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An Open-Label, Retrospective, Single-Arm, Multicentric Study Evaluating The Effect Of Researchayu Regimen For Autoimmune Treatment (Rrat) In Patients Of Autoimmune Joint Disease

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Abstract: Autoimmune joint diseases are characterized by chronic synovial inflammation and immune dysfunction, leading to joint destruction and impaired function. Integrative approaches such as Ayurveda may offer therapeutic potential through multi-targeted strategies addressing symptoms and immune modulation. This study evaluated the clinical effectiveness and immunomodulatory impact of the Researchayu Regimen for Autoimmune Treatment (RRAT) in patients with seropositive autoimmune joint diseases. An open-label, retrospective, single-arm, multicenter study was conducted at five ResearchAYU centers across Maharashtra, India. A total of 55 patients aged 40–85 years with knee pain and positive rheumatoid factor (RA factor) and/or antinuclear antibody (ANA) were included. The RRAT protocol involved structured Ayurvedic oral formulations, topical Shuddhu Lepa, and therapeutic purgation (Sadhyovirechana). Clinical assessments and laboratory investigations (RA factor, ANA, C-reactive protein [CRP], and serum uric acid) were performed at baseline and after 90 days. Statistical analysis included descriptive statistics, McNemar's test for seroconversion, and paired t-tests or Wilcoxon signed-rank tests for continuous variables, with significance at $P < 0.05$. At day 90, 80.64% of ANA-positive and 81.25% of RA factor–positive participants achieved seroconversion. CRP and serum uric acid levels showed significant reductions of 33.23% and 25.05%, respectively. Clinically, there was a 61.22% mean relief in walking-related pain and a 57.5% resolution of morning stiffness. No serious adverse events were reported. These findings suggest that the RRAT protocol may offer beneficial clinical and immunological effects in autoimmune joint diseases. Prospective randomized controlled trials are needed for further validation.

Index Terms - Autoimmune joint disease, Rheumatoid arthritis, Ayurveda, Researchayu Regimen for Autoimmune Treatment (RRAT), Immunomodulation, C-reactive protein, Seroconversion.

I. INTRODUCTION

Autoimmune joint diseases are a group of inflammatory conditions in which the immune system mistakenly attacks the body's own joint tissues, leading to chronic inflammation, pain, swelling, and progressive joint damage. This pathological immune response involves the production of autoantibodies and activation of autoreactive T cells, [1] resulting in persistent synovial inflammation and structural degeneration of the joints, deformity, and functional disability. [2]

Among autoimmune joint diseases, rheumatoid arthritis (RA), psoriatic arthritis (PsA), and spondyloarthritis (SpA) are the most common entities.[2,3] Clinically, these conditions manifest with joint pain, swelling, stiffness, and systemic symptoms such as fatigue and fever, often exhibiting periods of flare and remission.[4] According to the World Health Organization (WHO), 18 million people worldwide were living with rheumatoid arthritis in 2019, with 70% being women and 55% over the age of 55.[5] While the global PsA prevalence is varying by region from 17 to 207 per 100,000.[6] SpA affects approximately 0.5%–2% of the global population, making it one of the less prevalent rheumatic diseases, with diagnosis delays of up to 10 years increasing its overall burden.[7]

In autoimmune joint diseases such as rheumatoid arthritis, the primary target is the synovial membrane, which lines the diarthrodial joints. Aberrant activation of the immune system leads to chronic synovial inflammation (synovitis), characterized by infiltration of immune cells, hyperplasia of the synovial lining, and overproduction of pro-inflammatory cytokines. This pathological process results in progressive joint destruction, including erosion of cartilage and subchondral bone.[8] PsA involves both innate and adaptive immune mechanisms, with key roles played by Major Histocompatibility Complex (MHC) class I allele Cw6, Tumor Necrosis Factor (TNF-α), and osteoclast activation via the Receptor Activator of Nuclear Factor Kappa/ Receptor Activator of Nuclear Factor Kappa-B Ligand (RANK/RANKL) pathway, contributing to joint inflammation and bone remodelling.[9] While SpA's pathophysiology involves multiple proposed mechanisms—most prominently entered around the Human Leukocyte Antigen-B (HLA-B)*27 genes—such as arthritogenic peptides, unfolded protein response, HLA-B*27 homodimer formation, Endoplasmic Reticulum Aminopeptidase (ERAP) dysfunction, and gut dysbiosis, contributing collectively to chronic inflammation in genetically predisposed individuals.[10]

