INTER – RATER AGREEMENT FOR RHEUMATOID ARTHRITIS WITH AYURVEDIC CLASSIFICATIONS

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Abstract*:* Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by joint swelling, joint tenderness, and destruction of synovial joints, leading to severe disability and premature mortality. Rheumatologists face unique challenges in discriminating between rheumatologic and non-rheumatologic disorders with similar manifestations, and in discriminating among rheumatologic disorders with shared features. In Ayurvedic classics the chronic inflammatory joint diseases are classified under different terminologies like *Vatasonita*, *Amavata*, *Sandhigata vata*, are the important classification /diagnosis in comparison to Rheumatoid Arthritis. In addition to these three terminologies, *kadeesoola*, *sandhisoola* etc also considered by some physicians. Two individuals using identical methodology on identical samples (reproducibility) to obtain the same result. The objective of the study was to find out the inter-rater reliability in diagnosing the joint disorders using Ayurvedic terminologies. Cohen's κ was run to determine if there was agreement between two physicians judgement on 91 patients. There was fair agreement between the two physicians judgements, κ = .349 (95% CI, .300 to .886), *p* < .0005.

Index Terms *– Inter–rater reliability, Cohen's κ, Rheumatoid Arthritis, Vatasonita, Amavata, Sandhigata vata*

I. INTRODUCTION

Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by joint swelling, joint tenderness, and destruction of synovial joints, leading to severe disability and premature mortality(1). RA is widely prevalent throughout the world. The overall worldwide prevalence is 0.8% and steadily increases to 5% in women over the age of 70. RA is two to three times more common in women compared to men. In India the prevalence has been estimated to be 0.7% (2).

Rheumatologists face unique challenges in discriminating between rheumatologic and non-rheumatologic disorders with similar manifestations, and in discriminating among rheumatologic disorders with shared features. The majority of rheumatic diseases are multisystem disorders with poorly understood etiology; they tend to be heterogeneous in their presentation, course, and outcome, and do not have a single clinical, laboratory, pathological, or radiological feature that could serve as a "gold standard" in support of diagnosis and/or classification. Diagnosis may be defined as the determination of the cause or nature of an illness by evaluation of the signs, symptoms and supportive tests in an individual patient. Classification criteria are standardized definitions that are primarily intended to create well-defined, relatively homogenous cohorts for clinical research; they are not intended to capture the entire universe of possible patients, but rather to capture the majority of patients with key shared features of the condition. Hence the goal of classification differs from the intent of diagnostic criteria.(3).
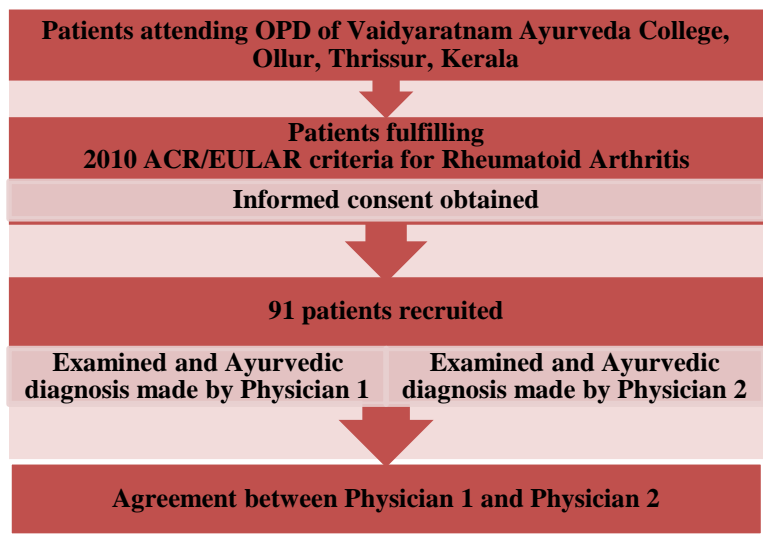
In Ayurvedic classics the chronic inflammatory joint diseases are classified under different terminologies with specific features. In practice clinicians show difference of opinion in diagnosing/classifying these conditions. *Vatasonita*, *Amavata*, *Sandhigata vata*, are the important classification /diagnosis in comparison to Rheumatoid Arthritis. In addition to these three terminologies, *kadeesoola*, *sandhisoola* etc also considered by some physicians. In this study patients fulfilling the2010 ACR/EULAR criteria for Rheumatoid Arthritis(1) are taken and referred to two physicians   for diagnosis using Ayurvedic terminologies.

