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Effects of age, gender and modifiable risk factors on low back pain

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Abstract

Low back pain increases with age and causes a burden of serious socio-economic adverse outcomes. Gender, age, vitamin D insufficiency, and obesity are some of the factors that are considered accountable for the etiology of low back pain, however, conflicting results are present in the literature regarding their effects on low back pain. In this study, we aimed to evaluate the effect of pain duration, pain intensity, gender, and preventable risk factors including vitamin D and body mass index (BMI), on low back pain. File registration data of 274 patients (211 females, 63 males) were included in this retrospective study. Age, gender, pain intensity, BMI, and vitamin D levels were recorded. Patients aged 60 and over were considered as the geriatric group. We observed that higher Visual Analogue Scale (VAS) scores were significantly associated with increased BMI (p=0.007) and advanced age (p=0.049). Duration of pain was positively correlated with, age (p<0.001) and BMI (p=0.02). There was no significant relation between VAS scores and vitamin D levels. The duration of the disease was longer in women than men (p=0.038), but no significant difference was observed for VAS scores between genders. When the study group was divided into geriatric and non-geriatric groups, disease duration was higher in the geriatric group (p<0.001), but no significant difference was observed between VAS scores. BMI, which is among the modifiable risk factors, is closely related to low back pain. The increase in both BMI and VAS scores, especially with advancing age, indicates that overweight older individuals are at high risk for low back pain.

Keywords: Low back pain, gender, age, body mass index, vitamin D

Introduction

Low back pain is the most common musculoskeletal pathology that negatively affects a person's daily life, can cause loss of labor, and many biopsychosocial factors are blamed in its etiology. Its annual estimated prevalence is accepted as 15-45% and it is considered to be among the most common diseases in the future [1]. The World Health Organization has defined low back pain in the elderly as a major disabling condition [2].

When the risk factors associated with low back pain in all age groups are evaluated, conflicting results cause confusion. Vitamin D and body mass index (BMI) are two of these factors.

Vitamin D (25-hydroxyvitamin D (25 (OH)D) is a fat-soluble vitamin, of which approximately 90% is synthesized from the skin after exposure to sunlight and 10% is taken from the diet. Vitamin D, that insufficiency is accepted as a modifiable risk factor, is effective on many systems such as musculoskeletal, neuropsychiatry, gastrointestinal, cardiovascular and immunological systems. Vitamin D deficiency is a common health problem in the geriatric population due to decreased

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sun exposure and cutaneous synthesis, increased obesity, and comorbidities. In addition, the result of deficiency of vitamin D on the development of sarcopenia and on pain severity was well-established [3,4] A meta-analysis showed that vitamin D insufficiency was associated with low back pain in young women [5] In another meta-analysis, vitamin D supplementation was not associated with improvement of low back pain [6].

One of the other modifiable risk factor for low back pain is BMI. In recent years, conditions such as the pandemic process and electronic device addiction have resulted an increase in the sedentary life and weight gain. This situation has become more pronounced especially in the geriatric population. Moreover, it has been shown in many studies that this weight gain is a risk factor for low back pain and chronic pain [7].

The studies that evaluated the relationship between gender and low back pain, the prevalence of low back pain was found to be higher in women even after including the confounders such as age range, socioeconomic status, daily living habits, smoking and comorbidities. [8].

In the light of all these data, when the increased lifespan and the increase in the geriatric population are take into account, the role of vitamin D and BMI in low back pain get more importance. The purpose of the study is to evaluate the relation between pain severity, assessed with VAS (Visual Analogue Scale) and pain duration, pain intensity, gender and preventable risk factors, including vitamin D and BMI, in patients with chronic low back pain.

Material and Method

The study was approved by the Sivas Cumhuriyet University Clinical Research Ethics Committee (22.06.2022-06/13). This is a retrospective study that was conducted from January 2021 to December 2021. The files of 274 patients aged between 18 and 90 who applied to the physical medicine and rehabilitation polyclinic of the university hospital due to low back pain were included. Patients aged 60 and over were registered as the geriatric group. Patients with a history of inflammatory disease, trauma, compression fracture, malignancy, and patients receiving vitamin D replacement therapy for low back pain in the medical records were excluded from the study. The patients' height, weight, 25 (OH)D levels, pain duration and pain severity scores, evaluated by VAS, in the current database were recorded.

