

## Psychometric Properties of the Persian Version of Chicago Multi-Scale Depression Inventory

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**Objective:** The aim of this study was to evaluate the psychometric properties of the Persian version of Chicago Multi-Scale Depression Inventory (CMDI) in Iranian subjects.

**Method:** CMDI was translated into Persian according to the standard method. Two hundred and sixty two medical students (of whom, 114 were re-tested 5-10 days after the first test), Archibald 40 patients with major depressive episodes, 23 patients with multiple sclerosis, 21 patients with epilepsy, and 43 normal persons selected from acquaintances of the patients were included in the study. Samples were matched for age, sex, marital status, and education. Exclusion criteria were as follows: neurologic diseases (except multiple sclerosis or epilepsy) or head trauma, serious medical condition, alcohol or opioid abuse. Subjects were omitted if they did not answer any of the items in BDI-II or CMDI. Demographic questionnaire, BDI-II, and CMDI were given to the subjects.

**Results:** The mean scores of CMDI and its subscales for depressed people were significantly different from multiple sclerosis patients, normal people, and medical students. The mean score of mood subscale for epilepsy patients was significantly different from normal people. The mean score of CMDI and evaluative and vegetative subscales for epilepsy patients were significantly different from the normal subjects and medical students. Correlation coefficient between BDI-II and CMDI was 0.86. Reliability and internal consistency coefficients for CMDI were 0.92 and 0.95 respectively. Cut off scores for CMDI and mood, evaluative, and vegetative subscales were 123, 46, 36, and 44 respectively.

**Conclusion:** The Persian version of CMDI has content, convergent, and discriminant validity and is reliable and internally consistent. These findings support the use of CMDI in Persian participants.

**Keywords:** *Depression, Iran, Psychological tests, Psychometrics*

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**D**epressive disorders are co-morbid with many chronic medical diseases including neurologic, cardiovascular, pulmonary, endocrinologic, and neoplastic diseases (1- 2). To some extent, the symptoms of those co-morbid diseases are similar to major depressive symptoms. Similarity falls between vegetative or somatic symptoms such as fatigue, sleep, or sexual disturbance. In patients with such symptoms, clinical diagnosis of depression might be a matter of debate. As most of the depression scaling systems are developed and standardized for psychiatric patients (3), using them in other medical settings may lead to over-diagnosis of depressive disorders and their severity (4). To measure those depressive symptoms related to chronic medical diseases, and to discriminate them from those in depressive disorders, Nyenhuis et al (3, 5) developed the Chicago Multi-scale Depression

Inventory (CMDI), which is a self-report depression questionnaire. In their preliminary study, 30.5% of the multiple sclerosis patients were depressed while they were tested by BDI. This figure was 17.7% when they were tested with CMDI (5). More studies showed acceptable results and good factorial model of CMDI (6). This scale has previously been translated in to Italian by Solari et al (7). They evaluated CMDI psychometric properties in Italian culture. Forn et al, and Julian et al, used CMDI as a tool for screening depression in multiple sclerosis patients to determine the nature of cognitive disturbance and the role of anxiety and depression in executive functioning of the patients (8, 9).

In this report, the Persian version of CMDI was developed and evaluated in normal subjects, patients with depression, and patients with two chronic

neurological diseases of multiple sclerosis and epilepsy.

## Materials and Methods

### Participants

Two group of normal volunteers and four groups of patients participated in the present study. The normal group included 313 medical students of Tehran University of Medical Sciences. They were asked to take part in the study at classrooms. The three groups of patients consisted of patients with major depression (n=51) diagnosed by a psychiatrist, multiple sclerosis (n=24), and epilepsy patients (n=26) both diagnosed by a neurologist. A group of normal, non-relative acquaintances of patients (n=57) were also included in the study. The participants were excluded from the study if they were drug-abusers. All the patients were recruited consecutively from Shariati and Rouzbeh hospitals, Tehran, within 6 months since data collection had started. Normal participants did not suffer from mental or neurological diseases as self-reported.

### Demographic Features

276 (88%) medical students, 42 (82%) depressed patients, 24 (100%) multiple sclerosis patients, 22 (85%) epilepsy patients, and 47 (82%) normal individuals accepted to answer the questionnaires. After excluding the incomplete questionnaires, 262 medical students (of which 114 were retested), 40 depressed patients, 23 multiple sclerosis patients, 21 epilepsy patients, and 43 normal people were included in the study. The omitted ones comprised of 14 medical students (9 males, 5 females), 2 depressed patients (2 females), and 1 male multiple sclerosis patient, 1 male epilepsy patient, and 4 normal people (3 males, 1 female). No one was excluded because of drug abuse.

