Journal of Caring Sciences, 2015, 4(3), 233-241
doi:10.15171/jcs.2015.024
http:// journals.tbzmed.ac.ir/ JCS

Relationship between Sleep Disorders, Pain and Quality of Life in Patients with Rheumatoid Arthritis

Majid Purabdollah[1], Sima Lakdizaji[1*], Azad Rahmani[2], Mehrzad Hajalilu[3], Khalil Ansarin[3]

[1]Department of Nursing, Nursing and Midwifery Faculty, Tabriz University of Medical Sciences, Tabriz, Iran
[2]Department of Nursing, Hematology and Oncology Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
[3]Department of Internal Medicine, Medicine Faculty, Tabriz University of Medical Sciences, Tabriz, Iran

ARTICLE INFO

Article Type:
Original Article

Article History:
Received: 19 May 2015
Accepted: 27 Jul. 2015
ePublished: 1 Sep. 2015

Keywords:
Rheumatoid arthritis
Pain
Sleep disorders
Quality of life

ABSTRACT

Introduction: Rheumatoid arthritis as one of the most common autoimmune diseases is known to be one of the leading causes of disability. Sleep disorders have direct influence on patient's life. According to studies, sleep problems are known to have negative impact on well-being and functioning, but the exact nature of relationship between sleep disorders and Rheumatoid arthritis is not completely understood.
This study aimed to investigate the relationship between sleep disorders, pain and quality of life in patients with rheumatoid arthritis patients.

Methods: In a descriptive -correlative study, 210 patients with rheumatoid arthritis referred to Tabriz medical university clinics selected by convenience sampling and were assessed by Sleep Disorders Questionnaire (SDQ), Epworth Sleepiness Scale (ESS), SF-36 Quality of Life Questionnaire and Visual Analog Scale (VAS). Data were analyzed using SPSS-13 by descriptive statistics such as frequency, mean (SD) and inferential statistics including Spearman correlation analysis, linear regression, χ^2, t- test and ANOVA.

Results: The mean age of participants was 48.41(12.92) years in which most of them (74%) were female. The mean (SD) quality of life was 40.51(22.94), sleepiness 13.14 (5.6) and pain 6.09 (2.14). There was significant negative relationship between some sleep disorders such as (naps, apnea, asphyxia,…) and pain with quality of life but pain severity had more effect on QOL compared to sleep problems. Furthermore, participants had low quality of life with more restriction in physical (mean=34.71) and general health (mean=34.42).

Conclusion: Sleep problems and pain were associated with poor quality of life in Rheumatoid Arthritis patients.

Introduction

Rheumatoid Arthritis (RA) is one of the common systemic inflammatory diseases, which is known as progressive chronic auto-immune illness with slow onset.[1] Clinically inflation causes tenderness, morning stickiness and limitation in joints. Global prevalence of this disease is one percent along the lifetime.[2] In Iran RA is the common musculoskeletal chronic inflammatory disease.[3] Which in most patients the disease have permanent changes with different severity of arthritis deformities as well as functional disturbances.[4] In this regard evidences show that every painful condition, disturbs sleep, which can lead to mood and abilities disturbances.[5]

Moreover, Quality of Life (QOL) in RA usually is affected by pain, dependency, fatigue, and sleep disorders.[6] This problem accelerates with age and additional chronic diseases.[7] In this regard, most of studies

* Corresponding Author: Sima Lakdizaji (MSc), email: sima.lak90@gmail.com.
This Project was approved and funded by the Tabriz University of Medical Sciences (Project number: 442).

indicate that 50-70% of patients with RA suffer from sleep disorders[8] which is 2-3 times more than general population compared to other medical conditions such as obesity, hypertension and respiratory diseases.[9,10] The possible reasons of the sleep disorders in patients with RA include restless leg syndrome, anxiety, depression and bone disturbances.[11]

Sleep as one of the basic human needs plays an important role in physical and emotional refreshment.[12] Moreover, some disturbances during sleep cause cardiovascular diseases,[13] behavioral disturbances, depression[14] and anxiety.[15] Reduction of general health, pain and negative effects on quality of life are common in RA,[16] however fewer researches have been done on sleep disorders of patients with RA. Although new methods for RA have been presented with new medical technology, but there have not been significant outcomes in solving the psychosocial and sleep problems of these patients. According to studies, sleep problems are known to have negative impact on wellbeing and functioning, but the exact nature of the relationship between sleep disorders and RA disease is not completely understood. So even more research in this area is needed.[17,18] Also evidences indicate that sleep in the chronic patients with pain is impaired, but the nature and severity of disturbances are unclear.[19] So recognizing sleep problems in these patients would help to improve their general health.

