

## ACTIVITIES OF DAILY LIVING AND QUALITY OF LIFE IN PATIENTS WITH RHEUMATOID ARTHRITIS.

Khanda Mustafa Ahmed<sup>1\*</sup>, Muhammad Rashid Amen<sup>2</sup>

<sup>1</sup>PhD student, Assist. Lecturer, Bscnursing, MSc pain management, Adult Nursing Department, College of Nursing, University of Sulaimani

<sup>2</sup>Assist. Professor, PhD nursing, Adult Nursing Department, College of Nursing, University of Sulaimani, Email Address: muhammad.amen@univsul.edu.iq. Phone number 009641574507

\*Corresponding author: Khanda Mustafa Ahmed, Email Address: khanada.mustafa@univsul.edu.iq

### Abstract:

**Background:** Rheumatoid Arthritis is a chronic inflammatory disease which characterized by progressive articular damage of the joints with extra-articular manifestations. Rheumatoid Arthritis has a significant impact on losing physical function and impairment of quality of life of patients; which is a leading cause of dependency and disability.

**Aim:** The aim of the present study was to determine relation between patients characteristics and each of activities of daily living and quality of life.

**Patients and methods:** The design of study was descriptive analytic (160) RA patients consecutively recruited from the Rheumatology and Physical Rehabilitation Center in Sulaimni provenance/Kurdistan region/ Iraq from March 2019 to February 2020. The study tools included Health Assessment Questionnaire, Barthel Index and World Health Organization Quality of Life-BREF. The data was collected through direct interview, descriptive and inferential statistics were used to analyze the data.

**Results:** The score of all domain of quality of life was negatively affected particularly the physical ( $51.11 \pm 12.53$ ) and psychological domain ( $53.13 \pm 12.37$ ). Physical functions on HAQ score was deteriorating with increasing age. Based on Barthel Index score, it showed that (35%) of the participant were moderately dependent on others. Quality of life and activities of daily living deteriorate with increasing age, body mass index, duration of disease and using walking aids.

**Conclusion:** Rheumatoid Arthritis has a significant negative effect on participant activities of daily living. Elderly, obese patients, longer duration of disease has impact on activities of daily living and quality of life.

**Key words:** Rheumatoid Arthritis, Activities of Daily Living, Quality of Life

### Introduction:

Rheumatoid Arthritis (RA) is a chronic autoimmune and multifactorial disease. The most commonly involved joints are the knee, elbow, metatarsophalangeal joints (MTP), proximal interphalangeal joints (PIP), toe PIP, lumbosacral phalangeal spine and cervical spine [1]. Common features of RA include daily pain, depression, fatigue, physical disability, stiffness and associated psychological features, in addition inflammation and joint damage is the leading cause for disability [2]. Furthermore, limitation of mobility, functional deterioration which affect HRQoL and increase mortality and morbidity [3].

Moreover, RA may cause extra articular signs and symptoms such as, vasculitis, rheumatoid nodules, interstitial lung disease, cardiovascular disease, lymphoma and amyloidosis [4]. In addition, patients with RA may develop specific deformities, like ulnar deviation, swan neck deformity (hyperextension at PIPs), Boutonniere deformity (flexion at PIPs), valgus or Varus, Baker cyst in popliteal fossa [5].

Rheumatoid Arthritis affects all population, the prevalence rate ranging from 0.4% to 1.3%, women are two to three times more affected than men increasing with age and peaks between the fourth and sixth decade of life [6]. According to geographical area and population the prevalence and incidence of RA is vary and is less prevalent in developing countries than in developed countries. In the Middle East and North Africa (MENA) region, the epidemiology of RA remains poorly understood with a dearth of data on its prevalence and disease activity. A recent global burden study estimated RA prevalence in MENA region as among the lowest at 0.16%. while in North American and Northern Europe is 0.5 to 1.1% [7]. The latest report confirmed that the incidence of RA annually is to be approximately near 40/100,000 globally [8].

Vicente-Herrero et al. [9] claimed that the central pathology of RA occurs in the synovial membrane; joint limitation is a typical manifestation of the disease. This, in addition to the fact that most RA patients also suffer from muscle loss, progressive evolution that leads the patient to reduce his mobility, the capacity of displacement and the social interaction, affecting the most elementary daily activities. Contributes to decreased physical function and QoL in these patients.

Activities of Daily Living often termed basic ADLs or physical ADLs, includes the fundamental skills typically needed to manage basic physical needs, includes: dressing, eating, toileting/continence, transferring /ambulating and grooming/personal hygiene. In spite of there is an improvement in the RA treatment, still limitations of daily living can occur, limitation refers to difficulty in performing ADLs tasks, nearly 41% of individuals aged 65 years and above have at least one limitation in ADLs [10].

Studies evaluating the impact of RA on physical function claimed that physical function was deteriorate in RA patients in addition to the limitation in wrist extension, bodily pain. Furthermore, patients become more depressed as the disease progress [1]. Another study by Omma et al. [11] concluded that there was a strong correlation between disease activity and functional disability in elderly RA patients, the researchers stated that self-report measure functional disability could be more notable during the active phase of the disease.

Moreover, QoL in RA patients reduced in several domains, such as personal beliefs, level of independence, environment and physical health, compared to with the healthy population. Quality of life in RA is affected by impaired physical functioning, stiffness, pain, and fatigue. In addition, QoL is also influenced by socio economic status, life style habits employment and age [12]. In addition, many patients with RA experience increased morbidity and disabilities as well as diminished HRQoL due to impairment of work productivity and daily activities. As a consequence, this may lead to decreased worker productivity, increase use of durable medical equipment (DMG) and joint replacement surgery. [13].

Health-Related Quality of Life is by nature, subjective and a multidimensional approach should be taken to encompass physical and occupational function, psychological state, social interaction, and somatic sensation caused by an illness and its consequent therapy on a patient [14].

The impact of RA on QoL has been examined in many studies. Patients with RA have role limitation due to physical problems and poor general health perception [15]. Qvarfordt et al. [16] demonstrated that there was an association between disease activity and HRQoL, the result showed lower level of physical activity. Also, physical activity influenced by environmental, psychological and physical factors. In addition to tenderness, pain and stiffness which leads to impaired physical function. Furthermore, patients were afraid from the movement due to pain and this may act as a barrier to being physically active.

The most common generic measure uses to assess QoL of RA patients are World Health Organization Quality of Life Instruments (WHOQOL-BREFEF) and The Short Form 36 Health Survey Questionnaire (SF-36) [9].

