To Determine Frequency of Radial Inclination in Normal Wrists of Local Population

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Authorship and contribution Declaration:
Each author of this article fulfilled ALL 04 Criteria of Authorship:
1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.
4. All authors agree to be responsible for all aspects of their research work

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ABSTRACT

Objective: To determine the radial inclination in normal wrists of our local population

Materials and Methods: This is a descriptive cross-sectional study that was conducted upon 100 volunteers in the orthopedic surgery unit at Mardan Medical Complex Mardan from January 2021 to June 2021. Data about age and gender was collected. Antero-posterior X-rays of normal wrists were taken. Percentages, frequencies and mean ± SD were calculated with SPSS (version 10) for the age, sex and radial inclination.

Results: The mean age of overall 100 normal subjects was 38.89 ± 12.98 years. The mean age of males was 37.10 ± 12.90 years and it was 40.26 ± 13.18 years for females. There were 59 male subjects and 41 female subjects with a male to female ratio of 1.44 to 1 in this study group. The male subjects as compared to females had higher radial inclination. The old age subjects also had higher values. Our population had different radial inclination from that of the Mexican race. The mean was 24.50 degrees ± SD 1.98 for radial inclination of our normal population. The minimum was 20.50 degrees and the maximum 28.50 degrees having range of 8 degrees.

Conclusion: The average value is 24.5 ± 1.98 degrees for radial inclination in our normal local adult population and varies with age, gender and race.

Keyword: Frequency, Radial Inclination, Normal Wrists, Local Population.

This article may be cited as: Ahmad T, Khan HD, Khan AS, Khan K, Khan R, Khan AS. To Determine Frequency of Radial Inclination in Normal Wrists of Local Population. J. Pak. Orthop. Assoc. 2023; Vol 35 (03): 138-141.

INTRODUCTION

The fracture at distal end of radius is a common injury accounting 17% of the upper limb injuries[1]. The radial inclination is the angle formed by the distal articular surface of the radius and the transverse axis of radius[2,3]. It is measured on anteroposterior X-rays of the wrist joint[2,4,5]. The radial inclination affects the load transfer to lunate and transmission of forces to the wrist[3,6].

The radial inclination in normal adults is 25 ± 4 degrees. It can help in diagnosing fractures of the distal radius[4,7,8]. Its value varies with ethnicity and geography[1,2]. According to some studies it has a difference in regards to age and gender but some other studies show no difference[4,7]. Kienbock's disease and digital ulnar drift have associations with radial inclination[6,9,10].

The radial inclination is lost in distal radius fracture and less than 5 degrees of this loss is acceptable[5,11,12] otherwise it can lead to arthritis of the radio-carpal joint[13] and chronic syptoms in distal radioulnar joint[6,14,15]. Radial inclination must be >15 degrees after reduction of distal radius fracture[7,16,17] otherwise it can lead to more time for rehabilitation and more time needed for resuming work activities[8,18]. Radial inclination must be maintained after distal radius fracture reduction for better function[4,9,19,20].

A study conducted on Egyptians by Mohammad Ali MH in 2009 revealed higher radial inclination in males and higher in the old age population as well[2]. Franco Valencia M in 2006 found a significant difference in radial inclination among men and women, he also observed differences between U.S. and Sweden populations[21]. Radial inclination can be different in right and left normal wrists[22].

The current study will reveal radial inclination in our normal population that will help our orthopedic surgeons in managing distal radius fractures of our local patients. It will show the difference among

males and females and among different age groups regarding radial inclination.

MATERIALS AND METHODS

This descriptive cross-sectional research study was conducted in the orthopedic surgery unit of Mardan Medical Complex at Mardan on 100 subjects from 1st January 2021 to 30th June 2021. WHO sample size calculator was used for sample size, using 25 ± 4 degrees as average radial inclination with confidence level of 95% and absolute error of 0.70 degrees. Data was collected regarding gender and age. Antero-posterior X-rays of wrists were carried out. Frequencies, percentages and means ± SD for age, sex and radial inclination were calculated with SPSS (version 10). Subjects with a previoius trauma and congenital disorders of upper limbs and inflammatory diseases were excluded. Approval for the study was taken from the ethical committee of the hospital. The sample subjects were taken from normal adult attendants of orthopedic patients in ER and OPD after explaining the purpose and benefits of the study and obtaining written informed consent. All the measurements on X-rays were done under the supervision of a single expert orthopedic surgeon.

The collected data was recorded in a proforma and analyzed on SPSS (version 10).For numerical variables such as radial inclination and age the mean ± SD was calculated. Frequency and percentage were calculated for categorical variables such as age. Radial inclination was calculated and stratified between age and sex for looking at effect modification. The results were calculated and presented in tables.