This study has been conducted to determine the relationship between sleep disorders and pain with QOL in patients with Rheumatoid Arthritis.

Materials and methods

In this descriptive-correlative study, 210 patients with RA were selected from those who referred to educational medical clinics of Imam Reza and Sina, affiliated to Tabriz University of Medical Science of Iran. In the period of April to June 2014, the participants were chosen by convenience sampling and assessed by interview. Research community included RA patients diagnosed by a rheumatologist based on American college of Rheumatology (ACR) criteria. Inclusion criteria included: at least 18 years old, consent to participate in the study, at least six months after the definite diagnosis. Exclusion criteria consisted of suffering from other chronic physical and mental diseases or treated with psychotropic medications as well as to have previous sleep problems before RA disease.

In order to estimate the sample size using G power software, a pilot study conducted upon 20 patients. So with r=0.23, power 0.95 and α=0.05, the sample size was calculated as 200 in which by adding sample loss of 10%, subjects were raised to 220 patients. However, 10 samples excluded due to other physical diseases, finally 210 patients participated.

Participants were assessed by sleep disorders questionnaire (SDQ), Epworth Sleepiness Score (ESS), Quality of Life (SF-36) and Visual Analogue Scale (VAS). Sleep disorders questionnaire consists of 37 questions related to sleep disorders with yes (1) or no (0) choices and open questions. Scores of each questionnaire has been calculated and analyzed separately. Last part of SDQ, Epworth sleepiness score consists of 8 items about probability of sleeping in different situations, which ranges from 0 (never) to 3 (high chance of dozing). The total score of ESS considered in a scale of 0-24, so final grade class has been calculated as 3-9 (Normal), 10-13 (mild), 14-19 (moderate) and 20-24 (severe sleepiness)[20,21] The validity of the questionnaire has been established in previous studies.[22] In this study, the internal reliability of Cronbach Alpha was 0.86.

Short form 36 (SF-36) is a general health questionnaire consisting of 36 Likert questions with 8 health concepts that assess QOL in: (1)physical function, (2)the physical function limitation as result of physical injury, (3)the role due to emotional problems, (4)energy and vitality, (5)mental health, (6)social function, (7)physical pain, (8)general health.[22] Results of SF-36 range

from 0 (worse outcomes) to 100 (the best outcome) in which the higher scores shows a better quality of life. QOL and its aspects have been classified into 3 groups: appropriate (75-100%), pretty appropriate (50-75%) and inappropriate (less than 50%). Its reliability in present study has been estimated as Cronbach Alpha 0.89.

Visual analogue scale is a 10-centimeter scale in which 0 represents no pain and 10 severe pain. Scores of 1-3 shows slight pain, 4-7 medium pain and 8-10 severe pain. This tool has been used in various studies and its validity and reliability have been confirmed.[23, 24]

Confidentiality of data, informed consent for participation, and the right to resign anywhere during the study were among the moral considerations respected in this research. This study was approved by ethics committee of Medical University of Tabriz (code 5.4.580).

Data were analyzed using Statistical Package for Social Science (SPSS) version13 by descriptive statistics using frequency, mean (SD) as well as inferential statistics using Spearman correlation analysis, Pearson, linear regression, ANOVA, χ^2 and t-test.

Results

This study was performed by participation of 210 patients with RA. Demographic characteristics showed that most of the participants were female (74.8%), married (98%), elementary education (34.8%).

Majority of samples (33.3%) had low knowledge, and (74.3%) have had RA disease more than five years and most (61%) had hospitalization history (Table 1).

The distribution of self-reported sleep disorders are shown in table 2. The participants obtained 40.51(22.94) in QOL, 6.09 (2.14) in pain and 13.14 (5.6) in sleepiness scale.

