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Diagnostic accuracy and practical utility of depression screening questionnaires across renal replacement therapy modalities

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A B S T R A C T

Background: Depression is common yet underdiagnosed in patients receiving renal replacement therapies (RRT). Several questionnaires have shown utility for depression screening, mainly among in-centre haemodialysis patients; however, no instruments have been evaluated for diagnostic accuracy in home dialysis or kidney transplant populations. This study aimed to assess the diagnostic performance of the Beck Depression Inventory–Second Edition (BDI-II), the Beck Depression Inventory–Fast Screen (BDI-FS), and the Depression Subscale of the Hospital Anxiety and Depression Scale (HADS-D) across RRT modalities and to identify the most efficient tool for clinical use.

Methods: Adult patients across RRT modalities completed the BDI-II, BDI-FS, and HADS-D, and were evaluated with the Structured Clinical Interview as the reference standard.

Results: Among the 203 included patients (mean age 67.3 years; 65% male), 18.2% met SCID-I criteria for depression. Optimal cut-offs were BDI-II $\geq$15 for in-centre haemodialysis and $\geq$ 16 for home dialysis and transplantation; BDI-FS $\geq$3 for in-centre and home dialysis and $\geq$ 4 for transplantation; and HADS-D $\geq$ 5 for in-centre haemodialysis and $\geq$ 6 for home dialysis and transplantation. Sensitivity and negative predictive values exceeded 90% for all instruments except the HADS-D, which showed lower sensitivity in transplanted (86.7%) and home dialysis patients (70%).

Conclusions: The BDI-II, BDI-FS, and HADS-D are useful for depression screening in renal populations, though the HADS-D demonstrated reduced performance in home dialysis. Standard cut-offs were inadequate, and modality-specific thresholds improved diagnostic accuracy. The BDI-FS, combining strong accuracy with brevity and ease of use, emerged as the most efficient tool for routine screening across RRT modalities.

1. Introduction

Depression affects approximately one-quarter of adults undergoing renal replacement therapy (RRT) [1] and is strongly associated with increased morbidity and mortality and poor quality of life [2–5]. However, depression frequently remains underrecognized [6], highlighting the need for effective strategies to identify major depressive disorder in routine renal care.

The gold-standard method for diagnosing depression is a psychiatric interview by a trained mental health professional [7], but this method is often too time-consuming and impractical to use in everyday practice.

To overcome these limitations, a wide variety of depression screening instruments have been applied in patients undergoing RRT; however, few questionnaires had been previously validated for this patient population. Evaluating the diagnostic performance of these instruments is particularly important, as patients with renal disease exhibit higher rates of comorbid depression and often present symptoms related to their underlying condition and treatments (e.g., fatigue, appetite changes, and sleep disturbances) that can mimic the somatic features of depression, thereby complicating accurate screening [8]. Consequently, the discriminative capacity of screening instruments and the cut-off scores identified in the general population or in other groups of patients with chronic conditions should not be automatically extrapolated to individuals with advanced kidney disease.

The Beck Depression Inventory, in its various versions, has been the most frequently used questionnaire in renal populations and is the instrument with the greatest number of validation studies available for this group [8]. The most recent version, the Beck Depression

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Inventory–Second Edition (BDI-II) [9], has been shown to be a valid screening instrument for the diagnosis of depression in dialysis patients [10–12], but this questionnaire incorporates somatic symptoms of depression that can resemble those arising from the renal condition and its treatment and it is a relatively lengthy tool (21 items) which may represent significant limitations for its use in clinical practice. Short instruments such as Depression Subscale of the Hospital Anxiety and Depression Scale (HADS-D) [13] and Beck Depression Inventory–Fast Screen (BDI-FS) [14] that minimize respondent burden (by consisting of only seven items) and exclude physical symptoms could be more suitable for depression screening in routine clinical practice [15].

The HADS-D has been evaluated against clinical interviews in two studies involving dialysis patients (including both haemodialysis and peritoneal dialysis) [16,17], showing that the tool performs well as a screening instrument when a cut-off lower than the standard recommendation is applied.

The BDI-FS, a shorter version of the BDI-II specifically developed for patients with chronic physical diseases, has shown promising evidence of performing well in renal patients when the BDI-II is used as a reference [15, 18, 19]. However, its diagnostic accuracy when compared with a structured clinical interview (considered the gold standard for depression diagnosis) has not yet been established.

It is important to note that all studies analyzing the diagnostic performance of the BDI-II, BDI-FS, and HADS-D in renal patients undergoing RRT have been conducted primarily in haemodialysis populations [10–12,15–18], and none have been carried out exclusively in patients receiving home dialysis (home haemodialysis or peritoneal dialysis) or in kidney transplant recipients. This highlights important knowledge gaps [20], as it remains unknown whether the performance of these instruments is comparable across renal patient populations with other treatment modalities that differ substantially in their clinical profiles, symptom burden, and patterns of care. In particular, patients receiving home-based therapies or kidney transplantation tend to be younger, have higher educational levels, and present lower comorbidity, whereas patients undergoing in-center haemodialysis often experience greater fatigue, more sleep-related problems, and higher treatment-related demands due to rigid dialysis schedules and dietary and fluid restrictions.

The aim of this study was to compare the diagnostic accuracy and propose the optimal cut-off values of the BDI-II, BDI-FS, and HADS-D for screening major depressive disorder across each RRT modality, in order to identify the most efficient instrument for routine clinical implementation.

2. Methods

2.1. Participants

An observational, cross-sectional, multicentre study was conducted involving chronic kidney patients undergoing in centre-haemodialysis, home dialysis or transplantation from four healthcare centres in Spain. The inclusion criteria for the study were age 18 years or older, have received the same modality of RRT during the last three months, and literacy in Spanish. Exclusion criteria were patients with a psychiatric diagnosis of severe mental disorder or dementia, patients on palliative dialysis, patients with combined kidney and other organ transplants, and patients with physical or mental limitations at the time of assessment that prevented them from completing the questionnaires or conducting the clinical interview.

