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ORIGINAL RESEARCH ARTICLE

COMPARISON OF DAS-28 ESR AND CDAI FOR ASSESSING DISEASE ACTIVITY IN PATIENTS WITH RHEUMATOID ARTHRITIS AT INITIAL PRESENTATION – A CROSS SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Introduction: Rheumatoid Arthritis (RA) is a chronic autoimmune disease, causing joint damage and functional impairment. Worldwide prevalence of RA is around 0.5 to 1 percent. Disease severity assessment in Rheumatoid Arthritis patients is done routinely using Disease Activity Score in 28 joints with ESR (DAS-28 ESR) and Clinical Disease Activity Index (CDAI). The present study sought to evaluate and correlate disease activity in RA patients from Southern India using DAS-28 ESR and CDAI.

Material and methods: First 100 newly diagnosed Rheumatoid Arthritis patients satisfying American College of Rheumatology/ European League Against Rheumatism (ACR/EULAR) 2010 criteria for RA who attended Rheumatology clinic in a tertiary care hospital in Southern India from April 2017 to September 2017 were studied. Based on previous established values, the patients were divided into low, moderate, and high disease activity groups. Chi-square test and Mann-Whitney U test were used to study association between the disease severity score and clinical factors. Spearman rank correlation was performed to assess the correlation between DAS-28 and CDAI scores.

Results: Median age of patients was 47.5 years, predominantly female. Elevated CRP was observed in 85% patients. All patients were classified having high disease severity for DAS 28 ESR score with mean score 6.8 (±0.8). Nine patients had moderate severity, while 91 patients had high disease severity CDAI score with mean score of 34.8 (±11.3). There was strong correlation between DAS 28 ESR score and CDAI score (r=0.94).

Conclusions: All patients enrolled had high disease severity using DAS 28 ESR score, while 91 patients were classified having high disease severity using CDAI in the present study. There was strong correlation between the DAS 28 ESR score and CDAI score. From an outpatient setting from Southern India, CDAI may be a preferred disease assessment tool in day-to-day clinical practice in assessing RA patients because it does not include laboratory tests and complex mathematical calculations.

Key words: Rheumatoid arthritis, Disease Activity Score 28, Clinical Disease Activity Index (CDAI)

INTRODUCTION

Rheumatoid arthritis (RA) is a systemic autoimmune disease characterized by persistent joint inflammation resulting in joint damage and significant functional impairment.[1]Majority of patients present with intermediate severity of RA and their progression is highly variable.[2] If the condition not managed early, may lead to structural damage and decreased quality of life.[3] Hence early

initiation of aggressive management and frequent monitoring of the patients helps in preventing progression of the disease.[2,4]

Quantifying the RA disease severity is equally important in determining the treatment course. [3] Several disease activity assessments were proposed and incorporated in clinical practice. Disease Activity Score-28 (DAS-28 ESR) was the most commonly used tool and recommended by the European League Against Rheumatism (EULAR) in measuring disease activity. [1][5]. DAS-28 ESR scoring requires measurement of acute phase reactants and the formula is very complex to implement on a daily basis in outpatient setting.

Clinical Disease Activity Index (CDAI) was a suggested newer alternative tool to DAS-28 ESR due to omission of laboratory tests and can be easily employed at a greater frequency in evaluation of patients with RA anytime. [1,3]Both these scores were validated in multiple cohorts globally. Few studies observed discordant results between them, thereby rheumatologists preferring the scores depending on the cost and availability of acute phase reactants.[3]

Therefore, the main objective of the present study was to assess disease activity in South Indian patients with RA using DAS-28 ESR and CDAI.

MATERIALS AND METHODS

This was a cross-sectional observational study conducted in a tertiary care hospital in Southern India. Ethical clearance was obtained from the Institutional Ethics committee and written informed consent was taken from all the patients at the onset of study. First hundred newly diagnosed RA patients aged between 20 and 70 years who attended Rheumatology clinic with disease duration of 3 months and more between April 2017 and September 2017 were included. Pregnant women, patients with other autoimmune diseases (such as Systemic Lupus Erythematosus (SLE), scleroderma, overlap syndrome), chronic liver disease, chronic kidney disease, malignancies, tuberculosis, uncontrolled diabetes mellitus and congestive cardiac failure were excluded.

