

Fatigue and sleep quality in rheumatoid arthritis patients during hospital admission

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Abstract

Objectives: Rheumatoid arthritis (RA) is a systemic disease of connective tissue characterised by chronic course with periods of exacerbation and remission. Even in the early stages of the disease patients report the occurrence of fatigue and sleep disorders. Reduced sleep quality and chronic fatigue are common among patients with rheumatoid arthritis. The aim of the research was to evaluate the severity of fatigue and sleep quality assessment among patients hospitalised with rheumatoid arthritis and to determine the relation between the level of symptoms of fatigue and sleep quality and variables such as: age, gender, disease duration, marital status, applied pharmacological treatment, and pain intensity.

Materials and methods: The study involved 38 patients (12 men and 26 women) hospitalised in the Rheumatologic Ward of the Orthopaedics and Rehabilitation Hospital of the University of Medical Sciences. The average age of the entire group was 56.26 years. Fatigue was evaluated with use of Polish version of Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F), while in order to evaluate sleep quality within the examined group of patients the Pittsburgh Sleep Quality Index (PSQI) was used.

Results: Patients with rheumatoid arthritis in the analysed group have lower sleep quality, and within subjects with such a diagnosis the fatigue is present. The relation was found between fatigue and such variables as: age, illness duration, marital status, applied pharmacological treatment, and severity of pain. Sleep quality within patients with RA is correlated by such variables as: age, gender, applied pharmaceutical treatment, and severity of pain. It was identified that patients with lower sleep quality experience increased levels of fatigue.

Conclusions: There is a need to clarify which factors determine the level of fatigue and sleep quality in patients suffering from RA in future population-based research and to indicate to doctors, nurses, psychologists, and physiotherapists the significance and importance of the problem, which requires specialised and holistic care.

Key words: rheumatoid arthritis, fatigue, sleep quality.

Introduction

Rheumatoid arthritis (RA) is a disease that is the fifth leading cause of death and the most common reason for disability in Europe. The disease affects approximately 1% of the Polish population [1]. Each year there are 8,000–16,000 new cases [2]. Rheumatoid arthritis is more common among young people, and women are affected more frequently than men [3].

Rheumatoid arthritis is a systemic disease of connective tissue, characterised by chronic course with periods of exacerbation and remission. It has an immunologic background characterised by nonspecific inflammation of symmetrical joints in the course of which joint and periarticular structures are destroyed [4].

Even in the early stages of the disease, in addition to symptoms such as joint and muscle pain (chronic pain, of high intensity), decreased appetite, fever, weight loss,

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Submitted: 16.01.2017; Accepted: 22.02.2017

systemic vasculitis, and anaemia (normochromic or hypochromic), patients report the occurrence of fatigue and sleep disorders.

Reduced sleep quality and chronic fatigue are common among patients suffering from rheumatoid arthritis. They contribute to disability, exacerbation of its symptoms, and increased exploitation of health care [5].

Fatigue has a substantial impact on patients' wellbeing and influences overall quality of life. Frequently this symptom is identified as one of the most difficult aspects in patients with RA. Fatigue expression and its effects can be modified by cultural differences. Significant fatigue is reported by 41–80% of RA patients. There are many causes of this symptom. They include disease activity, physical suffering, and applied medical treatment [6].

In patients with rheumatoid arthritis sleep disorders occur secondary to basic disease. It is estimated that the problem affects 54–70% of patients [7]. Deterioration in quality of sleep contributes to the development of cardiovascular diseases, behavioural disorders, depression, and anxiety [8]. Regulation of sleep rhythm and wakefulness engages pro-inflammatory cytokines, i.e. interleukin 1 (IL-1), interleukin 6 (IL-6), interferon γ (IFN- γ), and tumour necrosis factor α (TNF- α). The interdependence of the immune and the neuroendocrine systems with regulation of sleep is also emphasised [9].

Severity of fatigue and sleep quality assessment conducted by a nurse in a group of patients with rheumatoid arthritis should be regularly performed. Knowing the factors influencing fatigue and sleep quality in patients with RA, the nurse is able to adjust the care process to patients affected by the disease in order to provide them with adequate and complex care with the objective of symptom severity reduction and improvement in quality of life.

