Prevalence of Depression and Sleep Disorders in Patients on Dialysis: A Cross-Sectional Study in Qatar

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1. Introduction

Patients with end-stage renal disease (ESRD) who are treated with dialysis experience many risks to their health-related quality of life (HRQOL), both from the myriad symptoms of ESRD itself and from the physical and mental burden of dialysis treatment. For these patients, the careful assessment of HRQOL can help guide the provision of medical management to optimize their health experience [1].

In ESRD, low quality of life (QOL) is associated with increased morbidity and mortality. The modality of renal replacement therapy may affect QOL in ESRD, although previous studies comparing QOL in patients on continuous ambulatory peritoneal dialysis (CAPD) and hemodialysis (HD) showed conflicting results [2].

It is widely accepted that ESRD patients experience various problems due to medical illness as well as psychological problems that exert a negative influence on the outcome of the disease and QOL. Anxiety and depression are the most common psychiatric disorders that coincide with renal failure [3]. Depression contributes significantly to a diminished QOL in this population and can have a negative impact on patients’ nutritional status and their compliance with dialysis treatment [4].

In patients with ESRD, sleep disorders usually present as insomnia, restless leg syndrome, obstructive sleep apnea,
syndrome, or sleep apnea-hypopnea syndrome, excessive
daytime sleepiness, narcolepsy, sleepwalking, nighttime
twisting, nightmares, rapid eye movement behavioral dis-
order, periodic limb movements in sleep, and poor con-
centration, which are sometimes ascribed to the uremic state
itself [5]. However, improvements in the uremic state by
either dialysis or renal transplant may not necessarily
ameliorate the sleep disorders. This indicates that more
complicated processes that cause sleep disorders in patients
with ESRD are not fully understood yet [6].
QOL is becoming an important outcome measure after the
initiation of renal replacement therapy. The major therapeutic
goal is to improve the functioning ability of these patients so
that they can enjoy life to their fullest. Herein, we aimed (1) to
assess the prevalence of depression and sleep disorders in
dialysis patients in Qatar for the first time and (2) to assess the
risk factors (i.e., age, sex, and comorbid conditions) correlated
with both disorders and determine which group of dialysis
patients requires more screening and therapeutic interventions
to solve these two major health issues. We hypothesized that
ESRD patients on dialysis would have disturbed QOL due to
both ESRD and dialysis and comorbidities.

2. Materials and Methods

2.1. Ethics Statements. The study was approved by our in-
stitutional review board committee of Hamad General
Hospital. All patients provided informed consent before
study participation.

2.1.1. Study Design, Setting, and Population. We conducted
a cross-sectional study in patients with ESRD who received
either HD or peritoneal dialysis (PD) at the main tertiary
dialysis unit in Doha, Qatar, which serves about 900 dialysis
patients. The inclusion criteria were patients aged 18 years or
older, those treated at an in-center dialysis clinic, and those
who received chronic maintenance HD or PD for at least 1
month. The exclusion criteria were patients younger than 18
years of age and those treated with a home-based dialysis
modality or receiving HD for acute renal failure.

2.1.2. Study Procedures and Data Collection. To address our
primary objective, we asked all participants to complete two
different validated questionnaires related to the aspects of
QOL (sleep disorders and depression) (Figure 1). As we
explained to the patients, the questionnaires are mainly used
for assessing sleep disorders. Because of the participants’
health condition and continuous visits for dialysis treatment,
we thought the questionnaire was suitable as a data col-
clection instrument since ESRD patients with multiple
comorbidities commonly complain of sleep disorders, moods
wings, and decreased daily life activity.

The following questionnaires were used to evaluate our
study objectives:

(1) The Center for Epidemiologic Studies Depression
Scale (CES-D) is a screening test for depression and
depressive disorder that consists of 20 items. A score
of 16 or more is enough for the diagnosis of
depression.

