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Original Article

Determinants of office syndrome among working age women

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Abstract.
The health of office employees, the majority of whom are women, is affected by negative factors of the working environment. A complex set of disorders associated with the peculiarities of work in the office is usually called office syndrome. Manifestations of office syndrome include posture disorders and musculoskeletal pain. ***The purpose of the article*** is to study the risk factors that cause certain manifestations of office syndrome among women of working age under the influence of negative working environment. **Material and methods.** The research involved 52 women aged 21 to 57, who work in the office. **Results.** The research has shown that against the background of unsystematic physical activity and due to specific working conditions, 38.5% of female office employees are insignificantly overweight and 13.5% – significantly overweight. Most women work at a computer for more than 7 hours a day. In addition, 34.6 and 55.8%, respectively, often or occasionally use IT for entertainment purposes. Despite the fact that 17.3 know and 44.2% know in general which posture is ergonomically optimal, 34.6% of female office employees do not think about maintaining posture. Unfortunately, only 17.3% of respondents systematically control the working posture of a PC user, 7.7% always take active breaks while working at the computer, 13.5% perform self-massage, but 40.4 have a passive lifestyle, which does not promote good health. Half of female office employees do not take any measures to maintain posture. Obviously, the above-mentioned caused the manifestations of office syndrome among interviewed women of working age. 57.7% of female office employees considered the condition of the musculoskeletal system satisfactory, and 5.8% indicated its unsatisfactory condition. At the same time, 11.5% of women have spinal diseases and another 57.7% have posture disorders. A significant proportion of female office employees complain of musculoskeletal pain. The most typical for female office employees were pains localized in the neck and wrist (radiocarpal) joint, which was indicated by 40.4 and 44.2% of respondents, respectively. The research has revealed that among the factors that limit the possibilities of female office employees to take care of posture during the performance of duties, 34.6% indicated a lack of knowledge and skills to organize measures to maintain health while working at the PC. In addition, 80.8% of female office employees are interested in expanding their knowledge on the organization of health activities in the office. The research has proved that among female office employees, the symptoms of office syndrome increase with age, in particular, the level of musculoskeletal pain localized in the spine. There is also a tendency of increasing propensity to a passive lifestyle with the increase in the length of service in the office.
Key words: office, employee, syndrome, factor, risk, PC user, working posture, load, posture, disorders, spine, musculoskeletal system, musculoskeletal pain.

Introduction.

At present, the development of the society is under the influence of total informatization in all spheres of life, and production is increasingly characterized by the widespread use of information technology. This has led to a significant increase in the share of people involved in work related to the use of computer technology.

It is known that the most popular tools of a modern office are information technology and office equipment. Therefore, it can be stated that currently the work process in the office is determined by long-term work at the computer, and the work of office employees should be considered as the work of PC users.

The intensive increase in the number of office employees is accompanied by an increase in their workload and working hours, the encouragement of overwork by employers, which has led to a significant spread of musculoskeletal diseases among the working age population. At the same time, pathologies of a spine and joints among office workers are often accompanied with pains in the musculoskeletal system and lead to a short-term or constant loss of working capacity (Y. Karpukhina et al., 2020; A. Danylov, 2012).

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The observed health disorders among the population working in the office have reached such a scale that health professionals began to use the term 'repetitive strain injury' to determine a complex set of symptoms as an occupational pathology (E. Shahla, 2009).

Numerous studies of experts in ergonomics, occupational safety and biomechanics show that among the most threatening factors for the psychophysiological capabilities of PC users are static-dynamic loads on the spine caused by being in a monotonous position against the background of a large number of stereotyped highly coordinated movements performed only by the hand muscles (V. Kashuba, 2007-2018; N. Byshevets, 2018).

