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Epidemiology of papillomavirus infection in Ukraine

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ABSTRACT

The aim of this study was to assess the prevalence of HPV infection among women in different regions of Ukraine.

Materials and methods. An analysis of data from the Quintip Recordati database, containing 195 records, was performed using frequency analysis methods. The distribution of different HPV strains among the women surveyed, who live in different regions, was determined. An analysis of the frequency of seropositive results depending on the degree of urbanisation was performed. The main ways of preventing HPV infection were identified.

Results. It was found that the number of positive tests accounted for 38.5% of the total sample. When comparing the frequency of detection of high-oncogenic strains, it was found that they are more often registered in cities with larger populations.

Conclusions: 1. The prevalence of HPV in the women examined is twice the European average. 2. The frequency of detection of highly oncogenic HPV strains is higher in urbanised regions. 3. Widespread implementation of HPV screening methods in Ukraine could significantly reduce the incidence of cervical cancer

Keywords: human papillomavirus; epidemiology; women's health; prevention, screening

Introduction. Cervical cancer (CC) is one of the most common malignant neoplasms in women of reproductive age, ranking fourth among the causes of cancer morbidity and mortality in women worldwide. According to the Global Cancer Observatory (GLOBOCAN), in 2020, more than 604,000 new cases of HCLC and about 342,000 deaths were registered, indicating the significant burden of this pathology on health care systems, especially in low- and middle-income countries. The situation in Eastern European countries, including Ukraine, is particularly alarming, as coverage of human papillomavirus (HPV) vaccination and

screening programs remains insufficient [1, 3, 8-11]. In Ukraine, cervical cancer is consistently among the five most common cancers in women. According to the National Cancer Registry, more than 3,000 new cases of cervical cancer and more than 1,000 related deaths are registered annually. For more than three decades, it has been proven that persistent infection with human papillomavirus, primarily highly oncogenic types such as HPV 16 and 18, plays a key role in the development of cervical cancer [1-4]. The virus has the ability to integrate into the genome of cervical epithelial cells, initiating complex molecular processes that lead to neoplasia and malignant degeneration. However, not every case of HPV infection leads to the development of cancer, which indicates the importance of immune response factors, concomitant diseases, and socio-behavioural aspects. Given that the natural course of cervical cell transformation from infection to invasive cancer takes years, there is a unique window of opportunity for early intervention and prevention. The use of vaccines, modern screening technologies (cytological examination, HPV testing), as well as educational work on reproductive health can effectively reduce the incidence and mortality from cervical cancer. Despite the evidence base for the causal link between HPV and cervical cancer, awareness among both the general population and some healthcare professionals remains low. In addition, existing barriers — economic, cultural and organisational — limit the effectiveness of preventive strategies [3-5].

Thus, studying the mechanisms of HPV-induced carcinogenesis and analysing the effectiveness of existing approaches to the prevention, diagnosis and treatment of cervical cancer is extremely relevant for medicine, public health and health policy.

The epidemiology of HPV among women shows marked differences between rural and urban areas, depending on factors such as access to healthcare, socio-economic status and cultural practices [1, 2, 9, 10]. Studies have documented differences in HPV prevalence between rural and urban populations [2-4]. In eastern Brazilian Amazonia, a study involving 444 women (233 urban and 211 rural) showed that the overall HPV infection rate was 14.6%, with 15% among urban women and 14.2% among rural women. Marital status was identified as a significant risk factor among rural women aged 13-25, with higher prevalence rates among single, divorced and widowed women [3, 11]. In contrast, a study in the southern province of Yunnan, China, involving 367 women (177 rural and 190 urban) showed that urban women had a higher overall HPV infection rate (16.3%) compared to rural women (13.0%). Infections with multiple genotypes were more common among urban participants, and age patterns of prevalence differed between the two groups [4, 12].

There are differences between rural and urban areas in awareness of HPV vaccination [5, 6; 13, 14]. In the United States, rural residents demonstrated lower awareness of HPV and the HPV vaccine compared to urban residents: awareness levels were 55.8% and 58.6%, respectively, compared to 67.2% and 65.8% in urban areas.

Cervical cancer incidence rates further highlight these differences. A study analysing data from 2000 to 2019 found that among women who do not live in metropolitan areas (rural areas), the overall incidence of HPV-related cancer is 13.5 per 100,000, exceeding the rate of 11.7 per 100,000 among women in cities (urban areas). It is noteworthy that the incidence rate among women increased from 1.06 in 2000-2004 to 1.15 in 2015-2019 [13].

