



RESEARCH ARTICLE

Impact of rheumatoid arthritis on functional limitations of wrist and hand

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Abstract

Background: Rheumatoid arthritis is associated with various wrist and hand deformities and malalignment, which makes activities of daily living difficult to perform. Identification of these functional limitations in early stages is imperative as it can change the course of the disease and prevent further deterioration of the joints.

Results: On average 38.5% of subjects reported affection in their overall hand functions, 50.7% of subjects reported difficulty in performing an activity of daily living, 82.5% of subjects reported disturbance in their work performance.

Conclusion: The study of functional limitations of wrist and hand in rheumatoid arthritis is an important step forward to understanding the disease in different stages and its impact on wrist and hand functional limitations to effectively start early physiotherapy rehabilitation to prevent the progression of the disease as well as treat signs and symptoms too.

Keywords: Rheumatoid arthritis, Functional limitations, Wrist and hand, Activity of daily living, Work performance, Quality of life, Michigan hand outcome questionnaire.

Introduction

Rheumatoid arthritis (RA) is progressive in nature and a chronic autoimmune disease. It causes pain, swelling, and inflammation in and around the joints and can affect other parts of the body (Finckh *et al.*, 2022). Rheumatoid arthritis is an autoimmune illness that develops when your immune system unintentionally assaults healthy tissues in your body. Rheumatoid arthritis damages the lining of your joints, causing discomfort and swelling that may eventually lead

to bone erosion or joint deformity (England *et al.*, 2018b). This differs from the degenerative changes in osteoarthritis. Joint discomfort and swelling, decreased mobility and physical weakness, general fatigue, difficulty sleeping, and exhaustion are all side effects of rheumatoid arthritis (Kristiansen *et al.*, 2011b). A few signs and symptoms in the early stages of the disease include active inflammation of the joints, stiffness, especially early in the morning, hot, swollen, and painful joints, soft tissue deformity and contractures, and tenderness (Kung & Bykerk, 2014b). While the later stage is usually associated with various wrist and hand deformities due to the misalignment of bones and disturbed length-tension relationship between muscles and various soft tissues (Sharif *et al.*, 2017b). Some common risk factors associated with rheumatoid arthritis are genetics, hormones, smoking, obesity, diet and stress. Everyday chores and tasks like cooking, cleaning, laundry, gardening, and as the condition advances, leisure activities may become difficult. Identification of rheumatoid arthritis-related functional limitations in the initial presentation and necessary medical and physiotherapy rehabilitation at the earliest stage can affect the disease course, prevent the development of joint deformities, and help relieve signs and symptoms (England *et al.*, 2018b), (Kristiansen *et al.*, 2011b). Individuals with rheumatoid arthritis are at a huge risk for decreased muscle atrophy, strength, and flexibility. In later stages, it may also have an effect on one's cardiovascular

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endurance. Deficits in such areas will lead to functional impairments and compromise the quality of life (Lora *et al.*, 2018b), (Sayah & English, 2005b)

Materials and Methodology

The study was conducted after obtaining approval from the institutional ethical committee. Patients older than 30 years of age with a positive RH factor and a pre-diagnosed history of rheumatoid arthritis for more than 6 months were recruited for the study after obtaining aware written consent. To be eligible to participate in the study, the patient had to be free from any psychological disorders, hearing, and speech disabilities that would have interfered with answering the questionnaire. Exclusion criteria included patients with recent wrist or hand fractures and patients with conditions, like systemic lupus erythematosus (SLE), Sjogren syndrome, polymyalgia, osteoarthritis, osteoporosis, psoriatic arthritis, osteopenia, and reactive arthritis. The study's objective was to determine the impact of rheumatoid arthritis on functional limitations of the wrist and hand. The study involved 40 individuals in total (38 female and 2 male) with a history of wrist and hand rheumatoid arthritis. The subjects were taken from D.Y. Patil Hospital Nerul, Navi Mumbai. Michigan hand outcome questionnaire was administered to the selected subjects. Michigan hand outcome questionnaire is a commonly used questionnaire to assess wrist and hand functional impairments and disorders. Overall hand functions, daily living activities, pain, work performance, hand aesthetics, and happiness with hand functions are its six domains. (Killip *et al.*, 2022b), (Waljee *et al.*, 2011b). Michigan hand outcome questionnaire is a self-reported questionnaire that identifies concerns in both the left and right hand and also includes activities that require the involvement of both hands altogether (Shauver & Chung, 2013b). In the first domain of overall hand functions, the selected subjects answered the questions that they appropriately experienced with their wrist(s)/hand(s) functions during the past week. The subjects reported their concerns varying from very good, good, fair, poor and very poor. In the second domain of activities of daily living, the questions referred to the ability of their hand(s) to do certain tasks during the past week. The selected subjects rated their difficulty level according to their experience. In the third domain of work performance, which includes both

housework and schoolwork, the selected subjects answered the questions that referred to how their normal work was affected in the last four weeks due to their wrist and hand rheumatoid arthritis. The answers varied from always, often, sometimes, rarely, and never. The fourth domain was about pain; the selected subjects rated how often they had pain during the past week. The answers varied from always, often, sometimes, rarely, and never. They also described the intensity of their pain, which again varied from very mild, mild, moderate, severe, and very severe. These questions were addressed to both the left and right wrist(s)/hand(s).

