

To study the effectiveness of Physiotherapy Intervention in pain relief & improving joint ROM in Rheumatoid Arthritis patient-A systematic review study

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ABSTRACT

Objective: The Aim of this study is to review and compare the effect of various physical therapy interventions on reduction of pain intensity, improving joint mobility and quality of life of patient with Rheumatoid Arthritis.

Background: Rheumatoid Arthritis is defined as a progressive, inflammatory and autoimmune disease which primarily affects symmetrically small joints of body. It typically results out in warm, swollen and painful joints. This disease is more common in young and middle aged (40 – 50) female adults. RA is characterized by proliferation of synovial fluid and destructive changes of periarticular structures, skeletal muscles and perineural sheath. There are some Pharmacological and Non – pharmacological treatment available for treatment of RA. Pharmacological treatment includes DMARDS, Immunosuppressive drug, NSAIDS and Steroids. Non - pharmacological treatment involves physical therapy (Stretching exercises, strengthening exercises, ROM exercises, Aquatic therapy and Electrical modalities)

These exercises are most commonly prescribed to RA patients but there were only few evidences which proved its effectiveness, so this systematic review study aims to bring more informative results for future references.

Search Methods: The databases were searched –Google scholar, Google book, Global health, COCHRANE Library, Medline, Oxford Academic, SAGE, PubMed and Wiley online library for systematic reviewing of articles related to intervention of RA.

Result and discussion: This study was constructed from 20 reliable articles, it was concluded that K-taping and strengthening exercises has significant effect for treating people with RA.

The strengthening exercises along with paraffin wax bath, K-tape, moist heat helps to treat pain, joint mobility and muscle power of infected joints.

Conclusion: This review reveals that K-taping and therapeutic exercises are highly significant in improving pain intensity, hand movements, grip strength and physical activities of daily life.

KEYWORDS: Rheumatoid Arthritis, Conventional therapy, Therapeutic exercises, strengthening exercises, Hand function, Physical activity.

1. INTRODUCTION

Rheumatoid Arthritis (RA) is an autoimmune, chronic, systemic disabling disease which is mostly manifested by inflammation of synovial joints especially in smaller joints (peripheral joints).

The worldwide prevalence ranges from 0.5 to 1% which may occur in all ethnic groups .It mostly affects people of working age. The prevalence increases with age and may reach 5% above the age of 55 [1]. It is rated that the hands and wrists are affected in 80-90% of RA patients [2].

Types of Rheumatoid Arthritis-

- **Seropositive RA-** If blood tests is positive for the protein called the rheumatoid factor (RF) or antibody anti-cyclic citrullinated peptide (anti-CCP), it means you have the antibodies that cause your immune system to attack joints.
- **Seronegative RA-** If blood tests is negative for the protein called the rheumatoid factor (RF) or antibody anti-cyclic citrullinated peptide (anti-CCP), but you still have RA symptoms then you may develop seronegative RA.
- **Juvenile idiopathic arthritis (JIA)** - most common type of arthritis in children younger than 17 years of age. Earlier this condition was known as juvenile rheumatoid arthritis (JRA). It's symptoms include eye inflammation and interfere the child's growth and development when the disease is very severe.

RA is a progressive disease and it deteriorates the condition in 4 stages-

Figure no. 1 Stages Rheumatoid Arthritis-

Stage 1	The body mistakenly attacks its own joint tissue.
Stage 2	The body makes the antibodies and the joints starts swelling up.
Stage 3	The joint start becoming bent and deformed, the fingers become crooked. These misshapen joints can press on the nerves and can cause nerve pain as well.
Stage 4	If not treated, the disease will progress to the last stage in which there is no joint remaining at all and joint is fused essentially.

The synovitis associated with RA may cause disruption in articular ligaments, erosion of cartilage and subchondral bone and invasion of pannus into the joint.

Patients complain of various symptoms including joint pain and stiffness, reduction in muscle power and grip, loss of range of motion (ROM), all of which can lead to increasing difficulties in performing activities of daily living (ADL) and also affecting quality of life (QOL) of the patient.

