

## Research Article

# Relationship of Fatigue Severity with Disability, Pain and Sleep Disturbance in Patients with Rheumatoid Arthritis and Osteoarthritis: A Cross-Sectional Study

Zainab Aqeel Khan<sup>1</sup>, Muhammad Saad Khan<sup>2</sup>, Al-Wardha Zahoor<sup>3</sup>

<sup>1</sup>AO Hospital, Karachi, Pakistan; <sup>2</sup>Jinnab Postgraduate Medical Center, Karachi; <sup>3</sup>Ziauddin University, Karachi

### Abstract:

**Objective:** Fatigue is one of the most disabling symptoms of arthritis. The aim of this study was to evaluate fatigue severity in Osteoarthritis and Rheumatoid arthritis, and its correlation with pain, disability and sleep disturbance.

**Methods:** A cross sectional survey was conducted among patients attending a rheumatology and orthopaedic clinic in Karachi. Total 100 participants were included, fifty with osteoarthritis and fifty with rheumatoid arthritis respectively. They were assessed for fatigue, pain, disability and sleep disturbances in both the groups. Fatigue Severity Scale questionnaire was used to evaluate the intensity of fatigue. The disability index was measured by Health Assessment Questionnaire, whereas pain and sleep disturbances was assessed by Visual Analogue Scale.

**Result:** Our result showed osteoarthritis group has significant but weak correlation of fatigue with disability ( $r=0.45$ ) p-value 0.001, pain ( $r=0.41$ ) p-value (0.003) and sleep disturbances ( $r=0.49$ ) p-value  $<0.001$  whereas no correlation was found in Rheumatoid arthritis group.

**Conclusion:** Fatigue is a very common symptom in both arthritic conditions. In osteoarthritis, moderate correlation was seen between fatigue and disability, pain and sleep disturbance. However, a weak correlation was found in rheumatoid group.

**Corresponding Author** | Dr. Al-Wardha Zahoor, Assistant Professor, Ziauddin College of Rehabilitation Sciences, Ziauddin University, Karachi **Email:** alwardha.zahoor@zu.edu.pk

**Key words:** Fatigue, Arthritis, Rheumatoid Arthritis, Osteoarthritis, Rheumatic disease

### Introduction

Fatigue is a disabling symptom that is commonly observed in nearly all the communicable and non-communicable diseases<sup>1</sup>. It is state of intense tiredness that can reduce physical and mental abilities<sup>2</sup>. Researchers have documented that almost 40-80% of patients reported fatigue suffering with Rheumatoid arthritis (RA) whereas 35% in Osteoarthritis (OA) respectively<sup>1</sup>.

The incidence rate of RA is 50 to 100%<sup>3</sup>. RA has a major adverse effect on functional ability of patients<sup>4</sup>. Patients with RA reported not only physical, but also mental exhaustion that cause an absence of motivation, an ability to think patiently or to focus<sup>2</sup>. A study done in 2016 reported that fatigue in RA disease has multiple

factors such as obesity, depression and physical inactivity<sup>5</sup>. Pain is also seen to be a factor of sleep disturbance among individuals with RA<sup>6</sup>.

Unlike RA, OA is not an autoimmune disease but it is the most prevalent type of arthritis. OA has ranked among top ten disability causes globally<sup>7</sup>. It has been observed clinically that OA pain leads to fatigue and decrease in quality of life<sup>8</sup>. A study reported that patients suffering from OA reported a higher level of physical exhaustion as compared to a patient suffering from RA<sup>9</sup>. A study reported the high prevalence of disturbed sleep in both RA and OA patients in which pain was identified as a cause of awakening<sup>10</sup>. Rupp et al<sup>11</sup> reported the view of patients on fatigue as a significant factor

impacting their quality of life. Swedish RA patients believe that the basic aim of treatment should be to decrease fatigue<sup>12</sup>. Despite the immense burden of fatigue exhaustion placed on patients with arthritis, there are limited ways to mitigate it. To develop successful therapies and enhance the quality of life, an understanding of the causes of fatigue is necessary. To illuminate possible fatigue mechanisms in OA and RA, we first need to be aware of fatigue correlates.

In the literature we have multiple studies that have examined the different factors of osteoarthritis and rheumatoid arthritis that can be associated with fatigue, disease activity, pain but these have not yet been examined simultaneously in both conditions as predictors of fatigue, however they are frequently present among patients with condition<sup>13-15</sup>. We intend to incorporate the previous study of both RA and OA that aimed to analyze the correlation of fatigue with other variables, in order to provide a more detailed image of this relationship.