Results

Overall Hand Functions

Interpretations

For overall how well did your hand work (Figure 1)- Out of 40 subjects, 10 (25%) subjects reported very good, 15 (37.5%) subjects reported good, 9 (22.5%) subjects reported fair, 6 (15%) subjects reported poor 0% of subjects reported very poor. How well did your fingers move- Out of 40 subjects 8 (20%) subjects reported very good, 15 (37.5%) subjects reported good, 9 (22.5%) subjects reported fair, 5 (12.5%) subjects reported poor 3 (7.5%) of subjects reported very poor. How well did your wrist move- Out of 40 subjects 10 (25%) subjects reported very good, 16 (40%) subjects reported good, 9 (22.5%) subjects reported fair, 4 (10%) subjects reported poor 1 (2.5%) of subjects reported very poor. How was the strength in your hand - Out of 40 subjects 8 (20%) subjects reported very good, 11 (27.5%) subjects reported good, 10 (25%) subjects reported fair, 7 (17.5%) subjects reported poor 4 (10%) of subjects reported very

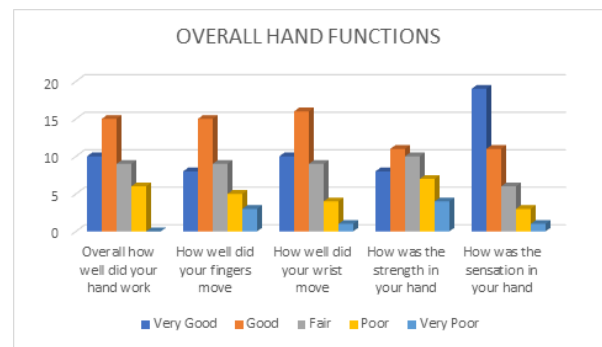


Figure 1: Overall hand functions

Table 1: Single factor ANOVA summary of overall hand functions

Groups	Count	Sum	Average	Variance
Overall how well did your hand work	40	92	2.3	1.035897
How well did your fingers move	40	100	2.5	1.384615
How well did your wrist move	40	90	2.25	1.064103
How was the strength in your hand	40	108	2.7	1.6
How was the sensation in your hand	40	78	1.95	1.433333

poor (Tables 1 and 2). How was the sensation in your hand - Out of 40 subjects 32 (80%) subjects reported very good, 5 (12.5%) subjects reported good, 3 (7.5%) subjects reported fair, 0 subjects reported poor and 0 of subjects reported very poor (Table 3).

Activity of Daily Living

Interpretations

Open a jar – Out of 40 subjects 19 (47.5%) subjects reported not at all difficult, 9 (22.5%) subjects reported a little difficulty, 8 (20%) subjects reported somewhat difficult, 2 (5%) subjects reported moderately difficult, 2 (5%) subjects reported very difficult (Figure 2). Button a shirt/blouse – Out of 40 subjects 23 (57.5%) subjects reported not at all difficult, 7

(17.5%) subjects reported a little difficulty, 6 (15%) subjects reported somewhat difficult, 2 (5%) subjects reported moderately difficult, 2 (5%) subjects reported very difficult. Eat with knife/fork – Out of 40 subjects 26 (65%) subjects reported not at all difficult, 6 (15%) subjects reported a little difficulty, 3 (7.5%) subjects reported somewhat difficult, 4 (10%) subjects reported moderately difficult, 1 (2.5%) subject reported very difficult. Carry a grocery bag – Out of 40 subjects 14 (35%) subjects reported not at all difficult, 6 (15%) subjects reported a little difficulty, 10 (25%) subjects reported somewhat difficult, 6 (15%) subjects reported moderately difficult, 4 (10%) subjects reported very difficult. Wash dishes – Out of 40 subjects 13 (32.5%) subjects reported not at all difficult, 11 (27.5%) subjects reported a little difficulty, 10 (25%) subjects reported somewhat difficult, 4 (10%) subjects reported moderately difficult, 2 (5%) subjects reported very difficult. Wash your hair – Out of 40 subjects 20 (50%) subjects reported not at all difficult, 8 (20%) subjects reported a little difficulty, 8 (12.5%) subjects reported somewhat difficult, 2 (5%) subjects reported moderately difficult, 2 (5%) subjects reported very difficult. Tie shoelaces/ knots – Out of 40 subjects 20 (50%) subjects reported not at all difficult, 12 (30%) subjects reported a little difficulty, 3 (7.5%) subjects reported somewhat difficult, 4 (10%) subjects reported moderately difficult, 1 (2.5%) subject reported very difficult (Table 4).