2.2. Measures

Sociodemographic data sheet collects information on age, sex, marital status, education, socio-economic level reported by the patient and smoking status.

Clinical data sheet collects information on the type of RRT, body mass index (BMI), length of time on current RRT modality, number of previous transplants, and serum concentrations of hematocrit (%), hemoglobin (g/dL) and albumin (g/dL). Information on comorbidity was also collected using the modified Charlson Comorbidity Index [21].

The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders Axis 1 Disorder (SCID-I) [22] Spanish version [23] is a semi-structured interview designed to verify in a standardised way the compliance with the diagnostic criteria of Diagnostic and Statistical Manual of Mental Disorders. In this study, module A was used to assess compliance with the diagnostic criteria for major depressive episode. The remaining modules were not applied because they assess disorders beyond the scope of the present study and may increase participant burden.

The BDI-II Spanish version [24] consists of 21 items. For each item, the patient must respond to different depressive symptoms (somatic and cognitive-affective) experienced during the last two weeks on a severity scale of 0 to 3 points. The total score ranges from 0 to 63, with higher values corresponding to greater severity of depressive symptoms.

The BDI-FS Spanish version [25] includes seven non-somatic symptoms from the BDI-II. As in the BDI-II, the patient responds to each item on a severity scale from 0 to 3 (higher scores indicate greater depressive symptomatology).

The HADS-D Spanish version [26] comprises seven items that evaluate non-somatic symptoms of depression. For each item, patients respond by referring to the previous week on a 4-point scale ranging from 0 (never) to 3 (almost all the time). The score ranges from 0 to 21, with a higher score indicating greater depressive symptoms.

2.3. Procedure

The nephrologist treating each patient selected participants based on the criteria established for inclusion in the study. The recruitment period extended from August 2022 to October 2023. For those patients who agreed to participate, the nephrologist completed the clinical data sheet with the information recorded in the patient's medical history. The BDI-II, BDI-FS and HADS-D were then administered by nursing staff. To control for overlapping items, the BDI-II and BDI-FS were administered in a counterbalanced order at the start and end of each assessment. For patients on in-centre HD and home haemodialysis, the questionnaires were completed during the HD session at the hospital. For peritoneal dialysis patients and transplant patients, the time of the assessment was agreed with the patients.

A psychologist collected sociodemographic data and administered the SCID-I to all patients within one week of completing the other questionnaires. The psychologist was blinded to the patients' medical histories and questionnaire scores. Depression was considered to be present when the patient fulfilled diagnostic criteria for depression as assessed by the SCID-I during the interview conducted by the psychologist.

All participants gave their written informed consent for inclusion. The study was conducted in accordance with the Declaration of Helsinki and the Declaration of Istanbul, and the protocol was approved by the Comité de Ética de la Investigación de Santiago-Lugo (registration code 2021/316).

2.4. Statistical analysis

Quantitative variables were expressed as mean, standard deviation, and range, while categorical variables were expressed as frequency and percentage. Differences between the three types of RRT were analysed in sociodemographic and clinical variables using the χ^2 test for categorical variables and one-way ANOVA or the Kruskal-Wallis test for quantitative variables according to the distribution determined by the Kolmogorov-Smirnov normality test.

The discrimination power of the BDI-II, BDI-FS, and HADS-D questionnaires was estimated by analyzing the Receiver Operating Characteristic (ROC) using compliance with the depression criteria according

to the SCID-I as the reference criterion. Areas under the ROC curve (AUC) ≥ 0.75 would represent good discrimination [27]. The statistical significance of the difference between the AUC of the three questionnaires was analysed using the method described by DeLong et al. [28].

Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), Youden's index, and Kappa concordance index were calculated for different cut-off points of the questionnaires for each treatment type (in-centre HD, home dialysis, and transplantation). A sensitivity and specificity above 70% were considered acceptable and we considered an NVP ≥ 90% given the importance of reducing the number of false negatives [29]. The cut-off point associate with the above criteria and the highest Youden index (to optimize the balance between sensitivity and specificity) was considered to be the threshold. Agreement between the BDI-II, BDI-FS, HADS-D and SCID-I was measured using the Kappa coefficient, and values between 0.40 and 0.59 were considered acceptable, values between 0.60 and 0.74 were considered good, and values above 0.75 were considered excellent [30].

Data were analysed using IBM SPSS Statistics for Windows (version 29) software, considering a p-value <0.05 as statistically significant.

3. Results

Of the 211 patients eligible for the study, five declined to participate and three were excluded for different reasons Therefore, the sample included 203 patients, of whom 65 (32%) were on in-centre haemodialysis; 59 (29.1%) were on home dialysis (16 on home haemodialysis, 43 on peritoneal dialysis); and 79 (38.9%) were transplant recipients (67 from cadaveric donors and 12 from living donors).

In the whole group the mean age was 63.7 years (range 25–88), 65% were men and the average duration of current RRT was 82.1 months (range 3–548). The sociodemographic and clinical characteristics of the sample are shown in Table 1. When comparing the three RRT modalities differences were found in age ($p = 0.002$), marital status ($p = 0.039$), level of education completed ($p = 0.024$), time in current RRT ($p < 0.001$) and comorbidity ($p < 0.001$). Regarding biochemical parameters, differences were found in hematocrit, hemoglobin and albumin ($p < 0.001$ for all comparisons).

A total of 37 (18.2%) had depression according the SCID-I criterion, 12 (18.5%) undergoing in-centre haemodialysis, 10 (16.9%) in home dialysis and 15 (19%) in transplant.