VAS scale is used both in the diagnosis of pain and determine the severity of pain, it is stated by marking the value according to the severity of the patient's pain on a 10 cm ruler (0=complete painlessness, 10= the most severe pain). The starting point is “0” or “No pain” and the ending point is “10” or “Unbearable pain”. Pain severity was classified as 1-4 mild, 5-6 moderate, and 7 and above severe according to VAS scores [9]

The ranges of vitamin D levels were defined as normal (30 to 100 ng/ml), insufficient (20 to 30ng/ml), deficient (<20ng/ml), and toxic (higher than 100ng/ml) [7].

The BMI was calculated using the formula: weight in kilograms (kg) divided by height in meters squared (m^2). According to BMI, the number of underweight (<18.5kg/m^2), healthy weight (18.5-24.9kg/m^2), overweight (25-29.9kg/m^2), obese (30-39.9kg/m^2) and morbidly obese (≥40kg/m^2) patients were classified. [10]. The study protocol was approved by the local ethics committee.

Statistical analysis

Data normality was assessed with the Shapiro Wilks test, histograms, and q-q plots. The Student’s t test and Mann Whitnay U test were used to compare the differences between continuous variables. Correlations among the variables including VAS scores, BMI, 25(OH)D levels, disease duration and age were analyzed by using Pearson or Spearman correlation analysis. p<0.05 was considered as statistically significant. Analyses were conducted using SPSS version 22.

Results

The registry data of 274 patients (211 females, 63 males) were included in the study, since 30 patients out of the 350 evaluated patients had minor or major trauma, 41 had inflammatory low back pain and 5 patients had malignancy. Nearly half of the of the patients (42.7%) were in geriatric population, aged 60 years and over. Mean age was 55.4±13.9 (geriatric group 68.31±7.02, non-geriatric group 45.85±9.40). According to BMI the majority of the patients were overweight and obese. Pain intensity reflected by the VAS score was mostly moderate to severe. The disease duration was approximately 24 months in most of the patients More than half of the patients had vitamin D insufficiency. Classification percentages of patients dermografik information, VAS scores, BMI values and vitamin D levels are given in Table 1.

Table 1. Frequency range of Pain and Modifiable Risk Factors in Patients with Low Back Pain

Classification of Pain Severity and Modifiable Risk Factors in Patients with Low Back Pain					
VAS classification	Mild 19 (6.9%)	Moderate 102 (32.7%)	Severe 153 (55.8%)		
BMI (kg/m^2) classification	Thin 2 (0.7%)	Normal 49 (17.9%)	Overweight 110 (40.1%)	Obese 96 (35.0%)	Morbidly obese 17 (6.2%)
25(OH)D (ng/ml) levels	Normal 39 (14.2%)	İnsufficient 82 (29.9%)	Deficite 153 (55.8%)		
VAS; visual analogue scale, BMI; body mass index, 25(OH)D; 25-hydroxyvitamin D					

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According to the correlation analysis, VAS scores were significantly associated with increased BMI (p=0.007) and advanced age (p=0.049). The positive correlation between VAS and BMI continued after adjusting for age (r=0.128, p=0.035). Duration of pain was positively correlated with, age (p<0.001) and BMI (p=0.02). There was a negative correlation between vitamin D levels and VAS scores, but not statistically significant. BMI and vitamin D levels were also negatively correlated, but not statistically significant. There was no statistically significant correlation between increasing age and vitamin D levels. Correlation analysis results are given in Table 2.

When the gender differences in the etiology of low back pain were evaluated, the duration of low back pain in women was significantly longer than men (p=0.038). BMI values were significantly higher in women (p<0.001). However, no significant difference was found regarding pain severity and vitamin D levels among genders (Table 3).

When the data of patients was compared according to age groups as geriatric and non-geriatric, no statistically significant difference was found between the groups for 25(OH) D levels and pain intensity. Disease duration and BMI values were higher in the geriatric group compared to the non-geriatric group (both p<0.001). Table 4 shows the statistical data of geriatric and non-geriatric groups.

