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A unified Approach to Studying Engineering Infrastructure of Medical Diagnostics Centers of Uzbekistan

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Abstract— *A comprehensive assessment of hygienic conditions and the state of the engineering infrastructure of the Medical Diagnostics Centers in conjunction with the impact of their activities on the formation of risk factors for environmental pollution. It is established that the unified approach, taking into account a complex of quantitative and qualitative environmental and hygienic criteria, allows to create a conceptual model of objective assessment of hygienic bases of medical care quality.*

Keywords— *Centers of medical diagnostics, consulting and diagnostic centers, sanitation, engineering infrastructure, water supply, sewerage.*

I. INTRODUCTION

Engineering infrastructure of the regions within the territory of the republic's regions is of key importance in the life support of the population, covering the issues of water supply, sewerage, electricity, gas, heat and cold supply, as well as telephone communication and transport links. In the context of the Health Care Facility (HCF), in particular, Medical Diagnostics Centers (MDCs), the engineering infrastructure is a key link in the creation of favorable working conditions for employees of the institution and a quality technological and hygienic platform for the provision of consultative and diagnostic assistance [2, 3, 4, 6].

According to studies conducted by international organizations, including the World Bank in Uzbekistan, there are problems related to centralized water supply and provision of the population with quality drinking water. Thus, according to the results of research conducted by the Center for Municipal Economy and Engineering in 2014-2015, only 56.5% of the rural population is supplied with tap water; the highest percentage of centralized water

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supply coverage is typical for residents of Tashkent city (99.5%) and cities of Samarkand, Ferghana and Andijan regions (93% on average). At the same time, the rural population of Bukhara, Khorezm and the Republic of Karakalpakstan has the least centralized water supply (49.7% on average). Moreover, there is a limited supply of tap water (for 2-3 hours a day). Of the total population of the republic provided with centralized water supply, only 17% of consumers receive water around the clock, 18% - within 12 hours and 65% - within no more than 2-6 hours a day. Efficient use of treatment facilities is ensured only in Tashkent city. The capacity of other water treatment plants is used on average by 35.3% [5].

Along with the problems of centralized water supply, the lack of centralized sewerage is also a risk factor for public health. For example, in the National Report on return water management in the Republic of Uzbekistan, the European Union's "Environmental Awareness for Strengthened European Union-Central Asia (EURECA) Partnership" program filtered about 1-1.5 billion cubic meters of wastewater through domestic toilets and wastewater pits into groundwater, which is used as a source of drinking water by about half of the rural population, which is also a direct threat to public health [7, 10, 11]. Wastewater treatment, unlike in rural areas, is more prevalent in urban areas. According to the Asian Development Bank, less than 40% of the country's population is provided with centralized sewerage systems. At the same time, most of the existing sewage treatment facilities do not provide quality wastewater treatment. There are no facilities for wastewater treatment, sludge treatment and disinfection, which leads to pollution of water bodies and soil, thereby complicating the sanitary and environmental situation. Buildings of the existing system of water supply and sewage disposal have largely worked out the standard service life and require complete reconstruction [8, 10].

Despite many achievements of reforms carried out in the republic, it is necessary to emphasize the existence of contradictions in rural areas of HCF (in particular, MDC). The high level of development of medical technologies in the system of diagnostic service of the republic implies hygienic conditions conducive to further modernization of the health care system, as well as ensuring epidemiological and environmental safety. However, despite the obvious breakthrough in the issues of medical technologies, the issues of hygienic fundamentals of the quality of medical care remain at a low level, which characterizes and explains many shortcomings in the quality of medical care to the rural population [1, 3, 6, 7].

The aim of the study was to study hygienic conditions and the state of engineering infrastructure of Medical Diagnostics Centers, taking into account the impact of the Centers' activities on the formation of risk factors for environmental pollution.

II. MATERIAL AND METHODS OF RESEARCH

The objects of the research were 10 medical and preventive institutions (medical institutions), diagnostic profile. Of the institutions covered, 3 are represented by Medical Diagnostic Centres (MDCs), which are public institutions based on mixed financing. 7 HCF are represented by private consultation and diagnostic centers (CDC). These centres are located in Tashkent City (1 MDC, 1 CDC), Bukhara Region (1 MDC, 1 CDC), Kashkadaryaregion (1 MDC, 1 CDC) and the Republic of Karakalpakstan (4 CDC).