In the group of in-centre haemodialysis ($n = 65$) the diagnostic performance of the three questionnaires was high (AUC = 0.963; 95% CI 0.916–1.010 for BDI-II; AUC = 0.883, 95% CI 0.743–1.023 for BDI-FS and AUC = 0.910; 95% CI 0.832–0.989 for HADS-D) (Fig. 1). No significant differences were found when comparing the area under the ROC curve of the BDI-II with the BDI-FS ($Z = 1.449$; $p = 0.147$) and with the HADS-D ($Z = 1.440$; $p = 0.150$). The area under the ROC curve of the BDI-FS and HADS-D was also not statistically different ($Z = -0.386$; $p = 0.699$).

According to the previously defined criteria, the optimal cut-off values were ≥ 15 for the BDI-II (sensitivity 91.7%, specificity 88.7%, PPV 64.7%, NPV 97.9%), ≥ 3 for the BDI-FS (sensitivity 91.7%, specificity 77.4%, PPV 47.8%, NPV 97.6%) and ≥ 5 for the HADS-D (sensitivity 91.7%, specificity 71.7%, PPV 42.3%, NPV 97.4%). The agreement between these cutoff and SCID-I diagnosis was good for BDI-II (kappa = 0.692) and acceptable for BDI-FS (Kappa = 0.510) and

Table 1
Sociodemographic and clinical characteristics in patients undergoing different modalities of renal replacement therapy.

Variable	Total ($N = 203$)	In-centre haemodialysis ($n = 65$)	Home dialysis ($n = 59$)	Renal transplant ($n = 79$)	p
Age (years)					
	63.7 ± 12.3 (25–88)	66.5 ± 11.6 (38–88)	65.7 ± 11.6 (36–86)	59.9 ± 12.5 (25–83)	0.002
Sex n (%)					0.982
Men	132 (65.0)	42 (64.6)	38 (64.4)	52 (65.8)	
Women	71 (35.0)	23 (35.4)	21 (35.6)	27 (34.2)	
Marital status n (%)					0.039
Single/separated or divorced/widowed	66 (32.5)	29 (44.6)	15 (25.4)	22 (27.8)	
Married or living with a stable partner	137 (67.5)	36 (55.4)	44 (74.6)	57 (72.2)	
Education n (%)					0.024
None/primary	117 (57.6)	45 (69.2)	35 (59.3)	37 (46.8)	
Secondary/university	86 (42.4)	20 (30.8)	24 (40.7)	42 (53.2)	
Socio-economic level n (%)					0.661
Low/medium-low	71 (35.0)	20 (30.8)	21 (35.6)	30 (38.0)	
Medium/medium-high/high	132 (65.0)	45 (69.2)	38 (64.4)	49 (62.0)	
Body mass index [a] n (%)					0.905
Underweight (< 18.5)	4 (2.0)	2 (3.2)	1 (1.7)	1 (1.3)	
Normal weight (18.5–24.9)	68 (34.2)	22 (35.5)	19 (32.2)	27 (34.6)	
Overweight or obesity (≥ 25.0)	127 (63.8)	38 (61.3)	39 (66.1)	50 (64.1)	
Smoking status n (%)					0.056
Non-smoker/ex-smoker	183 (90.1)	55 (84.6)	52 (88.1)	76 (96.2)	
Smoker	20 (9.9)	10 (15.4)	7 (11.9)	3 (3.8)	
Months in current renal replacement therapy	82.1 ± 94.8 (3–548)	63.4 ± 66.5 (3–318)	27.2 ± 23.8 (3–102)	138.5 ± 115.9 (8–548)	< 0.001
Comorbidity index [b]	5.3 ± 2.2 (2–13)	6.0 ± 2.3 (2–13)	5.9 ± 2.1 (2–10)	4.4 ± 1.8 (2–12)	< 0.001
Previous kidney transplants n (%)					0.554
None	159 (78.3)	48 (73.8)	48 (81.4)	63 (79.7)	
≥ 1	44 (21.7)	17 (26.2)	11 (18.6)	16 (20.3)	
Hematocrit (%)	37.0 ± 5.3 (20.3–58.3)	35.0 ± 3.3 (28.3–42.4)	34.2 ± 4.5 (20.3–42.8)	40.8 ± 5.1 (28.6–58.3)	< 0.001
Hemoglobin (g/dl)	12.1 ± 1.7 (7.0–19.3)	11.4 ± 1.0 (9.4–13.6)	11.3 ± 1.5 (7.0–14.4)	13.2 ± 1.7 (9.3–19.3)	< 0.001
Albumin (g/dl)	4.1 ± 0.4 (2.8–5.2)	3.9 ± 0.3 (3.0–4.5)	3.8 ± 0.4 (2.8–4.7)	4.3 ± 0.3 (3.5–5.2)	< 0.001

Note. Data are presented as M ± SD (range) except specification.
[a] Patients with BMI < 18.5 were not included in the comparison due to the small number of patients ($n = 4$).
[b] Modified Charlson Comorbidity Index [21].

