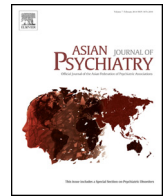




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Reliability, validity and factor structure of the CES-D in Iranian elderly

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ABSTRACT

Objectives: In developing countries such as Iran, elder populations are growing. Due to the high prevalence of depressive disorders among elders, reliable screening instruments for this population are required. The main purpose of this study was to determine the reliability and validity of the Farsi version of the Center for Epidemiological Studies-Depression Scale-10 (CES-D) among Iranian elderly persons.

Methods: The investigators created the Farsi version of the CES-D-10 by translation and back translation. Two hundred and four cases aged 59 and above completed the questionnaire. The reliability and validity of the translated CES-D-10 was established through comparison with the Composite International Diagnostic Interview (CIDI), a recognized gold standard method for diagnosing major depressive disorder. We used a receiver operating curve (ROC) to determine the optimum cutoff score.

Results: The Farsi version of the CED-D-10 displayed acceptable psychometric characteristics, as reflected in internal consistency with Cronbach's alpha, split-half coefficients and test-retest reliability of 0.85, 0.65 and 0.49, respectively. Factor analysis and the varimax rotation resulted in two factors including 'depression' and 'interpersonal relationships'. The Depression factor (introduced as CES-D-8 of the scale) had significant correlation with the 10 items form ($r = 0.99$) with 0.87 alpha coefficient.

The ROC showed that the optimum cutoff point is 5 with sensitivity of 82% and specificity of 70%, and positive and negative predictive values of 26% and 98%, respectively, for both of the forms.

Conclusion: Both the 10 and 8 items form of the Farsi version have desirable characteristics to be useful as a screening instrument for depressive disorders in Iranian elders, especially in urban areas.

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1. Introduction

According to the statistics released by the Statistical Center of Iran based on the last Population and Housing Census in 2006, the Iranian population simultaneous with world population is growing old. Approximately 20% of the Iranian population will be older than 50, 10% older than 60, and 6.5% older than 65 by 2020 (Statistical

center of Iran, 2008). The health and mental health of this segment of the population, particularly with regard to depressive disorders, will be one of the serious social issues confronted in our society. Epidemiological studies have revealed that the spectrum of depressive disorders is most common among the elderly (Reynolds, 1996; Lebowitz et al., 1997; Steffens et al., 2000; Alexopoulos, 2001).

Multiple instruments have been created to measure the severity of depressive disorders in the elderly (Gareri et al., 2001). The Center of Epidemiological Studies-Depression Scale (CES-D) (Radloff, 1977), which is an internationally recognized screening tool for depression, is one of the most common instruments to assess depression among older persons. This instrument is mainly focused on emotional and cognitive symptoms of depression. It has been translated, validated and used in different languages and in diversity settings of clinical, community based and among very old population living in residential homes. (Noh et al., 1998; Miller et al., 1997; Clement

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et al., 1999; Maqsood et al., 2013; Chokkanathan and Mohanty, 2013; St John et al., 2013; Dozeman et al., 2011). It has items to evaluate somatic complaints do not compromise the evaluation of depression. For example, the somatic items of the CES-D have been shown to be unbiased by respondents with somatic complaints (Foelker and Shewchuk, 1992). With respect to cross-cultural utility of CES-D, results from Asian populations were found to be comparable to results obtained in North American and European cultures. Significant somatization of depression in these Asian samples was not found. The results obtained from different cultures support the validity of comparing responses on the CES-D across populations (Mackinnon et al., 1998).

The 10-item short form of the CES-D derived from the 20-item long form displays reasonable validity and reliability. (Andresen et al., 1994) The short form is perhaps a better instrument to use clinically because of the utility of a briefer instrument, particularly in outpatient settings. The dichotomous answer format used in each questionnaire (i.e., a yes/no format) may positively influence its clinical utility, particularly when used with older populations (Kohout et al., 1993; Nishiyama et al., 2009). The validity and reliability of the short version of the CES-D has been reported in the assessment of depressive disorders among the elderly (Irwin et al., 1999).

