EPIDEMIOLOGICAL FEATURES AND RISK FACTORS OF MUSCULOSKELETAL AND CONNECTIVE TISSUE DISEASES

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ЕПІДЕМІОЛОГІЧНІ ОСОБЛИВОСТІ ТА ФАКТОРИ РИЗИКУ ХВОРОБ КІСТКОВО-М'ЯЗОВОЇ СИСТЕМИ ТА СПОЛУЧНОЇ ТКАНИНИ

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Резюме. Актуальність. *Актуальність дослідження обумовлена медико-соціальним і економічним значенням хвороб кістково-м'язової системи та сполучної тканини, які здійснюють значний внесок до тягаря хвороб та інвалідності населення світу.* **Мета.** *Провести аналіз захворюваності населення світу та України на хвороби кістково-м'язової системи та сполучної тканини, та факторів, що їх обумовлюють.* **Матеріали та методи.** *Використані дані дослідження глобального тягаря захворювань, травм і факторів ризику, метааналізів і систематичних оглядів; дані Державної служби статистики України, медичної статистики Центру громадського здоров'я МОЗ України. Методи: бібліосемантичний, порівняльного та статистичного аналізу, узагальнення.* **Результати.** *Установлено, що у 2017 році серед населення світу стандартизовані за віком показники поширеності, смертності та інвалідності від хвороб кістково-м'язової системи та сполучної тканини становили 16 276,2, 1,6 та 1 720 на 100 тис. нас. відповідно, а у 2021 році – 19 832, 1,43 та 1 908,87 на 100 тис. нас. відповідно. Найвища поширеність обумовлена болем в попереку (36,8 %), іншими захворюваннями цього класу (21,5 %), остеоартритом (19,3 %), болем у шиї (18,4 %), а також подагрою (2,6 %), ревматоїдним артритом (1,3 %). В Україні ці захворювання займають понад 5,0 % у структурі всіх зареєстрованих хвороб і посідають четверте рангове місце, а серед виявлених уперше – 4,0 % і посідають сьоме місце. У структурі первинної інвалідності дорослого населення цим хворобам належить третє місце, або понад 11,0 % випадків. Рівні первинної захворюваності, поширеності та інвалідності протягом 1993–2017 років мали стійку тенденцію до зростання. Немодифікованими факторами ризику захворювань кістково-м'язової системи визнані вік і жіноча стать, а модифікованими – низька фізична активність, ожиріння, куріння, погане харчування.* **Висновки.** *Динаміка рівнів поширеності та інвалідності населення від хвороб кістково-м'язової системи та сполучної тканини несприятлива, що посилюється численними модифікованими й немодифікованими факторами ризику.*
Ключові слова: *неінфекційні захворювання; больові синдроми; фактори ризику; поширеність, захворюваність та інвалідність; здоров'я населення.*

Abstract. Background. *The relevance of the study is due to the medical, social and economic importance of diseases of the musculoskeletal system and connective tissue, which make a significant contribution to the burden of diseases and disabilities of the world population. Purpose. To carry out an analysis of the incidence of diseases of the musculoskeletal system and connective tissue among the world's population and Ukraine, and the factors that cause them.* **Materials and methods.** *The data used were those of the study on the global burden of diseases, injuries and risk factors, meta-analyses and systematic reviews; data from the State Statistics Service of Ukraine, medical statistics from the Public Health Centre of the Ministry of Health of Ukraine. Methods: bibliosemantic, comparative, statistical analysis, generalization.* **Results.** *It was established that in 2017, among the world population, the age-standardized prevalence, mortality and disability rates for diseases of the musculoskeletal system and connective tissue were 16,276.2, 1.6 and 1,720 per 100,000 of us, respectively, and in 2021, 19,832, 1.43 and 1,908.87 per 100,000 of us, respectively. The highest prevalence is due to low back pain (36.8%), other diseases of this class (21.5%), osteoarthritis (19.3%), and neck pain (18.4%), as well as gout (2.6%), rheumatoid arthritis (1.3%). In Ukraine, these diseases occupy more than 5.0% of the structure of all registered diseases and occupy the fourth rank place, and among those detected for the first time – 4.0%, and occupy the seventh place. In the structure of primary disability of the adult population, these diseases belong to the third place, or more than 11.0% of cases. Primary morbidity, prevalence and disability levels during 1993–2017 had a steady upward trend. Age and female gender are recognized as unmodified risk factors for diseases of the musculoskeletal system, and low physi-*

cal activity, obesity, smoking, and poor nutrition are recognized as modified. **Conclusions.** *The dynamics of prevalence rates and population disability from diseases of the musculoskeletal system and connective tissue are unfavourable, exacerbated by numerous modified and unmodified risk factors.*
Key words: *non-communicable diseases; pain syndromes; risk factors; prevalence, morbidity and disability; public health.*

Introduction

Diseases of the musculoskeletal system and connective tissue cause a significant burden in the structure of non-infectious morbidity and disability of the population of many countries of the world [1]. Incidence, prevalence and disability rates differ in lesion localization, etiology, age, sex, social, territorial and other criteria.

