**An exploration of the characteristics of early RA hand involvement among different gender, age, and hand-dominance in a Chinese population**

**Abstract**

**Background:**

Rheumatoid arthritis (RA) is the most common inflammatory rheumatic disease across the globe causing symmetrical polyarthritis of large and small joints, including the hands and wrists. Understanding the disease presentation and impact across different global populations can add useful information to consider the impact of culture and different treatment regimes. Ethnicity, traditions, socioeconomic and lifestyles are assumed to have an impact on hand function and impairment, which Chinese population tends to experience less severe hand impairment. However, there are little data on the impact of RA on hand function in Chinese populations. The aim of this study was to use measurement protocols developed in the UK to explore and compare the characteristics of early hand RA among different sexes, ages, and hand-dominance in a Chinese population.

**Methods:** A cohort comparison study was conducted in one Rheumatic centre in Shanghai, China. 60 Chinese patients with early hand RA were recruited from Shanghai, China. The procedures of data collection in China followed the standard operating procedures employed in the UK NIHR-funded “SARAH” trial. Participant questionnaires including the Michigan Hand Outcomes Questionnaire and Pain troublesomeness scales were used to measure patients’ reported functional ability. Medication history and indicators of all disease activities such as ESR, CRP and RF were recorded. Physical assessments including active range of hand and finger movement, deformity, tender and swollen joint counts and a dexterity test were conducted to report hand impairment and function.

**Results:** There were nostatistical significant differences (P＞0.05) between Male (N=12) and Female (N=48) groups across all patient reported and objective outcome measures. Statistically significant differences (p＜0.05) were found between two age groups (Age≥60, N=28; Age ＜60, N=32) in active wrist flexion of both dominant (z=-2.595, p=0.009) and non-dominant hands (z=-3.627, p＜0.001) respectively. Dominant hand dexterity and combined finger flexion measurements were significantly better than the non-dominant measurements (t=2.232, p=0.029 and z=-2.085, p=0.037) in all participants. However, non-dominant hand composite finger extension was significantly greater than dominant hand extension (t=-2.463, p=0.017).

**Conclusion:** In this exploratory analysis of a Chinese RA population, hand impairment and hand function were not significantly different between men and women. Hand impairment and function of the hand tended to be worse for the non-dominant hand. This is the first time that the characteristics of hand impairment and function for a Chinese population have been reported and there is a need to fully analyse the characteristics of RA hand involvement in a Chinese population.

