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Reliability and validity of the Chinese version of the Patient Health Questionnaire-9 (C-PHQ-9) in patients with psoriasis: a cross-sectional study

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ABSTRACT

Objective To evaluate the clinical reliability and validity of the Chinese version of the Patient Health Questionnaire-9 (C-PHQ-9) in patients with psoriasis.

Design Cross-sectional study.

Setting Tertiary care centre.

Participants Patients with psoriasis who have not been diagnosed with depression (n=148; mean age 43.37±17.46 years; 31.19% female).

Primary and secondary outcome measures The primary outcome measures considered in this study were the C-PHQ-9 and the Hamilton Depression Scale (HAMD). The American Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-V) was used as the gold standard for the diagnosis of depression. Cronbach's α and test–retest reliability after 1 week were evaluated using reliability analysis, and criterion and structural validity were assessed using validity analysis. Receiver operating characteristic (ROC) analysis was performed to identify the best demarcation score and diagnostic accuracy.

Results Compared with DSM-V (27.27%), both C-PHQ-9 (39.19%) and HAMD (31.01%) had higher rates for detecting depression. The mean completion time for C-PHQ-9 evaluation (2.02±0.84 min) was significantly less than that for HAMD (23.37±3.21 min, p<0.001). The Cronbach's α coefficient for the C-PHQ-9 was 0.938. The correlation coefficients of the nine items with the total scale ranged from 0.540 to 0.854, and the mean inter-item correlation coefficients ranged from 0.376 to 0.933. After a week, the retest coefficient was 0.955 (p<0.01). Principal component factor analysis showed that C-PHQ-9 identified a unifactorial structure. The best cut-off point was 9 points, with a sensitivity of 98.00% and a specificity of 90.80%. The area under the ROC curve was 0.979 (95% CI 0.968 to 0.991).

Conclusion C-PHQ-9 has good reliability and validity in patients with psoriasis and can be used for primary screening of patients with psoriasis and depression. This scale has obvious time and labour advantages over the HAMD and should be considered for use in clinical practice.

INTRODUCTION

Psoriasis is a chronic inflammatory systemic disease with a strong genetic predisposition and autoimmune pathogenic traits affecting about 2% of the population.[1] Psoriasis is characterised by hyperproliferation of the epidermis, resulting in thick, red, scaly lesions.[2] Itchiness, skin flaking, swelling, redness, pain and other manifestations frequently accompany the lesions, and the arthritic complications of the disease can cause pain and lead to loss of mobility and even disability.[3] Although the pathogenesis of psoriasis is not clear, it is currently believed to be mainly related to genetics, immunity, oxidative stress, inflammatory response and environment.[4] Psoriasis typically affects the skin, but may also affect the joints and has been associated with a number of diseases. A study revealed that depression is a common complication of psoriasis, with an incidence of about 22.1%.[1] The impact of psoriasis on psychological and mental health is currently an important consideration due to the implications of the disease on social well-being and treatment. Patients with psoriasis have an increased prevalence of depression and anxiety and suicidal ideation. Interestingly, psoriasis treatment leads to improvement in

symptoms of anxiety.[5 6] Dantzer et al[7] proposed a hypothesis on inflammatory cytokines for depression through a large number of animal experiments and clinical observations. Activated immune inflammatory pathways are now thought to be involved in the development of depression. Some proinflammatory factors such as interleukin-1, tumour necrosis factor-α and interferon-γ can cause psoriasis and also play an important role as neurotransmitters in depression.[7] The inflammatory response may be a common pathway for depression in patients with psoriasis.