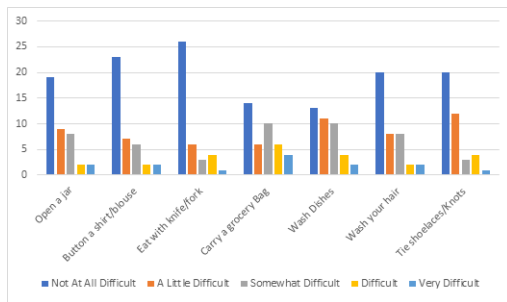


Figure 2: Activity of daily living

Table 2: ANOVA source of variations of overall hand function

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	12.68	4	3.17	2.431747	0.048921	2.417963
Within Groups	254.2	195	1.30359			
Total	266.88	199				

Table 3: Overall hand functions (%)

	Very good	good	Fair	poor	Very poor
Overall, how well did your hand work	25	37.5	22.5	15	0
How well did your fingers move	20	37.5	22.5	12.5	7.5
How well did your wrist move	25	40	22.5	10	2.5
How was the strength of your hand	20	27.5	25	17.5	10
How was the sensation in your hand	47.5	27.5	15	7.5	2.5

Table 4: Activity of daily living (%)

	Not at all difficult	A little difficult	Somewhat difficult	Moderately difficult	Very difficult
Open a jar	47.5	22.5	20	5	5
Button a shirt/blouse	57.5	17.5	15	5	5
Eat with knife/fork	65	15	7.5	10	2.5
Carry a grocery bag	35	15	25	15	10
Wash dishes	32.5	27.5	25	10	5
Wash your hair	50	20	12.5	5	5
Tie shoelaces/knots	50	30	7.5	10	2.5

Table 5: Work performance (%)

	<i>Always</i>	<i>Often</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
How often were you unable to do work	2.5	10	42.5	27.5	17.5
How often did you shorten your work day	2.5	20	32.5	27.5	17.5
How often did you have to take it easy at your work	7.5	20	37.5	20	15
How often did you accomplish less in your work	10	20	7.5	27.5	25
How often did you take longer to do tasks in your work	12.5	17.5	35	22.5	12.5

Work Performance

Interpretations

How frequently did you have to miss work due to hand or wrist issues (Figure 3)– Out of 40 subjects 1 (2.5%) subjects reported always, 4 (10%) subjects reported often 17 (42.5%) subjects reported sometimes, 11 (27.5%) subjects reported rarely, 7 (17.5%) subjects reported never. How frequently did you have to cut short your workday due to hand or wrist pain - Out of 40 subjects 1 (2.5%) subjects reported always, 8 (20%) subjects reported often 13 (32.5%) subjects reported sometimes, 11 (27.5%) subjects reported rarely, 7 (17.5%) subjects reported never. How often did issues with your hand(s) or wrist(s) force you to take it easy at work?

– Out of 40 subjects 3 (7.5%) subjects reported always, 8 (20%) subjects reported often 15 (37.5%) subjects reported sometimes, 8 (20%) subjects reported rarely, 6 (15%) subjects reported never. How often did issues with your hand(s) or wrist(s) make you to accomplish less at work? – Out of 40 subjects 4 (10%) subjects reported always, 8 (20%) subjects reported often 7 (17.5%) subjects reported sometimes, 11 (27.5%) subjects reported rarely, 10 (25%) subjects reported never. How often did issues with your hand(s) or wrist(s) make you to take longer to complete duties at work? – Out of 40 subjects 5 (12.5%) subjects reported always, 7 (17.5%) subjects reported often 14 (35%) subjects reported sometimes, 9 (22.5%) subjects reported rarely, 5 (12.5%) subjects reported never (Table 5).

Table 6: How often did you have pain (%)

<i>Always</i>	25
<i>Often</i>	32
<i>Sometimes</i>	20
<i>Rarely</i>	18
<i>Never</i>	5

How Often Did You Have Pain?

Interpretations

Out of 40 subjects 25% of subjects reported always, 32% subjects reported often, 20% subjects reported sometimes, 18% subjects reported rarely, 5% subjects reported never (Table 6).

