

Herpes zoster epidemiology during and after the COVID-19 pandemic: A 5-year retrospective study from primary care in Poland

Michał Oleszko^{1,A–D,F}, Lech Zaręba^{2,A,C,E,F}, Aleksandra Łoś^{1,B,D,F}, Nikola Król^{1,B,D,F}, Hanna Czajka^{1,A,D–F}

¹ College of Medical Sciences, University of Rzeszów, Poland

² Institute of Computer Science, University of Rzeszów, Poland

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of the article

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Address for correspondence

Michał Oleszko

E-mail: michaloleszkoole@gmail.com

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Abstract

Background. Herpes zoster (HZ) is caused by reactivation of latent varicella-zoster virus and affects 25–30% of individuals, with the highest incidence in adults aged ≥ 50 years and a lifetime risk exceeding 50% after the age of 85. Its most common complication is postherpetic neuralgia (PHN), i.e., persistent neuropathic pain. Reports of increased HZ incidence during or after SARS-CoV-2 infection suggest potential epidemiological associations requiring further investigation.

Objectives. Our goals were to evaluate the incidence of HZ and its complications during the pandemic and the post-pandemic period in primary care settings in Poland.

Materials and methods. We conducted a retrospective multicenter study in 20 primary care clinics in Poland, covering 43,949–81,091 patients from 2020 to 2024. Incident HZ cases and complications (PHN, herpes zoster ophthalmicus (HZO), HZ oticus, and disseminated HZ) were identified, and demographic data, including place of residence, were collected. Statistical analyses included χ^2 or Fisher's exact tests, Student's t-tests or nonparametric equivalents, odds ratios (ORs) with 95% confidence intervals (95% CIs), and receiver operating characteristic (ROC) analysis to assess age-related risk of prolonged symptoms.

Results. A total of 570 HZ cases were recorded from 2020 to 2024. Incidence ranged from 1.61 to 2.14 per 1,000 persons and increased with age, reaching 6.57 per 1,000 in individuals aged ≥ 80 years. Patients aged ≥ 71 years had higher odds of developing PHN (pain persisting for >90 days) than younger patients (OR = 4.47; 95% CI: 2.30–8.67; $p < 0.001$). Older adults were also more likely to develop HZO ($p = 0.001$). Rural incidence was significantly lower during the pandemic than in the post-pandemic period ($p = 0.005$), with no significant differences in urban or semi-urban areas.

Conclusions. The risk of HZ, PHN, and HZO rises with age. During the pandemic (2020–2021), rural incidence was significantly lower than in the post-pandemic period (2022–2024). The study provides updated data on HZ epidemiology in Poland and highlights the impact of the COVID-19 pandemic on healthcare access and HZ reporting in rural areas.

Key words: herpes zoster, postherpetic neuralgia, herpes zoster ophthalmicus, COVID-19 pandemic, primary healthcare

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Highlights

- Herpes zoster (HZ) incidence increases markedly with age, with the highest rates observed in adults aged 80 years and older.
- Older age is strongly associated with an increased risk of postherpetic neuralgia (PHN) and HZ ophthalmicus in patients with HZ.
- A multicenter primary care study provides updated epidemiological data on HZ and its complications in Poland from 2020 to 2024.
- The COVID-19 pandemic influenced HZ reporting patterns, with significantly lower incidence observed in rural areas during the pandemic compared with the post-pandemic period.

Background

Herpes zoster (shingles; HZ) is caused by reactivation of the latent varicella-zoster virus (VZV), which persists in the sensory ganglia after primary infection.¹ Primary infection with VZV – varicella – occurs predominantly in childhood, manifests as a vesicular, itchy rash accompanied by systemic symptoms such as malaise, headache, or loss of appetite, and is highly contagious.^{2–9}

Approximately 25–30% of the general population will develop HZ during their lifetime, with the highest incidence observed in adults aged ≥ 50 years.¹⁰ The risk rises to more than 50% in patients aged >85 years.^{11,12} Clinically, HZ manifests as an erythematous vesicular rash in 1 or 2 dermatomes, most commonly facial or thoracic,¹³ but it may involve multiple dermatomes or become disseminated, particularly in immunocompromised patients.^{14,15} Acute pain typically resolves within 2–4 weeks; however, more than 20% of individuals develop postherpetic neuralgia (PHN),^{16–18} with the incidence increasing substantially with age.^{19–25}

