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The Quality of Life Difference between Smoker and Non Smoker Rheumatoid Arthritis and Ankylosing Spondylitis Patients

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Abstract

Objective: We aimed to investigate the effect of smoking on the life quality of patients with Rheumatoid arthritis (RA) and Ankylosing spondylitis (AS).

Materials and Method: Our study was carried out on 79 (54.5%) RA and 66 (45.5%) AS patients that were followed by Ondokuz Mayis University Medical Faculty Hospital between March 2014 and July 2014. Since these patients were grouped as study (smokers) and control (non-smokers). Both of these groups were applied a questionnaire including certain demographic features, disease history, SF-36 and EQ-5D general quality of life scale. Both groups' quality of life is compared with each other.

Findings: Of the 145 patients, 54.5% (n=79) of the participants were females. The mean age of RA and RA patients was found as 49.6 ± 12.9 years and 39.5 ± 12.7 years (t=4.712, p<0.001). 39.2 % of the RA and 50.0% of the AS patients were active smokers. The average cigarette consumption of RA and AS patients was 17.94 ± 14.73 and 13.03 ± 9.50 packet/year respectively. First symptoms of disease were initiated 5 years earlier in RA and 7 years in AS patients who smoked patients compared with no smokers (Respectively t=2.214, t=1.9965, p<0.001). There was no statistical difference between the scores of SF-36, sub-groups of SF-36 and EQ-5D scale between smoker and non-smoker RA and AS patients (p>0.05).

Conclusion: Although we found no relation between quality of life and smoking in RA and AS patients, our study revealed that smoker AR and AS patients' initial symptoms begin much earlier compared with non-smokers. More studies needed to investigate the effects of smoking in AR and AS patients are needed.

Keywords: Quality of life; Smoking; Rheumatoid arthritis; Ankylosing spondylitis; SF-36; EQ-5D; Inflammation

Introduction

Many health problems await individuals who have chronic exposure to cigarette smoke, being either an addicted or passive smoker [1]. Approximately six million people die from direct or indirect effects of smoking each year across the world, with a number of much more suffering from serious diseases including various types of cancer, chronical obstructive lung disease (COLD) and coronary heart disease [2]. Cigarette smoke induces or causes to several diseases due to a number of about 4000 chemical materials such as toluene and arsenic [3]. Many systems and organs are affected by these toxic materials however musculoskeletal system is considered to be one of the most severely effected [4]. In both etiological and morbidity aspects, an association has been shown between cigarette smoke, and rheumatoid arthritis (RA) and ankylosing spondylitis (AS), being the most crucial chronically musculoskeletal degenerative diseases [5,6]. In particular, several research pointed out an increased etiological risk between RA and smoking [7]. It has been shown that smoking has an adverse effect on disease activity by means of induced retaining of lungs in RA [7,8]. AS has also been suggested to emerge further severe lung conditions with emphysema due to smoking and closed costasternal joints as well as having adverse effects leading to increased level of osteoporosis [9]. Smoking not only increases the risk for developing a disease, but it affects the severity of the disease. The risk for developing RA increases directly in proportion to the numbers of package/year. The association depends on the dose intake and it is much evident in those who are highly addicted to smoking. Although there are some findings suggesting increased severity of the disease with smoking, the mechanism is still unclear [10]. Smoking leads to deteriorated life quality in AS patients by reactivating the disease more frequently as well as destroying the physical functions. While typical symptoms of the disease including low back pain and morning stiffness are associated with active smoking, disease-induced injuries and deformations are related to smoking in past [11]. In subjects diagnosed with AS, it is known that smoking limits Lumbar Schober test, finger – floor distance, occiput – wall distance and total spinal motions [12].

In consideration of these clinical data, it may be asserted that smoke addiction is likely to adversely affect on the life qualities of patients with RA and AS. The present study is designed so as to investigate how smoking addiction affects on the life-quality related to inflammatory diseases in Turkish patients with RA and SA who applied to Ondokuz Mayıs University Medical Faculty Hospital.