Musculoskeletal and connective tissue disorders include short-term conditions that occur unexpectedly (such as fractures, sprains, and tendons), and long-term conditions such as chronic low back pain and osteoarthritis (OA).

Morphological points of influence of diseases of the musculoskeletal system and connective tissue are considered:

1) joints whose involvement leads to OA, rheumatoid arthritis (RA), psoriatic arthritis, gout, spondyloarthritis;

2) bones, with such pathology as osteoporosis, osteopenia and as their consequence – fragility fractures, traumatic fractures;

3) muscles, with the development of sarcopenia;

4) different areas of the body or organ system, (eg back and neck pain, fibromyalgia);

5) connective tissue (inflammatory diseases – vasculitis, systemic lupus erythematosus, which have manifestations from the musculoskeletal system;

6) amputation as a result of illness or injury [2].

In total, about 150 individual conditions are identified as disorders of the musculoskeletal system and connective tissue, and lower back pain, neck pain, OA, RA, gout, and other diseases are considered the main pathologies. As a result of bone, joint, muscle and connective tissue lesions, they cause pain syndromes and dysfunction. Pain in musculoskeletal structures is the most common form of neoncological pain. Pain syndromes and impairment of functions lead to disability, limitation of life activities in everyday life, reduction of quality of life, mental well-being and loss of work for the individual and economic losses for the country [3].

The medical, social and economic significance of diseases of the musculoskeletal system and connective tissue determines the relevance of constant updating of knowledge about the epidemiology and risk factors of these diseases, which makes it possible to trace and respond in a timely manner to threats to their development, taking into account the etiology, geographical, gender, and age characteristics of the population.

Purpose

To carry out an analysis of the incidence of diseases of the musculoskeletal system and connective tissue among the world's population and Ukraine and the factors that condition them, taking into account the specific characteristics of their etiological, geographical, age, and sexual characteristics.

Materials and methods

The data used are from the Global Burden of Disease, Injury and Risk Factors (GBD) study, meta-analyses and systematic reviews from academic databases through a PubMed search using the keywords "Musculoskeletal and connective tissue diseases", "Risk factors for musculoskeletal and connective tissue diseases"; prevalence and morbidity data in Ukraine – from data of the State Statistics Service of Ukraine and medical statistics of the Public Health Center of the Ministry of Health of Ukraine. Methods used: bibliosemantic, comparative, statistical analysis, generalization.

Results

According to the 1990–2017 Global Burden of Disease Survey, among 195 countries, it is shown that in 2017, approximately 1,3 billion cases of musculoskeletal diseases were reported worldwide, with 121,3 thousand deaths and 138,7 million cases of disability. The age-standardized prevalence, mortality and disability rates were 16,276.2, 1.6 and 1,720 per 100,000 of us respectively. The proportion of common cases was greatest for low back pain (36.8%), the second place was occupied by other diseases of the musculoskeletal system (21.5%), hereinafter OA (19.3%), neck pain (18.4%), gout (2.6%) and RA (1.3%). The prevalence rate was higher in women than in men and increased with age. Higher stress on the musculoskeletal system was in economically developed countries. The countries with the highest age-standardized prevalence rates in 2017 were Switzerland (23,346.0), Chile (23,007.9) and Denmark (22,166.1) [4].

In 2021, a total of more than 1,6 billion cases of musculoskeletal system and connective tissue were reported worldwide, with more than 367,193 million cases of these diseases and 118,499 deaths from them reported for the first time. Age-standardized prevalence rates were 19,832 cases per 100,000 people, morbidity – 4,351 cases per 100,000 people, mortality – 1.43 per 100,000 people. The disability rate was equal to 1,908.87 per 100,000 of us. [5]. Thus, over the course of five years, prevalence and disability due to diseases of the musculoskeletal system and connective tissue increased, indicating an increase in their global burden on the health of the world's population.