Aim of the study

The aim of the research was to evaluate the level of fatigue and to determine the quality of sleep among patients with rheumatoid arthritis. Moreover, the aim of the research was to determine the relation between the level of fatigue and sleep quality and variables such as: age, gender, disease duration, marital status, pharmacological treatment used, and pain intensity. The survey also examined whether there is a correlation between fatigue and sleep quality.

Material and methods

Patients

The research involved 38 patients with diagnosed rheumatoid arthritis in accordance with the criteria

established by the American College of Rheumatology (ACR) and European League Against Rheumatism, (EULAR) in 2010 [10, 11], who were hospitalised in the Rheumatology ward of the Orthopaedics and Rehabilitation Hospital of University of Medical Sciences

The study involved 12 male (M) (31.58%) and 26 female (F) (68.42%) patients, between 34 and 78 years of age. The average age of the entire group was 56.26 years. 76.32% of patients were married, 15.79% were widows/widowers, and the remaining 7.89% of patients remained in free marital status. Higher education characterised 21.05% of the patients, secondary education – 36.84%, vocational education – 23.69%, and primary education – 18.42%. The average duration of disease within the patients was 16.32 years. The most numerous group were the subjects with stage II and III of disease according to Steinbrocker [12]. 39.47% of the patients were treated conventionally (NSAIDs, disease-modifying anti-rheumatic drugs – DMARDs, glucocorticosteroids, immunosuppressive agents), whereas 60.53% of respondents used the conventional treatment combined with biological agent treatment (Table I).

Methods

To assess the severity of fatigue the Polish version of the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) [13] questionnaire was used (with the permission of the authors).

The questionnaire consists of five categories: physical state, family and social life, emotional state, functioning in everyday life, and other ailments.

Each category contains several questions concerning given living areas of patients with RA. The patients were asked to circle one digit referring to the last seven days in all 40 asked questions.

Each digit represented:

- 0 – not at all,
- 1 – very little,
- 2 – a little,
- 3 – a lot,
- 4 – extremely.

Individual digits corresponded with the points. In the categories concerning physical state, family and social life, and everyday life functioning the respondents could obtain from 0 to 28 points, in the category referring to emotional state the patient results varied from 0 to 24 points, and when it comes to other ailments connected with experiencing fatigue, from 0 to 52 points.

Results obtained from individual categories were summed up in order to receive a total score. The minimal number of points possible after completion of the FACIT-F questionnaire amounted to 0 points, whereas the maximal number of points possible was 160. The higher the point

Table I. Demographic and clinical characteristics of 38 patients with RA

Variables	Total (n = 38)	F (n = 26)	M (n = 12)
Average age in years (\pm SD)	56.26 (9.87)	57.81 (11.41)	52.92 (10.38)
Marital status, n (%)			
marriage	29 (76.32)	20 (76.93)	9 (75)
widow/widower	6 (15.79)	4 (15.38)	2 (16.67)
single	3 (7.89)	2 (7.69)	1 (8.33)
Education, n (%)			
primary	7 (18.42)	4 (15.38)	3 (25)
secondary	14 (36.84)	9 (34.62)	5 (41.67)
vocational	9 (23.69)	5 (19.23)	4 (33.33)
higher	8 (21.05)	8 (30.77)	0
Average time of RA (\pm SD)	16.32 (6.91)	15.77 (8.06)	17.5 (5.55)
VAS scale (cm) (\pm SD)	5.21 (2.14)	5.48 (2.26)	4.67 (2.03)
Stage of disease according to Steinbrocker, n (%)			
I – early	3	3 (11.54)	0
II – moderate changes	17	11 (42.31)	6 (50)
III – severe changes	16	11 (42.31)	5 (41.67)
IV – terminal	2	1 (3.84)	1 (8.33)
Pharmacological treatment applied, n (%)			
conventional	15 (39.47)	11 (42.31)	4 (33.33)
conventional and biological	23 (60.53)	15 (57.69)	8 (66.67)

RA – rheumatoid arthritis; VAS scale – Visual Analogue Scale

value reached by the respondents, the lower the level of fatigue in patients with RA, while the patients with low number of points were characterised by higher levels of fatigue.

In order to evaluate the quality of sleep among the group of patients with RA the Pittsburgh Sleep Quality Index (PSQI) was used [14] (with the permission of the authors).