The aim of this study is to rule out the frequency of fatigue by means of comparing two types of arthritis; OA and RA and to determine whether incidence and severity of fatigue differs by type of arthritis or not. Additionally, we aim to find the correlation of fatigue in comparison with the disability, pain and sleep disturbances which will help in the development of better treatment strategies for RA and OA.

### Methods:

The study was conducted at Rheumatology and Orthopaedic outpatient departments of different clinical settings in Karachi, Pakistan from September 2017 to August 2018. A cross-sectional survey was used; collected data for a total of 100 patients were included in this study. There were fifty patients each with RA (Rheumatoid arthritis) and fifty with OA (Osteoarthritis), calculated by open epi version 3.01. The participants were recruited through convenience sampling technique. Patients above the age of 18 years with confirmed radiological and medical diagnosis of RA and OA by their physicians, rheumatologist and orthopaedic surgeons were included in this study. Patients having any other co-morbidity that can cause persistent fatigue were excluded from the study. The study was approved by the Institutional Review Board IRB of Jinnah

postgraduate medical centre (No.F.2-81-IRB/2017-GENL/1517/JPMC). All participants provided written consent accordance with the Declaration of Helsinki.

The questionnaire intended to test the severity of fatigue, disability, pain and sleep disturbance in between RA and OA groups. To assess disability, the Stanford Health Assessment Questionnaire functional disability index (HAQ disability) was used. Fatigue Severity Scale (FSS) was used to measure fatigue level whereas Visual Analogue Scale (VAS) was administered for sleep disturbance and pain intensity. All questionnaires were administered by data collectors. Permission was received to use HAQ questionnaire in this research.

FSS scale comprised of 25 items in which only 9 items were selected that identified features of fatigue by using theoretical consideration. The 9 item scale showed a reliability of 0.89 (Cronbach's alpha)<sup>16</sup>. The response of each statement was judged on a 7-point likert scale in which 1 represents strongly disagree and 7 represents strongly agree.

To measure disability, HAQ disability questionnaire was utilized. It was comprised of total 20 questions that were divided into eight categories. The score of each item was in between 0 to 3, where 0 means (no difficulty) and 3 are (unable to do). The test retest reliability was found to be in between (0.87-0.99) with an excellent Cronbach's alpha 0.9<sup>17</sup>.

VAS was used to measure sleep disturbance that is a validated tool<sup>2</sup> using a 100-mm scale where 0 indicating no sleep and 10 indicates full night sleep. VAS measure with the question that "how would you rate the amount of sleep you have in night"? Moreover, VAS was also used to measure pain. The test retest reliability found to be good ( $R = 0.71-0.94$ )<sup>18</sup> and Cronbach alpha 0.91<sup>19</sup>. The 11 point numeric scale ranges between 0-10, where 0 represents "no pain" and 10 represent "worst possible pain". The question was asked that "how would you rate your pain in this scale".

Data was analysed on SPSS version 20. Descriptive statistics were calculated. The distribution of data was analysed; Man Whitney U test was applied for the difference in between the groups of OA and RA whereas Spearman's correlation for fatigue and others variable were

calculated. P-value <0.05 was considered as significant.

### Results:

A hundred patients were selected for the study, with the mean age ( $40 \pm 11.14$ ) in RA whereas ( $56.52 \pm 10.7$ ) in OA. We found 50 females with RA whereas in OA 46 were females and 4 were males. The demographic data of patients showed in Table 1.

**Table 1: Demographic Data of Patients**

Variable	RA		OA	
	n=50		n=50	
Gender	50 female	46 female	4 male	
Age	$40 \pm 11.14$	$55 \pm 9.97$	$59 \pm 14.9$	

The normality of data was evaluated, we found Skewness-1, kurtosis 0.4, mean 5.4 and median 5.7. The variables assessed in groups RA and OA are mentioned in tables 2 & 3. As the data was not normally distributed so median was taken for both the group. It shows that both diseases have the same perspectives, but patients suffering from RA report higher levels of fatigue, pain and disability.