Postherpetic neuralgia is described as aching, burning, throbbing, or shooting pain and may involve allodynia.²⁶ Herpes zoster ophthalmicus (HZO) affects the ophthalmic branch of the trigeminal nerve and may lead to conjunctivitis, keratitis, uveitis, or vision loss,^{27,28} while HZ oticus can result in facial palsy, vertigo, tinnitus, or hearing loss.^{29,30} Herpes zoster occurs globally, with no apparent seasonal variation in its incidence rate (IR). The clinical and epidemiological characteristics of HZ are largely consistent across different geographic regions.³¹

Growing evidence suggests that the coronavirus disease 2019 (COVID-19) pandemic has influenced the epidemiology and reporting of non-COVID infectious diseases, including HZ. Reduced access to routine medical care and changes in healthcare-seeking behavior were widely documented during the pandemic, leading to underdiagnosis and fluctuations in surveillance data.^{32,33}

Additionally, case series and observational studies have described VZV reactivation during or following infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), suggesting that pandemic-related immune

dysregulation or physiologic stress may contribute to triggering HZ in susceptible individuals.^{34,35} These observations highlight the importance of evaluating pandemic-related trends in HZ and PHN incidence.

In Poland, vaccination against varicella is included in the mandatory childhood immunization schedule, while vaccination against HZ is recommended for adults but not universally funded. Since 2024, recombinant zoster vaccine (RZV) has been partially reimbursed for selected adult groups, although availability remains limited and vaccination is not routinely offered in primary care settings.³⁶ These factors underline the public health relevance of analyzing HZ epidemiology and its complications in the Polish population, including differences between urban and rural settings.

The Podkarpackie Voivodeship provides a valuable setting for such an analysis because of its mixed urban–rural structure, aging population, and documented disparities in healthcare accessibility relative to other regions of Poland. Primary care practices in this area provide access to large community-based patient populations, enabling the assessment of HZ incidence and meaningful comparisons across demographic and geographic subgroups.

Objectives

Considering the well-established risk factors for HZ reported worldwide^{37–39} and the limited epidemiological data available from Central and Eastern Europe, this retrospective, population-based study aimed to characterize the epidemiology of HZ in Poland between 2020 and 2024. Specifically, we determined the incidence of HZ and its associated complications, including PHN, HZO, HZ oticus, and disseminated HZ, with particular attention to differences between urban and rural populations. We also examined the influence of age and sex on HZ incidence and assessed the impact of the COVID-19 pandemic by comparing data from the pandemic period (2020–2021) with those from the post-pandemic years (2022–2024), while accounting for territorial differences.

Materials and methods

Study population

We conducted a retrospective, population-based study using the primary care database of Medical Center Medyk in the Podkarpackie Voivodeship, Poland. Podkarpackie is the southeasternmost voivodeship in the country, and Medical Center Medyk is one of the largest multisite healthcare providers in the region, operating 20 primary care clinics across the area. The total number of patients registered with a general practitioner increased from 43,949 at the end of 2020 to 81,091 at the end of 2024 (Table 1). This substantial growth resulted primarily from the ongoing registration of new patients, reflecting the gradual enlargement of the study population over the study period. In this study, we analyzed all cases of HZ (ICD-10: B02–B02.9) diagnosed in outpatient primary care settings over a 5-year period (January 2020–December 2024). The database was used to identify patients with HZ and its complications, including PHN, HZO, HZ oticus, and disseminated HZ.

Urban areas were defined as cities with more than 100,000 inhabitants, suburban areas as towns with municipal status but fewer than 100,000 inhabitants, and rural areas as non-urbanized localities without municipal rights, regardless of population size. The IR is a measure of HZ incidence that expresses the number of new cases that arise in a study population during a given year.

Comorbidities were not included in the analysis because the documentation in the primary care database was insufficient. Many chronic conditions are managed exclusively by specialists rather than documented in primary care records, resulting in incomplete records that do not allow for a robust evaluation of their potential impact. Vaccination rates for HZ were not addressed in this study, as RZV has been partially reimbursed in Poland since January 2024 for individuals aged ≥ 65 years with comorbidities and has been fully reimbursed since April 2025 for this population (https://bip.aotm.gov.pl/assets/files/zlecenia_mz/2024/158/AWA_158_AWA_OT.423.0.7.2024_Shingrix_BIP_REOPTR.pdf). Before January 2024, the vaccine was available only commercially, with uptake generally very low.⁴⁰

Table 1. Total number of patients by year

Year	Number of patients with HZ	Total number of patients	Incidence per 1,000 patients per year
2020	94	43,949	2.139
2021	95	50,976	1.864
2022	124	61,958	2.001
2023	126	71,736	1.756
2024	131	81,091	1.616

HZ – herpes zoster.