Patients satisfying the ACR/EULAR 2010 criteria were assessed according to a proforma containing detailed history, physical examination and laboratory findings. The demographic statistics of patients including age, gender, duration of disease, duration of morning stiffness, clinical features, activities of daily living (ADL), vocation, tender joint count, swollen joint count and global health assessment using Visual Analogue Scale (VAS) were recorded. Results of laboratory tests such as Rheumatoid factor (RF), ACCP, ESR and CRP were also noted.

Disease activity of patients was assessed by DAS-28 (Disease Activity Score in 28 joints) and CDAI (Clinical Disease Activity Index) in the initial visit. DAS-28 was calculated using tender joint count (TJC), swollen joint count (SJC), global health assessment (GH) using visual analogue scale (VAS in 0 to 100mm) and ESR (erythrocyte sedimentation rate in mm/first hour) using Westergren Method. The DAS-28 score was calculated using the formula

$$\text{DAS-28} = 0.56\sqrt{\text{TJC}} + 0.28\sqrt{\text{SJC}} + 0.70 \ln(\text{ESR}) + 0.014\,(\text{GH})$$

CDAI was calculated using TJC (0 to 28), SJC (0 to 28), patient global assessment of disease activity using VAS (0 to 10cm) and provider global assessment of disease activity using VAS (0 to 10cm). CDAI was estimated using the formula

CDAI = TJC + SJC + Patient global assessment + Provider global assessment

Patients were categorized based on disease activity using DAS-28 score and CDAI score in Table 1.

Statistical Analysis

The data from the proforma was entered in MS Excel. Categorical data was expressed as frequency (percentage) and continuous data either as mean (SD) or median (range). Chi-square test and Mann-Whitney U test were used to study association between the disease severity score and clinical factors. Spearman rank correlation was performed to assess the correlation between DAS-28 ESR and CDAI scores. A p-value of <0.05 was considered statistically significant. The analysis was performed using SPSS version 20.

RESULTS

Out of 100 patients included in the study, 85 were female. The median age of the study population was 47.5 (20 to 70) years. The median duration of illness was 3 (0.3 to 22) years. Most patients presented with polyarthritis (82%) and morning stiffness >1hour (78%). Elevated C- Reactive Protein (CRP) was observed in 85%. Positive rheumatoid factor (RF) was observed in 76% and 64% patients had positive Anti-Cyclic Citrullinated Peptide (ACCP). The median TJC was 15 (8 to 36), while median SJC was 6 (0 to 28). The median ESR was 71 mm (34 to 150) and EULAR score 10 (7 to 10). The demographic, clinical and prognostic features of patients were shown in table 2.

All 100 patients were classified having high disease severity for DAS 28 ESR score with mean 6.8 (0.8) and median 6.7 (5.1 to 8.7). However, when stratifying the disease severity using CDAI, the mean score was 34.8 (11.3) and median 32 (19 to 69) (Figure 1). Nine patients had moderate severity, while 91 patients had high disease severity CDAI score (Table 3). Among the clinical factors, positive RF (p=0.03) and EULAR score (p<0.01) had a significant difference between moderate and high CDAI scores (Table 4). Figure 2 shows there was strong correlation between DAS 28 ESR score and CDAI score (r=0.94).

DISCUSSION

In this study, DAS 28 ESR and CDAI to assess disease severity was performed in RA patients attending the OPD clinic at resource limited setting. RA is a disabling disease, and aim of the therapy was to improve the quality of life with patient's functionality. Hence early initiation of DMARD by assessment of disease severity forms the main focus in treating RA. DAS-28 ESR though considered gold standard in severity assessment requires estimating acute phase reactants and complex formulas for computing them. CDAI omits acute phase reactants and only rely on clinical variables, so easily employed at time of initial evaluation, and can be repeated at greater frequency to study the disease course and treatment response.

