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HYGIENIC ASSESSMENT OF LEVELS OF ELECTROMAGNETIC RADIATION FROM Wi - Fi EQUIPMENT IN TASHKENT COMMUNICATION INSTITUTIONS

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workplaces,
questionnaire survey.

Abstract:

The article presents the results of a hygienic assessment of the levels of electromagnetic radiation from wireless communication equipment of the Wi-Fi standard in workplaces in office premises of some communication institutions in the city of Tashkent. The actual levels of electromagnetic radiation generated by Wi-Fi transmitters and other devices (routers) have been established. Research has shown that the levels of electromagnetic radiation from the equipment of the wireless Wi-Fi system at the workplaces of the main and control groups of employees of the Tashkent city communications institution do not exceed the hygienic standards established for the premises of public buildings - 10 μW/cm ^{2}. The impact of electromagnetic radiation from Wi-Fi equipment on the health of employees of communications institutions was studied using a questionnaire survey based on subjective indicators.

Introduction. Wireless technologies have become an integral part of people's everyday life, have become familiar and ordinary. The current level of technology development allows using complex

high-tech equipment without thinking about how it is designed and how it works. At the current stage of development of new technologies, sources of electromagnetic radiation (EMR) of low intensity (for example, Wi - Fi) are becoming increasingly important. equipment), the influence of which on the life processes of biological objects has not been sufficiently studied [1].

WI-FI is a modern wireless technology for connecting computers to a local network and connecting them to the Internet. It is thanks to this technology that the Internet becomes mobile and gives the user freedom of movement not only within the room, but also around the world [2]. The presence of a large number of such sources is dictated by the development of modern technologies, the transmission of significant amounts of information via wireless communication .

Wi - Fi devices are usually placed in offices, public places, and they are also installed for home use, creating their own wireless networks. Research has established that electromagnetic radiation of the radio frequency range (EMR RF) is one of the serious factors of environmental pollution, causing the risk of adversely affecting the health of the population. Electromagnetic radiation of Wi - Fi devices can affect the biological systems of a warm-blooded organism through thermal or non-thermal effects [3].

When exposed to electromagnetic radiation Wi - Fi equipment in experimental animals, a reliable decrease in horizontal and vertical motor activity indicators is observed compared to the control group, which indicates the occurrence of stress in animals; on the 25th day, a depressive state sets in and there is a slight slowdown in body weight gain [4].

The unique characteristics of wireless device systems include: low equipment cost, high reliability of network solutions, low requirements for the transmission medium, minimal installation and operating costs, ease of marketing, and the ability to use the existing infrastructure of the city telephone network [5, 6, 7].

Wi - Fi Equipment introduced at the household level or used in places of mass presence of people, as a rule, is characterized by low intensity of EMI, but with its long-term operation, conditions of round-the-clock exposure can be created. The effects of exposure do not always manifest themselves acutely, but there are prerequisites for their cumulation and, as a consequence, for the development of remote disorders leading to chronic disorders of a psychofunctional nature [8, 10].

The results of studies assessing the effect of wireless network modulation (2.45 GHz) indicate the induction of oxidative toxicity in the laryngeal-tracheal mucosa of rats. The effect of selenium and L -carnitine on the indices of EMI-induced oxidative stress in the blood of rats has been described [9, 11].

EMF with a frequency of 2.4 GHz from wireless networks and working phones affects the autonomic nervous system, causing changes in heart rhythm [12, 13].

The influence of the electromagnetic field Wi - Fi has been studied equipment on changes in brain rhythms on EEG depending on gender. The study involved 50 women and 50 men who performed tests aimed at assessing short-term memory. All subjects were exposed to EMF at a frequency of 2.4 GHz. In this case, women, unlike men, showed a decrease in the strength of the alpha and beta rhythm.

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The differences between men and women were reliable [14].

Similar studies were conducted to assess the impact of Wi - Fi signals on concentration and working memory in a linguistic test in a group of 15 men and 15 women. It was found that the impact of EMF Wi - Fi can lead to changes in neural activity and depends on gender. This is associated with the amount of internal reserves for maintaining focused attention during a linguistic test [15].

Materials and methods. The studies were conducted in office premises in communication institutions of the city of Tashkent. The Wi - Fi standard equipment in the premises was represented by routers: wall-mounted «TP - Link Dego S 4 R", wall-mounted "TP-Link" with external radiating antennas, ceiling mounted "Zyxel", "Huawei" and desktop mounted "AIR - AP 1131".