(2) The Pittsburgh Sleep Quality Index (PSQI) is an
effective instrument used to measure the quality and
patterns of sleep in adults and to differentiate the
quality of sleep (poor versus good) and its pattern in
adults. The PSQI has a sensitivity of 89.6% and a
specificity of 86.5% for identifying cases with sleep
disorders, using a cutoff score of 5 [7].

We also recorded the patients’ demographics, diagnosis,
and laboratory data including glucose, hemoglobin, albumin,
calcium, phosphate, parathyroid hormone (PTH), glycated
hemoglobin (HbA1c) levels, and adequacy of dialysis.

We measured the study participation.

To address our secondary objective, we reviewed the patient’s characteristics and laboratory and diagnostic inves-
tigations for each patient through our data system and our
quality unit. Patients’ characteristics including demographic
and nondemographic data were collected and analyzed as
follows:

(1) Demographic and clinical characteristics included
age, sex, ethnic group, nationality, smoking status,
nutritional status, dialysis adequacy (single-pool Kt/V),
type of vascular access, vintage (time on dialysis),
type of membrane in patients with PD, and
comorbidities such as the presence of diabetes, hy-
pertension, infections, hepatitis, and cardiovascular
diseases.

(2) Nondemographic characteristics included both
laboratory and diagnostic investigations. Laboratory
investigations included levels of the complete blood
count, PHT, calcium, phosphorus, HbA1c, iron,
vitamin D level, serum albumin, electrolytes, and
lipid profiles. Diagnostic investigations included
electrocardiography, echocardiography, and chest
radiography.

2.1.3. Sample Size and Sampling Technique. Patients were
enrolled in the study using a nonprobability convenience
sampling technique. The sample size was calculated using a
cross-sectional study sample size calculation technique with
a 95% confidence level and 5% margin of error [8]. The
minimum effective sample size required was 248 patients
with ESRD. The sample of the whole population of patients
with ESRD was based on the total number and distribution
of patients at the Fahad Bin Jassim Kidney Center (HD = 533
and PD = 170; total = 703). The proportions of patients with
HD and those with PD were 75.8% and 24.18%, respectively.
Thus, the numbers needed in each category based on the
calculated proportions were 223 patients with HD and 117
patients with PD.

2.2. Statistical Analysis. Continuous variables are presented
as mean ± standard deviation or median and range, and
categorical variables are presented as absolute and relevant
frequencies. To compare parametric variables between the groups, the paired T-test was used, and to compare non-parametric variables between the groups, the chi-square test was used. Multiple logistic regression analysis was performed to assess the association of several demographic and clinical characteristics with mortality in our patients. We report the adjusted odds ratios with 95% confidence intervals (CIs) herein. Analyses of the results were performed using Statistical Package for Social Sciences version 17.0 for Windows (IBM Corp., Armonk, NY). Probability values of $p < 0.05$ (two-tailed) were considered statistically significant. No missing data were reported as we used a nonprobability convenience sampling technique.

### 3. Results

3.1. **Demographic Data and Comorbidities.** In this study, 253 ESRD patients on renal replacement therapy were enrolled; 157 (62%) patients were on HD, and 96 patients were on PD (38%). Patients’ mean age was $56 \pm 14$ years. There were 137 female patients (54%) and 116 male patients (46%). Their mean weight was $76 \pm 26$ kg, and mean body mass index (BMI) was $29 \pm 7$ kg/m$^2$.

Overall, 148 (58.5%) patients had DM. The most common causes of ESRD were DM (146 patients (57%)) and hypertension (81 patients (32%)). Table 1 shows the demographic data and laboratory test results of the study population.
3.2. General Quality of Life Outcomes. One hundred twenty-two (48%) patients had depression (62 with mild depression (CES-D score ≤21) and 60 with moderate-to-severe depression (CES-D score >21)). Univariate regression analysis revealed no significant correlation between CES-D and the BMI, serum albumin level, vitamin D level, PTH level, serum calcium level, phosphate level, or Kt/V level. Two hundred twelve patients had poor sleep (PSQI score ≥5). The median PSQI score was 10 (interquartile range (IQR): 6–18). Table 1 shows the general QOL outcomes regarding depression and sleep disorders.

