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Prevalence of depression in hemodialysis patients and associated risk factors: A single-center observational study in Mexico.

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Abstract

Introduction: Depression is the leading mental health problem in hemodialysis (HD) patients. Its prevalence has been estimated to range from 25% to 50%, depending on the scale used. The objective of this study was to determine the prevalence of depression in Mexican HD patients via three different scales and the risk factors associated with its development.

Methodology: A cross-sectional, analytical design was used for hemodialysis in Mexican adults with CKD. Patients were administered the BDI, CES-D, and PQH-9 depression questionnaires.

Results: A total of 210 patients were included. The overall prevalence of depression was 64.7%. The BDI scale score was 49% (mild 24.8%, moderate 14.8%, and severe 9.4%), the CES-D score was 54.8%, and the PQH-9 score was 28.1%. In the BDI and CES-D questionnaires, female sex was a risk factor for depression (OR = 2.410, 95% CI 1.365--4.265, p = 0.002 and OR = 1.995, 95% CI 1.019--3.899, p = 0.044, respectively); in the BDI and PQH-9 questionnaires, a stronger association with heart disease was observed (OR = 6.72, 95% CI 1.179--38.365, p = 0.032 and OR = 5.858, 95% CI 1.667--20.608, p = 0.006, respectively).

Conclusions: Depression and a lack of treatment affect the quality of life of HD patients. The prevalence of depression was 64.7% according to the three scales, with female sex and the presence of some heart disease as risk factors for the development of depression.

Keywords:

Depression, Hemodialysis, Chronic kidney disease

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Depression as an emotional state characterized by somatic and cognitive symptoms that include feelings of sadness, worthlessness, insomnia, loss of appetite and sexual desires and interest in habitual activities. The prevalence of depression in the general population is estimated to be 6–10% [1, 2].

Depression has been identified as a complication of multiple severe medical comorbidities, such as heart disease, cancer, cerebrovascular events, and diabetes, and is associated with deteriorated recovery and increased mortality. Since the advent of dialysis therapy for chronic kidney disease (CKD), the psychological health of patients has been a matter of concern, with depression being identified as the primary mental health problem in these patients [3, 4]. It has been shown that depressive patients with CKD on hemodialysis have a greater risk of death and hospitalization than do those without depressive symptoms, with prevalences in some series of up to 60%; however, it is difficult to estimate the real prevalence of depression in this population owing to the overlap of depressive symptoms with symptoms of uremia and the wide variety of medications used in CKD [5].

Given the wide variation in options for detecting depression and the lack of a standard evaluation tool for patients with CKD, different diagnostic tools have been proposed, the most notable of which are the Beck Depression Inventory (BDI), Center for Epidemiologic Studies Depression Scale (CES-D) and Patient Health Questionnaire (PQH-9) [6, 7].

Several studies have been conducted to evaluate the sensitivity and specificity of these scales. With the BDI scale, Watnick et al. determined a sensitivity (S) and specificity (E) of 91% and 86%, respectively, with an area under the curve (AUC) of 84% for the diagnosis of depression [8]; however, Hedayati et al. with a cutoff of 14 points, they determined S and E values of 62% and 81%, respectively, with an AUC of 77% [9]; Wang et al. used a higher cutoff point, with a cutoff of 19 points, obtaining an S value of 83% and an E value of 86%, with an AUC of 84% [10]; finally, with a 10-point cutoff, Balogun et al. established an S value of 68% and an E value of 77%, with an AUC of 73% [11].

Hedayati et al. used a score of 18 points to determine an S of 69%, with an E of 83% and an AUC of 89% for the diagnosis of depression [9]. Finally, Watnick et al. established an S and E of the PQH-9 questionnaire for the diagnosis of depression of 92% in both, with an AUC of 94% [8].

Owing to the high prevalence of depression in CKD patients undergoing HD replacement therapy, accompanied by a significant reduction in their quality of life, increased morbidity and mortality in these patients, coupled with their underdiagnosis, few studies have been carried out in Mexican patients. This highlights the importance of surveying the prevalence of depression in hemodialysis patients in a tertiary hospital within the Mexican Institute of Social Security in Mexico City.