The analysis of normative acts and documents that establish safety, sanitary and hygienic requirements for the equipment of workplaces of PC users shows that the main normative document on labor protection of office workers is "Rules of labor protection during operation of computers", which clearly states the need for regulated breaks for rest lasting 10 minutes after each hour of work for computer operators and 15 minutes every two hours for employees who use computers. However, both the references and authors' own experience show that, unfortunately, these breaks are either not used properly or there are no such breaks at all, and office workers, who usually work at least 40 hours a week, stay most of the time during the working day sitting at the computer (A. Danylov, 2012).

The contingent of office workers, including clerks, computer operators, accountants, secretaries, managers, etc., who actively use personal computers in the course of their professional duties, are predominantly women. The above proves the relevance of the research aimed at studying peculiarities of work in the office, determining the condition of the musculoskeletal system, assessing the level of musculoskeletal pain in the spine and joints, as well as summarizing data on the current state of preventive measures against posture disorders among women who carry out professional activities in the office.

The purpose of the research is to study the risk factors that cause certain manifestations of office syndrome among women of working age under the influence of negative working environment.

Material and methods.

Participants. The research involved 52 female office employees. 62.0% of the study participants are married women who have a child/children, 50.0% of them have a complete higher education (master's degree), and 26.9% are skilled employees. The age of female office employees ranged from 21 to 57 years old.

Procedure / Test protocol / Skill test trial / Measure / Instruments. The research methods included theoretical analysis of scientific literature, survey and statistical analysis.

The research involved an anonymous online survey with a questionnaire developed using the Google Form and distributed through social networks and the most popular messengers (Viber and Telegram).

The level of pain in the spine and joints was proposed to be assessed using a visual-analog scale (VAS technique), which is widely used in medicine and physical education to measure the intensity of pain (Yu. Tomilina, 2018; N. Byshevets, 2018).

Data collection and analysis / Statistical analysis. The STATISTICA software package developed by StatSoft to perform statistical analysis was used for data processing.

The hypothesis H_0 about the conformity of the initial data to the normal distribution law was tested using the Shapiro-Wilk consistency criterion W for the data obtained on an interval scale. Under the condition $p>0.05$, we assumed that the analyzed distribution does not differ from normal (V. Kashuba, 2020).

Average indicators, calculated using data that do not obey the normal distribution law, are presented as median and interquartile range Me (25; 75).

The questionnaire data were processed using frequency analysis with the Pearson consistency criterion χ^2 (L. Denysova, 2011). It allowed checking whether the distribution in the sample of female office employees are subject to the uniform distribution law according to the answers to the relevant questions. Kendall's tau correlation coefficient (τ_b) was used to determine and assess the correlation between the age and length of service of office workers as a PC user and categorical variables, and Spearman correlation coefficient (ρ) was a measure of the strength of the relationship between the age and experience of the research participants and the level of their musculoskeletal pain (A. Grzhybovsky, 2017). The level of statistical significance was taken as $\alpha=0.05$ ($p<0.05$). Its value of p was rounded to thousandths, and in the case when the value of p-level was less than 0.001, the value of p is given in the standard form. In some cases, when the value of p was less than $1 \cdot 10^{-6}$, its value is presented as $p<0.05$. The calculated values of the median and interquartile range, as well as the fractions are rounded to tenths, and the rest of the calculated data – to hundredths.

Results.

The study of the characteristics of the female contingent has shown that 62% of respondents are married women, and 82% of them have children. Among the respondents, women with full higher education predominate – 50% have a master's degree, and 26.9% are skilled workers. The majority of study participants, 59.6%, combine office offline work and online work. At the same time, 21.2% of women work exclusively in the office.

Examining the age and experience of work with a computer, the research has found that the sample data are not subject to the normal distribution law: Shapiro-Wilk criteria were W=0.9097 at p=0.0008 and W=0.9511 at p=0.03236, respectively. Therefore, the median values of the indicators were 40.0 (38.5; 45.0) and 17.0 (11.0; 20.0) years. In addition, the research has shown that 38.5% of women are slightly overweight and 13.5% – significantly overweight. Taking into account that 26.92% of women chose among the answers the option "have not checked for a long time", it can be assumed that most of them also have increasing body weight indicators. Only 21.2% of female office employees indicated that their body weight met the established norms. The research has proved that the share of women with normal body weight is statistically significantly lower compared to other female office employees (χ^2=17.308; df=1; p=$3.2 \cdot 10^{-5}$).