This study has been designed to provide a Farsi version of the CES-D-10 version of the CES-D, based on community samples.

2. Methodology

The Ekbatan district in the west of Tehran, the capital, was selected due to its larger elderly population in relation to other districts. Trained health volunteers participated in undertaking a census of elderly persons in the district, via a door-to-door survey. The operation was performed under permission of the directors of each residential block.

3. Participants

Among 1422 older residents of Ekbatan, 300 subjects were selected randomly. Subjects with severe disabilities, such as dementia, neurological problems serious problem at hearing and vision difficulties were excluded. During the six month period, from the census date until the completion of the study, 54 subjects were excluded because of death or leaving the district. Another 42 subjects refused to continue with this study. Thus, 204 elders were enrolled in the study. From this group, 104 subjects were chosen by chance and interviewed using the Composite International Diagnostic Interview (CIDI), as a gold standard diagnostic instrument, to determine the presence or absence of a diagnosis of Major Depressive Disorder (MDD). No significant difference was seen in gender between included and omitted study subjects. Out of study sample of whom the CIDI was not completed ($n = 100$), 29 subjects were selected randomly and the questionnaire was completed after two weeks for the second time to evaluate the test-retest reliability.

4. Instruments

4.1. Composite International Diagnostic Interview (CIDI)

The CIDI is designed by the World Health Organization and the National Institute of Health to enable non-clinician interviewers to screen for various psychiatric disorders. We used the lifetime prevalence version of the CIDI. Satisfactory validity, reliability and agreement with clinical diagnosis have been confirmed in 20 countries during 1990s (Robins et al., 1988; Andrews and Peters, 1998; Janca et al., 1992). In Iran, it has been proved to have a

sensitivity of 0.91, specificity of 0.53 and positive and negative likelihood ratio of 1.94 and 0.17, respectively. Test-retest reliability was reasonable ($\kappa = 0.55$, Yule's $Y = 0.56$; Robins et al., 1988; Andrews and Peters, 1998; Janca et al., 1992).

Using the lifetime version of the CIDI which is not approved to make current diagnosis of depressive disorder and, for providing the study subjects who were suffering from MDD at the same time of completing CES-D, only item 1 of E27 question was considered. This item confirms of presence of MDD in the "last 2 weeks".

4.2. Center for Epidemiological Studies-Depression Scale (CES-D)

This scale is a self-report inventory including 20 items which do not take more than 5 min to be answered. It was created by National Institute of Mental Health (NIMH) as a part of a study, specifically to determine depression among adult communities (Radloff, 1977; Wilcox et al., 1998). Due to some problems for elderly respondents, a 10-item version has been proposed. Psychometric features of the 10-item CES-D were found to be comparable to the original CES-D. Irwin and colleagues in 1999 reported the sensitivity of CES-D-10 was 100%; specificity, 93%; and positive predictive value, 38% in their study on a sample of cases older than 60 (Irwin et al., 1999). Further studies have confirmed the clinical use and strong psychometric properties of the short form of CES-D (Grzywacz et al., 2010; Bjorgvinsson et al., 2013). The 10-item version includes 3 items for depression, 4 items for somatic complaints, 2 items for well-being, and 1 item for irritability. Each item of the questionnaire has a dichotomous answer of "yes/no" to reduce the interviewee burden. Each item was given score of zero to one, therefore, the total score of each questionnaire will be zero to 10. A CESD (20) cutoff score of 16 is indicative of "significant" or "mild" depressive symptomatology and a cut score of 11 for the shorter version is recommended according to the original validation study on a general population by Radloff (1977).

There are 10 and 20 item versions that use a 3-point ordinal scale with the range of scores on the CES-D-20 is 0–60 (0–30 for the CES-D-10).

In this study previous 10-item scale validated for elderly was selected (Andresen et al., 1994). In this study the dichotomous response for each item was considered to prevent the interviewees' burden.

