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ASSESSMENT OF MODIFIABLE RISK FACTORS FOR CHRONIC LOW BACK PAIN IN DIFFERENT AGE GROUPS

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Introduction. Chronic low back pain is a global problem for people of working age worldwide, leading to impaired functioning, quality of life, and social activity. Modifiable risk factors are risks that are more related to human behavioral strategies and can be changed. The main modifiable risk factors for chronic low back pain include a sedentary lifestyle, bad habits, obesity, comorbidities, and high stress levels. Studying risk factors for chronic low back pain is important for developing preventive strategies and effective rehabilitation interventions in patients with chronic low back pain.
Objective. To investigate the relationship between modifiable factors and chronic low back pain, and to assess the severity of modifiable risk factors for chronic low back pain in differentage groups.
Materials and methods. To achieve this goal, a questionnaire was conducted based on the Rehabilitation Department of the University Clinic of the Bogomolets National Medical University (NMU), which included an assessment of socio-demographic and anthropometric indicators, an assessment of the level of stress according to the PSS-10 (Perceived Stress Scale) in people aged 18–60 years. All patients were divided into two groups: the control group, consisting of practically healthy individuals, and the comparison group, consisting of individuals with chronic nonspecific low back pain.
Results. The study involved 240 people, with a mean age of 34.3±12.7, 121 women (36.2±15.3) and 119 men (32.3±9.1). Comparative analysis revealed that individuals with chronic low back pain had statistically significant risk factors: higher BMI ($p<0.01$), lower physical activity ($p=0.001$), higher sedentary time ($p=0.010$), higher prevalence of smoking ($p=0.016$), sleep disturbances ($p<0.001$), higher stress levels ($p<0.001$) and comorbidities ($p=0.002$). The results of a comparative analysis of the relationship between modifiable risk factors among patients with chronic low back pain, depending on age, revealed differences in BMI, smoking prevalence, physical inactivity, sleep disturbance, and comorbidities.
Conclusions. Individuals with chronic low back pain, compared to practically healthy individuals, have significantly higher rates of modifiable risk factors. Among patients with chronic low back pain in the age group of 18–24, a more significant risk factor is underweight; in the age group of 25–44, smoking; in the age group of 45–60, overweight and obesity, insufficient physical activity, sleep disorders and comorbidities.

Keywords: back pain, low back pain, chronic pain, risk factors, smoking, obesity, sedentary behavior, sleep, stress.