The research has found that 25% of female office employees work at a computer for 6-7 hours, 36.5% for 7-8 hours, and 21.2% for 8-9 hours a day to perform their professional duties. The share of women working less than 6 hours is 15.4% (χ^2=24.923; df=1; p=$1.0 \cdot 10^{-6}$).

In addition to long-term use of PCs for work purposes, female office employees often or occasionally use IT for entertainment and communication, as indicated by 34.6 and 55.8%, respectively. Therefore, the share of women who do not use IT outside the office is statistically significantly lower than the share of women who spend leisure time using PCs or other gadgets (χ^2=33.923; df=1; p<0.05). It has been found that 55.8% of women use IT for entertainment purposes in leisure time about 2 hours a day.

Statistical processing of the research results has shown that the indicators of the duration of the use of information technology for work and entertainment by women are characterized by significant fluctuations. Thus, the duration of the use of IT for professional duties varies from 5.5 to 12.5 hours per day, and the range of variation in the duration of the use of IT by women for communication and entertainment is 3 hours (from 1.5 to 4.5 hours per day). These indicators are also not subject to the normal distribution law. For indicators of the use of IT for professional purposes, the Shapiro-Wilk criterion was W=0.8657 at p=$0.3 \cdot 10^{-4}$, and for the duration of the use of IT for entertainment purposes – W=0.7314 at p<0.001. The research has determined that the median duration of the use of IT for work is 7.5 (6.5; 7.5) hours per day, while another 1.5 (1.5; 3.0) hours IT is used for entertainment.

Therefore, generally, female office employees are married women with children, have higher education, aged 38.5 to 45, 11 to 20 years of computer experience, and are prone to gaining excess weight. According to the type of their professional activity, they are in the working position of a PC user from 6.5 to 7.5 hours a day, and they use IT for their own pleasure and entertainment from 1.5 to 3 hours a day.The research has found that 38.5% of women have not thought about which working position of a PC user is ergonomically optimal (χ^2=2.769; df=1; p=0.096).

The has proved that only a quarter of female office employees are concerned about maintaining posture, and 34.6% do not think about this issue (χ^2=4.923; df=1; p=0.027). However, the working posture of a PC user is controlled by a statistically insignificant share of women, namely 17.3% of respondents (χ^2=22.231; df=1; p=$2 \cdot 10^{-6}$), and 44.2% of them do not pay attention to this issue.

In addition, it has been found that among female office employees, a statistically significantly lower percentage of respondents, namely 21.2%, are systematically engaged in health-improving physical activity (χ^2=17.308; df=1; p=$3.2 \cdot 10^{-5}$) compared to the proportion of women engaged occasionally and not engaged at all. It should be noted that a quarter of respondents indicated that they did not engage in physical fitness at all. An even smaller percentage of respondents, namely 7.7% (χ^2=37.231; df=1; p<0.05), systematically performs mini sets of exercises when working with a PC, and 13.5% do self-massage (χ^2=27.769; df=1; p<0.05). As the research shows, only a small proportion of women are really concerned about posture and take measures that are adequate to the static-dynamic load on the spine that occurs during the performance of office duties. Thus, it is not surprising that 57.7% of female office employees indicated that they had posture disorders, and another 11.5% stated the presence of spinal diseases.

According to the research results, 69.2% of women working in the office have musculoskeletal pain in different or all parts of the spine. 30.8% of female office employees are not worried about musculoskeletal pain, but their share is statistically significantly lower (χ^2=7.692; df=1; p=0.006) than the proportion of women who have complaints of constant or recurrent pain in the spine (Fig. 1).