Materials and methods

Study design

The study is observational. The source is prospective.

Stage

The study was carried out in the hemodialysis unit of the UMAE-Specialties CMN Siglo XXI "Dr. Bernardo Sepúlveda ", in Mexico City. The study period was from January 1, 2023, to May 31, 2023.

Participants

Patients older than 18 years who were undergoing standard three-week hemodialysis and met the dialysis adequacy goal (defined as Kt/V > 1.2) were included in the study.

Variables

Demographic data were collected, including age, sex, marital status, occupation, education, time in the program, hemodialysis shift, and comorbidities. Depression was measured with the BDI, CES-D, and PHQ-9 scales.

Data sources/measurements

The source was direct. The information was collected through a form. The data from the institutional medical history were collected, and depression questionnaires were carried out in the waiting room of the hemodialysis unit before admission to treatment.

Biases

Observation and selection bias were prevented by applying the participant selection criteria. The principal investigator consistently managed the data using a guide and records approved by the research protocol to avoid possible interviewer, information, and recall biases. When the standard deviation of the data was uncertain, corrections were made through onsite reviews of anomalous data. Two researchers independently analyzed each record twice, and the variables were entered into the database after confirming their agreement.

Study size

The sample was probabilistic. Mexico reported 180,000 patients in hemodialysis programs, with a 95% confidence level, an estimated depression prevalence of 15% in the general population, a 5% confidence interval, and an estimated sample size of 196 cases.

Quantitative variables

The results are presented as frequencies and percentages. Categorical variables were not converted to scale variables.

Statistical analysis

The quantitative variables are reported as the mean and standard deviation (±) or median and interquartile range 25–75 (IQR 25–75),

depending on their distribution. Categorical variables are described using frequencies and percentages. Student's t-test was used to analyze differences in means, the Mann–Whitney U test for medians, and Fisher's exact test or Pearson's $\chi 2$ test for qualitative variables, as appropriate. In analyzing risk factors, associations with depression in hemodialysis patients were examined using a logistic regression model to obtain odds ratios (ORs). For all statistical analyses, a significance level of $P < 0.05$ was used.

Results

Participants

A total of 210 patients were included, fulfilling the expected sample size.

Group description

Of the 210 patients, 102 were female (48.6%), with an average age of 50.82 ± 15.43 years. The median duration on hemodialysis was 36 months (range 60–383 months), and most of the 121 patients (68%) were on the evening shift. Eighty-two (39%) of the patients were inactive, 92 (43.8%) engaged in some work activities, and 36 (17.1%) were retired. Sixty percent of the population had a partner, while the rest were single. Seventy-six percent had basic education (preschool, primary, or secondary), 20% had higher education (preparatory, undergraduate, or graduate), and 4% were illiterate (Table 1). Among the associated comorbidities, systemic arterial hypertension was present in 123 patients (58.6%), diabetes in 79 patients (37.6%), lung disease in 13 patients (6.2%), heart disease in 12 patients (5.7%), systemic lupus erythematosus in 9 patients (4.3%), vasculitis in 4 patients (1.9%), polycystic kidney disease in 8 patients (3.8%), cancer in 6 patients (2.9%), hypothyroidism in 5 patients (2.4%), and glomerulonephritis in 4 patients (1.9%).

Prevalence of depression

The prevalence of depression with the use of the BDI scale was 49% globally, with 24.8% classified as mild, 14.8% classified as moderate, and 9.5% classified as severe. The prevalence of depression with the CES-D questionnaire was 54.8%, and that with the PQH-9 questionnaire was 28.1%. Using the scales simultaneously, a prevalence of 64.7% was presented.