Disease-modifying anti-rheumatic medications (DMARDs), corticosteroids, and non-steroidal anti-inflammatory medicines (NSAIDs) are commonly prescribed for the management. Although NSAIDs quickly relieve symptoms, they can also increase the risk of cardiovascular (CV) disease, renal impairment, and gastrointestinal (GI) bleeding. While corticosteroids are beneficial in short-term relief, they are linked to Cushingoid warning signs, osteoporosis, hypertension, and hyperglycaemia. DMARDs, which are crucial for maintaining long-term illness control, may cause acute infections, pulmonary toxicity, myelosuppression, and hepatotoxicity. To avoid joint injury, DMARDs must be administered early and monitored frequently. [11]

In already published literature, Ayurvedic Whole System (AWS) intervention demonstrated promising benefits in managing RA by significantly improving clinical outcomes and normalizing disrupted metabolic profiles. Unlike conventional therapy, AWS offers a holistic approach—combining herbal formulations, local therapies, and dietary recommendations—which not only reduces inflammation and joint symptoms but also modulates key serum metabolites, indicating restoration of metabolic homeostasis. [12]

The WHO, Allopathic and Ayurvedic doctors at the Ayurvedic Trust in Coimbatore, India, collaborated to conduct a study that assessed the safety and effectiveness of traditional Ayurvedic treatment for RA patients. All clinical measures, including walking time, joint swelling and pain, and rheumatoid factor levels, showed significant improvements among the first group of 33 patients who finished treatment. The results showed significant clinical benefits, especially in patients with severe functional impairment, despite the lack of a control group. This suggests that classical Ayurveda may be a viable treatment choice for autoimmune. [13]

Therefore, in light of the limitations of conventional therapies and the emerging evidence supporting Ayurvedic interventions, the present study was designed to systematically evaluate the comprehensive effectiveness of a structured Ayurvedic regimen—Researchayu Regimen for Autoimmune Treatment (RRAT)—in patients with autoimmune joint diseases.

II. MATERIAL AND METHODS

Study Design and Ethics

To comprehensively evaluate the impact of the RRAT on clinical and immunological outcomes, an open-label, retrospective, single-arm, multicentre study was conducted across five Ayurvedic centres located in Vashi, Nigdi, Dombivli, Manpada, and Thane, Maharashtra, India. The study design, patient selection criteria, treatment regimen, and outcome measures are detailed below.

The study protocol adhered to the ethical standards outlined in the Declaration of Helsinki, and followed local regulations regarding human research. Patients' confidentiality was maintained by de-identifying all data.

Total of 55 patients who were RA factor and antinuclear antibody (ANA) positive. Patients were assessed at baseline and followed for 90 days, with clinical and laboratory parameters, including RA factor and ANA levels, documented at both time points to evaluate the impact of RRAT intervention.

Study Visits

Scheduled study visits included a screening visit followed by enrolment on baseline visit, and follow-up visits parting a month for 90 days. These visits were used to assess clinical outcomes, monitor safety, and track treatment response over the 90-day period.

Study Participants

The study enrolled 55 patients aged 40 to 85 years, of both sexes, all presenting with knee pain were enrolled in the study. Participants presenting any one of the following symptoms were also included in the study, like morning stiffness, with varying degrees of restriction in range of motion, swelling and crepitus. Participants were with or without RA factor and/ or ANA positive. All were recruited across multiple centers in Maharashtra.

Participants were excluded from the clinical trial if they had been diagnosed with systemic complications of rheumatoid arthritis (RA), such as rheumatic heart disease, rheumatic fever, or pleural–pericardial disease, as these conditions could confound the assessment of treatment outcomes. Subjects with a known allergy, hypersensitivity, or any contraindication to the investigational Ayurvedic product were not considered eligible due to safety concerns. The trial further excluded individuals with a treatment using DMARDs or other biological therapies for RA, given their potential to alter disease progression or interfere with study results. Participants with psychiatric disorders that could impair their ability to provide informed consent or comply with study requirements were excluded. Pregnant or lactating women, current users of RA-targeted nutraceutical/ herbal/ ayurvedic supplements, and those deemed unsuitable by the investigator for any medical or surgical reason were also excluded.

