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Evaluation of factors related to depression in peritoneal dialysis patients: a multicenter cross-sectional study

Sepehr Bazazzadeh[1], Mohammad Reza Sharbafchi[1,2], Maryam Kazemi Naeini[1,3], Sayed Mohsen Hosseini[1], Abdolamir Atapour[1] and Mojgan Mortazavi[1*]

Abstract

Background End-stage renal disease (ESRD) is serious global public health challenge in many developing countries. Treatment of ESRD is carried out through renal replacement therapy like peritoneal dialysis (PD). Depression is the most common mood disorder which has a strong impact on the quality of life in patients with ESRD. Little is known about the prevalence and risk factors of depression in peritoneal dialysis patients.

Method and materials A multicenter cross-sectional study was conducted on 164 adult ESRD patients undergoing peritoneal dialysis for at least three months who referred to the peritoneal dialysis centers of Al-Zahra, Noor & Ali Asghar hospitals, Isfahan, Iran from May to August 2019. Beck Depression Inventory Second Edition questionnaire was used to measure the symptoms of depression and its severity.

Results 43.5% of patients had some levels of depression. Assessing the association of depression with demographic and PD-related factors showed that there was no significant difference regarding age, BMI, dialysis adequacy and residual kidney function, dialysis frequency, type of dialysis solution used, disease duration, and age at the start of dialysis. Ordinal logistics regression analysis showed significant association between depression severity categories and gender (OR = 0.397, CI: 0.160–0.985, $p = 0.046$), marital status (OR = 2.983, CI: 1.180–7.541, $p = 0.021$), having a separate room for dialysis (OR = 2.511, CI: 1.108–5.692, $p = 0.027$).

Conclusion As our findings have revealed 43.5% of our participants suffered from mild-to-severe depression, we suggest careful attention and routine evaluation for depression in PD patients, especially women and single patients and those who have low socioeconomic status.

Keywords Depression, Peritoneal dialysis, Kidney failure, Chronic kidney disease

Introduction

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) are serious global public health challenges and major problems for many developing countries [1, 2]. In Iran, like other developing countries, diabetes mellitus and hypertension are the main causes of end-stage renal disease (ESRD) [3]. The incidence of ESRD in Iran is growing, from 380 per million people (pmp) in 2016

*Correspondence:
Mojgan Mortazavi
m_mortazavi@med.mui.ac.ir
[1] Isfahan University of Medical Sciences, Isfahan Kidney Diseases Research Center, Isfahan, Islamic Republic of Iran
[2] Department of Psychiatry, Isfahan university of Medical Sciences, Isfahan, Islamic Republic of Iran
[3] Isfahan University of Medical Sciences, Isfahan, Islamic Republic of Iran

with annual increase of 5–6 percent [4]. ESRD represents a persistent, progressive clinical condition in which there is an irreversible loss of endogenous renal function below a sufficient degree leading to dependence on renal replacement therapy (RRT) to avoid life-threatening uremia and other complications. Treatment of this disease is carried out through RRT including peritoneal dialysis (PD), hemodialysis (HD), or kidney transplantation (KT) [5]. KT has been accepted as the best RRT method, which contributes to the best prognosis, either regarding survival or quality of life in ESRD patients [6]. Given the high rate for KT in Iran, number of patients who undergo dialysis is less than other parts of the world [4]. However, due to the rapid increase in the prevalence of ESRD and the long waiting list for KT, most patients with ESRD would experience a period of using any of the dialysis modalities in their life. The number of patients on hemodialysis was increased from 106.7 pmp in 1991 to 179 pmp in 2006 [4]. According to the PD registry in Iran, in 2010, only 4.1 percent of ESRD patients were on PD, showing a slight increase in using PD from 0.5 percent in 2001. The average age of the patients on PD was 46.46 years [7]. In Iran, due to earlier presentation of HD (approximately 30 years ago) and KT (about 22 years ago) compared to PD which was presented only in the recent decade [8, 9], fewer studies were addressed PD and related factors.