Currently, there are more than 10 kinds of assessment scales for clinical depression. Different studies have shown that different assessment scales have different detection rates for depression.[8] The most widely used is the Hamilton Depression Scale (HAMD). However, due to its complexity and need for professional input, it requires more labour and time. The Chinese version of the Patient Health Questionnaire-9 (C-PHQ-9) is a self-evaluation tool for the diagnosis and assessment of depression based on the major disorder of the Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) (DSM-IV).[9]

With the emergence of novel biological agents, most psoriasis can now be effectively controlled. However, because biological agents are expensive, most patients with psoriasis do not use biologics and so their symptoms are not effectively controlled. The symptoms of psoriasis have a profound impact on the patient's quality of life, and patients often experience depression, anxiety and even suicidal behaviour. These adverse emotions can further aggravate the condition of patients with psoriasis, through the nervous-endocrine system and the nervous-immune system, forming a vicious circle. The 'neurotransmitter hypothesis' suggests that neurotransmitters such as norepinephrine and dopamine are abnormally expressed in patients with depression. These neurotransmitters are important components of the neuroendocrine-immunomodulatory system which can regulate the phagocytosis and proliferation activity of lymphocytes and macrophages and may promote the occurrence and development of psoriasis. Therefore, clinicians should screen and identify patients with psoriasis early and develop individualised psychosomatic treatment programmes to adapt to the biopsychosocial model under the new situation. However, in the dermatology clinic, the diagnosis of depression is difficult for healthcare practitioners who are not qualified psychiatrists. In particular, professional, complex and time-consuming survey scales make such diagnoses more difficult to achieve. Therefore, it is necessary to identify an accurate and simple depression screening tool. Considering these, this study aimed to evaluate the clinical reliability and validity of the Chinese version of the C-PHQ-9 in screening for depression in patients with psoriasis.

METHODS

Study design

This is a cross-sectional study. Written consent for use of clinical data in aggregate form was obtained from all patients after they were informed about the study procedures. In this observational study, 148 patients with psoriasis were included from the outpatient and inpatient departments of the Affiliated Hospital of Southwest Medical University from January to February 2018. The diagnosis of depression was made by a psychiatrist using the American DSM-V, which is considered the gold standard for assessing depression. The psychiatrist determined each patient's HAMD score. The PHQ-9 is a self-evaluation tool for the major disorder based on the criteria of the DSM-IV. Every patient from the sample group who had an additional previous diagnosis of depression completed a questionnaire we created, which aimed to evaluate the C-PHQ-9 score, sociological data and treatment satisfaction. The designated personnel received standardised training to follow specific instructions to guide patients in completing the questionnaire and assessment. After reading the questionnaire, the C-PHQ-9 was carefully and completely filled out by each patient. HAMD and DSM-V were assessed by two attending physicians. The psychiatrist completed the assessment and recorded the time it took to complete each questionnaire.

Measurements

The assessment range for C-PHQ-9 considers only the time period within the previous 2 weeks, with each symptom having a possible score of 0–3 points (0=no, 1=a few days, 2=more than half of the days, 3=almost every day). The total score of the scale is 27 points, with 0–4 points indicating absence of depression, 5–9 points mild depression, 10–14 points moderate depression, and 15–27 points severe depression.

A 17-item version of HAMD was used in this study, with a total score of 0–7 points indicative of no depression, 8–17 points mild depression, 18–24 points moderate depression, and >24 points severe depression.

As noted, DSM-V was used as the gold standard for the diagnosis of depression. These questionnaires were collected by the same trained physician to avoid selection bias.

Statistical analysis

In this cross-sectional study, data were processed and analysed using SPSS V.20.0. Listwise deletions were carried out to manage missing values. Subgroup analysis was used to control for confounding factors. Quantitative data are presented as mean±SD, and count data are expressed as percentages. To calculate the internal consistency of HAMD and C-PHQ-9, we used Cronbach's α. To derive the optimal cut-off points for HAMD and C-PHQ-9, we performed receiver operating characteristic (ROC) analysis. We compared the areas under the ROC curves (AUCs) to determine the respective abilities of HAMD