Hand function is the most important factor to diagnose RA.

In later stages of RA, there are several hand deformities which occur in people such as ulnar deviation, boutonniere deformity and swan neck deformity.

ETIOLOGY-

Real cause behind the RA disease is still idiopathic. However, some studies depicts that certain factors are triggering the onset of RA among people.

These factors are listed below in fig. no. 2

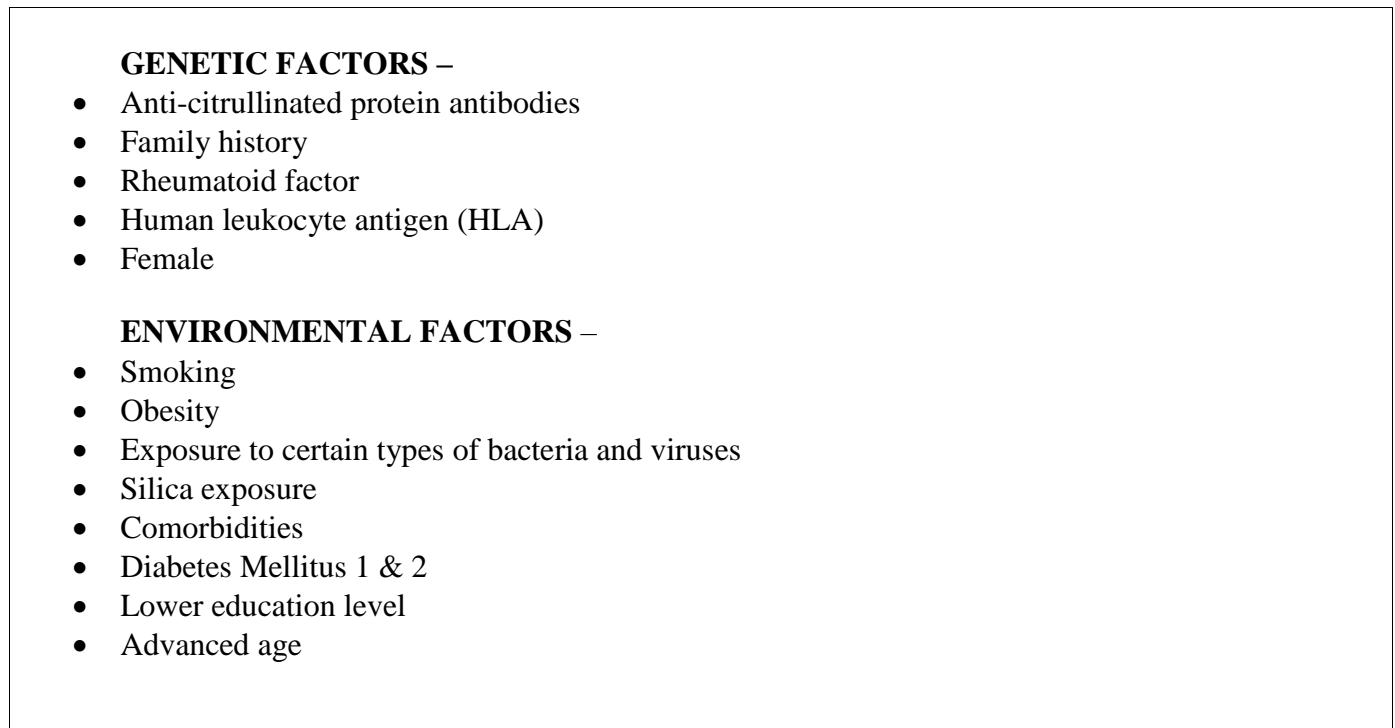


Figure no. 2

Factors affecting Rheumatoid Arthritis

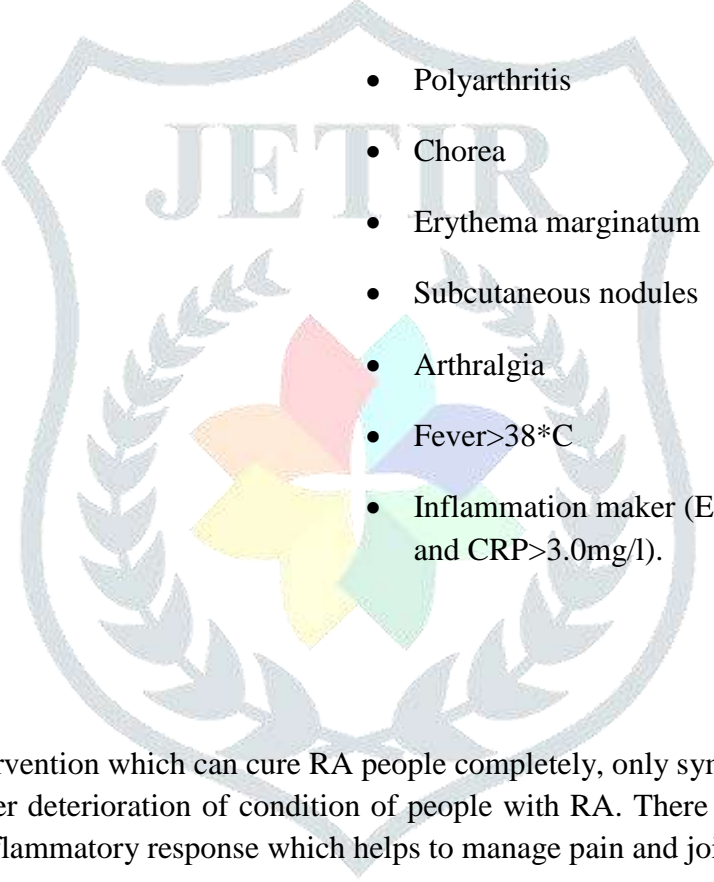
INVESTIGATION-

Early diagnosis of RA is difficult because progression of RA is slow and its symptoms are noticeable in later stage only.

Diagnostic tools used in RA are listed below-

- **Serological test-** this test finds out that genetic marker HLA-B27 is present in blood.
Rheumatoid factor- this test confirms that RF anti gamma-globulins antibody is present in the blood.
- **Laboratory test-** if anti-cyclic citrullinated peptide (anti-CCP) level is higher than 20 units/milliliter more chances of RA is there.

- If antinuclear antibody level is high, more risk of cell destruction is possible.
- C-reactive protein presence initiates inflammation response.
- Increased ESR level, increased lymphocyte count.
- **Radiological impression** shows erosion of joint margins and reduced joint space and cyst formation.
