunction, NSF, normal sexual function

* Differences were analyzed using the Mann–Whitney *U* and Chi-squared tests

** Significant with logistic regression analysis ($\beta = -0.06$, $P = 0.01$)

Table 8 Comparison of clinical variables between patients with FSD and those with normal sexual function

	FSD	NSF	*P* value*
BMI (mean)	25.24 ± 5.19	25.43 ± 3.88	0.456
Systolic BP (mmHg)	122.1 ± 5.21	119.19 ± 17.85	0.697
Diastolic BP (mmHg)	73.32 ± 14.81	72.43 ± 11.64	0.907
Glucose (mg/dl)	108.01 ± 31.96	98 ± 45.4	0.002
Creatinine (mg/dl)	5.47 ± 9.46	2.87 ± 2.59	0.019
Hemoglobin (g/dl)	11.24 ± 1.82	11.2 ± 1.64	0.858
Cholesterol (mg/dl)	185.6 ± 46.14	167.63 ± 42.27	0.072
LDL (mg/dl)	94.43 ± 37.8	83.96 ± 35.11	0.243
HDL (mg/dl)	53.85 ± 23.47	54.55 ± 14.77	0.352
FSH (mIU/ml)	38.58 ± 58.96	24.78 ± 48.19	0.186
LH (mIU/ml)	29.76 ± 39.7	26.36 ± 35.98	0.981
PRL (mIU/ml)	57.62 ± 40.88	20.33 ± 12.84	0.227
Estradiol (pg/ml)	81.95 ± 80.35	130.29 ± 93.65	0.072
Testosterone (ng/dl)	0.5 ± 0.49	0.53 ± 0.35	0.468

BMI, body mass index; BP, blood pressure; LDL, low density lipoprotein; HDL, high density lipoprotein; FSH, follicle-stimulating hormone; LH, luteinizing hormone; PRL, prolactin; FSD, female sexual dysfunction, NSF, normal sexual function

*Differences were analyzed using the Mann–Whitney *U* test

48.3 and 46.9% in Turkish women using the FSFI questionnaire, similar to our control group [1, 6]. Sexual dysfunction is a common problem in female patients with CRF. It is primarily organic in nature and is related to uremia as well as the other risk factors that frequently accompany the disease. Toorians et al. [2] showed that the prevalence of female hypoactive sexual desire disorder was 100% in HD, 67% in PD, and 31% in Tx patients, and female sexual arousal disorder was present in 71% of HD, 50% of PD, and 26% of Tx patients. Sexual functioning and the variables affecting it were compared among these groups, and a significant difference was only observed in transplanted patients suffering less from a lack of desire for sexual activity than the other two groups.

When we compare sexual function among groups using Dunn's analysis test, the most significant FSD was found in PreD patients out of all the other groups. HD patients had a reduction in sexual desire compared with both transplant and control women. We observed that sexual desire and orgasm scales, the initiative and result of normal sexual functioning,, were the most important factors for the FSFI in our patients. Lubrication and pain were the least affected domains in the FSFI. In a comparison between control and transplanted women, no statistically significant difference was noted. Also, there was no significant difference between the FSFI scores of the PD and HD groups. Peng et al. [7] reported lower scores in all dimensions except sexual desire, comparing female HD patients with healthy volunteers. Wu et al. [8] documented that at the end of 1 year; patients on HD had significantly better sexual functioning than those on PD. However, Guan et al. [9] showed that the prevalence and severity of sexual dysfunction of the patients on HD were similar to those on PD.

Although disturbances of sexual function in women are a common feature of PreD compare with healthy women, literature regarding detailed study of FSD is limited. In our study, PreD patients had the worst FSFI scores and Tx was seemed to be the proper treatment option for the improvement of FSD. Only a few studies focused on the sexual function of the renal transplant population, and half of these studies included women who had undergone transplants in their samples [10]. Ghahramani et al. [11] demonstrated 85% of normal libido in Tx women, and Burgos et al. [12] reported that 70% of respondents described their post-transplant sexual desire as "good." Although these studies reported improvement in sexual function after Tx, problems with sexual function are prevalent. Diemont et al. [13] found a 44.4% incidence of sexual problems in women. In another study, no significant increase in sexual satisfaction was indicated after Tx, despite a significant increase in sexual desire [14].

Kidney failure and dialysis have negative effects on QoL, resulting in depression, anxiety, interpersonal stress, and marital discord [15]. The most markedly affected scales were the physical domains

of the SF-36, notably role physical and general health, while mental aspects were the least affected scales [16]. Dialysis and transplantation are the options for renal replacement therapy, and there is no simple answer to the question of which treatment modality can be expected to provide better QoL.