Materials and Methods

Study design

The study is designed as a retrospective case control study. Power analysis was performed in order to determine total number of the participants. The Power is accepted as 80% (Type II error range 20%). The minimal accepted level of Type I error range is accepted as 5%. Accordingly, in our country, the incidence of smoking addiction in subjects over 18 years old was considered 50.6% in men and 16.6% in women regarding to the general population in Turkey [13],while the incidence of RA and AS was evaluated as 1.2% [14,15]. Thus, the minimal numbers of participants were calculated as 140 (75 RA and 65 AS) subjects. The present study was performed with the patients of AS and RA in Ondokuz Mayıs University Medical Faculty Hospital between March 1, 2014 and July 31, 2014. A total of 145 subjects were included in the study on voluntary basis who were diagnosed as RA and AS with a recent smoking history of at least one year, or those who expressed not to have been smoking for at least 5 years. As a consequent, a total of 7 subjects were excluded from the study sample, five of whom expressed to have started smoking more than 1 year, and the remaining 2 subjects for having quitted smoking more than 5 years. Firstly, a questionnaire was carried out to the participants in order to investigate their demographical and overall health conditions. By using this questionnaire, several sociodemographic parameters of the patients were assessed including age, gender, height, weight, body mass index, age at onset of complaints related to the disease, any use of alcohol and cigarette, (if he/she smokes) age at onset of smoking, status of menopause, and status of contraceptive pill usage. The patients meeting the inclusion criteria in the research were divided into two categories as the study group (smokers) and the control (non-smokers). The smoking history of patients and their characteristics were questioned. Information such as age at onset of smoking, how long and how often they smoke, any attempts to quit smoking etc. were all investigated. This group was applied Fagerstrom Test for Nicotine Dependence and the degree of their addiction was measured. SF-36 and EQ-5D overall life scales were applied to assess the life quality in both groups. Of the subjects, anthropometric measurements were performed and their waist circumference and body mass index (BMI) were calculated. The data were analyzed comparatively. Fagerstrom Test for Nicotine Dependence was applied to patients in the study in an effort to measure their degree of addiction and, thus any relationship between the degree of addiction and life-quality was investigated. Subsequently, the differences in life quality between the two groups were statistically analyzed.

The Tools Used in the Study

The Short Form (SF) 36 Questionnaire

With a generic scaling feature in life-quality scales providing a wide-angle measurement, Short Form–36 was developed in 1992 by the Rand Corporation and introduced into usage [16]. It has eight subscales (physical role, pain, health perception, vitality, social function, emotional role and mental health). Kocyigit et al [17] studied the reliability and validity of the Turkish version of the SF-36. SF-36 subscales grouped according to the Question Numbers were obtained by Arat [18]. There is no specific cut point of the test. The participants have better quality of life with the higher results from the test.

EQ-5D VAS Scale

EQ-5D is a generic health scale used to measure the life-quality, developed by Western European Quality of Life Research Group (EuroQol) in 1987. EQ-5D generic health scale has been translated into more than 60 languages, one of which is Turkish language by EuroQol Group. It was first published in 1990, without any change in its feature (5 dimensions) consisting of mobility, self-care, usual activities, pain/discomfort and anxiety/depression since the year 1991. The answers given to each dimension have three options including "No problem", " I have a little problem", and "Major problems". The higher the test scores, the more the quality of life increases [19]. In VAS scale, the subjects evaluate their own health status between 0 and 100 scores, where "0" accounts for poor health status and "100" indicates the status of good health.

Fagerstrom Test for Nicotine Dependence

Heatherton et al. [20] modified Fagerstrom Tolerance Test in 1991. Fagerstrom Test for Nicotine Dependence (FTND) was reported to have better internal consistency being answered more easily comparing to the Fagerstrom Tolerance Test. The reliability of Fagerstrom test for nicotine dependence has been found as moderate in a study conducted in Turkey in 2004, and it was concluded to be feasible in smoking cessation clinics in Turkey. Regarding to the overall logic of this test, the number of cigarettes smoked and the degree of endurance without smoking in a certain time are examined. The survey consists of 6 questions with scores ranging from 0 to 10. It is supposed that increased scores indicate to an increased degree of smoking addiction. A few methods have been proposed for grouping the level of dependence based on the scores. The most detailed grouping: evaluates the scores between 0 and 2 as equal to "very low level of addiction", 3 and 4 as "Low level of addiction", 5 as "moderate addiction", 6 and 7 as "Highly addictive" and 8 and 10 as "ultimately addictive" [21].

Statistical analyses

The data analysis was performed by using SPSS (Statistical Package for Social Sciences) version 15.0. Descriptive statistics for continuous variable were expressed as mean, standard deviation, minimum and maximum values, while numbers and percentage were used for categorical variables. Chi-square testing for determining the relationships between groups and categorical variables, T-test for comparing the means of the dual groups, One Way ANOVA for comparing the means of the groups in terms of continuous variables, and Pearson correlation coefficient for determining the relationship among continuous variables under parametric conditions were all calculated. Kolmogorov-Smirnov test for ensuring data in compliance to normal distribution, and Bonferoni-corrected Mann-Whitney U test under inability to ensure parametrical conditions were used. The factors that may affect the life-quality of smoking and non-smoking patients with AS and RA were investigated using Logistical Regression Analysis. Statistically significance level was considered as $p<0.05$.