Table 1 Patient characteristics

Variables	Patients with psoriasis (n)	C-PHQ-9(+) (n)	Positive rate (%)	X^2 value	P value
Gender				0.009	0.926
Male	90	35	38.89		
Female	58	23	39.66		
Age (years)				0.032	0.858
≤60	126	49	33.56		
>60	22	9	40.91		
Disease duration (years)				8.984	0.003
≤10	91	27	29.67		
>10	57	31	54.39		
Marital status				0.814	0.666
Unmarried	44	15	34.09		
Married	100	41	41		
Divorced or widowed	4	2	50		
Educational level				1.334	0.248
Junior high school and below	91	39	42.86		
High school and above	57	19	33.33		
Place of residence				0.613	0.434
City	58	25	43.1		
Rural	90	33	36.67		

C-PHQ-9, Chinese version of the Patient Health Questionnaire-9.

and C-PHQ-9 in diagnosing depression. In all tests, statistical significance was defined as p<0.05.

Patient and public involvement

Patients with psoriasis were included from the outpatient and inpatient departments of the Affiliated Hospital of Southwest Medical University from January to February 2018. Patients with psoriasis were evaluated by professional dermatologists and met the clinical diagnostic criteria for psoriasis. All subjects signed the informed consent form. The sample size was determined by retrieving previous studies.

RESULTS

Patient characteristics

A total of 150 questionnaires were distributed in this study, and 148 valid questionnaires were collected (response rate 98.67%). Each patient met the diagnostic criteria for psoriasis, and there were no other confounding factors such as systemic diseases and mental illness with a clear diagnosis. The study sample comprised 90 male (60.81%) and 58 female (31.19%) patients, with a mean age of 43.37±17.46 (range 18–85) years. The mean disease course was 9.63±7.85 (range 0.5–43) years. Table 1 outlines the sociodemographic variables considered in the study and the rate of depression with respect to each of these variables.

Subanalyses with men and women

To help identify populations where C-PHQ-9 can be particularly useful, subanalyses based on disease duration were conducted in men and women. The results in tables 2 and 3 showed no statistically significant difference in the incidence of depression between men and women with the same disease duration (p>0.05).

Incidence of depression in patients with psoriasis

This study identified 30 (20.27%) patients who met the DSM-V criteria for the diagnosis of depression and 118 (79.73%) patients without depression. There was no significant difference between the C-PHQ-9 (39.19%) and HAMD (31.09%) detection rates for depression (Xc^2=2.14, p=0.15) (table 4).

Table 2 Depression rate between men and women with disease duration ≤10 years

	Disease duration ≤10 years			
	Patients with psoriasis	C-PHQ-9(+) (n)	X^2 value	P value
Male	57	17	0.002	0.967
Female	34	10		

C-PHQ-9, Chinese version of the Patient Health Questionnaire-9.

Table 3 Depression rate between men and women with disease duration >10 years

	Disease duration >10 years			
	Patients with psoriasis	**C-PHQ-9(+) (n)**	**X² value**	**P value**
Male	33	18	0.001	0.977
Female	24	13		

C-PHQ-9, Chinese version of the Patient Health Questionnaire-9.

Trust-level analysis

Homogeneity reliability

The internal consistency coefficient (Cronbach's α coefficient) of the C-PHQ-9 scale was 0.938. The correlation coefficient between each item and the total score of the scale ranged from 0.540 to 0.854, and the correlation coefficient between each item ranged from 0.376 to 0.933, all of which demonstrated significant correlation (p<0.01) (table 5).

Test reliability

The initial score and the retested C-PHQ-9 total score after 1 week were analysed and the correlation coefficient was 0.955 (p<0.01).

Validity analysis

Validity

The consistency analysis between C-PHQ-9 and HAMD showed a kappa coefficient of 0.779. The two were divided into positive correlations and the correlation coefficient was 0.504 (p<0.01).

Structural validity

Principal component analysis showed that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value was 0.877, and the Bartley spherical test statistics was 31 130.97 (p<0.05), indicating that there are common factors among the items, making them suitable for factor analysis. The principal component factor analysis was a one-factor structure, the extracted eigenvalue was 6.20, the variance of the factor was 68.88% of the total, and the factor load matrix coefficients of all the entries were greater than 0.572 (0.572–0.950).

