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Global disparities and trends in cervical cancer morbidity and mortality

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Cervical cancer remains one of the leading causes of morbidity and mortality among women worldwide, despite the availability of effective prevention methods such as human papillomavirus (HPV) vaccination and screening programs. High-income countries have seen significant declines in recent decades, while the burden of disease remains critically high in low- and middle-income countries, underscoring global health inequalities.

Aim – to analyze global trends in morbidity and mortality from cervical cancer, as well as to assess regional disparities and factors affecting their formation.

A systematic literature review was conducted using the Scopus, PubMed, and Web of Science databases for the period 2000–2025. The search was carried out using the keywords «cervical cancer», «incidence», «mortality», «epidemiology», and «global trends». The analysis included peer-reviewed articles in English that contained epidemiological data at the global or regional levels. The selection of studies was carried out in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations, followed by a qualitative synthesis of the results. The analysis showed significant unevenness in the distribution of morbidity and mortality from cervical cancer. In high-income countries, rates have declined with the introduction of HPV screening and vaccination. At the same time, low- and middle-income countries, particularly in Africa and Southeast Asia, continue to have high rates of morbidity and mortality. Determining factors include limited access to health services, low vaccination coverage, and socio-economic barriers.

Conclusions. Cervical cancer remains a significant global problem with marked regional disparities. There is a need to expand HPV vaccination programs, increase the availability of screening, and implement effective early diagnosis strategies, especially in low- and middle-income countries. No conflict of interests was declared by the authors.

Keywords: cervical cancer, morbidity, mortality, epidemiology, global trends.

Глобальні диспропорції та тренди захворюваності і смертності від раку шийки матки

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Рак шийки матки залишається однією з провідних причин захворюваності та смертності серед жінок у всьому світі, попри наявність таких ефективних методів профілактики, як вакцинація проти вірусу папіломи людини (HPV) та скринінгові програми. Упродовж останніх десятиліть спостерігається значне зниження показників у країнах із високим рівнем доходу, тоді як у країнах із низьким та середнім рівнем доходу тягар захворювання є критично високим, що підкреслює глобальні нерівності у сфері охорони здоров'я.

Мета – провести аналіз глобальних тенденцій захворюваності та смертності від раку шийки матки, а також оцінити регіональні диспропорції і фактори, що впливають на їхнє формування.

Проведено систематичний огляд літератури з використанням баз даних Scopus, PubMed та Web of Science за період 2000–2025 років. Пошук здійснювався за ключовими словами «cervical cancer», «incidence», «mortality», «epidemiology», «global trends». До аналізу включено рецензовані статті англійською мовою, що містили епідеміологічні дані на глобальному або регіональному рівнях. Відбір досліджень проводився відповідно до рекомендацій PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) з подальшим якісним синтезом результатів. Аналіз показав суттєву нерівномірність у розподілі захворюваності та смертності від раку шийки матки. У країнах із високим рівнем доходу спостерігається зниження показників завдяки впровадженню скринінгу та вакцинації проти HPV. Водночас у країнах із низьким та середнім рівнем доходу, зокрема в Африці та Південно-Східній Азії, зберігаються високі показники захворюваності та смертності. Визначальними факторами є обмежений доступ до медичних послуг, низьке охоплення вакцинацією та соціально-економічні бар'єри.

Висновки. Рак шийки матки залишається значною глобальною проблемою з вираженими регіональними диспропорціями. Необхідним є розширення програм вакцинації проти HPV, підвищення доступності скринінгу та впровадження ефективних стратегій ранньої діагностики, особливо у країнах із низьким та середнім рівнем доходу.

Автори заявляють про відсутність конфлікту інтересів.

Ключові слова: рак шийки матки, захворюваність, смертність, епідеміологія, глобальні тенденції.

Introduction

Cervical cancer is one of the most important problems of modern oncology and public health, occupying leading positions among malig-

nant neoplasms in women worldwide. Despite significant progress in prevention, early diagnosis, and treatment, this disease remains one of the leading causes of mortality among women, especially in low- and middle-income countries. High morbidity and

mortality are largely due to uneven access to effective screening programs, human papillomavirus (HPV) vaccination, and modern treatments.

