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P.Yu. Tokar

Vaccination against the human papillomavirus as a component of the prevention of cervical dysplasia: analysis of age and regional trends in Ukraine

Bukovinian State Medical University, Chernivtsi, Ukraine

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The introduction of vaccination against the human papillomavirus (HPV) in Ukraine remains insufficiently studied, especially taking into account age and regional characteristics. Analysis of the coverage of the female population with HPV vaccination is necessary to assess the potential impact of preventive measures on the incidence of cervical dysplasia.

Aim – to assess the age and regional characteristics of vaccination against the human papillomavirus among the female population of Ukraine in 2021–2025 and to determine their significance in the prevention of cervical dysplasia.

Materials and methods. The research material was compiled from statistical data of the National Health Service of Ukraine regarding the number of administered doses of the HPV vaccine to the female population of Ukraine in 2021–2025. The analysis was carried out taking into account age groups (0–9, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79 years) and administrative-territorial units. The methods of descriptive statistics, comparative and analytical analysis with an assessment of the dynamics of indicators in temporal and regional aspects were used.

Results. It was established that in 2021, vaccination against HPV among the female population of Ukraine was isolated. In 2022–2023, a gradual increase in the number of administered doses was noted, mainly in the age group of 10–19 years. The most pronounced increase in vaccination volumes was observed in 2024–2025, with the dominance of the 20–29 and 30–39 age groups. Significant regional unevenness of vaccination coverage was revealed: the highest rates were registered in the city of Kyiv and certain regions, while vaccination remained minimal or absent in a number of regions. Age groups under 9 and over 50 were characterized by consistently low rates of vaccination.

Conclusions. Vaccination against HPV in Ukraine in 2021–2025 has pronounced age and regional disparities. Insufficient coverage of prepubescent age groups limits the effectiveness of primary prevention of cervical dysplasia. The obtained data indicate the need to expand and standardize HPV immunoprophylaxis programs, taking into account the epidemiological characteristics of the regions.

The author declares no conflict of interest.

Keywords: human papillomavirus, vaccination, cervical dysplasia, prevention, female population, Ukraine.

Вакцинація проти вірусу папіломи людини як складова профілактики дисплазії шийки матки: аналіз вікових та регіональних тенденцій в Україні

П.Ю. Токар

Буковинський державний медичний університет, м. Чернівці, Україна

Впровадження в Україні вакцинації проти вірусу папіломи людини (ВПЛ) залишається недостатньо вивченим, особливо з урахуванням вікових та регіональних особливостей. Аналіз охоплення жіночого населення вакцинацією проти ВПЛ є необхідним для оцінки потенційного впливу профілактичних заходів на захворюваність на дисплазію шийки матки.

Мета – оцінити вікові та регіональні особливості вакцинації проти вірусу папіломи людини серед жіночого населення України у 2021–2025 роках та визначити їхнє значення у профілактиці дисплазії шийки матки.

Матеріали та методи. Матеріалом дослідження стали зведені статистичні дані Національної служби здоров'я України щодо кількості введених доз вакцини проти ВПЛ жіночому населенню України у 2021–2025 роках. Аналіз проведено з урахуванням вікових груп (0–9, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79 років) та адміністративно-територіальних одиниць. Застосовано методи описової статистики, порівняльного та аналітичного аналізу з оцінкою динаміки показників у часовому та регіональному аспектах.

Результати. Встановлено, що у 2021 році вакцинація проти ВПЛ серед жіночого населення України мала поодинокий характер. У 2022–2023 роках спостерігалося поступове зростання кількості введених доз, переважно у віковій групі 10–19 років. Найбільш виражене збільшення обсягів вакцинації простежувалося у 2024–2025 роках, з домінуванням вікових груп 20–29 та 30–39 років. Виявлено суттєву регіональну нерівномірність охоплення вакцинацією: найвищі показники зареєстровано у м. Києві та окремих областях, тоді як у низці регіонів вакцинація залишалася мінімальною або відсутньою. Вікові групи до 9 років та старше 50 років характеризувалися стабільно низькими показниками вакцинації.

Висновки. Вакцинація проти ВПЛ в Україні у 2021–2025 роках має виражені вікові та регіональні диспропорції. Недостатнє охоплення допубертатних вікових груп обмежує ефективність первинної профілактики дисплазії шийки матки. Отримані дані свідчать про необхідність розширення та стандартизації програм імунопрофілактики ВПЛ з урахуванням епідеміологічних особливостей регіонів.