The response of entire scale intended to measure fatigue, disability, pain and sleep in r OA and RA is mentioned in table 4. Participants with RA rated their fatigue higher than patient's with OA. There appeared to be a greater number of patients with RA experiencing severe fatigue when compared to OA. Similarly in disability index, participants with RA showed much difficulty in executing the daily activities mentioned in health assessment questionnaire, although patients

**Table 2: Percentiles of variables in RA**

VARIABLE	RA		
	25 <sup>th</sup>	Median, Mean	75 <sup>th</sup>
FSS	5.6	6.26, 6.01	6.7
HAQ	1.25	1.5, 1.7	2.1
VAS (sleep)	1	5, 4.8	8
VAS (pain)	6	8, 7.4	9

**Table 3: Percentiles of variables in OA**

VARIABLE	RA		
	25 <sup>th</sup>	Median, Mean	75 <sup>th</sup>
FSS	3.4	5.26, 4.8	6.2
HAQ	0.63	0.94, 0.95	1.25
VAS (sleep)	1	5, 4.08	6
VAS (pain)	5	6, 6.34	8

with OA also have difficulty in performing activities but with less difficulty as compared to RA. Pain was documented higher in RA group in comparison to OA. Sleep disturbance was slightly raised in RA group. However, there is no severe sleep disturbance in either group.

The difference in between the variables of two groups, non-parametric Mann Whitney U test was applied. A significant difference was found in between OA and RA fatigue ( $p < 0.001$ ), pain (0.002) and disability ( $p < 0.001$ ) except sleep ( $p = 0.31$ ). The spearman test has shown to determine the relationship of fatigue with pain, disability and sleep disturbances. There was a significantly weak correlation of fatigue with pain, disability and sleep ( $p < 0.01$ ) in OA group, conversely there is insignificant correlation was found in RA group fatigue with pain and sleep mentioned in table 5.

**Table 4: Responses of Measurement Scale**

SCALES	RESPONSES	RA	OA
Response of Fatigue Severity Scale:	Mild to moderate (1-2)	3.3%	15.1%
	Moderate (3-5)	4.6%	7.5%
	Severe (5-7)	92%	77.3%
Responses of disability index, Health Assessment Questionnaire	Without any difficulty	10.5%	51.1%
	With some difficulty	38%	26%
	With much difficulty	30.25%	15%
	Unable to do	21.25%	8%
VAS scale for pain	Mild	0%	4%
	Moderate	2%	32%
	Severe	98%	64%
VAS scale for sleep	Mild	38%	46%
	Moderate	62%	54%
	Severe	0%	0%

**Table 5:** Correlation of Fatigue with different variables

Variable	RA		OA	
	Correlation Coefficient (r)	P-Value (<0.05)	Correlation Coefficient (r)	P-Value (<0.05)
Disability	0.27	0.056	0.45	0.001
Pain	0.09	0.529	0.41	0.003
sleep	0.23	0.100	0.49	<0.001

**Discussion:**

Osteoarthritis and Rheumatoid arthritis are considered as one of the most common musculoskeletal diseases that lead to fatigue, causing adverse consequences such as disability. Our study showed significant result in OA group with p-value of 0.001 in disability index, 0.003 in pain, and <0.001 in sleep disturbances, and weak correlation was found, fatigue with disability  $r = 0.45$ , fatigue with pain  $r = 0.41$  and fatigue with sleep disturbance  $r = 0.49$  whereas in contrast insignificant result and weak correlation was found in RA group with p-value  $>0.01$  and correlation of fatigue with disability is  $r = 0.27$ , fatigue with pain  $r = 0.09$  and fatigue with sleep disturbance  $r = 0.23$ . It has been shown that the fatigue is associated with sleep disturbance, disability and pain in patients suffering with OA. However, fatigue as a symptom is found to be more persistent in patients suffering with RA.

A similar study conducted by Stebbing et al.<sup>20</sup>, measured their patient's fatigue on the MAF-GFI, a different scale compared to our study, and found that OA's fatigue was significantly higher than RA with p-value = 0.03, attributing 45.6% with moderate fatigue relative to those with RA 27.2%, although in our study, RA was found to be 92% severely fatigued compared with OA that is 77.3%. Another cross-sectional study<sup>21</sup> investigated the relationship of fatigue, pain, sleep quality and depression in participants with knee osteoarthritis but they do not have a comparison group of RA. They found higher fatigue and positive correlation with variables ( $p < 0.05$ ). Moreover, another study demonstrated that fatigue is significantly associated with disability. In addition, daily fatigue may increase hindrance in performing activities of daily living and is integral to predict poor functional status of an individual<sup>21</sup>. Similarly in our study, the patients suffering with higher fatigue score also have high disability index. It has been

noted during survey, that the patients who felt fatigue more often were not able to perform their work independently.