Table 1. Demographic characteristics of the population based on BDI

	With depression (n:103)	Without depression (n:107)	*P*
Age	50.4±15.7	51.2 ±15.3	0.938
Time in HD (months)	30 (12-72)	36 (8-72)	0.995
Sex female	62 (60.2)	40 (37.4)	0.001
With partner	64 (62.1)	62 (57.9)	0.535
Occupation			
Pensioner	14 (13.6)	22 (20.6)	0.387
Does not work	43 (41.7)	39 (36.4)	
Works	46 (44.7)	46 (43)	
Schooling			
No education	5 (4.9)	4 (3.7)	0.034
Basic	84 (81.6)	75 (70.1)	
Advanced	14 (13.6)[a]	28 (26.2)[a]	
Hemodialysis schedule			
Morning	24 (23.3)	24 (22.4)	0.639
Evening	60 (58.3)	68 (63.6)	
Nightly	19 (18.4)	15 (14.0)	
Comorbidities			
Diabetes	41 (39.8)	38 (33.5)	0.521
HAS	60 (58.3)	63 (58.9)	0.927
Polycystic Kidney	1 (1.0)	7 (6.5)	0.035
LES	6 (5.8)	3 (2.8)	0.280
Vasculitis	1 (1.0)	8 (7.5)	0.200
Cancer	3 (2.9)	2 (2.8)	0.962
Hypothyroidism	2 (1.9)	3 (2.8)	0.682
Heart disease	10 (9.7)	2 (1.9)	0.014
Pneumopathy	9 (8.7)	4 (3.7)	0.133
GMN	2 (1.9)	2 (1.9)	0.969

Table 2. Demographic characteristics of the population based on CES-D

	With depression (n:103)	Without depression (n:107)	*P*
Age	50.90±16.11	50.72±14.64	0.920
Time in HD (months)	24 (12-60)	36 (15-72)	0.071
Sex female	66 (57.4)	36 (37.9)	0.005
With partner	64 (62.1)	62 (57.9)	0.777
Occupation			
Pensioner	11 (9.6)[a]	25 (26.3)[a]	0.006
Does not work	50 (43.5)	32 (33.7)	
Works	54 (47)	38 (40.0)	
Schooling			
No education	6 (5.2)	3(3.2)	0.478
Basic	89 (77.4)	70(73.7)	
Advanced	20 (17.4)	22(23.2)	
Hemodialysis schedule			
Morning	26 (22.6)	22 (23.2)	0.806
Evening	72 (62.8)	56 (58.9)	
Comorbidities			
With diabetes	45 (39.1)	34 (35.8)	0.619
With HAS	69 (60.0)	54 (56.8)	0.644
With vasculitis	3 (2.6)	6 (6.3)	0.187
With heart disease	8 (7.0)	4 (4.2)	0.393

Table 3. Demographic characteristics of the population based on QH-9

	With depression (n:103)	Without depression (n:107)	*P*
Age	49.95±15.72	51.16±15.35	0.748
Time on hemodialysis (months)	36 (12-84)	34 (12-72)	0.533
Sex female	33 (55.9)	69 (45.7)	0.182
With partner	36 (61.0)	90 (59.6)	0.851
Occupation			
Pensioner	8 (13.6)	28 (18.5)	0.554
Does not work	26 (44.1)	56 (37.1)	
Works	25 (42.4)	67 (44.4)	
Schooling			
No education	3 (5.1)	6 (4.0)	0.181
Basic	49 (83.1)	110 (72.8)	
Advanced	7 (11.9)	35 (23.2)	
Hemodialysis schedule			
Morning	12 (20.3)	36 (23.8)	0.805
Evening	38 (64.4)	90 (70.3)	
Comorbidities			
With diabetes	29 (49.2)	50 (33.1)	0.031
With HAS	39 (66.1)	84 (55.6)	0.166
With vasculitis	4 (6.8)	5 (3.3)	0.265
With heart disease	8 (13.6)	4 (2.6)	0.002

Table 4. Logistic regression of questionnaires.

			IC 95%		*p*
Test	**Variable**	**OR**	**Lower**	**Superior**	
BDI					
Sex		2.53	1.453	4.416	0.001
Vasculitis		0.12	0.015	0.988	0.049
Heart disease		5.65	1.206	26.428	0.028
CES-D					
Sex		2.207	1.267	3.847	0.005
Occupation Pensioner (Reference)					0.023
Does not work		3.551	1.538	8.197	0.003
Works		3.320	1.420	7.345	0.005
PQH-9					
Diabetes		1.953	1.058	3.603	0.032
Heart disease		5.765	1.665	19.956	0.006