In different domains of QOL, participants had highest mean (SD) in mental health 47.66 (19.60) and lowest mean (SD) in the physical function 34.71 (24.93) (Table 3).

Results of these analyses indicate that there were significant differences in QOL and different aspects of sleep disorders (Table 4). The impact of sleep problems and pain severity on QOL by linear regression shows significant differences (P<0.001), but pain severity has more effect on QOL (r^2 =0.650) compared to sleep problems (r^2 =0.586) and sleepiness scale (r^2 =0.568). (Figure1)

The relation between QOL and gender has shown significant relationship (P<0.001).

ANOVA showed significant differences in QOL based duration of RA disease, time period and severity of morning signs (p<0.001) marital status (P=0.013). Pearson correlation test indicated significant relation between QOL with age (P=0.02), (r= - 0.16).

χ^2- test presented significant differences between apnea based gender, snoring (P<0.001) and difficulty in falling sleep (P<0.001). There was no significant difference in presence of apnea and overweight (P=0.139) but there was significant difference between apnea and drowsiness (P<0.001). Finally the Spearman test showed significant correlation between pain with all domains of QOL (P<0.001).

Discussion

In this study, different aspects of sleep disorders with QOL have been assessed in patients with RA by self-reported. Results indicated that 78.6% of patients reported sleep disorders. The mean of QOL in patients was 40.5 indicating poor level of QOL among these patients. This represents high rate of dysfunction in physical and general health. In assessment of various domains of QOL, patients reported better mental health compared to other aspects of QOL. In addition, findings demonstrated that sleep problems and pain were associated with poor quality of life in RA patients.

These findings are in line with the literature. Parvan et al., in a study on relation between QOL and sleep showed that poor level in general health had inverse relations with sleep.[25]

Table 1. Distribution of participants according to demographic characteristics (N=210)

Characteristics	N (%)
Sex	
Male	53 (25.2)
Female	157 (74.8)
Marital	
Single	10 (4.8)
Married	191 (91.0)
Divorced	4 (1.9)
Widow	5 (2.4)
Employment	
Employed	63 (30.0)
Unemployed	147 (70.0)
Literature	
Illiterate	50 (23.8)
Elementary	73 (34.8)
Diploma	57 (27.1)
University	30 (14.3)
Length of RA disease	
<5 years	54 (25.7)
5-10 years	73 (34.8)
>10 years	83 (39.5)
Hospitalization history	
Yes	128 (61.0)
No	82(39.0)
Family history of RA	
Yes	75 (35.7)
No	135 (64.3)
Smoking	
Yes	20 (9.5)
No	186 (88.6)
Quit	4 (1.9)
Knowledge about RA	
Very low	55 (26.2)
Low	70 (33.3)
Average	47 (22.4)
A lot	38 (18.1)
Age (Yrs.) Mean (SD)	48.41(12.92)
Weight (Kg) Mean (SD)	72.60 (11.23)

Table 2. Frequency of self-reported sleep disorders using SDQ* (N=210)

Sleep disorders	N (%)
Napping daytime	176 (83.80)
Trouble falling sleep	154 (73.30)
Numbness	148 (70.50)
Snoring	140 (66.70)
Sleep paralysis	132 (62.90)
Kick or twitch feet	117 (55.70)
Palpitation	87 (41.40)
Asphyxia	81 (38.60)
Apnea	25 (11.90)
Sleep terrors	47 (22.40)
Sleep walking	3 (1.40)

*SDQ: Sleep Disorder Questionnaire

Table 3. Distribution of quality of life in participants (N=210)

Quality of life domains	Mean (SD)	CI95%
Physical function	34.71 (24.93)	31.32, 38.10
Physical limitation	39.43 (22.48)	36.37, 42.49
Emotional problems	39.92 (24.52)	36.62, 43.22
Joy/fatigue	40.41 (19.22)	37.80, 43.03
Mental health	47.66 (19.60)	44.99, 50.33
Social function	45.32 (26.46)	41.72, 48.92
Physical pain	42.27 (25.31)	38.82, 45.71
General health	34.42 (21.70)	31.56, 37.29
Total	40.51 (22.94)	37.40, 43.63