Several factors contribute to these differences between rural and urban areas [2, 7, 9, 15, 16]. More urbanised areas typically offer better access to preventive services, including HPV vaccination and regular screening, leading to higher detection rates. Higher education and income levels in urban settings are also associated with increased health awareness and use of preventive care. In addition, cultural norms and behaviours, such as age of sexual debut and parity, differ between rural and urban populations, influencing patterns of HPV infection.

A comprehensive study conducted in Ukraine from 2014 to 2016 analysed more than 40,000 women of different age groups [17]. Thirty-four per cent of these women were HPV

seropositive, with 65 per cent of these infections caused by high-risk (oncogenic) HPV genotypes and 90 per cent of cases involving mixed infections. The most common high-risk genotypes identified were HPV-16 (23%), HPV-53 (16%), HPV-31 (14%), HPV-33 (11%), HPV-66 (11%) and HPV-68 (11%). In our country, young women, especially those under the age of 30, show the highest level of HPV infection. The severity of cervical intraepithelial neoplasia (CIN) was inversely correlated with the number of HPV genotypes detected; CIN III lesions were associated with fewer genotypes, predominantly HPV-16, which was detected in 70% of CIN III cases [18, 19].

Although direct comparative studies of rural and urban areas in Ukraine are few, general trends observed in other countries suggest that urban areas typically have higher HPV prevalence rates, possibly due to increased sexual activity, earlier sexual debut, and greater access to health services, including screening and vaccination. In rural areas, reported prevalence rates are expected to be lower, which can be explained by limited access to healthcare, lower screening and vaccination rates, and potential underdiagnosis [10, 13, 15, 18]. Further research focusing on rural-urban differences in Ukraine is needed to develop targeted health strategies for HPV prevention and control.

The aim of this study was to assess the prevalence of HPV infection among women in different regions of Ukraine.

Materials and methods. An analysis of data from the Quintip Recordati database [18], containing 195 records, was performed using frequency analysis methods. The distribution of different HPV strains among the women surveyed, living in different regions of Ukraine, was determined. An analysis of the frequency of seropositive results depending on the degree of urbanisation was performed. The main ways of preventing HPV infection were identified.

Results. It was found that the number of positive tests was 38.5% of the total number, which is much higher than the levels established for Eastern Europe. The distribution of cases by detection of different types of HPV is shown in Table 1.

Table 1

Distribution of HPV strains in the surveyed population

Strain	Oncogenic risk	Frequency	
		Abs.	%
6	Low	25	12,8
16	High	12	6,2
31	High	11	5,6
33	High	7	3,6
39	High	7	3,6
42	Low	6	3,1
45	High	3	1,5
52	High	4	2,1
53	High	7	3,6
56	High	7	3,6
59	High	2	1,0
61	Low	6	3,1
66	High	4	2,1
68	High	10	5,1
70	Low	5	2,6
73	High	4	2,1
82	High	2	1,0

Despite the relatively broad geography of the study, its representativeness is low (Fig. 1). Most of the research was conducted in the cities of Kyiv and Odesa, which are very heterogeneous in terms of population structure, particularly the cohort of women of childbearing age – many of the residents of these cities are now internally displaced persons or are in the city temporarily (for study, contract work, etc.).