### Translation protocol

1. Forward translation was done by a bilingual non-psychiatrist, non-psychologist person. Another bilingual non-psychiatrist, non-psychologist person performed the backward translation. To determine how the translation comes up with the English version, two professional psychologists evaluated the suitability of items of the Persian version and also compared the whole translation with the original questionnaire. The problematic items were changed according to the original version.

2. The translated version was evaluated in terms of content validity by clinical psychologists, and it was also evaluated by ten medical students in terms of simplicity, the time taken to answer the items, and correctness of the language. The whole items were reviewed and adapted culturally in terms of the comments made by two clinical psychologists.

### Reliability & Validity

Demographic, BDI-II, and CMDI questionnaires were given to the sample. 5-10 days after the baseline

administration, the three questionnaires were again given to medical students for evaluation of test-retest reliability. To determine the convergent validity, BDI-II and CMDI were given to depressed patients. Differential validity was determined by sampling depressed and non-depressed people, i.e. medical students and normal acquaintances.

### Cut-off Scores

Nyenhuis et al and Solari et al computed the cutoff points with the formula which is as follows:

Cutoff points = Mean + 1.5\*S.D. (3, 6).

The cut-off points for BDI-II (10), total CMDI score, mood, evaluative, and vegetative subscales were 23, 123, 46, 36, and 44 respectively. With BDI-II and CMDI cutoff points, 30.4% and 8.7% of the multiple sclerosis patients were depressed, the difference of which was not statistically significant. The same figures for epilepsy were 42.9% and 33.3% (p<0.001). With cutoff point of 23 for BDI-II, the least score for CMDI and its subscales to screen depression were 63, 17, 14, and 24.

### Statistical Methods

ANOVA and post-hoc Scheffe tests were used for comparing BDI-II, CMDI, and its subscales' scores among different groups. Test-retest reliability was determined by intra-class correlation in medical students. Correlation between BDI-II, CMDI, and its subscales was determined by Pearson correlation coefficient. Internal Consistency was assessed by Cronbach's alpha.

## Results

The mean age of medical students was 21.85 years. The mean ages for depressed patients, multiple sclerosis patients, epilepsy patients, and normal people were 32.50, 28.57, 26.81, and 26.79 years respectively. 92.7% of medical students, 47.5% of depressed patients, 60.9% of multiple sclerosis patients, 57.1% of epilepsy patients, and 76.7% of normal people were single. 21.4% of medical students, 17.5% of depressed patients, 43.5% of multiple sclerosis patients, 9.5% of epilepsy patients, and 44.2% of normal people were male.

All of the normal people were employed at the time of the study. Five persons took antihypertensive drugs, 3 anxiolytic drugs, and 2 herbal medicines. They were not afflicted with either neurological or a major psychiatric disease. Anxiolytics were taken for sleep disorders. No one had depression, psychosis, or anxiety.

The mean duration of disease was 4.25 years in the depressed group. Thirty one patients took antidepressant, 15 anxiolytic, 8 mood stabilizers, and 4 took antipsychotic drugs. Only 3 of the depressed patients were unemployed.

The mean duration of disease was 9.61 years in the multiple sclerosis group. Twenty one patients had relapsing-remitting disease, and two secondary

progressive disease. Eighteen patients took beta-interferone, 9 anxiolytic, and 8 other drugs such as oxybutinine or baclofen. All of them were employed. The mean duration of disease was 4.90 years in the epilepsy group. Twenty patients had generalized tonic-clonic seizures, and one complex partial seizure. Eighteen patients took first line anti-epileptic medications such as phenytoin and valproic acid and 11 took second line medications such as topiramate and lamotrigine. Nine patients took anxiolytic drugs. All of the patients were employed at the time of the study.

**Psychometric properties**

The mean time for answering the three questionnaires was 9.6 minutes (range 6-21 minutes). Only 3 multiple sclerosis patients could not complete the package alone due to visual impairment (two patients) and severe tremor (one patient). They were helped with reading and checking the numbers of appropriate answers.