Regarding the localization of musculoskeletal pain in the spine, 23.1% of female office employees complain of chest pain, and 28.8% – in the lumbar part. However, the maximum share of women, which is 40.4% (χ^2=1.923; df=1; p=0.166), indicates that musculoskeletal pain in various configurations is localized in the neck part. Thus, it can be argued that half of female office employees is concerned about musculoskeletal pain in the neck. In contrast, among the musculoskeletal pain in the joints, 44.2% (χ^2=0.692; df=1; p=0.405) of the respondents report pain in the wrist joint, and 19.2% of respondents experience discomfort in the elbow and knee joints. Thus, half of female office employees have manifestations of tunnel syndrome.

It should be noted that only one of the respondents rated the condition of the musculoskeletal system as high, while three indicated an unsatisfactory level. At the same time, 34.6 and 57.7% of the respondents rated the condition of the musculoskeletal system as good or satisfactory, respectively.

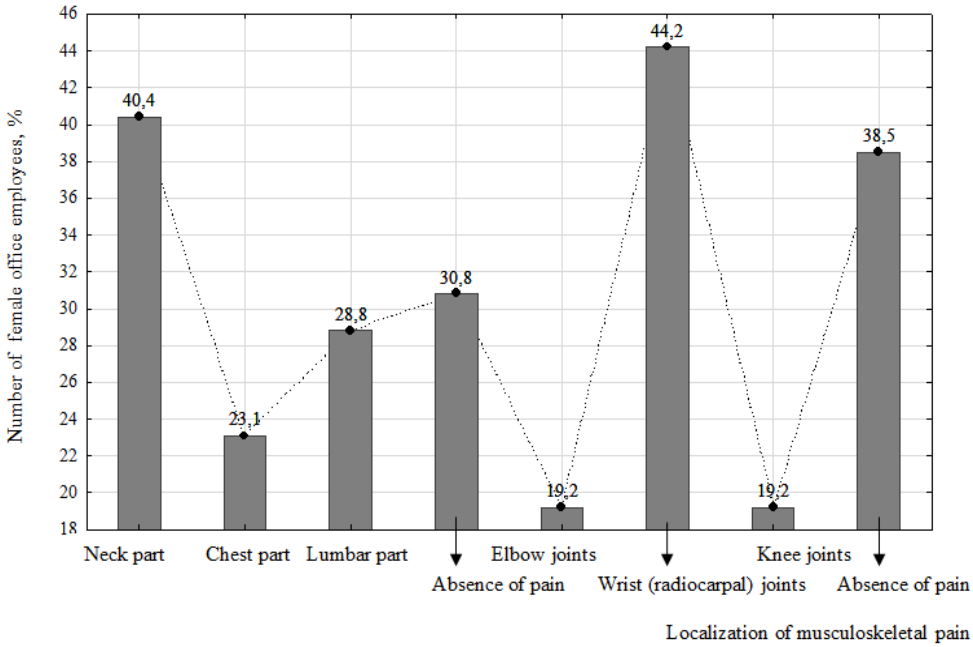


Fig. 1. Analysis of the presence and localization of musculoskeletal pain among female office employees, n=52

Among female office employees, dominate women who either lead a passive lifestyle or try to follow the principles of a healthy lifestyle – 40.4% (χ^2=1.923; df=1; p=0.166). However, only 11.5% of the respondents (χ^2=30.769; df=1; p<0.05) indicate that they lead an active lifestyle. It should be noted that 7.7% of office workers admit to a tendency to a lifestyle that is not good for health, namely, they have little rest, are not engaged in health-improving motor activity and do not take care of themselves.

Determining what measures female office employees take to maintain posture, it has been found that 21.2% of the respondents get massage, 19.2% follow the regime of work and rest, 15.4% control the working posture of a PC user and/or take active breaks while working with a PC, 9.6% strengthen the muscles involved in the working position of a PC user, 9.6% are systematically engaged in health-improving motor activity, and 7.7% have a specially equipped workplace. It should be noted that among the proposed answers, some female office employees chose several answers. However, 38.5%, which is half of the respondents (χ^2=2.769; df=1; p=0.096), do not take any measures to maintain posture.