Commonly people with RA reported to have restriction in joint movement, swelling and pain which may lead to difficulty in performing ordinary tasks and ADLs, such as personal hygiene, dressing, walking, climbing stairs, manipulating objects and standing [17]. In addition to the involvement of other parts and organs in the body RA has a major impact on the other areas of person's life such as: psychological well-being, family life, social dependency, increased financial burden, reduced recreational activities and consequently decreased in QoL [18]. Therefore, the aim of this study was to assess the ADLs, QoL and find out the associations with the patient's characteristics.

## Materials and Method

## Setting of the study

The present study was conducted at Rheumatology and Physical Rehabilitation Center, which is largest and the only rehabilitation center that provide out patient service for the rheumatologic patients in Sulaimani provinces/Kurdistan region/Iraq.

## Study Population

The study was descriptive analytic design, enrolled (160) patients from March 2019 to February 2020. The inclusion criteria were: (1) Patients 18 years and above; (2) Has no mental illness or disturbance of consciousness; (3) Patients willing to participate. The exclusion criteria were: (1) physically disabled conditions; (2) Autoimmune diseases other than RA or other joint diseases; (3) Cancer patients; (4) Patients with other serious illnesses that affect quality of life such as: cardiovascular disease, diabetes, chronic respiratory diseases and cerebrovascular accident.

## Ethical Approval:

The research was approved by the Ethical Committee at the College of the Medicine University of Sulaimani and informed consent was obtained from all study participants.

## Data Collection:

The researcher collected data through utilization of the structured questionnaire by means of face to face interview technique and administered forms were used. The study questionnaire consisted of five parts which distributed as following:

**Part I:** Socio-demographic characteristics: which includes Age, gender, marital status, level of education, occupation and financial status.

**Part II:** Patients' lifestyle and biomedical factors: which includes body mass index (BMI), smoking, dining style, walking aids and disease duration.

Classification of participants' BMI was according to WHO guidelines for Asian populations as follow: (<18.5-22.5 kg/m<sup>2</sup> underweight, 23-24.9 kg/m<sup>2</sup> normal weight, 25-29.9 kg/m<sup>2</sup> overweight and >30 kg/m<sup>2</sup> obese) [19].

## Part III: The Barthel Index (BI)

The functional status can be described as a person's level of independence in performing ADL. The functional status of a person can be assessed by using ADL score [20]. Dorothea Barthel and Mahoney introduced the Barthel Index in 1955 to measure the severity of disability [21]. It is a validated tool and a simple weighted scale [22] inquiring as the ability of patients to perform common basic ADLs [23].

The BI includes 10 items: bathing, getting on and off a toilet, feeding, controlling bladder, dressing, controlling bowel, walking on level surface (or propelling a wheelchair if unable to walk) and ascending and descending stairs, personal toileting moving from wheelchair to bed and returning, each domain was scored in 1-point increments with scores ranging from 0 to 20. It seems reasonable to choose the BI as it is easy to use, only takes a few minutes to taking information from nurses or relatives. Easy understood method of describing the important area of disability of many chronic diseases such as RA [24].

In the BI the minimum score is of (0) and the maximum is (20). The Interpretation the scores are as follows; totally independent (20) and dependent (0-19). The level of dependency in the BI were divided into categories: slight dependent (12-19), moderate dependent (9-11), severe dependent (5-8), and totally dependent (0-4) [20].

## Part IV: The standardized Health Assessment Questionnaire (HAQ)

In 1978s James F. Fries, MD, and colleagues at Stanford University developed HAQ for assessing dysfunction occurs in RA and the functional capacity [25] and it has been validated and translated into many languages by Ferraz et al in 1990 [26].

The HAQ is the most widely used in measure of functional disability in RA and it is a validated disability index. HAQ composed of 8 sections include: activities, hygiene, walking, grip, eating, reach, arising and dressing. There are 2 or 3 questions for each section. Each section scored from (0-without difficulty) to (3-unable to do). For each section the score given to that section is the worst score within each section. i.e. if one question is scored 1 and another 2, then the score of the section is 2. In addition, if device or aid is used or if help required from another individual, then the minimum score for that section is 2. If the section score is already 2 or more then no modification is made [27]. It consists of 20 items assessing functional ability of patients in 8 domains of daily living, eating, arising, hygiene, dressing and grooming, walking usual activities, reach and grip [28].

Questionnaire are answered on four level scale score (0 without difficulty, 3 unable to do), and the highest rating for each domain are averaged into a final score out of three, where higher scores indicates greater disability [29].

Questionnaire attempt to measure functional loss by to measure functional disability reliably and validly by observation or by physical examination. To that reason it is recommended the self-reported assessment of disability has become standard in observational studies in clinical trials [30].

**Part V: The WHOQOL-BREF**

The WHOQOL-BREF is a 26-item instrument consisting of four domains: physical health (7items), psychological health(6items), social relationships (3items), and environmental health (8 items); it also contains QOL and general health items. Each individual item of the WHOQOL-BREF is scored from 1 to 5 on a response scale, which is stipulated as a five- point ordinal scale. The scores are then transformed linearly to a 0–100-scale [31].

The physical health domain includes items on mobility, daily activities, functional capacity, energy, pain, and sleep. The psychological domain measures include self-image, negative thoughts, positive attitudes, self-esteem, mentality, learning ability, memory concentration, religion, and the mental status. The social relationships domain contains questions on personal relationships, social support, and sex life. The environmental health domain covers issues related to financial resources, safety, health and social services, living physical environment, opportunities to acquire new skills and knowledge, recreation, general environment (noise, air pollution, etc.), and transportation [32].

**Statistical analysis**

Descriptive statistics were used to identify participants' characteristics, and the scores of quality of life domains and HAQ scores presented in mean, standard deviation, minimum and maximum, the relation between QoL and participants characterized found by t-test and ANOVA, finally, the

association between Barthel Dependency levels and patient characteristics was determined by chi-square. Statistical analysis was performed using the SPSS 22.0 software (IBM SPSS Statistics). The level of significance was set at  $p \leq 0.01$ .

