

Influence of Arthritis on the Hand Grip Strength in the Middle Aged Women Patients of Punjab

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Abstract: Aim of the study is to see influence of RA and OA on hand grip and compare it with normal women. The cross-sectional study comprised female population (45-65) years from urban and rural areas of Punjab. The number of samples were 50 rheumatoid arthritis, 50 osteoarthritis patients and 50 control females. Grip strength was measured with elektronisches Hand- Dynamometer. From available set of data, values of mean±SD of hand grip strength were computed to be 18.1±4.98 for OA group, 12.8±6.57 for RA group and 22.6±4.61 for the control group. Applying t statistics for the paired comparisons of control vs OA group was found to be 4.680 which was statistically highly significant. This implied that average hand grip strength of control group was significantly larger than that of OA group. Similarly, for the paired comparison of control vs RA group the value of t was seen to be 8.667 which again was highly significant. This again implied that the average hand grip strength of control group was significantly higher than that of RA group. Furthermore, application of the t test for OA vs RA group indicated that the average hand grip strength of OA group was significantly larger than that of RA group (t=4.599, p< 0.0001).

Keywords: Hand grip strength, Rheumatoid arthritis, Osteoarthritis, Disability.

I. INTRODUCTION

Osteoarthritis (OA) is the most common joint disorder that results in pain, joint deformation and physical disability [1]. OA largely affects health of older and middle aged females [2]. In osteoarthritis hip, knee and hands are mainly involved. Hand disability in osteoarthritis has been largely ignored, although recent studies shows significant impact of OA on hand strength [3], [4], [5], [6], [7]. Specifically to examine hand disability, grip strength is significant determinant [8].

Rheumatoid arthritis (RA) is an autoimmune disorder characterized by destruction and inflammation of joints that affects approximately 0.5 to 1% of the adult population [9], [10], [11].

Approximately in 80 to 90% of RA individuals involvement of wrist and hand joint is noticed that results in restriction of the hand function and malformation of hand [12]. Wrist joints, metacarpophalangeal (MCP) and proximal interphalangeal (ICP) are predominantly affected joints in hands that cause functional disability which further affects activities of daily life [13].

Hand grip strength is the most related parameter with hand disability. Grip strength measurements are of great significance to check functionality of hand. Some studies have concluded that in comparison of OA patients with normal individuals, hand grip strength is reduced in case of OA patients [4]. Prevalence of hand OA in true population is much higher with estimation of 30-52% [14], [15], [16], [17].

In spite of this, contribution of OA in hand dysfunction, disability and pain is in smaller extent. Various studies suggest that in hand functioning contribution of hand OA is little despite having negative correlation with grip strength [18], [19], [20]. In RA patients for hand assessment, grip strength is valuable parameter [21]. Disability of hand in RA patients is due to numerous factors. Reduced muscle power or muscle fatigue, hand pain, malformation and reduced range of movements in hand play a vital role in joint limitation. Majority of RA patients possess diminished hand grip strength and hindered hand function which influence overall rate of mortality and morbidity [22] [23] [24] [25] [26].

Hand dominance is one of the most determining factor of grip strength. Previous studies suggest that in comparison of non-dominant hand, dominant hand is approximately 10% strong [27]. Limited number of previous studies have investigated existence of Bouchard and Heberden's nodules, the effects of involvement of joint and pain in functioning of hand [6], [3], [28]. For assessment of hand function, grip strength, pinch strength and various functional indices methods can be used [28].

It is apparent from previous studies that rheumatoid arthritis have strong impact on hand grip strength, where as it is debatable in case of osteoarthritis. Although few prior research has confirmed influence of RA and OA on hand grip strength. However, there are several researches which do not confirm this association in case of OA [18], [19], [20]. Therefore, this study aims to investigate impact of arthritis on hand grip strength in middle aged women of Punjab.

II. MATERIAL AND METHODS

Study Area and Subjects:

The prime objective of present study is to see association of arthritis with hand grip strength. Aim of the study is to see impact of RA and OA on hand grip and compare it with normal women. The cross-sectional study comprised female population (45-65) years from urban and rural areas of Punjab. The number of samples were 50 rheumatoid arthritis, 50 osteoarthritis patients and 50 control females. The diagnosis of rheumatoid arthritis was confirmed using the classification criteria of the American College of Rheumatology by Arnett et al. 1988 [29].

Grip strength was measured with elektronisches Hand- Dynamometer. Grip strength measurements were taken from right hand by making them seated in a standardized position having elbows flexed at 90° angle. All the subjects both patients and control group individuals were informed and their consent was taken prior to the inclusion in the study.

Women who were pregnant, not ambulant or taking oral corticosteroids, with bilateral shoulder surgery or severe shoulder disease or knee replacement were excluded.

III. RESULTS

Table No.1 describes trends in mean, SD and SE_m of hand grip strength of RA and OA subjects. From the available set of data, values of mean±SD of hand grip strength were computed to be 18.1±4.98 for OA group, 12.8±6.57 for RA group and 22.6±4.61 for the control group.

