

## Validity and Reliability of Clinical Dementia Rating Scale among the Elderly in Iran

Nahid Sadeghi,<sup>1</sup> Maryam Noroozian,<sup>\*2</sup> Hassan Khalaji,<sup>3</sup> Pouneh Mokhtari<sup>4</sup>

1. Department of Physical Education and Sport Sciences, Faculty of Humanities, Islamic Azad University, Science and Research Branch, Tehran, Iran
2. Department of Neurology, Tehran University of Medical Sciences, Tehran, Iran
3. Department of Physical Education and Sport Sciences, Arak University, Arak, Iran
4. Department of Physical Education and Sport Sciences, Islamic Azad University of Tehran, Tehran, Iran

Article information	Abstract
<p>Article history: Received: 14 Oct 2011 Accepted: 6 Nov 2011 Available online: 24 Oct 2012 ZJRMS 2012; 14(10): 47-50</p> <p>Keywords: Clinical dementia rating scale Reliability Validity Iran</p> <p>*Corresponding author at: Department of Neurology, Tehran University of Medical Sciences E-mail: maryam@onlinememory.org</p>	<p><b>Background:</b> The most common cause of dementia among the elderly is Alzheimer's disease. Given the increasing population of the elderly, achieving a screening tool with high reliability and validity is an essential need for all communities. The main objective of the project was to determine the Persian version of Clinical Dementia Rating Scale (P-CDR1).</p> <p><b>Materials and Methods:</b> Twenty subjects were randomly selected from among 150, 50-70 year old people, who were illiterate and not mentally retarded, residing in the nursing home; and they were given the Persian version of CDR scale (test). After three months, the group was given the test again.</p> <p><b>Results:</b> The findings showed that from the specialists' standpoint CDR scale had acceptable validity, and the test validity was achieved 0.05 at the significant level with Cronbach's alpha and reliability coefficients 73% and 89%, respectively.</p> <p><b>Conclusion:</b> CDR scale is a reliable instrument for evaluation of clinical dementia rating among the elderly in Iran. It can be used in screening dementia, Alzheimer, and diagnosis of the severity and stages of Alzheimer.</p> <p>Copyright © 2012 Zahedan University of Medical Sciences. All rights reserved.</p>

### Introduction

Life span of people increased in the last century. The population all over the world is aging. The average human life has been increased about 30 years over the last 100 years. In Iran also, there has been about 10 year increase in Iranians' lives from 1365 until 1375 [1]. According to the results of the latest statistics in Iran, the population of the aged (65 years old and older) reaches 26 million in 1428 from 5 million in 1385 [2]. The increase in the life span is not a desirable and positive phenomenon in case it is associated with serious problems. Hence, it is time to deal with the quality of life in the century to come.

The studies indicate dementia as the most important problem, and Alzheimer as the most common one at the old age. Based on the prediction, outbreak of dementia among 1 million individuals all over the world in 1990 will reach to 2.9 million in 2020 [3]. Timely diagnosis and prevention of the progress of the illness can reduce physical, mental and financial burdens of the patient, family and society. Lots of assessment tools have been suggested in different countries. As the most important tests among them, it can be referred to CDR, MMSE, FAST, WMS, ADAS-Cog. For any assessment, the test is selected based on the culture and level of knowledge. According to the statistics in 1996, most of the individuals older than 65 especially women (97%) are illiterate [4] (Table 1). Therefore, it is essential to

determine a test which does not cause deviation of the memory test result. Among the existing tests, CDR scale is the only one that deals with the memory level through short-term and long-term memory. Given that in a memory test while facing complicated questions, the elderly avoid completing the test due to the fear of the onset of memory impairment in front of the others, the test does not require them to answer complicated questions. But, the examinees are encouraged to complete the test because it does not contain hard and complicated questions.

CDR scale was first administered in Washington School of Medicine in 1982 [5]. After revision in 1993, it was of high reliability and validity [6, 7].

One method for valuation of a test is its comparison with other standard tests. Maria Beatriz and Louise Ramos compared CDR scale with the scale of MMSE test among the population in Portugal. The test was identified as an instrument with 100% positive diagnostic criterion. Given MMSE, they also stated the instrument as a normal scale for dementia assessment [8].

Comparing the test with a gold standard, the best of which concerns the individuals' medical and clinical characteristics, is another method for approving its valuation. A study was conducted in an Asian community with different races and in different countries. The score of an individual's clinical dementia rating was compared

with his clinical characteristics and psychometric scores. The results indicated the convergent validity of the test with the assessment [9].