**Results and discussion**

**Table 1: participants' characteristics**

Characteristics		N (160)	%
Age Groups (Years)	< 40	16	10
	40-60	88	55
	> 60	56	35
Age(Years)(mean±SD)		54.76±10.94	
Gender	Female	154	96.3
	Male	6	3.8

Occupations	Paid Employed	13	8.1
	Housewife	134	83.8
	Retired / Jobless	7	4.4
	Other	6	3.8
Marital Status	Single	7	4.4
	Married	126	78.8
	Widow/Divorced	27	16.9
Levels of Education	Illiterate	87	54.4
	Primary school	45	28.1
	Secondary school	21	13.1
	University/Institute	7	4.4
Financial	Income > Expenditure	33	20.6
	Income = Expenditure	40	25.0
	Income < Expenditure	87	54.4
Body Mass Index	Normal	57	35.6
	Overweight	66	41.3
	Obese	37	23.1
Smoking	No	154	96.3
	Yes	6	3.8
Dinning Style	Ground	122	76.3
	Dining table	38	23.8
Walking Aid	No	135	84.4
	Yes	25	15.6
Disease Duration	<5 years	61	38.1
	5-10 years	35	21.9
	>10 years	64	40.0

As presented in the table 1 the mean±SD age was (54.76±10.94) years, more than half (55%) of participant was between (40-60) years old and (35%) was older than 60years. Almost all (96%) were female and (83.8%) of them were house wives. As expected nearly (80%) were married and still live with their spouse. More than half (54.4%) participant were illiterate and few (4.4%) were university graduate. The income for (54.4%) was less than expenditure. Moreover, nearly two-third of the participant were either (41.3%) over weight or (23.1%) Obese. Almost all (96.3%) were not smoker. The percentage of participants who were used ground for dining was more than three fourth (76.3%) and (15.6%) of participants used walking aids. The proportion of patients who had RA for less than 5 years was (38.1%),5-10 years was (21.9 %)and more than 10 years was (40%).

The results of the present study were similar to the findings by Yang et al. [33]. They revealed that age and gender play an important role in developing RA. Higher prevalence of RA was found in patients with age (48-63). Also, women were 3 to 4 times more likely to develop RA than men. As, common in Kurdish society the majority of house

hold tasks performing by women such as regular light housework, food preparation and washing clothes, dishes .....etc. As known these activities require flexion movements of the metacarpophalangeal joints, increasing deviant forces and favoring ulnar deviation, kneeling, bending. This seems to be an important aspect to live independently in the community, supported by a study in Austria [34]. In addition, the highest income level had lowest rate. Higher incidence of RA was observed among lower socioeconomic status when monthly income less than 1000USD [30]. Moreover, Gamal [35] stated that university education was present in (22%) and (33.5%) were illiterate. Similarly, in another study Radwan and Borai [36] confirmed that the percentage of RA patients who were university graduate was (12%) and (73.7%) illiterate.

The association between obesity and increased risk of developing RA claimed by epidemiologic studies, although these studies have shown conflicting results. Some studies proposed that obesity may be associated with more refractory inflammation through increased levels of inflammatory resistin, adipocytokines leptin or visfatin or decreased levels of the anti-inflammatory adipocytokine adiponectin. This may have an impact on the innate immune and adaptive immune system, activating monocytes and increasing levels of inflammatory cytokines such as tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ), interleukin 12 and 6 (IL-12, IL-6) [37].

Regarding the dining style as it is clear from the table (1) that three fourth (76.3%) of the participants using ground while eating. This may reflect cultural and social habit in Kurdish society, in spite of having dining table in most of houses, still dining on ground. Dining on ground needs cross-legs sitting position keeps the joints and supportive structures (muscles, ligaments, etc.) under constant tension and can cause stiffness and discomfort. These symptoms may lead to extra stress on the joints [38].

Table 2: Distribution of QoL, HAQ scores and Barthel Index.

Variables	Mean	SD	Minimum	Maximum
General QoL (1-5)	3.11	0.65	2	5
General Health (1-5)	2.92	0.59	2	4
Physical Domain (0-100)	51.03	12.53	19	75
Psychological Domain (0-100)	53.13	12.37	31	75
Social Domain (0-100)	59.80	13.52	25	81
Environmental Domain (0-100)	54.94	11.48	31	75
HAQ(0-40)	1.01	0.85	0.00	2.375

  

Barthel Dependency Levels, Frequency (%)	
Moderate Dependence	56 (35)
Slight Dependence	45 (28.1)
Total Independent	59 (36.9)

As showed in the table 2 the mean scores of the general QoL and general health were  $(3.11 \pm 0.65)$  and  $(2.92 \pm 0.59)$  respectively. Physical domain score according to WHOQOL-BREFE was most affected by RA  $(51.11 \pm 12.53)$ . Psychological domain was second with mean score of  $(53.13 \pm 12.37)$ . The sequence of environmental domain was the third with mean  $(54.94 \pm 11.48)$  and social domain was least affected domain by RA with mean  $(59.80 \pm 13.52)$ . The scores of QoL which found by the present study was lower than cut-off point which reported in Brazil by Silva et al [39,40] the results depicted that a critical value 60 as the optimal cut-off point for assessing perceived QoL and satisfaction with health and they considered 60 as minimal value for good QoL domains, overall QoL and general

health. Similar Iraqi study by Faiq et al [41] found that QoL was significantly affected by RA, physical domain score was mostly affected and social domain score was the least affected ( $42.5 \pm 12.0$ ) and ( $55.1 \pm 11.9$ ) respectively. Although, the result of the aforementioned study was lower than result of our findings. Despite development of the Iraqi environment after 2003, the health sector has not kept pace with the global development. As there is shortage of staff and lack of resources which reflect in the poor quality of health services provided to patients [42].

The score of the HAQ scale which reflects the patients' functional ability is ranged between (0 -3), increasing scores represent substantial difficulties. [27]. As shown in previous studies by Chiu et al. [43] that RA patients had significantly lower score in physical and psychological domain than control subjects. Also, higher HAQ scores or more severe functional impairment were associated with lower QoL.

Level of the dependency according to the Barthel index, more than one-third (36.9%) of the participant were totally independent, (28%) were slightly dependent and need little help to perform their activities while the proportion of moderately dependent was about (35%) which they require some help from others.

Table 3: Association between QoL, HAQ and clinical characteristics.