Depression is the most common mood disorder which has a strong impact on the quality of life in patients with ESRD [10–12]. The incidence of depression in dialysis patients has been reported to be variable [13–15]. The majority of previous studies involved HD patients [11, 16–19], and those on PD are limited [15, 20]. Although patients receiving PD show better psychosocial adjustment and quality of life than those receiving HD [21], the incurability of ESRD and its long-term effects can put the patients under a very stressful condition. Such psychological stress contributes greatly to the induction of various psychological problems among PD patients, especially depression [22, 23]. Depression may negatively affect the quality of life of dialysis patients and might impact on patients' survival [24–26]. However, depression is usually left untreated in dialysis patients [24, 27].

Knowing the prevalence and risk factors of depression is necessary; however, there is little research in this regard in Iran. To address this issue, we conducted a multicenter cross-sectional study among PD patients. We aimed to determine the prevalence of depressive symptoms among PD patients, also noted the demographic and clinical characteristics associated with the prevalence and degree of depression.

Material and methods

This cross-sectional study was conducted on ESRD patients undergoing peritoneal dialysis who referred to the peritoneal dialysis centers of Al-Zahra, Noor, and Ali Asghar hospitals from May to August 2019, in Isfahan, Iran. PD patients with at least three months of treatment of peritoneal dialysis and older than 18 years of age were included in our survey. The exclusion criteria of the Study include poor cognitive status and disability for answering questions.

First, the study protocol was completely explained to the nurses of the peritoneal dialysis centers and all of the patients who were referred to these centers for 3 months from May to August 2019. Then, written informed consent was obtained from them. This study was approved by the ethical committee of the Isfahan University of Medical Science (ethical number: 1398.441, Project number: 398598). The previously trained team was responsible for visiting patients on their appointed dialysis day to complete the checklist and questionnaire. Variables including age, sex, the underlying cause of ESRD, comorbidities, duration of dialysis, the solution type that has been used for PD (dextrose and Icodextrin), residual renal function, dialysis adequacy, and hemoglobin level were collected from patients' medical documents. Residual renal function is defined as the ability of the native kidneys to evacuate water and uremic toxins, and has been assessed as urea or creatinine clearance. Dialysis adequacy was calculated based on the kt/V method that described earlier [28]. Also, patients were asked about depression using the Beck Depression Inventory Second Edition (BDI-II) questionnaire. It was used to measure the symptoms of depression and its severity in the last two weeks in our population.

Beck depression inventory second edition (BDI-II)

The BDI-II is a widely used 21-item self-report inventory measuring the severity of depression in adolescents and adults. The BDI-II was revised in 1996 to be more consistent with DSM-IV criteria for depression. Numerous studies have been provided evidence for its reliability and validity across different populations and cultural groups [29–31]. The validity and reliability of this questionnaire were conducted in the Iranian population by Rajabi and Hamidi et al. in 2012 and 2015, respectively [32, 33]. Patients were grouped as normal (BDI score = 0–13), mild (BDI score = 14–19), moderate (BDI score = 20–28), and severe (BDI score = 29–63) [34, 35].

Statistical analysis

In descriptive statistics report for qualitative variables frequency and percentage were reported, for quantitative

variables mean and standard deviation were reported and for normal distributed variables, standard deviation was also used while median and interquartile range were utilized for non-normal ones. In univariate analysis section to compare mean of variables between groups, analysis of variance (ANOVA) was used. Chi-square test was used for investigating association between categorical variables. Finally, multivariable analysis was done using multiple ordinal logistic regression model with variables selected from univariate analysis (P value < 0.2). In addition, stepwise linear regression was used to investigate variables associated with depression score. All of the statistical analysis were performed using IBM SPSS Statistics for Windows, version 20.0. (Armonk, NY: IBM Corp.). 0.05 was considered as significant level.