Table 5. Multivariate logistic regression of questionnaires

			IC 95%		*p*
Test	**Variable**	**OR**	**Lower**	**Superior**	
BDI					
Sex		2.41	1.365	4.265	0.002
Vasculitis		0.112	0.012	1.031	0.053
Heart disease		6.72	1.179	38.365	0.032
CES-D					
Sex		1.994	1.019	3.899	0.044
Occupation Pensioner (Reference)					0.012
Does not work		2.257	0.876	5.815	0.092
Works		2.897	1.260	6.663	0.012
PQH-9					
Diabetes		1.974	1.054	3.697	0.034
Heart disease		5.858	1.665	20.608	0.006

BDI questionnaire

Table 1 compares the characteristics of the population with and without depression, as assessed by the BDI questionnaire. Statistical significance was shown by the variables of sex ($P = 0.001$), the presence of polycystic kidneys ($P = 0.035$), and the presence of heart disease ($P = 0.014$).

A greater prevalence of depression was observed in the female sex (60.2%) and in the group of people with work (44.7%) than in the pensioners (13.6%) and people without work (41.7%). It is also more prevalent in people with a partner (62.1%). Within the intragroup analysis, a greater prevalence of major depression was observed in the group with basic education (81.6%) than in the groups without education (4.9%) and with advanced education (13.6%). The highest prevalence of depression was observed in the evening shift group (58.3%), followed by the morning shift group (23.3%) and the night shift group (18.4%).

CES-D questionnaire

In Table 2, the characteristics of the population with and without depression were analyzed using the CES-D scale, and significant differences were detected in sex (P = 0.005) and occupation (P = 0.006) between the groups. Depression was more common in females (57.4%), people with work (47.0%), people with a partner (60.9%), those with basic education (77.4%), and those who had evening shifts in HD (62.8%). Depression was more common in people without diabetes (60.9%) than in those with diabetes (39.1%), and was more common in the group with systemic arterial hypertension (60.0%) than in the group without systemic arterial hypertension (40.0%).

Questionnaire PQH-9

In Table 3, the characteristics of the population were analyzed using the PQH-9 questionnaire, where a direct relationship with statistical significance was observed: the presence of diabetes (P = 0.031%) and heart disease (P = 0.002%).

Analysis of depression factors by the 3 questionnaires

Depression was more prevalent in women (55.9%), in the group of people without work (44.1%), in people with a partner (61.0%), in those who had only basic education (83.1%) and in those who were in the evening shift (64.4%) of HD.

Regarding the associated comorbidities, a greater prevalence of depression was observed in the group without diabetes (50.8%) than in the group with diabetes (49.2%); in the group with systemic arterial hypertension (66.1%) than in the group without systemic arterial hypertension (33.9%); and in the group without heart disease (86.4%) than in the group with heart disease (13.6%).

In the bivariate logistic regression analysis carried out with the BDI questionnaire, female sex was associated with an odds ratio (OR) of 2,533 (95% CI 1,453--4,416, P = 0.001) for the presence of depression, similar to the presence of vasculitis (OR 0.121, 95% CI 0.015--0.988, P = 0.049), and the presence of heart disease (OR 5.635, 95% CI 1.206--26.428, P = 0.028) was associated with the presence of depression (Table 4). In the multivariate analysis, these factors were found to be statistically significant (Table 5).

Table 4 shows the results of the bivariate logistic regression analysis of the CES-D questionnaire; again, the female gender OR = 2.207 (95% CI 1.267--3.847, p = 0.005), not working OR = 3.551 (95% CI 1,538--8,197, P = 0.003) and working group OR 3,320 (95% CI 1,420--7,345, P = .005%) presented a risk for the presence of depression. In the multivariate analysis, these factors were statistically significant and presented as risk factors for the development of depression (Table 5).

Table 4 shows the results of the bivariate logistic regression analysis of the PQH-9 questionnaire; an association with the presence of depression was found when the participants had HD sessions during the evening shift (OR = 1.267, 95% CI 0.595–2.296, P = 0.54), the night shift (OR = 1.267, 95% CI 0.595–2.296, P = 0.54), the presence of diabetes (OR = 1.953, 95% CI 1.058–3.603, p = 0.032), and the presence of heart disease (OR = 5.765, 95% CI 1.665–19.956, P = 0.006). According to the multivariate logistic regression analysis, these factors were statistically significant (Table 5).