3.3. Quality of Life Outcomes: Diabetic versus Nondiabetic Patients. Of 253 patients, 148 (58.5%) patients had DM, and 105 (41.5%) patients did not. Seventy-eight women had poor sleep (PSQI score ≥5). The median PSQI score was 10 (IQR: 6–18). Table 1 shows the general QOL outcomes regarding depression and sleep disorders.

3.4. Quality of Life Outcomes: Peritoneal Dialysis versus Hemodialysis. Of 253 patients, there were 157 (62%) patients on HD and 96 (38%) patients on PD. Patients on HD had the same mean CES-D score as patients on PD (17.2 ± 8.8 and 16.5 ± 7.9, respectively; \( p = 0.55 \)). There was no significant difference in the prevalence of depression between patients on HD and those on PD. Forty-four patients on PD had depression (45.8%), whereas 77 patients on HD had depression (49%) \( (p = 0.6) \). Significantly more patients had poor sleep in the PD group than in the HD group (72 patients (75%) versus (vs.) 140 (89.1%), \( p = 0.003 \), as illustrated in Table 3.

3.5. Quality of Life Outcomes: Comparison of Elderly versus Young Patients. Of 253 patients, there were 121 (47.8%) elderly patients (age ≥60 years) and 132 (52.2%) young patients (age <60 years). Table 4 shows the demographic and laboratory test results between the elderly and young groups.

Sixty-five elderly patients had depression (53.7%), whereas 57 young patients had depression (43.1%) \( (p = 0.09) \). Most of our dialysis patients had poor sleep, but this was more significant in the elderly group 109 (90%) than in the young group 103 (78%) \( (p = 0.009) \), as illustrated in Table 4.

3.6. Quality of Life Outcomes: Women versus Men. Of 253 patients, there were 137 (54.1%) female patients and 116 (45.8%) male patients. Table 5 shows the demographic and laboratory test results between the female and male groups.

The CES-D score was 17 ± 8 with a depression rate of 39%. More women had depression than men (52% vs. 25%) \( (p < 0.0001 \); odds ratio: 3.27 (95% CI: 1.9–5.6), \( p < 0.0001 \)). Based on the PSQI global score, 76.5% of dialysis patients were classified as poor sleepers (women: 120 (87.6%), men: 93 (80%), \( p = 0.1 \).

We identified three factors associated with both depression and poor sleep. First, diabetic women on dialysis had more depression and poor sleep than nondiabetic women (59% vs. 40%, \( p = 0.03 \), and 92% vs. 79%, \( p = 0.02 \), respectively). Second, women on HD had more depression and poor sleep than women on PD (54% vs. 46%, \( p > 0.05 \), and 88% vs. 65%, \( p = 0.001 \), respectively). Third, women

| Table 1: Demographic and clinical data of the study population. |
|---------------------------------------------------------------|
| **Parameters (N = 253)**                                      | **Means**                               |
| Age                                                          | 56.8 ± 14.5                             |
| Gender                                                       | 116 46%                                 |
| Male                                                         | 137 54%                                 |
| Female                                                       |                                        |
| Dialysis modality                                            |                                          |
| HD                                                           | 157 62%                                 |
| PD                                                           | 96 38%                                  |
| Diabetic                                                     | 148 58.5%                               |
| Nondiabetic                                                  | 105 41.5%                               |
| BMI                                                          | 29.0 ± 7.1                              |
| Vit D                                                        | 22.7 ± 7.9                              |
| LDL                                                          | 2.6 ± 8.8                               |
| HbA1c                                                        | 6.0 ± 1.9                               |
| PTH                                                          | 447 ± 420                               |
| Calcium                                                      | 2.4 ± 0.21                              |
| Albumin                                                     | 31.3 ± 4.8                              |
| Hemoglobin                                                   | 11.0 ± 1.56                             |
| Kt/V                                                         | 1.75 ± 0.49                             |
| Depression score                                             | 16.9 ± 8.4                              |
| PSQI                                                         | 12.1 ± 7.8                              |