Characteristics	Physical Domain Mean $\pm$ SD	Psychological Domain Mean $\pm$ SD	Social Domain Mean $\pm$ SD	Environmental Domain Mean $\pm$ SD	HAQ Scores Mean $\pm$ SD
<b>Age group</b>					
<40 years	63.9 $\pm$ 5.8	64.3 $\pm$ 10.8	70.1 $\pm$ 7.9	62.4 $\pm$ 9.8	3.4 $\pm$ 5.7
40-60 years	51.4 $\pm$ 11.0	52.0 $\pm$ 11.7	59.8 $\pm$ 13.0	54.3 $\pm$ 12.0	8.0 $\pm$ 7.2
>60 years	46.8 $\pm$ 11.7	51.8 $\pm$ 12.4	56.8 $\pm$ 14.3	53.9 $\pm$ 10.5	9.5 $\pm$ 5.9
<b>p-value</b>	<b>0.000</b>	<b>0.001</b>	<b>0.002</b>	<b>0.023</b>	<b>0.007</b>
<b>Gender</b>					
Female	51.1 $\pm$ 12.4	53.2 $\pm$ 12.4	59.7 $\pm$ 13.4	54.7 $\pm$ 11.5	6.8 $\pm$ 0.8
Male	50.2 $\pm$ 17.7	51.2 $\pm$ 12.0	62.5 $\pm$ 16.9	60.7 $\pm$ 11.6	7.9 $\pm$ 0.7
p-value	0.86	0.69	0.62	0.21	0.63
<b>Occupation</b>					
Paid Employed	48.1 $\pm$ 14.7	52.6 $\pm$ 12.3	58.7 $\pm$ 12.1	57.5 $\pm$ 12.4	91.9 $\pm$ 10.5
Housewife	51.3 $\pm$ 12.1	53.3 $\pm$ 12.2	60.0 $\pm$ 13.4	54.3 $\pm$ 11.5	88.6 $\pm$ 13.9
Retired / Jobless	46.6 $\pm$ 18.7	45.4 $\pm$ 14.0	53.7 $\pm$ 15.8	53.6 $\pm$ 7.8	81.4 $\pm$ 18.6
Other	56.3 $\pm$ 6.9	58.5 $\pm$ 14.0	64.7 $\pm$ 16.8	64.7 $\pm$ 10.3	95.0 $\pm$ 10.0
<b>p-value</b>	0.435	0.274	0.514	0.143	0.385
<b>Marital status</b>					
Single	54.6 $\pm$ 10.6	59.0 $\pm$ 17.3	59.9 $\pm$ 17.0	62.7 $\pm$ 11.9	6.1 $\pm$ 7.9
Married	51.3 $\pm$ 12.4	53.5 $\pm$ 12.3	62.4 $\pm$ 11.7	55.5 $\pm$ 11.6	7.8 $\pm$ 7.0
Widow/Divorced	48.9 $\pm$ 13.8	49.9 $\pm$ 10.8	49.4 $\pm$ 15.9	50.3 $\pm$ 9.5	9.7 $\pm$ 5.2

<b>p-value</b>	0.498	0.175	0.000	0.19	0.299
<b>Education</b>					
Illiterate	51.4±11.9	52.9±12.4	56.9±13.8	52.99±11.2	9.0±6.4
Primary school	48.7±13.6	52.1±12.7	62.8±13.4	55.1±11.2	8.4±7.2
Secondary school	51.5±13.4	55.6±12.4	64.95±10.6	60.2±12.7	5.6±7.1
University/Institute	59.9±5.2	54.6±12.3	60.9±12.4	62.0±5.7	2.0±3.8
<b>p-value</b>	0.146	0.748	0.024	0.020	0.018
<b>Financial</b>					
Income>expenditure	49.9±15.4	56.1±13.1	61.2±11.7	59.8±11.8	8.1±6.7
Income=expenditure	51.5±13.1	53.9±13.4	61.9±13.6	56.4±11.0	5.8±6.7
Income<expenditure	51.2±11.1	51.7±11.5	58.3±14.1	52.4±10.97	9.1±6.7
<b>p-value</b>	0.843	0.204	0.327	0.004	0.040
<b>Body Mass Index</b>					
Normal	58.3±7.7	58.4±12.7	63.2±13.3	57.6±12.4	5.7±7.0
Overweight	51.2±9.9	53.4±11.4	60.6±13.5	55.97±10.8	8.1±6.8
Obese	39.6±14.4	44.7±9.0	53.2±11.8	48.95±9.0	11.7±5.4
<b>p-value</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.001</b>	<b>0.000</b>
<b>Smoking</b>					
No	50.9 ±12.7	53.0±12.4	59.8±13.6	54.9±11.4	8.3±6.8
Yes	55.2±4.9	57.5±11.5	60.5±12.3	56.5±14.2	2.8±4.4
<b>p-value</b>	0.76	0.666	0.664	0.243	0.47
<b>Dining style</b>					
Ground	50.6± 12.8	52.8± 12.2	59.9± 13.6	54.97 ±11.6	8.0±6.7
Dining table	52.3±11.8	54.3±13.08	59.5±13.5	54.8±11.3	8.3±7.2
<b>p-value</b>	0.450	0.603	0.929	0.543	0.346
<b>Walking Aids</b>					
No	51.7±12.4	53.9±12.4	61.2±12.9	56.2±11.3	6.9±6.7
Yes	47.4±13.0	48.8±11.6	52.1±14.7	48.1±10.3	14.1±2.4
<b>p-value</b>	0.632	0.236	0.942	0.318	<b>0.000</b>



**Duration of Disease**

> 5years	52.5±12.8	56.7±11.0	63.5±11.9	57.8±11.2	5.6±6.3
5-10 years	51.9±10.95	53.9±12.9	60.1±13.0	52.9±11.6	8.0±7.3
<10 years	49.1±12.96	49.3±11.97	56.1±14.4	53.3±11.3	10.4±6.1
p-value	0.280	0.003	0.009	0.043	<b>0.000</b>

Table 4: Association between Barthel dependency levels and participants' characteristics.