The analysis of the reasons, which hinder taking measures to prevent office syndrome, has shown that all female office employees consider the impact of the work environment and the peculiarities of professional activity to be harmful to their health. At the same time, 13.5% of the respondents take care about their health.

However, as it can be seen, the share of such women is not statistically significant (χ^2=27.769; df=1; p<0.05). According to the factors that limit their ability to take care of posture during the performance of their duties, the rest of the women are distributed as follows: 34.6% of the respondents do not have the knowledge and skills to organize health measures while working at a PC, 23,1% are fully involved in work and do not want to be distracted for a break, 17.3% do not have the opportunity to take measures to maintain health in the office, 17.3% do not have the opportunity to systematically engage in health-improving physical activity, 7.7% do not have such a desire, and 1.9% do not want to be distracted while performing professional duties. Again, as in the previous case, the respondents had the opportunity to choose several factors from those proposed.

Despite the disappointing results, the research has shown that the vast majority of female office employees (χ^2=19.692; df=1; p=$9.0 \cdot 10^{-6}$), whose share is 80.8%, want to expand knowledge about the organization of measures for maintaining health in the office.

In the course of the research, we performed a correlation analysis, during which we analyzed the correlations between the age and length of service of female office employees and their answers to the questionnaire, presented in the form of dichotomous variables. The results of the correlation analysis are presented in the table (Table 1).

Table 1

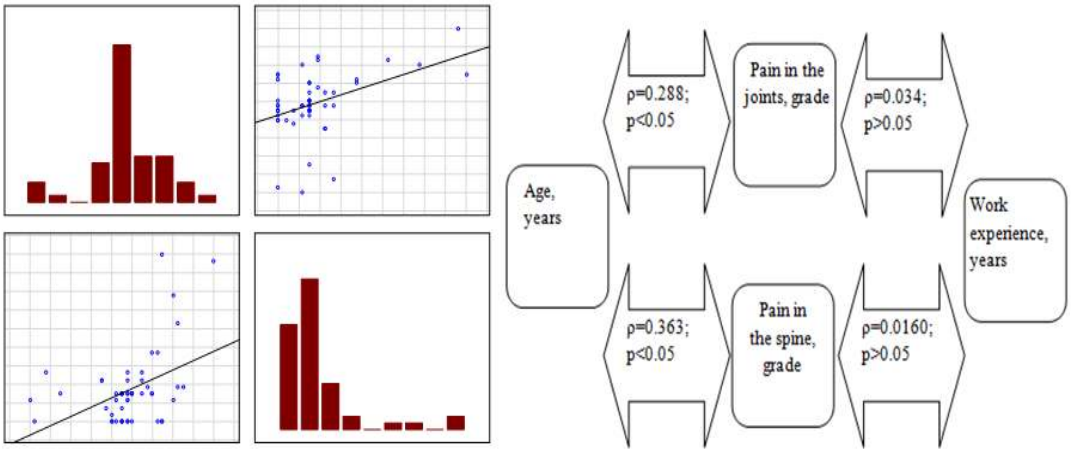
Correlation analysis of the research results, n=52