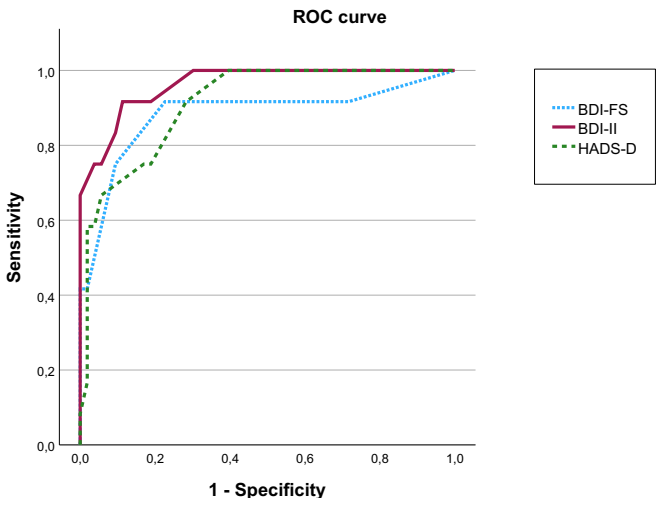

Fig. 1. ROC curves of BDI-II, BDI-FS, and HADS-D scores in patients undergoing in-centre haemodialysis, using SCID-I as a reference.

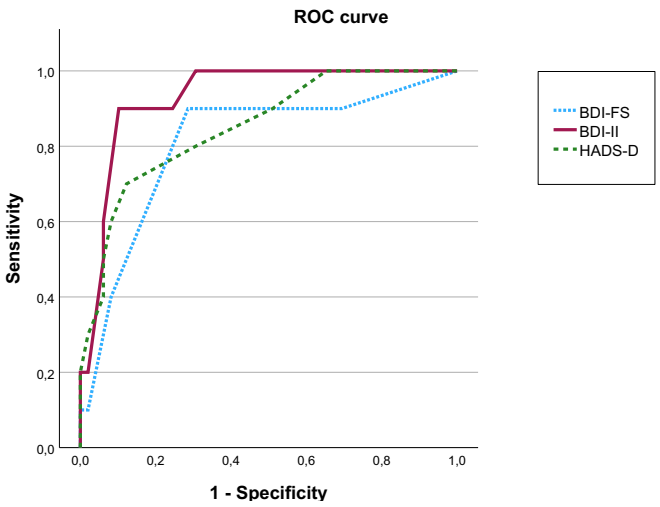

Fig. 2. ROC curves of BDI-II, BDI-FS, and HADS-D scores in home dialysis patients, using SCID-I as a reference.

HADS-D (kappa = 0.437) (Table 2).

In the group of patients in home dialysis ($n = 59$) the discriminative capacity was good for the BDI-II (AUC = 0.930; 95% CI 0.861–0.998), for the BDI-FS (AUC = 0.808; 95% CI 0.644–0.972) and for HADS-D (AUC = 0.851; 95% CI 0.719–0.983 the HADS-D) (Fig. 2). The difference between the areas under the ROC curves of the three instruments was not statistically significant (BDI-II vs. BDI-FS Z = 1.955; $p = 0.051$; BDI-II vs. HADS-D Z = 1.311; $p = 0.190$; and BDI-FS vs. HADS-D Z = −0.581; $p = 0.561$).

Based on previously defined criteria, the optimal cut-off points were ≥ 16 for the BDI-II (sensitivity 90%, specificity 89.8%, PPV 64.3%, NPV 97.8%), ≥ 3 for the BDI-FS (sensitivity 90%, specificity 71.4, PPV 39.1%, NPV 97.2%) and ≥ 6 for HADS-D (sensitivity 70%, specificity 87.8%, PPV 53.8%, NPV 93.5%). The agreement between these cut-off points and SCID-I diagnosis was good for BDI-II (Kappa = 0.688) and acceptable for BDI-FS (kappa = 0.405) and HADS-D (kappa = 0.516) (Table 3).

In the group of kidney transplant patients ($n = 79$) the three questionnaires showed high diagnostic performance (AUC = 0.999; 95% CI 0.996–1.001 for the BDI-II; AUC = 0.958; 95% CI 0.909–1.007 for the BDI-FS; and AUC = 0.934 (95% CI 0.867–1.001 for HADS-D) (Fig. 3). The results of the comparison of the areas under the ROC curves of the three questionnaires did not reveal statistically significant differences (BDI-II vs. BDI-FS Z = 1.643; $p = 0.100$; BDI-II vs. HADS-D Z = 1.879; $p = 0.060$; and BDI-FS vs. HADS-D Z = 0.703; $p = 0.482$).

Based on previously defined criteria, the optimal cut-off values for the BDI-II were ≥ 16 (sensitivity 100%, specificity 98.4, PPV 93.7%, NPV 100%), ≥ 4 for the BDI-FS (sensitivity 93.3%, specificity 92.2%, PPV 73.7%, NPV 98.3%), ≥ 6 for the HADS-D (sensitivity 93.3%, specificity 76.6%, PPV 48.3%, NPV 98%). The agreement between these cut-off points and SCID-I diagnosis was excellent for BDI-II (Kappa = 0.960) and BDI-FS (kappa = 0.776) and acceptable for HADS-D (kappa = 0.590) (Table 4).

4. Discussion

Given the high prevalence of depression among renal patients across all modalities of RRT and its association with poor health outcomes [1–5], depression screening has become a high priority in the clinical care of these patient populations. This requires the availability of screening instruments with good diagnostic accuracy, in which an optimal threshold can be established to allow their use as reliable screening tools for each population in which they are applied. In addition, the questionnaires need to be brief and easy to administer so that they can be incorporated into routine clinical practice.

The BDI-II was the questionnaire that demonstrated the highest diagnostic accuracy in renal patients across all RRT modalities when compared with the psychiatric interview. Our results in patients undergoing in-centre haemodialysis are consistent with previous studies [10–12]. To the best of our knowledge, this is the first study to

Table 2
Diagnostic performance indices for different cut-off points of the BDI-II, BDI-FS, and HADS-D in patients undergoing in-centre haemodialysis, using the SCID-I as a reference.