Over the past decade, strong evidence has been presented that musculoskeletal diseases make a leading contribution to the global burden of disability associated with non-communicable diseases (NCDs), and regional pain conditions (particularly low back and neck pain) form the highest burden of disability of all diseases in this class [6, 7].

In 2019, in adolescents and individuals in the 10–24 age group, the main causes of disability were injuries: road injuries (first place), self-harm (third) and interpersonal violence (fifth). In the 25–49 age group, the first place in terms of causes of disability was occupied by road injuries, and the fourth place was – low back pain [8, 9].

In 2020, 619 million people worldwide suffered from low back pain, and according to forecast estimates, by 2050 the number of registered cases will reach 843 million. Lower back pain is defined as pain between the 12th rib and the gluteal folds lasting a day or more. Of the total, 38.8% of the cases of disability in this regard were related to occupational factors, smoking and overweight [10].

In 2020, 203 million people suffered from neck pain; the age-standardized prevalence rate of this pain was 2,450 per 100,000 of us. The prevalence rate among women (2,890 per 100,000 of us) exceeded that of men (2,000 per 100,000 of us), the highest prevalence rates were recorded in the age period 45–74 in persons of both sexes. Population growth and its aging have been identified as the main factor influencing the development of neck pain [11].

Musculoskeletal pain is very common in elderly Europeans, especially in women, with large differences depending on the country of residence. The overall prevalence of chronic musculoskeletal pain was 35.7%, from 18.6% in Switzerland to 45.6% in France. Prevalence was higher in women (41.3%) than in men (29.1%). Chronic musculoskeletal pain was lower in specific gravity in men over 75 years of age than in the younger group of 50–59 years. Separation/divorce status increased prevalence rates for both men and women compared to married ones, and unemployment significantly increased similar levels for men [12].

Among diseases of the musculoskeletal system, OA is considered one of the most common, which in 2020 had 595 million people, or 7.6% of the world's population. The age-standardized prevalence was over 5.5% in all regions of the world, ranging from 5,677.4 per 100,000 us in Southeast Asia to 8,632.7 per 100,000 us in the Asia-Pacific region in high-income countries. Since 1990, this number has increased by 132.2%. The most common localization of OA was the knee joint, whose development in 20.4% of cases was facilitated by a high Body Mass Index (BMI) [13].

Main clinical characteristics of OA – pain, activity limitation and reduced quality of life. The economic burden of OA is 1.0–2.5% of the gross national product in countries with established market economies (North America and Europe). The average annual cost of OA treatment, depending on the country, is $700 – 15,600. Predictive estimates of the prevalence of OA suggest its increase in the indicated regions in relation to population ageing and the prevalence of obesity [14, 15].

Osteoporosis is characterized by reduced bone mineral density, bone loss, increased bone fragility, tendency to fractures, and is a common disease in the elderly. The UK Ministry of Health estimates that 137 million women and 21 million men worldwide are at high risk of fractures due to osteoporosis and its prevalence is expected to double in the next 40 years [16].

A global problem for population health is RA. It is an autoimmune disease characterized by symmetrical peripheral polyarthritis of the upper and/or lower extremities and results in prolonged disability in the absence of effective treatment. In the world, the age-standardized RA prevalence rate increased over the years 1990–2019 from 207.6 to 224.25 per 100,000 us, and the incidence rate from 12.21 to 13.0 per 100,000 us. The age-standardized DALY rate also increased, respectively, from 39.12 to 39.57 per 100,000 of us. Rates increased with age and were higher in women. The maximum values of the indicators were noted in the age groups 70–74 years for women and 75–79 years – for men. The highest age-standardized levels of prevalence (471.8 per 100,000 us) and incidence (27.5 per 100,000 us) were reported in 2017 in the United Kingdom, and the largest increases in these levels between 1990 and 2017 were noted in Canada, Paraguay and Guatemala [17, 18].

Review data [19] indicate that RA, as the most common form of inflammatory joint disease, affects about 1.0% of the population (in Ukraine – 0.4%, in Europe and North America –1.0–2.0%).