Автор заявляє про відсутність конфлікту інтересів.

Ключові слова: вірус папіломи людини, вакцинація, дисплазія шийки матки, профілактика, жіноче населення, Україна.

Introduction

Diseases of the cervix, in particular cervical intraepithelial neoplasia, remain one of the leading medical and social problems of modern gynecology and oncogynecology [1,3,6,8]. Dysplasia of the cervix is considered a morphological substrate of precancerous changes, which, in the absence of timely prevention, diagnosis, and treatment, can progress to invasive cancer [2]. According to epidemiological studies, persistent infection with human papillomavirus (HPV) of high oncogenic risk plays a decisive role in the development of dysplastic processes, which determines the urgency of implementing effective primary prevention measures [2,3,7].

Vaccination against the HPV is recognized as one of the most effective methods of preventing HPV-associated diseases, in particular dysplasia and cervical cancer [4]. International experience shows that a high level of vaccination coverage in pre-puberty and adolescence allows for a significant reduction in the prevalence of oncogenic types of HPV and the frequency of precancerous lesions of the cervix in later years. At the same time, the effectiveness of vaccine prophylaxis largely depends on the timeliness of its implementation, the level of availability of medical services, and the organizational characteristics of the health care system [5].

In Ukraine, from 2021 to 2025, vaccination against HPV is not included in the mandatory vaccinations of the national calendar, which causes the uneven implementation of this preventive measure and the formation of pronounced age and regional disparities. Under these conditions, the analysis of real indicators of coverage of the female population with vaccination against HPV at the national and regional levels becomes particularly important. These data allow not only to assess the current state of immunoprophylaxis, but also to predict its potential impact on the epidemiology of cervical dysplasia.

The aim of the study is to assess the age and regional characteristics of vaccination against the HPV among the female population of Ukraine in 2021–2025 and to determine their significance in the prevention of cervical dysplasia.

Materials and methods of the study

The study was carried out using a retrospective analytical approach based on official statistical data of the National Health Service of Ukraine. The material of the study was summarized, reporting data on the number of administered doses of vaccines against the HPV among the female population of Ukraine for the period 2021–2025. The analysis covered all administrative and territorial units of Ukraine, including oblasts and the city of Kyiv, which ensured representativeness of the obtained results at the national level.

The study of vaccination rates was carried out taking into account the age stratification of the female population, namely in the groups of 0–9, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, and 70–79 years. The distribution made it possible to assess vaccination coverage in prepubescent, adolescent, reproductive, and perimenopausal age periods, which is fundamentally important in the context of prevention of HPV-associated diseases and cervical dysplasia. Particular attention was paid to the analysis of age groups that correspond to the peak periods of the risk of HPV infection and the development of cervical intraepithelial neoplasia.

The research methodology included the use of descriptive statistics methods with the calculation of absolute vaccination rates, as well as comparative analysis to assess the dynamics of changes in temporal and regional aspects. To identify trends, a comparison of indicators between individual years of observation and between administrative-territorial units was used. The obtained results were interpreted taking into account the organizational features of the health care system, the availability of vaccines, and the possible influence of socio-demographic factors.

Statistical data processing was carried out using standard methods of analytical evaluation, which allowed to ensure the objectivity and reproducibility of the research results. The study did not involve intervention in clinical practice and was conducted using depersonalized aggregated data, which complies with the ethical principles of biomedical research.

Results of the study and discussion

The analysis of the data of the National Health Service of Ukraine regarding the vaccination of the female population against the HPV in 2021–2025 made it possible to identify clear age, temporal, and regional patterns that are of fundamental importance for understanding the current state of primary prevention of cervical dysplasia in Ukraine (Table).

In 2021, HPV vaccination was actually in the early stages of implementation. The total number of administered doses among the female population was extremely low and was limited to isolated cases

Table

The number of administered vaccines against the human papillomavirus among the female population of Ukraine by age groups and regions in 2021–2025, abs.

