Original Article

Validity and reliability of CDAI in comparison to DAS28 in Iraqi patients with active rheumatoid arthritis

Faiq I. Gorial * CABM, FIBMS (Rheum& Med. Rehab.)

Summary:

Background: Rheumatoid arthritis (RA) disease activity plays a central role in causing disability both directly and via indirect effects mediated through joint damage. Evaluation of RA disease activity is therefore important to predict the outcome and effectiveness of therapeutic interventions during follow-up. Clinical disease activity index (CDAI) is new simple tool for measurement of disease activity.

Objectives: To assess validity and reliability of CDAI in comparison to disease activity score-28 joints (DAS28) in Iraqi patients with active RA.

Patients and Methods: Sixty nine Iraqi RA patients were included in this study. All patients were fulfilling the ACR classification criteria and active. Full history was taken and complete clinical examination was done for all patients. Patients' age, sex, duration of the disease, number of tender joints, number of swollen joints, patient's and physician's (evaluator) global assessment by visual analogue scale (VAS) (0–10 cm) were recorded. Laboratory analysis included erythrocyte sedimentation rate (ESR). CDAI and DAS28 were measured to assess disease activity.

Results: Of 69 patients included in this study, there were 58 women and 11 men. Mean age of the patients was 45.65±12.26 years and mean duration of disease was 7.75±7.85 years. Mean DAS28 and CDAI were 5.86±1.24 and 30.07±14.07respectively.There was direct significant correlation between CDAI and DAS28 (r= 0.879, P< 0.001). Also we found good agreement between CDAI and DAS28 (Kappa = 0.795, P < 0.001). CDAI had sensitivity 90%, specificity 92%, Likelihood ratio (LR) 45.67, Area under the curve (AUC) 0.983 [95% confidence interval (CI) 0.933-1.000] (P value < 0.001).

Conclusions: CDAI is a valid and reliable measure for assessment of Iraqi patients with active RA in comparison to DAS28.

Keywords: Clinical disease activity index, disease activity score 28 joints, rheumatoid arthritis activity.

Fac Med Baghdad 2012; Vol. 54, No. 3
Accepted June. 2012
Received May. 2012

Introduction:

Rheumatoid arthritis (RA) is an inflammatory joint disease that causes structural joint damage, incapacitation, and alterations in quality of life. These adverse consequences can be prevented, at least in part, by early appropriate therapy, in particular a "tight control" strategy (1). Such strategy necessitates evaluating disease activity and response to treatment with objective and standardized tools (2). Various factors are known to determine the disease activity in patients with rheumatoid arthritis (RA) (3). Disease Activity Score-28 joints (DAS28) is one of the standard methods to measure the disease activity in patients of RA (4). DAS28 use in clinical practice is recommended by the European League against Rheumatism (EULAR) (5). DAS28 is calculated from the number of tender and swollen joints (28-joint count), patient self-assessment of disease activity (visual analog scale), and ESR (6) by the following formula: DAS28 = (0.56 * tender joint count $^{1/2}$) + (0.28 * swollen joint count $^{1/2}$) + (0.7 * ln [ESR]) + (0.014*VAS) (7). This means that this formula requires very complicated calculation, which requires a calculator; whereas the clinical disease activity index (CDAI) is calculated by adding the sum of tender joint count(TJC) and swollen joint count (SJC), as well as patient global assessment (PGA) and evaluator global assessment (EGA), using a 10-cm visual analog scale (8). This study was designed to evaluate the validity of CDAI in comparison to DAS28 in assessment of Iraqi patients with active rheumatoid arthritis.

Patients, materials and methods:

This cross-sectional study was conducted in Baghdad Teaching Hospital, Rheumatology Unit from August 2011 to January 2012. A total of 69 patients (58 females and 11 males) with active RA were involved in this study. Patients were diagnosed to have RA by the rheumatologist according to American College Rheumatology (ACR) classification Criteria for RA (9). All patients were asked about their age, duration of the disease, medication taken. We assessed disease activity by disease activity score (DAS28) and (CDAI). The patients were clinically examined and the number of swollen joints (0–28) and tender joints (0–28) were documented. The 28 joints included bilateral knees, shoulders, elbows, wrists,

** Department of Medicine, Medical Rheumatology Unit. , College of Medicine, Baghdad University.*

metacarpophalangeal and proximal interphalangeal joints. The patients were asked to mark on the VAS (Visual analogue scale) of 0–10cm according to their global assessment of disease activity. The physician marked on the VAS of 0–10 cm according to the physician global assessment of the disease activity.