The scale consists of 10 questions. The questions refer to typical sleeping habits of patients during the last four-week interval.

The scale allows us to assess the following factors that have an influence on overall sleep quality: sleep duration, sleep disturbing factors, sleep latency (time of falling asleep), disorders in everyday functioning caused by somnolence, sleep efficiency, patient's subjective sleep quality assessment, and the need to use sleeping medications.

The total score obtained from the categories allows us to evaluate sleep quality. The minimal obtainable score is 0 and maximal is 21 points. A result ≤ 5 points refers to good quality of sleep, whereas a result > 5 points refers to poor sleep quality [14].

The intensity of pain was assessed with use of the visual analogue scale (VAS). Patients were asked to mark the point on a 10 cm scale, which corresponds to perceived pain intensity caused by arthritis within the last month. The beginning of the length in "0" point defined lack of pain, while the other end in the point "10" stood for unbearable pain. The distance from "0" was the measure of pain intensity [15].

The research was conducted in the period between 2.10.2015 and 17.03.2016 at the Department of Rheumatology and Internal Diseases.

Participation in the study was conditioned by patient's informed consent. The research was approved by the Ethics Committee.

Statistical analysis

To characterise the examined groups and variables the following measures of descriptive statistics were used: arithmetic average, standard deviation, and fraction rates. During statistical calculations Student's *t*-test for unrelated variables and Mann-Whitney nonparamet-

ric *U* test were used. To investigate the correlation between variables *r*-Spearman and *r*-Pearson correlation coefficients were used. Predetermined significance level $p < 0.05$.

Results

Assessing the level of fatigue, the respondents obtained an average of 92.68 (SD 29.72), of which: F – 89.15 points (SD 31.16) and M – 100.33 points (SD 25.90). The lowest sum of points in the conducted study was 37 points, whereas the highest score was 148 points. Among the women the lowest points the score was 37, while among men it was 62. The highest score among women was 141, whereas among men it was 148 (Table II).

Subsequently, the relation between fatigue occurrence and the following variables was analysed: age, gender, duration of illness, education, marital status, period of illness, pharmacological treatment applied, and the degree of joint pain sensation with respondents assessed using the VAS scale.

The occurrence of correlation between the level of fatigue and age was identified ($r = -0.489$; $p = 0.002$). The perception of fatigue in patients increased with age.

The relations between the level of fatigue and gender was not identified ($r = 0.394$; $p = 0.53$).

The relation between the level of fatigue and duration of illness was found ($r = -0.486$; $p = 0.002$). Patients with longer lasting illness felt greater levels of fatigue compared to respondents with shorter disease duration.

Examination of the relation between experienced fatigue and patient's education did not reveal any association ($r = 0.25$; $p = 0.13$).

Marital status had an influence on felt fatigue ($p = 0.002$). It was observed that married subjects obtained higher scores in the FACIT-F scale, so the severity of fatigue was greater than among unmarried people and widows/widowers.

The relations between the experience of fatigue and period of illness according to Steinbrocker was not identified ($r = -0.233$; $p = 0.16$).

However, the relation between applied pharmacological treatment and feeling of fatigue within patients with RA ($p = 0.05$). Patients treated with conventional pharmacological agents (non-steroidal anti-inflammatory drugs, disease-modifying anti-rheumatic drugs, glucocorticosteroids, immunosuppressive drugs) in connection with biological treatment experienced lower severity of fatigue compared to patients treated only with conventional pharmacological agents.

Answering the research question concerning relations between fatigue and joint pain felt by patients assessed in VAS scale, it was noted that with the significance level < 0.001 the rho-Spearman correlation of fatigue severity and pain severity was -0.586 . It was found that pain severity affected the increase of sensation of fatigue within RA patients (Table III).

The Pittsburgh quality of sleep questionnaire (PSQI) respondents obtained an average of 7.53 points (SD 4.24) – women: 8.69 (SD 4.31), men: 5 (SD 2.86).

Twenty-four (63.16%) of the respondents obtained a score > 5 points, which means that their sleep quality was poor. The group consisted of 19 (79.17%) women and 5 (20.83%) men (Table IV).

Subsequently, the relation was assessed between sleep quality and evaluated variables: age, gender, duration of illness, education, marital status, period of illness, pharmacological treatment applied, and the severity of pain according to the VAS scale (Table V).