III. RESEARCHAYU REGIMEN FOR AUTOIMMUNE TREATMENT (RRAT)

Details of Ingredients of Internal Medicine Used

Participants received a combination of oral Ayurvedic formulations and topical applications, administered as per a structured schedule provided below:

Day 0		
Sr.No	SKU	Dosage
1	Tab .Adyant	2 tablets two times in a day after food
2	TabSatwik	2 tablets two times in a day before food
3	Erand oil	1tsp(5ml) in luke warm water at bed time
4	Shuddhu lepa	for Local application once in day

Day 5		
Sr.No	SKU	Dosage
1	Tab Rasapachak	2 tablets two times in a day after food
2	Tab .Adyant	2 tablets two times in a day after food
3	TabSatwik	2 tablets two times in a day before food
4	Tab Erand Haritaki	Two tablet at bed time
5	Tab.Trushna Meha	2 tablets two times in a day after food
6	Tab Urgika	2 tablets three times in a day after food

7	Mahayograj Guggul	2 tablets two times in a day after food
8	Erand oil	1tsp(5ml) in luke warm water at bed time
9	Tab Chandraphabha Vati	2 tablets two times in a day before food
10	Shuddhu lepa	for Local application once in day

Day 10		
Sr.No	SKU	Dosage
1	Tab Amapachak	2 tablets two times in a day after food
2	Tab.Rakta packat	2 tablets two times in a day after food
3	TabSatwik	2 tablets two times in a day before food
4	Tab Urgika	2 tablets three times in a day after food
5	Mahayograj Guggul	2 tablets two times in a day after food
6	Tab. Chi hormony	2 tablets two times in a day after food
7	Erand oil	1tsp(5ml) in luke warm water at bed time
8	Shuddhu lepa	for Local application once in day

Day 15		
Sr.No	SKU	Dosage
1	TabSatwik	2 tablets three times in a day before food
2	Tab Urgika	2 tablets three times in a day after food
3	Mahayograj Guggul	2 tablets two times in a day after food
4	Sansamani vati	2 tablets three times in a day after food
5	Tab Chi hormony	2 tablets two times in a day after food
6	Tab Agnitundi Vati	one tablets three times in day
7	Tab Arogya vardhini	2 tablets two times in a day after food
8	Erand oil	1tsp(5ml) in luke warm water at bed time
9	Shuddhu lepa	for Local application once in day

Day 25		
Sr.No	SKU	Dosage
1	TabSatwik	2 tablets three times in a day before food
2	Tab Urgika	2 tablets three times in a day after food

3	Mahayograj Guggul	2 tablets two times in a day after food
4	Sansamani vati	2 tablets three times in a day after food
5	Tab Chi hormony	2 tablets two times in a day after food
6	Tab Agnitundi Vati	one tablets three times in day
7	Tab Arogya vardhini	2 tablets two times in a day after food
8	Erand oil	1tsp(5ml) in luke warm water at bed time
9	Shuddhu lepa	for Local application once in day

From day 25 onward, the treatment regimen was consistently maintained through the conclusion of the study.

Procedure

The following procedure was administered orally to patients at each follow-up visit conducted on Day 0, 5, 10, 15, 25, and at subsequent scheduled intervals, as part of the therapeutic detoxification process.
From an Ayurvedic perspective, autoimmune conditions are considered to arise from profound imbalances in the doshas—Vata, Pitta, and Kapha—along with the accumulation of ama (metabolic toxins) and impaired agni (digestive and metabolic fire). The Ayurvedic approach to managing autoimmune diseases focuses on restoring systemic balance and eliminating accumulated toxins through a two-fold therapeutic strategy: Amapachana (the digestion and clearance of toxins) and Shodhana (purificatory therapies aimed at systemic detoxification).

IV. OBJECTIVES OF THE STUDY

This retrospective analysis aimed to evaluate the impact of an RRAT intervention on disease activity by alleviating key clinical symptoms of RA, including morning stiffness, knee pain, CRP, rheumatoid factor, uric acid and antinuclear antibody levels. Safety was evaluated by reviewing adverse event profiles throughout the study duration.

V. RESULTS

Assessment of Demographics

Among the total study population, 35% were male and 65% were female. The mean age among males was 62.42 ± 10.93 years and among females was 57.75 ± 10.92 years, with an overall average age of 59.36 ± 10.92 years. The mean body weight was 69.36 ± 11.43 kg in males and 71.74 ± 11.06 kg in females as shown in Table 1.