Figure 1 shows the results of BDI-II for five different groups. The overall comparison showed a statistical significance ( $F(4,384)=45.4, p<0.001$ ). Scheffe's post hoc showed significant differences between depressed patients and epilepsy patients ( $p=0.04$ ), multiple sclerosis patients ( $p<0.001$ ), medical students ( $p<0.001$ ), and normal people ( $p<0.001$ ), and between epilepsy patients and medical students ( $p<0.001$ ) and normal people ( $p<0.001$ ); and between multiple sclerosis patients and medical students ( $p=0.028$ ). Figures 2 to 5 show similar diagrams for CMDI and its subscales. For CMDI, the overall comparison showed a significant difference ( $F(4,384)=23.5, p<0.001$ ). There were significant differences between depressed patients and multiple sclerosis patients ( $p<0.001$ ), medical students ( $p<0.001$ ), and normal people ( $p<0.001$ ), and between epilepsy patients and medical students ( $p=0.033$ ) and normal people ( $p<0.001$ ). For Mood subscale, Scheffe's post-hoc test showed a statistically significant difference ( $F(4,384)=18.1, p<0.001$ ). Statistical difference was present between depressed patients and multiple sclerosis patients ( $p<0.001$ ), medical students ( $p<0.001$ ), and normal people ( $p<0.001$ ), and between epilepsy patients and normal people ( $p=0.025$ ). In the Evaluative subscale, the comparison between all groups showed a statistical significance ( $F(4,384)=22.5, p<0.001$ ). Statistical difference was observed between depressed patients and multiple sclerosis patients ( $p=0.002$ ), medical students ( $p<0.001$ ), and normal people ( $p<0.001$ ) and patients and multiple sclerosis patients ( $p<0.001$ ), medical students ( $p<0.001$ ), and normal people ( $p<0.001$ ), and between epilepsy patients and medical students ( $p=0.046$ ) and normal people ( $p=0.009$ ). In the normal sample in the present study, correlation coefficients between BDI-II and CMDI and its subscales were mostly above 0.80 except between the BDI-II and vegetative subscale, which was 0.79

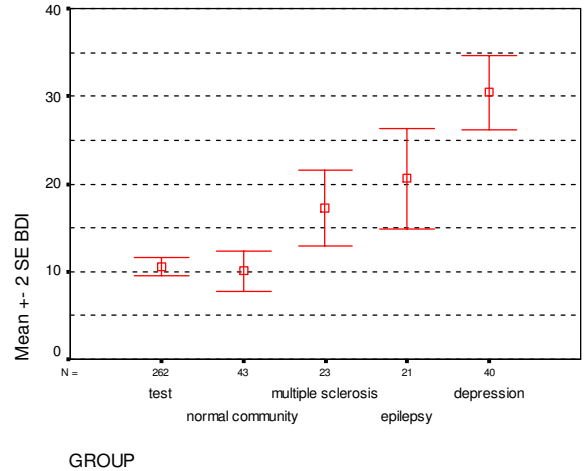


Figure 1. Mean and standard error of BDI-II scores for 5 different groups.

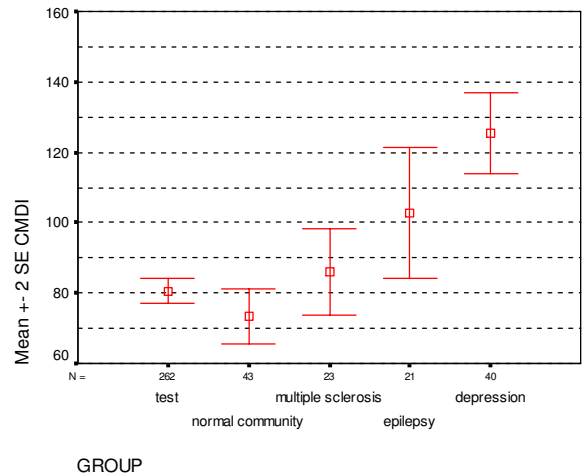


Figure 2. Mean and standard error of CMDI scores for 5 different groups.