Instrument	Cut-off point	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Youden Index	Kappa
BDI-II							
	≥ 14	91.7	81.1	52.4	97.7	0.728	0.564
	≥ 15	91.7	88.7	64.7	97.9	0.803	0.692
	≥ 16	83.3	90.6	66.7	96.0	0.739	0.674
	≥ 17	75.0	94.3	75.0	94.3	0.693	0.693
	≥ 19	75.0	96.2	81.8	94.4	0.712	0.736
BDI-FS							
	≥ 3	91.7	77.4	47.8	97.6	0.690	0.510
	≥ 4	75.0	90.6	64.3	94.1	0.656	0.616
HADS-D							
	≥ 5	91.7	71.7	42.3	97.4	0.634	0.437
	≥ 6	75.0	81.1	47.4	93.5	0.561	0.458
	≥ 7	75.0	83.0	50.0	93.6	0.580	0.486

Note. BDI-II = Beck Depression Inventory-Second Edition; BDI-FS = Beck Depression Inventory-Fast Screen; HADS-D = Hospital Anxiety and Depression Scale-Depression subscale; NPV = Negative Predictive Value; PPV = Positive Predictive Value.

Table 3
Diagnostic performance indices for different cut-off points of the BDI-II, BDI-FS, and HADS-D in home dialysis patients, using the SCID-I as a reference.

Instrument	Cut-off point	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Youden Index	Kappa
BDI-II							
	≥ 12	90.0	75.5	42.9	97.4	0.655	0.456
	≥ 13	90.0	81.6	50.0	97.6	0.716	0.543
	≥ 14	90.0	85.7	56.2	97.7	0.757	0.611
	≥ 15	90.0	87.8	60.0	97.7	0.778	0.649
	≥ 16	90.0	89.8	64.3	97.8	0.798	0.688
BDI-FS							
	≥ 3	90.0	71.4	39.1	97.2	0.614	0.405
	≥ 4	60.0	83.7	42.8	91.9	0.437	0.377
HADS-D							
	≥ 6	70.0	87.8	53.8	93.5	0.578	0.516

Note. BDI-II = Beck Depression Inventory-Second Edition; BDI-FS = Beck Depression Inventory-Fast Screen; HADS-D = Hospital Anxiety and Depression Scale-Depression subscale; NPV = Negative Predictive Value; PPV = Positive Predictive Value.

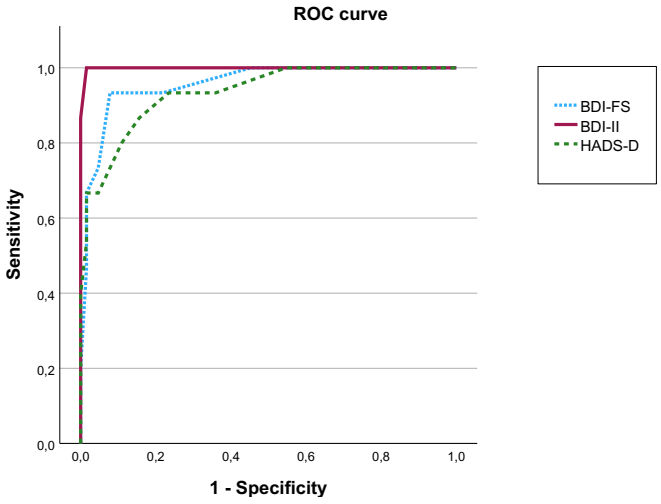

Fig. 3. ROC curves for BDI-II, BDI-FS, and HADS-D scores in kidney transplant patients, using SCID-I as a reference.

determine the diagnostic accuracy of this questionnaire specifically in patients on home dialysis and kidney transplantation, finding that the BDI-II has excellent discriminative ability in both modalities and reliably identifies patients with depression in these populations. It is worth noting that in all RRT modalities, the identified optimal cut-off scores (BDI-II ≥ 15 for in-centre HD and BDI-II ≥ 16 for home dialysis and transplant) are higher than the cut-off of 14 recommended in the general population [9]. This supports the notion that the BDI-II may capture somatic symptoms of depression—such as sleep disturbances, appetite and weight changes, and fatigue—that often overlap with those caused by chronic illness and its treatment and might not be attributable to a depressive disorder. Therefore, higher thresholds are necessary for a more accurate detection of patients with depression in all treatment types, avoiding a high rate of false positives.

The BDI-FS also showed good discriminative ability between patients with and without depression across all RRT modalities. According to the available literature, this is the first study to assess the diagnostic accuracy of the BDI-FS against a structured psychiatric interview in renal patients. A cut-off point BDI-FS ≥ 3 identified patients with depression with high sensitivity and a high negative predictive value both in patients receiving in centre-haemodialysis or home dialysis. This threshold is slightly lower than that proposed by the original authors of the questionnaire (BDI-FS ≥ 4); however, this is in line with the cut-off identified in another independently studied sample of dialysis in which the diagnostic accuracy of the BDI-FS was tested using the BDI-II as the reference standard [15]. In the group of kidney transplant recipients, the most appropriate cut-off point was BDI-FS ≥ 4, which aligns with the threshold established by the original authors [14].

Our results demonstrate that the HADS-D is a useful screening instrument for depression in patients undergoing in-centre dialysis, consistent with previous studies [16,17], but in our sample, the optimal cut-off for in-centre dialysis patients was HADS-D ≥ 5, which is lower than the thresholds reported in these previous research (HADS-D ≥ 6/7). For patients receiving home dialysis and kidney transplant recipients,

Table 4
Diagnostic performance indices for different cut-off points of the BDI-II, BDI-FS, and HADS-D in kidney transplant patients, using the SCID-I as a reference.