Table 1: Demographic Details

Parameters	Observation(n=55)	
Gender	Male	Female
n (%)	19 (35%)	36 (65%)
Age (years)	62.42±10.93	57.75±10.92
	59.36±10.92	
Weight (kg)	69.363±11.43	71.737±11.06

Data is represented as Mean ± Std. Deviation and n is the total number of participants.

Assessment of ANA and Rheumatoid Factor

Among 31 participants who were ANA positive at baseline, only 6 remained positive by the end visit, with 25 converting to negative—indicating an 80.64% reduction. Similarly, out of 16 participants who were RF positive at baseline, only 3 remained positive by the end of study, with 13 showing seroconversion to negative, reflecting an 81.25% improvement. These findings highlight the potential of the Ayurvedic intervention to downregulate autoimmune activity and contribute to clinical remission as depicted in Table 2 and the ANA and RF down trends in Fig 1.

Table 2. Change in ANA and Rheumatoid Factor from Baseline to Follow-up in ANA-Positive Patients

Parameter	Baseline (n)	End Visit (n)	% Participants Turned Negative	p-value
ANA Status				
Positive (+)	31	6	80.64%	<0.001
Negative (–)	–	25		
RA Factor				
Positive (+)	16	3	81.25%	<0.001
Negative (–)	–	13		

Data is represented as Mean ± SD and n is the total no of participants. Data was analysed by McNemar's test. Significant at p value < 0.05.

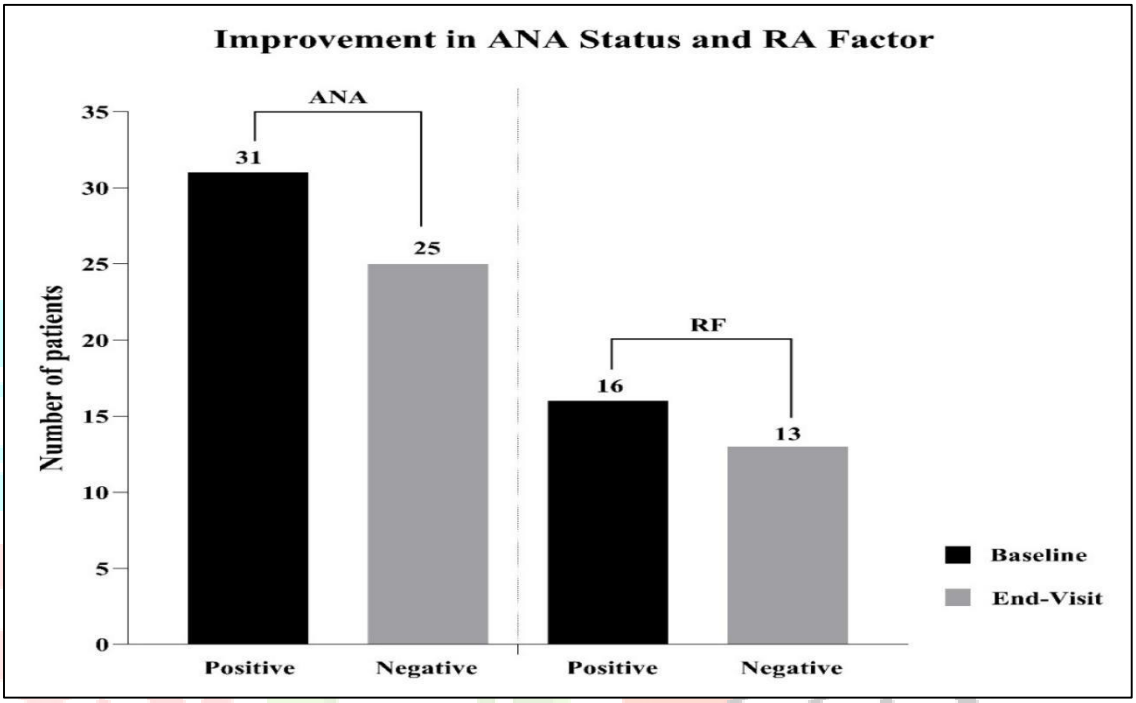

Figure1. Change in ANA and Rheumatoid Factor from Baseline to Follow-up in ANA-Positive Patients

Evaluation of Morning Stiffness

A gradual and consistent reduction in morning stiffness was observed throughout the study duration. At baseline, all 40 participants experienced morning stiffness. By Follow-up 1, 40% (n=16) reported absence of symptoms, which increased to 55% (n=22) at Follow-up 2, and 57.5% (n=23) by the end of study. The resolution of symptoms highlights the potential efficacy of the Ayurvedic intervention in alleviating inflammatory joint discomfort commonly associated with autoimmune conditions as shown in Table 3 and Fig 2.