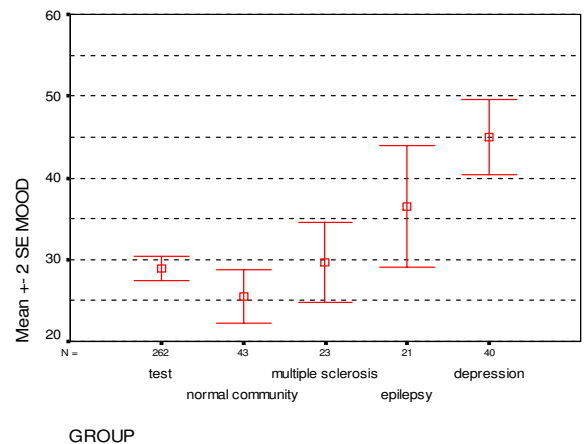


Figure 3. Mean and standard error of Mood subscale scores for 5 different groups

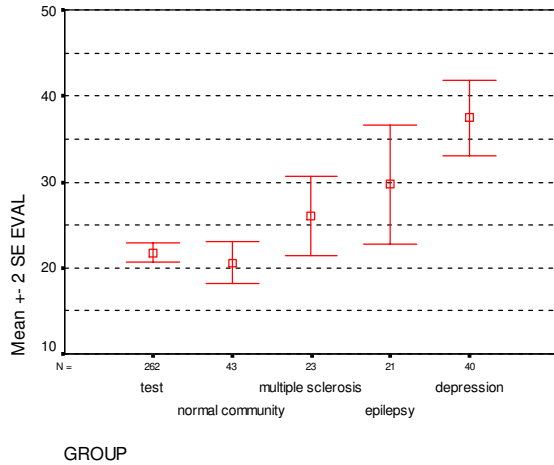


Figure 4. Mean and standard error of Evaluative subscale scores for 5 different groups

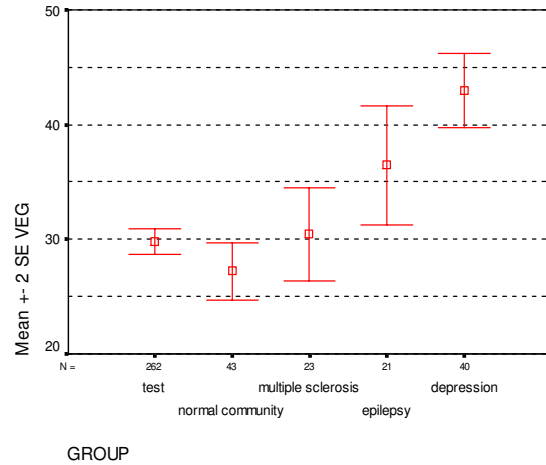


Figure 5. Mean and standard error of Vegetative subscale scores for 5 different groups.

( $p < 0.001$  for all correlations). Reliability coefficients for CMDI and its subscales (mood, evaluative, and vegetative), and internal consistency for CMDI between 5 different groups are included in the tables 2 and 3.

The cutoff scores which are shown in table 4 are obtained by the method mentioned in the Methods section. They are shown in table 4. Table 4 also demonstrates the cutoff scores in Italian and American samples. With this method, the cutoff score for BDI-II was 23. Table 5 shows demonstrates the mean scores of different groups in Persian and Italian samples. As shown, the total and subscales' scores are higher in normal Persian people and multiple sclerosis patients, but lower scores are present in the Persian depressed patients. Of these, there was a significant difference between the normal Persian community and normal Italian acquaintances ( $t = 2.4, p < 0.05$ ).

**Discussion**

Lifetime prevalence of major depressive disorder is 15%-25% (1). Major depression is associated with many chronic neurological diseases (1, 2). Multiple underlying disease. As noted earlier, many depression scales cannot differentiate these similar symptoms, which mostly are vegetative or somatic ones. Moreover, many studies have shown that in the presence of chronic diseases, depressive disorders will be over-diagnosed (3).

quality of life and functionality of the patients. This association makes the evaluation of the underlying adolescence, and therefore can have influence on disease and depression difficult. This will be more neurological diseases, often begin from childhood and problematic when there are some similarities between sclerosis and epilepsy, two of the most common symptoms of the co-morbid depression and the

Nyenhuis et al have developed CMDI in order to prevent this kind of misdiagnosis. They showed that it would be better to discriminate the similar symptoms than to use BDI-II. Multiple sclerosis and sleep apnea

Table 1. Correlation coefficients. p values for all correlations were  $< 0.001$

	CMDI	Mood	Evaluative	Vegetative
<b>BDI-II</b>	0.86	0.81	0.81	0.79
<b>CMDI</b>		0.94	0.96	0.93
<b>Mood</b>			0.87	0.80
<b>Evaluative</b>				0.84

Table 2. Test-retest reliability (TRR)

BDI-II	CMDI	Mood	Evaluative	Vegetative
0.87	0.92	0.89	0.91	0.90

Table 3. Internal Consistency (IC)

Total	Medical Students	Normal People	Depres.	Multiple Sclerosis	Epilepsy
0.95	0.93	0.94	0.95	0.92	0.96

Table 4. Cutoff scores for CMDI and its subscales in Persian, Italian, and American samples

	Persian	Italian	American
<b>CMDI</b>	123	89	98
<b>Mood</b>	46	23	23
<b>Evaluative</b>	36	10	11
<b>Vegetative</b>	44	25	28

**Table 5. Mean scores of CMDI and its subscales in Persian and Italian subject. MS: multiple sclerosis**

Persian subjects	CMDI	Mood	Evaluative	Vegetative	Italian subjects	CMDI	Mood	Evaluative	Vegetative
Normal community	73	26	21	27	Normal acquaintances	63	21	17	24
Medical students	81	29	22	30	Normal family members	68	23	18	26
MS subjects	86	30	26	30	MS subjects	74	26	19	29
Depressed subjects	125	45	37	43	Depressed subjects	127	48	33	46

showed that CMDI had acceptable results in MS and depressive patients (7).