Results

In this cross-sectional study, we recruited 164 adult patients who were undergoing PD for at least three months. Of these, 161 have answered the questionnaire questions. The mean age of participants was 56 [17]. On average, they started PD at 35 years of age and there were 109 (99.9) months since the start of the CKD and need for RRT.

We assessed the patients regarding the severity of depression based on the Beck depression inventory score. We categorized the patients based on the scores as none or minimal depression (scores of 0–13), mild (score of 14–19), moderate (score of 20–28), severe (scores of 29–63). Tables 1 and 2 show the demographic and dialysis-related characteristics of patients by depression severity level. Only 56.5% of the enrolled patients were normal or have minimal signs of depression with mean BDI score of 6.81 (3.73) and 22.4% had mild depression (mean BDI score: 16.36 (1.62)), 14.3% had moderate level of depression (mean BDI score: 22.96 (2.51)), and 6.8% were in severe level of depression (mean BDI score: 42.27 (9.12)). Assessing the relationship between participants' characteristics and depression severity categories showed that only having a separate room for dialysis was significantly associated with their depression severity level. Our results showed that the prevalence of moderate and severe depression was higher in the patients who did not have a separate room for dialysis. Notably, there was no significant difference regarding different genders, age, marital status, BMI, dialysis adequacy and residual renal function, dialysis frequency, type of dialysis solution used, disease duration, and age at the start of dialysis (Tables 1 and 2).

To investigate the relationship between the factors affecting different levels of depression in patients undergoing peritoneal dialysis, we have included variables that had a p value of less than 0.2 from previous univariate analyzes. Therefore, gender, marital status, having a separate room for dialysis, frequency of dialysis sessions, residual kidney function, were included in an ordinal logistic regression model. As is shown in Table 3, there were significant relationships between depression severity categories and gender ($p = 0.046$), marital status ($p = 0.021$), having a separate room for dialysis ($p = 0.027$). The odds of ordered to higher level of depression is 2.51 times higher in women compared to man (OR = 2.51, CI: 1.20–6.25). Also, odds of ordered to higher level of depression in single people is 2.98 times

Table 1 Demographic characteristics of enrolled patients by the depression severity level

Variables		Total ($n = 161$)	None or minimal ($n = 91$)	Mild ($n = 36$)	Moderate ($n = 23$)	Severe ($n = 11$)	*p* value
Gender	Male	101 (66.46%)	59(64.8%)	23(63.9%)	15(65.2%)	4(36.4%)	0.318
Education	Ignorant	28 (17.39%)	15(16.5%)	8(22.2%)	5(21.7%)	0(0.0%)	0.401
	Elementary	78 (48.45%)	46(50.5%)	16(44.4%)	7(30.4%)	9(81.8%)	
	Diploma	36 (22.36)	22(24.2%)	8(22.2%)	6(26.1%)	0(0.0%)	
	University	19 (11.8%)	8(8.8%)	4(11.1%)	5(21.7%)	2(18.2%)	
Job	housewife	54 (33.54%)	30(33.0%)	11(30.6%)	6(31.6%)	7(63.6%)	0.441
	retired	33 (20.50%)	19(20.9%)	8(22.2%)	6(31.6%)	0(0.0%)	
	Self-employed	49 (30.43%)	31(34.1%)	12(33.3%)	4(21.1%)	2(18.2%)	
	Employee	10 (6.21%)	7(7.7%)	2(5.6%)	1(5.3%)	0(0.0%)	
	Unemployed & student	11 (6.83%)	4(4.4%)	3(8.3%)	2(10.5%)	2(18.2%)	
Marital status	Married	120 (74.53%)	74(81.3%)	24(66.7%)	14(60.9%)	8(72.7%)	0.129
Age		56 ± 17	58 ± 16	53 ± 17	55 ± 17	53 ± 19	0.303
BMI		24.63 ± 4.10	24.66 ± 3.99	24.49 ± 3.98	23.10 ± 4.44	25.65 ± 4.64	0.303

Table 2 Dialysis-related characteristics of enrolled patients by the depression severity level