Table4. Correlation of sleep disorders with total quality of life in participants (N=210)

Sleep disorders	P	r*
Naps during day	<0.001	-0.73
Apnea	<0.001	-0.56
Asphyxia	<0.001	-0.56
Trouble falling sleep	<0.001	-0.56
Kick or twitch leg	<0.001	-0.41
Awaken during sleep	<0.001	-0.56
Numbness	<0.001	-0.51
Sleep terrors	0.002	-0.21
Somnambulism	0.314	-0.07
Snoring	<0.001	-0.48
Time period to sleep (min)	<0.001	-0.53
Sleeping average (Hrs.)	<0.001	-0.50
Awakening on work times	0.089	-0.11

*r calculated by Spearman test

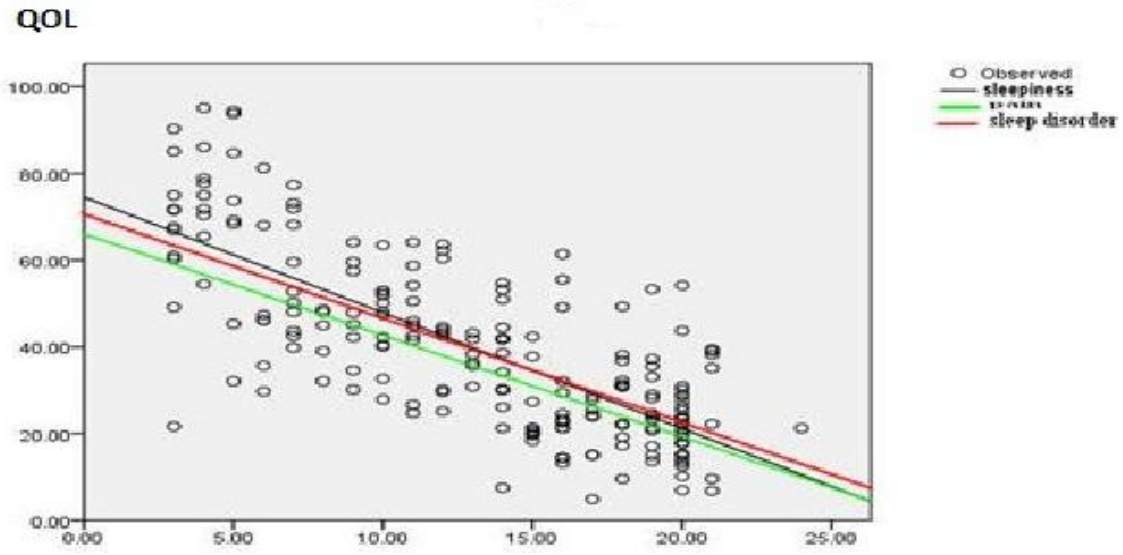

Figure1. Quality of life of participants based sleepiness, pain and sleep problems

Furthermore, Alishiri et al., in Tehran showed an inappropriate general health in RA patients, also they found a significant relationship between general health with sleep and pain severity.[26]

In the current study, 59.5% of the participants had low awareness about nature and complications of illness. In regard to significant relationship between duration of disease and QOL in participants, Masayo kojima et al., indicated a significant relation between duration of disease and number of surgeries related to illness and the QOL.[27]

Furthermore, Monjamed found that 50% of patients had disrupted sleep in her survey about the effect of symptoms on quality of life in patients with RA.[28] Rupp and his colleagues who studied on disability and health-related quality of life, pointed to RA as an effective factor interferes with normal daily activities and sleep.[29]

Also individual character is one of those factors which can be aligned with sleep rhythm and rest, also can be effective on QOL. For instance, results showed that age as an individual character can influence the QOL. In addition, in this study gender had significant relation with QOL. As well as Yardim- Akaydin and collogues indicated this correlation more apparent in females than males.[30]

It seems that marriage could play an effective role in improving their QOL. In this study 91% were married and significant relation obtained between marital status and the QOL. Also Slatkowasky et al., in a study on health-related quality of life in women with symptomatic hand osteoarthritis, indicated significant relation between marriage and QOL.[31]

One of the effective variables on QOL in this study was period of illness, that 40% of patients had more than 10 years history of RA which have had lower QOL comparing to other people with less history of illness. Masayo kojima indicated that high duration of having the illness could be an independent risk factor in decreasing QOL.[27] Most of patients (83.8%) reported taking a nap during daytime that could interfere with influence night sleep pattern.