Ethical approval

The ethical approval for the present study was issued by the Ethical Committee of Ondokuz Mayıs University Medical Faculty Hospital.

Results

The demographic, anthropometric, disease and smoking characteristics of the participants are shown in Table 1. When evaluated the mean age of participants, it was observed that the patients with RA were 10 years older than those with AS (p<0.001). Similarly, the first symptoms of RA patients were emerged 10 years later as compared to those diagnosed with AS (t=4.400, p<0.001). No notably correlation between the onset of disease symptoms and the age at onset of smoking was found in smokers (r=-0.004, p=0.953). The distribution of subsets belonging to SF-36, EQ-5D and Fagerstrom tests were uniform (p<0.001, p<0.001, and p<0.001 respectively). Four subset scales of SF-36 life quality test (physical function, bodily pain, overall health perception, and vitality) could account for 66 % of the changes in EQ-5D scale scores (adjusted R^2 = 0.66), when examined the effects of scores obtained from EQ-5D life quality scale on the subsets of SF-36 life quality survey by means of a multi-regression model. Accordingly, while the EQ-5D index score increased, patients' scores for physical function, bodily pain, overall health perception, and vitality were also increased. No significant results were obtained from the regression model analyzing the relationship between sociodemographic characteristics of the patients and SF-36 and EQ-5D (p>0.05, Adjusted R^2 = 0.057).

Variables	**Diagnose (RA)**	**Diagnose (AS)**	**P , t, x^2 values**
Men (n) **Women (n)**	24 55	42 24	x2= 0,214 p= 0,324
Mean age	49,65 ± 12,92	39,56 ± 12,72	t=4,712 p<0,001
Height (cm) **Weight (kg)** **BMI (kg/m^2)** **Waist circumference (cm)** **Male** **Female**	162,24 ± 7,690 79,94 ± 14,44 30,47 ± 5,80 107 ± 2,8 91 ± 1,8	166,50 ± 8,633 75,23 ± 10,28 27,23 ± 3,86 105 ± 2,1 89 ± 2,7	t=3,141 p=0,002 t=2,219 p=0,028 t=3,880 p<0,01 t=2,894, p<0,01 t=2,897, p<0,001
Package/year	17,94 ± 14,73	13,03 ± 9,5	t=0,125, p=0,321
Fagerstrom Dependence Test Scores	2,65 ± 2,58	2,36 ± 2,24	t=0,225, p=0,124
Age at onset of smoking	15,65 ± 2,2	14,98 ± 1,9	t=0,25, p=0,452
Smoker **Alcohol (+)**	%39,2 (n=31) %7,6 (n=6)	%50 (n=33) %13,6 (n=9)	x2= 1,124 p=0,24 x2=0,895 p=0,28
BMI Smoker(kg/m^2) **BMI non-smoker (kg/m^2)**	27,94 ± 3,9 * 32,11 ± 6,25 *	26,85 ± 3,7 ** 27,60 ± 4,0 **	*t= 3,312 p<0,001 **t=0,786 p=0,434
Age at onset of symptoms **Smoker** **Non-smoker**	39,13 ± 13,26 35,21 ± 1,8 40,01 ± 2,0	29,97 ± 11,47 25,12 ± 12,2 32,12 ± 10,21	t=4,400 p<0,001 t=2,214, p<0,001 t=1,965, p<0,001

Table 1: Some characteristics of sociodemographic, anthropometric and smoking related to the subjects.

According to the analyses, BMI values were found to be 27.94 ± 3.9 kg/m^2 in RA patients who smoke, and 32.11 ± 6.25 kg/m^2 in non-smoker RA patients (t=3.312, p<0.001). A similar relationship has not been observed on the BMI of patients with AS (26.85 ± 3.7 for smokers, 27.6 ± 4.0 kg/m^2 for non-smokers) (t=0.786, p=0.434). When examined the participants, it was seen a direct relationship between the SF-36 total score and the age of onset of symptoms related to the disease. Smoking patients with RA denoted that their symptoms had emerged about 5 years ago, while those with AS stated 7 years earlier than non-smokers. The earlier the onset of disease symptoms emerged, the lower scores the subjects obtained from SF-36 test (x^2=-0.181, p=0.030). In our patients, a statistically significant relationship between the age at onset of complaints related to the disease and the amount of cigarettes they had smoked by that time (package/years) was found (r=0.212, p<0.01). There was also a medium correlation between emergence of an early disease symptom and those who smoke much (r=0.419, p<0.001). Table 2 shows the subscales of SF-36 life-quality scale and EQ-5D score means in patients with AS and RA as comparison.