The time taken for completing the questionnaires and lack of need for help in the majority of the participants is indicative of simplicity of the questionnaire. This finding makes this questionnaire suitable for studies accomplished by mail. Solari et al suggested that if there are less than 4 items undone in each subscale, the researcher can substitute their score with the mean score of other items in the corresponding subscale (7) Acceptable internal consistency, reliability, and correlation with BDI-II are similar to the results of Nyenhuis et al and Solari et al. Among multiple factors, only the samples' age had a good correlation coefficient with the score of CMDI and BDI-II. This finding was also similar to Solari et al which showed that older age is associated with higher incidence of depression.

With BDI-II cut-off score, 30% of the MS patients were depressed. This figure was 9% for CMDI and its mood subscale. There were no significant differences between these two figures, and since the figure of BDI-II was more than that of CMDI, BDI-II One, it may be concluded that it over-diagnoses depression in MS patients. This is consistent with Nyenhuis et al, which considered non-mood symptoms to be involved in over-diagnosis of depression in multiple sclerosis patients. They also noted that the only exact criterion for the diagnosis of depression in multiple sclerosis patients is mood symptoms, a finding which is confirmed by this study. Another finding is that 30% is very similar to that of Nyenhuis et al (1995), but according to their study, 18% of MS patients were depressed when tested with CMDI. This difference may be due to the result of the inherent dissimilarities between American and Persian people, of which lack of knowledge about MS is the major one.

43 %of epilepsy patients were depressed when tested with BDI-II ; however, tested by CMDI and its mood subscale, 33% of them were depressed. There was a significant difference between these figures. In addition, vegetative scores were significantly higher when compared to the BDI-II score. This may indicate that higher percentage of BDI-II is the result of vegetative symptoms evaluated falsely in the study of depression by BDI-II. Since there are fewer reports on non-mood symptoms of epilepsy in comparison to other

chronic neurological diseases, further studies are needed to tackle this problem.

No great difference was observed in the total CMDI score and its subscales between the Persian and Italian MS and depressed patients. Since no study was conducted on epileptic patients with CMDI, such a comparison couldn't be accomplished.

Psychometric results of this study were comparable to Nyenhuis et al and Solari et al. Normal people and medical students were discriminated from epilepsy and depressed patients, but MS patients couldn't be differentiated by CMDI or its subscales from normal subjects and medical students. There could be three types of explanation:

- 1) The psychological aspects of MS patients in Iran are somewhat different compared to other countries.
- 2) The sample size is not large enough ; therefore, CMDI was not capable of discriminating depressed MS patients from non-depressed MS patients.
- 3) CMDI is not as applicable as BDI-II in Persian people because our goal for which we conducted this study was reached by BDI-II.

This is the first study that evaluated the CMDI in Persian patients. This is also the first study which examined epilepsy patients with CMDI. Some shortcomings of this study are as follows:

- 1) Our sample size was much smaller compared to Solari et al. Therefore, some statistical analyses were not performed including factor analysis. Nyenhuis et al (1995), derived 5 main factors out of CMDI.
- 2) Caution should be taken in terms of reliability property, as the reliability quotient was examined only in normal participants.
- 3) It should also be noted that in order to measure more precise differential validity, future studies may include more non-depressed MS and epileptic patients in the study. This allows the researchers to look into deferential validity between depressed and non-depressed MS or epileptic patients .
- 4) To test construct validity by factor analysis, larger sample size is needed in future studies.

The prevalence of depression is higher in MS and epilepsy patients, so monitoring such symptoms during treatment seems appropriate. Although similarities between depressive symptoms and medical diseases may lead to incorrect evaluation of depression, correct severity and treatment of depression can improve the patients' quality of life and outcome and may lead to a decrease in administering drugs.

## Conclusion

The Persian version of CMDI can be used in Persian subjects with acceptable validity and reliability and also internal consistency. Further studies are needed in order to perform factor analysis in normal and medically diseased subjects. Moreover, the comparison of CMDI with other Persian-versioned depression scales, can improve its power.

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