

# Correlation Between Instrumental Hand Function and Activities of Daily Living in Rheumatoid Arthritis

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## Abstract

**Objective:** To find the correlation of instrumental hand function (grip strength, muscle power and range of motion) and Activities of Daily Living (ADL) in rheumatoid arthritis patients.

**Methods:** 50 patients of either sex were included in the study. Objective evaluation of hand function was done using Hand dynamometer and Electrogoniometer (Tracker system-version 4®). The patients were assessed for their functional limitations using Indian version of HAQ-DI. Spearman rank correlation was performed to find out the association among the variables.

**Results:** It was found that most of the disease specific parameters like morning stiffness, number of inflamed joints, duration of the disease and deformities had a strong

correlation with the instrumental hand function. Deficits in grip strength, tip pinch, palmar pinch, and range of motion of hand strongly correlated to difficulty in activities of daily living in patient with RA. Instrumental hand functions (grip strength, pinch strength and range of motion of joints) were significantly impaired in patient with RA and they had good correlation with Indian Health Assessment Questionnaire Disability Index (IHAQ-DI).

**Conclusion:** Instrumental hand function assessment along with IHAQ-DI is an effective tool in evaluation and modulation of therapeutic interventions in patients with rheumatoid arthritis. The instrumental hand function assessment can also predict the deficits in ADL.

**Key words:** Rheumatoid Arthritis, Hand function, Activity of Daily Living.

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## Introduction

Rheumatoid arthritis (RA) is a chronic symmetrical inflammatory polyarthritis of small and large joints of the extremities. Involved joints show inflammation with swelling, tenderness, warmth, and decreased range of motion (ROM). Joint and tendon destruction may lead to various deformities of the extremities. These patients show different degrees of difficulty in performing activities of daily living (ADL)<sup>1</sup>. As the disease has a considerable impact on the ADL, it was tried to assess and establish the correlation of hand function (grip strength, pinch strength and range of motion) and ADL in RA patients using Indian version of Health Assessment Questionnaire-Disability Index (IHAQ-DI)<sup>2</sup>.

## Material and Methods

Fifty consecutive patients of either sex fulfilling the inclusion criteria and agreeing to participate in the study were taken from those attending the outpatient department of Physical Medicine and Rehabilitation, All India Institute of Medical Sciences, New Delhi. The inclusion criteria were: (1) age group: 20 – 50 years, (2) sex: both males and females, (3) all old and newly diagnosed cases of RA at any stage of disease, (4) Symptoms present at the time of initial examination (5) Patient's ability to understand and perform the prescribed test for hand function and answer IHAQ-DI questionnaire and (6) Willingness to participate.

Objective evaluation of hand function was done using Hand dynamometer and Electrogoniometer (Tracker system-version 4<sup>®</sup>). The patients were made to sit comfortably and their hand function was evaluated using dynamometer for grip strength, pinch strength and by using goniometer for range of motion of wrist and joints of hands. After the testing of hand function, the patients were assessed for their functional limitations using Indian version of HAQ-DI. The result obtained was analyzed statistically and interpreted with a view to comparatively evaluate the instrumental finding and ADL assessment using the IHAQ-DI scale. Spearman rank correlation was performed using SAS 8.0 statistical package to find out the association among variables and p-value <0.05 was considered as statistically significant level.

## Results

Median age of the 50 patients was 36.50 years (range 23 to 50). Median duration of disease was 4 years (range 0.25 to 30). Pain score on visual analogue scale (VAS) was 0 to 8 with a median of 4. IHAQ-DI in these 50 patients was 0.08 to 2.08 with a median of 0.75.

There were 40 (80%) females and 10 (20%) males in the study. At the time of study there was no active inflammation in any joint in 26 patients. 30 (60%) patients were having anemia.

Morning stiffness of more than 30 minutes was present only in 38% patients. There was no significant correlation between morning stiffness and IHAQ-DI however morning stiffness had correlation of deficit of ROM of right hand.

Duration of RA strongly correlated with diminished ROM of bilateral hand and presence of deformities but not with any other parameters of instrumental hand function or IHAQ-DI. Strong correlation of inflamed joint count with deficit of ROM of both sides was found. There was no correlation between pain score on VAS and IHAQ-DI and instrumental hand function in the study.

Seventy percent of patients were having deformities. Hand deformities strongly correlated with deficit of right side tip pinch, deficit of bilateral hand ROM and with IHAQ-DI. It was found that restriction of ROM was present in 62% patients. Restriction of ROM of bilateral hands strongly correlated with IHAQ-DI.

Most of the patients were having deficits of grip strength affecting the right side more frequently. Grip strength deficits of both sides were strongly correlated with IHAQ-DI.

Tip pinch and palmar pinch strengths were lower in most of the patients (88%) and left hand was more severely

involved than the right hand. Bilateral tip and palmar pinch strength deficits strongly correlated with IHAQ-DI. In most of the patients key pinch was impaired, but no significant correlation was found with IHAQ-DI.

## Discussion

Outcome assessment in patients with RA includes measurement of physical function. Physical disability is an important outcome of rheumatoid arthritis<sup>1,2</sup>.

Morning stiffness (lasting more than 30 minutes) was present only in 19 (38%) patients as the patients were in different stages of the disease and treatment. There was no significant correlation between morning stiffness and IHAQ-DI. Morning stiffness strongly correlated with deficits of ROM of right hand in this study. Curkovic<sup>3</sup> found that there was general trend of the rising grip strength since morning to evening without statistical relevance and grip strength negatively correlated with the grade of morning stiffness but in this study no association could be found between morning stiffness and grip strength.