Measurements of the electromagnetic radiation (EMR) levels were performed using the electromagnetic radiation meter PZ-42, serial number 034, manufactured by Electronpribor CJSC , Russia. EMR levels were determined at a height of 0.5; 1.0 and 1.2 meters in accordance with the measurement technique presented in the regulatory document: GOST 12.1.006-84 "OSBT. Radiofrequency electromagnetic fields. Permissible levels in the workplace and requirements for monitoring". To achieve the set goal, 174 measurements of electromagnetic radiation were performed.

Results of the research and their discussion. The research was conducted at the workplaces of office workers. To compare the working conditions, the workers were divided into two groups: the main group, whose workplaces were at a distance of up to 3 meters from the Wi -Fi standard routers (29 workplaces), the second group, employees whose workplaces were at a distance of more than 3 meters from the Wi -Fi equipment (29 workplaces).

When measuring electromagnetic radiation at work places, conditions were created for maximum hardware transmitter power with active radiation of electromagnetic energy by the router into the surrounding space (when transmitting a large volume of information or high-quality video materials to at least 4 receiving terminals simultaneously).

The impact of electromagnetic radiation of Wi - Fi equipment on the health of workers in the studied groups of communication institutions was assessed by subjective indicators using a questionnaire using a specially developed questionnaire. The respondents' answers to the questions posed made it possible to assess the possible adverse impact of electromagnetic radiation of the Wi - Fi standard on the well-being of workers.

The average age of workers in the main group is 35.3 ± 1.29 years, the average length of service is 12.16 years ± 1.65, in the control group the average age was within 41.17 years ± 1.71, the average length of service was 16.34 ± 2.0, respectively.

Wi -Fi transmitters (routers) at workplaces in office buildings in Tashkent has been established: the average value of the generated parameters of the energy flux density of electromagnetic radiation of Wi -Fi equipment at a frequency of 2.4 GHz at workplaces of the main group is 0.77 ± 0.09 μW/cm2 · At workplaces of employees of communications organizations at a distance of up to 1 m from the router, the average value of electromagnetic radiation was determined at the level of 1.63 ± 0.04 μW/cm2 · from

1 to 2 m from the router - 1.11 ± 0.24 μW/cm2 and at a distance of 2 to 3 m from the router 0.51 ± 0.05 μW/cm2 , respectively.

The average value of the energy flux density levels of electromagnetic radiation at a frequency of 2.4 GHz at the workplaces of the control group of workers is 0.065 ± 0.013 μW/cm ^{2} .

The surveys showed that 69% of the main group and 72.4% of the control group of respondents have been using Wi - Fi wireless transmission equipment for over 2 years in their work . The work schedule is 8 hours (93.1% and 96.6%, respectively), and the working week for the studied groups of workers is 5 days. 34.5% of the main group and 31% of the control group answered positively to the question about the possible adverse effects of electromagnetic radiation from Wi - Fi equipment on the human body and the presence of a relationship between the location of wireless communication devices and the distance at which the device is installed.

The results of the questionnaire survey showed that 20.6% of the main and 6.9% of the control group of workers noted the presence of deviations in their health before connecting the equipment of wireless data transmission devices of the Wi - Fi standard , and after connecting the number of subjective complaints about deterioration in health increased more than twofold and amounted to 48.3% in the main and 10.3% in the control groups of surveyed individuals. The results of the questionnaire survey showed that 41.4% of the main and 10.3% of the control groups of surveyed individuals associate the adverse effects of electromagnetic radiation from Wi - Fi equipment on their health and that of their colleagues, and 17.2 and 10.3% of respondents believe that the cause may be different, 41.4% of the main group and 79.3% of the control group of subjects do not associate changes in health with the impact of wireless data transmission equipment.

Conclusions.

1. Research has established that the levels of electromagnetic radiation from wireless Wi -Fi system equipment at the workplaces of the main and control groups of workers do not exceed the hygienic standards established for the premises of public buildings (10 μW/cm^2) .

2. The survey results showed that more than 30% of respondents in each group consider the adverse effect of electromagnetic radiation from Wi -Fi standard equipment on the human body to be possible, while the number of subjective complaints among representatives of the main survey group about deterioration in health after connecting wireless communication devices of the WiFi standard in the office increased more than twofold, compared to the indicators associated with the period of time before connecting WiFi equipment .

3. Taking into account the above, it is relevant to further study the influence of subthreshold levels of electromagnetic radiation generated by WiFi wireless communication devices on biological organisms, including through experimental research.

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