Years	Age group	Vinnytsia region	Volyn region	Dnipropetrovsk region	Donetsk region	Zhytomyr region	Zakarpattia region	Zaporizhzhia region	Ivano-Frankivsk region	Kyiv region	Kirovohrad region	Luhansk region	Lviv region	Kyiv	Mykolayiv region	Odesa region	Poltava region	Rivne region	Sumy region	Ternopil region	Kharkiv region	Kherson region	Khmelnytskyi region	Cherkasy region	Chernivtsi region	Chernihiv region	Ukraine
2021	0–9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10–19	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
	20–29	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	6
	30–39	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	40–49	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	50–59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	60–69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	70–79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	0–9	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	47
	10–19	0	0	26	0	0	0	6	0	2	0	0	0	4	0	0	0	427	0	0	0	0	0	0	0	0	465
	20–29	0	2	17	0	0	0	13	0	0	0	0	2	7	0	0	0	1	0	0	0	0	0	0	0	0	42
	30–39	0	0	29	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
	40–49	0	0	3	0	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	7
	50–59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	60–69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	70–79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	0–9	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	1	0	0	0	0	0	0	20
	10–19	0	0	23	0	0	0	20	0	15	0	1	0	3	0	8	0	413	0	4	0	0	2	4	0	0	493
	20–29	0	1	24	0	0	0	10	0	23	0	0	8	28	1	12	0	8	9	7	0	0	32	5	4	3	175
	30–39	0	0	17	0	0	0	7	2	8	0	1	3	17	0	4	0	2	0	4	16	0	15	2	0	1	99
	40–49	0	0	3	0	0	0	3	0	11	0	0	0	2	0	0	0	0	0	1	0	0	2	2	0	0	24
	50–59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	60–69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	70–79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	0–9	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	10–19	1	2	5	0	0	0	12	1	4	1	8	3	11	0	11	0	14	0	0	6	0	16	2	12	0	109
	20–29	1	10	22	0	0	0	14	26	27	2	13	20	75	2	18	6	72	3	7	73	0	78	12	5	1	487
	30–39	5	1	16	0	0	1	3	6	9	2	8	11	66	0	15	6	25	4	25	24	0	53	5	0	0	285
	40–49	0	4	5	0	0	0	3	2	1	4	0	5	14	0	5	1	0	3	11	7	0	11	2	0	0	78
	50–59	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	60–69	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	70–79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	0–9	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
	10–19	9	0	9	0	0	0	8	17	7	34	7	32	49	0	18	2	28	1	11	16	0	40	10	7	2	307
	20–29	12	2	46	0	1	3	80	90	25	60	53	247	381	0	76	31	105	10	17	178	0	141	36	20	3	1617
	30–39	8	2	18	0	2	1	53	52	26	18	43	135	246	0	47	11	91	10	16	58	0	84	9	20	2	952
	40–49	0	4	10	0	0	0	55	22	2	2	15	22	97	0	13	0	5	0	5	22	0	22	0	4	0	300
	50–59	0	0	0	0	0	0	5	0	1	0	1	1	1	0	0	0	0	0	0	0	0	3	0	0	0	12
	60–69	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	70–79	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

in the age groups 10–19, 20–29, and 30–39 years. In the country, the total number of vaccinations did not exceed a few dozen cases, which indicates the lack of a systematic approach to HPV immunoprophylaxis during this period. The age groups 0–9 years, 50 years and older were characterized by a complete lack of vaccination, which is unfavorable from the point of view of evidence-based medicine, since it is the pre-pubescent age that is considered optimal for the formation of specific immunity.

In 2022, the first signs of increasing vaccination coverage were noted. Nationwide rates increased, primarily due to the 10–19 age group, where 465 vaccine doses were administered. More noticeable indicators also appeared in the groups of 20–29 years (42 cases) and 30–39 years (30 cases). At the same time, vaccination of children under 9 years of age remained limited, and in age groups over 50 years of age, vaccination was practically not carried out. This structure testifies to the fragmented implementation of recommendations on primary prevention of HPV and insufficient orientation on the preventive nature of vaccination.

In 2023, the upward trend persisted and became more systematic. The total number of vaccinations increased in all major reproductive age groups. The highest rates were again registered among persons aged 10–19 years (493 cases); however, the vaccination of women aged 20–29 years (175 cases) and 30–39 years (99 cases) increased significantly. For the first time, relatively stable indicators appeared in the age group of 40–49 years (24 cases). These data may indicate an increase in the awareness of the female population about the role of HPV in the development of cervical dysplasia and an increase in the demand for vaccination among women of reproductive age. At the same time, the low coverage of children up to 9 years old remained an unchanged problem.