Some researchers regard the tool appropriate and valid for screening between normal aging and dementia (for example: the score 0.05 as Mild Cognitive Impairment) [10-14].

The test reliability and validity were examined in different countries including Brazil [15], Korea [16], Portugal [8] and China [17]. CDR scale was concluded as a reliable test for dementia diagnosis and classification. In this project, the validity and reliability of the Persian version of CDR were reviewed for population in Iran.

**Table 1.** Distribution of illiteracy percentage among the population above 65 years old in urban and rural areas in Iran in 1996

	Women and men	men	Women
The whole country	77	67.4	88.2
Urban areas	67.3	54.7	81.3
Rural areas	89.7	83.2	97.7

## Materials and Methods

Twenty subjects (the average age of  $61.6 \pm 6.5$ ) were randomly selected from among 150 women of 50-70 year old residing in the nursing home in Tehran Shahr-e-Ghods. Confidential information in the records of the participants in the center, personal information questionnaires filled out at the beginning of the research, in addition to the confirmation by the physician and psychologist of the center helped to identify the individuals without brain damage, epilepsy, and mental and psychological problems. The participants are assured that the data achieved from the test is confidential and just for assessing their clinical dementia rating and not for transferring them to other sections (mentally retarded). CDR scale was administered after the participants consented.

CDR clinical tools were developed for evaluation of staging dementia severity in aging and memory project in Washington School of Medicine in 1979. A semi-structured standard set is for evaluating dementia severity. The reason for being semi-structured is the difference in culture and practical terms, which are changed proportionally, in different countries. The test includes 75 questions from the subject and his companion in six fields: memory, time and space orientation, judgment and problem solving, social affairs, home and recreations, and personal matters. Each area is separately rated from 0 to 5. Finally, evaluation is done as follows: zero indicates the absence of Alzheimer dementia, 1, 2, and 3 represent the suspected and low, moderate and severe degree, respectively. Four and five are indications of the profound and final degree [6]. The rating of the test under consideration was consistent with the features of different stages of Alzheimer's disease [18].

After rendering the test into Persian, necessary changes were applied in the study in compliance with Iranian culture with the viewpoints of neurologists and Persian and English linguists. Then, the test was experimentally

administered among different people in different classes. Common, important and applied terms were intended to be identified at different ages, and the final version was administered after specialists' confirmation. For test-retest review, the participants were retested after 3 months.

As mood changes and depression have an impact on memory tests, the subject's depression rate was controlled with Geriatric Depression Scale (GDS) [19].

To compute the reliability of clinical dementia rating scale, the questions of the scale were assessed first through Cronbach's Alpha, Half-Split and then Internal Consistency methods. To determine the internal consistency of a test, Spearman-Brown formula was used in half-split method. Low level of internal consistency was reported by Guttman's coefficient.

The reliability coefficient was calculated through test-retest method. To calculate the reliability coefficient through this method, first, the scaling tool was administered among a group of subjects and again after an interval of time, the scale was administered for the same group in the same condition. The achieved correlation coefficients of the scores of the two tests indicate the reliability of the tool.

To calculate reliability coefficient, the amount of Pearson correlation coefficient between the test and the retest was reported separately for the subscales of clinical dementia rating scale. Correlation coefficient test was applied in any item which assessed the theory of lack of reliability (Reliability coefficient=0).

Finally, Interclass Correlation Coefficient (ICC) method was used to compute the total reliability coefficient. The confidence limits for the total reliability coefficient and ICC scale were reported zero for the theory of lack of reliability or zero reliability.

In order to consider the validity of the test according to the items related to the accurate and clear translation of the questionnaire questions, the way of writing, the use of appropriate words, observing grammatical points and consistent with Iranian culture, relevance of the question for memory assessment, the necessity and clarity of the question, neurologists, psychiatrists, and psychologists' views were used.

## Results

As mood has no changes due to the use of GDS in the study, depression is not expected to have an impact on the memory of the subjects. Then, the impact of the rate of depression on memory is neutral in the study.

Cronbach's alpha, reliability through half-split method, and reliability based on Guttman's method were achieved 0.73, 0.69, and 0.84, respectively. The amount of Pearson correlation coefficient between the test-retest scores for reliability coefficient assessment in each subscale and P-value for reliability coefficient test for each subscale were presented in table 2.

Zero significant level ( $p = 0.00$ ) for each item rejected the theory of lack of reliability for the items of clinical dementia rating scale with a  $p = 0.01$ . The amount of ICC=0.89 was achieved for calculating reliability

coefficient. Confidence limits for reliability coefficient are 0.96 and 0.79 which represent the desirable reliability of the test. The amount of  $F_{19, 209} = 3.15$  was achieved for the total reliability scale and  $p < 0.01$  indicated the total reliability significance at the level of 0.01.