Furthermore, changes in night sleep pattern are along with alteration in QOL of people. Sariyildiz et al., were concerned with impact of useful and sufficient sleep on physical function and QOL, indicated that disturbance in each stage of sleep had negative influence on QOL and reduces it.[32]

On the other hand pain due to illness, is one of the factors influencing sleep pattern and rest which is significantly effective on people's QOL. This results are consistent with Lee and et al., findings on assessing the role of sleep problems in central pain processing in rheumatoid arthritis.[33] Also a study on sleep and its relationship to pain and disease activity in juvenile idiopathic arthritis indicated meaningful correlation between sleep apnea and insomnia with pain.[34] Night sleep deprivation and pain could be playing a role in reducing the QOL as a factor with interaction effects. In a survey on the relationship between RA activity, sleep, psychiatric distress and pain sensitivity indicated no significant relation between pains with QOL but the sleep disorders had direct and significant relation with pain.[16]

In this study we observed significant difference between QOL with various aspects of sleep. Our findings indicated that there were significant relations between apnea, twitch leg during sleep, numbness of legs with the QOL. It means that increasing the apnea during sleep, night terror and any disturbance in process of night sleep reduces the QOL. Also Neven Fouda indicated that there was significant relationship between sleep apnea and period of illness and patients with RA more suffers from apnea during sleep. It seemed improving sleep conditions could raise QOL of people.[35]

Finally, results indicated that sleep disorders in RA patients are more common, and these results were consistent with Gjever et al., studies who revealed that most patients with RA have sleep disorders.[10]

Furthermore, in this study patients had restless legs syndrome and apnea, which it could be related to the cervical instability.[36] The important aspect is the effects of two factors sleep and pain on QOL which could affect other health related patterns. We investigated what could worsen the QOL: sleep disturbance or pain, that pain severity had more effect. On the other hand, pain severity could impair sleep. In addition sleep disturbances would increase pain. So pain control in RA patients would help to promote their sleep thereupon promotion of the QOL.

Conclusion

Results of this study indicated that pain severity would worsen sleep disorders, which may increase the disease process as well as having negative relations with QOL.

Further studies with large sample size, as well as more careful tools of sleep disorders, would help to generalize results and suggestions. By providing adequate health care, and recognition of the patients' pain conditions we would increase the QOL of RA patients.

Acknowledgments

This study was based on Master Degree of nursing thesis. We would like sincerely thank all patients' participation. Furthermore, we appreciate Tabriz University of Medical Science for their facilities and helps in this study.

Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

References

1. Baker JF, Pullman-Mooar S, Ibrahim S. Management of rheumatoid arthritis. Rheumatology (Oxford) 2014; 53 (10): 1721-2. doi:10.1093/rheumatology/ket477.
2. Cutolo M, Kitas GD, van Riel PL. Burden of disease in treated rheumatoid arthritis patients: going beyond the joint. Semin Arthritis Rheum 2014; 43 (4): 479-88. doi:10.1016/j.semarthrit.2013.08.004.
3. Davatchi F, Jamshidi AR, Banihashemi AT, Gholami J, Forouzanfar MH, Akhlaghi M, et al. WHO-ILAR COPCORD Study (Stage 1, Urban Study) in Iran. J Rheumatol 2008; 35 (7): 1384.
4. Wolfe F, T.Walitt B, S.Katz R, Häuser W. Symptoms, the nature of fibromyalgia, and diagnostic and statistical manual 5 (DSM-5) defined mental illness in patients with rheumatoid arthritis and fibromyalgia. PLoS One 2014; 9 (2): e88740. doi: 10.1371/ journal. pone.0088740
5. Stephenson E, Delongis A, M.Esdaile J, J.Lehman A. Depressive symptoms and rheumatoid arthritis: spouse empathic responding as a buffer. Arthritis Care Res 2014; 66 (4): 532-41. doi:10.1002/acr. 22161.
6. Cappuccio FP, D'Elia L, Strazzullo P, Miller MA. Sleep duration and all-cause mortality: a systematic review and meta-analysis of prospective studies. Sleep 2010; 33 (5): 585-92.
7. Taibi DM, Landis CA, Petry H, V.Vitiello M. A systematic review of valerian as a sleep aid: safe but not effective. Sleep Med Rev 2007; 11 (3): 209- 30. doi: 10.1016/j.smrv.2007.03.002.
8. Moldofsky H. Rheumatic manifestations of sleep disorders. Curr Opin Rheumatol 2010; 22 (1): 59-63. doi: 10.1097/ BOR. 0b0 13e 32 8333b9cc.