5. Execution of the study

To prepare the Farsi version of CES-D, two psychologists translated the questionnaire into the Farsi language and two professional English language translators (MS in English literature) translated it back into English. The translated version was derived from comparisons of the two back-translated versions. Twenty five elders completed the questionnaire to evaluate its face validity. The final edition of the Farsi version was administered to the participants who were enrolled in the main part of the study and were completed by them during home visits.

After making an appointment, the interviewers, including two psychiatrists and one psychologist (MS), administered the instruments. Two hundred and four subjects, of whom 104 were interviewed by CIDI, completed the CES-D. For all subjects the CES-D was read out loud to the interviewees. To perform the test-retest evaluation 28 subjects out 204 subjects who were not performed the CIDI, were chosen randomly to complete the CES-D after two weeks again for test-retest reliability measurement. The interviewer was the same person who did the interview at the first time. Regarding illiteracy of some study subjects all the interviews were conducted by the interviewers.

The team members made telephone contacts with each participant before the face to face interview to explain the study and its purposes briefly.

The human subjects committee of the Tehran Psychiatric Institute approved this project.

6. Analysis

The *T*-test, ANOVA, Cronbach's alpha, split half and Pearson's correlation coefficient tests were used to evaluate the variables and their relationships. Exploratory factor analysis (Eigen values >1) was used for the validity study. Item loadings of 0.4 or greater used in correspondence studies (Malakouti et al., 2006, 2007) were considered. The CIDI was used as the gold standard to make MDD diagnoses. A receiver operating characteristic (ROC) curve was generated to demonstrate the sensitivity and specificity for depression at different cut scores. Data were analyzed with SPSS (version 13) software. Probability (*P*) value less than 0.05 was regarded as statistically significant.

7. Results

Demographic features of study subjects are summarized in the Tables 1 and 2.

8. Reliability

Cronbach's alpha for CES-D-10 was 0.85, increased to 0.87 if item number 6 and 9 were omitted (CES-D-8). The split-half coefficient and test-retest reliability after 2 weeks were 0.65 and 0.49 (*p* = 0.01), respectively.

9. Validity

(1) The KMO coefficient was 0.4 and the Bartlett analysis resulted in desirable outcomes ($\chi^2 = 819.4$, *df* = 43, *p* < 0.001). The factor analysis revealed 2 factors: The first factor (called "depression") included item numbers 1, 2, 3, 4, 5, 7, 8, and 10 with the Eigen value of 4.55 and the second factor (called "Interpersonal Relationships") included items 6 and 9, with the Eigen value of 1.2; these accounted for 45.5% and 12% of the total variance, respectively. The correlation between them was 0.3 (*p* < 0.001) and the alpha coefficients of the first and second factors were 0.87 and 0.45, respectively (Table 3).

Table 1
Demographic characteristics of study sample (*n* = 204).

Demographic features (<i>n</i> = 204)			
Variable		Number	%
Gender	Male	109	53.4
	Female	95	46.6
Age	59–74	128	62.7
	75–84	68	33.3
	85+	8	3.9
Living with	Partner	71	34.8
	Partner and children	64	31.4
	Children and others	43	21.1
	Alone	26	12.7
Employment status	Retired and pensioner	124	60.7
	Unemployed	75	36.8
	Employed	5	2.5
Efcational status	Illiterate	29	14.2
	Primary school	54	26.5
	Middle school	49	24
	Diploma/Higher	72	35.2

Table 2
Main factors of the CES-D (Eigen values more than 1).

Item No	Factors	
	First factor (Depression)	2nd factor (Interpersonal relationship)
1	0.856	
2	0.754	
3	0.658	
4	0.827	
5	0.550	
6		0.765
7	0.607	
8	0.861	
9		0.791
10	0.592	

Extraction Method: Principal Component Analysis.