Instrument	Cut-off point	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Youden Index	Kappa
BDI-II							
	≥ 11	100	75.0	48.4	100	0.750	0.533
	≥ 12	100	78.1	51.7	100	0.781	0.576
	≥ 13	100	84.4	60.0	100	0.844	0.672
	≥ 14	100	87.5	65.2	100	0.875	0.727
	≥ 15	100	92.2	75.0	100	0.922	0.818
	≥ 16	100	98.4	93.7	100	0.984	0.960
	≥ 17	86.7	100	100	97.0	0.867	0.913
	≥ 18	80.0	100	100	95.5	0.800	0.866
	≥ 19	73.3	100	100	94.1	0.733	0.817
BDI-FS							
	≥ 3	93.3	78.1	50.0	98.0	0.715	0.537
	≥ 4	93.3	92.2	73.7	98.3	0.855	0.776
	≥ 5	73.3	95.3	78.6	93.8	0.686	0.704
HADS-D							
	≥ 5	93.3	76.6	48.3	98.0	0.699	0.515
	≥ 6	86.7	84.4	56.5	96.4	0.710	0.590
	≥ 7	80.0	89.1	63.2	95.0	0.691	0.627

Note. BDI-II = Beck Depression Inventory-Second Edition; BDI-FS = Beck Depression Inventory-Fast Screen; HADS-D = Hospital Anxiety and Depression Scale-Depression subscale; NPV = Negative Predictive Value; PPV = Positive Predictive Value.

the optimal cut-off was HADS-D ≥ 6. It is worth noting, however, that in both populations the sensitivity of the HADS-D was lower than that observed for the BDI-II and BDI-FS, particularly in home dialysis patients (sensitivity = 70%), indicating a lower capacity of this instrument to accurately identify cases of depression in this RRT modality. To our knowledge, no prior studies have assessed the diagnostic performance of the HADS-D in home dialysis or kidney transplant patients, preventing direct comparison of these findings with previous data.

It must be emphasized that the optimal cut-off scores identified in the HADS-D for patients in all RRT modalities are markedly lower than those recommended for use in general medical populations by the questionnaire's authors (HADS-D $\geq$ 8) [13], and the most commonly used threshold in both dialysis and kidney transplant patients [31,32], Using cut-off points that are not appropriate for the population in which the questionnaire is applied may result in inaccuracies in screening, errors in prevalence estimates, or limitations in the assessment of treatment effects when depression estimated by the HADS-D was used as an outcome variable.

Considering diagnostic accuracy of the three questionnaires, including sensitivity, specificity, NPV and PPV, the BDI-II was the most accurate instrument for detecting depression across all RRT modalities, but it is relatively lengthy for use in routine clinical practice. Among the shorter questionnaires, the BDI-FS showed diagnostic performance indices close to those of the BDI-II across all RRT modalities, whereas the HADS-D performed lower than the BDI-II and BDI-FS in sensitivity in home dialysis. Moreover, the BDI-FS is easier to complete and score than the HADS-D, as some items do not require reverse scoring, and it has greater readability [33]. Importantly, it also identifies patients at risk of suicide [14]. Given the high suicide rates among dialysis patients [34] this feature allows efficient screening for suicidal ideation without adding extra burden to patients or healthcare providers. Taking into account all these factors together, the BDI-FS could be regarded as the preferred alternative to both the BDI-II and the HADS-D for routine depression screening in clinical practice across all RRT modalities.

It is important to note that this study was limited to the comparison of three questionnaires. The BDI-II was included because it is by far the most widely researched and commonly used instrument in epidemiological studies and intervention trials among patients undergoing RRT [8]. The HADS-D and BDI-FS were included as potential alternatives to the BDI-II in clinical practice, as they are brief, easy-to-administer tools that focus only on cognitive-affective symptoms, thereby overcoming some of the limitations of the BDI-II, which is relatively long and includes somatic items. Other instruments, such as the Patient Health Questionnaire (PHQ-9) [35], are also commonly used in renal populations; however, because it contains somatic items that may overlap with symptoms of renal disease and its treatment, it was not the focus of this study. Nevertheless, given its brevity and public availability, future research could explore the diagnostic accuracy of the PHQ-9 in different modalities of RRT.

This study has several limitations. First, the small sample size may limit the precision of the estimates of diagnostic performance indices. In addition, the findings were obtained from Spanish patients on RRT, and the generalizability of these results to populations from other countries or cultures, or to patients with chronic kidney disease not undergoing renal replacement therapy, remains to be tested. Finally, with respect to the BDI-II and BDI-FS, it should be noted that these are copyrighted instruments and require payment for use, which may limit their integration into routine clinical practice; nevertheless, the BDI-FS may still be a useful tool due to its brevity, demonstrated diagnostic accuracy, and clinical utility as a rapid screening tool.

This study also has significant strengths. Of particular importance that the diagnostic precision of instruments were validated against a clinical interview based on DSM criteria, considered the gold standard. The clinician conducting the interviews was blinded to both questionnaire results and psychological records from medical charts, and interviews were performed face-to-face with minimal delay from questionnaire administration, which ensures greater reliability of the results. In addition, the multicentre design, high participation rate, and inclusion of diverse RRT modalities (including the rarely studied home haemodialysis) provide a highly representative sample of the population undergoing RRT in routine clinical practice.

In conclusion, the BDI-II, BDI-FS, and HADS-D are useful for detecting clinical depression in renal patients across all treatment modalities, provided that cut-off points specifically designed for these patient populations—distinct from conventional standards—are applied. Although the BDI-FS has been scarcely used in the renal patient population undergoing RRT (in contrast to the BDI-II and HADS-D which are the most commonly used), it may be the most suitable tool for depression screening. Its brevity and ease of use facilitate systematic screening at initiation of care and every 6–12 months thereafter, following the screening schedule proposed by Gregg et al. [36]. This could be considered the first step in a stepped approach, leading to clinical assessment for diagnostic confirmation and, when appropriate, initiation of treatment. By enabling early detection, this approach may improve psychological well-being, potentially reduce morbidity and mortality, and enhance quality of life across all RRT modalities.

