General Hospital Psychiatry 54 (2018) 31–36

Contents lists available at ScienceDirect

General Hospital Psychiatry

journal homepage: www.elsevier.com/locate/genhospsych

Self-reported depression symptoms in haemodialysis patients: Bi-factor structures of two common measures and their association with clinical factors

Joseph Chilcot[a,*,1], Michael K. Almond[b,1], Ayman Guirguis[c], Karin Friedli[d], Clara Day[e], Andrew Davenport[f], David Wellsted[d], Ken Farrington[g,h]

[a] Health Psychology Section, Psychology Department, Institute of Psychiatry, Psychology and Neuroscience, King's College London, 5th floor Bermondsey Wing, Guy's Campus, London Bridge, London SE1 9RT, UK
[b] Southend University Hospital NHS Foundation Trust, Prittlewell Chase, Westcliff-On-Sea, Essex, SS0 0RY, UK
[c] Oxford Health NHS Foundation Trust, Psychiatric In Reach Liaison Service (PIRLS), Stoke Mandeville Hospital, HP21 8AL, UK
[d] Centre for Lifespan and Chronic Illness Research, Department of Psychology, School of Life and Medical Sciences, University of Hertfordshire, College Lane Campus, Hatfield AL10 9AB, UK
[e] Department of Renal Medicine, University Hospitals Birmingham NHS Foundation Trust, Queen Elizabeth Hospital, Birmingham B15 2WB, UK
[f] UCL Centre for Nephrology, Royal Free Hospital NHS Foundation Trust, Rowland Hill Street, London, NW3 2PF, UK
[g] Postgraduate Medical School, University of Hertfordshire, College Lane Campus, Hatfield AL10 9AB, UK
[h] Renal Unit, Lister Hospital, East & North Hertfordshire NHS Trust, Coreys Mill Lane, Stevenage SG1 4AB, UK

ARTICLE INFO

Keywords:
Depression
Dialysis
BDI-II
PHQ-9
Screening
Psychometrics
Factor analysis
End-stage kidney failure

ABSTRACT

Objective: To validate the factor structure of two common self-report depression tools in a large sample of haemodialysis (HD) patients and to examine their demographic and clinical correlates, including urine output, history of depression and transplantation.

Methods: Factor structures of the Beck Depression Inventory (BDI-II) and Patient Health Questionnaire (PHQ-9) were evaluated using confirmatory factor analysis (CFA). Data was utilised from the screening phase (n = 709) of a placebo-controlled feasibility randomised control trial (RCT) of sertraline in HD patients with mild to moderate Major Depressive Disorder. Alternative factor models including bi-factor models for the BDI-II and PHQ-9 were evaluated. Coefficient omega and omega-hierarchical were calculated.

Results: For both measures, bi-factor measurement models had the overall best fit to the data, with dominant general depression factors. Omega-hierarchical for the general BDI-II and PHQ-9 factors was 0.94 and 0.88 respectively. Both general factors had high reliability (coefficient omega = 0.97 and 0.94 respectively) and explained over 85% of the explained common variance within their respective models. BDI-II and PHQ-9 general depression factors were negatively associated with age and urine output and positively with a history of depression, antidepressant use within the last 3 months and a history of failed transplantation. In adjusted regression models, age, urine output and a history of depression remained significant.

Conclusions: These data suggest that both the BDI-II and PHQ-9 are sufficiently unidimensional to warrant the use of a total score. Younger age, lower urine output and a history of depression appear consistent correlates of depression severity among HD patients.

1. Introduction

Efforts to develop a core set of outcomes for haemodialysis (HD) trials are well underway with both clinical and patient reported outcomes being identified as important [1]. It is well established that depression remains one of the most common symptoms among individuals with End-Stage Kidney Failure (ESKF), with 30–40% of patients experiencing significant depressive symptomology [2]. Depression symptoms are associated with adverse outcomes among dialysis patients with increased mortality being the most consistently reported [3–5]. Evaluating which self-report depression tools are most suited for regular screening and serving as appropriate outcome measures in

* Corresponding author.
E-mail address: joseph.chilcot@kcl.ac.uk (J. Chilcot).
[1] Joint first authors.

https://doi.org/10.1016/j.genhosppsych.2018.08.007
Received 27 June 2018; Received in revised form 12 August 2018; Accepted 16 August 2018
0163-8343/

intervention trials is therefore warranted.

Two depression measures, the Beck Depression Inventory (BDI-II) [6] and the Patient Health Questionnaire-9 (PHQ-9) [7], have been commonly used to evaluate depression symptoms among HD patients. Whilst these measures appear valid within this clinical population, only a few studies in dialysis patients have examined their underlying factor structures [8,9]. Within the renal literature there remains a tendency to consider cognitive/affective symptoms vs. somatic symptoms of depression, in an attempt to try and separate physical symptoms that might overlap with kidney disease. Despite this rationale to reduce criterion contamination, physical and cognitive/affective symptoms often correlate highly. Given this, bi-factor measurement models might be more appropriate in this setting, allowing underlying general and subgroup depression factors to be identified and used in research as outcome measures.