Characteristics	Moderate dependence	Slight dependence	Total independent	Chi-Square (p-value)
	Number (%)	Number (%)	Number (%)	
<b>Age groups</b>				
<40 years	12.5	18.8	68.8	12.92 (0.012)
40-60 years	36.4	23.9	39.8	
>60 years	39.3	37.5	23.2	
<b>Gender</b>				
Female	35.1	28.6	36.4	0.59 (0.75) *
Male	33.3	16.7	50.0	
<b>Occupation</b>				
Paid Employed	30.8	15.4	53.8	5.95 (0.43) *
Housewife	35.8	29.1	35.1	
Retired / Jobless	42.9	42.9	14.3	
Other	16.7	16.7	66.7	
<b>Marital status</b>				
Single	28.6	14.3	57.1	6.05 (0.20) *
Married	34.1	26.2	39.7	
Widow/Divorced	40.7	40.7	18.5	
<b>Education</b>				
Illiterate	37.9	37.9	28.7	11.68 (0.07)
Primary school	37.8	24.4	37.8	
Secondary school	28.6	14.3	57.1	
University/Institute	0.0	28.6	71.4	
<b>Financial</b>				
Income>expenditure	39.4	24.2	36.4	6.48 (0.17)
Income=expenditure	25.0	22.5	52.5	

Income<expenditure	37.9	32.2	29.9	
<b>Body Mass Index</b>				
Normal	21.1	24.6	54.4	
Overweight	31.8	33.3	34.8	22.53 (0.000)
Obese	62.2	24.3	13.5	
<b>Smoking</b>				
No	36.4	27.9	35.7	3.74
Yes	0.0	33.3	66.7	(0.15) *
<b>Dining style</b>				
Ground	34.4	29.5	36.1	0.49
Dining table	36.8	23.7	39.5	(0.78)
<b>Walking Aids</b>				
No	26.7	29.6	43.7	
Yes	80.0	20.0	0.0	28.76 (0.000)
<b>Duration of RA</b>				
> 5years	19.7	29.5	50.8	
5-10 years	34.3	25.7	40.0	15.54 (0.004)
<10 years	50.0	28.1	21.9	

The results indicate that QoL in RA patients deteriorate with increasing age. The score of all QoL domains significantly higher than in patients younger than 40 years old than in patients older than 60 years old, (p-value >0.05). Which indicate that younger patients had better QoL when compare to elderly as presented in table 3. This may be due to physiological related changes. In addition, the score of ADLs according to HAQ and Barthel index increased with increasing age. HAQ score for younger 40 years old than was (3.4±5.7) and older than 60 years old was (9.5±5.9). The proportion of total independency for younger participants was (68.8%) and (23.2%) in participants older than 60 years old as presented in table 3 and 4. As reported by Magyari et al. [44] due to aging process there may be changes in body compositions with a loss of muscle mass, water content, bone mass beside neuro motor and musculoskeletal function which may lead to increased risk of disability and functional decline.

Regarding BMI, studies reveal that relationship between obesity and RA still unknown. The score of all QoL domain in Participants with normal BMI was highest as compared to obese or overweight participants. Also, participants with normal BMI was better in performing ADLs than obese and overweight (p-value<0.05) in HAQ score and Barthel Index. Similarly, Jankowska et al. [45] depicted that there was a significant relationship between BMI and QoL. Likewise, Gharbia et al. [46] found HAQ score was significantly lower in patients with normal BMI as compared to obese and overweight. Conversely, Anna Świtła et al. [47] declare that there was no statistical significant between the body mass and QoL in RA patients.

The mean score in all domain in QoL was higher in participant who were not using walking aids. According to HAQ score Participants who were not using walking aids had better performance in physical activities. However, there was a shortcoming in literature regarding the relationship between using of walking aids, QoL and daily activities.

The duration of disease had a significant impact on patient's life to perform their ADLs. patients with less than 5 years' duration of disease had higher score in all QoL domains as compared to those patients who had RA for more than 10 years. In addition, HAQ score and Barthel Index was the lowest in patients with less than 5 years' duration than patients with more than 10 years' duration, (p-value<0.05). Which means the ability to perform daily activities increased with decreasing the disease duration, as depicted in table 3 and 4. Likewise, Chiu et al. [43] stated that the

longer duration of disease the patient may experience lower score on functional ability. As RA is a long-term condition and makes the patients struggle to live with it. Consequently, it may lead to mobility loss, reduction in muscle strength, swelling, pain and morning stiffness in addition to psychological problems. Furthermore, Hammad et al. [48] claimed that patients with more than 10 years' duration of disease confirmed greater disability and had highest score on MHAQs. As this may be related to disability in old aged people which is due to more-comorbidity, longer exposure to medications, polypharmacy with more drug interactions, longer duration of the disease and disease activity.

The result of the present study did not find any significant association between participant gender, occupation, marital status, financial, smoking and dining style.

The mean and standard deviation was slightly higher in female than male in physical and psychological domain. While, male had a higher score in social and environmental domain. According to HAQ score and Barthel Index; HAQ was slightly higher in male than female, the proportion of female and male patients who were total independent was (36.4%) and (50.0%) respectively. Similarly, Hekmat et al. [49] revealed that male patients reported better outcomes with lower score for HAQ and higher SF-36 component score.

Patients with other occupation (i.e, shopkeeper and driver) owned the highest score in all domains of QoL. Whereas, retired /job less had the lowest score. As well as other occupation had better physical ability in the HAQ score and Barthel Index. The percentage of participants in other occupation who were totally independent was (66.7%) and (14.3%) in retired group. This may due to that employee have fixed working schedule, fixed number of sick leaves, less flexibility and work-related stress which may affect their physical function and lower level of QoL [50].

In marital status the single participant showed the highest score in all other domains of QoL except in social domain. Whereas, widow owned the lowest score. Physical activity according to HAQ score and Barthel Index; the score was the lowest in single and highest in widow/divorced. Moreover, slightly more than half (57.1%) and (18.5%) were total independent in single and widow respectively. Similarly, Suh et al. [51] stated that patients who were not married had better physical function and reported better general health perception as compared to their counterparts.

Socio-education showed that Participants who graduated from university had the highest score in all domains as compared to the others. According to HAQ score and Barthel Index participants who graduate from university had better physical function in performing their ADLs and the proportion of total independent university was (71.4%) graduate and (28.7%) in illiterate. Also, Hammad et al. [48] claimed that in developing countries illiteracy is still the main problem and MHAQ scores was significantly higher in illiterate patients as compared with different levels of education. In addition, participants with a high educational level had better physical functions than with low education. This may have resulted from low educated had physically demanding works or more strenuous workload. Therefore, they may experience more pain and disability in relation to their daily activities [34].

Moreover, the scores in all domain in QoL was the highest in participant had their Income>expenditure and the lowest in Income<expenditure. However, the HAQ score and Barthel Index in participants who had their income equal to expenditure was better than the others. Callhoff et al. [52] found that worse functional capacity, more swollen joints and a higher disease burden was in patients with low income than higher income. In addition, low income participants more often reported the negative effects of RA such as family life, social relationships and psychological problems than wealthy people. Moreover, low income patients tend to change their profession or workplace very often due to physically more demanding jobs. As supported by Taylor et al. [53] that the highest income level had lowest rate of developing RA. Higher incidence of RA was observed among lower socioeconomic status. Also, the disease itself may cause financial situation and economic costs for the families and the patients. Therefore, this may lead to dependence on the family members to manage their daily life.