Most patients had severe disease activity at presentation, with DAS-28 ESR showing 100% and CDAI 91%. Similar presentation was also reported by Kumar et al, with DAS-28 ESR at 97% and CDAI at 93% disease severe. [2]

Previous studies from the West discussed that almost half of the patients with low active RA had neither ESR nor CRP elevated. Only 17% patients with moderately active RA had neither of the acute phase reactants elevated. [3,5] In our patients, elevated ESR levels positively reflected the severely active disease (table 2). Among the laboratory values, only patients with CRP positivity strongly correlated with elevated ESR levels (p=0.002). There was no relationship between ESR levels and RF (p=0.309) and ACCP (p=0.402).

The mean DAS 28 ESR score in this study was 6.8 ±0.8 and all patients had severe disease activity with this tool. Similar studies from India reported the mean DAS 28 ESR of 5.5 ±1.49 and 5.97 ±1.21, signifying high disease activity in Indian population at presentation. [4][6] In contrast, the mean scores from Pakistan was 3.4 ±1.8 (mean ±SD), and most patients had moderately active disease. [3].

However, when stratifying the disease severity using CDAI, the mean score was 34.8 (11.3) and median 32 (19 to 69) (Figure 1). Singh et al observed a lower mean CDAI score of 25 (16) while Arya et al observed similar mean CDAI scores of 32(15). [4,6] When classified based on CDAI, only positive RF (p=0.03) had a significant difference between the moderate and severe CDAI groups, while the differences were not observed with CRP (p=1.0) and ACCP (p=0.07).

With large percentage of patients having high disease activity, the present study showed a very strong correlation between DAS 28 ESR score and CDAI score (r=0.94) (figure 2). This result was in parallel to previous studies from India (r=0.980). [4] While Kumar et al demonstrated a significant positive correlation (r=0.568; p<0.001) with slight to fair agreement (kappa=0.296), Ranganath et al reported a 70 to 80% agreement for different categories of disease activity in patients. [2,7] Also outside Indian studies showed a moderate to substantial agreement between the tools at different levels of disease activity.[4] The level of agreement between the two tools using kappa statistics could not be performed as all patients were grouped severe disease in DAS-28 in this study.

With the western world, using objective disease activity measurements routinely in clinical setting, the similar trend is not seen in Indian setting. Literature review demonstrated compelling evidence that routine measurement of disease activity in clinical practice correlates well with improved patient outcomes and this disease activity measures should be routinely measured. [4] The present study was conducted in tertiary care government centre catering predominantly to people with low socio-economic category. As repeated laboratory tests for monitoring the disease response would be cost inhibitive and assessment with clinically calculated CDAI score was beneficial.

The major limitation of this study was that it was a single centre study with predominant patients presenting with high disease activity. Therefore, to correlate the CDAI to DAS-28, larger prospective studies are required with patients with wide range of presentations to validate the values from CDAI with DAS-28 for disease activity.

CONCLUSION

All patients were stratified having high disease severity using DAS 28 ESR score, while 91 patients were classified having high disease severity using CDAI. There was strong correlation between the DAS 28 ESR score and CDAI score in classifying disease severity in RA patients. Hence CDAI can be a useful disease assessment tool in day-to-day clinical practice in assessing RA patients.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Nil

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Nil

REFERENCES

Table 1: Stratification of disease activity in patients with Rheumatoid Arthritis using DAS-28 score and CDAI score

Disease Activity	DAS-28 Score	CDAI Score
Remission	<2.6	0 to 2.8
Low Disease Activity	≥2.6 and ≤3.2	>2.8 and ≤10
Moderate Disease Activity	>3.2 and ≤5.1	>10 and ≤22
High Disease Activity	>5.1	>22

DAS: Disease Activity Score; CDAI: Clinical Disease Activity Index

Table 2: Clinical and Prognostic features of patients with Rheumatoid Arthritis (n=100)

		Frequency Range
Age	20 to 49	53
	50 to 70	47
Gender	Male	15
	Female	85
Morning Stiffness	<1hour	22
	>1hour	78
Clinical features	Polyarthritis	82
	Polyarthritis + Fatigue	18
ADL	Independent	99
	Dependent	1