Definition of cases and complications

An incident case of HZ was defined as a new diagnosis (ICD-10: B02) recorded between 2020 and 2024 in individuals with no prior HZ diagnosis in the preceding 12 months. The data extracted from the Medical Center Medyk primary care database were checked for completeness and consistency to ensure reliable identification of HZ cases and complications. Postherpetic neuralgia was identified based on either the co-occurrence of ICD-10 codes B02 and G53.0 or B02 and G63.0, recorded on the same date more than 90 days after the initial HZ diagnosis and listed as primary or secondary diagnoses, or documentation of persistent postherpetic pain lasting more than 90 days in the medical history. Other HZ-related complications were defined and identified analogously using specific 5-character ICD-10 codes (B02.0–B02.9) corresponding to specific clinical manifestations. These included, e.g., HZO (B02.3), HZ oticus (B02.2), and disseminated HZ (B02.7). All diagnoses were further verified by trained personnel to ensure consistency and minimize misclassification. Detailed medical history entries recorded within 30 days of the initial HZ diagnosis were also reviewed to ensure that complications not fully reflected in the diagnostic codes were accurately captured.

Approval for the study was granted by the Bioethics Committee at the University of Rzeszów, Poland (approval No. 044/11/2024, issued on 6 November 2024), and all consent required by the Committee was obtained.

Statistical analyses

We used TIBCO STATISTICA v. 13.3 software (StatSoft Inc., Tulsa, USA) and R v. 4.3.1 (R Foundation for Statistical Computing, Vienna, Austria; packages: stats, base, car 3.1-5, FSA 0.10.1, pROC 1.19.0.1, and sm 2.2-6.0; base: <https://search.r-project.org/R/refmans/base/html/base-package.html>; stats: <https://search.r-project.org/R/refmans/stats/html/stats-package.html>; car 3.1-5: <https://CRAN.R-project.org/package=car>; FSA 0.10.1: <https://CRAN.R-project.org/package=FSA>; pROC 1.19.0.1: <https://cran.r-project.org/web/packages/pROC/index.html>; sm 2.2-6.0: <https://cran.r-project.org/web/packages/sm/index.html>) to analyze the data. Categorical variables were presented as numbers with percentages and compared using the χ^2 test or Fisher's exact test, as appropriate. The Shapiro–Wilk ($n = 10–50$) or Lilliefors ($n > 50$) test was used to assess the normality of the data distribution (the results are presented in Supplementary Table 2). Medians with Q1–Q3 ranges and means with 95% confidence intervals (95% CIs) and standard deviations (SDs) were presented for all continuous variables. As the assumptions for parametric tests were not met (Supplementary Table 2), the Mann–Whitney or Kruskal–Wallis test was used, as appropriate, to compare continuous variables between study groups. For multiple comparisons, Tukey's post hoc test with Bonferroni correction or Dunn's

Table 2. Demographic distribution of herpes zoster cases by year (2020–2024): number of cases (n) and incidence per 1,000 persons per year (incidence rate (IR))

Variable	2020		2021		2022		2023		2024	
	n	IR	n	IR	n	IR	n	IR	n	IR
Age [years]										
0–17	2	0.463	1	0.157	8	0.856	2	0.174	2	0.149
18–49	23	1.048	30	1.174	42	1.345	39	1.066	37	0.882
50–59	22	3.706	17	2.631	21	2.847	25	3.047	24	2.682
60–69	27	4.872	20	3.366	27	4.064	26	3.542	32	4.027
70–79	14	3.332	17	3.761	16	3.180	17	3.083	21	3.532
>80	6	3.000	10	4.695	10	4.294	17	6.571	15	5.212
Sex										
Women	63	2.747	66	2.482	72	2.193	79	2.074	78	1.813
Men	31	1.475	29	1.189	52	1.785	47	1.397	53	1.393
Area of living										
Rural	0	0.000	7	2.928	11	4.207	15	3.608	11	2.213
Suburban	12	1.297	14	1.230	21	1.540	13	0.831	24	1.357
Urban	82	2.519	74	1.989	92	2.013	98	1.887	86	1.472
Total	94	2.139	95	1.864	124	2.001	126	1.756	131	1.615

test, as appropriate, was used. Spearman's correlation coefficient was used to describe the relationship between quantitative characteristics. The test of monotonicity in a regression curve (sm.monotonic) was used to assess monotonicity. This test uses the concept of a "critical bandwidth" to assess evidence that a regression curve is non-monotonic. A two-proportion test was used to compare the IR. For binary variables, odds analysis (with a 95% CI) was used to estimate the odds ratio (OR), with a significance level of $p = 0.050$. Receiver operating characteristic (ROC) analysis was used to determine the age that best discriminated between patients with pain lasting >90 days and those with pain lasting ≤90 days. A two-sided $p < 0.05$ was considered statistically significant.