Table 3. Improvement in Morning Stiffness Over the Study Period (n = 40)

Time Point	Baseline	Follow-up 1	Follow-up 2	End Visit
Presence of Morning Stiffness (n)	40	24	18	17
Absence of Morning Stiffness (n)	0	16	22	23
% Participants without Morning Stiffness	–	40%	55%	57.5%
P value	–	<0.001	0.0005	<0.001

Data is represented as Mean ± SD and n is the total no of participants. Data was analyzed by McNemar's test. Significant at p value ≤ 0.05.

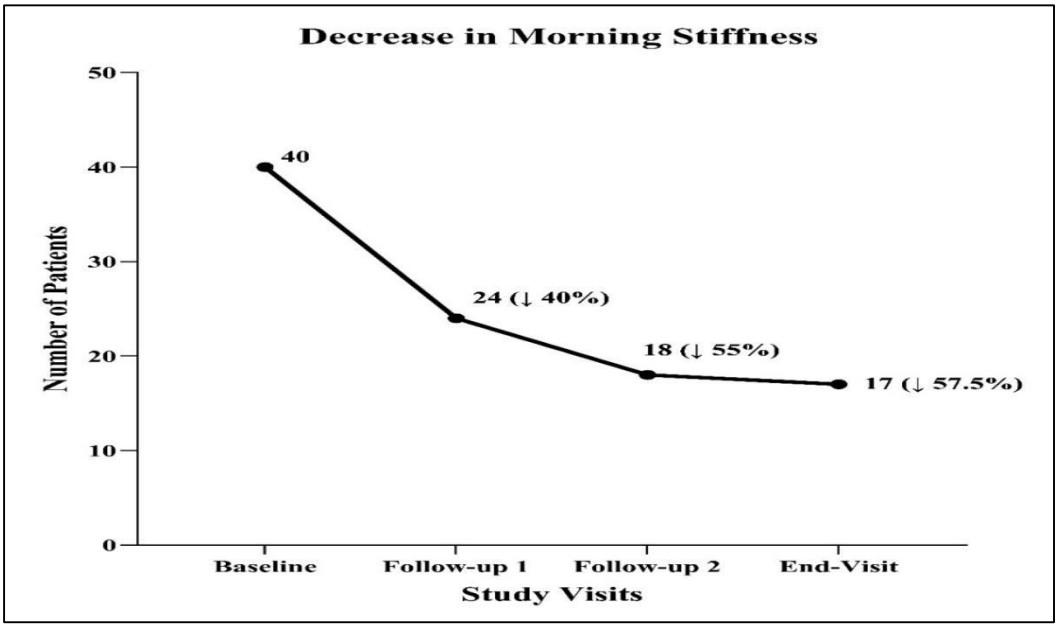

Figure2. Improvement in Morning Stiffness Over the Study Period (n = 40)

Evaluation of Percent relief in pain while walking

A progressive improvement in pain relief while walking was observed over the course of the study, as evidenced by mean percentage reductions reported at sequential follow-up visits. At Follow-up 1, the mean percentage relief in pain while walking was 35.09% ± 27.32, indicating an early therapeutic response. This improvement was further enhanced by Follow-up 2, with a mean relief of 55.84% ± 21.34, reflecting a substantial reduction in symptom. By the End Visit, the mean percentage relief reached 61.22% ± 22.40, suggesting a persistent and clinically meaningful alleviation of pain with continued Ayurvedic intervention. The consistent rise in mean values over time emphasizes the potential effectiveness of the treatment in alleviating ambulatory pain as illustrated in Table 4 and Fig 3.

Table 4. Percentage Pain Relief While Walking Over Follow-ups (n = 55)

Follow-up	% Relief in pain while walking (Mean ± SD)
Follow-up 1	35.09 ± 27.32
Follow-up 2	55.84 ± 21.34
P value	<0.001
End Visit	61.22 ± 22.40
P value	<0.001

Data is represented as mean ± SD. Data was analyzed by using Wilcoxon Signed rank test for within group comparison. Significant at p value < 0.05.