Table 2. Correlation analysis between age, disease duration, VAS scores, BMI and 25(OH)D levels

	Age	Disease duration (month)	VAS	BMI (kg/m²)	25(OH)D (ng/ml)
Age	r: 1	r: .489 p: .000*	r: .119 p: .049*	r: .401 p: .000*	r: .009 p: .887
Disease duration (month)		r: 1	r: .101 p: .095	r: .182 p: .002*	r: -.071 p: .242
VAS			r: 1	r: .164 p: .007*	r: -.002 p: .980
BMI (kg/m²)				r: 1	r: -.061 p: .311
25(OH)D (ng/ml)					r: 1

*p<0.05 is significant, VAS; visual analogue scale, BMI; body mass index, 25(OH)D; 25-hydroxyvitamin D

Table 3. Evaluation of pain intensity, duration and risk factors for both genders

	Total N:274	Women N:211	Men N=63	p
Disease duration (month)	24.0(38.0)	24.00 (48.00)	24.00 (24.00)	.038*
VAS (score)	6.87±1.67	7.00 (2.00)	6.00(3.00)	.130
BMI (kg/m²)	29.8±5.83	30.36 (7.29)	25.80 (3.75)	.000*
25(OH)D (ng/ml)	18.3(13.10)	18.20 (14.10)	19.50 (11.20)	.337

Data were presented as median (interquartil range) *p<0.05 is significant VAS; visual analogue scale, BMI; body mass index, 25(OH)D; 25-hydroxyvitamin D

Table 4. Comparison of data in geriatric and non-geriatric patient groups

	Geriatric groups N:117	Non-geriatrik groups N:157	p
Disease duration (month)	48.00 (42.00)	12.00 (23.00)	.000*
VAS (score)	7.07± 1.74	6.73± 1.74	.094
BMI (kg/m²)	32.11± 6.01	28.08± 5.05	.000*
25(OH)D (ng/ml)	20.00 (15.60)	17.60 (13.05)	.191

Data were presented as median (interquartil range) or mean±standart deviation. *p<0.05 is significant VAS; visual analogue scale, BMI; body mass index, 25(OH) D; 25-hydroxyvitamin D

Discussion

In this study, we observed that higher VAS scores were associated with increased BMI and advanced age. The positive correlation between VAS score and BMI persisted even after adjusting for age. No significant difference was observed between VAS scores and vitamin D levels. When comparing the genders, the duration of disease was longer in women, but no significant difference was observed between VAS scores in both genders. When the study group was divided into geriatric and non-geriatric groups according to age, disease duration was higher in the geriatric group, but no significant difference was observed between VAS scores.

There are many risk factors that can cause chronic low back pain. Two of these factors are vitamin D insufficiency and obesity,

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which are considered modifiable. Age and gender are among the other defined risk factors. With advancing age, an increase in the incidence of low back pain is observed, along with loss of labor, increase in health care costs, and negative effects on activities of daily living. In a review evaluating chronic low back pain, the prevalence was found to be 3-4 times higher in individuals over 50 years of age compared to the 18-30 age group, and it was observed that in accordance with our study pain was more prevalent among women and patients with low sociocultural level [11].

An increase in the incidence of low back pain with obesity has been shown in many studies [12]. In particular, BMI values of 30 and above are a risk factor for the development of low back pain and the chronicity of pain. The limitation of movement caused by obesity has been shown to induce low back pain [13]. In the study of Bazargan et al., which included 905 patients over 55 years of age, ethnicity, lifestyle, and secondary health problems were evaluated in chronic low back pain as well as BMI and they found a positive correlation between low back pain and increased BMI values [14]. In another study, which evaluated the prevalence of chronic low back pain, in the form of telephone interviews between 1992 and 2006, and compared with data including age, gender, ethnicity, BMI and a significant increase was observed in the prevalence of low back pain, especially in women, in 2006, and BMI was the potential reason for this increase [15]. In another study involving patients over 18 years of age, physical activity, educational status, ethnicity, and BMI were evaluated, and an increase in BMI was found to be associated with an increase in low back pain [16]. In our study, the increase in BMI and the increase in VAS severity were correlated and statistically significant, which supports the literature.