Results

Herpes zoster was diagnosed in 570 individuals over the 5-year period (2020–2024). The demographic distribution of HZ cases by year, along with the IR, is presented in Table 2, whereas IRs with corresponding 95% CIs are summarized in Supplementary Table 1.

Table 3 presents the median time between the first and last visits and the number of visits during the course of illness, along with the corresponding 1st and 3rd quartiles for each year.

The incidence by age group is shown in Fig. 1. The incidence of HZ by sex from 2020 to 2024, expressed per 1,000 persons per year, is summarized in Fig. 2. Supplementary Fig. 1 presents the IR across urban, semi-urban, and rural areas.

Descriptive statistics for age and time to the last visit according to HZ localization are summarized in Table 4.

Table 3. Descriptive statistics of the number of visits, pain duration, patient age, and time between first and last visit during the pandemic and post-pandemic periods

Year	Number of patients with HZ	Median	Q1	Q3
2020	94	1	1	2
2021	95	1	1	2
2022	124	1	1	2
2023	126	1	1	2
2024	131	1	1	2
Pain duration [days]				
2020	94	0.00	0.00	15.00
2021	95	0.00	0.00	14.00
2022	124	0.00	0.00	20.00
2023	126	0.00	0.00	11.00
2024	131	0.00	0.00	21.00
Pain duration [days] broken down into 90 days				
Group	n in group	median	Q1	Q3
≤90	531	58.00	43.00	69.00
>90	39	72.00	60.00	78.00
Descriptive statistics of age of patients with HZ in pandemic and post-pandemic periods				
Years	n in years	median	Q1	Q3
2020–2021	189	59.000	46.000	69.000
2022–2024	381	58.000	43.000	70.000
Time between first and last visit in the pandemic and post-pandemic periods [days]				
Year	n in years	median	Q1	Q3
2020–2021	78	27	7	56
2022–2024	156	32	8	74