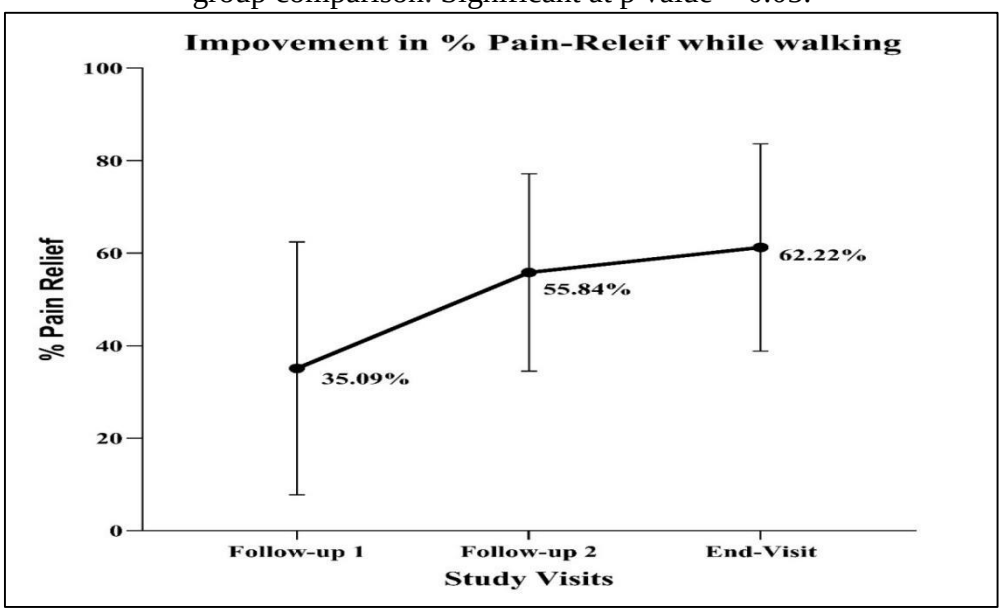

Figure 3. Percentage Pain Relief While Walking Over the Study Duration

Assessment of Inflammation parameters

A clear and progressive improvement in key biochemical parameters was observed from baseline to the end of the study, indicating a positive response to the intervention.

CRP levels (n = 15) demonstrated a reduction from 11.53 ± 6.26 mg/L at baseline to 7.69 ± 10.94 mg/L at the end visit, corresponding to a 33.23% decrease. This decline suggests a measurable attenuation of systemic inflammatory activity over the treatment period. Although inter-individual variability was evident, the overall trend indicates a marked decline.

Similarly, serum uric acid levels (n = 27) showed a substantial reduction from 6.84 ± 1.64 mg/dL at baseline to 5.12 ± 1.69 mg/dL at the end visit, representing a 25.05% decrease. This consistent reduction reflects a favorable metabolic response and further supports the potential biochemical efficacy of the intervention as depicted in below Table 5 and Fig.4.

Table 5. Changes in CRP and Serum Uric Acid Levels

Parameter	n	Baseline	End Visit	P Value
CRP (mg/L)	15	11.53 ± 6.26	7.69 ± 10.94 (33.23%)	0.060
Serum Uric Acid (mg/dL)	27	6.84 ± 1.64	5.12 ± 1.69 (25.05%)	0.036

Data is represented as mean ± SD. Data was analyzed by using Student t dependent test for within group comparison. Significant at p value < 0.05.