Variables		Total (*n* = 161)	None or minimal (*n* = 91)	Mild (*n* = 36)	Moderate (*n* = 23)	Severe (*n* = 11)	*p* value
Dialysis frequency	1 or 2	13 (8.07%)	7(7.8%)	4(11.1%)	2(9.1%)	0(0.0%)	0.095
	3	66 (40.99%)	44(48.9%)	11(30.6%)	8(36.4%)	3(27.3%)	
	4	63 (39.13%)	32(35.6%)	16(44.4%)	9(40.9%)	6(54.5%)	
	5 or 6	17 (10.56%)	7(7.8%)	5(13.9%)	3(13.6%)	2(18.2%)	
Separate room (for operating the dialysis)	Yes	108 (67.08%)	70(77.8%)	21(60.6%)	10(43.5%)	7(63.6%)	0.010
Solution type	Dextrose	48 (29.81%)	25(27.8%)	14(40.0%)	8(34.8%)	1(10.0%)	0.269
	Dextrose & Icodextrin	110 (68.32%)	65(72.2%)	21(60.0%)	15(65.2%)	9(90.0%)	
Residual kidney function		1.97 (0–4.39)	*2.06(0–4.21)	3.39(0.9–5.61)	1.35(0–4.61)	0(0–0.95)	0.146
Dialysis adequacy		1.83 (1.56–2.2)	1.84(1.67–2.3.57)	1.94(1.64–2.24)	1.8(1.4–2.1)	1.83(1.55–2.2)	0.624
Hemoglobin		11.1 (9.9–12.4)	11.24 ± 1.96	10.70 ± 2.02	11.26 ± 2.16	10.62 ± 1.75	0.446
Disease duration		72 (48–144)	78(48–144)	60(36–144)	120(54–171)	72(36–141)	0.904
Age at Start of dialysis		24 (15–48)	24(14.5–48)	22(14–37)	41(16–72)	17(9.75–48)	0.599

* Median(Quartile1–Quartile3)

Table 3 Ordinal logistics model of associated characteristics of participants with depression severity levels

Variable	OR	95% CI	*P* value
Sex (Male)	2.51	1.20–6.25	0.046
Marriage (Married)	2.983	1.180–7.541	0.021
Dialysis frequency	0.846	0.507–1.411	0.552
Residual kidney function	1.002	0.857–1.172	0.977
Separate room for dialysis (Yes)	2.511	1.108–5.692	0.027

Reference category

higher than married people (OR = 2.983, CI: 1.18–7.54). Besides, odds of ordered to higher level of depression in people who did not have a separate room is 2.51 times more than patients who had a separate room for dialysis (OR = 2.511, CI: 1.10–5.69). (Table 3). Also, stepwise linear regression was used to examine the factors related to the depression score among patients, and the separate room variable was significant (regression coefficient = 4.95, *p* value = 0.021).

Discussion

Our finding revealed that 43.5% of our participants suffered from mild-to-severe depression. This finding is consistent with some previous studies that have estimated that depression occurs in 20–50% of dialysis patients [13–15, 20, 36–38]. However, some other estimates of the prevalence of depression among dialysis patients have been inconsistent. Fishbein et al. and Sacks et al. [39, 40] reported a range of point prevalence of 6–18% for major depression among patients with ESRD on dialysis therapy for at least 6 months. Variety in the diagnostic tool, depression severity, dialysis type, and population race might explain this wide range of estimation. Kim et al. investigated the characteristics of depression in continuous ambulatory peritoneal dialysis (CAPD) patients in detail and showed that 70% of patients experienced depression and a substantial number of patients experienced depression of more than moderate degree. Moreover, CAPD patients tended to have more negative thoughts about their future than the general population based on their findings [20]. While Watnic et al. represented that 44% of the patients with ESRD starting dialysis therapy had some levels of depression [38].