The correlation was observed at the level of significance $p < 0.05$ ($r = 0.422$; $p = 0.008$) when it comes to age and sleep quality. Patients in older age had lower quality of sleep.

The relation between sleep quality and gender was confirmed (significance level $p < 0.001$). Women were

Table II. Intensity of fatigue in the examined group of patients with RA

Variables	Total (n = 38)	F (n = 26)	M (n = 12)
Average score obtained by respondents from FACIT-F questionnaire (\pm SD)	92.68 (9.72)	89.15 (31.16)	100.33 (25.90)
Average score obtained in individual categories (\pm SD)			
physical state	15.16 (5.62)	14.23 (6.02)	17.17 (4.20)
family and social life	17.68 (6.56)	17.69 (6.80)	17.67 (6.29)
emotional state	12.71 (5.26)	12.12 (5.11)	14 (5.56)
everyday life functioning	17.84 (7.0)	16.85 (7.59)	20 (5.15)
other ailments	29.29 (12.08)	28.27 (13.62)	31.5 (7.83)

RA – rheumatoid arthritis; FACIT-F questionnaire – Functional Assessment of Chronic Illness Therapy-Fatigue

characterised by lower sleep quality as compared to the examined men.

No relation was confirmed between sleep quality and illness duration ($r = 0.271$; $p = 0.1$), education ($r = 0.151$; $p = 0.37$), marital status ($r = - 2.101$; $p = 0.06$), and period of illness according to Steinbrocker ($r = 0.113$; $p = 0.5$).

Correlation was confirmed ($r = 1.129$; $p < 0.001$) between sleep quality and applied pharmaceutical treatment. Patients treated with conventional medications (NSAIDs, disease-modifying anti-rheumatic drugs, glucocorticosteroids, immunosuppressive drugs) in combination with biological drugs demonstrated higher quality of sleep compared to patients who received conventional drugs.

A statistically significant correlation was found ($r = 0.669$; $p < 0.001$) between sleep quality and joint pain severity according to the VAS scale. Respondents who experienced higher pain severity had lower sleep quality.

A correlation was found ($r = -0.625$; $p < 0.001$) between fatigue occurrence (FACIT-F) and quality of sleep (Pittsburgh PSQI sleep quality questionnaire). Patients with lower quality of sleep experienced fatigue on a higher level.

Discussion

The researches confirmed previous reports of other researchers [16–18] that patients with longer medical history feel greater fatigue than subjects suffering the illness for a shorter period of time.

Gossec et al. [17] showed that the high level of fatigue felt by patients during hospital admission results mainly from the overall state of patients and from psychological stress associated with the disease activity.

Pain and impact of pharmacotherapy are factors related to the occurrence and severity of fatigue [19–22]. The severity of pain affects the growth of fatigue perceived by patients. In accordance with Madsen et al. [20], fatigue appeared to be positively correlated with the patients joint pain and with elevated markers of inflammation (ESR and CRP) and disease activity. Fatigue is not affected by the duration of the disease and swelling in joints. According to the results of Madsen et al. [20], pain is the dominant factor of fatigue, which increases the degree of its perception by the patient. Disease activity is positively correlated with fatigue but does not significantly contribute to the level of its perception when the pain symptoms do not occur or are optimally reduced [20].

According to our results, RA therapy that is based on the combined administration of anti-inflammatory drugs, disease-modifying anti-rheumatic drugs, immunosuppressant drugs, and biological drugs gives a re-

Table III. Relation between occurrence of fatigue and investigated variables

Variables	Fatigue at patients with RA assessed on the basis of FACIT-F scale
Age	$r = -0.489^*$
Gender	$Z = 0.394$
Duration of illness	$r = -0.486^*$
Education	$Z = 0.25$
Marital status	$Z = 3.26^*$
Period of illness (according to Steinbrocker)	$Z = -0.233$
Applied pharmacological treatment	$Z = -1.538^*$
Joint pain according to VAS scale	$r = -0.586^{**}$

Significance level $*p < 0.05$, $**p < 0.001$

RA – rheumatoid arthritis; FACIT-F questionnaire – Functional Assessment of Chronic Illness Therapy-Fatigue; Z – test statistic (Mann-Whitney U test); r – correlation coefficient; VAS scale – Visual Analogue Scale

duction in severity of fatigue compared to conventional treatment.