**Table 1: Comparison between Chinese males and females**

|  |  |  |  |
| --- | --- | --- | --- |
| **MHQ** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
| MHQ overall hand function (dominant hand) (scores, greater scores= greater hand function) |
|  | 12 | 48 | -0.450 | 0.652 |
| MHQ overall hand function (non-dominant hand) (scores, greater scores= greater hand function) |
|  | 12 | 48 | -1.425 | 0.154 |
| MHQ ADLs (dominant hand) (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 12 | 48 | -1.467 | 0.142 |
| MHQ ADLs (non-dominant hand) (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 12 | 48 | -1.746 | 0.081 |
| MHQ ADLs (both hands) (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 12 | 48 | -1.375 | 0.169 |
| MHQ work (both hands) (scores, greater scores= greater hand performance) |
|  | 12 | 48 | -0.540 | 0.589 |
| MHQ pain (both hands) (scores, greater scores= greater pain) |
|  | 12 | 48 | -0.130 | 0.896 |
| MHQ aesthetics (dominant hand) (scores, greater scores= better hand appearance) |
|  | 12 | 48 | -1.424 | 0.155 |
| MHQ aesthetics (non-dominant hand) (scores, greater scores= better hand appearance) |
|  | 12 | 48 | -1.119 | 0.263 |
| MHQ satisfaction (dominant hand) (scores, greater scores= greater satisfaction) |
|  | 12 | 48 | -0.824 | 0.410 |
| MHQ satisfaction (non-dominant hand) (scores, greater scores= greater satisfaction) |
|  | 12 | 48 | -1.037 | 0.300 |
| MHQ overall scores (scores, greater scores= better hand function) |
|  | 12 | 48 | -1.164 | 0.244 |
| **Pain troublesomeness overall score** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
|  | 12 | 48 | -1.432 | 0.216 |
| **Disease activity** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
| MCP joint deformity (dominant hand) (degrees, greater score= greater deformity) |
|  | 12 | 48 | -0.148 | 0.882 |
| MCP joint deformity (non-dominant hand) (degrees, greater score= greater deformity) |
|  | 12 | 48 | -0.235 | 0.814 |
| Swollen joint count (both hands) (scores, greater score= greater number of joints affected) |
|  | 12 | 48 | -0.112 | 0.911 |
| Tender joint count (both hands) (scores, greater score= greater number of joints affected) |
|  | 12 | 48 | -0.775 | 0.438 |
| **Range of movement (ROM)** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
| Active wrist extension (dominant hand) (degrees, greater score= greater movement) |
|  | 12 | 48 | -0.169 | 0.866 |
| Active wrist extension (non-dominant hand) (degrees, greater score= greater movement) |
|  | 12 | 48 | -0.094 | 0.925 |
| Active wrist flexion (dominant hand) (degrees, greater score= greater movement) |
|  | 12 | 48 | -0.187 | 0.852 |
| Active wrist flexion (non-dominant hand) (degrees, greater score= greater movement) |
|  | 12 | 48 | -0.766 | 0.443 |
| Combined finger flexion (dominant hand) (mm, lesser score= greater movement) |
|  | 12 | 48 | -1.272 | 0.203 |
| Combined finger flexion (non-dominant hand) (mm, lesser score= greater movement) |
|  | 12 | 48 | -1.077 | 0.282 |
| Composite finger extension (dominant hand) (mm, greater score= greater movement) |
|  | 12 | 48 | -1.397 | 0.163 |
| Composite finger extension (non-dominant hand) (mm, greater score= greater movement) |
|  | 12 | 48 | -1.388 | 0.165 |
| Thumb opposition score (dominant hand) (greater score= greater movement) |
|  | 12 | 48 | -0.808 | 0.419 |
| Thumb opposition score (non-dominant hand) (greater score= greater movement) |
|  | 12 | 48 | -1.201 | 0.230 |
| **Dexterity: Nine-hole peg test** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
| Dexterity (dominant hand) (seconds, lesser score= greater dexterity) |
|  | 12 | 48 | -1.914 | 0.056 |
| Dexterity (non-dominant hand) (seconds, lesser score= greater dexterity) |
|  | 12 | 48 | -1.905 | 0.057 |
| **Strength** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
| Full hand grip force (dominant hand) (Newtons. Greater score= greater strength) |
|  | 12 | 48 | -0.712 | 0.477 |
| Full hand grip force (non-dominant hand) (Newtons. Greater score= greater strength) |
|  | 12 | 48 | -0.527 | 0.598 |
| Pinch grip force (dominant hand) (Newtons. Greater score= greater strength) |
|  | 12 | 48 | -1.100 | 0.271 |
| Pinch grip force (non-dominant hand) (Newtons. Greater score= greater strength) |
|  | 12 | 48 | -1.432 | 0.152 |