Correlation coefficient between the two forms of CES-D was 0.99.
(2) Criterion validity has been evaluated by comparing the mean scores of CES-D-8 and CES-D-10 between two groups of MDD (*M* = 6.55, *SD* = 1.44 and *M* = 7, *SD* = 1.67) and non-MDD (*M* = 2.8, *SD* = 2.8 and *M* = 2.9, *SD* = 2.9), respectively (*p* < 0.005).

10. Cut off point score

To obtain the best cut point for the two forms of the questionnaire, a ROC analysis was performed. The area under the curve value (AUC) was 0.849 and 0.850 for CES-D-8 and CES-D-10 respectively (*p* < 0.002). The optimum cutoff point was 5, with sensitivity of 81% and specificity of 74%, for both forms of CES-D. The positive and negative predictive values calculated as 26% and 98%, for both forms.

The CES-D scores among women (*M* = 3.8, *SD* = 2.98) were significantly higher than among men (*M* = 2.64, *SD* = 2.86, *p* = 0.004). However, it did show significant differences among the groups with different educational status. The scores were the highest for the illiterate elders ($\chi^2 = 13.366$, *p* < 0.02). Finally, there were no meaningful differences among the scores of elders depending on their living conditions and the family members who live with them.

11. Discussion

Having a response sheet with three options may cause difficulties and time consuming for the elderly interviewees (Kohout et al., 1993). In this study the short form included 10 items, with a dichotomous response set for each item chosen to be assessed for reliability and validity.

Exception of test re-test with average result, which is belonged to CES-D-10, performing different methods of statistical analysis, results showed that the Farsi version of CES-D-10 and CES-D-8 has

Table 3
Positive and negative predictive values of CES-D-8 for major depression.

		CES-D		MDD		Total
				Negative	Positive	
CES_D_8	Negative	No.	63	1	64	
		%	98.4%	1.6%	100.0%	
	Positive	No.	28	10	38	
		%	73.7%	26.3%	100.0%	
Total	No.	91	11	102		
	%	89.2%	10.8%	100.0%		

suitable properties for utility as a screening instrument for MDD among older community-dwelling persons in Iran. The availability of a translated CES-D will provide an opportunity for researchers to evaluate the epidemiology of depressive disorders among elderly Iranians. Most of the health/mental health services propose to integrate into the “family physician program” of the Iranian Ministry of Health, which could be useful for general practitioners. The general tendency of people to see GPs as a first preference for seeking remedies for mental health issues would support this idea.

The Cronbach's alpha yielded in this study is compatible with studies from other countries. It is concordant with studies carried out on other cultures (Boey, 1999; Van de Rest et al., 2010; Zauszniewski and Bekhet, 2009). In this study the dichotomous response form of the questionnaire was used (Turvey et al., 1999). An ROC method and the validated diagnostic gold standard, CIDI, were used in this study in a sample of elderly and city residents. The cutoff score was similar to previous studies (Irwin et al., 1999; Robison et al., 2002), however the sensitivity and specificity in the first study was higher. The gold standard to find cases of depression was CIDI in Robison and the current study, as opposed to Irwin in which SCID was used to find the depressed cases. Similar to the current study, the positive predictive value in the Irwin study was lower than 50%. Using non-clinical study subjects could account for this finding.

In a factor analysis study of the 20 item CES-D, three to four factors (negative affect, positive affect, somatic symptoms and relation with others, (1) depressive/somatic; (2) positive; (3) interpersonal; and (4) social well-being) were identified (Long Foley et al., 2002).

Item analyses demonstrated that seven of the CES-D-20 items failed to discriminate major, minor and non-depressed patients, and that several of them tapped somatic symptoms. These findings suggest that the validity of the CES-D may be compromised when used with elderly medical patients and modifications for its use appear necessary (Schein and Koenig, 1997; Foelker and Shewchuk, 1992).