Gout does not lose its significance as the most common inflammatory arthritis in the world. Worldwide, 55.8 million people were affected by gout in 2020, with an age-standardized prevalence of 659.3 per 100,000 people, an increase of 22.5% over 1990. The prevalence of gout among men was 3.26 times higher than among women and increased with age. High BMI accounted for 34.3% of gout cases. Studies have shown an association of gout with diseases such as metabolic syndrome, diabetes mellitus, renal impairment, and cardiovascular disease. Researchers attribute the increasing incidence and prevalence of gout worldwide, especially in Australia, high-income countries in North America, and southern Latin America, to the increasing prevalence of risk factors. The United States ranks first in terms of incidence and prevalence of gout [20, 21].

The burden of other musculoskeletal disorders, which is increasing worldwide, is essential. In 2020, 494 million people worldwide suffered from them, which exceeded the number of patients in 1990 by 123.4%. The global age-standardized prevalence of other musculoskeletal disorders was 47.4% higher among women than among men and increases with age with maximum values of 65–69 years in men and women. Other musculoskeletal disorders were associated with 83,100 deaths [22].

Epidemiological analysis of diseases of the musculoskeletal system in Ukraine for 1993–2017 showed that diseases of the musculoskeletal system occupy more than 5.0% in the structure of all registered diseases and occupy a consistently fourth rank place, and in the category of – detected for the first time 4.0%, and occupy seventh place. According to the level of primary disability of the adult population, the disease of the musculoskeletal system ranks third in its structure – over 11.0%, and the population of working age – 13.0%. Primary morbidity, prevalence and disability levels during 1993–2017 have had a steady upward trend [23].

In particular, the number of newly reported cases of diseases of the musculoskeletal system and connective tissue, according to outpatient visits of health care institutions of the Ministry of Health of Ukraine, increased from 2,761 to 2,878 per 100,000 people from 1995 to 2017, and the prevalence of – from 6,719.1 to 9,344.0 per 100,000 people.

Age and female sex are the two most important unmodified risk factors for musculoskeletal disorders. Modified risk factors such as low physical activity and obesity are largely associated with OA and low back pain. Smoking is the main risk factor for the development of

RA, and lifestyle-related risk factors for the development of OA are identified as smoking, poor nutrition, and low physical activity. They became especially widespread in developed countries as a result of sustainable and systematic urbanization. Similar impacts are carried out by heavy labour in agriculture [24].

The economic burden of musculoskeletal diseases is high. In the US alone, a highly industrialized country, the Department of Health and Human Services estimated the average annual cost of musculoskeletal disorders in 2009 and 2010 at $212.7 billion USA, of which 82 billion dollars USA – direct costs and $130.7 billion USA – indirect costs [25–30].

Diseases of the musculoskeletal system are thus manifested by numerous nosological forms and are characterized by high prevalence, a significant contribution to the level and structure of the population's disability. Modified risk factors common to many other non-communicable diseases contribute to the development of diseases of this class: excess body weight, obesity, low physical activity, irrational nutrition, occupational factors and smoking.

Conclusions

1. Musculoskeletal and connective tissue pathology has been found to be an urgent health problem in the world population: age-standardized prevalence, mortality and disability rates for these diseases in 2017 were 16,276.2, 1.6 and 1,720 per 100,000 of us, respectively, and in 2021, 19,832, 1.43 and 1,908.87 per 100,000 of us, respectively. The highest prevalence was due to low back pain (36.8%), other diseases of this class (21.5%), osteoarthritis (19.3%), neck pain (18.4%), as well as gout (2.6%), rheumatoid arthritis (1.3%). These diseases violate the moral and psychological state, social and professional adaptation of the patient and bring significant economic losses to the state.

2. It was established that diseases of the musculoskeletal system and connective tissue occupy more than 5.0% and the fourth rank place in the structure of all registered diseases among the population of Ukraine, and in the category of newly detected diseases – respectively, 4.0% and the seventh rank place. In the structure of primary disability of the adult population, the disease of the musculoskeletal system ranks third (more than 11.0%). Primary incidence and prevalence levels during 1993–2017 had a steady upward trend.

3. The theoretical study found that the leading risk factors for pathology of the musculoskeletal system and connective tissue are factors common to other non-infectious diseases: tobacco smoking, excess body weight, obesity, low physical activity, occupational factors. The levels of this pathology increase significantly with age, more often in women and in combination with other diseases, complicating the course of multimorbid conditions, in particular, in the elderly.

4. Patterns of the dynamics of morbidity and prevalence of diseases of the musculoskeletal system and connective tissue, identification of risk factors for their development serve as an information basis for forecasting and planning measures to improve policies and prevent their progression on the part of interested social institutions, medical workers and the population of countries and their individual regions.

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