Within kidney patients, two studies have reported that for both the BDI-II and PHQ-9, bi-factor measurement models provide the best fitting and most conceptually acceptable interpretation [10,11]. In both of these studies, the general depression factors explained over 73% and 81% of the common variance between items for the PHQ-9 and BDI-II respectively, with smaller subgroup cognitive and somatic factors explaining < 10% of the explained variance. From this data it would appear that both tools are sufficiently unidimensional to warrant the use of a total severity depression score. However, further evaluation of these screening tools is warranted in order to better understand their psychometric performance in kidney patients and identify appropriate underlying latent factors. Accordingly, the aim of this study was to examine the underlying latent factor structures of the BDI-II and PHQ-9 in a large sample of HD patients using Confirmatory Factor Analysis (CFA). Depression screening data used to select patients into a multicentre placebo controlled feasibility randomised control trial (RCT) of sertraline in HD patients with mild to moderate Major Depressive Disorder [12,13] was used here. In line with past findings we hypothesized that bi-factor models, with dominant general depression factors would provide the best fitting and most appropriate interpretation of the BDI-II and PHQ-9. Since this was a secondary data analysis, we also had the opportunity to explore demographic and clinical correlates of the identified latent depression factors.

2. Materials and methods

2.1. Design

BDI-II and PHQ-9 depression screening data (n = 709) used to select patients into a multicentre placebo controlled feasibility randomised control trial (RCT) of sertraline in HD patients with mild to moderate Major Depressive Disorder [12,13] were analysed here (trial registration number: ISRCTN06146268).

2.2. Patients

Prevalent HD patients treated across five UK dialysis centres were screened for depression using both the BDI-II and PHQ-9. Patients were eligible for screening providing they had been receiving HD for at least 3 months, were over 18 years of age and could speak and read English well enough to complete the screening measures. 1353 patients were approached for depression screening, with 243 excluded due to inability to read or understand English. Of the remaining 1110, 64% consented to be screened (n = 709). The majority of the sample was male (63.3%) with a median dialysis vintage of 33 months (inter quartile range = 59). The average age was 64.1 (16.4) years. Mean depression scores at screening were 13.5 (s.d. = 11.4) and 6.9 (s.d. = 6.2) for the BDI-II and PHQ-9 respectively. 33% (95% confidence interval 30–37) had a BDI-II ≥16 and 28% (95% confidence interval 25–31) scored ≥10 on the PHQ-9. A self-reported past history of depression was noted in 25% of patients. Antidepressant use within the 3 months prior to screening was 11%. 16% of the sample had at least one failed transplant, with the remaining 84% with no history of transplantation. A summary of clinical factors is provided in Table 1.

Table 1
Clinical characteristics.

Variable	Statistic
Heart disease (%)	31.7
Diabetes (%)	33.3
Cancer (%)	10.6
Liver disease (%)	2.4
Lung disease (%)	6.4
Amputation of limbs (%)	3.2
Stroke (%)	8.0
Haemoglobin g/L (mean, s.d.)	11.1 (1.2)
Serum albumin g/L (mean, s.d.)	37.4 (4.4)
Dry weight (mean, s.d., kg)	75.5 (18.3)
CRP (> 5 mg/L, %)	52%
Kt/V (mean, s.d.)	1.4 (0.3)

2.3. Clinical and demographic factors

Presence of comorbidities (diabetes, heart disease, stroke, cancer, limb amputation, liver disease, lung disease), dialysis vintage (length of time on HD, months), haemoglobin (g/L), serum albumin (g/L), the number of past transplants (actual number and recoded as history of failed transplantation yes = 1/no = 0), urine output (passing more than cup per day; self-reported yes = 1/no = 1) and dialysis treatment adequacy (Kt/V) were collected from medical records. C-reactive protein (CRP, mg/L) was only available in a subset of the sample (n = 396) since it is not commonly measured as part of routine practice. Due to its skewed distribution it was handled here as categorical variable using a clinical cut-off (CRP > 5 mg/L). Self-reported clinical history of depression and antidepressant use within the last 3 months (on an antidepressant or not) was collected via a research nurse and was coded as yes = 1, and no = 1 for both variables. Demographic factors were collected from a questionnaire including age, gender and ethnicity (white vs. non-white).

2.4. Statistical analysis

CFA was used to evaluate the factor structures of the BDI-II and PHQ-9 using Weighted Least-Squares with Mean and Variance adjustment (WLSMV) estimation. Missing data was small (< 2% for all items). Given this and the estimator used (WLSMV) available case data was used in the models. Alternative one, two and bi-factor models were tested for both measures. In the bi-factor PHQ-9 model, all 9 items were loaded onto a general depression factor (Fig. 1). Two smaller group factors – somatic (3-items) and affective/cognitive (6-items) were also specified. Correlations between all latent factors were fixed to zero and variances of the latent factors fixed. A two factor PHQ-9 model comprising of correlated physical (3-items) and cognitive/somatic factors (6-items) was tested, in line with past analyses of the PHQ-9 in other clinical settings [14]. A one factor PHQ-9 model was also evaluated with all items loaded onto a single depression factor.

A bi-factor BDI-II model based upon Ward [15], and supported in past studies of HD [10] and myocardial infarction patients [16], was tested (Fig. 2). This model contains a general factor with all 21 items loaded upon it, and two smaller cognitive (8 items) and somatic (5 items) group factors. A two factor BDI-II model comprising of correlated cognitive-affective and somatic factors was also evaluated [6]. A one factor model was also evaluated with all items loaded onto a single depression factor.

Assessment of goodness-of-fit was based upon a confirmatory fit index (CFI) > 0.95, root mean squared error of approximation (RMSEA) < 0.08, and the Tucker-Lewis index (TLI) > 0.95 [17].