The test validity was assessed based on the fluent writing of translation, the relevance of the question to testing the memory, and the necessity of the questions. The validity was acceptable according to medical professionals in the fields of neurology, psychiatry, and psychology.

**Table 2.** Reliability coefficient of the clinical dementia rating subscales

Subscale	Reliability coefficient	p-value
Memory	0.91	0.001
Time and space orientation	0.87	0.001
Judgment and problem Solving	0.79	0.001
Social affairs	0.77	0.001
Home and recreations	0.83	0.001
Personal matters	0.74	0.001

## Discussion

Due to the census of Iran Statistical Center in 1996, more than 70% of the elderly in Iran are illiterate. Therefore, a test which does not require reading and writing skills is needed for screening and clinical dementia rating assessment. Reviewing the best existing tests in the world, some conclusions were drawn in this respect. In Wechsler test specific to memory, the memory score is deviated due to numerical calculations and association reminiscence because reading and writing skills are required. In MMSE test also, a polygonal design should be drawn; while, an illiterate person has difficulty in holding a pen and he is unable to draw a shape. Ganguli et al. reported that MMSE test has no application as it requires education in the South of India. Thus, the validity of this type of memory tests is unclear for the illiterate [20]. Because the subject may have a good memory but for his weakness in calculation and picture drawing due to the above reasons, the test would calculate a negative score for his memory. So, just the individual's memory, not his knowledge and ability, should be assessed. Among memory tests, CDR scale does not necessitate reading and writing skills; and all its subscale have been designed based on general information, and daily and personal life. Hence, the test can be called an internal assessment indicator.

Therefore, CDR tool seems to be the most appropriate existing one in terms of studying clinical dementia rating for an individual without any kind of education, because, he is compared with his own past.

## References

1. Clare L, Woods RT. Clinical psychology of aging. 2<sup>nd</sup> ed. New York: John Wiley & Sons; 2008: 348-380.
2. Shahidi M. Lecture of adult national institute of Iran. available on <http://kahrizak.com>. Accessed 20 march 2006.
3. Ishii H, Meguro K, Ishizaki J, et al. Prevalence of senile dementia in a rural community in Japan: The Tajiri project. Arch Gerontol Geriatr 1999; 29(3): 249-65.
4. Noroozian M. The elderly population in Iran: A growing health concern. IPA Bulletin 2009; 26(3): 8-9.

Given the findings in the project, CDR scale is of high validity and reliability and the finding is consistent with lots of research. Morris, one of the inventors of the test, believes that the test is a valid and reliable tool for dementia of Alzheimer type [21]. The face validity [22], predictive validity [23], and evaluators' reliability have been presented. Concurrent validity also has been examined and confirmed by psychometrists [24, 25].

Wee Shilon et al., who studied CDR application in Asian communities, concluded that the test is a valid and reliable tool which is used in many studies on Asian population [26].

In 2001, the validity of the Korean version of the test was investigated among 34 subjects without dementia, 41 subjects with Alzheimer, and 37 suffering from vascular dementia. The results presented a significant and very high correlation between the test and K-BNT, K-SKT, and MMSE tests. Moreover, the Korean version of the test was identified as reliable and valid tool for rating the patients with dementia [16].

To investigate the CDR value criterion among Brazil population, a good degree was concluded for the identification quality of CDR scale. In addition, a high level of error finding was confirmed for the test [15].

The new Korean study in 2006 and the American and European studies showed similar results. Accordingly, CDR scale well predicts the progress of Alzheimer's disease in individuals with mild cognitive impairment (MCI) [11].

Given the subjects' age, the long administration time is one of the problems with the test. Research on clinical application and in both genders is recommended to be done. CDR scale is an assessment tool of clinical dementia rating with high validity and reliability for diagnosing dementia and Alzheimer among Iranian community. The use of the tool is suggested in dementia screening studies and determining Alzheimer's stages.

## Acknowledgements

The cooperation of the staff and the aged mothers in the nursing home in Tehran Shahr-e-Ghods is appreciated. The project is a part of the PhD dissertation conducted by Nahid Sadeghi.

## Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

## Conflict of Interest

The authors declare no conflict of interest.

## Funding/Support

Tehran University of Medical Sciences.