The fatigue in RA also interested Steenbergen et al. [23], who pointed out that it is a common problem among patients; however, it is very rarely investigated and its degree of correlation with inflammation is unclear. Research lasting eight years led the authors to the following conclusions: the relation between inflammation and fatigue is statistically significant, but its impact on fatigue is low, which suggests participation of other pathomechanisms in its perception.

Those authors present a different view when it comes to the importance of the type of therapy in the severity of fatigue. They claim that methods of treatment do not have an impact on decreased fatigue perception among the patients. However, they evaluated that contemporary strategies of treatment involve lower intensity of radiographic progression, which is associated with higher quality of life of patients suffering from rheumatoid arthritis [21].

Our research confirmed the correlation between fatigue and age of patients and their marital status. Among patients with RA the symptom increased with age. It was observed that fatigue within married subjects was not as severe as within singles and widows/widowers. Similar studies evaluating the relation of socio-demographic factors and severity of fatigue have not been found in the literature.

Table IV. Sleep quality in examined group of patients with RA

Variables	Total (n = 38)	Women (n = 26)	Men (n = 12)
Average score obtained by respondents from PSQI questionnaire (\pm SD)	7.53 (4.24)	8.69 (4.31)	5 (2.86)
Sleep latency (min) (\pm SD)	42.11 (36.29)	50 (40.60)	25 (14.77)
Sleep duration (h) (\pm SD)	7.2 (1.1)	7.05 (1.19)	7.03 (1.35)
Subjective sleep quality, n (%)			
very good	4 (10.53)	1 (3.85)	3 (25)
fairly good	19 (50)	13 (50)	6 (50)
fairly bad	11 (28.94)	8 (30.77)	3 (25)
very bad	4 (10.53)	4 (15.38)	0
Habitual sleep efficiency, n (%)			
not during the past month	13 (34.21)	8 (30.77)	5 (41.67)
less than once a week	8 (21.05)	5 (19.23)	3 (25)
once or twice a week	11 (28.95)	8 (30.77)	3 (25)
three or more times a week	6 (15.79)	5 (19.23)	1 (8.33)
Sleep disturbances, n (%)			
not during the past month	2 (5.27)	0	2 (16.67)
less than once a week	18 (47.37)	11 (42.31)	7 (58.33)
once or twice a week	15 (39.47)	13 (50)	2 (16.67)
three or more times a week	3 (7.89)	2 (7.69)	1 (8.33)
Use of sleeping medication, n (%)			
not during the past month	28 (73.69)	19 (73.08)	9 (75)
less than once a week	5 (13.16)	4 (15.38)	1 (8.33)
once or twice a week	2 (5.26)	1 (3.85)	1 (8.33)
three or more times a week	3 (7.89)	2 (7.69)	1 (8.33)
Daytime dysfunction, n (%)			
not during the past month	28 (73.69)	20 (76.92)	8 (66.67)
less than once a week	6 (15.79)	3 (11.54)	3 (25)
once or twice a week	1 (2.63)	1 (3.85)	0
three or more times a week	3 (7.89)	2 (7.69)	1 (8.33)

RA – rheumatoid arthritis; PSQI questionnaire – Pittsburgh Sleep Quality Index

Our studies revealed that patients with rheumatoid arthritis suffer from low sleep quality. Loppenthin et al. [24] evaluated sleep quality in patients with RA using the Pittsburgh sleep quality (PSQI) questionnaire. In 61% (PSQI > 5) poor quality of sleep was found. The authors of the study indicate a linear relationship between sleep disorders in patients and mental fatigue, reduced activity associated with fatigue, physical fatigue, and general

fatigue. They pointed out that mental and general fatigue were independently associated with quality and sleep efficiency, its duration, sleep latency, and daytime disorders in the functioning of patients [24]. The results of other researchers confirm the results obtained on sleep quality among Polish patients.

