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Амлаев К. Р., Атоева М. А., Юлдашова Ш. Т., Намозова Н. С.

ПРОГРАММА ПРОФИЛАКТИКИ И КОНТРОЛЯ НОЗОКОМИАЛЬНЫХ ИНФЕКЦИЙ: МИРОВОЙ ОПЫТ И РЕКОМЕНДАЦИИ ПО ВНЕДРЕНИЮ

Бухарский государственный медицинский институт имени Абу Али ибн Сино Министерства здравоохранения Узбекистана, 200118, г. Бухара, Узбекистан

Инфекции, связанные с оказанием медицинской помощи, остаются одной из ключевых проблем системы здравоохранения, обусловленной высокой заболеваемостью, смертностью и экономическими потерями. По данным Всемирной организации здравоохранения, распространенность таких инфекций колеблется от 7 до 15% среди госпитализированных пациентов, а в странах с низким уровнем дохода этот показатель может достигать 20%. В данной статье представлен обзор современных данных о распространенности, клинических особенностях и факторах риска инфекций, связанных с оказанием медицинской помощи. Рассмотрены типы инфекций, их экономические последствия, а также вопросы, связанные с резистентностью к противомикробным препаратам.

К л ю ч е в ы е с л о в а : инфекции, связанные с оказанием медицинской помощи; эпидемиология; факторы риска; резистентность к противомикробным препаратам; профилактика инфекций.

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Для корреспонденции: Амлаев Карэн Робертович, д-р мед. наук, профессор кафедры превентивной медицины, общественного здоровья и управления здравоохранением Бухарского государственного медицинского института имени Абу Али ибн Сино Министерства здравоохранения Республики Узбекистан, e-mail: karen.amlaev@bsmi.uz

Amlaev K. R., Atoyeva M. A., Yuldashova Sh. T., Namozova N. S.

THE PROGRAM OF PREVENTION AND CONTROL OF NOSOCOMIAL INFECTIONS: WORLD EXPERIENCE AND RECOMMENDATIONS FOR IMPLEMENTATION

The Bukhara State Medical Institute named after Abu Ali ibn Sino, Ministry of Health of the Republic of Uzbekistan, 200118 Bukhara, Uzbekistan

The nosocomial infections that are related to provision of medical care continue to be one of the key problems of health care system conditioned by high morbidity, mortality and economic losses. According to the WHO, prevalence of such infections ranges from 7% to 15% among hospitalized patients. In countries with low-income this indicator can reach 20%. The article presents a review of modern data on prevalence, clinical characteristics and risk factors of nosocomial infections. The types of these infections, their economic consequences and issues related to resistance to of antimicrobial preparations are considered.

K e y w o r d s : nosocomial infections; epidemiology; risk factors; antimicrobial preparations; resistance; infection; prevention.

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For correspondence: Amlaev K. R., doctor of medical sciences, professor of the Chair of the Preventive Medicine, Public Health and Health Care Management of the Bukhara State Medical Institute named after Abu Ali ibn Sino Ministry of Health of the Republic of Uzbekistan. e-mail: karen.amlaev@bsmi.uz

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Relevance

Nosocomial infections (NI) remain one of the leading problems in modern epidemiology and healthcare. They affect millions of patients annually, increasing morbidity, mortality, length of hospital stay, and treatment costs [1–3]. According to the World Health Organization (WHO), the prevalence of HAIs ranges from 7% to 15% among hospitalized patients, and in low-income countries, this figure can reach 20% [4].

This problem has become particularly relevant in the context of the COVID-19 pandemic, when the burden on the healthcare system has increased significantly and it has become critically important to reduce the risk of HAI [5–7]. In addition, the growth of antimicrobial resistance (AMR) has made treatment even more difficult and costly [8–10].

In this regard, analysis of current data on the prevalence, characteristics, and risk factors of HAIs, based on recent studies, is an important prerequisite for the development of effective methods of HAI prevention and infection control.

Materials and methods

To prepare this review, a systematic analysis of the results of scientific studies published between 2020 and 2024 in the PubMed, Scopus, Web of Science, and Google Scholar databases was conducted. The keywords for the scientific search included the following options: “hospital infections”, “healthcare-associated infections”,

"nosocomial infections", "risk factors", "epidemiology", "prevalence", "mortality", and others.