5. Hughes CP, Berg L, Danziger WL, et al. A new clinical scale for the staging of dementia. *Br J Psychiatry* 1982; 140: 566-72.
6. Morris JC. The Clinical Dementia Rating (CDR): current version and scoring rules. *Neurology* 1993; 43(11): 2412-4.
7. Bergner M, Finkel S. *Treating Alzheimer and other dementia: Clinical application of recent research advances*. New York, NY: Springer publishing; 1995: 338-346.
8. Montano MB, Ramos LR. [Validity of the Portuguese version of clinical dementia rating] Portuguese [abstract]. *Rev Saude Publica* 2005; 39(6): 912-7.
9. Lim WS, Chin JJ, Lam CK, et al. Clinical dementia rating: Experience of a multi-racial Asian population. *Alzheimer Dis Assoc Disord* 2005; 19(3): 135-42.
10. Lam LC, Ho P, Lui VW and Tam CW. Reduced semantic fluency as an additional screening tool for subjects with questionable dementia. *Dement Geriatr Cogn Disord* 2006; 22(2): 159-64.
11. Lee DY, Youn JC, Choo IH, et al. Combination of clinical and neuropsychologic information as a better predictor of the progression to Alzheimer disease in questionable dementia individuals. *Am J Geriatr Psychiatry* 2006; 14(2): 130-8.
12. Wang PN, Liu HC, Lin KN. The MCI study in Taiwan. *Acta Neurol Taiwan* 2006; 15(1): 66-8.
13. Meguro K, Ishii H, Yamaguchi S, et al. Prevalence and cognitive performances of clinical dementia rating 0.5 and mild cognitive impairment in Japan. The Tajiri project. *Alzheimer Dis Assoc Disord* 2004; 18(1): 3-10.
14. Meguro K, Shimada M, Yamaguchi S, et al. Neuropsychosocial features of very mild Alzheimer's disease (CDR 0.5) and progression to dementia in a community: The Tajiri project. *J Geriatr Psychiatry Neurol* 2004; 17(4): 183-9.
15. Chaves ML, Camozzato AL, Godinho C, et al. Validity of the clinical dementia rating scale for the detection and staging of dementia in Brazilian patients. *Alzheimer Dis Assoc Disord* 2007; 21(3): 210-7.
16. Choi SH, Na DL, Lee BH, et al. Estimating the validity of the Korean version of expanded clinical dementia rating scale. *J Korean Neural Assoc* 2001; 19(6): 585-591.
17. Peggie Pik Ki NG. Cognitive profile of the Chinese version of dementia rating scale for Chinese elderly with dementia. *Hong Kong J Occupational Therapy* 2003; 13(1): 11-18.
18. Galasko D, Edland SD, Morris JC, et al. The consortium to establish a registry for Alzheimer's disease (CERAD). Part XI. Clinical milestones in patients with Alzheimer's disease followed over 3 years. *Neurology* 1995; 45(8): 1451-5.
19. Malakouti SK, Fatollahi P, Mirabzadeh A, et al. Reliability, validity and factor structure of the GDS-15 in Iranian elderly. *Int J Geriatr Psychiatry* 2006; 21(6): 588-93.
20. Ganguli M, Dube S, Johnston JM, et al. Depressive symptoms, cognitive impairment and functional impairment in a rural elderly population in India: A Hindi version of the geriatric depression scale (GDS-H). *Int J Geriatr Psychiatry* 1999; 14(10): 807-20.
21. Morris JC. Clinical dementia rating: A reliable and valid diagnostic and staging measure for dementia of the Alzheimer type. *Int Psychogeriatr* 1997; 9(Suppl 1): 173-6.
22. Morris JC, Ernesto C, Schafer K, et al. Clinical dementia rating training and reliability in multicenter studies: The Alzheimer's disease cooperative study experience. *Neurology* 1997; 48(6): 1508-10.
23. Berg L, Danziger WL, Storandt M, et al. Predictive features in mild senile dementia of the Alzheimer type. *Neurology* 1984; 34(5): 563-9.
24. Burke WJ, Miller JP, Rubin EH, et al. Reliability of the Washington University Clinical Dementia Rating. *Arch Neurol* 1988; 45(1): 31-2.
25. Zec RF, Landreth ES, Vicari SK, et al. Alzheimer disease assessment scale: Useful for both early detection and staging of dementia of the Alzheimer type. *Alzheimer Dis Assoc Disord* 1992; 6(2): 89-102.
26. Lim WS, Chong MS, Sahadevan S. Utility of the clinical dementia rating in Asian populations. *Clin Med Res* 2007; 5(1): 61-70.

*Please cite this article as:* Sadeghi N, Noroozian M, Khalaji H, Mokhtari P. Validity and reliability of clinical dementia rating scale among the elderly in Iran. *Zahedan J Res Med Sci (ZJRMS)* 2012; 14(10): 47-50.