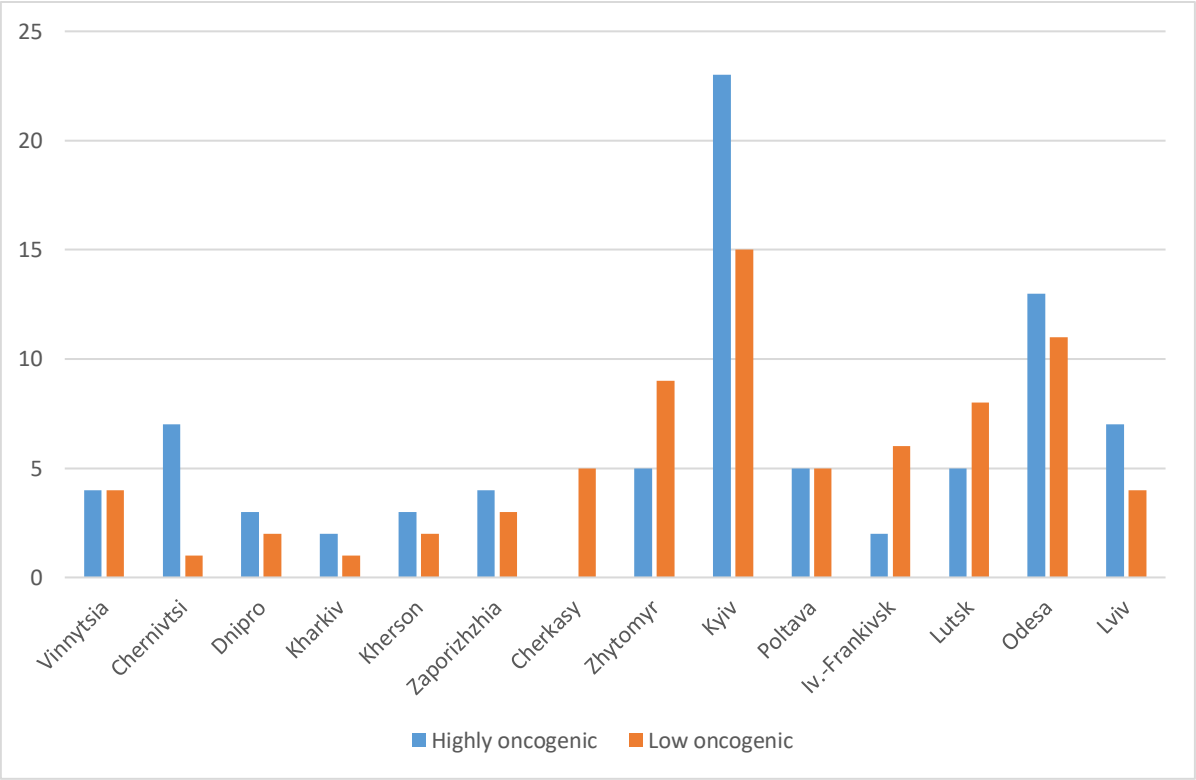

Fig. 1 Distribution of respondents by city

Dr Ryan A. Wilcox has actively researched the diversity of human papillomavirus (HPV) strains and their impact on the development of precancerous and cancerous diseases. In his work, he considers the classification of HPV by genus and species, and also studies the impact of HPV variants on the risk of developing cervical cancer [1, 9, 19]. All high-risk mucosal HPV types belong to the genus α, which is divided into several species. A high risk of cervical cancer is associated with HPV types belonging to the α-9 species, in particular HPV types 16 and 18 [20].

When comparing the frequency of detection of highly oncogenic strains, it was found that they are more often registered in cities with larger populations. Given the limitations of the sample, it is impossible to establish regional characteristics, but the existing trends towards an increase in the frequency of HPV in urbanised regions deserve attention.

We believe that the high prevalence of HPV in Ukraine is the result of low vaccination coverage, lack of mass screening, lack of awareness, and limited access to prevention programmes. In countries with systematic screening (e.g., Sweden, the United Kingdom, the Netherlands), the incidence and mortality rates of cervical cancer have decreased by 2–3 times over several decades [1]. This is a direct result of regular testing of women, reliable recording of results, and a well-established mechanism for referral to specialists. In addition to the traditional PAP test, high-precision HPV tests are now available that detect the presence of oncogenic types of the virus even before cellular changes appear and can be performed independently at home (self-sampling) [18], which is especially important for rural and remote areas.