Previous studies demonstrated that fatigue is a substantial variable in inflammatory and non-inflammatory diseases. Further, it has also been concluded that the inflammatory components contribute minimally to fatigue. Although the current study stated that fatigue is a dominating variable in both the groups regardless of the inflammation whereas contrasting results were showing no association with OA and RA management<sup>22</sup>.

Furthermore our study demonstrated that the RA patients had poor sleep quality, due to the association of pain, fatigue or severity of disease. These results were consistent with the studies of Ullus et al.<sup>23</sup> that stated that individuals suffering from RA had poor sleep quality on the similar outcome measures.

Another study conducted by Ruppert et al. evaluated the impact of fatigue on Health-Related Quality of Life (HRQoL) in RA patient. It had shown that the different aspects of fatigue selectively explained different dimensions of HRQoL<sup>15</sup>. Similarly, the same Health Assessment Questionnaire was used in our study, examining different activities related to quality of life and disability. Therefore it has been observed that fatigue may have adverse consequences on quality of life.

Nikolaus et al.<sup>24</sup> assessed the impact of fatigue level on physical functioning and stated that majority of young women reported that fatigue was interfering with their physical functioning. Similar to our study it has shown that physical functioning is decreased by severe fatigue.

Pain is the most evident factor in any musculoskeletal disorders. Previous studies revealed a significant relationship between sleep and pain whereas pain initiates and exacerbates sleep disturbance, whereas disturbed sleep maintains and exacerbates pain. Moreover, it has

been concluded that improving sleep can reduce pain<sup>25</sup>. This study is different from our study in the perspective of intervention but the relationship they had established in their literature is as same as we have aimed to do in our study.

Consecutively, our study reported a significant difference in fatigue levels of OA and RA patients. However, pain, disability and sleep quality were moderately correlated with fatigue in OA patients whereas low correlation on the similar outcome measures was interpretive in RA group.

The limitation of the study that it was highly dependent on the perception basis, furthermore it should commence with some quantitative measurements. The sample size was small and the participants were recruited by non-probability sampling technique. Other variable such as duration, severity of disease and medication intake can also be measured as it could have an effect on correlation. It is recommended to conduct clinical trials to determine the mean difference in health related outcome measures in respective domain to address the effective management of rheumatologic disorders.

### Conclusion:

It was concluded that high level of fatigue is found in RA patient than OA, whereas the correlation of fatigue with disability, pain and sleep disturbances was found significant in only OA group. Assessing the other variables brought a disparity changes concluded that fatigue experiences cannot be generalized to both arthritic condition of OA and RA.

The ultimate purpose of this study is to provide insight into areas of required research and direct future study towards the conceptual understanding into the fatigue of osteoarthritis and rheumatoid arthritis. This awareness could lead to new clinical approaches among adults with arthritis for the management of fatigue.

**Ethical Approval:** Given

**Conflict of Interest:** The authors declare no conflict of interest.

**Funding Source:** None

### References:

- Overman CL, Kool MB, Da Silva JA, Geenen R. The prevalence of severe fatigue in rheumatic diseases: an international study. *Clin Rheumatol*. 2016;35(4):409-15.
- Stebbing S, Treharne GJ. Fatigue in rheumatic disease: an overview. *Int J Clin Rheumatol*. 2010; 5(2):487.
- Silman AJ, Pearson JE. Epidemiology and genetics of rheumatoid arthritis. *Arthritis Res Ther*. 2002; 4(2):S265.
- Singh JA, Saag KG, Bridges Jr SL, Akl EA, Bannuru RR, Sullivan MC, et al. American College of Rheumatology guideline for the treatment of rheumatoid arthritis. *Arthritis Rheumatol*. 2016;68(8):1-26.
- Katz P, Margaretten M, Trupin L, Schmajuk G, Yazdany J, Yelin E. Role of sleep disturbance, depression, obesity, and physical inactivity in fatigue in rheumatoid arthritis. *Arthrit Care Res*. 2016;68(1): 81-90.
- Abad VC, Sarinas PS, Guilleminault C. Sleep and rheumatologic disorders. *Sleep Med. Rev*. 2008; 12(3):211-28.
- Power JD, Badley EM, French MR, Wall AJ, Hawker GA. Fatigue in osteoarthritis: a qualitative study. *BMC Musculoskelet. Disord*. 2008;9(2):63.
- Murphy SL, Alexander NB, Levoska M, Smith DM. Relationship between fatigue and subsequent physical activity among older adults with symptomatic osteoarthritis. *Arthritis Care & Res*. 2013;65(12):1617-24.
- Cross M, Lapsley H, Barcenilla A, Brooks P, March L. Association between measures of fatigue and health-related quality of life in rheumatoid arthritis and osteoarthritis. *Patient Journal*. 2008;1(2):97-104.
- Taylor-Gjevre RM, Gjevre JA, Nair B, Skomro R, Lim HJ. Components of sleep quality and sleep fragmentation in rheumatoid arthritis and osteoarthritis. *J. Musculoskelet. Res*. 2011;9 (3):152-9.
- Rupp I, Boshuizen HC, Jacobi CE, Dinant HJ, van den Bos GA. Impact of fatigue on health-related quality of life in rheumatoid arthritis. *Arthrit Care Res*. 2004;51(4):578-85.
- Ahlmén M, Nordenskiöld U, Archenholtz B,