Categorial variables	Analysis of correlations between categorial variables and								
	age of female office employees					work experience of female office employees			
	Number of gradations	τ_b	Z	p; df=50	p	τ_b	Z	p; df=50	p
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Excess body weight	4	0.2833	2.9645	0.0030	<0.05	0.2919	3.0543	0.0023	<0.05
Duration of work with a PC	5	0.0297	0.3109	0.7559	>0.05	0.2614	2.7348	0.0062	<0.05
Duration of IT use for entertainment purposes	4	0.0392	0.4102	0.6817	>0.05	-0.0138	-0.1442	0.8853	>0.05
Knowledge of ergonomic-optima posture	3	-0.0751	-0.7859	0.4320	>0.05	-0.1773	-1.856	0.0635	>0.05
Care about posture	3	0.1689	1.7672	0.0772	>0.05	-0.0038	-0.0401	0.9680	>0.05
Systematic control of the workin posture of a PC user	3	0.0956	1,000	0.3172	>0.05	-0.0705	-0.7381	0.4605	>0.05
Engagement in health-improving motor activity	3	-0.1989	-2.0809	0.0374	<0.05	-0.0799	-0.8361	0.4031	>0.05
Active breaks while working wit a PC	3	-0.2070	-2.1664	0.0303	<0.05	-0.1431	-1.4974	0.1343	>0.05
Self-massage when working	3	-0.0259	-0.2715	0.7860	>0.05	-0.1674	-1.7517	0.0798	>0.05
Spine diseases	3	0.1218	1.2747	0.2024	>0.05	-0.0394	-0.4123	0.6801	>0.05
Pain in joints	3	0.0348	0.3646	0.7154	>0.05	0.1050	1.0988	0.2719	>0.05
Pain in the parts of the spine	3	0.2170	2.2703	0.0232	<0.05	0.0592	0.6191	0.5358	>0.05
Condition of the musculoskeleta system	4	-0.1760	-1.8406	0.0657	>0.05	-0.2766	-2.8943	0.0038	<0.05
Lifestyle	4	-0.1386	-1.4502	0.1470	>0.05	-0.1882	-1.9690	0.0490	<0.05
Need for knowledge to organize health activities in the office	4	0.0534	0.5588	0.5763	>0.05	-0.0383	-0.4009	0.6888	>0.05

Thus, the research has established that among female office employees, with increasing age, there is an increase in the tendency to gain weight, as well as in the level of musculoskeletal pain in the spine. At the same time, there is an inverse correlation between the age of female office employees and their performance of active breaks while working with a PC and the level of their physical activity.

At the same time, the increase in office experience directly correlates with the increase in the length of the working day and the increase in the use of IT for entertainment purposes, and leads to an increase in body weight and a decrease in their musculoskeletal system. In addition, increasing work experience as a PC user increases the tendency of female office employees to a passive lifestyle.

In addition, the research has revealed direct statistically significant correlations between the age of female office employees and the level of their musculoskeletal pain and the absence of such links with the experience in the office (Fig. 2).



a) b)

Fig. 2. Graphical representation of the correlation between the age of female office employees and the level of musculoskeletal pain in the spine (scattergram) and the results of the correlation analysis

Discussion.

The spread of posture disorders among women of working age has led to the increased interest of scientists in this issue. A significant number of scientists, including V. Kashuba (2008-2021), N. Nosova (2017), A. Hakman (2020), have been studying the attitude of various groups of the population (including women) to the condition of posture. Analyzing the scientific works, which deal with the condition of the musculoskeletal system of women, we noticed that the vast majority of women in the first period of adulthood from time to time experience musculoskeletal pain in the spine and/or joints (Yu. Tomilina, 2018; V. Kashuba, 2020). It should be noted that the results of this research are consistent with the results of previous studies; moreover, female office employees complained even more of pain in the neck part of the spine.

At the same time, scientists have begun to pay more and more attention to the consequences of work with a PC (V. Kashuba, 2018; N. Byshevets, 2017; O. Lazko et al., 2021). In addition, due to the total informatization, which has led to the wide use of IT by the population, and office workers have actually switched to PC users, posture disorders have become widespread. The results of the research fully confirm the presence of such manifestations of office syndrome among women of working age as musculoskeletal pain in the spine and joints. Moreover, posture disorders can be considered an occupational type of disorder among office workers.