In our study, MCS scores were similar and no statistically significant differences were found between the control group and Tx, PreD, and dialysis patients, whereas the PCS scores of these groups were lower than that of the control group ($P < 0.05$). Using Dunn's method for pair-wise comparison; we found that the control group gave significantly higher scores on the PCS scale than all patients receiving PD ($P < 0.05$). In addition, the GH scores in the Tx group were better than those in the dialysis groups. The score change most probably reflects an alteration in uremia, improved independence, and freedom from dialysis. In a recent study, 1 year after the start of the dialysis, patients on both HD and PD reported better scores in nearly all aspects of PCS. However, patients on HD improved more on aspects of PCS than patients on PD, with greater improvements in PF and GH perceptions [8]. Dew et al. [17] examined prospective studies evaluating QoL before and after kidney transplant in a meta-analysis. They revealed that 100% of the studies described an improvement in overall QoL ratings from pre-transplant to post-transplant. About 78% of these studies found an improvement in the physical or functional domains, and 85% found improvement in the mental health domains of QoL [18].

In a previous study, the authors demonstrated that FSD was associated with lower physical functioning and mental health in HD patients. Those patients with higher sexual desire had better social functioning, signifying that the FSD and QoL often interfered with each other [7]. In the present study, the domains of the SF-36 showed significant correlations with all the FSFI scales. The only exception was mental health, and there was a significant worsening in all dimensions of the FSFI scores. , we found the role physical of the SF-36 to be significantly associated with the FSD on the logistic regression analysis.

Only a few studies were focused on FSD, and demographic variables were mentioned in 70% of them. In the literature, a significantly higher prevalence of FSD was documented in the presence of older age, a lower educational level, unemployment status, chronic disease, and menopause status [1, 6]. Peng et al. [7] confirmed that advanced age was strongly associated with FSD in the total score and each dimension. We also tried to determine possible demographic and clinical risk factors that may worsen FSD. Older age, high number of children, and unemployment were the worsening factors causing a significant difference of FSD among our patients. However, in logistic regression analysis, only the patient′s age was significantly associated with the FSD. Thus, it is reasonable to expect that with increasing age there is a deterioration in the physical performance.

Serum creatinine level is the major biochemical variable of FSD. Using multiple regression analyses of clinical data and scale scores, Fujisawa et al. [19] demonstrated that the QoL was significantly dependent on the serum level of creatinine, while Raiz et al. [10] found no correlation between creatinine level and sexual function in Tx patients. Our study confirmed that one of the important clinical factors affecting FSFI was the present serum creatinine level.

Chronic renal failure is associated with disturbances of reproductive hormones, which may impair hypothalamic–pituitary function and contribute to FSD in these patients. Amenorrhea and anovulation are commonly found in PreD women. Amenorrheic patients may have low estradiol levels that can secondarily lead to vaginal atrophy and dryness and result in discomfort during intercourse. PreD women also tend to complain of decreased libido and reduced ability to reach orgasm [20]. However, the levels of FSH, LH, prolactin, estradiol, and testosterone showed no significant correlation with FSD in our study. Although the majority of uremic women have anovulation, and the resultant infertility, most of our patients were unaware of their infertility and therefore afraid of pregnancy in the uneducated group. This may lead to decreased sexual desire. The abnormalities in ovulation can usually be reversed and successful pregnancy can be achieved in women with a well-functioning renal transplant. Therefore, successful Tx clearly seems to be the most effective means of restoring normal sexual desire in women with CRF.

A majority of CRF patients suffer from one or more chronic illnesses, such as hypertension, anemia, and atherosclerosis. Atherosclerosis is accelerated in patients with CRF, but the rapid onset of improvement of sexual function after Tx renders it unlikely that it is an important factor. Also, each of these conditions can influence QoL [2, 21]. In our survey,

parameters for evaluating atherosclerosis, such as blood pressure and cholesterol level, were not found to be the risk factors associated with FSD.

Diabetes is another common variable that affects many CRF and Tx patients [18, 21]. Previous studies showed that diabetes was associated with FSD in the dimensions of desire, orgasms, and clitoral sensation [21]. In our study, the number of diabetic patients was limited in order to make a comparison between groups; therefore, the statistical differences regarding this variable were not evaluated separately. However, among the laboratory results, the value of glucose was significantly higher in our patients with FSD than in the patients with normal sexual function ($P < 0.05$).

Conclusion

Successful Tx is the most effective way of improving FSD in CRF patients. The improvement of the FSFI score most probably reflects a change in a multitude of factors, including relief from uremia, renamed independence and freedom from dialysis, which were attributed to the successful Tx. In the present study, we observed that FSD is highly prevalent in PreD patients, and more improved in Tx patients. Additionally, we documented that when all variables were analyzed as a whole, role physical, age, value of glucose and creatinine have a significant influence on the patients' perception of their sexual function.

This preliminary progressive study warned that FSD is frequent in CRF patients; the evaluation and therapy of FSD should be a part of routine clinical assessment.

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