**a statistically significant (p＜0.05)**

**Table 2: Comparison between different age group**

|  |  |  |  |
| --- | --- | --- | --- |
| **MHQ** | **Number of patients** | **Z-value** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** |
| MHQ overall hand function (dominant hand) (scores, greater scores= greater hand function) |
|  | 28 |  32  | -1.166 | 0.243 |
| MHQ overall hand function (non-dominant hand) (scores, greater scores= greater hand function) |
|  | 28 | 32 | -1.074 | 0.283 |
| MHQ ADLs (dominant hand) (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 28 | 32 | -1.221 | 0.222 |
| MHQ ADLs (non-dominant hand) (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 28 | 32 | -1.752 | 0.080 |
| MHQ ADLs (both hands) (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 28 | 32 | -1.453 | 0.146 |
| MHQ work (both hands) (scores, greater scores= greater hand performance) |
|  | 28 | 32 | -0.271 | 0.787 |
| MHQ aesthetics (dominant hand) (scores, greater scores= better hand appearance) |
|  | 28 | 32 | -0.756 | 0.450 |
| MHQ aesthetics (non-dominant hand) (scores, greater scores= better hand appearance) |
|  | 28 | 32 | -0.324 | 0.746 |
| MHQ satisfaction (dominant hand) (scores, greater scores= greater satisfaction) |
|  | 28 | 32 | -1.329 | 0.184 |
| MHQ satisfaction (non-dominant hand) (scores, greater scores= greater satisfaction) |
|  | 28 | 32 | -1.587 | 0.113 |
| **MHQ** | **Number of patients** | **Mean value (SD)** | **Mean difference (95%CI)** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** | **Age≥60 (China)** | **Age＜60 (China)** |
| MHQ pain (both hands) (scores, greater scores= greater pain) |
|  | 28 | 32 | 47.32 (19.316) | 43.91 (17.813) | 3.42 (4.795, -6.182) | 0.479 |
| MHQ overall scores (scores, greater scores= better hand function) |
|  | 28 | 32 | 53.16 (16.147) | 58.57 (15.460) | -5.41 (4.084, -13.587) | 0.190 |
| **Pain troublesomeness overall score** | **Number of patients** | **Z-value** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** |
|  | 28 | 32 | -1.239 | 0.224 |
| **Disease activity** | **Number of patients** | **Z-value** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** |
| MCP joint deformity (dominant hand) (degrees, greater score= greater deformity) |
|  | 28 | 32 | -1.249 | 0.212 |
| MCP joint deformity (non-dominant hand) (degrees, greater score= greater deformity) |
|  | 28 | 32 | -1.320 | 0.187 |
| Swollen joint count (both hands) (scores, greater score= greater number of joints affected) |
|  | 28 | 32 | -0.358 | 0.720 |
| Tender joint count (both hands) (scores, greater score= greater number of joints affected) |
|  | 28 | 32 | -1.078 | 0.281 |
| **Range of movement (ROM)** | **Number of patients** | **Z-value** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** |
| Active wrist extension (dominant hand) (degrees, greater score= greater movement) |
|  | 28 | 32 | -0.504 | 0.614 |
| Active wrist extension (non-dominant hand) (degrees, greater score= greater movement) |
|  | 28 | 32 | -0.647 | 0.518 |
| Active wrist flexion (dominant hand) (degrees, greater score= greater movement) |
|  | 28 | 32 | -2.595 | 0.009 |
| Active wrist flexion (non-dominant hand) (degrees, greater score= greater movement) |
|  | 28 | 32 | -3.627 | 0.000 |
| Combined finger flexion (dominant hand) (mm, lesser score= greater movement) |
|  | 28 | 32 | -0.752 | 0.452 |
| Combined finger flexion (non-dominant hand) (mm, lesser score= greater movement) |
|  | 28 | 32 | -1.102 | 0.271 |
| Composite finger extension (non-dominant hand) (mm, greater score= greater movement) |
|  | 28 | 32 | -1.165 | 0.244 |
| Thumb opposition score (dominant hand) (greater score= greater movement) |
|  | 28 | 32 | 0.000 | 1.000 |
| Thumb opposition score (non-dominant hand) (greater score= greater movement) |
|  | 28 | 32 | -0.696 | 0.487 |
| **Range of movement (ROM)** | **Number of patients** | **Mean value (SD)** | **Mean difference (95%CI)** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** | **Age≥60 (China)** | **Age＜60 (China)** |
| Composite finger extension (dominant hand) (mm, greater score= greater movement) |
|  | 28 | 32 | 28.66 (13.458) | 32.48 (13.977) | -3.82 (3.555, -10.932) | 0.288 |
| **Dexterity: Nine-hole peg test** | **Number of patients** | **Mean value (SD)** | **Mean difference (95%CI)** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** | **Age≥60 (China)** | **Age＜60 (China)** |
| Dexterity (dominant hand) (seconds, lesser score= greater dexterity) |
|  | 28 | 32 | 59.14 (26.754) | 55.88 (23.132) | 3.27 (6.439, -9.622) | 0.429 |
| Dexterity (non-dominant hand) (seconds, lesser score= greater dexterity) |
|  | 28 | 32 | 58.36 (26.258) | 53.50 (20.955) | 4.86 (6.100, -7.353) | 0.614 |
| **Strength** | **Number of patients** | **Mean value (SD)** | **Mean difference (95%CI)** | **P-value** |
| **Age≥60 (China)** | **Age＜60 (China)** | **Age≥60 (China)** | **Age＜60 (China)** |
| Full hand grip force (dominant hand) (Newtons. Greater score= greater strength) |
|  | 28 | 32 | 116.65 (33.864) | 123.57 (19.271) | -6.92 (-20.936, 7.100) | 0.327 |
| Full hand grip force (non-dominant hand) (Newtons. Greater score= greater strength) |
|  | 28 | 32 | 120.13 (33.864) | 124.69 (19.008) | -4.56 (-18.717, 9.604) | 0.522 |
| **Strength** | **Number of patients** | **Z-value** | **P-value** |
| **Males (China)** | **Females (China)** |
| Pinch grip force (dominant hand) (Newtons. Greater score= greater strength) |
|  | 28 | 32 | -1.200 | 0.230 |
| Pinch grip force (non-dominant hand) (Newtons. Greater score= greater strength) |
|  | 28 | 32 | -0.986 | 0.324 |