Introduction

Low back pain is one of the leading health problems that leads to significant economic costs and has a tendency to increase incidence among people of working age. According to the 2016 Global Burden of Disease, Injury and Risk Factors Study (GBD 2016), low back pain is the leading cause of disability. About 25–40% of people report low back pain in the past 12 months, and 4 to 25% of people report a chronic nature of this problem [1], although some sources indicate a higher percentage of chronic low back pain, reaching 48% [2]. The transition from acute to chronic pain is a complex, multicomponent process influenced by biological, psychological and social factors. Biological factors include genetic predisposition, neurobiological and immune factors, anatomical and structural factors, and comorbidities. Scientists have found that chronic low back pain has a genetic predisposition, which is 4.6%, and is significantly higher than acute low back pain (0.81%). Heredity is primarily associated with brain-specific genes, as the analysis showed that the vast majority of genes responsible for the development of chronic lower back pain are expressed in the central nervous system [3]. Metabolic and other chronic diseases with high levels of chronic inflammation are associated with an increased risk of developing chronic low back pain. Obesity has been shown to correlate with the prevalence and severity of low back pain, and proinflammatory cytokines, including C-reactive protein, tumor necrosis factor (TNF-α), and interleukin (IL-6), are associated with the development of chronic low back pain [4]. Among psychological factors, distress, anxiety, depression, sleep disturbances, and kinesiophobia contribute to the chronicization of low back pain. Studies have shown that high levels of stress and catastrophizing of pain are associated with higher pain intensity, can contribute to the formation of a vicious pathological cycle and can be a significant barrier to recovery [5; 6]. Among the social risk factors, the highest associations with chronic low back pain were noted in cases of physical inactivity, sedentary work, smoking, alcohol consumption, low education and economic status [7; 8]. Studies indicate a higher prevalence of chronic low back pain among smokers compared to those who do not have this habit. For example, among daily smokers, the prevalence of chronic low back pain is 23.3% compared to 15.7% among those who do not have this habit [9]. One of the mechanisms of the impact of smoking on the onset of chronic pain is that smoking leads to the release of a number of proinflammatory substances that have a negative effect on the intervertebral disc and lead to its degenerative changes. Smoking also affects the vascular supply of spinal tissues and causes local hypoxia, thereby impairing the integrity of intervertebral discs and other spinal structures [10]. According to the World Health Organization (WHO), one in three adults and 81% of adolescents lack a sufficient level of physical activity (PA) (150–300 minutes of moderate-intensity physical activity or 75–150 minutes of high-intensity aerobic activity per week). Approximately 31% of the world's population over the age of 15 has an insufficient level of physical activity, which is known to lead to the death of approximately 3.2 million people each year [11]. A sedentary lifestyle increases mortality from all causes and the risk of developing cardiovascular disease, diabetes mellitus, hypertension, and various types of cancer (breast, colon, endometrial, and epithelial ovarian cancer) [12]. The study demonstrates a dose-response relationship between insufficient physical activity and the development of chronic low back pain, with lower physical activity levels associated with higher pain intensity and impaired functioning. In particular, physical inactivity correlates with decreased intervertebral disc height and higher adipose tissue levels in the paraspinal muscles, a key link in the pathogenesis of low back pain [13]. Overweight and obesity are global health problems of modern society, the prevalence of which is growing rapidly. Obesity contributes to serious diseases and is considered a significant risk factor for chronic low back pain. Obesity has complex, multifactorial mechanisms of influence on the development of chronic low back pain, including direct effects on spinal structures and indirect effects through inflammatory mediators. For the long-term effective management of chronic low back pain, it is recommended to assess BMI and, if excessive values are detected, to build strategies for weight correction [14; 15]. An in-depth study of modifiable risk factors such as overweight and obesity, comorbidities, distress, sleep disturbances, physical inactivity, and prolonged sitting is of considerable interest, as their correction has a positive effect on the course of chronic low back pain. In the Ukrainian population, no previous studies have been conducted to assess modifiable risk factors for chronic low back pain. Thus, the study and understanding of risk factors for chronic low back pain are crucial for developing preventive strategies and effective rehabilitation interventions in patients with chronic low back pain. Objective. To investigate the relationship between modifiable factors and chronic low back pain, and to assess the severity of modifiable risk factors for chronic low back pain in different age groups.

Materials and methods

To achieve this goal, 240 people aged 18–60 were surveyed at the Rehabilitation Department of the University Clinic of the Bogomolets National Medical University (NMU). Patients were included in the study based on their voluntary informed consent, and the subjects were informed about the purpose of the study. The study was conducted within the framework of the research work of the Department of Physical Rehabilitation and Sports Medicine of the Bogomolets National Medical University, 2024–2026, "Complex physical therapy of patients with diseases and injuries of the musculoskeletal system and nervous system," State registration number: 0124U000230. The research fully complied with the bioethical and moral requirements of the Helsinki Declaration, the Council of Europe Convention on Human Rights and Biomedicine, WHO regulations, the laws of Ukraine and Order of the Ministry of Health of Ukraine No. 281 of November 1, 2000. The study was approved by the Bioethics Committee of the Bogomolets National Medical University, Order No. 192, dated February 24, 2025. Based on the study results, all patients were divided into two groups: the control group consisted of practically healthy individuals without chronic low back pain, and the comparison group comprised individuals with chronic nonspecific low back pain. We have previously identified potential modifiable risk factors for chronic low back pain based on the literature [16 17]. The subjects were assessed for socio-demographic indicators (age, gender, economic and professional status, level of PA, and anthropometric indicators (height, body weight, body mass index (BMI)). BMI was calculated using the formula: body weight in kilograms (kg) divided by height in meters (m) squared. BMI was classified according to the National Heart, Lung, and Blood Institute Classification of Overweight and Obesity: underweight (BMI <18.5 kg/m2), normal weight (BMI 18.5-24.9 kg/m2), overweight (BMI 25.0-29.9 kg/m2), obesity I (BMI 30.0-34.9 kg/m2), obesity II (BMI 35.0-39.9 kg/m2), and obesity III (BMI ≥40.0 kg/m2) [18]. The PSS-10 (Perceived Stress Scale) self-assessment questionnaire was used to determine the subjective stress level [19]. All subjects were divided into three groups according to the WHO age classification: the first group consisted of persons aged 18–24, the second group of persons aged 25–44, and the third group comprised persons aged 45–60. In each group, modifiable risk factors for chronic low back pain were analyzed by indicators: BMI, time spent in a sedentary position, physical activity level, comorbidities, smoking, sleep disorders, and stress level. Descriptive statistics were presented by the mean (μ) and standard deviation (σ) because the data follow a normal distribution. Student's t-test was used to compare the two groups, with a value of $p<0.05$ considered statistically significant. Interval estimation methods (Fisher's angular transformation) were used to evaluate categorical data, Fisher's angular transformation (taking into account the Yates correction), χ^2-Pearson, and the correlation between the data was evaluated using Spearman's rank and Pearson's correlation coefficient.