- **Synovial fluid** analysis shows yellow watery and turbid color due to increased WBCs and low sugar content.
- **Jones criteria for Rheumatoid Arthritis** - in these criteria 7 components are present. If 7 out of 4 components are present then it is confirmed that person is diagnosed with RA. Components include-

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- Polyarthrititis
 - Chorea
 - Erythema marginatum
 - Subcutaneous nodules
 - Arthralgia
 - Fever >38°C
 - Inflammation maker (ESR >30mm in 1 hour and CRP >3.0mg/l).

TREATMENT

There is no particular intervention which can cure RA people completely, only symptomatic management is available to prevent further deterioration of condition of people with RA. There is conservative treatment available to control the inflammatory response which helps to manage pain and joint condition.

Conservative treatment includes following ways to manage condition of RA people.

DRUG THERAPY - NSAIDS (Aspirin, Ibuprofen)
 DMARDS (Methotrexate)
 CORTICOSTEROIDS (Prednisone)
 Ant cytokines (Infliximab, Golimumab)

ELECTRICAL MODALITIES - Thermal bath
 Hot/Cold therapy
 Faradic hand bath

Wax therapy

Ultrasound

Laser therapy

Neuromuscular electrical stimulation

THERAPEUTIC EXERCISES AND THERAPEUTIC TECHNIQUES-

- Mobilization techniques

-Therapeutic exercises

-Kinesiology taping

-Muscle energy technique

-Assistive devices and adaptive treatment

-Aquatic exercises

-Joint protection patient education.