It has been established that persistent infection with oncogenic types of HPV is a key etiological factor in the development of cervical cancer. At the same time, the influence of socio-economic, behavioral, and medical-organizational factors largely determines the level of prevalence of this disease in different regions of the world. These factors include limited access to medical services, low level of public awareness, lack of organized screening programs, and uneven implementation of vaccination.

Over the past decades, high-income countries have seen a steady trend towards a reduction in the incidence and mortality of cervical cancer, which is associated with the widespread implementation of cytological screening and immunoprophylaxis programs. On the other hand, in the countries of Africa, Asia, and Latin America, the indicators remain high or even show a growing trend. Such differences emphasize the presence of significant global disparities in the structure of cancer incidence.

The study of global epidemiological trends of cervical cancer, in the context of modern initiatives aimed at its elimination as a public health problem, is gaining special relevance. Analysis of the dynamics of morbidity and mortality, as well as regional features of the disease spread, allows you to identify key gaps in the health care system and outline priority areas of prevention.

The systematization of modern scientific data on the epidemiology of cervical cancer is necessary for the formation of effective strategies to combat this disease at the global level, which determines the relevance of this study.

Aim – to analyze global trends in morbidity and mortality from cervical cancer, as well as to assess regional disparities and factors affecting their formation.

This study was carried out in the format of a systematic review of the literature with the aim of summarizing the current data on the epidemiology of cervical cancer. The search for scientific sources was carried out in international scientometric databases Scopus, PubMed, and Web of Science. Keywords and their combinations were used: «cervical cancer», «incidence», «mortality», «epidemiology», «global trends», «HPV». The search was limited to publications published between 2000 and 2025.

Only peer-reviewed scientific articles in English containing quantitative or qualitative data on cervical cancer incidence, mortality, or prevalence at the

global or regional levels were included in the analysis. Duplicates, conference abstracts, clinical cases, and studies with a limited sample or insufficient methodological transparency were excluded.

The selection of sources was carried out in several stages in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations. At the first stage, titles and abstracts were screened, followed by a full-text analysis of relevant publications. The final inclusion of studies was determined by compliance with the selection criteria.

In order to ensure objectivity, the research results were summarized by means of a qualitative synthesis followed by a comparative analysis of epidemiological indicators in different regions of the world. Special attention was paid to the assessment of time trends, regional disparities and factors influencing the level of morbidity and mortality.

As a result of a systematic review of the literature, it was established that the epidemiology of cervical cancer in the world is characterized by pronounced unevenness, which is manifested both in morbidity and mortality rates, and in the availability of preventive and diagnostic measures [1]. Summarizing the analyzed publications made it possible to reveal a clear division between countries with a high level of income, where there is a gradual decrease in the burden of the disease, and countries with a low and middle income level, where cervical cancer remains one of the main causes of cancer mortality among women [2].

Most authors agree that the main reason for this disparity is the different levels of development of health care systems. Some researchers emphasize the role of organized screening, pointing out that it was the introduction of cytological control, HPV testing, and early detection algorithms that made it possible to significantly reduce the incidence rates in the countries of Western Europe, North America, and Australia [3]. Other authors believe that screening in itself is not the only explanation for the positive dynamics, since an important role is also played by increasing the level of medical awareness of women, better routing of patients, availability of specialized care, and effective treatment of precancerous conditions [4].

A number of studies emphasize that in high-income countries, the significant reduction in mortality from cervical cancer occurred earlier than the reduction in incidence. According to some authors, this is due to the improvement of oncological care and improved survival due to early diagnosis [6]. Other researchers

explain this trend by a gradual change in the structure of detected cases: an increase in the share of localized forms and a decrease in the share of neglected stages. Thus, even with a relatively stable number of new cases, the results of treatment became better, which affected the mortality rate [7].