Vocational affected	Yes	95	
	No	5	
CRP	Positive	85	
	Negative	15	
RF	Positive	76	
	Negative	24	
ACCP	Positive	64	
	Negative	36	
Disease Duration	Median (Range)	3	(0.3 to 22)
TJC	Median (Range)	15	(8 to 36)
SJC	Median (Range)	6	(0 to 28)
Patient Global Assessment	Median (Range)	70	(50 to 90)
Physician Global Assessment	Median (Range)	50	(40 to 80)
ESR	Median (Range)	71	(34 to 150)
EULAR Score	Median (Range)	10	(7 to 10)

Table 3: Classifying CDAI Score based on severity among Rheumatoid Arthritis patients

CDAI Score	**Frequency**	**Median (Range)**
Moderate (10 to 22)	9	21 (19 to 21)
High (>22)	91	33.5 (23 to 69)

CDAI: Clinical Disease Activity Index

Table 4: Comparison of clinical features among moderate and high disease severity according to CDAI score in Rheumatoid Arthritis patients

		CDAI Moderate (10 to 22)	**CDAI High (>22)**	**P value**
Age	20 to 49	5	4	1.00
	50 to 70	48	43	
Gender	Male	2	13	0.62
	Female	7	78	
Morning Stiffness	<1hr	4	18	0.10
	>1hr	5	73	
Clinical Features	Polyarthritis	9	73	0.36
	Polyarthritis + Fatigue	0	18	
ADL	Dependent	0	1	1.0
	Independent	9	90	
Vocational Affected	Yes	7	88	0.06
	No	2	3	
CRP	Positive	8	78	1.0
	Negative	1	13	
RF	Positive	4	72	**0.03**
	Negative	5	19	
ACCP	Positive	3	61	0.07
	Negative	6	30	
Disease Duration	Median (Range)	2 (0.5 to 4)	3 (0.3 to 22)	0.13
ESR	Median (Range)	63 (45 to 118)	71 (34 to 150)	0.50
EULAR Score	Median (Range)	7 (7 to 10)	10 (7 to 10)	**<0.01**
DAS 28 ESR	Median (Range)	5.7 (5.1 to 6.1)	6.8 (5.5 to 8.7)	**<0.01**

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Figure 1: Boxplot displaying the distribution of DAS28 ESR Score and CDAI Score among RA patients

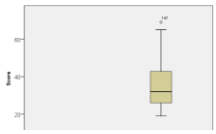
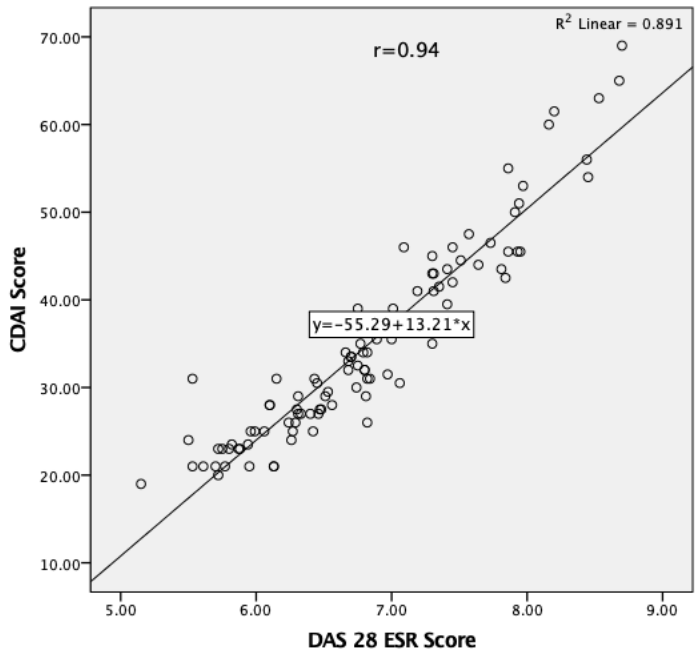


Figure 2 : Scatter plot displaying strong correlation between DAS 28 ESR score and CDAI score (r=0.94).



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