-ROM exercises and strengthening exercises

2. SEARCH METHODS

The various sources used for obtaining this information are listed below: Various search Engines and databases were visited for reviewing the articles. Data have been taken from PubMed, Cochrane Library, Science Direct, Research gate of Physical Therapy.

Pub Med (2001 -2019)	Keywords- Rheumatoid Arthritis, Joint Mobilization, Kinesiology Taping, Physical Therapy, Quality of life, Conservative Hand Therapy, Laser Therapy, Neuromuscular Electrical Stimulation.
Science direct (2014-2017)	Keywords- Rheumatoid Arthritis, Cryotherapy, Hand exercises, Aquatic exercises, Conditioning exercises.
Research gate (2017-2020)	Keywords- Rheumatoid Arthritis, Therapeutic exercise Program, Manual therapy, activities of daily living, Hand and Wrist function.

Cochrane Library (2000 -2008)	Keywords- Intensive exercises, Isometric strengthening Exercises, Hand and Wrist Rheumatoid Arthritis.
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Table 1: various search methods and databases

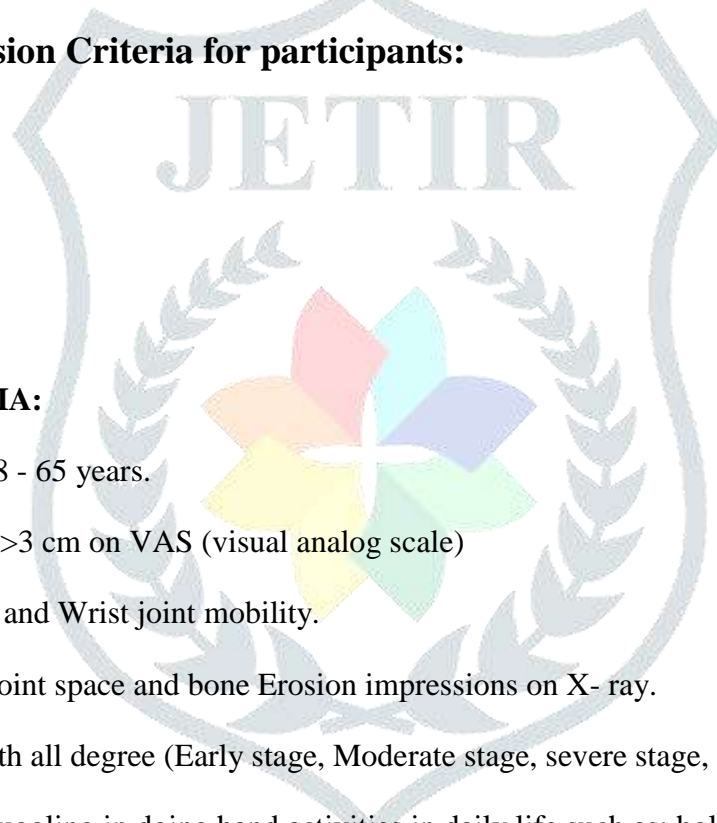
3. SELECTION CRITERIA

Type of studies:

Included studies: Case studies, Randomized controlled trials, Clinical trials, Case report and pilot studies.

Excluded studies: Meta-Analysis and systematic reviews.

Inclusion and Exclusion Criteria for participants:



INCLUSION CRITERIA:

- Age criteria- 18 - 65 years.
- Pain intensity- >3 cm on VAS (visual analog scale)
- Reduced Hand and Wrist joint mobility.
- Narrowing of joint space and bone Erosion impressions on X- ray.
- Participants with all degree (Early stage, Moderate stage, severe stage, End stage) of RA.
- Participants struggling in doing hand activities in daily life such as: holding any object (pen, glass, key etc.), chopping vegetables, grooming etc.
- RA in both hands and wrist joint.
- Hand and Wrist Complications of RA.

EXCLUSION CRITERIA:

- The presence of peripheral nerve complications.
- Finger amputation and mix OA and RA.
- Fractures and Contracture in upper limb.