ROC curve

A total of 148 subjects were evaluated using the DSM-V, including 30 patients with depression and 118 patients without depression. DSM-V was used as the standard for the ROC curve, with the maximum Youden index (sensitivity+specificity=1). The best cut-off point for C-PHQ-9 was 9 points, with a sensitivity of 98.00% and a specificity of 90.80%. The AUC of C-PHQ-9 was 0.979 (95% CI 0.968 to 0.991) (figure 1).

Comparison of the completion time of the two scales

In this study, the mean completion time for C-PHQ-9 evaluation (2.02±0.84 min) was significantly less than that for HAMD (23.37±3.21 min), and the difference was statistically significant (t=−78.37, p<0.001).

DISCUSSION

About 300 million people worldwide are affected by depression,[10] with different prevalence rates in different countries, including about 8.1% in the USA,[11] 8.7% in Argentina,[12] 14% in Brazil,[10] 5.9%–9.8% in Germany,[13] 5.5% in Singapore[14] and 5.9%–13.2% in China.[15 16] Psoriasis is a common chronic inflammatory skin disease that has a notable impact on the lives of patients. A study that employed different survey populations and screening tools found that 9%–55% of patients with psoriasis have depression.[8] However, currently, dermatologists are not very aware of depression, resulting in undiagnosed depression in some patients with psoriasis and thus affecting the treatment of psoriasis. Screening for depression in patients with psoriasis is currently limited by three factors: (1) high variability of currently available questionnaires, (2) absence/lack of questionnaires designed and validated for patients with psoriasis, and (3) dermatologists' limited use and non-familiarity with questionnaires.[17] Therefore, it is necessary to find an evaluation scale for patients with psoriasis and depression that is both specific and sensitive, as well as economical and time-saving.

Screening for depression refers to the use of a depression screening questionnaire to identify patients who may have depression but have not been diagnosed with the condition. PHQ-9 has been recommended by DSM-V for investigating depression and has been shown to have good reliability and validity in different populations.[18–20] However, there are no reports on its use in patients with psoriasis. In this study, 148 patients with psoriasis were investigated using the C-PHQ-9 scale. The rate of depression in patients with psoriasis using C-PHQ-9 scale was 39.19% and is consistent with the results of previous research.[8] However, after controlling for disease duration, there was no difference in the prevalence of depression between men and women. In future work, we will focus on whether C-PHQ-9 is particularly useful to a specific population. The rate of depression was significantly

Table 4 C-PHQ-9 and HAMD depression findings, n (%)

Scale	Patients without depression	Mild depression	Moderate depression	Severe depression
C-PHQ-9	90 (60.81)	37 (25.00)	15 (10.14)	6 (4.05)
HAMD	102 (68.91)	29 (19.59)	10 (6.76)	7 (4.73)

C-PHQ-9, Chinese version of the Patient Health Questionnaire-9; HAMD, Hamilton Depression Scale.

Table 5 Correlation between items in C-PHQ-9 and each item and total score (r)

Items	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Q1	1								
Q2	0.608*	1							
Q3	0.749*	0.650*	1						
Q4	0.661*	0.788*	0.561*	1					
Q5	0.702*	0.606*	0.589*	0.634*	1				
Q6	0.625*	0.508*	0.591*	0.567*	0.680*	1			
Q7	0.490*	0.390*	0.431*	0.509*	0.589*	0.803*	1		
Q8	0.501*	0.376*	0.438*	0.527*	0.573*	0.804*	0.858*	1	
Q9	0.499*	0.376*	0.436*	0.543*	0.589*	0.804*	0.868*	0.933*	1
Total score	0.840*	0.839*	0.839*	0.854*	0.761*	0.683*	0.573*	0.575*	0.540*

Q1 refers to the first score, Q2 refers to the second score, and so on.
*P<0.01 (two-sided test).
C-PHQ-9, Chinese version of the Patient Health Questionnaire-9.