Two individuals using identical methodology on identical samples (reproducibility) to obtain the same result(4). Two examiners often do not derive the same result. The extent to which observers agree or disagree is an important issue, whether considering physical examinations, laboratory tests, or other means of assessing human characteristics. Therefore need to be able to express the extent of agreement in quantitative terms (5). To what extent does the agreement between the two observers exceed the level of agreement that would result just from chance? One approach to answering this question is to calculate the kappa statistic, proposed by Cohen in 1960(5). The objective of the study was to find out the inter-rater reliability in diagnosing the joint disorders using Ayurvedic terminologies.

II. METHODOLOGY

The present study was carried out at the Vaidyaratnam Ayurveda College, Ollur, Thrissur, Kerala. A total of 91 patients who attended the OPD during the period of data collection from August 2017 to May 2018 fulfilling   2010 ACR/EULAR criteria for Rheumatoid Arthritis(1) were recruited into the study consecutively after obtaining written informed consent. The patients were given appropriate treatment and at the same time examined by physician 1 and physician 2 in separate rooms for Ayurvedic classification under 4 heads viz. *Vatasonita, Amavata, Sandhigata vata* and Others. The physicians were having 25 yrs of

teaching experience and guidelines were given to classify the patients on the basis of same methodology. The pattern and type of disease prevalent in the community was explored by descriptive statistics. Agreement between the diagnosis made by physician 1 and physician 2 was calculated using kappa (κ) statistics. Two observers were instructed to categorize each patient into one of the following four categories: *Vatasonita, Amavata*, *Sandhigatavata* and others. The readings of observer 1 are cross tabulated against those of observer 2.

Patients attending OPD of Vaidyaratnam Ayurveda College, Ollur, Thrissur, Kerala
Patients fulfilling 2010 ACR/EULAR criteria for Rheumatoid Arthritis
Informed consent obtained
91 patients recruited

Examined and Ayurvedic diagnosis made by Physician 1	Examined and Ayurvedic diagnosis made by Physician 2

Agreement between Physician 1 and Physician 2

Methodology – flow chart

III. RESULTS AND ANALYSIS

Table.1 Descriptive statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	91	29.0	60.0	49.341	8.1965
Duration of RA in Months	91	12.0	120.0	37.824	18.2955
RA score	91	6.0	10.0	6.549	0.7784
Morning stiffness	91	1.5	8.0	2.962	1.0226
VAS	91	5.0	9.0	7.121	0.8411
DAS28 score	91	5.10	6.37	5.5793	0.29129

Table.2 Distribution according to gender

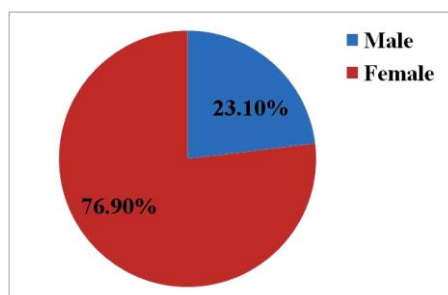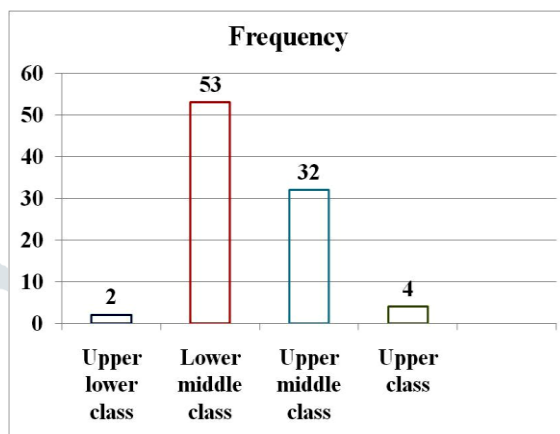| Gender	Frequency	Percent
Male	21	23.1
Female	70	76.9
Total	91	100.0

Fig.1 Distribution according to gender

Table.3 Distribution according to Socio Economic Status (Kuppuswamy Scale)

| SES	Frequency	Percent
Upper lower class	2	2.2
Lower middle class	53	58.2
Upper middle class	32	35.2
Upper class	4	4.4
Total	91	100.0

Fig.2 Distribution according to SES (Kuppuswamy Scale)