Erythrocyte sedimentation rate (ESR) was measured (usingWestergren's method, in mm/ hour). DAS28 was calculated using an electronic device in the online softwarehttp://www.4s-awn.com/DAS28/DAS28.html. (7). Patients with diseases other than rheumatoid arthritis were excluded from the study. All patients included in the study signed the informed consent form according to the declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Baghdad University, College of Medicine, Medical Department.

Statistical analysis: Statistical analysis was done using statistical package for social sciences version 18 (SPSS v.18, Chicago, IL, USA). Chi square test was used to test the association between discrete variables. One sample T test was used to find the means of normally continuous samples. Pearson correlation coefficient used to assess the correlation between continuous variables. Receiver operator characteristic (ROC) curve used to assess the performance of a screening test at different levels. Kappa statistics were used to assess the agreement between CDAI and DAS28. All P values used were asymptotic and two sided. Findings with P value less than 0.05 were considered significant.

Results:

Of the 69 patients who were included in the study, 58 were females and 11 were males. The mean age of the patients was 45.65 years (standard deviation: 12.26 years; range: 28 – 69 years). The means and standard deviations of different study variables were shown in In Table 1. There was direct significant correlation between CDAI and DAS28 (r= 0.879, P< 0.001, Table 2). Also we found good agreement between CDAI and DAS28 (Kappa = 0.795, P < 0.001, Table 3) Sensitivity, specificity, likelihood ratio(LR), and area under the curve (AUC) were significantly high in comparison to DAS28 as shown in Table 4 and figure1 (P value < 0.001). DAS28, Disease activity score 28; CDAI, clinical disease activity index, ESR, erythrocyte sedimentation rate; VAS visual analog scale; EGA, evaluator global assessment

Table 1: Baseline characteristics of 69 active RA

Variables	values
Age (years; mean ± SD)[range]	45.65±12.26 [28–69]
Female: male	58:11
Duration(years; mean ± SD)	7.75±7.85
DAS28	5.86±1.24
CDAI (mean ± SD)	30.07±14.07
ESR (mm/hr)	47.51±29.20
Morning Stiffness (min)	31.4±29.3
Number of Swollen Joints (mean ± SD)	7.13±5.02
Number of Tender Joints (mean ± SD)	11.55±7.39
VAS (mean ± SD) (mm)	63.48±25.43
EGA (mean ± SD) (mm)	53.91±21.50

Table 2: Correlation of CDAI with DAS28 in 69 active RA patients

Variable	Pearson's correlation (r)	P-value
CDAI	0.879	0.000

DAS28, Disease activity score 28; CDAI, clinical disease activity index

Table3: Measurement of agreement between DAS28 and CDAI in 69 active RA patients

Agreement test	Value	P-value
Kappa test	0.795	0.000

DAS28, Disease activity score 28; CDAI, clinical disease activity index

Table4: Validity of CDAI in comparison to DAS28 in 69 active RA patients

Test -variable	AUC	95%CI	Sensi-tivity	Speci-ficity	LR	P-value
CDAI	0.968	0.933-1.000	90%	92%	45.67	0.000

CDAI, Clinical disease activity index, DAS28, disease activity score 28; AUC, area under the curve; LR, likelihood ratio. CI, confidence interval

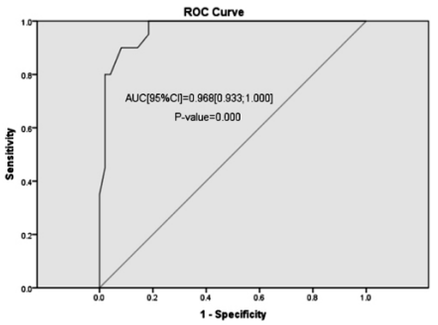

Figure1: ROC curve illustrating the sensitivity and 1-specificity values for different values of CDAI corresponding to a DAS28; AUC, area under the curve; CI, confidence interval

Discussion:

Our study showed that there was direct correlation between CDAI and DAS28 with good agreement between the two measurements. In addition, CDAI had high sensitivity, high specificity, high area under the curve, and good predictive likelihood ratio. This is of clinical importance and suggests that CDAI is a valid tool for measurement of disease activity in RA in Iraqi patients and it is as good as DAS28 in its ability to assess the patient's status. These results agreed with other studies which showed that CDAI is a valid and comparable tool to DAS28 (2, 8-14), however these studies did not mention and measure the predictive LR of CDAI in comparison to DAS28 that we measured in our study. The management of RA has changed radically over the last 10 years, with the introduction of new drugs and treatment strategies and with the emergence of new concepts of disease severity, treatment targets, and means of evaluating treatment effects (8). The CDAI is a more simplified score than the DAS28 because it is determined by the summation of the SJC, TJC, patient's global assessment, and the physician's global assessment (8) and unlike the DAS28; it does not include the ESR. This enables the physician to immediately know the disease activity score and make treatment decisions during the patient encounter. Therefore; CDAI, in contrast to DAS28, can be obtained at any time and in any setting and shows validity similar to that of DAS28. It may be easier to understand by the patients and may enhance adherence to the treatment regimen. And similar to the DAS28, It has been reported to perform well in clinical practice (15 ,16). The small number of patients included in this study may be seen as a limitation. Therefore, patients should be further studied and validated using a larger patient pool. However, to the best of our knowledge, this is the first report describing validity and reliability of CDAI in comparison to DAS28 in Iraqi patients with active Rheumatoid arthritis.

Conclusion

CDAI is a valid and reliable measure for assessment of Iraqi patients with active RA in comparison to DAS28.

References:

1.Goekoop-Ruiterman YP, de Vries-Bouwstra JK, Kerstens PJ, et al. DAS-driven therapy versus routine care in patients with recent-onset active rheumatoid arthritis. Ann Rheum Dis 2010; 69:65–9.

2.Cécile Gaujoux-Viala, Gaël Mouterde, Athan Baillet, et al Evaluating disease activity in rheumatoid arthritis:Which composite index is best? A systematic literature analysis of studies comparing the psychometric properties of the DAS, DAS28, SDAI and CDAI. Joint Bone Spine 2012; 79: 149–155

3.Pincus T. The American College of Rheumatology (ACR) Core Data Set and derivative "patient only" indices to assess rheumatoid arthritis. Clin Exp Rheumatol 2005; 23(Suppl 39):S109–13.

4.Prevoo ML, van't Hof MA, Kuper HH, et al. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. Arthritis Rheum 1995; 38: 44–8.

5.Josef S Smolen, Daniel Aletaha , et al. Treating rheumatoid arthritis to target:recommendations of an international task force : Ann Rheum Dis 2010;69:631–637.

6.Oliver A M., St. Clair E W. Rheumatoid Arthritis: Treatment and Assessment. In: Klippel J H, Stone J H, Crofford L J, And White P H, Eds,.Primer On Rheumatic Diseases, 13th. New York, USA: Springer Science And Business Media, 2008; Ch 6: 133-141(CD)

7.DAS 28 - Disease Activity Score Calculator for Rheumatoid Arthritis. The online software http://www.4s-dawn.com/DAS28/DAS28.html. (accessed: January 2012)

8.Aletaha D, Smolen J. The Simplified Disease Activity Index (SDAI) and the Clinical Disease Activity Index (CDAI): a review of their usefulness and validity in rheumatoid arthritis. Clin Exp Rheumatol. 2005;23(5 Suppl 39):S100-S108.

9.Arnett FC, Edworthy SM, Bloch DA, et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum 1988; 31: 315–24.

10. Arya V , Malaviya AN, Raja RR. Clinical disease activity index (CDAI) in rheumatoid arthritis: cut-off values for classification into different grades of disease activity. Indian Journal of Rheumatology 2007; 2(3): 91–94

11. Ghosh A , Biswadip G, Shantashil P, et al. Comparison between DAS28, CDAI and HAQ-DI as tools to monitor early rheumatoid arthritis patients in eastern India. Indian Journal of Rheumatology 2011; 6(3): 116–122

12. Hamdi W , Ne´ji O , Ghannouchi MM , et al. Comparative study of indices of activity evaluation in rheumatoid arthritis. Ann Phys Rehabil Med. 2011 Oct; 54(7):421-8. Epub 2011 Oct 1.

13. So-Yeon Park, Hyeseon Lee, Soo-Kyung Cho, et al. Evaluation of disease activity indices in Korean patients with rheumatoid arthritis. Rheumatol Int 2012; 32:545–549

14. Rintelen B, Sautner J, Haindl PM, et al. Comparison of three rheumatoid arthritis disease activity scores in clinical routine. Scand J Rheumatol 2009;38:336-341

15. Aletaha D, Smolen J S. The Simplified Disease Activity Index and Clinical Disease Activity Index to Monitor Patients in Standard Clinical Care. Rheum Dis Clin N Am 2009; 35: 759–772

16. Aletaha D, Smolen JS. The Simplified Disease Activity Index (SDAI) and Clinical Disease Activity Index (CDAI) to monitor patients in standard clini cal care. Best Pract Res Clin Rheumatol. 2007; 21(4):663-75.