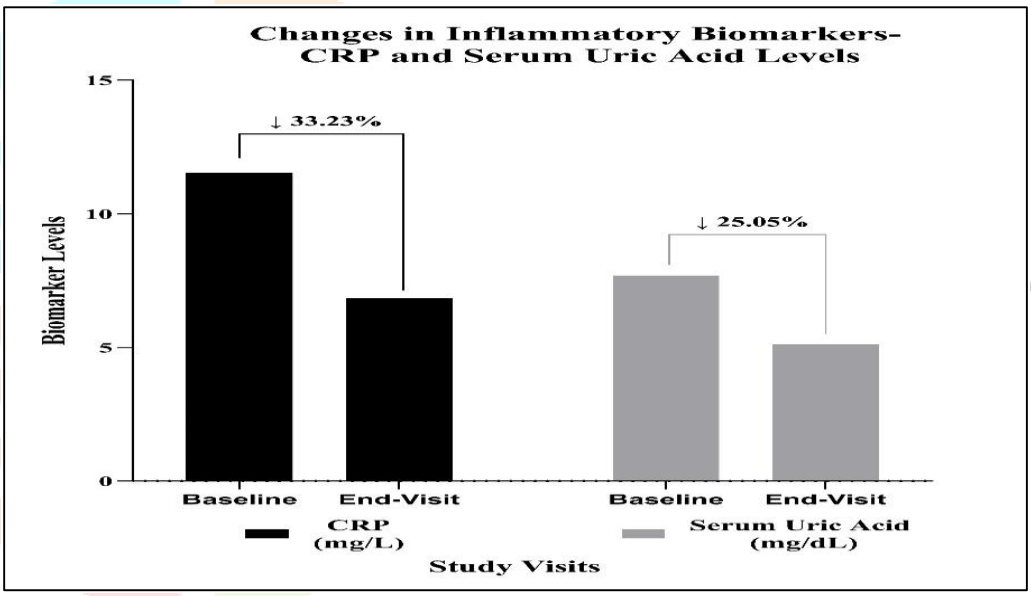

Figure 4. Changes in CRP and Serum Uric Acid Levels

VI. DISCUSSION

This open-label, retrospective, single-arm, multicentric study evaluated the effectiveness of an RRAT intervention in patients with seropositive autoimmune profiles, specifically those positive for ANA and RA factor. Autoantibodies such as Antinuclear Antibodies (ANA) and Rheumatoid Factor (RF) are critical biomarkers in the diagnosis and monitoring of autoimmune conditions such as rheumatoid arthritis and systemic lupus erythematosus, PsA and SpA. By the end of the study, a significant proportion of participants demonstrated seroconversion, with 80.64% of ANA-positive and 81.25% of RF-positive individuals turning negative. Additionally, marked reductions in C-reactive protein (CRP) and serum uric acid levels were observed, indicating a positive effect on systemic inflammation and metabolic balance.

The data demonstrates a significant reduction in autoimmune serological markers, specifically Antinuclear Antibodies (ANA) and Rheumatoid Factor (RF), which are commonly used in the diagnosis and monitoring of autoimmune diseases. ANA are autoantibodies directed against nuclear components of cells and are typically associated with systemic autoimmune disorders. RF is an autoantibody targeting the Fragment crystallisable region (Fc) portion of Immunoglobulin G (IgG), frequently elevated in RA and indicative of disease activity and severity. A decline in these markers post-treatment suggests modulation of the underlying autoimmune response, reflecting therapeutic efficacy at the immunological level.

The RRAT intervention was linked to significant improvements in overall function and symptoms in clinical trials. Morning stiffness, which was initially experienced by all participants, gradually decreased,

and by end of the visit, 57.5% of them reported full resolution. Similarly, walking-related pain showed consistent improvement, rising from 35.09% at the first follow-up to 61.22% at the conclusion of the research. These results support the RRAT approach's potential as a supplemental method in the control of inflammatory and autoimmune diseases by indicating that it might offer immunomodulatory and anti-inflammatory advantages.

A previous study on Shuddha Guggulu, an active ingredient in our treatment regimen, demonstrated notable efficacy in managing symptoms associated with autoimmune joint diseases. It provided a 55.55% reduction in joint pain and 23.68% reduction in tiredness—both statistically significant ($p<0.001$)—highlighting its potential anti-inflammatory and immunomodulatory properties. In line with these findings, our study also showed meaningful improvements in joint-related symptoms, including a 61.22% relief in pain while walking and marked reductions in morning stiffness. [14]

A study investigating the effects of Shallaki (Boswellia serrata), a key ingredient in our treatment regimen, highlighted its significant role in alleviating symptoms of Sandhigata Vata, which is characterized by joint pain, swelling, and stiffness. The research demonstrated Shallaki's anti-inflammatory and Vata-pacifying properties, leading to notable improvements in symptoms. Symptomatic relief was observed in both groups, with the group receiving oral Shallaki capsules showing greater improvement in joint discomfort and stiffness. Similarly, our study reported 61.22% relief in pain while walking and 57.5% resolution of morning stiffness, further validating the effectiveness of Ayurvedic treatments like Shallaki for Vata-related joint discomfort. [15]