higher in patients with disease duration >10 years. This finding is consistent with the results of other research and seems reasonable due to the long-standing adverse effects of psoriasis in these patients. Specificity in this study was similar to that in previous studies and across reference standards. Based on semistructured interviews, the standard cut-off score of 9 maximised combined sensitivity and specificity, which yielded values of 98.00% and 90.80%, respectively. In this study, we hoped to find a simpler, more convenient and efficient scale that dermatologists can use to evaluate the psychological state of

Figure 1 ROC curve of C-PHQ-9. The blue line represents the ROC curve of C-PHQ-9, and the green line represents the diagnostic reference line. C-PHQ-9, Chinese version of the Patient Health Questionnaire-9; ROC, receiver operating characteristic.

patients with psoriasis in clinical work and to timely identify patients with depression, and the results show the best truncation. The cut-off point is 9 and the sensitivity and specificity can reach 98% and 90.8%, which are slightly different from previous studies.[21] Martin et al[22] found the best cut-off score is 10, and this part of patients always need psychological intervention by psychologists. Our results show that C-PHQ-9 can screen out some patients with early depression, including those who can take early psychological intervention to avoid serious consequences. The kappa coefficient between the C-PHQ-9 and HAMD scales was 0.779. The two scales were divided into positive correlations and the correlation coefficient was 0.504, which indicates good consistency. The identification of depression was higher using C-PHQ-9 and HAMD compared with DSM-V, which is consistent with previous studies, indicating that both have good false-positive rates. The time to complete C-PHQ-9 was less than the time taken to complete HAMD.

The main strength of this study is that all patients with psoriasis were assessed using the gold standard for evaluating depression. DSM-V and the C-PHQ-9 were innovatively applied to patients with psoriasis. Moreover, the time to complete C-PHQ-9 and HAMD was also assessed. However, the study was limited by its small sample size, as well as its cross-sectional and single-centre design. In the future, randomised controlled trials are needed to analyse factors related to psoriasis and assess the effect of C-PHQ-9 in patients with psoriasis and depression.
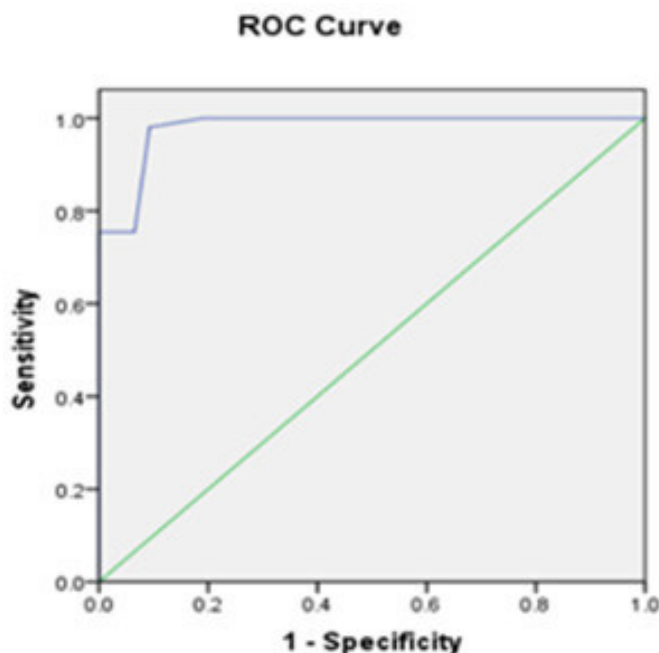
CONCLUSIONS

C-PHQ-9 has the advantages of fewer items, easier administration, better clarity, high screening efficiency and having nine diagnostic criteria for depression based on DSM-V. PHQ-9 not only provides value for screening but can also assess the severity of depression. Also, this scale has clear advantages over the HAMD with regard to time

and effort in completing the questionnaire. Due to its simplicity, high sensitivity and high specificity, we believe C-PHQ-9 should be strongly considered for use in clinical setting to screen psoriasis patients with depression, with a recommended cut-off score of ≥9.

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