Results

Our study involved 240 people, with a mean age of 34.3±12.7, 121 women (36.2±15.3) and 119 men (32.3±9.1). The subjects included 45 practically healthy people who did not have chronic low back pain (control group), mean age 28.9±11.6, 195 people who had chronic nonspecific low back pain (comparison group), mean age 32.7±12.7 ($p\geq0.05$). The mean BMI of the control group was 23.2±3.9 kg/m2, the mean BMI of the comparison group was 25.4±4.8 kg/m2, and patients with chronic low back pain had significantly higher BMI values ($p<0.01$). Detailed comparison data on modified risk factors between the groups of people depending on the presence of chronic low back pain and without it are presented in Table 1.

There was a significant difference ($p<0.05$) between the groups regarding BMI. More patients with chronic low back pain had a BMI ≥ 24.9 kg/m2, and correlation analysis revealed a positive weak relationship between BMI and pain ($r=0.179$, $p=0.005$). Among patients with chronic low back pain, the majority (56.4%) did not have an adequate level of FA. The difference between groups was significant ($p=0.001$), and there was a positive correlation between insufficient FA and pain ($r=0.169$, $p=0.009$). There was a significant difference in the time spent in a sitting position per day between the control and comparison groups ($p=0.010$). Among patients with chronic pain, about 43.6% spent more than six hours per day in a sitting position. Correlation analysis showed a significant positive weak correlation between sitting for more than 6 hours a day and low back pain ($r=0.171$, $p=0.008$). For the risk factor of smoking, a significant difference was found between the groups in favor of those with chronic low back pain ($p=0.016$), while no correlation was found ($r=0.105$, $p=0.152$).

Table 1. Comparison of modifiable risk factors among practically healthy individuals (control group) and individuals with chronic low back pain (comparison group)

Characteristics	Control group n=45		Comparison group n=195		p
	%	95 CI	%	95 CI	
BMI					
<18.5 kg/m²	6.7	1.2–16.0	4.1	1.8–7.3	p=0.742
18.5–24.9 kg/m2	68.9	54.3–81.7	48.2	41.2–55.2	p=0.018
25.0–29.9 kg/m2	17.8	7.9–30.5	30.3	24.0–36.9	p=0.118
30.0–34.9 kg/m2	4.4	0.4–12.6	12.8	8.5–17.9	p=0.135
34.9–39.3 kg/m²	2.2	0.0–8.7	4.1	1.8–7.3	p=0.865
40.0 kg/m²	0	0.0–4.2	0.5	0.0–2.0	p=0.510
PA min/week					
≤150	28.9	16.4–43.2	56.4	49.4–63.3	p=0.001
≥150	71.1	56.8–83.6	43.6	36.7–50.6	p=0.001
Time spent in a sitting position per day					
≤6 hours	77.8	64.2–88.8	56.4	49.4–63.3	p=0.010
≥6 hours	22.2	11.2–35.8	43.6	36.7–50.6	p=0.010
Smoking	13,3	4.9–25.0	31.3	25.0–38.0	p=0.016
Sleep disorders	4.4	0.4–12.6	32.8	26.4–39.6	p<0.001
Stress level					
Low	48.9	34.1–63.7	23.6	17.9–29.8	p=0.002
Medium	46.7	32.1–61.6	66.7	59.9–73.1	p=0.023
High	4.4	0.4–12.6	9.7	6.0–14.3	p=0.364
Comorbidities	8.9	2.3–19.2	30.3	24.0–36.9	p=0.002