91 participants were recruited for the study. The mean age of the participants was 49.34 with SD 8.196. 76.9 % of the participants were females and. The prevalence of RA is higher in females than males, the incidence is 4-5 times higher below the age of 50, but above 60-70 years the female/male ratio is only about 2 (6). 58.2.7% of the participants belongs to lower middle class. Low socio-economic status (SES) has been found to be associated with worse clinical outcomes, decreased functional ability and reduced quality of life, less is known about the association between SES and the development of RA(7). The mean duration of RA patients participated in the study was 37.82 months with SD of 18.29 months. As per 2010 ACR/EULAR classification criteria for Rheumatoid Arthritis the minimum score was 6 and maximum 10 with mean 6.55 (SD 0.78). The participants were having morning stiffness of 2.96 hrs with SD of 1.023 hrs and DAS28 score 5.57 with SD 0.29. The mean pain sore was 7.121 with SD 0.84. (Table 1, 2, 3 Fig 1, 2)

Table.4 Distribution according to *Prakriti*

Prakriti	Frequency	Percent
Vatadhika	26	28.6
Pittadhika	45	49.5
Kaphadhika	20	22.0
Total	91	100.0
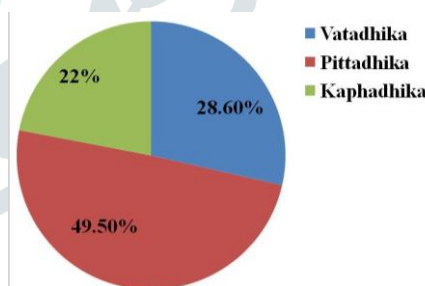
Fig.3 Distribution according to *Prakriti*

The *prakriti* of the participants has been assessed by TNMC *prakriti* assessment questionnaire. Around half of the participants (49.5%) belong to *pittadhika prakriti*. No study is available specifying *prakriti* in RA.

Table.5 Distribution according to deformity

Deformity	Frequency	Percent
No deformity	82	90.1
Deformity	9	9.9
Total	91	100.0

Table.6 Distribution according to symmetry

Symmetry	Frequency	Percent
No symmetry	37	40.7
Symmetrical	54	59.3
Total	91	100.0

Table.7 Distribution according to diet

Table.8 Distribution according to addiction

Diet	Frequency	Percent
Vegetarian diet	3	3.3
Mixed diet	88	96.7
Total	91	100.0

Addiction	Frequency	Percent
No addiction	86	94.5
Alcohol, smoking	5	5.5
Total	91	100.0

Out of 91 RA patients only 9 patients are having deformity and 59.35% of them are having symmetrical joint distribution. 96.7% of the participants are taking mixed diet and addiction of alcohol and smoking is seen only in 5 patients.

Table.9 Inter-rater reliability

		Rater2				Total
		Vatasonita	Amavata	Sandhigata vata	Others	
Rater1	Vatasonita	**32**	8	2	2	44
	Amavata	8	**11**	2	0	21
	Sandhigata vata	1	5	**7**	0	13
	Others	5	4	2	**2**	13
	Total	46	28	13	4	91

Table.10 Symmetric Measures – Kappa value

	Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Measure of Agreement (Kappa)	0.349	0.074	5.272	0.000

Table 9 shows the two physicians agree that 32 cases are *vatasonita*, 11 cases *Amavata*, 7 cases *Sandhigata vata* and 2 cases are diagnosed as *other*s. Cohen's κ was run to determine if there was agreement between two physicians judgement on 91 patients. There was fair agreement between the two physicians judgements, κ = 0.349 (95% CI, .300 to .886), $p < .0005$. Perfect agreement is evident when Cohen's kappa equals 1; a value of Cohen's kappa equal to zero suggests that the agreement is no better than that which would be obtained by chance alone. Although there is no formal scale, the following levels of agreement are often considered appropriate for judging the extent of the agreement (8).Agreement is Poor if k <= 0.00, Slight if 0.00 <=k <=0.20, Fair if 0.21 <= k <= 0.40, Moderate if 0.41<=k <= 0.60, Substantial if 0.61 <= k<=0.80, Almost perfect if k >= 0.80.

IV. DISCUSSION AND CONCLUSION

The study shows only fair agreement (κ =0.349) between physicians. All cases has been classified as per 2010 ACR/EULAR classification criteria. This shows the need of developing criteria for each of the diagnostic terminologies in Ayurveda

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