9. Gibofsky A. Epidemiology, pathophysiology, and diagnosis of rheumatoid arthritis: A Synopsis. Am J Manag Care 2014; 20 (7 Suppl): s128-45.
10. Gjevre JA, Taylor-Gjevre RM, Nair BV, Lim HJ. Do sleepy rheumatoid arthritis patients have a sleep disorder? Musculoskeletal Care 2012; 10 (4): 187-95. doi: 10.1002/msc.1016
11. Shoda N, Seichi A, Takeshita K, Chikuda H, Ono T, Oka H, et al. Sleep apnea in rheumatoid arthritis patients with occipitocervical lesions: the prevalence and associated radiographic features. Eur Spine J. 2009;18(6):905-10. doi: 10.1007/s00586-009-0975-z.
12. Zhu G, Li Y, Wen PP. Analysis and classification of sleep stages based on difference visibility graphs from a single-channel EEG signal. IEEE J Biomed Health Inform 2014; 18 (6): 1813-21. doi: 10.1109/JBHI.2014.2303991.
13. Chandola T, Ferrie JE, Perski A, Akbaraly T, Marmot MG. The effect of short sleep duration on coronary heart disease risk is greatest among those with sleep disturbance: a prospective study from the Whitehall II cohort. Sleep 2010; 33 (6): 739-44.
14. Pigeon WR, Pinquart M, Conner K. Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. J Clin Psychiatry 2012; 73 (9): e1160-7. doi: 10.4088/JCP. 11r07586.
15. Budhiraja R, Roth T, Hudgel DW, Budhiraja P, Drake CL. Prevalence and polysomnographic correlates of insomnia comorbid with medical disorders. Sleep 2011; 34 (7): 859-67. doi: 10.5665/SLEEP. 1114.
16. Lee YC, Chibnik LB, Lu B, Wasan AD, Edwards RR, Fossel AH, et al. The relationship between disease activity, sleep, psychiatric distress and pain sensitivity in rheumatoid arthritis: a cross-sectional study. Arthritis Res Ther 2009; 11(5): R160. doi: 10.1186/ar2842
17. Abbasi M, Yazdi Z, Rezaie N. Sleep disturbances in patients with rheumatoid arthritis. Niger J Med 2013; 22 (3): 181-6.
18. Ellis SK, Walczyk JJ, Buboltz W, Felix V. The relationship between self-reported sleep quality and reading comprehension skills. Sleep Science 2014; 7 (4): 189-96. doi:10.1016/ j.slsci.2014.12.001.
19. S. Lewandowski A, M. Ward T, M. Palermo t. sleep problems in children and adolescents with common medical conditions. Pediatr Clin North Am 2011; 58 (3): 699-713. doi: 10.1016/j.pcl. 2011. 03.012.
20. Masoudzadeh A, Zanganeh A. Shahbaz nezhad L. Daytime sleepiness in medical students at Mazandaran university of medical sciences, 2003. Journal of Mazandaran University of Medical Sciences 2006; 16 (52): 75-80. (Persian)
21. Rique GLN, Fernandes Filho GMC, Ferreira ADC, de Sousa-Muñoz RL. Relationship between chronotype and quality of sleep in medical students at the Federal University of Paraiba, Brazil. Sleep Science 2014; 7 (2): 96-102. doi: 10.1016/ j.slsci.2014.09.004
22. SooHoo NF, McDonald AP, Seiler JG 3rd, McGillivary GR. Evaluation of the construct validity of the DASH questionnaire by correlation to the SF-36. J Hand Surg Am 2002; 27 (3): 537-41.
23. Lakdizaji S, Zamanzadeh V, Totonchi MZ, Hosseinzadeh A. Impact of Patient-Controlled Analgesia on Pain Relief after Coronary Artery Bypass Graft Surgery: A Randomized Clinical Trial. J caring sci 2012;1(4): 223.
24. Aratake Y, Tanaka K, Wada K, Watanabe M, Katoh N, Sakata Y, et al. Development of Japanese version of the checklist individual strength questionnaire in a working population. J Occup Health 2007; 49 (6): 453-60.
25. Parvan K, Lakdizaji S, Roshangar F, Mostofi M. Quality of sleep and its relationship to quality of life in