- Presence of cardiopulmonary complications.
- Serious Lung diseases and systemic diseases.
- Upper and lower limb blisters and ulcers.
- Untreated skin lesions and open wound of upper and lower limb.

4. REVIEW OF LITERATURE

Four Researchers searched total 43 articles and selected 20 articles based on inclusion and exclusion criteria using keywords. They reviewed all 20 articles and analyzed its abstract and treatment protocol to compare the effect of various physiotherapy interventions used for reducing pain intensity, improving joint mobility and enhancing quality of life of RA patients.

In all 20 articles, researchers used numerous physical therapy treatment protocol which included both Electrotherapy, Therapeutic exercises and Therapeutic Techniques for rehabilitating RA patients.

Table no.2 List of several physiotherapy interventions for RA patients

ELECTRICAL MODALITIES	THERAPEUTIC EXERCISES AND THERAPEUTIC TECHNIQUES
Thermal bath	Mobilization techniques
Hot/Cold therapy	Therapeutic exercises
Faradic hand bath	Kinesiology taping
Wax therapy	Art based therapy
Ultrasound	Assistive devices and adaptive treatment
Laser therapy	Aquatic exercises
Neuromuscular electrical stimulation	Joint protection patient education

In study design, they randomly categorized total number of patients into two equal groups (experimental group and control group). Experimental group received physiotherapy intervention (electrical modalities, therapeutic exercises, manual and mechanical techniques) protocol till the decided time period of study.

Control group received standardized, conventional therapy including pharmacological treatment and home exercise regimen allotted by their respective hospitals. Asked to avoid high intensity physical workout and restricted to change their treatment protocol themselves, so that variations in prescribed program not create any false outcomes.

List of intervention protocols included in 20 articles for experimental and control group were depicted in table no.3

Table no.3- Treatment protocol for both experimental group and control group

Seri al no.	Experimental group	Control group	Total time period of study
1.	Home exercises program (Resistive band exercises)	Conventional treatment (Pharmacological and recreational activities)	12 weeks [20]
2.	Manual therapy (Post isometric relaxation and joint mobilization)	Standardized exercise program (Cycle ergometer and isometric contractions of muscles)	10 days [19]
3.	Neuromuscular electrical stimulation	Volitional training (Leg extension exercises and leg press)	16 weeks [18]
4.	Home based exercises (Strengthening exercises)	Conventional therapy (Joint protection, assistive devices, alternative methods to perform ADLs)	8weeks [17]
5.	Kalten born joint mobilization (Grade 1 - 2)	Kalten born joint mobilization (Grade 2 – 5)	2 months [16]
6.	Water based aerobic exercises	Land based aerobic exercises	16 weeks [15]
7.	Active nerve mobilization exercises	Joint mobilization exercises	4 weeks [14]
8.	Kinesiology and Therapeutic exercises (Stretching, strengthening, pulmonary expansion exercises, balance and proprioception exercises and relaxation exercises)	Kinesiology treatment	5 weeks [13]
9.	Art based intervention (Origami, paper quelling, clay modeling, oil painting)	Conventional physiotherapy (Recreational activities)	4 weeks [12]
10.	Underwater ultrasound therapy	Ultrasound therapy (Placebo effect)	3 months [11]
11.	Therapeutic exercise program (Patient education, thermotherapy, stretching, strengthening, PNF techniques, dynamic resistive exercises, aerobic exercises)	Electrotherapy and Hospital/Home based training	12 weeks [10]
12.	Kinesiology taping	Joint protection education	4 weeks [4]
13.	Cryotherapy` (walking in circle, kinesiology and performing energetic movements of upper limb)	Traditional rehabilitation program (Magnet therapy, electrotherapy, ultrasound therapy, laser therapy and kinesiology)	2 weeks [9]
14.	Usual care and exercise program (Mobility exercises, strengthening exercises, resistive exercises and therapeutic ball exercises)	Clinical guidance, joint protection and functional splinting	12 weeks [3]