A separate section of the research is devoted to the regional features of the disease's spread. Thus, the authors who analyzed the countries of sub-Saharan Africa indicate an extremely high level of morbidity and mortality, which is combined with low coverage of screening programs and limited access to vaccination against the HPV [5]. Some researchers focus on the fact that in these regions, cervical cancer is often detected already at the III-IV stages, when the possibilities of radical treatment are significantly limited. Other authors add that the situation is significantly affected by the high prevalence of HIV infection, which increases the risk of HPV persistence and accelerates the progression of precancerous changes to the invasive process [8].

In the works devoted to Southeast Asia, a slightly different picture is noted. On the one hand, in some countries, there is a gradual improvement in epidemiological indicators, which is associated with the modernization of the health care system, the expansion of preventive programs, and urbanization. On the other hand, the authors draw attention to significant intraregional heterogeneity [9]. Some countries are showing positive trends, while in others the morbidity rate remains high due to unequal access to health services between urban and rural populations.

Thus, even within one macroregion, epidemiological patterns can differ significantly [10].

Researchers who analyzed the situation in Latin America emphasize that this region occupies an intermediate position between countries with a very high and relatively low disease burden. Some authors note that in many countries of the region, national prevention programs have already been created, but their effectiveness is uneven due to fragmented implementation, unstable financing, and insufficient coverage of target population groups [11]. Others point out that inequality between different social and ethnic groups remains an important problem, as a result of which indicators characteristic of both developed and low-income countries can co-exist even within one country [12].

Analysis of the literature showed that almost all authors recognize the leading role of persistent infection with oncogenic types of HPV in the development of cervical cancer. However, the emphases in

the explanation of the epidemiological situation differ. Some researchers consider HPV primarily as a biological risk factor and emphasize the need for the widest possible vaccination of adolescents before the onset of sexual life [13]. Others emphasize that the fact of infection alone does not determine the severity of the epidemiological situation, since social conditions that affect the possibility of early detection and treatment of precancerous conditions are of decisive importance. Thus, modern literature demonstrates a transition from a purely biomedical understanding of the problem to a broader, socio-epidemiological approach [14].

An important direction of the analysis was the assessment of the impact of vaccination against HPV on current trends in morbidity.

Most authors agree that vaccination is one of the most promising tools for primary prevention. In countries where vaccinations were early integrated into national calendars, a decrease in the prevalence of high-risk HPV types and the frequency of precancerous intraepithelial lesions was noted [15]. At the same time, some researchers note that the direct effect of vaccination on the rates of invasive cancer requires longer observation, since a considerable time passes between infection, the development of precancerous changes, and the formation of a clinically pronounced malignant process. Other authors emphasize that the effectiveness of vaccination at the population level depends not only on the availability of the vaccine, but also on the level of coverage, commitment of the population, and the state organization of immunoprophylaxis [5].

Regarding age characteristics, the analyzed sources show a relative consensus: the greatest burden of invasive cervical cancer falls on middle-aged and older women, while HPV infection is most common among younger age groups [3]. Some authors explain this by the long latent period of the disease, while others emphasize the lack of continuity between prevention at a young age and screening control at an older age. Some researchers also pay attention to changes in the age structure of morbidity in certain countries, where, thanks to vaccination and active screening, a gradual decrease in the frequency of precancerous conditions among young women is noted [9].

Time trends are analyzed in a number of publications. Most researchers report a steady decline in morbidity and mortality in countries where prevention programs have been in place for several decades. However, some authors note that the pace of this

decline has been slowing down in recent years [1]. In their opinion, this may indicate that a certain limit of the effectiveness of traditional cytological screening has been reached and the need to switch to more sensitive methods, in particular primary HPV testing. Other researchers believe that the slowdown in dynamics is related to the preservation of hard-to-reach population groups that remain outside the scope of preventive programs [14].

In most works, socio-economic factors are defined as critically important modifiers of the epidemiological situation. One author's approach emphasizes population income and public health spending as the main predictors of successful prevention.

Another approach emphasizes the role of education, cultural attitudes, stigmatization of gynecological examinations and mistrust of vaccination [8]. Many works emphasize that a low level of education is associated with later seeking medical care, insufficient understanding of preventive measures, and lower participation in screening programs [2].