**a statistically significant (p＜0.05)**

Table 3: Comparison between dominant hand and non-dominant hand among Chinese patients

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MHQ** | **Number of patients** | **Mean value** | **Paired mean difference (95%CI)** | **P-value** |
| **Dominant hand (China)** | **Non-dominant hand (China)** | **Dominant hand (China)** | **Non-dominant hand (China)** |
| MHQ overall hand function (scores, greater scores= greater hand function) |
|  | 60 | 60 | 53.67 | 53.92 | -2.50 (-2.749, 2.249) | 0.842 |
| MHQ ADLs (scores, greater scores= greater hand abilities in doing daily activities) |
|  | 60 | 60 | 64.83 | 66.58 | -1.75 (-4.903, 1.403) | 0.271 |
| MHQ aesthetics (scores, greater scores= better hand appearance) |
|  | 60 | 60 | 52.19 | 53.14 | -0.95 (-2.238, 0.346) | 0.148 |
| **MHQ**  | **Number of patients** | **Z-value** | **P-value** |
| **Dominant hand (China)** | **Dominant hand (China)** |
| MHQ satisfaction (scores, greater scores= greater satisfaction) |
|  | 60 | 60 | -1.115 | 0.265 |
| **Disease activity** | **Number of patients** | **Z-value** | **P-value** |
| **Dominant hand (China)** | **Dominant hand (China)** |
| MCP joint deformity (degrees, greater score= greater deformity) |
|  | 60 | 60 | -1.483 | 0.138 |
| **Range of movement (ROM)** | **Number of patients** | **Mean value** | **Paired mean difference (95%CI)** | **P-value** |
| **Dominant hand (China)** | **Dominant hand (China)** | **Dominant hand (China)** | **Dominant hand (China)** |
| Active wrist extension (degrees, greater score= greater movement) |
|  | 60 | 60 | 56.67 | 56.95 | -0.24 (-2.042, 2.609) | 0.808 |
| Active wrist flexion (degrees, greater score= greater movement) |
|  | 60 | 60 | 52.33 | 52.38 | -0.05 (-1.781, 1.881) | 0.957 |
| Composite finger extension (mm, greater score= greater movement) |
|  | 60 | 60 | 30.70 | 31.52 | -0.83 (-1.495, -0.155) | 0.017 |
| **Range of movement (ROM)** | **Number of patients** | **Z-value** | **P-value** |
| **Dominant hand (China)** | **Dominant hand (China)** |
| Combined finger flexion (mm, lesser score= greater movement) |
|  | 60 | 60 | 2.085 | 0.037 |
| Thumb opposition score (greater score= greater movement) |
|  | 60 | 60 | 0.159 | 0.874 |
| **Dexterity: Nine-hole peg test** | **Number of patients** | **Mean value** | **Paired mean difference (95%CI)** | **P-value** |
| **Dominant hand (China)** | **Dominant hand (China)** | **Dominant hand (China)** | **Dominant hand (China)** |
| Dexterity (seconds, lesser score= greater dexterity) |
|  | 60 | 60 | 57.40 | 55.77 | 1.633 (0.169, 3.098) | 0.029 |
| **Strength** | **Number of patients** | **Mean value** | **Paired mean difference (95%CI)** | **P-value** |
| **Dominant hand (China)** | **Dominant hand (China)** | **Dominant hand (China)** | **Dominant hand (China)** |
| Full hand grip force (Newtons. Greater score= greater strength) |
|  | 60 | 60 | 120.34 | 122.56 | -1.48 (-3.787, 0.832) | 0.205 |
| Pinch grip force (Newtons. Greater score= greater strength) |
|  | 60 | 60 | 27.94 | 29.42 | -2.22 (-6.140, 1.706) | 0.263 |

**a statistically significant (p＜0.05)**