Most of the patients (70%) were having deformities of hand. Hand deformities strongly correlated with deficit of right side tip pinch, deficits of ROM of bilateral hand and with IHAQ-DI. Adams<sup>4</sup> concluded that in this early RA population handgrip strength was an accurate indicator of upper limb ability and ulnar deviation at the MCP joints and had only a weak to moderate association with upper limb functional activity and ability. Agustín<sup>5</sup> found that both the joint inflammation and joint deformity impairments displayed strong direct paths toward functional limitation.

Duration of RA strongly correlated with decrease of ROM of bilateral hand and deformities. It did not have any correlation with any other parameter of instrumental hand function and IHAQ-DI. In contrast, Bodur<sup>6</sup> found that disease duration strongly correlated with special hand disability index of Stanford HAQ.

Inflamed joint count strongly correlated with deficits of ROM of both sides. However, any correlation between inflamed joint count and IHAQ-DI was not found. van Lankveld<sup>7</sup> found that an increase in the number of swollen joints most strongly correlated with a decrease in dexterity, even after controlling for impairment at baseline. But Hakkinen<sup>8</sup> found in their study that number of swollen and tender joints was of lesser importance for function.

No significant correlation was found between pain score on VAS and IHAQ-DI and instrumental hand function. However Hakkinen<sup>9</sup> concluded that in patients with RA, pain and ROM of joints had the greatest impact on individual subdimensions of the HAQ.

ADL: Are you able to	Without any difficulty	With some difficulty	With much difficulty	Unable to do
	No. of Patients (%)	No. of Patients (%)	No. of Patients (%)	No. of Patients (%)
Dress yourself, including tying sari/ salwar/ dhoti/ pyjama and doing buttons?	24(48)	21(42)	4(8)	1(2)
Get in and out of bed?	28(56)	20(40)	1(2)	1(2)
Lift a full cup or glass to your mouth?	25(50)	22(44)	2(4)	1(2)
Walk outdoors on flat grounds?	23(46)	19(38)	7(14)	1(2)
Wash and dry your entire body?	16(32)	28(56)	5(10)	1(2)
Squat in the toilet or sit cross-legged on the floor?	14(28)	14(28)	7(14)	15(30)
Bend down to pick up clothing from the floor?	25(50)	18(36)	5(10)	2(4)
Turn a tap on and off?	27(54)	17(34)	6(12)	0(0)
Get in and out of auto rickshaw /manual rickshaw /car?	15(30)	24(48)	9(18)	2(4)
Walk three kilometers?	7(14)	23(46)	9(18)	11(22)
Shop in vegetable market?	8(16)	27(54)	7(14)	8(16)
Climb a flight of stairs?	15(30)	21(42)	10(20)	4(8)

Table-1: Indian health assessment questionnaire

	Right grip	Left grip	Right tip pinch	Left tip pinch	Right key pinch	Left key pinch	Right palmar pinch	Left palmar pinch	Right hand ROM	Left hand ROM
Deformities	0.48	0.654	0.011*	0.698	0.368	0.463	0.252	0.3	0	0
Duration (years)	0.46	0.375	0.764	0.583	0.117	0.24	0.782	0.651	0.013*	0.005*
Morning Stiffness	0.63	0.844	0.681	0.055	0.615	0.591	0.473	0.349	0.017*	0.145
Inflamed joint count	0.29	0.303	0.235	0.492	581	1	0.252	0.3	0*	0*
VAS	0.26	0.584	0.784	0.985	0.425	0.687	0.145	0.179	0.245	0.572
IHAQ-DI	0.002*	0.0*	0.010*	0.016*	0.724	0.115	0.035*	0.003*	0.018*	0.001*

Table-2: Correlation Between Hand Function Evaluation, IHAQ-DI and Disease Parameters

In this study, most of the patients were having decreased grip strength with right side affected more severely. Both sides of grip strength deficits strongly correlated with IHAQ-DI. Hakkinen<sup>9</sup> also found that grip strength was associated with the total HAQ disability index.

Tip pinch strength was lower in most of the patients (88%) and left hand was more severely involved than the right hand probably because of neglect of the non-dominant side. Tip pinch strength deficits of bilateral hands strongly

correlated with IHAQ-DI. It was also found that right tip pinch strength was more strongly correlated with IHAQ-DI.

In right hand, key pinch was impaired in almost 100% patients and right hand was also more severely impaired. But there was no significant correlation between IHAQ-DI and key pinch deficit in both hands. Palmar pinch strength was also lower in most of the patients (88%) and left hand was more severely involved. Both sides

palmar pinch strength deficits strongly correlated with IHAQ-DI.

Bodur<sup>6</sup> noted that disease duration, grip strength, pinch measurements, clinical and laboratory activity parameters strongly correlated with hand disability. They concluded that grip strength and pinch measurements seemed to be the most related variables with hand disability and articular damage. So, grip strength and pinch measurement should be included in the evaluation and follow-up of the patients with RA in hand rehabilitation units.

In this study, there was no restriction of ROM in 38% patients. ROM was more severely affected in the left hand probably because of the neglect due to non-dominant side. Decrease in ROM of bilateral hands strongly correlated with IHAQ-DI. Dellhag<sup>10</sup> found that flexion and extension deficits in digits II through V were the strongest predictors of actual hand function. Hakkinen<sup>7</sup> concluded that in patients with rheumatoid arthritis, pain and ROM of joints had the greatest impact on individual sub dimensions of the HAQ.

## Conclusion

In this study, it was found instrumental hand functions (grip strength, pinch strength and range of motion of joints) were significantly impaired in patient with RA and they had good correlation with IHAQ-DI. The instrumental hand functions assessment along with IHAQ-DI are effective tools in evaluation and modulation of therapeutic interventions in patients with RA. The instrumental hand functions assessment can also predict the deficits in ADL.

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