To reduce administration time and burden of response a short form of CES-D introduced (Kohout et al., 1993). Study performed by Irwin et al. (1999) among community-dwelling older adults using SCID for clinical diagnosis with 68 study sample and cut off score of 4, the results revealed 38% for PPV with sensitivity and specificity of 100% and 93%. In contrast, with this cut point among clinical depressed sample the PPV appeared 85%. Based on a Belgian sample, the response rate for the measurement of depression within a general population (with Likert options including three responses) was 99.9% for both genders, with a Cronbach's alpha of 0.82 in men and 0.84 in women. The items making up the CES-D-8 was similar to our study (Van de Velde et al., 2009).

Turvey et al. (2009) showed that both chronic illness and physical function may independently predict depression in late-life. In addition, comparing with the CIDI, the CESD-8 appeared more informative about depressive symptoms. (Turvey et al., 2009)

There are controversies regarding to the effect of somatic problems and age on the CES-D score. However, the results showed that independent of the severity of depression, based on the three questions about somatic complaints, the total score would rise if the questionnaire was used in geriatric patients with increased somatic complaints (Grayson et al., 2000; Radloff, 1977; Foelker and Shewchuk, 1992; Williamson and Schulz, 1992).

Two factors emerged from the factor analysis of the CES-D-10 in this study. Items 6 (people are unfriendly) and 9 (people dislike me) might not be implicated in depressive concepts in elderly people on our culture. In the reliability study too, by omitting these two items the internal consistency increased. The CES-D-8 items was generated by inclusion of the items number 1, 2, 3, 4, 5, 7, 8, and 10 which were determined as reflecting a depression factor.

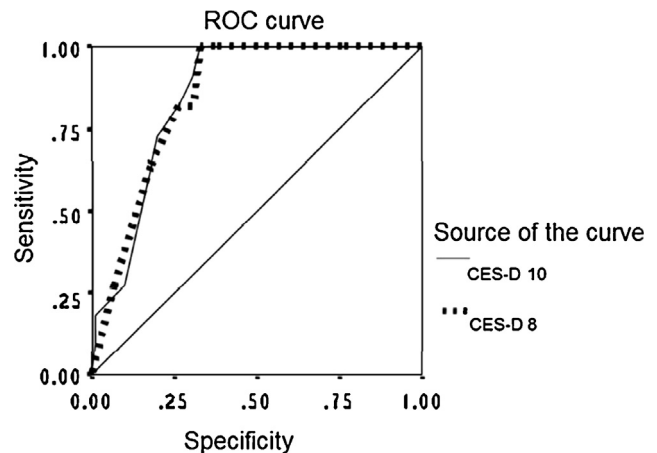


Diagram 1. ROC curve for CES-D both forms of 10 and 8 questions

Similarly, in the study carried out by Lee and Chokkanathan (2008) two factors were identified in CES-D-10 (Lee and Chokkanathan, 2008; Demura and Sato, 2003). Turvey et al. (2009) showed that both chronic illness and physical function may independently predict depression in late-life. In addition, comparing with the CIDI, the CESD-8 appeared more informative about depressive symptoms. (Turvey et al., 2009). Finally, we conclude that the both form of CES-D (10 and 8 items) with similar psychometric characteristics are suitable interments for screening of depressive disorders among Iranian elderly, however the CES-D-8 has better internal consistency.

Some limitations should be considered in the interpretation of our data. It should be noted that till date the CIDI has not been validated among Iranian elderly. The demographic characteristics of the residents from the selected district used in our study are rather different from the elderly population of Iran in some aspects. Released data from the latest Iranian general census (Statistical Centre of Iran, vice presidency for strategic planning and supervision, Presidency of I.R.I, 2006) revealed that more than 35% of old Iranian people are settled in rural areas and more than 70% are illiterate (versus 14% in the current study). Further studies are required with a larger and more heterogeneous sample, encompassing both rural and urban older persons (Diagram 1).

Conflict of interest

None.

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Key points

- The Iranian version of CES-D-10 has acceptable reliability and validity as a screening instrument for depressive disorder.
- The optimum cutoff score is 5 with appropriate sensitivity and specificity.
- By omitting two items of 6 and 9 with low factor loading, CES-D-8 was derived.

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