Discussion

A 64.7% prevalence of depression was found in our population with the use of 3 questionnaires (BDI, CES-D and PQH-9), which are higher than those reported in the literature; this is probably related to the simultaneous use of three surveys compared with other studies where only one survey was used for the diagnosis of depression.

A prevalence of depression was observed with the use of the BDI scale, at 49%, of which 24.8% corresponded to a mild degree, 14.8% to a moderate degree, and 9.4% to a severe degree. This finding is similar to data previously reported in the Mexican literature. An example of this is found in two studies carried out in the Mexican population, where the incidence of depression was assessed via the BDI questionnaire in the HD population. The first study was carried out in Monterrey by Fuentes et al., who included a population of 223 patients and reported a prevalence of 47.1%, a figure similar to that reported in our study. Regarding the degree of depression, 19.1% of the patients had mild depression, 13.8% had moderate depression, and 14.2% had severe depression [12]. As was found in our population, a higher prevalence of mild depression was reported. In the second study carried out in the state of Coahuila by Molina et al., a prevalence of depression of 53.7% was observed with the use of the BDI scale, where 18.2% of the population presented a mild degree of depression, 20% presented a moderate degree of depression and 14.5% presented severe depression [13], with a difference of 4.7% greater than that reported in our study. A moderate degree of depression was the most common in this population; however, the small sample size was striking, with only 54 patients, which could explain the differences in the data obtained in our study.

In the study by Fuentes et al., the main risk factors associated with depression in the Monterrey population studied were receiving HD during night shifts (OR 3.0, 95% CI, 1.7–5.0, P <0.001), female sex (OR 1.95, 95% CI, 1.10–3.30, P = 0.010), receiving HD during the program 1–4 years (OR 2.65, 95% CI, 1.30–5.10, P <0.001) and HD sessions 1–2 times per week (OR 2.69, 95% CI, 1.50–4.60, p <0.001) [12]. In our study, the same questionnaire revealed that the risk factors associated with depression were female sex (OR 2,533, 95% CI 1,453–4,416, p = 0.001) and the presence of heart disease (OR 5,635, 95% CI 1,206–26.428, p = 0.028), in addition to the presence of vasculitis as a protective factor (OR 0.121, 95% CI 0.015–0.988, P = 0.049). In both studies, it was observed that the female sex is an identifiable risk factor for the development of depression in HD patients, with a risk that is twice that of males, which could be explained by multiple factors, including hormonal (estrogenic) fluctuations throughout their lives, greater externalization of symptoms than the male sex, a probable genetic predisposition and some sociocultural situations [14].

Notably, the presence of vasculitis was found to be a protective factor when the BDI survey was used. These findings have not been

previously reported; however, it has even been reported in multiple studies as a risk factor for the development of depression. This may be explained by the small number of patients with vasculitis in our population. We only counted 9 patients, of whom only one was positive for depression. However, when performing a more detailed analysis of this population and although only 11% (1 patient) presented with depression when the BDI survey was conducted, it is striking that when the CES-D and PQH-9 surveys were conducted, the diagnosis of depression increased to 44.4%, so this finding is probably biased by the size of the population and the study conducted. Therefore, we recommend not only using a survey for the diagnosis of depression but also conducting the 3 surveys simultaneously, thereby increasing the number of diagnoses in these patients.

With respect to heart disease, in our population, an association with depression was reported in up to 83% of patients with this diagnosis. Data superior to those reported in other studies, for example, Bichara et al. reported an association of depression in patients with heart disease of up to 13–37%, which can be explained by the direct effects of heart disease on the quality of life of the patients, coupled with the greater number of hospitalizations that come to present owing to decompensation of the base disease and the high costs for which their treatment chronically generates them [15].

On the other hand, with the application of the CES-D questionnaire in our population, a prevalence of depression of 54.8% was found, a higher percentage than that reported in other studies, for example, in the article published by Lopes et al. In the DOPPS II study, which included 9832 patients, a prevalence of up to 43% was found [16]. In another study by Tomita et al. involving a population of 99 HD patients, the prevalence of depression was 19.2% according to the CES-D questionnaire [17].