Table 1: Mean, SD and SE_m of the measurements on hand grip strength (kg) in the subjects of osteoarthritis (OA), rheumatoid arthritis (RA) and control (CNT) groups

Parameter (kg)	Group								
	OA			RA			CONTROL		
	Mean	SD	SE _m	Mean	SD	SE _m	Mean	SD	SE _m
Hand Grip Strength	18.1	4.98	0.70	12.8	6.57	0.93	22.6	4.61	0.65

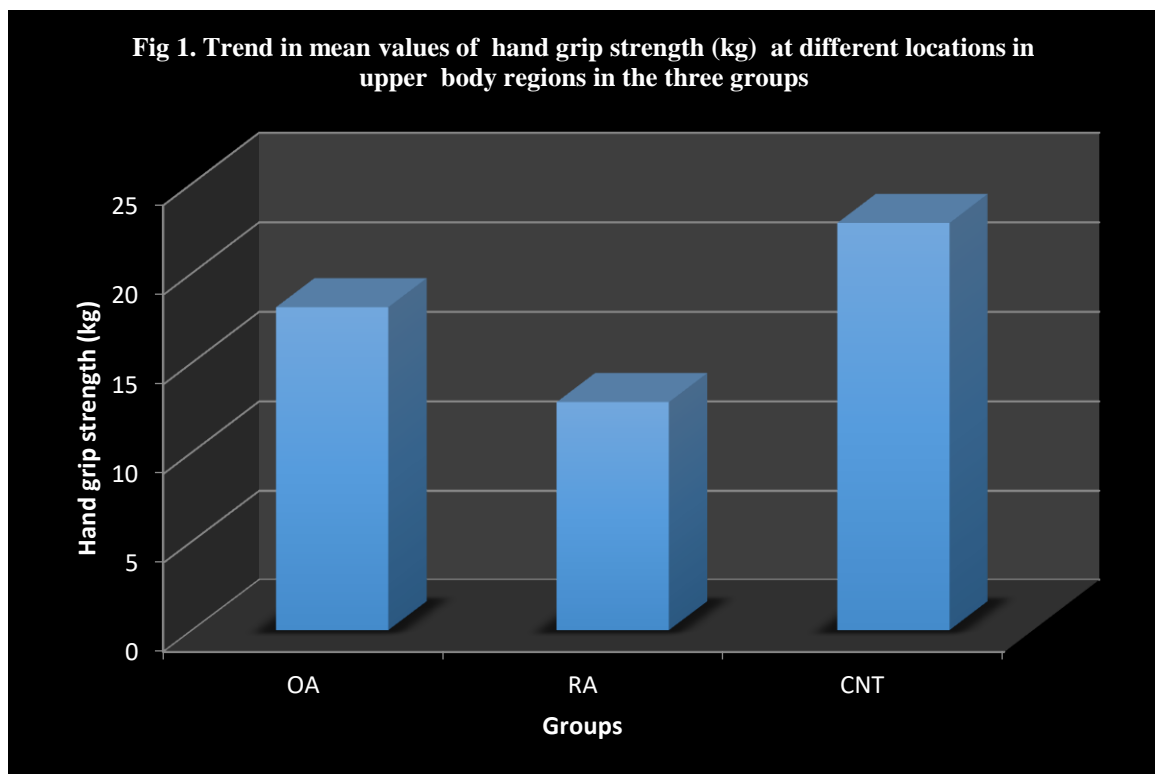


Fig. 1: Trend in mean values of hand grip strength (kg) at different locations in upper body regions in the three groups

Table 2. Significant differences for sample means of hand grip strength (kg) in the three groups

Parameter (kg)	Paired Comparisons					
	CNT vs OA		CNT vs RA		OA vs RA	
	t-ratio [§]	p-value	t-ratio	p-value	t-ratio	p-value
Hand Grip Strength	4.680***	< 0.0001	8.667***	< 0.0001	4.599***	< 0.0001

For the purpose of testing whether mean values of hand grip strength in the three groups were significantly different from each other or not, the data were subjected to unpaired t test.

As per the computations, (Table no. 2) values of the t statistics for the paired comparisons of control vs OA group was found to be 4.680 which was statistically highly significant ($p < 0.0001$). This implied that average hand grip strength of control group was significantly larger than that of OA group.

Similarly, for the paired comparison of control vs RA group the value of t was seen to be 8.667 which again was highly significant ($p < 0.0001$). This again implied that the average hand grip strength of control group was significantly higher than that of RA group.

Furthermore, application of the t test for OA vs RA group indicated that the average hand grip strength of OA group was significantly larger than that of RA group ($t=4.599$, $p < 0.0001$).

In nutshell, we could say that hand grip strength_{control} >> hand grip strength_{OA} >> hand grip strength_{RA}

IV. DISCUSSION

Previous researches manifested that there is depletion of grip strength in rheumatoid patients [30], [31]. Smith et al. (2005) concluded that there is direct association between grip strength and overall body strength in middle age females [32].

Few studies carried with dynamometers report that in comparison of RA patients with healthy subjects, hand grip strength was reduced in RA patients and functional ability was correlated [33], [34], [35], [36], [37]. RA is a common chronic disease that lead to dysfunctioning of joints. Reduced joint locomotion with diminished grip strength and distortion prevails at early phase of disease [38].

However, few studies have attempted to evaluate that in hand functioning contribution of hand OA is little despite having negative correlation with grip strength [18], [19], [20]. Physical fitness and body strength are predictors of hand grip strength to assess performance of athletes to increase their performance and diminish possible wounds [39], [40].

Lihui Wen et al revealed hand and knee osteoarthritis is vigorous related with decreased grip strength. Low hand grip strength manifested powerful association with joint space narrowing [41]. Speigel et al. stated that joint stiffness and joint distortion were strongly affected by hand grip strength which was objective functional computation [42]. Wolfe and Catley concluded that to check dysfunctioning in RA patients, hand grip strength is an effective predictor [43].

The principal finding of our study showed same results. Grip strength was much reduced in RA patients. However, in case of OA group the hand grip strength was very prominent. Average hand grip strength of control group was significantly higher than that of RA group and OA group.

V. CONCLUSION

In the present study it was observed that average hand grip strength of control group was significantly higher as compared to RA group. However, in case of OA group the hand grip strength was very prominent. Hence it can be concluded that hand grip strength_{control}>>hand grip strength_{OA}>>hand grip strength_{RA}.

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