hemodialysis patients. J caring sci 2013; 2 (4): 295-304.
26. Alishiri GH, Bayat N, Fathi Ashtiani A, Tavallaii SA, Assari S, Moharamzad Y. Logistic regression models for predicting physical and mental health-related quality of life in rheumatoid arthritis patients. Mod Rheumatol 2008; 18 (6): 601-8. doi: 10.1007/s10165-008-0092-6.
27. Kojima M, Kojima T, Shiguro N, Oguchi T, Oba M, Tsuchiya H, et al. Psychosocial factors, disease status, and quality of life in patients with rheumatoid arthritis. J PSeycho Res 2009. 67(5): 425-31. doi:10.1016/ j.jpsy chores.2009.01.001.
28. Monjamed Z, Razavian F. The effects of disease signs and symptoms on quality of life in patients with rheumatoid arthritis Referred to hospitals of Tehran University of Medical Sciences. Journal of Ghom University of Medical Sciences 2008; 1 (1): 27-35.
29. Rupp I, Boshuizen HC, Dinant HJ, Jacobi CE, van den Bos GA. Disability and health-related quality of life among patients with rheumatoid arthritis: association with radiographic joint damage, disease activity, pain, and depressive symptoms. Scand J Rheumatol 2006; 35 (3): 175-81.
30. Yardim-Akaydin S, Caliskan-Can E, Firat H, Ardic S, Simsek B. Influence of gender on C-reactive protein, fibrinogen, and erythrocyte sedimentation rate in obstructive sleep apnea. Antiinflamm Antiallergy Agents Med Chem 2014; 13 (1): 56-63.
31. Slatkowsky-Christensen B, Mowinckel P, Loge JH, Kvien TK. Health-related quality of life in women with symptomatic hand osteoarthritis: a comparison with rheumatoid arthritis patients, healthy controls, and normative data. Arthritis Rheum 2007; 57 (8): 1404-9
32. Sariyildiz MA, Batmaz I, Bozkurt M, Bez Y, Cetincakmak MG, Ucar D, et al. Sleep quality in rheumatoid arthritis: relationship between the disease severity, depression, functional status and the quality of life. J Clin Med Res 2014; 6 (1): 44-52. doi: 10.4021/jocmr1648w
33. Lee YC, Lu B, Edwards RR, Wasan AD, Nassikas NJ, Clauw DJ, et al. The role of sleep problems in central pain processing in rheumatoid arthritis. Arthritis Rheum. 2013;65(1):59-68. doi: 10.1002/art.37733.
34. Bloom BJ, Owens JA, McGuinn M, Nobile C, Schaeffer L, Alario AJ. Sleep and its relationship to pain, dysfunction, and disease activity in juvenile idiopathic arthritis. J Rheumatol 2002 ; 29 (1): 169-73.
35. Fouda N, Dayem A A. Obstructive sleep apnea in patients with rheumatoid arthritis: Correlation with disease activity and pulmonary function tests. The Egyptian Rheumatologist 2014; 36 (4): 165–71. doi:10.1016/j.ejr.2014.04.002.
36. Chen SY, Wang HH. The relationship between physical function, knowledge of disease, social support and self-care behavior in patients with rheumatoid arthritis. J Nurs Res 2007; 15 (3):183-92.

