Sexual dysfunction (SD) is a common problem in patients with the end-stage renal disease. In contrast to SD in males, relatively little work has been performed in the field of SD in females. In this study, we tried to identify the main determinants of SD in women aged 15–45-year-old on chronic hemodialysis (HD). One hundred-forty female patients aged 15–45-year-old on chronic HD were studied in the winter of the year 2013. Healthy relatives of the patients were chosen as controls and matched for age, level of education, marital status, and income. Both cases and controls were interviewed by the same female interviewer. The Arizona Sexual Experiences Scale (ASEX) was used as a questionnaire. A significant correlation was found between the total ASEX score and age and duration on HD ($r = 0.599$, $P = 0.003$ and $r = 0.434$, $P = 0.043$, respectively). No correlation was found between serum hemoglobin, parathormone, creatinine, iron, calcium, phosphorus, and urea reduction ratio and the ASEX score. Moreover, the correlation between the ASEX score and socioeconomic parameters like level of education and monthly income was not significant (all $P >0.1$). There was a significant difference in the total ASEX score between cases and controls ($16.31 \pm 2.50$ vs. $9.80 \pm 4.21$, $P <0.001$). Our study suggests that sexual function in chronic hemodialyzed female patients is mainly impacted by age and duration on HD.

**Introduction**

Sexual dysfunction (SD) is quite common in the community, as well as among patients attending the clinics. Current figures suggest a community prevalence of 7–10% for female orgasmic disorder and 4–5% for premature ejaculation. SD is more prevalent and usually begins much earlier in patients with end-stage renal disease (ESRD) in comparison with age-matched general population. Since SD undoubtedly has a great impact on the quality of life (QoL)...
of patients with ESRD, studies addressing different aspects of this problem are necessary.\textsuperscript{3,6} In some areas of the world, particularly the Middle Eastern countries, cultural and social burdens regarding the discussion of sexual matters has an aggravating effect on this problem.

A combination of multiple factors including clinical- and treatment-related parameters such as psychosocial factors, drug side effects, hormonal, neurogenic, and vascular disease impact the sexual function in dialysis patients.\textsuperscript{4,7} Unfortunately, the extent of impact of each of these factors on sexual function has never been thoroughly investigated. SD is mutually related to depression, anxiety, and patients’ overall QoL that is why clinical investigation in this field may lead toward a better overall patient care.\textsuperscript{7,10}

This study was designed for defining independent factors for SD among female patients on maintenance hemodialysis (HD).

**Methods**

This study was designed as a case–control study. One hundred-forty female patients aged 15–45-year-old with a history of at least six months on HD, from Ghaem, Hashemi Nejad and Imam Reza Hospitals, Mashhad, Iran, were selected as cases in the winter of the year 2013. One hundred-forty healthy controls were selected from the relatives and visitors of the patients and matched for age, weight, level of education, marital status, and income. A monthly income of <400 US dollars was considered as living below the poverty line; this was the definition of the threshold level for poverty announced by the government at the time of the study. Patients with active infection, malignancy, severe heart failure, or depression were excluded from the study. About two-thirds of patients (65%) were receiving antihypertensive drugs and thus were regarded as being hypertensive; 25% of the patients were diabetic. Both cases and controls were interviewed by the same female interviewer. The Arizona Sexual Experiences Scale (ASEX) was used as the questionnaire. The ASEX was developed by McGahuey et al in the University of Arizona to evaluate psychotropic drug-induced SD.\textsuperscript{11} Initially, the scale was tested to assess SD among selective serotonin re-uptake inhibitor-treated subjects\textsuperscript{11} and subjects with ESRD.\textsuperscript{12} The ASEX is a brief 5-item questionnaire designed to measure sexual function in the following domains: sexual drive, arousal, penile erection/vaginal lubrication, ability to reach orgasm, and satisfaction with orgasm over the past week.\textsuperscript{12} Items are rated on a 6-point scale ranging from one (hyperfunction) through to six (hypofunction), providing a total score range between 5 and 30. A total score >18 or a score of five (very difficult) on any single item or any three items with individual scores of four is indicative of clinically significant SD. Data were expressed as a mean ± standard deviation. ASEX scores were compared between the two groups using Mann–Whitney U-test. The correlations between ASEX sores and continuous variables within the HD group were tested using the Spearman’s correlation coefficient test. Chi-square statistics was used for evaluating the correlation between categorical parameters such as level of education, defined as whether the patient has finished high school or not, and monthly income. A multivariate general linear analysis was used for estimating the impact of independent factors such as age, duration from the beginning of HD, serum hemoglobin (Hb), serum parathormone (PTH), serum creatinine, serum calcium, urea reduction ratio (URR), level of education, and monthly income. The Statistical Package for the Social Sciences software (SPSS version 20.0, SPSS Inc., Chicago, IL, USA) was used for data analyses. A $P <0.05$ was considered significant.

**Results**

None of the patients with SD had discussed this problem with the gynecologist, nephrologist, primary provider, or HD nurses. Duration in months from the beginning of HD was 3.78 ± 4.74. Laboratory findings of the patients included creatinine (mg/dL) of 7.88 ± 2.1, blood urea nitrogen (BUN) (mg/dL) of
Table 1. Matched demographic and social characteristics of cases and controls.

| Factor                        | Cases (chronic hemodialysis women) | Controls | P     |
|-------------------------------|-------------------------------------|----------|-------|
| Age (years)                   | 34.03±7.5                           | 31.05±8.4| >0.05 |
| Weight (kg)                   | 40±10.08                            | 42±12.10 | >0.05 |
| Married (percentiles)         | 84                                  | 80.5     | >0.05 |
| Living below the poverty line (percentiles) | 92                                      | 89       | >0.05 |
| College education or higher (percentiles) | 12                                     | 15       | >0.05 |

61.25 ± 20.29, URR of 0.65 ± 0.15, calcium (Ca) (mg/dL) of 8.45 ± 1.24, phosphorus (mg/dL) of 5.17 ± 1.40, PTH (ng/mL) of 250.18 ± 292.30, and Hb (g/dL) of 11.67 ± 1.42.