15.	Conditioning exercise program (Aerobic, isometric and isotonic exercises)	Booklet (Joint protection and home exercises)	8 weeks [2]
16.	Electrotherapy and Therapeutic exercises (Heat therapy, paraffin wax bath and isometric strengthening exercises)	Therapeutic heat and paraffin wax bath	6 weeks [8]
17.	Laser therapy (Low level laser therapy)	Laser therapy (Placebo effect)	10 days [7]
18.	Strengthening exercises and mobilizing exercises	Joint protection and stretching exercises	6 months [1]
19.	Physical therapy treatment (Thermal bath, hot/cold therapy, faradic hand bath and exercise therapy)	Pharmacological therapy	7 weeks [6]
20.	Conservative exercise program and Intensive exercise regimen	Conservative exercise program	30 days [5]

5. OUTCOME MEASURES

A. PRIMARY OUTCOMES –

Pain- Pain intensity of the patient was assessed using a **Visual Analog Scale(VAS)**.

VAS is a self-reporting outcome measure. It is a numerical scale used to describe pain severity. This scale is categorized into 0 (no pain) to 10 (worse pain) score.

In our study patients who had pain from mild to chronic pain intensity, they all are included in our review and patients themselves are giving scores according to their pain intensity under supervision of examiner.

Range of Motion - Goniometry and **Michigan Hand Questionnaire** used to evaluate hand functional mobility.

MHQ- Michigan Hand Questionnaire is an outcome measure which specifically focuses upon hand joint dysfunction. This questionnaire is divided into six scales- Pain, hand function, aesthetics, and work performance, satisfaction of patient related to hand and activity of daily living. It is a patient assessed questionnaire, contains 37 items comprised into six domains. High score denotes worse pain in pain scale and in all other 5 scales high score means better improvement in hand condition.

B. SECONDARY OUTCOMES

36-item Short Form Survey (SF- 36)

SF-36 is a self-reported instrument to evaluate condition of health. It is derived from a study regards as medical outcomes study. This survey is used in RA patients to assess problems in physical activity, social activity, bodily pain, psychological disturbance, vitality, general health perception and usual role activity limitation in physical problem and emotional disturbance.

Disease Activity Score (DAS-28)

This outcome measure is used to describe severity of rheumatoid arthritis in patients. It's scoring start from 0(very well) to 10(very poor). Reduction of 0.5 in score shows improvement in RA individual and increment in score denotes worsening of condition.

Health Assessment Questionnaire (HAQ)

Questionnaire used for assessment of RA people's Activity Of Daily Living with respect to dressing, grooming, arising, eating, walking, hygiene, reach and grip strength. Each section is having 3 grades 0 (no difficulty) to 3 (unable to do). Sum of all 8 section's score is divided by 8 to get HAQ score.

6. RESULTS- A total of 43 pertinent articles were picked out based on initial search, but only 20 studies are included in this review study. All identified studies were RCTs, clinical trials and case reports. There were more of female participants in most articles as compared to male participants.

Physiotherapy intervention used for experimental groups in their respective studies were diversified in nature such as- Kinesio taping, therapeutic exercises (strengthening exercises, aerobic exercises, stretching exercises and resistance exercises), isometric strengthening exercises, paraffin wax bath, laser therapy, manual therapy and faradic hand bath. In reverse, control group obtained education of joint protection, usual rheumatology care and conventional programs. Numerous assessment tools were applied to appraise the effect of various intervention protocols according to respective studies with the peculiarity of 3 studies.

7 studies had shown great improvement among experimental groups in deterioration of pain severity, improvement among joint mobility and quality of life of the participants and 10 studies depicted equal effect in both groups.

Intervention outcomes were reported using the patient, intervention, and comparison and outcome method. These were the following evidences which drew significant improvement in MHQ, HAQ and VAS score in outcomes in context of pain reduction, functional mobility and performance of ADL's among RA patients.