Participants who were smoker had higher score in all domains as compared to non-smokers. Physical functions according to HAQ score was lower in smoker patients than non-smokers and more than two-third (66.7%) of smokers were totally independent in Barthel Index. On the other hand, Lu et al. [54] claimed that smoker patients had higher level of disability as compared to non-smokers.

Regarding dining style, patients who were using dining table had higher scores in QoL domains as compared to those using ground. HAQ score was approximately same in both, on the other hand the proportion of total independency level was (39.5%) in patients who were using dining table and (36.1%) in those using ground. Relating to the dining style, in the present study it seems more related to cultural habits. As in Eastern cultures people prefer sitting on the ground using cross-legged, squat or kneeling position. In addition, the floor is used for most of the daily routines such as watching TV, eating and sleeping. Due to majority of activities happening on the floor so cleaning the floor is number priority and require kneeling, bending and flexion movements in the joints which may add an extra stress on the joints.

Table 5 The proportion of HAQ subscale

Characteristics	Without difficulty		With some difficulty		With much difficulty		Unable to do	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
<b>Dressing</b>	63	(39.4)	51	(31.9)	46	(28.7)	0	
<b>Arising</b>	62	(38.8)	50	(31.3)	48	(30.0)	0	
<b>Eating</b>	66	(41.3)	70	(43.8)	24	(15.0)	0	
<b>Walking</b>	61	(38.1)	28	(17.5)	68	(42.5)	3	(1.9)
<b>Hygiene</b>	63	(39.4)	25	(15.6)	69	(43.1)	3	(1.9)
<b>Reach</b>	67	(41.9)	30	(18.8)	48	(30.0)	15	(9.4)
<b>Grip</b>	61	(38.1)	13	(8.1)	53	(33.1)	33	(20.6)
<b>Activity</b>	61	(38.1)	56	(35)	39	(24.4)	4	(2.5)

The result of the table 5 indicates that RA more affected patients grip (20%) unable to perform gripping, reaching was second affected activity (9.4%)unable to do it. Activity subscale in the HAQ was third subscale with proportion of (2.5%)unable to do it. Walking and hygiene were less affected subscale with percentage of (1.9%).Similarly, Silva et al. (2018) and Singh et al. (2019) {55,56} reported that these limitations in RA were most strongly related to the involvement of the joints. The most common joints involved are toe, shoulder, wrists, knees, fingers and elbows additionally it also results in feet and hand deformity. This deformity may lead to limitation in joint movement, impairment in ADLs due to pain, decreased flexion at the shoulder, reduction in grip strength and causes the significant effect on clothing. Furthermore, Ji et al et al. and Durmus et al. {57,58} revealed that the determinants of functional status of the hand were found as disability. Statistically significant positive correlation was found between hand functions, morning stiffness and pinch. Moreover, the limitation of wrist extension and lower body pain score were significant risk factors for functional disability.

### Conclusion

Based on findings of the present study. It can be concluded thatalmost two-third of the participant moderately depend on the other to perform their ADLs.The activity of daily life for one-third were moderately depend on the others. Younger age participant with normal BMI and shorter duration of the disease had better physical functions and QoL in terms of physical, psychological, social and environmental. Furthermore, grip and reaching were the most affected subscale on HAQ.

### Conflicts of Interest

The authors declare that they have no conflicts of interest.

## Acknowledgements

The authors thank the patients who participated in the study.

## References

[1] Jalil, Syed Fazal, Maria Arshad, Attya Bhatti, Jamil Ahmad, Fazal Akbar, Shahid Ali, and Peter John. "Rheumatoid arthritis: what have we learned about the causing factors?" *Pakistan journal of pharmaceutical sciences* 29, no. 2 (2016).

[2] Thomas, Rachel, S. Hewlett, C. Swales, and Fiona Cramp. "Keeping physically active with rheumatoid arthritis: semi-structured interviews to explore patient perspectives, experiences and strategies." *Physiotherapy* 105, no. 3 (2019): 378-384.

[3] RYU, Ji Sun, Sun Hee PARK, and MiHueon SEONG. "Factors influencing self-care competence in Korean women with rheumatoid arthritis." *Journal of Nursing Research* 27, no. 2 (2019): e16.

[4] Alam, Javaid, Ibrahim Jantan, and Syed Nasir Abbas Bukhari. "Rheumatoid arthritis: recent advances on its etiology, role of cytokines and pharmacotherapy." *Biomedicine & Pharmacotherapy* 92 (2017): 615-633.

[5] Lee, Ji-Eun, In Je Kim, Min-Sun Cho, and Jisoo Lee. "A case of rheumatoid vasculitis involving hepatic artery in early rheumatoid arthritis." *Journal of Korean medical science* 32, no. 7 (2017): 1207.

[6] Smolen, J. S., D. Aletaha, and I. B. McInnes. "Rheumatoid arthritis. *Lancet LondEngl* 388: 2023–2038." (2016): 0-6736

[7] Hunter, Theresa M., Natalie N. Boytsov, Xiang Zhang, Krista Schroeder, Kaleb Michaud, and Andre B. Araujo. "Prevalence of rheumatoid arthritis in the United States adult population in healthcare claims databases, 2004–2014." *Rheumatology international* 37, no. 9 (2017): 1551-1557.

[8] Jafarzadeh, S. Reza, and David T. Felson. "Updated estimates suggest a much higher prevalence of arthritis in United States adults than previous ones." *Arthritis & Rheumatology* 70, no. 2 (2018): 185-192.

[9] Vicente-Herrero, M. Teófila, Santiago Delgado Bueno, and Luisa CapdevilaGarcía. "Assessment of limitations in rheumatology. Tools most used in practice." *Revista Colombiana de Reumatología (English Edition)* 26, no. 3 (2019): 185-193.

[10] Giebel, Clarissa M., Caroline Sutcliffe, and David Challis. "Activities of daily living and quality of life across different stages of dementia: a UK study." *Aging & Mental Health* 19, no. 1 (2015): 63-71.