Studying office syndrome, which includes diseases caused by negative factors of the working environment, including musculoskeletal pain in the chest, neck and upper extremities, as well as the so-called tunnel syndrome, manifested in paresthesia, pain and swelling of the hand, numb fingers, A. Danylov (2012) points to pain as the most common disorder among office workers. On the other hand, studying the impact of IT on the health of office workers, N. Shvets (2018) primarily focuses on such syndromes and symptoms as “text neck syndrome”, which is based on the curvature of the cervical spine and which occurs due to the unnatural tilt of the head forward and down when working with technical devices, the above-mentioned tunnel syndrome, upper cross syndrome, which is determined by a complex of muscular changes in scoliotic posture disorders, contraction of the thigh extensor muscles due to the excessive time in the posture of a PC user and resulting in posture disorders accompanied by pain in the lumbar spine. Investigating the risk factors for musculoskeletal pain caused by the working environment of office workers, we have found that in general, the negative factors are divided into individual, physical, clinical and psychological (E. Shahla, 2009). From the point of view of this research, we first paid attention to the physical factors, namely the lack of control of the working position of a PC user by female office employees, unjustifiably long continuous stay in a forced position, lack of adequate physical exercise, as well as to clinical, manifested in posture disorders and diseases of the spine. According to some reports, neglect of physical factors triples the risk of pain and can lead to its transition to a chronic form (M. Eline, 2008). However, the research has shown that, despite the negative consequences recognized by female office employees, most women do not have a possibility or desire to take action to prevent office syndrome. According to the results of the study, a significant number of women are overweight; at the same time, they are not systematically engaged in health-improving motor activity and mostly lead a passive lifestyle. The study has confirmed the presence of a trend that manifests itself in the exacerbation of some negative consequences of the working environment among female office employees with age and length of service in the office. It can be argued that the performance of work duties gradually leads to the emergence of manifestations of office syndrome among women of working age. In addition, it can be noted that excess weight, lack of active breaks while working at the computer and lack of adequate exercise – all this provokes pain and causes spinal diseases among female office employees.

Conclusions

Against the background of significant changes in production processes under the influence of scientific and technological progress and the growing share of women involved in mental labor, there is a change in working conditions and the working environment as a whole. At present, office workers spend most of their time in the working position of a PC user, which negatively affects their health in general and posture in particular. The increase in the intensity of the production process, lengthening of the working day and the lack of regulated breaks during work exacerbate the negative factors of the working environment for office workers.

For a set of disorders, which is characteristic of office workers, modern scientists use a term “office syndrome”. Among such disorders, the most threatening are diseases of the musculoskeletal system and musculoskeletal pain in the spine and joints, caused by inadequate static-dynamic loads on the spine, which are typical for PC users. The research has shown that most women do not have a possibility or desire to take measures to prevent office syndrome, do not systematically engage in health-improving physical activity, generally do not take active breaks during work, do not do self-massage, do not control a PC user’s posture and mostly have a passive lifestyle. The research has confirmed the presence of a tendency manifested in the age-related exacerbation of the negative consequences of the working environment for female office employees. Thus, the research has found a direct correlation between the age of female office employees and tendency to be overweight, spread of spinal diseases and musculoskeletal pain in the spine, as well as the inverse correlation with the level of performance of active breaks during work with a PC. On the other hand, the research has

proved that the increase in work experience in the office causes the appearance of excess body weight, lowers the condition of musculoskeletal system, and contributes to the fact that female office employees not only work longer, but also are more inclined to a passive lifestyle. There are direct statistically significant correlations between the age of female office employees and the presence of musculoskeletal pain localized in the spine.

Taking into account the results of the research and the desire expressed by women to expand their knowledge on the organization of health activities in the office, we consider it necessary to develop a system of measures that would help to solve this problem. In particular, there is a need to organize and conduct lectures aimed at highlighting the role of health-improving motor activity in neutralizing the negative consequences of the working environment for female office employees. It is also advisable to conduct practical classes, during which female office employees could learn and develop skills to prevent office syndrome.

Further research is planned to assess the level of the bio-geometric profile of the posture among female office employees of working age.

Compliance with Ethical Standards

Conflict of Interest. The authors declare that there is no conflict of interest that could be perceived as interfering with publication of the article.

Competing Interests. The authors declare that they have no competing interests.

Ethical Approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent. Informed consent was obtained from all individual participants included in the study. All subjects of the institutional survey gave consent for anonymized data to be used for publication purposes.

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