	RA	AS	U and p values
SF-36 Physical Function	49,55 ± 29,49	61,74 ± 27,56	1963 0,010
SF-36 Physical Role	31,64 ± 44,52	50,74 ± 44,71	1983 0,007
SF-36 Pain	51,64 ± 25,27	60,77 ± 25,89	2114 0,048
SF-36 Overall Health Perception	42,96 ± 20,65	49,13 ± 19,63	2145 0,066

SF-36 Vitality	43,79 ± 19,33	49,39 ± 21,63	2185 0,093
SF-36 Social Function	52,37 ± 25,08	65,53 ± 26,13	1851 0,002
SF-36 Emotional Role	49,78 ± 48,00	58,08 ± 47,97	2386 0,329
SF-36 Mental Health	55,79 ± 15,76	57,45 ± 19,28	2505 0,677
EQ-5D	0,376 ± 0,1	0,429 ± 0,1	2211 0,115

Table 2: The relationship between the mean scores of EQ-5D and SF-36 life-quality subscales in patients with RA and AS.

For the patients with RA, the mean scores from physical functionality, bodily pain, role-physical, and social functionality belonging to the SF-36 quality of life subscales were significantly lower than patients with ankylosing spondylitis. There was no statistical association between the scores of SF-36 (t=0.158 p=0.065) and EQ-5D (t=0.874, p=0.096) from smoker and non-smoker patients. In smoking patients, no relationship was found between either FNDT or package/year scores or SF-36 (t=0.654 p=0.148 and t=0.125, p=0.658) and EQ-5D (t=0.456 p=0.214 and t=0.044, p=0.658). For each patient with RA and AS, binary logistical regression models were created investigating the statistical significance level of age, the SF-36 total score, EQ-5D total score, EQ-5D general health perception score, weight, height, BMI, the age at onset of disease symptoms in patients smoking and not smoking. These logistic regression models have been shown in Tables 3 and 4. According to this model, there was not found any relationship between the status of smoking and non-smoking in terms of those variables (p>0.05).

Variables	**B**	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**95.0% C.I.for EXP(B)**	
	Lower	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**
Age	.019	.040	.212	1	.645	1.019	.941	1.102
SF-36	.113	.169	.448	1	.503	1.120	.804	1.558
EQ-5D	-.241	.256	.883	1	.347	.786	.476	1.298
Weight	-.063	.273	.053	1	.817	.939	.549	1.604
Length	.133	.257	.269	1	.604	1.143	.691	1.890
BMI	.035	.712	.002	1	.960	1.036	.257	4.183
D.Age*	-.038	.037	1.049	1	.306	.963	.895	1.035
EQ-5D Percentage†	-.012	.025	.237	1	.626	.988	.940	1.038
Constant	-16.426	40.541	.164	1	.685	.000		

Table 3: The binary regresson model investigating the relationship between smoking with quality of life (SF-36, EQ-5D) and other variables in RA patients. *The age at onset of disease symptoms in patients. †The general health perspective percentage in EQ-5D patients.

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
Variables	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Age	0.03	0.04	0.549	1	0.459	1.03	0.952	1.115
SF-36	0.154	0.15	1.057	1	0.304	1.166	0.87	1.564
EQ-5D	-0.019	0.179	0.011	1	0.916	0.981	0.691	1.393
Weight	0.053	0.281	0.036	1	0.849	1.055	0.608	1.83
Lenght	0.021	0.257	0.006	1	0.936	1.021	0.617	1.689
BMI	-0.115	0.771	0.022	1	0.881	0.891	0.197	4.039
D.Age*	-0.052	0.042	1.519	1	0.218	0.949	0.874	1.031
EQ-5D Percentage†	-0.01	0.021	0.232	1	0.63	0.99	0.949	1.032
Constant	-5.162	42.259	0.015	1	0.903	0.006		

Table 4: The binary regresson model investigating the relationship between smoking with quality of life (SF-36, EQ-5D) and other variables in AS patients. *The age at onset of disease symptoms in patients. †The general health perspective percentage in EQ-5D patients.

Discussion

Very interesting results were obtained from our study to investigate the quality of life of patients both smoking and non-smoking. First of all, our study revealed a high smoking ratio between AR and AS patients (39.2% of RA, 50% of AS). When evaluated according to gender, 22.8% of women (n=18) and 69.7% of men (n=46) were smokers. Fallah et al. [22] reported in their study that the smoking rate among patients with AS was 29.4%, while Hazes et al. [7] reported the rate of smoking in patients with RA as 33.0%. Again, Hazes et al reported in their study that the alcohol consumption in patients with RA was 23.0%, while the rate in our study was only 7.6%. These results were higher than the general population as a total of 31.2% of adults aged 15 and over in Turkey are smokers (47.9% among men and 15.2% for women) [23].