Sarivildiz et al. [25] conducted a study which aimed to evaluate sleep quality and related variables. The study

involved 94 patients with diagnosed RA and 52 healthy subjects. The PSQI questionnaire was used to assess sleep disturbances. Patients suffering from rheumatoid arthritis obtained significantly higher results in the following categories: subjective sleep quality, sleep latency, habitual sleep efficiency, sleep disturbances, and total PSQI score, when compared to a healthy control group. These studies indicate the relation between age, disease activity, CRP, pain, fatigue, depression, functional impairment, quality of life, radiation damage, menopause, duration of morning stiffness, ESR levels, and sleep disorders. The authors came to conclusion that sleep quality is lower in patients with RA when compared to a group of healthy subjects, and that quality of sleep is significantly affected by disease activity and depression [25].

Low sleep quality is affected by several factors; however, the most frequent cause repeated in numerous studies is pain [8]. This thesis is consistent with the results obtained in our research. It was found that subjects who experience greater pain intensity have lower quality of sleep.

Purabdollah et al. [8] conducted their studies in a group of patients in clinics of Tabriz University of Medical Science in Iran. They reported that pain, fatigue, and sleep disturbances led to reduced quality of life, mood disorders, and disturbances in performing certain activities. Problems associated with a decreased quality of life increase with age and with the coexistence of other chronic diseases.

Moreover, in accordance with the authors, decrease of sleep quality within the group of patients with RA increased with age [8]. Aged patients with rheumatoid arthritis experience lower quality of sleep.

Our studies indicate the relation between quality of sleep and gender and applied pharmacological treatment. Sleep quality within women with RA is lower than within men. Patients treated with conventional medications together with biological treatment experience better sleep quality than patients treated only with conventional medications.

Our studies indicate that the severity of fatigue correlates with sleep disorders in patients; subjects who presented lower quality of sleep experienced greater fatigue. Confirmation of this result is found in the research of Loppenthin [24].

Ignoring the problem of fatigue and poor sleep quality in RA patients deteriorates physical, mental, and social functioning, which contributes to the worsening of disease symptoms.

Conclusions

Patients with rheumatoid arthritis present poorer sleep quality and the existence of fatigue.

Table V. Relation between sleep quality and evaluated variables

Variables	Sleep quality assessed with PSQI questionnaire
Age	$r = 0.422^*$
Gender	$Z = -0.184^*$
Duration of illness	$r = 0.271$
Education	$Z = 0.151$
Marital status	$Z = -2.101$
Period of illness (according to Steinbrocker)	$Z = 0.113$
Applied pharmacological treatment	$Z = 1.129^{**}$
Joint pain according to VAS scale	$r = 0.669^{**}$

Significance level $*p < 0.05$, $**p < 0.001$

RA – rheumatoid arthritis; PSQI questionnaire – Pittsburgh Sleep Quality Index; VAS scale – Visual Analogue Scale; Z – test statistic (Mann-Whitney U test); r – correlation coefficient

The relation of fatigue with the following variables was defined: age, duration of illness, marital status, applied pharmaceutical treatment, and joint pain severity.

A relation exists between sleep quality and the following variables: age, gender, applied pharmaceutical treatment, and pain severity.

Among patients with RA there is a correlation between fatigue and sleep quality. Patients who experience poorer sleep quality feel greater severity of fatigue.

It is essential for patients with RA to reduce the severity of disease symptoms because controlling them can have an impact on reduction of fatigue and can improve sleep quality.

There is a need to clarify which factors determine the fatigue level and sleep quality with patients suffering from RA and to indicate to doctors, nurses, psychologists, and physiotherapists the significance and importance of the problem, which requires specialised and holistic care.

The authors declare no conflict of interest.

References

1. Rutkowska-Sak L, Moskalewicz B. Projekt strategii wczesnej diagnostyki reumatoidalnego zapalenia stawów. *Reumatologia* 2007; 45: 64-66.
2. Kontny E. Patogeneza reumatoidalnego zapalenia stawów. Część I – Odpowiedź nabyta, uwarunkowania genetyczne i środowiskowe. *Reumatologia* 2011; 49: 47-54.