Sleep disturbance was more pronounced among individuals with chronic low back pain compared to those without pain (p<0.001), and we observed a positive mean correlation between sleep disturbance and pain (r=0.332, p<0.001). In terms of stress level, we observed a significant difference between the control and comparison groups (p<0.001), with a higher level of stress having a direct correlation with pain (r=0.222, p=0.001). Regarding the prevalence of comorbidities, there was a statistically significant difference between the groups (p=0.002) and a positive correlation (r=0.293, p=0.001). All patients with chronic nonspecific low back pain were divided into three groups, depending on age. The first group (aged 18–24) had an average age of 21.2±1.5, the average BMI was 22.1±3.3 kg/m2, the second group (aged 25–44) had an average age of 36.9±5.6, the average BMI was 25.6±3.9 kg/m2, the third group (aged 45–60) had an average age of 51.7±4.9, the average BMI was 28.9±4.7 kg/m2. A comparative analysis of the relationship between modifiable risk factors and chronic low back pain depending on age revealed several data points presented in Table 2.

Table 2 Comparative analysis of associations between modifiable risk factors and chronic low back pain depending on age

Characteristics	18–24 (n=66)		25–44 (n=77)		45–60 (n=52)		χ^2	p
	%	95 CI	%	95 CI	%	95 CI		
BMI								
<18,5 kg/m²	9.1	3.3–17.3	2.6	0.2–7.4	0	0.0–3.7	6.84	0.033
18.5–24.9 kg/m²	77.3	66.3–86.7	44.2	33.1–55.5	17.3	8.2–29.0	42.7	<0.001
25.0–29.9 kg/m²	9.1	3.3–17.3	40.3	29.5–51.5	42.3	29.0–56.2	21.2	<0.001
30.0–34.9 kg/m²	4.5	0.8–11.0	10.4	4.5–18.3	26.9	15.6–40.0	13.7	0.001
34.9–39.3 kg/m²	0	0.0–2.9	2.6	0.2–7.4	11.5	4.2–21.8	10,5	0.005
40.0 kg/m²	0	0.0–2.9	0	0.0–2.5	1.9	0.0–7.5	2.76	0.251
PA min/week								
≤150	37.9	26.4–50.1	63.6	52.5–74.1	69.2	55.8–81.2	14.3	<0.001
≥150	62.1	49.9–73.6	36.4	25.9–47.5	30.8	18.8–44.2	14.3	<0.001
Time spent in a sitting position per day								
≤6 hours	72.7	61.2–82.9	48.1	36.9-59.3	48.1	34.4-61.9	10.8	0.005
≥6 hours	27.3	17.1–38.8	51.9	40.7–63.1	51.9	38.1–65.6	10.8	0.005
Smoking	36.7	23.6–50.9	47.7	35.5–60.0	25.0	13.6–38.4	6.08	0.048
Sleep disorders	35.3	19.8–52.5	46.9	32.9–61.2	72.5	57.3–85.4	11.0	0.004
Stress level								
Low	30.3	19.7–42.1	22.1	13.5–32.1	17.3	8.2–29.0	2.89	0.236
Medium	60.6	48.4–72.2	72.7	62.1–82.2	65.4	51.7–77.9	2.4	0.301
High	9.1	3.3–17.3	5.2	1.3–11.3	17.3	8.2–29.0	5.23	0.073
Comorbidities	25.9	10.9–44.7	62.8	47.5–76.8	69.4	53.0–83.6	13.3	0.001

It was found that among people aged 18–24, as a modifiable risk factor for the development of chronic low back pain, underweight by BMI can be identified, which had a statistically significant (p=0.033) level compared to other age groups. Among people aged 25–44, smoking was a statistically significant risk factor for chronic pain (p=0.033). Among patients aged 45–60, statistically significant risk factors for chronic pain were overweight and obesity, respectively (p<0.001, p=0.001), low PA (<0.001), sleep disorders (p=0.004) and comorbidities (p=0.001). Sitting time as a risk factor was characteristic of both age groups over 24 years, and the stress level, although higher in the group of people over 45, was not significant.