[11] Omma, Ahmet, SeldaÇelik, Cemal Bes, ÖzlemPehlivan, Sevinç Can Sandıkçı, Sibel Yılmaz Öner, and NilüferAlpayKanitez. "correlates of functional disability with disease activity in elderly patients with rheumatoid arthritis." *Psychology, health & medicine* 23, no. 6 (2018): 668-673.

[12] Malm, Karina, Stefan Bergman, Maria LE Andersson, Ann Bremander, and Ingrid Larsson. "Quality of life in patients with established rheumatoid arthritis: a phenomenographic study." *SAGE open medicine* 5 (2017): 2050312117713647.

[13] Centers for Disease Control and Prevention. Arthritis-related statistics (2020). [http://www.cdc.gov/arthritis/data\\_statistics/arthritis-related-stats.htm](http://www.cdc.gov/arthritis/data_statistics/arthritis-related-stats.htm)

[14] Bottomley, Andrew, Jaap C. Reijneveld, Michael Koller, Henning Flechtner, Krzysztof A. Tomaszewski, Eva Greimel, Patricia A. Ganz et al. "Current state of quality of life and patient-reported outcomes research." *European Journal of Cancer* 121 (2019): 55-63.

- [15] Hussein, WijdanAkram. "The quality of life in patients with rheumatoid arthritis in Baghdad, 2017: a cross-sectional study." *International Journal of Medical Research & Health Sciences* 6, no. 11 (2017): 20-34.
- [16] Qvarfordt, Maria, Maria LE Andersson, and Ingrid Larsson. "Factors influencing physical activity in patients with early rheumatoid arthritis: A mixed-methods study." *SAGE open medicine* 7 (2019): 2050312119874995.
- [17] Sien, Ng Yee, and Heeyoune Jung. "Assessment of the six activities of daily living in adults." *The Singapore Family Physician* 40, no. 4 (2014): 26-36
- [18] Martinec, Renata, Renata Pinjatela, and Diana Balen. "Quality of Life in Patients with Rheumatoid Arthritis—a Preliminary Study." *ActaClinicaCroatica* 58, no. 1. (2019): 157-166.
- [19] Jih, Jane, Arnab Mukherjea, Eric Vittinghoff, Tung T. Nguyen, Janice Y. Tsoh, Yoshimi Fukuoka, Melinda S. Bender, Winston Tseng, and Alka M. Kanaya. "Using appropriate body mass index cut points for overweight and obesity among Asian Americans." *Preventive medicine* 65 (2014): 1-6.
- [20]Diyanto, RizkyNurwan, Marina A. Moeliono, and LazuardhiDwipa. "Level of Dependency Based on Barthel and Lawton Score in Older People Living in PantiWerdha, Ciparay." *Althea Medical Journal* 3, no. 4 (2016): 493-498.
- [21]Mahoney, Florence I., and Dorothea W. Barthel. "Functional evaluation: theBarthel Index: a simple index of independence useful in scoring improvement in the rehabilitation of the chronically ill." *Maryland state medical journal* (1965).
- [22] Wade, Derrick T., and R. Langton Hewer. "Functional abilities after stroke: measurement, natural history and prognosis." *Journal of Neurology, Neurosurgery & Psychiatry* 50, no. 2 (1987): 177-182.
- [23] Brown, Jeffrey H., Lewis E. Kazis, Patricia W. Spitz, Paul Gertman, James F. Fries, and Robert F. Meenan. "The dimensions of health outcomes: a cross-validated examination of health status measurement." *American Journal of Public Health* 74, no. 2 (1984): 159-161.
- [24] Collin, C., D. T. Wade, S. Davies, and V. Horne. "The Barthel ADL Index: a reliability study." *International disability studies*10, no. 2 (1988): 61-63.
- [25]Fries, James F., Patricia Spitz, R. Guy Kraines, and Halsted R. Holman. "Measurement of patient outcome in arthritis." *Arthritis & Rheumatism* 23, no. 2 (1980): 137-145.
- [26]Ferraz, M. B., L. Maglhaes Oliveira, P. M. Araujo, E. Atra, and P. Tugwell. "Cross cultural reliability of the physical ability dimension of the health assessment questionnaire." *The Journal of rheumatology* 17, no. 6 (1990): 813-817.
- [27] Wolfe, Frederick, and Theodore Pincus, eds. *Rheumatoid arthritis: pathogenesis, assessment, outcome, and treatment*. M. Dekker, 1994.
- [28]Bruce, Bonnie, and James F. Fries. "The Stanford health assessment questionnaire: dimensions and practical applications." *Health and quality of life outcomes* 1, no. 1 (2003): 1-6.
- [29]Ebbevi, David, Anna Essén, and Helena Hvitfeldt Forsberg. "Persons with rheumatoid arthritis challenge the relevance of the health assessment questionnaire: a qualitative study of patient perception." *BMC musculoskeletal disorders* 18, no. 1 (2017): 1-10.
- [30]Felson, D. T. "Choosing a core set of disease activity measures for rheumatoid arthritis clinical trials." *The Journal of rheumatology* 20, no. 3 (1993): 531-534.
- [31] Skevington, Suzanne M., and Christine Tucker. "Designing response scales for cross-cultural use in health care: Data from the development of the UK WHOQOL." *British journal of medical psychology* 72, no. 1 (1999): 51-61.