3. Ostanek M, Ciechanowicz A. Czynniki genetyczne w patogenezie reumatoidalnego zapalenia stawów. *Reumatologia* 2009; 47: 143-150.
4. Zimmermann-Górska I. Uogólnione choroby tkanki łącznej. In: *Choroby reumatyczne. Podręcznik dla studentów*. Zimmermann-Górska I (ed.). Wydawnictwo Lekarskie PZWL, Warszawa 2004: 143-163.
5. Durcan L, Wilson F, Cunnane G. The effect of exercise on sleep and fatigue in rheumatoid arthritis: a randomized controlled study. *J Rheumatol* 2014; 41: 1966-1973.
6. Mortada M, Abdul-Sattar A, Gosec L. Fatigue in Egyptian patients with rheumatic diseases: a qualitative study. *Health Qual Life Out* 2015; 13: 134-142.
7. Bourguignon C, Lahyak SE, Talbi D. Investigating sleep disturbances in adults with rheumatoid arthritis. *Holist Nurs Pract* 2003; 17: 241-247.
8. Purabdollah M, Lakdizaji S, Rahmani A, et al. Relationship between Sleep Disorders, Pain and Quality of Life in Patients with Rheumatoid Arthritis. *Scand J Caring Sci* 2015; 4: 233-241.
9. Wrońska A, Nowicki Z, Jakitowicz J. Zaburzenia snu w chorobach tkanki łącznej. *Sen* 2006; 6: 21-29.
10. Hochberg M. The American College of Rheumatology. Revised criteria for the classification of global functional status in rheumatoid arthritis. *Arthritis Rheum* 1991; 35: 498-502.
11. Stanisławska-Biernat E, Sierakowska M, Sierakowski S. Nowe kryteria klasyfikacyjne reumatoidalnego zapalenia stawów. *Reumatologia* 2010; 48: 361-365.
12. Steinbrocker O, Traeger C, Batterman, R. Therapeutic criteria in rheumatoid arthritis. *Am J Med Assoc* 1949; 140: 659-661.
13. Chadran V, Bhella S, Schentag C, Gladman DD. Functional assessment of chronic illness therapy – fatigue scale is valid in patients with psoriatic arthritis. *Ann Rheum Dis* 2007; 66: 936-939.
14. Buysse D, Reynolds C, Monk T, et al. The Pittsburgh Sleep Quality Index: A New Instrument for Psychiatric Practice and Research. *Psychiatry Res* 1988; 28: 193-213.
15. Huskisson EC. Measurement of pain. *Lancet* 1974; 9: 1127-1131.
16. Fitzpatrick R. The measurement of health status and quality of life in rheumatologic disorders. *Baill Clin Rheum* 1993; 7: 207-317.
17. Gossec L, Steinberg G, Rouanet S, Combe B. Fatigue in rheumatoid arthritis: quantitative findings on the efficacy of tocilizumab and on factors associated with fatigue. The French multicentre prospective PEPS Study. *Clin Exp Rheumatol* 2015; 33: 664-670.
18. Wiśłowska M, Kanecki K, Tyszko K, et al. Jakość życia zależna od zdrowia u pacjentów z reumatoidalnym zapaleniem stawów. *Reumatologia* 2010; 48: 104-111.
19. Hifinger M, Putrik P, Ramiro S, et al. In addition to individual demographic and clinical measures, levels of fatigue are dependent on country of residence. An analysis among 3920 patients from 17 countries (the COMORA study). *Ann Rheum Dis, Suppl* 2014; 2: 73.
20. Madsen SG, Danneskiold-Samsøe B, Stockmarr A, Bartels EM. Correlations between fatigue and disease duration, disease activity, and pain in patients with rheumatoid arthritis: a systematic review. *J Rheumatol* 2016; 45: 255-261.
21. Olsen CL, Lie E, Kvien TK, Zangi HA. Predictors of fatigue in rheumatoid arthritis patients in remission or low disease activity. *Arthritis Care Res* 2015; 30: 2151-4658.
22. Wysocka-Skurska I, Sierakowska M, Sierakowski S. Ocena jakości życia pacjentów z reumatoidalnym zapaleniem stawów w zależności od stosowanej terapii farmakologicznej. *Reumatologia* 2012; 50: 16-23.
23. Steenbergen HW, Tsonaka R, Huizinga TW, et al. Fatigue in rheumatoid arthritis; a persistent problem: a large longitudinal study. *RMD Open* 2015; 4: 1-9.
24. Loppenthin K, Esbensen BA, Jennum P, et al. Sleep quality and correlates of poor sleep in patients with rheumatoid arthritis. *Clin Rheumatol* 2015; 34: 2029-2039.
25. Sarivildiz MA, Batmaz I, Bozkurt M, 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: 44-52.