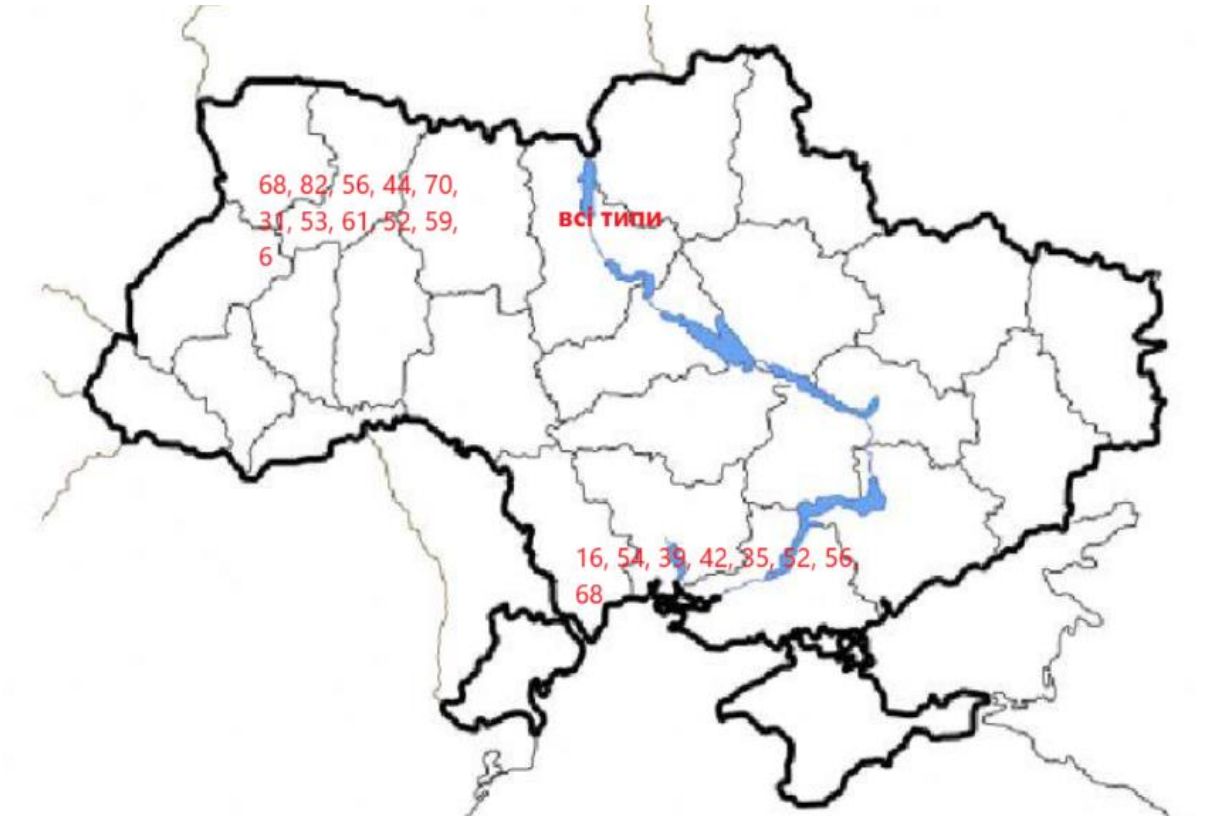

Fig. 2 Medical and geographical characteristics of HPV distribution in the population

Comparing the data obtained with current research in this field, it should be noted that some discrepancies may be due to geographical and population factors. For example, a recent study from China (Frontiers, 2024) involving >149,000 women with different cervical conditions demonstrated the presence of: HPV 52 (36.6%), HPV 58 (18.9%), HPV 16 (8.8%) in women with ASC-US cytology, HPV 16, 52, 58, 33 and 18 were the five main strains in patients with HSIL, but in the presence of cervical cancer, HPV 16 was the most common strain (65.31%) [6]. An Indian meta-analysis of precancerous stages and cervical cancer [8] analysed 5,990 clinical cases and demonstrated that HPV infection was detected in 71.3% of women with CIN II–III/HSIL, 59. 2% in patients with CIN I/LSIL and 34.8% in patients with ASCUS. At the same time, in invasive cancer, 85.4% of cases were HPV-positive. The most common genotypes in ICC were HPV 16 (58%) and HPV 18 (16.5%). According to domestic sources, in Ukraine, even with normal cytology, 3.8% of women carry HPV 16/18, while in the presence of HSIL/CIN 2/3 — 54–62.8%, and in the case of invasive cancer — 74–83% of cases have HPV 16/18 [6,7]. According to the Lancet Global Assessment (2024) [7], the overall HR-HPV positivity rate is 6.45% worldwide, but any type of HPV is found in 11.7% of women. At the same time, in countries such as India and Pakistan, HR HPV prevalence is very high in CIN II–III stages and in invasive carcinoma — over 70%. In Ukraine, according to this study, the spectrum of HPV positivity corresponds to international trends and confirms the role of HPV 16/18 in >70% of cases of cervical pathology — HSIL and cancer.

Analysing the data we have obtained, it should be noted that despite the initial costs of implementation, systematic screening reduces the cost of treating severe forms of cancer, reduces the loss of working capacity among women of productive age, and is an investment in the health of the nation that pays off in the medium and long term.

Today, screening around the world helps to raise women's awareness of HPV and cervical cancer and to foster a responsible attitude towards preventive healthcare. At the same

time, it reduces the fear of a cancer diagnosis, as it is no longer a death sentence if detected at an early stage. Thus, the introduction of systematic, accessible and regular HPV screening in Ukraine could radically reduce the incidence and mortality rates from cervical cancer, replicating the successful experience of European Union countries.

Conclusions

1. The prevalence of HPV in the women examined is twice the European average.
2. The biomarker role of HPV types (especially 16/18) is important for risk stratification, surveillance and therapeutic tactics.
3. The frequency of detection of highly oncogenic HPV strains is higher in urbanised regions.
4. Widespread implementation of HPV screening methods in Ukraine could significantly reduce the incidence of cervical cancer
5. The data confirm the relevance of introducing type-specific HPV testing into routine cervical cancer screening practice.

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