The most pronounced changes were recorded in 2024–2025. In 2024, the total number of vaccinations increased significantly, especially in the age groups 20–29 years (487 cases) and 30–39 years (285 cases). The age group of 10–19 years also showed growth (109 cases), but its share in the overall structure began to gradually decrease due to the intensification of vaccination among women of older reproductive age. In 2025, a sharp increase in the number of administered vaccine doses was recorded, which can be considered a turning point in the introduction of HPV vaccination in Ukraine. In the age group of 20–29 years, 1617 doses were administered, in the group of 30–39 years – 952 doses, in the group of 40–49 years – 300 doses. The age group of 10–19 years also showed high rates (307 cases).

The analysis of the age structure of vaccination in 2025 shows the dominance of women of reproductive age, who could potentially have had contact with the HPV. On the one hand, this reflects the growing awareness of the risks of HPV-associated pathology; on the other hand, it indicates insufficient implementation of the concept of primary prevention, which involves vaccination before the start of sexual life. Even in 2025, the 0–9 age group remained minimally covered by vaccination, which significantly reduces the long-term preventive potential of immunization programs.

Regional analysis showed significant unevenness of vaccination coverage. The highest rates were consistently recorded in the city of Kyiv and certain regions, which is probably due to the better availability of medical services, the availability of local programs, and a higher level of public awareness. At the same time, in a number of regions, for several years, vaccination was either not carried out or was of an isolated nature. Such regional differentiation creates prerequisites for maintaining inequalities in the incidence of cervical dysplasia and cervical cancer in the future.

From the point of view of cervical dysplasia prevention, the obtained results are of fundamental importance. It is known that the greatest effect of vaccination against HPV is achieved when it is carried out in pre-adolescent age, while vaccination in older age groups has limited effectiveness against already existing HPV infections [7]. The predominance of vaccination among women aged 20–39 indicates a shift in emphasis from primary to conditionally secondary prevention, which cannot fully prevent the formation of dysplastic changes of the cervix.

At the same time, a general increase in the number of vaccinations in 2024–2025 should be considered a positive trend, which creates the prerequisites for reducing the prevalence of oncogenic types of HPV in the population of women of reproductive age. In the long term, this may contribute to reducing the frequency of mild and moderate cervical intraepithelial neoplasia, as well as reducing the oncological burden on the health care system [4,8].

The results of the study indicate that vaccination against HPV in Ukraine is at the stage of active development; however, it is characterized by signifi-

cant age and regional disparities. In order to achieve the maximum preventive effect in relation to cervical dysplasia, it is necessary to expand the coverage of pre-pubertal and adolescent age groups, as well as the introduction of unified national approaches to immunoprophylaxis, taking into account regional characteristics.

Conclusions

The conducted research made it possible to comprehensively characterize the current state of vaccination against the HPV among the female population of Ukraine in 2021–2025 and to assess its significance in the context of the prevention of cervical dysplasia. The obtained results indicate the existence of a clear positive dynamic regarding the increase in the number of injected doses of the vaccine, especially in 2024–2025, which reflects the growing attention to the problem of HPV-associated diseases and the gradual expansion of access to immunoprophylaxis. At the same time, vaccination is characterized by significant age and regional disparities, which limit its nationwide preventive effect.

The predominance of vaccination among women of reproductive age, primarily in the 20–39 year age group, indicates the prevalence of a late preventive strategy that does not provide maximum prevention of HPV infection before the onset of sexual life. Extremely low coverage of prepubescent age groups reduces the potential for primary prevention of cervical dysplasia and creates the risk of maintaining a high prevalence of precancerous changes in the future. The revealed regional unevenness of vaccination points to the need to unify organizational approaches and strengthen state coordination of immunoprophylaxis programs.

The results of the study justify the feasibility of expanding and systematizing vaccination against the HPV in Ukraine with an emphasis on early age groups, which is a key condition for effectively reducing the frequency of cervical dysplasia and HPV-associated pathology in the female population.

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Відомості про авторів:
Токар Петро Юрійович — д.філос., асистент каф. акушерства, гінекології та перинатології БДМУ. Адреса: м. Чернівці, пл. Театральна, 2.
https://orcid.org/0000-0002-5862-4532.
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