Vitamin D insufficiency is frequently encountered in clinical practice and many factors are blamed for its etiology. The need for vitamin D for healthy musculoskeletal anatomy has been proven and its insufficiency is known to worsen chronic non-specific musculoskeletal pain [17]. Back pain is one of them. Ghai et al. found statistically significant increase in functional capacity and decrease in VAS severity in patients with vitamin D insufficiency and back pain in the follow-ups after vitamin replacement therapy [18]. Contrary to these findings in the literature, Thorneby et al., in the study of 44 chronic low back pain and 44 control groups, vitamin D levels were examined and it is one of the rare studies that did not find a statistically significant difference [19]. One of the factors blamed in the etiology of vitamin D insufficiency is overweight. Vitamin D was found to be 20% decreased in overweight individuals than in normal-weight individuals, and the prevalence of insufficiency was reported to be between 40-80% [20,21]. Dadkhah et al. found a significant relationship between low back pain and vitamin D insufficiency in a study including 298 volunteers with 148 low back pain. In the same study, BMI and mean age were found to be higher in the group with low back pain [22]. In another study, in which only women were included, the relationship between obesity and vitamin D insufficiency was evaluated, and volunteers were divided into obese, morbidly obese, and control groups, and vitamin insufficiency was found to be statistically substantially lower in morbidly obese compared to normal-weights [23]. In our study, an inverse relationship was observed between BMI and vitamin D levels, but this difference was not statistically significant. This is one of the rare studies that did not find a statistically significant difference between VAS severity and vitamin D. It may be due to the very low vitamin D levels of the patients.

There are many studies on the high prevalence of low back pain in females, and this has been attributed to pregnancy, child care, and daily workload [24]. Age, gender, pain severity and psychological factors were evaluated in the cross-sectional study of Liu et al. with 2052 participants. Pain severity and age and gender differed, but they emphasized that the effect of psychological factors on this difference was very important [25]. In another study involving 22,511 volunteers over the age of 18, neck pain and migraine were evaluated in addition to low back pain, and a higher prevalence was reported in women. Advanced age and immobilization have been emphasized as associated factors in low back and neck pain [26]. In our study, a large proportion of the study population was female. Disease duration and BMI were significantly higher compared to men. However, pain severity and vitamin D levels were not significant different among genders.

The incidence of low back pain increases with increasing age, accompanied by increased degenerative changes and limitation of activity [27]. In a study that included epidemiological data by forming age ranges, they reported that low back pain was more severe in olders than in patients under 65 years of age [28]. In a 7-year follow-up study of 277 patients aged 70 years, the prevalence of chronic low back pain increased with age, but a slight decrease in pain intensity and frequency was observed [29]. In another study evaluating low back pain in the geriatric male patients, low back pain severity was associated with increased BMI [30]. Contrary to our findings, Wettstein et al. found a negative correlation, but not statistically significant, between age and pain intensity in a heterogeneous group of 228 low back pain patients [31]. In our study the BMI values were significantly higher in older age groups. However, pain intensity was not differed with increasing age. We attribute this to the high mean age of the non-geriatric patient group and the high severity of pain in the evaluated patient population.

The limitations of our study are that it was planned as a single-center, retrospective sudy. Psychological and environmental factors were not evaluated in patients while evaluating low back pain. In addition results of imaging methods were not included in the study, there was not a control group, and study population represented relatively a small sample size.

Conclusion

It has been shown that the frequency of low back pain increases with age, but the question of the different results regarding the

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type and severity of pain, and the effect of concomitant vitamin D insufficiency on pain severity has still not been fully answered. In our study, no effect of vitamin D insufficiency on pain severity was found, but more than half of the study population was vitamin D insufficient. The effect of higher BMI values on low back pain as a modifiable risk factor has been shown once again. Contrary to what is expected in the female gender, the finding that the severity of pain is similar to that of the men is a remarkable finding. In addition, contrary to expectations, there was no difference in pain severity in the geriatric population. The close relationship of pain severity with advanced age and increasing BMI indicates that obese elderly individuals are at high risk for low bak pain. With the support of further prospective studies, preventive health policies should be developed for this modifiable risk factors.

Conflict of interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical approval
This study was approved by Sivas Cumhuriyet University Faculty of Medicine Ethics Committee local ethics committee (Number: 2022-06/13, Date: 22.06.2022) and this study was conducted in accordance with the Declaration of Helsinki.

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