In our study, the risk factors for developing depression that were found with the CES-D questionnaire were female sex (OR = 2.207; 95% CI 1.267--3.847; p = 0.005), not working (OR = 3.551; 95% CI 1.538--8.197; p = 0.003) and working (OR 3.320; 95% CI 1.420--7.345; *P* = 0.005), which were greater than those of the pensioner group. The risk factor for "not working" can be explained by these patients generating a greater load of stress due to a lack of economic resources, which leads to inadequate mental health. In a different way, the group of people with "work" are subjected to stress on multiple occasions due to the workload and the time involved in moving to their HD unit several times a week, which directly affects their working hours.

With the use of the PQH-9 questionnaire, we observed a depression prevalence of 28.1% in our population, which is lower than that reported in other studies. An example of this is the study carried out by Kumar et al., which included 100 patients, reporting a prevalence of up to 78% (18); however, it is striking that, in this study, a cutoff score of 9 points was used for the diagnosis of depression, with a mean of 8.86 ± 5.48 SD compared with the 10 points used by us, the latter being recommended. In our study, the risk factors associated with depression according to the PHQ questionnaire were HD session in the evening shift OR = 1.267 (95% CI 0.595--2.296, *P* = 0.54), night shift OR = 1.267 (95% CI 0.595--2.296, *P* = 0.54), diabetes OR = 1.953 (95% CI 1.058--3.603, *P* = 0.032), and heart disease OR = 5.765 (95% CI 1.665--19.956, *P* = 0.006). The presence of depression with diabetes has already been described previously in some reports; for example, in what was published by Badescu et al., suffering from diabetes has been associated with up to three times the risk of presenting depression, mentioned as a probable cause of the psychological burden of being ill, the presence of other comorbidities, the complications that may occur and sociocultural factors [19].

In the BDI and CES-D questionnaires, a greater risk factor was observed for depression in females. Similarly, in the BDI and PQH questionnaires, a greater association with depression was observed, with the presence of heart disease being the risk factor with the most significant impact on the presence of depression.

The high prevalence of depression in patients with terminal CKD who receive HD-based treatment should alert health personnel since it is an underdiagnosed and untreated problem that directly influences adherence to treatment and quality of care. life and increased the morbidity and mortality of patients. Therefore, we recommend the application of questionnaires (BDI, CES-D and PQH) as initial and periodic evaluations in HD patients to detect some degree of depression and be able to be referred to a specialist doctor for treatment, to achieve a better quality of life, together with better adherence to treatment, and indirectly reduce morbidity and mortality in this population.

Conclusion

In patients with CKD on HD in our center, a global prevalence of depression of 64.7% is reported using the three scales already mentioned, so we suggest their simultaneous use when making the diagnosis of depression as part of the comprehensive management of patients who are found within any HD program. Greater emphasis should be placed on female patients with a history of heart disease.

Abbreviations

BDI: Beck Depression Inventory.
CES-D: depression scale from the Center for Epidemiological Studies.
CKD: Chronic kidney disease.
HD: hemodialysis.
PQH: Patient Health Questionnaire.

Supplementary information

The supplementary materials have not been declared.

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Authors' contributions

Francisco Jesús Sevilla-Jiménez: Conceptualization, methodology, research, writing - original draft, project management, supervision, validation, visualization, writing - review and edition.
Fabiola Pazos-Estrada: Conceptualization, Project management, Supervision, validation, visualization, Writing - review and edition.

Manolo Ramos Gordillo: Conceptualization, methodology, research, Writing - Original draft.
Aurora Estefania Guillen Graf: Conceptualization, methodology, research, Writing - Original draft.
All the authors read and approved the final version of the manuscript.

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Availability of data or materials
Does not apply.

Declarations

Ethics committee approval and consent to participate
The study was approved by the ethics committee of the High Specialty Medical Unit – Hospital de Especialidades CMN Siglo XXI "Dr Bernardo Sepúlveda", in Mexico.

Consent for publication
It does not apply when specific images, radiographs or photographs of patients are not published.

Conflicts of interest
The authors declare that they have no conflicts of interest.

Author information
Not declared.

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