Lab results are presented as mean value ± standard deviation; BMI: body mass index; PSQI: Pittsburgh Sleep Quality Index; CES-D: Centre for Epidemiological Studies Depression (depression score); Kt/V: a number used to quantify hemodialysis and peritoneal dialysis treatment adequacy.

| Table 2: Comparison between diabetic and nondiabetic HD patients based on different parameters. |
|---------------------------------------------------------------|
| **Parameters**                                               | **Diabetic N = 157** | **Nondiabetic N = 105** | **P value** |
| Age                                                          | 61.7 ± 11.4          | 49.9 ± 15.7             | 0.000       |
| Gender                                                       |                      |                         |
| Male                                                         |                      |                         |
| Female                                                       |                      |                         |
| BMI                                                          | 31.0 ± 7.2           | 26.1 ± 2.2              | 0.001       |
| Vit D                                                        | 22.1 ± 7.6           | 23.5 ± 8.3              | 0.305       |
| LDL                                                          | 1.89 ± 0.68          | 3.6 ± 13.7              | 0.039       |
| HbA1c                                                        | 6.7 ± 1.7            | 4.9 ± 1.7               | 0.269       |
| PTH                                                          | 423.0 ± 404.2        | 482.6 ± 440.9           | 0.269       |
| Calcium                                                      | 2.25 ± 0.19          | 2.21 ± 0.23             | 0.009       |
| Phosphorus                                                   | 1.43 ± 0.43          | 1.55 ± 0.48             | 0.425       |
| Albumin                                                     | 31.1 ± 4.6           | 32.2 ± 4.9              | 0.647       |
| Hemoglobin                                                   | 10.9 ± 1.31          | 11.0 ± 1.8              | 0.029       |
| Kt/V                                                         | 1.7 ± 0.52           | 1.83 ± 0.44             | 0.597       |
| Depression score                                             | 17.4 ± 8.7           | 16.3 ± 8.0              | 0.216       |
| PSQI                                                         | 12.8 ± 7.9           | 11.1 ± 7.5              | 0.587       |
Depression and sleep disorders represent part of the quality of life spectrum. Our study found high prevalence of depression and sleep disorder in the dialysis population in Qatar. This finding supports the hypothesis that dialysis patients have poor quality of life. Depression has been identified as the most common psychiatric illness in patients with ESRD, but its prevalence has varied widely in different studies, in different populations, and with use of different assessment tools. In our study, depressive symptoms were reported in 48% of patients, which is similar to that in other previous studies [9, 10]. This rate is substantially higher than those found in the general population, for which the rates of depression are 3–6% [11].

The comparison between patients on HD and those on PD with regard to aspects of QOL including depressive symptoms showed some degree of controversy. In 2008, differences in QOL were compared between 77 in-center HD and 58 CAPD/PD patients, and the study concluded that patients on HD experienced more compromised QOL compared to those on CAPD/PD [12]. The same results were supported later by more recent trials [13–15]. However, some other trials concluded that depression is highly more prevalent in patients on PD than in those on HD [16]. In our study, the CES-D scores were almost similar between the HD and PD groups, which significantly minimized the impact of dialysis modality on the prevalence of depression in dialysis patients.

We found that the incidence of depression is on the rise among female patients, and this has been reported elsewhere [17, 18], especially in diabetic, HD, and elderly subgroups that may be associated with a higher risk of hospitalization and poor outcomes [19]. However, no significant differences were observed in the prevalence of depression and life event variables among male and female patients in a more recent study [20]. Therefore, more studies are still needed to clarify which sex is more susceptible to depressive symptoms in the dialysis population.

Sleep disorders also are common among patients undergoing dialysis. Although variable, their prevalence has been reported to be higher than that in the general population. Sleep disorders were reported in almost 70–80% of patients on dialysis [21, 22]. In the present study, the prevalence of sleep disorders was similar to that in previous studies, but the prevalence was higher in patients on PD than in those on HD, especially in elderly and diabetic patients.