RESULTS

In this study we included and analyzed 100 normal subjects. The mean age of our all subjects was 38.89 ± 12.98 years. In male subjects the mean age was was 37.10 ± 12.90 years and that was 40.26 ± 13.18 years in female subjects.

The study included 59 male subjects and 41 female subjects with a male to female ratio of 1.44:1. The young age group (19-40 years) included 59 subjects and the old age group (above 40 years) had 41 subjects with a ratio of 1.44:1.

The mean radial inclination in our study came out to be 24.5 degrees ± SD 1.98. The minimum was 20.5 degrees and the maximum was 28.5 degrees having a range of 8 degrees that is shown in Table 1. In male subjects it was 24.95 degrees ± SD 1.98, with a minimum of 21.5 degrees and a maximum of 28.5 degrees. In female subjects it was 23.50 degrees ± SD 1.64, with a minimum of 20.5 degrees and a maximum of 26.5 degrees which is shown in Table 2.

The radial inclination was further stratified statistically regarding age. Mean radial inclination in the young age group (19 to 40 years) was 23.75 degrees ± SD 2.02 having a minimum of 20.5 degrees and a maximum of 27 degrees. In the old age group (above 40 years) the mean radial inclination was 25.75 degrees ± SD 1.82 having a minimum of 23 degrees and a maximum of 28.5 degrees which is shown in Table 3.

Table 1. Radial Inclination values (in degrees)

Total number of subjects	100
Mean	24.5
Standard Deviation	1.98
Minimum	20.5
Maximum	28.5
Range	8

Table 2. Gender-wise values of Radial Inclination (in degrees)

	Male subjects	Female subjects
Mean	24.95	23.50
Standard Deviation	1.98	1.64
Range	7	6
Minimum	21.5	20.5
Maximum	28.5	26.5

Table 3. Age-wise values of Radial Inclination (in degrees)

	Young age group (19-40 years)	Old age group (above 40 years)
Mean	23.75	25.75
Standard Deviation	2.02	1.82
Range	7.5	5.5
Minimum	20.5	23
Maximum	27	28.5

DISCUSSION

We conducted this study because we don't have reference values of radial inclination for our local population and research studies show that it can vary according to geography. We should have knowledge about its variations and measurements. It is easily measurable. Antero-posterior X-rays of wrist joint are taken with shoulder abducted to 90°, elbow flexed to

90° and hand aligned with forearm[23].

In our study, the mean value of radial inclination was 24.50 degrees ± 1.98, with 24.95 degrees ± 1.98 in males and 23.50degrees ± 1.64 in females. It was 25.75 degrees ± 1.82 in the old age group (above 40 years) and 23.75 degrees ± 2.02 in the young age group (19 to 40 years) with anteroposterior X-rays of wrist joint in a neutral position[23]. Our results are comparable to other studies performed in other regions. A research study of Franco Valencia M in Mexicans showed higher values for normal radial inclination. Comparison of these studies is presented in Table 4.

We included more male subjects in our study as compared to female subjects. It was because of our dominant male and conservative female type of society. We included 59 (59%) male subjects and 41 (41%) female subjects. Other studies included subjects with almost equal gender distribution[7,24].

In this study, we found a statistically significant (p-value < 05) difference between the radial inclination of the old age group (above 40 years) and that of the young age group (19-40 years) and it was 25.75±1.82 degrees and 23.75±2.02 degrees respectively. Jafari D et al found no significant difference between young and old age population regarding radial inclination[7] but some other researchers found a statistically significant difference[1].

In the present study, we found smaller value of radial inclination in females. It was 23.50 ± 1.64 degrees in females and 24.95 ± 1.98 degrees in males with statistically significant difference (p-value < 0.05). Franco Valencia M et al also found a significant difference in Mexican males and females regarding radial inclination[21]. A research study on Egyptians also revealed significant difference[1] but other researchers found no significant difference[7].

Table 4. Comparison of the current study with other studies

Study by	Radial Inclination (degrees)
Mohammad Ali MH[2] (Egypt)	25
Franco Valencia M[21] (Mexico)	36.5
Schuind FA[24] (Minnesota)	24
Jafari D[7] (Iran)	25
CYW Chan[25] (malaysia)	25.1
Current study	24.5

Our population sample was not randomized but it is unlikely to produce any bias. A disproportionate number of subjects in different groups like a smaller number of subjects in the female group and old age group as compared to males and young age group may have affected the variations of radial inclination in different groups. But other studies which have an almost equal distribution of subjects in different groups support our results. Our sample size was relatively smaller so a multicentric study is suggested to resolve this problem.

CONCLUSION

The radial inclination in our normal local adult population is 24.5 degrees ± SD 1.98. It is higher in males and old age as compared to females and young age group. This difference is statistically significant in both cases. Further reserch with a larger sample size and equal distribution of age and gender are suggested.

Conflict of Interest: None

Grants/Funding: None

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