- Thyberg I, Ronnqvist R, Lindén L, et al. Rheumatology outcomes: the patient's perspective. A multi-centre focus group interview study of Swedish rheumatoid arthritis patients. *Rheumatol*. 2005;44(1):105-10.
13. Nikolaus S, Bode C, Taal E, van de Laar MA. Fatigue and factors related to fatigue in rheumatoid arthritis: a systematic review. *Arthrit Care Res*. 2013;65(7):1128-46.
  14. Van Dartel SA, Repping-Wuts JW, Van Hoogmoed D, Bleijenberg G, Van Riel PL, Fransen J. Association between fatigue and pain in rheumatoid arthritis: does pain precede fatigue or does fatigue precede pain? *Arthrit Care Res*. 2013;65(6):862-9.
  15. Nicassio PM, Ormseth SR, Custodio MK, Irwin MR, Olmstead R, Weisman MH. A multidimensional model of fatigue in patients with rheumatoid arthritis. *J Rheumatol*. 2012; 39(9):1807-13.
  16. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scale: application to patients with multiple sclerosis and systemic lupus erythematosus. *Arch neurol*. 1989;46(4):1121-3.
  17. Bruce B, Fries JF. The Stanford Health Assessment Questionnaire: a review of its history, issues, progress, and documentation. *J Rheumatol*. 2003; 30(5):167-78.
  18. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual analog scale for pain (vas pain), numeric rating scale for pain (nrs pain), mcgill pain questionnaire (mpq), short-form mcgill pain questionnaire (sf-mpq), chronic pain grade scale (cpgs), short form-36 bodily pain scale (sf-36 bps), and measure of intermittent and constant osteoarthritis pain (icoap). *Arthritis Care Res*. 2011;63(4):240-52.
  19. Knop C, Oeser M, Bastian L, Lange U, Zdichavsky M, Blauth M. Development and validation of the visual analogue scale (VAS) spine score. *Der Unfallchirurg*. 2001;104(6):488-97.
  20. Stebbings S, Herbison P, Doyle TC, Treharne GJ, Highton J. A comparison of fatigue correlates in rheumatoid arthritis and osteoarthritis: disparity in associations with disability, anxiety and sleep disturbance. *Rheumatol*. 2010;49(2):361-7.
  21. Fertelli TK, Tuncay FO. Fatigue in individuals with knee osteoarthritis: Its relationship with sleep quality, pain and depression. *Pak J Med Sci*. 2019;35(4):1040.
  22. Belza BL, Henke CJ, Yelin EH, Epstein WV, Gilliss CL. Correlates of fatigue in older adults with rheumatoid arthritis. *Nurs Res*. 1993; 42(2):93-99.
  23. Ulus Y, Akyol Y, Tander B, Durmus D, Bilgici A, Kuru O. Sleep quality in fibromyalgia and rheumatoid arthritis: associations with pain, fatigue, depression, and disease activity. *Clin Exp Rheumatol*. 2011; 29(4):S92.
  24. Nikolaus S, Bode C, Taal E, van de Laar MA. New insights into the experience of fatigue among patients with rheumatoid arthritis: a qualitative study. *Ann Rheum Dis*. 2010;69(5): 895-7.
  25. Vitiello MV, Rybarczyk B, Von Korff M, Stepanski EJ. Cognitive behavioural therapy for insomnia improves sleep and decreases pain in older adults with comorbid insomnia and osteoarthritis. *J Clin Sleep Med*. 2009;5(2):355-6.