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For the study, the Environmental Hygiene Passport (EHP) has been developed, which consists of 7 sections including 63 questions, identification of risk factors based on quantitative and qualitative criteria affecting environmental pollution and the health status of employees and patients of the MDC. The main sections of the EHP are: working and living conditions of employees and patients of MDC and CDC (9 questions - 16 points); power supply and lighting (7 questions - 8 points); air temperature, ventilation and heating (11 questions - 20 points); water supply (11 questions - 14 points); sewerage (7 questions - 12 points); conditions for hand hygiene (3 questions - 6 points); conditions for medical waste disposal (15 questions - 24 points). Positive assessment of each item was assessed as maximum 2 points, with partial conditions or negative assessment - 0 points. The maximum assessment of hygienic conditions at the MDC is 100 points, which meant that the studied parameters were available in 100% of cases. The EHP scoring system provides a unified approach and objectivity in the assessment of the sanitary and technical conditions of the MDC and the occurrence of environmental pollution risk factors.

Since the level of quality of hygienic conditions depends on the score, the grading was presented as follows: 80 and more points (%) are green, 50 to 80 points (%) are yellow, and less than 50 points (%) are red levels of hygiene quality.

Qualitative assessment criteria include security and availability of favorable working and staying conditions for patients in accordance with the requirements of hygienic standards, energy efficiency, rational energy consumption, reduction of consumption of primary non-renewable resources, reduction of emissions of harmful substances into the environment, thereby compliance with environmental quality parameters to prevent negative impact on the environment.

III. RESEARCH FINDINGS AND DISCUSSION

The analysis of the results of the evaluation showed that private CDC buildings were built according to individual designs in the period from 2004 to 2015, while MDCs were housed in adapted buildings from 1993 to 1995. The institutions surveyed have a centralized building system and are represented by single-brick buildings or in combination with reinforced concrete structures. Of the 7 privately owned CDC buildings, six are single-storey and one is two-storey. At the same time, state CDC are located in 3-4 storey buildings. All institutions are located in a residential area with good access to public transport.

The private CDC structure included from one room (ultrasonic diagnostics) to 10 multi-disciplinary rooms. At the same time, the MDC is an extensive network of diagnostic services, including a functional diagnostics department, a clinical and diagnostic laboratory, an X-ray department, as well as consulting rooms for highly specialized doctors.

The number of private CDC employees, depending on the size of the institution, ranged from 2 to 58 people. The Centre's human resources potential was represented by 103-155 employees, 41.7% of whom were doctors, 35% middle-size and 13.6% junior medical personnel. The number of patients of the studied medical institutions, depending on the volume of diagnostic services, varied from 1200 to 95000 people.

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The results of the study show that in terms of favorable working and staying conditions for employees and patients of the MDC and CDC, in the context of creating conditions for meals, personal hygiene, physical education and short-term recreation, only two surveyed institutions scored 50 points each, which corresponded to the yellow level of quality of hygienic conditions. The remaining 8 MDCs and CDC scored less than 38 points.

In terms of the quality of electricity supply and the level of artificial lighting, 6 institutions scored 50-75 points, which corresponded to the yellow level of quality, and 4 MDCs and CDCs - the red level of quality with the number of points from 0 to 25.

Temperature and ventilation indicators were more in line with health standards at the MDC and CDC in Nukus, Bukhara and Tashkent (90-100 points) and indicated a green level of quality. In terms of microclimatic parameters, 4 MDCs and CDCs had a yellow quality level with 50-70 points and 3 CDCs with 20-40 points, which corresponded to the red level, according to hygienic requirements.

The assessment of water supply and safe sanitation is presented only in yellow and red levels of engineering infrastructure quality. Thus, the assessment of water supply in 7 surveyed institutions reached 57-71 points, and the sewerage system in 4 MDCs and CDC - 50-67 points, which corresponds to the yellow level of quality.

Availability of hand hygiene conditions in three MDCs and CDC in Nukus, Bukhara and Tashkent was 100%, along with 3 CDCs with yellow, and 2 CDCs and 1 MDC with red quality levels.

The results of the analysis of the last section of the EHP studied, which reflected the conditions for the disposal of medical waste, showed that out of 24 maximum possible points, all surveyed CDC and CDC were rated at 27-36 points, i.e. corresponded to the red level of quality.

Thus, the total values of the results of the 7 sections studied allow us to determine the level of hygienic conditions and the availability of engineering infrastructure in the MDC and CDC. The final comprehensive assessment of the environmental and hygienic certification of the MDC and CDC indicates that the green level of the MDC of Bukhara and Tashkent cities and the CDC of Tashkent and Nukus cities scored from 52 to 66 points and have a yellow level of quality. This allows the MDC and CDC to provide diagnostic services to the population at a relatively lower cost to improve the hygiene and engineering infrastructure. The rest of the CDC and CDC scored between 16 and 42 points, which corresponds to a red level of quality and indicates poor hygienic conditions. In this case, more thorough measures should be taken to address the problems of these facilities.

IV. CONCLUSION

Compilation of ecological and hygienic passport in each medical facility, being a unified tool for studying quantitative and qualitative criteria for the assessment of hygienic conditions and engineering infrastructure, contributes to the identification of deficiencies and allows to create a conceptual model of objective assessment of hygienic foundations of quality of medical care.

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