Serum iron (microgram/deciliter) was 225.91 ± 426.73 and fasting blood sugar (FBS) (mg/dL) was 87.80 ± 24.64. Demographic and social characteristics of the patients and controls are shown in Table 1. By using the standard definition of SD as proposed by the ASEX, more than 72% of patients had SD. Among the five different items of sexual function, sexual drive had the highest score indicating more SD in this parameter (Table 2). There was a significant difference in the total ASEX score between HD patients and controls (16.31±2.50 versus 9.80±4.21, P <0.001). The total ASEX score was significantly correlated with age and duration on HD (r = 0.599, P = 0.003 and r = 0.434, P = 0.043, respectively). There was no correlation between serum Hb, PTH, creatinine, Ca, and URR and the ASEX scores. Correlation of categorical parameters such as level of education, monthly income, and being diabetic or not, with ASEX scores was also not significant. Multivariate general linear analysis showed that only independent factors such as age and duration on HD had a significant impact on the ASEX score. Although diabetic and hypertensive patients had higher total ASEX score (19.31 ± 2.50 and 17.80 ± 4.21, respectively), this difference did not reach statistical significance in comparison with nondiabetic and nonhypertensive patients (both P>0.05).

### Discussion

High prevalence of SD among women on HD reaching nearly 80% has been reported by other workers.13,14 Our study showed that in women on chronic HD, age and duration on HD were both positively and significantly correlated with total sexual score. Although our study was conducted in HD patients, others have shown that the mode of renal replacement therapy has no impact on female sexual function,14 confirming that patients on HD, peritoneal dialysis, and after renal transplantation are all at higher risk of developing SD compared with healthy subjects. Association between SD and diabetes mellitus, chronic glomerulonephritis and anemia is reported by some studies,15,16 although we found no correlation between serum Hb or FBS levels and

Table 2. Mean ± standard deviation, minimum, maximum, and percentiles of the ASEX brief 5-item questionnaire in chronic hemodialyzed women.

| Item                        | Mean  | Std. Deviation | Minimum | Maximum | 25th | 50th (Median) | 75th |
|-----------------------------|-------|----------------|---------|---------|------|---------------|------|
| Sexual drive                | 3.66  | 1.016          | 2.00    | 6.00    | 3.000| 4.000         | 4.000|
| Sexual arousal              | 3.61  | 1.160          | 2.00    | 6.00    | 3.000| 4.000         | 4.000|
| Vaginal lubrication         | 3.28  | 1.544          | 1.00    | 6.00    | 2.000| 3.000         | 4.000|
| Reaching orgasm            | 3.61  | 1.39           | 1.00    | 6.00    | 3.000| 3.000         | 5.000|
| Satisfactory orgasm        | 3.28  | 1.23           | 1.00    | 6.00    | 3.000| 3.000         | 4.000|

ASEX: Arizona Sexual Experiences Scale
ASEX scores. Restless leg syndrome has also been found to correlate with ASEX scores in HD patients. However, regarding the impact of HD adequacy on SD, our finding that the URR does not have a significant effect on SD is supported by other studies. In the present study, we found that patients with SD had not discussed this problem with a gynecologist, nephrologist, primary provider, or HD nurses, which may be regarded as a marker of sexual inactivity due to lack of interest. Indeed in a study published in 2014, the authors concluded that true SD is uncommon in this population and that treatment opportunities are rare. The lack of correlation between features suggestive of socioeconomic status like monthly income or level of education with the ASEX score, seen in our study, is supported by some other studies, while it is negated by other studies. We did not assess the cultural and psychosexual factors such as level of depression and anxiety, marriage type, marital duration, husband’s age and sexual function, the time spent by the couples with each other, weekly frequency of sexual intercourse, and the number of children, other studies have addressed these parameters and shown the impact of sociocultural and psychological factors on SD in HD patients. A recent study has found no significant role of oral contraceptives in female sexual function. Identified determinants associated with improvement of sexual function after kidney transplantation in one study are decreased serum prolactin levels, age younger than 45 years, and the onset of dialysis <6 months; these findings are in concordance with our results. In one study, more than 50% of studied women reported the association between SD and age, depressive symptoms, menopause, low serum albumin, and diuretic therapy. Sexual inactivity is also important; few studies have examined the problem of the perception of sexual function among women with ESRD. Mor et al reported the reduced sexual activity among these patients (on all assessments, 81% of women reported that they were sexually inactive), which has been reported in other studies as well. The study further found that the main reasons for sexual inactivity, according to the patients, was a lack of a partner (39%) and lack of interest (43%); at least 84% of HD women in our study were married. Thus, the lack of a partner cannot be an explanation for SD in our patients although we were not able to evaluate the sexual function in husbands. Moreover, the impact of cultural barriers regarding the discussion of husbands’ sexual performance or any extramarital affairs should always be kept in mind. Regarding the effect of the underlying disease causing ESRD, no such association was seen in our study.

This study is limited by a relatively small sample size. The cutoffs used in the study are the same used in original scale, and validation of a sexual functioning questionnaire for redefining these cutoff values in different cultures or communities is probably needed.

**Conclusion**

SD was prevalent among women on chronic HD in our study. Sexual drive compared with other aspects of sexual function is more severely damaged in this group of patients. Advancing age and prolonged duration on HD have the greatest impact on the ASEX scores in women on maintenance HD.

**Conflict of interest:** None declared.

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