Comparing depression prevalence between two major method of RRT (peritoneal vs hemodialysis), Khan et al. found a depression prevalence of 71.3 to 84.9 percent in various visits of hemodialysis [41]. Moreover, reviewing literature showed a rather lower rate of depression in hemodialysis patients, ranging from 23.3 to 60.5 percent [42–47]. A recent study by Maruyama et al. showed rather similar depression scores in HD and PD patients [48]. However, it is obvious that this difference could be in part described by different depression definition and assessment methods, according to our findings the rate of depression in peritoneal and hemodialysis patients were not quite different.

Depression is the most common psychological problem in patients with ESRD and ranked fourth among disabling diseases affecting people all over the world [49]. Therefore, more attention has been paid to the impact of psychological factors on the outcome of ESRD patients recently [17, 50]. Several studies have shown a relationship between depression and mortality in dialysis patients [15, 51–53]. Analyses of factors that may affect

depression in dialysis patients, although not modifiable, may serve as targets for depression screening. These factors include genders, age, marital status, BMI, dialysis adequacy and residual renal function, dialysis frequency, type of dialysis solution used, disease duration, and age at the start of dialysis.

We found significant relationships between depression severity categories and gender, and marital status. However, Kim et al. [20] reported that there was no significant correlation between depression and demographic factors including age, gender, frequency of dialysis, and clinical parameters. These differences might arise from the cultural differences which affect single people and men more in Iranian population.

We showed that the prevalence of depression in the three groups of mild, moderate, and severe depression was higher in people who did not have a dialysis room (this may be related to the economic status of patients and there is a need to examine the socioeconomic index in this regard). Similar to our findings, Kim et al. reported that the depression in dialysis patients was well explained by objective economic status [16]. While Iran has various health policies which provide different range of coverage for catastrophic health expenditure [54], the annual average cost of peritoneal dialysis is $12,865 in Iran [55]. Thus, it is assumed that patients with low income are more likely to suffer from depression. Further studies concerning the effects of social background and economic status are required to clarify this relationship.

Strengths and limitations

We are aware of the limitations of this study. First, it is important to be aware of the predictive limitations of cross-sectional studies. Without longitudinal data, it is not possible to establish a true cause and effect relationship. Second, self-rating depression may assign somatic symptoms as indicative of the somatic symptoms of depression and thus could overestimate the prevalence of depression in PD patients.

Conclusion

As our findings have revealed 43.5% of our participants suffered from mild-to-severe depression, we conclude that all patients maintained on long-term PD therapy undergo a routine evaluation for depression, especially women and single patients and those who have low socioeconomic status. It could be performed at dialysis therapy initiation through the BDI, a simple self-administered test. Careful attention must be given to patients with evidence of clinical depression, and consideration must be given to treat patients who meet diagnostic criteria for depression. Earlier and more active treatment of depression may improve patient well-being, which may lead to an improvement in patient quality of life.

Abbreviations

ESRD	End-stage renal disease
PD	Peritoneal dialysis
CKD	Chronic kidney disease
RRT	Renal replacement therapy
KT	Kidney transplantation
HD	Hemodialysis
CAPD	Continuous ambulatory peritoneal dialysis

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Author contributions

SB, MM, and MRS researched literature and conceived the study. All authors were involved in protocol development. SMH and MKN did the data analysis. SB and MM wrote the first draft. MM revised the article. All authors reviewed and edited the manuscript and approved the final version of the manuscript.

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Availability of data and materials

Data were obtained from the peritoneal dialysis centers of Al-Zahra, Noor, and Ali Asghar hospitals. Non-digital data supporting this study are curated at Isfahan Kidney Diseases Research Center and also, they are available on request from the corresponding author, Mortazavi M. The data are not publicly available due to the privacy of research participants.

Declarations

Ethical approval and consent to participate

This study was approved by the ethical committee of the Isfahan University of Medical Science (ethical number: 1398.441, Project number: 398598). Written informed consent was obtained from the patients for their anonymized information to be published in this article.

Consent for publication

Written informed consent was obtained from the patients for their anonymized information to be published in this article.

Competing interests

The authors declare that there is no conflict of interest.

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