A previous study on Guduchi (Tinospora cordifolia) demonstrated its significant immunomodulatory and anti-inflammatory properties, particularly its ability to modulate key immune pathways such as the Nuclear Factor kappa-light-chain-enhancer of activated B cells (NF-κB) pathway and interleukin signaling. The study emphasized Guduchi's antioxidant activity and its role in inducing apoptosis in immune cells, which are crucial mechanisms in managing autoimmune conditions like rheumatoid arthritis. In our study, the incorporation of Guduchi into the RRAT corresponded with notable clinical improvements, including reductions in inflammatory markers and symptomatic relief, underscoring its therapeutic potential in autoimmune joint diseases. [16]

An earlier study on Rasna (Pluchea lanceolata), a key ingredient in our RRAT, demonstrated its efficacy in managing Amavata. In this study, 15 patients were administered a combination of Rasna powder (3 g) along with a Shunti powder daily for three months. The results indicated significant relief in symptoms such as joint pain, stiffness, and swelling, highlighting Rasna's & Shunti's role in alleviating inflammatory joint discomfort associated with autoimmune conditions. This aligns with our study's findings, where Rasna similarly contributed to a reduction in joint pain and improvement in muscle cramps, signifying its therapeutic potential in autoimmune joint diseases. [17]

A prior study on Eranda Sneha oil demonstrated its efficacy in managing the Sama stage of Amavata, a condition akin to rheumatoid arthritis. In this study, 61 patients aged between 20 to 60 years, exhibiting symptoms of the acute stage of Amavata, were administered Eranda Sneha alone or in combination with a Shunti (Zingiber officinale) once daily on an empty stomach. After 15 days of treatment, both groups showed similar symptomatic improvements. The study concluded that both Eranda Sneha alone and in combination are effective in alleviating the symptoms of the Sama stage of Amavata, providing symptomatic relief. These findings align with the results of our study, supporting the efficacy of Eranda Sneha in managing symptoms associated with Amavata. The synergistic effect of Eranda Sneha with other ingredients in our RRAT may have enhanced the overall therapeutic outcomes, demonstrating its potential as a valuable component in the management of autoimmune joint diseases. [18]

A randomized clinical study assessed the efficacy of Sadhyovirechana with Gandharvahastadi Eranda Taila followed by Agnilepa or Dhanyamla Dhara in managing Amavata, a condition analogous to rheumatoid arthritis. Group A, receiving Sadhyovirechana followed by Agnilepa, demonstrated superior improvement in symptoms such as joint pain, stiffness, and general malaise compared to Group B, which received Dhanyamla Dhara. These findings underscore the effectiveness of Sadhyovirechana as a primary intervention in Amavata management. In our study, the incorporation of Sadhyovirechana contributed to significant reductions in joint pain and stiffness, aligning with the aforementioned study's outcomes and reinforcing its role in the therapeutic regimen for autoimmune joint diseases. [19]

Despite the promising findings, this study has several limitations such as retrospective design, the absence of a randomized control group, small sample size, and the relatively short follow-up duration restricts the assessment of long-term outcomes. Future research should focus on conducting randomized, controlled, prospective studies with larger, more diverse populations and extended follow-up periods to validate these preliminary observations.

Taken together, these steps will be pivotal in advancing RRAT from a promising complementary approach to an evidence-based therapeutic strategy for autoimmune joint diseases.

VII. CONCLUSION

In this retrospective, multicenter study, RRAT demonstrated notable potential in reducing autoimmune activity and alleviating joint-related clinical symptoms in patients with seropositive autoimmune joint diseases. Significant seroconversion rates for antinuclear antibodies and rheumatoid factor, coupled with improvements in inflammatory markers and functional outcomes, suggest a promising immunomodulatory and anti-inflammatory role for RRAT regimen. Further prospective, randomized, controlled trials are warranted to validate these preliminary observations and to establish the therapeutic efficacy and safety of RRAT as a complementary approach for the management of autoimmune joint diseases.

VIII. CONFLICTS OF INTEREST/ COMPETING INTERESTS

Dr. Sandip Mali is part of the Tec clinic Connect Pvt. Ltd. Other author declares no conflict of interest. This study was funded by TechClinic Connect Pvt Ltd.

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