Sleep disorders have been reported to be common in diabetic patients even in those without chronic kidney diseases, and poor diabetes control is an important factor of disturbed sleep quality [23, 24]. The main risk factor for sleep disorders is depression [16, 25], which was also found to be more prevalent in diabetic patients than in other dialysis patients in the present study. Studies have revealed that there is a bidirectional relationship between sleep disorders and diabetes: diabetes may cause sleep disorders, while sleep...
disorders may also complicate the control of diabetes [26]; and microvascular and macrovascular complications of diabetes, such as diabetic retinopathy and cardiovascular disease, respectively, have also been linked to abnormal duration of sleep [27].

In 2011, one study compared the prevalence of different sleep disorders between patients on PD and those on HD; 227 patients with ESRD were screened using questionnaires, and the results revealed that different aspects of sleep disorders were more common in patients on PD than in those on HD [28]. More recently, Lee et al. compared the incidence of sleep disorders between 7,645 incident patients on PD and 38,225 incident patients on HD, and their results showed that patients on PD had a high risk for sleep disorders compared to those on HD [29]. The results in our study support the previous findings with regard to the higher prevalence of poor sleep in patients on PD than in those on HD; this finding may be associated with general cognitive dysfunction, as demonstrated in a recent study conducted by Zhao et al. in 2019 [30]. Therefore, patients on PD should undergo more focused, regular psychiatric evaluation that targets the identification of risk factors and therapeutic measures.

Our study revealed that older patients had more severe sleep disorders than younger patients, which is consistent with findings reported in the literature [21, 31]. These findings could be explained by concurrent geriatric comorbidities in these groups of patients. Correlations between sleep disorders and sex in patients on dialysis result in some degree of debate. Some trials concluded that sex was neither significantly correlated with the presence of sleep disorders nor with their severity [32]; however, female sex was an independent predictor of patients being poor sleepers among 164 patients on HD who had been screened by Pai et al. for sleep disorders [25]. In addition, in 227 patients on HD in Saudi Arabia, poor sleep was more significant in female patients than in male patients [33]. Our results are consistent with these previous findings, which revealed the prominence of sleep disorders in female patients on dialysis. According to the statistical analysis of our data, we identified three risk factors associated with both depression and sleep disorders in female patients on dialysis: the presence of diabetes, elderly age, and the presence of HD.

5. Strengths and Limitations

The strength of this study is that it is the first to assess different aspects of QOL in a considerable number of patients on dialysis in Qatar and to compare the prevalence and severity of sleep disorders and depression in patients on HD and PD. The limitations are as follows:

(1) The patient population was predominantly Middle Eastern with no significant number of other ethnicities.

(2) Most patients had a relatively high socioeconomic level, which limits the interpretation of results to this group of patients.

(3) We did not assess the therapeutic effect of treatment even though some of the patients started medical treatment for depression and sleep disorders. Thus, we plan to follow up with these patients later in a different research study that focuses on depression and sleep disorders as the most common aspects of impaired QOL.

(4) We did not cover other aspects such as chronic pain or exercise intolerance, which may have been due to insignificant prevalence of these conditions in our patients during the initial screening.

6. Conclusions

We performed the first study that evaluated depression and sleep disorders in patients on dialysis therapy in Qatar. Both disorders were widespread among our patients on dialysis in Qatar. Thus, it is essential for healthcare professionals to recognize different aspects of poor QOL in patients on dialysis. In addition, more studies are needed to further clarify the risk factors of depression and sleep disorders and to assess the efficacy of therapeutic measures in these patients [24, 29–33].

Data Availability

All the data collected during the study are presented in this manuscript, and no data from the study have been or will be published separately. We attest that we will provide the data if requested according to the HMC policy.

Consent

All participants signed informed consent before their participation.

Conflicts of Interest

All authors declare no conflicts of interest.

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