- [32]Nejat, S. A. H. A. R. N. A. Z., A. Montazeri, K. HolakouieNaieni, K. A. Z. E. M. Mohammad, and S. R. Majdzadeh. "The World Health Organization quality of Life (WHOQOL-BREF) questionnaire: Translation and validation study of the Iranian version." *Journal of school of public health and institute of public health*
- [33] Yang, Deng-Ho, Jing-Yang Huang, Jeng-Yuan Chiou, and James Cheng-Chung Wei. "Analysis of Socioeconomic Status in the Patients with Rheumatoid Arthritis." *International journal of environmental research and public health* 15, no. 6 (2018): 1194.
- [34]Stamm, Tanja Alexandra, Karin Pieber, Richard Crevenna, and Thomas Ernst Dorner. "Impairment in the activities of daily living in older adults with and without osteoporosis, osteoarthritis and chronic back pain: a secondary analysis of population-based health survey data." *BMC musculoskeletal disorders* 17, no. 1 (2016): 1-10.
- [35]Gamal, Sherif M., Hatem H. Eleishi, AbdelkawyMoghazy, Kamal El-Garf, MervatEissa, NesreenSobhy, Basma M. Medhat, Nehal El-Ghobashy, and Bassel El-Zorkany. "Effect of education on disease activity and functional status in rheumatoid arthritis patients." *The Egyptian Rheumatologist*43, no. 1 (2021): 7-11.
- [36]Radwan, Abdullah, and Ahmed Borai. "Quality of sleep in rheumatoid arthritis patients: Relationship with disease activity, depression and functional status." *The Egyptian Rheumatologist* 43, no. 2 (2021): 183-187.
- [37]Versini, Mathilde, Pierre-Yves Jeandel, Eric Rosenthal, and Yehuda Shoenfeld. "Obesity in autoimmune diseases: not a passive bystander." *Mosaic of Autoimmunity* (2019): 343-372.
- [38]Ogden, Cynthia L., Margaret D. Carroll, Cheryl D. Fryar, and Katherine M. Flegal. "Prevalence of obesity among adults and youth: United States, 2011-2014." (2015): 1-8.
- [39]Silva, S. M., Santana, A. N. C., Silva, N. N. B. D., &Novaes, M. R. C. G. VES-13 and WHOQOL-bref cutoff points to detect quality of life in older adults in primary health care. *Revista de saudepublica*, 53(2019): 26.
- [40]Silva, PatríciaAparecida Barbosa, Sônia Maria Soares, Joseph Fabiano Guimarães Santos, and Líliam Barbosa Silva. "Cut-off point for WHOQOL-bref as a measure of quality of life of older adults." *Revista de saudepublica* 48 (2014): 390-397.
- [41]Faiq, Mirna K., Dheyaa J. Kadhim, and Faiq I. Gorial. "INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES." (2019).
- [42]Ojah, HassnainKadhem, Yasir Sahib Malik, and Ahmed Maher Mohammad Ali. "The Use of the Balanced Scorecard in Improving Health Performance-The Study of the Health Sector in Iraq." *International Journal of Multidisciplinary Research and Publications (IJMRAP)* 2, no. 5 (2019): 24-30.
- [43] Chiu, Ying Ming, Mei Shu Lai, Hsiao Yi Lin, Hui Chu Lang, L. J. Lee, and Jung-Der Wang. "Disease activity affects all domains of quality of life in patients with rheumatoid arthritis and is modified by disease duration." *Clinical and experimental rheumatology* 32, no. 6 (2014): 898-903.
- [44] Magyari, Peter, Randi Lite, Marcus Kilpatrick, and James Schoffstall, eds. *ACSM'S resources for the exercise physiologist: A practical guide for the health fitness professional*. Wolters Kluwer Health, 2018.
- [45]Jankowska-Polanska, Beata, and Jacek Polanski. "Methods of evaluation of the quality of life in rheumatic diseases." *Reumatologia* 52, no. 1 (2014): 69.
- [46]Gharbia, O. M., A. S. El-Bahnasawy, A. E. Okasha, and S. A. Abd El-Karim. "Impact of obesity on rheumatoid arthritis: relation with disease activity, joint damage, functional impairment and response to therapy." *Int J ClinRheumatol* 13 (2018): 346-52.
- [47]Anna Świtała, Anna, JustynaJustynaWyszyńska, Kinga KingaCzerwińska, KatarzynaKatarzynaDereń, JustynaJustynaPodgórska-Bednarz, and AgnieszkaAgnieszkaGuzik. "Association between body mass and physical

activity with quality of life in patients with rheumatoid arthritis." *European Journal of Clinical and Experimental Medicine* 3 (2017).

[48]Hammad, Marwa, MervatEissa, and Ghada A. Dawa. "Factors contributing to disability in rheumatoid arthritis patients: An Egyptian multicenter study." *ReumatologíaClínica (English Edition)* 16, no. 2 (2020): 103-109.

[49]Hekmat, Korosh, Lennart T. Jacobsson, Jan-Åke Nilsson, YlvaLindroth, and Carl Turesson. "Changes and sex differences in patient reported outcomes in rheumatoid factor positive RA—results from a community based study." *BMC musculoskeletal disorders* 15, no. 1 (2014): 1-8.

[50]Chen, Chung-An, Barry Bozeman, and Evan Berman. "The grass is greener, but why? Evidence of employees' perceived sector mismatch from the US, New Zealand, and Taiwan." *International Public Management Journal* 22, no. 3 (2019): 560-589.

[51]Suh, Chang-Hee, Ju-Yang Jung, Hyunjin Oh, and Sunjoo Boo. "Evaluation of factors affecting the levels of physical activity in patients with rheumatoid arthritis: a cross-sectional study." *Clinical rheumatology* 38, no. 9 (2019): 2483-2491.

[52]Callhoff, Johanna, Andres Luque Ramos, Angela Zink, Falk Hoffmann, and Katinka Albrecht. "The association of low income with functional status and disease burden in German patients with rheumatoid arthritis: results of a cross-sectional questionnaire survey based on claims data." *The Journal of rheumatology* 44, no. 6 (2017): 766-772.

[53] Taylor, Peter C., Adam Moore, RaduVasilescu, Jose Alvir, and Miriam Tarallo. "A structured literature review of the burden of illness and unmet needs in patients with rheumatoid arthritis: a current perspective." *Rheumatology international* 36, no. 5 (2016): 685-695.

[54] Lu, B., Rho, Y. H., Cui, J., Iannaccone, C. K., Frits, M. L., Karlson, E. W., &Shadick, N. A. (2014). Associations of smoking and alcohol consumption with disease activity and functional status in rheumatoid arthritis. *The Journal of rheumatology*, 41(1), 24-30.}

[55] Silva, GrazielaSferra da, Mariana de Almeida Lourenço, and Marcos Renato de Assis. "Hand strength in patients with RA correlates strongly with function but not with activity of disease." *Advances in Rheumatology* 58 (2018).

[56]Singh, S. A Study on Adaptive Clothing for Females with Arthritis. *International Journal of Advanced Scientific Research and Management*, (2019) 4(4)

[57]Ji, Juan, Lijuan Zhang, Qiuxiang Zhang, Rulan Yin, Ting Fu, Liren Li, and ZhifengGu. "Functional disability associated with disease and quality-of-life parameters in Chinese patients with rheumatoid arthritis." *Health and quality of life outcomes* 15, no. 1 (2017): 1-7.

[58] Durmus, Elif, NurdanPaker, DeryaBugdayci, and GoksenGoksenoglu. "Determinants of the hand functions in patients with rheumatoid arthritis." *Ann Med Res* 26 (2019): 1493-1497.