Author contribution

Isabel Vázquez was responsible for the conceptualization, design, and planning of the study, contributed to the statistical design, analysis, and interpretation of the data, supervised and directed the entire project, and wrote the manuscript.

Lorena García-Becerra conducted the administration of the diagnostic interview, managed the project data, and participated in the analysis and interpretation of the results. Jesús Calviño, Pablo Bouza, Pablo Otero and María Dolores Arza collected the clinical data and reviewed the manuscript. Ángel Salgado designed and performed the statistical analysis and reviewed the manuscript. All authors approved the final version of the manuscript.

CRediT authorship contribution statement

Isabel Vázquez: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Formal analysis, Conceptualization. **Lorena García-Becerra:** Methodology, Funding acquisition, Formal analysis, Data curation. **Jesús Calviño:** Methodology, Data curation. **Pablo Bouza:** Methodology, Data curation. **Pablo Otero-Alonso:** Data curation. **Mª. Dolores Arza:** Data curation. **Ángel Salgado:** Methodology, Formal analysis, Data curation.

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Declaration of competing interest

The authors declare that they have no conflicts of interest related to this study.

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Data availability

The datasets used during the current study are available from the corresponding author on reasonable request.

References

[1] S. Palmer, M. Vecchio, J.C. Craig, M. Tonelli, D.W. Johnson, A. Nicolucci, et al., Prevalence of depression in chronic kidney disease: systematic review and meta-analysis of observational studies, Kidney Int. 84 (2013) 179–191, https://doi.org/10.1038/ki.2013.77.

[2] S.C. Palmer, M. Vecchio, J.C. Craig, M. Tonelli, D.W. Johnson, A. Nicolucci, et al., Association between depression and death in people with CKD: a meta-analysis of cohort studies, Am. J. Kidney Dis. 62 (2013) 493–505, https://doi.org/10.1053/j.ajkd.2013.02.369.

[3] S.S. Hedayati, H.B. Bosworth, L.P. Briley, R.J. Sloane, C.F. Pieper, P.L. Kimmel, et al., Death or hospitalization of patients on chronic hemodialysis is associated with a physician-based diagnosis of depression, Kidney Int. 74 (2008) 930–936, https://doi.org/10.1038/ki.2008.311.

[4] F. Dobbels, M.A. Skeans, J.J. Snyder, A.V. Tuomari, J.R. Maclean, B.L. Kasiske, et al., Depressive disorder in renal transplantation: an analysis of Medicare claims, Am. J. Kidney Dis. 51 (2008) 819–828, https://doi.org/10.1053/j.ajkd.2008.01.010.

[5] I. Vázquez, S. Pértega-Díaz, L. García-Becerra, Effect of depression on health-related quality of life of renal patients according to the modality of renal replacement therapy, J. Nephrol. 36 (2023) 2143–2145, https://doi.org/10.1007/s40620-023-01649-1.

[6] W. Orzechowski, W. Buczek, J.E. Szczerba, R. Gellert, A. Rydzewski, B. Fiderkiewicz, et al., Underdiagnosis of major depressive episodes in hemodialysis patients: the need for screening and patient education, J. Clin. Med. 10 (2021) 4109, https://doi.org/10.3390/jcm10184109.

[7] S. Shirazian, C.D. Grant, O. Aina, J. Mattana, F. Khorassani, A.C. Ricardo, Depression in chronic kidney disease and end-stage renal disease: similarities and differences in diagnosis, epidemiology, and management, Kidney Int. Rep. 2 (2017) 94–107, https://doi.org/10.1016/j.ekir.2016.09.005.

[8] K. Kondo, J.R. Antick, C.K. Ayers, D. Kansagara, P. Chopra, Depression screening tools for patients with kidney failure: a systematic review, Clin. J. Am. Soc. Nephrol. 15 (2020) 1785–1795, https://doi.org/10.2215/CJN.05540420.

[9] A.T. Beck, R.A. Steer, G.K. Brown, BDI-II. Beck Depression Inventory–Second Edition. Manual, The Psychological Corporation, San Antonio, 1996.

[10] J. Chilcot, D. Wellsted, K. Farrington, Screening for depression while patients dialyse: an evaluation, Nephrol. Dial. Transplant. 23 (2008) 2653–2659, https://doi.org/10.1093/ndt/gfn105.

[11] A. Kubanek, M. Renke, B.R. Godlewska, P. Paul, M. Przybylak, A.S. Kowalska, et al., Screening for depression in chronic haemodialysis patients as a part of care in dialysis setting: a cross-sectional study, Front. Psychol. 15 (2024) 1410252, https://doi.org/10.3389/fpsyt.2024.1410252.

[12] S. Sharma, S. Norton, K. Bhui, R. Mooney, E. Caton, T. Bansal, et al., The use of culturally adapted and translated depression screening questionnaires with South Asian haemodialysis patients in England, PLoS One 18 (2023) e0284090, https://doi.org/10.1371/journal.pone.0284090.

[13] A.S. Zigmond, R.P. Snaith, The hospital anxiety and depression scale, Acta Psychiatr. Scand. 67 (1983) 361–370, https://doi.org/10.1111/j.1600-0447.1983.tb09716.x.

[14] A.T. Beck, R.A. Steer, G.K. Brown, BDI–FastScreen for medical patients. Manual, The Psychological Corporation, San Antonio, 2000.

[15] I. Vázquez, A. Figueiras, Á. Salgado-Barreira, The utility of brief instruments for depression screening in dialysis patients, Clin. Kidney J. 18 (2024) sfae369, https://doi.org/10.1093/ckj/sfae369.