- 7 Weeks of intervention protocol of K-taping reduced pain intensity ($p=0.01$ VAS), enhanced ulnar deviation functional mobility ($p=0.01$) in MHQ scale [18].
- Therapeutic exercises enhanced functional status ($p<0.0001$), grip strength ($p<0.001$) and reduced pain intensity ($p<0.0001$) in Euro-QOL scale [15].
- Traditional rehabilitation program and cryotherapy significantly reduced in DAS-28 score ($p<0.05$) and in HAQ score, reduced difficulty in performing ADL's ($p<0.01$) [10].
- Kinesio taping reduced pain intensity, improved QOL and significantly obtained functional ability and muscular strength in RA with women [4].
- LLLT (Low Level Laser Therapy) significantly improved 95% of the pain score and functional status scale score [9].
- Physical therapy programs especially conditioning exercises (aerobic, isometric and isotonic exercises) enhances pain score and health status of RA patients ($p<0.001$) [1].
- Isometric strengthening along with paraffin wax bath appreciable enhances grip strength ($p=0.003$) and hand function of both hands ($p=0.000$ and $p=0.001$) within 6 weeks of protocol [5].

7. DISCUSSION:

To the best of our comprehension, this is the first systematic review to incorporate all the physical therapy interventions in people with RA and estimate the results of interventions in outcomes. This study evaluates and compares the effect of Therapeutic exercises, Therapeutic techniques, Electrotherapy and Joint protection along with usual Rheumatology care for pain management and improving joint mobility among RA patients.

The results depicted that Therapeutic Rehabilitation Program and Therapeutic Manual Techniques are effective in decreasing pain intensity and enhancing functional mobility of joints in patients with RA. In this review, most of the study shows that Therapeutic techniques (kinesiology, manual therapy, LLLT) and Traditional Rehabilitation programs (isometrics, strengthening, stretching and aerobic exercise) along with usual care, joint protection are more beneficial than usual rheumatology care and pharmacological treatment.

The results are derived from previous published articles (2000 to 2021) including intervention methods in RA patients, various rehabilitation protocols and appraisal tools were incorporated in this review. In a prominent evidence based treatment, one study was conducted to ascertain that K-taping of the MCP joints helps to enhance hand function and reducing pain intensity in individuals with RA [18]. Through this study it was revealed that K-taping stimulates the somatosensory system (mechanoreceptor, thermoreceptor and nociceptors) in the skin. It leads to different reactions at neuronal level in CNS that may have favorable consequences on pain reduction via endogenous, analgesics activation, spinal inhibition and reduction in inflammatory process and joint functional mobility will improve because of pain reduction and relieving soft tissue irritation around MCP joints.

In this context, one more study proved that Therapeutic exercise program (moist heat, paraffin wax bath, ROM exercises, strengthening exercises, aerobic exercise program) ensures pain depletion and refinement in hand functioning, grip strength in early adults with RA [15]. Implementation of therapeutic exercises assists patients to prevent deterioration of condition because physical activity helps in energy conservation, joint protection and improves overall health of patients with RA.

Limitation of this review is that our study is conducted on the small scale of database and we did not conducted a meta- analysis. Moreover, in our study we focused more upon treatment of hand joints functioning but other small joints like elbow, knee, and ankle are rarely included in our study. On the other hand in our study we did not considered the complications in respect of RA. In future we will conduct studies on large scale and will comprise all other joints and the deformities related to RA in further researches.

As RA is an autoimmune and progressive disease, so its symptoms and functional deterioration are noticeable after long period. Hence its treatment is important to prevent worsening of the health condition. So this review study helps the physiotherapists to treat RA patients efficiently with evidence based practice as well as help other researcher to conduct experimental, case studies and case series to find out most effective rehabilitation protocol for individuals with RA.

8. CONCLUSION

The result of this study indicates that **k-taping** and **therapeutic exercises** shows significant impact on pain reduction and enhancing functional joint mobility of hands, grip strength and quality of life of patients with RA.

Among therapeutic exercises, strengthening exercises are highly remarkable for improving daily activity functioning but it also considered that implementation of strengthening exercises along with paraffin wax bath, moist heat and K-taping helps more to reduce pain and improve grip strength and ulnar deviation.

Moreover, further RCTs, clinical case series required to appraise the significant impact of these intervention protocols among different age related RA patients for evidence based practice in physical therapy settings.

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