Our results revealed that a direct use of tobacco has no effects on quality of life of both patients with RA and AS. Patients were selected in a way to prevent the formation of bias and retention side on power analysis. Considering the fact that most smokers are male and that the quality of life scores in males are higher, it was first thought that gender had a confusing effect; however, it was then observed that the situation did not change when stratification by gender was achieved. Smoking patients are approximately 4 years younger than those non-smokers (42.64 ± 13.3 vs. 46.9 ± 13.8 years). These factors in the regression analysis examining the sociodemographic variables including age were also observed to be unsignificant.

Hazes et al concluded in their study on SF-36 and EQ-5D scores that smoking and alcohol consumption had a protective effect on RA disease, which was similar to our findings [7]. When addressed according to their diagnosis, the highest subscale scores in patients with RA belonged to SF-36 General Mental Health, and the lowest were the SF-36 physical role. Nicotine is a very potent psychological and neurological stimulant that influences behaviors, emotions and mood and disables physical capacity of the patients [24]. The scores from our test might be explained with balancing effect of these two subscales (general mental health and physical role) with each other. However this phenemon couldn't explain the results of AS patients. The highest subscale scores for AS patients belonged to SF-36 social functionality, while the lowest were SF-36 general health as expected. In a study, Durmus et al. [25] obtained the highest score among SF-36 life-quality subscales from Social Function, suggesting a similarity to our study as well. Ward et al. [26] examined the functional status and daily life activities of patients with AS more than 20 years, and they found out that the patients smoking showed increased limitation on functional and daily life activities compared to those never started smoking or those who had already given it up. They associated this limitation with lack of exercise due to possible health problems rather than a direct effect of smoking. In another study investigating the effect of smoking on functional status and disease activities in patients with AS for at least 20 years, it was seen that smoking deteriorated the clinical manifestation and functionality [27]. Saag et al. [28] found greater numbers of subcutaneous noduls, radiological erosion degree and the level of Rheumatoid Factor in smoking patients diagnosed with RA, compared to non-smokers or those who had given it up. In our study, smoker RA patients have 5 kg/m^2 higher BMI values more than non-smokers. However, it is not valid for patients with AS, whose mean BMI were found to have 30.4 ± 5.8.

In our study, the age at onset of symptoms in patients diagnosed with RA was 39.1 ± 132 years, while 29.9 ± 11.4 years in AS patients. In a study, Tas et al. [29] founded these values as 41.3 years in RA and 29.3 years in AS diagnosed patients. In the study of Hazes, the most frequent range of age at onset of complaints was 50s years [7]. Similarly, in the study of Fallahi, the most frequent range of age at onset of complaints was 30s years in patients with AS [22]. The core key result of our study was that heavily smoking was associated with early onsets of AS and RA symptoms. This association was about 7 years for AS patients and about 5 years for RA patients. Thus, smoking triggered the occurence of both diseases. In our study, this result had correlation with the amount of cigarettes in total package per year. Although it was not designed to collect any research data related to inflammatory process and agents in our study method, the main reason of this smoking effect is the probability of triggered inflammatory factor. Publications suggesting that smoking addiction leads to occurrence of a chronical inflammatory process and this is associated with its severity in body have been increasing [2,3].

However our study has some limitations. Our aim was to investigate the relation between the quality of life in RA and AS patients with smoking. The negative cumulative effect of smoking in our patients was determined by Fagerstrom Nicotine Dependency Score and package year. However these variables are highly dependent on the patient's history. Nicotine is a very potent psychological and neurological stimulant and its disabling effcts are not fully understood yet. Patients might find physcological benefits (stress control etc.) to balance the disabling physical capacity. Also the smoker patients' quality of life might be affected with a cumulative dose of and time of smoking. To exposure nicotine might have cut-off levels which cascades inflammatory process. The clinical severity of both diseases could be affected by this way. In our study we also didn't investigated that non-smoker patients exposed to passive smoking. If this exposure is critical the quality of life of the non-smoker patients are also affected. Our results might be affected by the selected targeted power range of level of Type II error (80%). A bigger sample selection might have different results.

As a conclusion although our study have revealed that there is no statistical relationship between the life qualities of AS and RA patients, the symptoms in smokers was observed to onset earlier. Further research are required on the factors in which smoking affects the life quality in both diseases.

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