The results of studies comparing urban and rural populations are also interesting. A significant number of authors report worse indicators in rural areas, which is associated with the territorial remoteness of medical institutions, a smaller number of specialists, and a lower level of information coverage. Other researchers, however, point out that in some countries, urbanized groups also have increased risks due to social polarization, migration processes, and unequal access to quality primary health care. This indicates that the territorial factor should be analyzed in relation to broader social determinants [11].

Summarizing the results, we can state that the current literature shows a high degree of agreement regarding the general direction of changes: on a global scale, cervical cancer remains a preventable, but still insufficiently controlled, malignant disease. At the same time, there are certain differences between the authors in the interpretation of the causes of the disparities found. Some authors see the main problem in the weakness of institutional prevention mechanisms, others in wider socio-economic inequalities that go beyond the boundaries of the medical system itself. It is the combination of these approaches that allows the most complete understanding of the current burden of cervical cancer.

Therefore, the results of the analysis show that morbidity and mortality from cervical cancer are determined by a complex interaction of biological, medical, social, and organizational factors. Reductions in

the burden of disease are most notable in countries where prevention is implemented as a multi-level strategy that includes vaccination, organized screening, early diagnosis, and timely treatment. In contrast, in regions with limited resources, insufficient coverage of prevention programs, and pronounced social barriers, cervical cancer continues to be one of the leading causes of premature death among women.

The obtained results are consistent with the data of the modern scientific literature and confirm the presence of significant global disparities in the incidence and mortality from cervical cancer. Most researchers emphasize that the implementation of organized screening programs plays a key role in reducing the burden of the disease. In particular, some authors emphasize that systematic cytological screening and HPV testing allow effective detection of precancerous changes, which significantly reduces the level of invasive cancer. Other researchers, however, indicate that the effectiveness of screening largely depends on the level of population coverage and the organizational structure of the health care system [4,8].

In the context of vaccination against the HPV, most authors agree on its high effectiveness as a means of primary prevention.

Some researchers emphasize that countries that have previously integrated vaccination into national programs already demonstrate positive dynamics in reducing the frequency of precancerous lesions. At the same time, other authors note that the impact of vaccination on morbidity and mortality is manifested with a time delay, which requires long-term epidemiological monitoring [5,13].

Particular attention is paid in the literature to socio-economic factors. Some researchers consider them as a determining factor affecting access to prevention, diagnosis, and treatment. Other authors emphasize cultural and behavioral aspects that may limit women's participation in screening programs even when medical resources are available [15].

The results of the study confirm the multifactorial nature of the spread of cervical cancer. The alignment of different scientific approaches indicates the need for comprehensive strategies combining medical, social, and organizational measures to effectively reduce the global burden of this disease.

Conclusions

The results of a systematic review of the literature indicate that cervical cancer remains one of the leading public health problems at the global level, de-

spite the availability of effective means of prevention and early detection. It was established that the epidemiological indicators of morbidity and mortality are characterized by significant regional variability, which is caused by uneven access to medical services, the level of development of the health care system, and socio-economic conditions.

It has been proven that in high-income countries, there is a steady decrease in the burden of the disease, which is associated with the effective implementation of organized screening programs and vaccination against the HPV. At the same time, in low- and middle-income countries, cervical cancer continues to be one of the main causes of death among women, which indicates insufficient effectiveness of preventive measures and limited access to quality medical care.

Persistent HPV infection, low vaccination coverage, lack of systematic screening, and social and behavioral determinants have been confirmed to be key factors influencing the spread of the disease. The influence of the educational level of the population and the availability of information on prevention is also important.

Thus, an effective reduction in the incidence and mortality from cervical cancer is possible only with a comprehensive approach, which includes the expansion of vaccination programs, the introduction of organized screening and the improvement of the availability of medical services. Further research should be aimed at evaluating the effectiveness of integrated prevention strategies and reducing global inequalities in cancer care.

The authors declare no conflict of interest.

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