Discussion

Low back pain affects more than 50–80% of the world's population and is the leading cause of disability and reduced social activity. In 2020, the prevalence of low back pain was 500 million cases, and according to WHO forecasts, in 2050, more than 800 million people worldwide will suffer from low back pain [20]. The biopsychosocial approach to the recovery of patients with chronic low back pain is based on the identification and correction of biological and psychosocial factors that directly affect the course of chronic pain. Significant risk factors for chronic low back pain include a sedentary lifestyle, bad habits, obesity, comorbidities, and high stress levels [21]. Our study found that all lifestyle-related risk factors were statistically significant and associated with chronic low back pain. Our work demonstrates that risk factors for chronic low back pain were expressed to varying degrees depending on age, which is of great interest and opens up several prospects for developing effective preventive and therapeutic strategies to overcome chronic low back pain. Interestingly, previous studies have identified gender-specific features of chronic low back pain and risk factors associated with it. Men were characterized by risk factors, namely overweight, excessive PA, heavy lifting, and smoking. Women were more likely to have the following risk factors: low PA, catastrophizing health conditions, prolonged sitting, stress, sleep disturbances, and comorbidities [22]. Our study found that sitting for more than 6 hours daily was a significant risk factor for people over 24. Our

result was confirmed by other studies, where over an approximately 8-year follow-up period of roughly 3,006 participants, it was found that 9% experienced chronic low back pain, and 1,537 people (51.13%) reported chronic low back pain when sitting for more than 4 hours [23]. The researchers concluded a significant relationship exists between the duration of sitting, the ergonomics of the working posture, and the frequency of lower back pain. In particular, students who sit for more than 7 hours a day have a higher risk of developing low back pain [24]. Obesity has been frequently reported in the literature as a risk factor for chronic low back pain, and a direct association between obesity and chronic low back pain has been observed [25; 26]. Our results confirm the above-mentioned research findings and demonstrate that in individuals over 45, overweight and obesity are associated with an increased risk of chronic low back pain. The study by Liu L et al. (2024) highlighted that a sedentary lifestyle may activate the link between obesity and chronic low back pain. Subgroup analysis showed that the duration of a sedentary lifestyle modulates the association between obesity and chronic low back pain in people aged ≥45 [27]. Smoking has been identified as a risk factor for chronic low back pain, and studies show that smokers have a higher prevalence of this condition than those who do not have this habit. For example, a study using the Korean National Health Insurance Database showed that smokers have a higher incidence of low back pain [28]. Similar results were obtained in our study, where smoking was a risk factor in people over the age of 24. Psychological stress is a well-studied risk factor for chronic low back pain. Chronic stress increases cortisol release, muscle tension, and nociceptor activation, thereby contributing to increased pain intensity. In our study, we found that individuals with chronic low back pain had statistically significantly higher stress levels compared to apparently healthy individuals. Other studies confirm the results obtained in our study and demonstrate a strong correlation between psychological stress and the occurrence of low back pain [29; 30]. Nevertheless, a comparative analysis of the relationship between stress levels and chronic low back pain depending on age did not reveal any significant differences.

In Conclusions: Patients with chronic low back pain compared to practically healthy individuals have significantly higher rates of modifiable risk factors, namely: overweight and obesity, low PA, sitting for more than 6 hours a day, smoking, sleep disturbance, higher stress levels, and comorbidities. Among patients with chronic low back pain in the 18–24 age group, being underweight is a more pronounced risk factor; in the 25–44 age group, smoking, and in the 45–60 age group, overweight and obesity, insufficient exercise, sleep disturbances, and comorbidities are more pronounced. In managing chronic low back pain, it is crucial to identify risk factors and implement active strategies to overcome them through psychoeducation, pain management education, and healthy lifestyle education.

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