[16] W.L. Loosman, C.E.H. Siegert, A. Korzec, A. Honig, Validity of the Hospital Anxiety and Depression Scale and the Beck Depression Inventory for use in end-stage renal disease patients, Br. J. Clin. Psychol. 49 (2010) 507–516, https://doi.org/10.1348/014466509X477827.

[17] V.T. Preljevic, T.B.H. Østhus, L. Sandvik, S. Opjordsmoen, I.H. Nordhus, I. Os, et al., Screening for anxiety and depression in dialysis patients: comparison of the Hospital Anxiety and Depression Scale and the Beck Depression Inventory, J. Psychosom. Res. 73 (2012) 139–144, https://doi.org/10.1016/j.jpsychores.2012.04.015.

[18] A. Neitzer, S. Sun, S. Doss, J. Moran, B. Schiller, Beck Depression Inventory–Fast Screen (BDI-FS): an efficient tool for depression screening in patients with end-stage renal disease, Hemodial. Int. 16 (2012) 207–213, https://doi.org/10.1111/j.1542-4758.2012.00663.x.

[19] M. Alsaleh, L. Videloup, T. Lobbedez, J. Lebreuilly, R. Morello, A.T. Lecouf, et al., Improved detection and evaluation of depression in patients with chronic kidney disease: validity and reliability of PHQ-2 and BDI-FS-fr, Kidney Dis. 5 (2019) 228–238, https://doi.org/10.1159/000497352.

[20] L.P. Gregg, S.S. Hedayati, Screening for depression in people with kidney failure, Clin. J. Am. Soc. Nephrol. 15 (2020) 1702–1704, https://doi.org/10.2215/CJN.16381020.

[21] S. Beddhu, F.J. Bruns, M. Saul, P. Seddon, M.L. Zeidel, A simple comorbidity scale predicts clinical outcomes and costs in dialysis patients, Am. J. Med. 108 (2000) 609–613, https://doi.org/10.1016/S0002-9343(00)00371-5.

[22] M.B. First, R.L. Spitzer, M. Gibbon, J.B.W. Williams, Structured Clinical Interview for DSM-IV Axis I Disorders: SCID-I. Clinician Version, American Psychiatric Press, Washington (DC), 1997.

[23] M.B. First, R.L. Spitzer, M. Gibbon, J.B.W. Williams, Entrevista clínica estructurada para los trastornos del eje I del DSM-IV: SCID-I, Versión clínica, Masson, Barcelona, 1999.

[24] A.T. Beck, R.A. Steer, G.K. Brown, Manual Inventario de Depresión de Beck-II, Pearson, Madrid, 2011.

[25] A.T. Beck, R.A. Steer, G.K. Brown, Manual Inventario de Depresión de Beck FastScreen para pacientes médicos, Pearson, Madrid, 2011.

[26] I. Caro, E. Ibáñez, La Escala Hospitalaria de Ansiedad y Depresión: su utilidad práctica en Psicología de la Salud, Bol. Psicol. 36 (1992) 43–69.

[27] A.C. Alba, T. Agoritsas, M. Walsh, S. Hanna, A. Iorio, P.J. Devereaux, et al., Discrimination and calibration of clinical prediction models: users' guides to the medical literature, JAMA 318 (2017) 1377–1384, https://doi.org/10.1001/jama.2017.12126.

[28] E.R. DeLong, D.M. DeLong, D.L. Clarke-Pearson, Comparing the areas under two or more correlated receiver operating characteristics curves: a nonparametric approach, Biometrics 44 (1988) 837–845, https://doi.org/10.2307/2531595.

[29] R. Trevethan, Sensitivity, specificity, and predictive values: foundations, pliabilities, and pitfalls in research and practice, Front. Public Health 5 (2017) 307, https://doi.org/10.3389/fpubh.2017.00307.

[30] D.V. Cicchetti, Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology, Psychol. Assess. 6 (1994) 284–290, https://doi.org/10.1037/1040-3590.6.4.284.

[31] D.T.A. Qawaqzeh, R. Masa'deh, S.H. Hamaideh, A. Alkhawaldeh, M. Al Bashtawy, Factors affecting the levels of anxiety and depression among patients with end-stage renal disease undergoing hemodialysis, Int. Urol. Nephrol. 55 (2023) 2887–2896, https://doi.org/10.1007/s11255-023-03578-1.

[32] B. Zhang, P. Zhao, H. Wang, S. Wang, C. Wei, F. Gao, et al., Factors associated with frailty in kidney transplant recipients: a cross-sectional study, J. Ren. Care 49 (2023) 35–44, https://doi.org/10.1111/jorc.12407.

[33] J.W. Williams Jr., M. Pignone, G. Ramirez, C. Perez Stellato, Identifying depression in primary care: a literature synthesis of case-finding instruments, Gen. Hosp. Psychiatry 24 (2002) 225–237, https://doi.org/10.1016/S0163-8343(02)00195-0.

[34] L. Zerbinati, F. Caccia, F. Baciga, M. Belvedere Murri, P. Esposito, R. Caruso, et al., Suicide risk in patients undergoing hemodialysis: a systematic review and meta-analysis of prevalence, Ren. Fail. 47 (2025) 2521453, https://doi.org/10.1080/0886022X.2025.2521453.

[35] K. Kroenke, R.L. Spitzer, J.B. Williams, The PHQ-9: validity of a brief depression severity measure, J. Gen. Intern. Med. 16 (2001) 606–613, https://doi.org/10.1046/j.1525-1497.2001.016009606.x.

[36] L.P. Gregg, L. Goodman, E.Q. Carroll, S.S. Hedayati, A practical primer on how to detect and treat depression in CKD, Am. J. Kidney Dis. (2025), https://doi.org/10.1053/j.ajkd.2025.07.020.