Table 7: Type of pain (%)

<i>Very mild</i>	27
<i>Mild</i>	28
<i>Moderate</i>	30
<i>Severe</i>	15
<i>Very severe</i>	0

Type of Pain

Interpretations

Out of 40 subjects 27% of subjects reported very mild pain, 28% of subjects reported with mild pain, 30% of subjects reported moderate pain, 15% of subjects reported severe pain (Table 7).

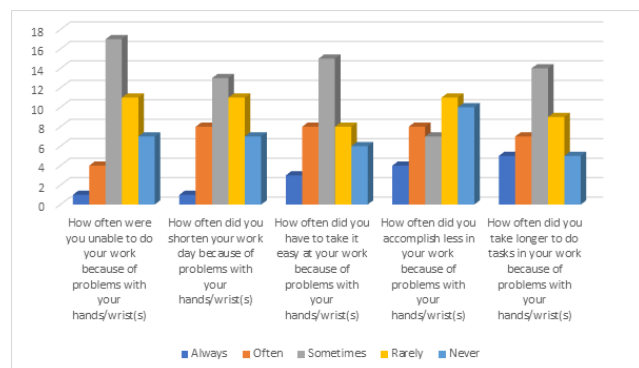


Figure 3: Work performance

Discussion

In our study was conducted on 40 subjects, individuals over the age of 25. Out of 40 subjects, there were 95% females and 5% males. Females are more likely to get RA than the male population. Hormones play a huge role in either preventing or triggering it (Kanik & Wilder, 2000c). RA generally starts in the third decade of life for women and somewhat later in life for men (Favalli *et al.*, 2018b). Additionally, out of 40 subjects, 77% were right-hand dominant and 23% were left-hand dominant.

Overall hand functions 31.25% of subjects reported good function, 22.5% reported fair function, and 15% reported poor function of the wrist and hands. This reveals that on average, 37.5% of individuals have limited range of motion and impaired mobility in their wrist, hand, and fingers,

leading to a decrease in their overall strength of the hand. Out of which, 25% of subjects have reported trouble carrying out simple tasks including holding a frying pan, picking up a penny, turning a key in a lock, and twisting a door knob (Tables 1 and 2). This suggests to us that decreased range and mobility have a serious influence on the grip strength, grasp, and precision of the wrist and hand. Inability to perform these day to day activities can make individuals dependent on caretakers, and joints become more vulnerable to injuries and erosion (Hewlett *et al.*, 2011b).

In ability to perform tasks and activities of daily living (ADL) with both hands, like carry a supermarket bag, eat with a knife or fork, open jars, button blouses, wash dishes and hair, and tie shoelaces or knots 27.5% of subjects found it a little difficult, 20% found it to be somewhat difficult, 15% subjects reported moderately difficult, and 10% found it very difficult. ADL are necessary daily chores that the majority of healthy people can complete on their own. This includes physical mobility, bathing, dressing, personal hygiene, and eating. Interference with these activities can lead to poor personal hygiene and dependence on family members and caretakers (Matcham *et al.*, 2014b).

In our study, 25% of subjects complained of pain throughout the day (always), whereas 30% of them complained of often pain. Out of which, 30% of them had moderate type of pain and 15% had severe type of pain. Regardless of the source, pain can negatively impact almost every aspect of a person's life. Their capacity to work and engage in social activities may be hindered, and impact their relationship, causing isolation, frustration, and anxiety. Over time, this leads to weaker physical strength and mobility and a further lack of function in joints (Uda *et al.*, 2021c).

Due to rheumatoid arthritis of the wrist and hand, 55% of subjects reported that they were unable to do their housework, office work/school work and had to shorten their day. 65% of subjects had to go easy at their workspace and took longer to accomplish tasks. Whereas, 37.5% of subjects often accomplish less in their workspace. Rheumatoid arthritis has a huge impact on work performance. Limitations in activities such as typing, writing, lifting objects, sitting, or standing for prolonged periods of time have an adverse effect on careers and make it more difficult to compete with peers, limiting their career choices or their on the job skills (Kessler *et al.*, 2008b).

RA can later result in a low quality of life and has numerous physical, psychological, and social effects. It leads to discomfort, incapacity, and movement problems. This study confirms that RA causes impairment in all aspects of quality of life (QoL): overall hand functions, ability to perform tasks, limitation of physical function, constant pain, decreased productivity in work life, awkward social situations, and disturbed sleep cycle. Hence, physiotherapy intervention and rehabilitation at the earliest can prevent deterioration of the disease and quality of life (Yasui *et al.*, 2016b).

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