Inclusion criteria:

- Original studies and systematic reviews.
- Publications in English or English.
- Studies covering all age groups.
- Articles containing data on the prevalence, risk factors, and outcomes of HAIs.

Exclusion criteria:

- Unpublished works.
- Works without an available abstract.
- Articles not related to the topic of HAI.

After removing duplicates, 3,210 articles were analyzed by title and abstract, after which 968 studies were reviewed in full. A total of 185 studies with a total of more than 15 million participants were included in the final analysis [11]. A random effects model was used for the analysis, as well as a heterogeneity criterion and a publication bias test.

Results and discussion

Prevalence of nosocomial infections

According to meta-analysis data from recent years, the overall prevalence of HAIs is about 7–10% among all hospitalized patients, with significant differences between different studies and types of healthcare facilities [12]. In high-income countries, the rate of HAIs is lower than in other countries, where it can reach 15–20% [13].

The most common types of HAIs are:

- Surgical site infections (SSI) — 20–30%
- Pneumonia — 15–25%
- Urinary tract infections — 20–30%
- Bacteremia — 10–15%

Nosocomial pneumonia (NPC) is one of the most severe forms of HAIs and is associated with high mortality (up to 30–50%) [14].

For example, a study conducted in 2022 in the intensive care unit of a large hospital in South Korea showed that the incidence of HAP was 12.3% and the mortality rate was 34.5% [15]. Another study conducted in India in 2021 also showed a high rate of HAIs (16.8%), with a significant proportion of cases caused by antibiotic-resistant strains [16].

Risk factors

Analysis of the study results reveals the main risk factors for the development of HAIs, including [17–19]:

- Prolonged hospital stay.
- Use of invasive devices (catheters, drains, mechanical ventilation).
- Chronic diseases (diabetes, immunosuppression).
- Previous antibiotic therapy in medical history.
- Age over 65.
- Skin disorders
- Multiple surgical procedures
- Transfer of patients between departments.

For example, the use of a central venous catheter increases the risk of HAI by 3–5 times, and the use of artificial ventilation by 6–9 times [20, 21]. It has also been established that elderly patients have an increased risk of developing HAI due to impaired immunity and multiple comorbidities [22].

Economic burden

HAIs place a heavy burden on the healthcare economic system. The cost of additional treatment for one case of catheter-associated urinary tract infection (CAUTI) is $700–$1000, surgical site infection (SSI) is $10,000–$30,000, and a ventilator-associated pneumonia (VAP) infection in hospitals is more than $40,000 [23–25]. These figures vary depending on the country and type of infection, but the overall trend is clear: HAIs require significant financial resources and efforts for prevention and treatment.

A study conducted in the United States (2021) showed that the average additional cost per patient with HAI was $19,800, and the total loss to the national healthcare system is $10 billion per year [26].

The problem of antibiotic resistance

HAIs caused by antibiotic-resistant strains (e.g., MRSA, VRE, CRE) pose a particular danger. According to a number of studies, the frequency of such cases ranges from 10 to 50%, depending on the region and type of infection [27–29]. This leads to increased mortality, prolonged hospital stays, and the need for more effective drugs [30].

A study in Ghana (2020) showed that 42% of HAI cases were caused by strains resistant to third-generation cephalosporins, which requires strengthening control measures and restricting the unjustified use of antibiotics [31].

Conclusions and recommendations

Nosocomial infections are one of the most acute problems in modern healthcare. This is due to high morbidity, mortality, and economic losses. Based on the systematic review, the following conclusions can be drawn:

1. The prevalence of HAIs is 7–10% among all hospitalized patients, with this figure being significantly higher in low-income countries.
2. The most common types of HAIs are surgical site infections, pneumonia, urinary tract infections, and bacteremia.
3. Risk factors include being over 65 years of age, having comorbidities, using invasive devices, and being hospitalized.
4. Antibiotic resistance significantly complicates the treatment of HAIs and predicts a worsening of the situation.
5. The economic losses from HAIs amount to billions of dollars annually.

Based on these data, the list of recommendations should include:

- Implementation of comprehensive HAI prevention programs, including staff training, monitoring, and strict control of antibiotic use.
- Improvement of hygiene, sanitation, and anti-epidemic conditions in hospitals, especially in intensive care units.

- Developing national programs to control antibiotic resistance.
- Conducting further scientific research into new methods of diagnosis and treatment of HAIs.

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