HZ – herpes zoster; Q1 – 1st quartile; Q3 – 3rd quartile

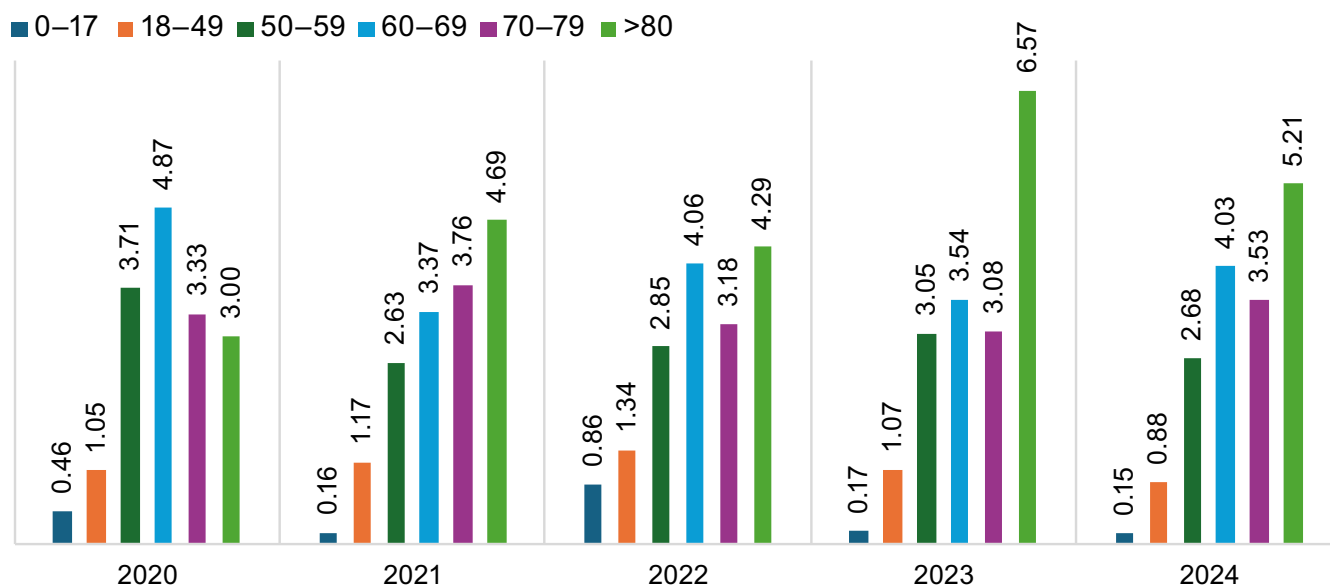


Fig. 1. Incidence by age group per 1,000 persons per year in 2020–2024

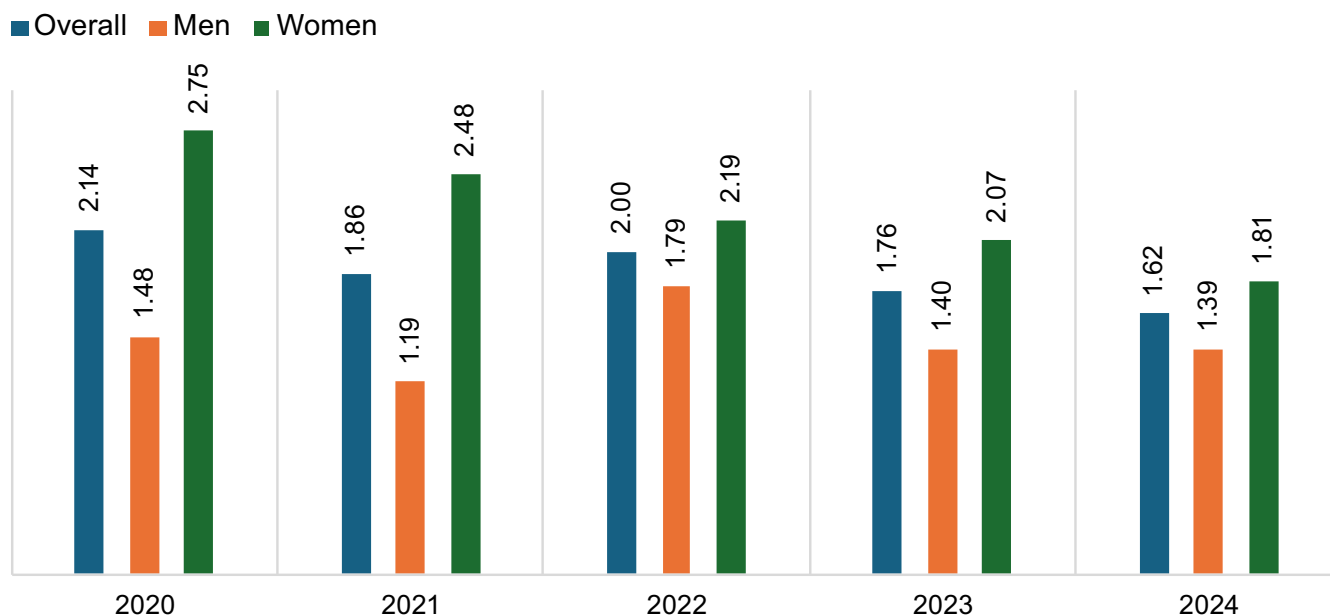


Fig. 2. Incidence by sex group per 1,000 persons per year in 2020–2024

Table 4. Descriptive statistics of age and time to last visit according to herpes zoster (HZ) localization

Localization	Variable	n	Median	Q1	Q3
HZ ophthalmicus	age	32	69	60	78
	time to last visit	32	3.5	0	40.5
HZ oticus	age	13	63	51	70
	time to last visit	13	3	0	70
Limited HZ	age	485	58	43	69
	time to last visit	485	0	0	16
Localization	variable	n	–	min	max
Disseminated HZ	age	3	–	42	73
	time to last visit	3	–	0	101

Q1 – 1st quartile; Q3 – 3rd quartile; min – minimum; max – maximum.

In 37 cases (6.49%), information on HZ localization was unavailable. To examine whether patient age differed significantly across HZ types, the nonparametric Kruskal–Wallis test was applied because some subgroups had small sample sizes. The Kruskal–Wallis test showed that age differed significantly across HZ localization groups ($n = (32, 13, 3, 485)$; $p < 0.001$), whereas time to the last visit did not ($n = (32, 13, 3, 485)$; $p = 0.222$). Patients with HZO were significantly older ($p < 0.001$) than patients with a limited form of HZ. No significant age differences were observed in the other pairwise comparisons (ophthalmicus vs oticus: $p = 0.915$; ophthalmicus vs disseminated: $p > 0.999$; oticus vs limited: $p > 0.999$; oticus vs disseminated: $p > 0.999$; ophthalmicus vs limited: $p > 0.999$; disseminated vs limited: $p > 0.999$).

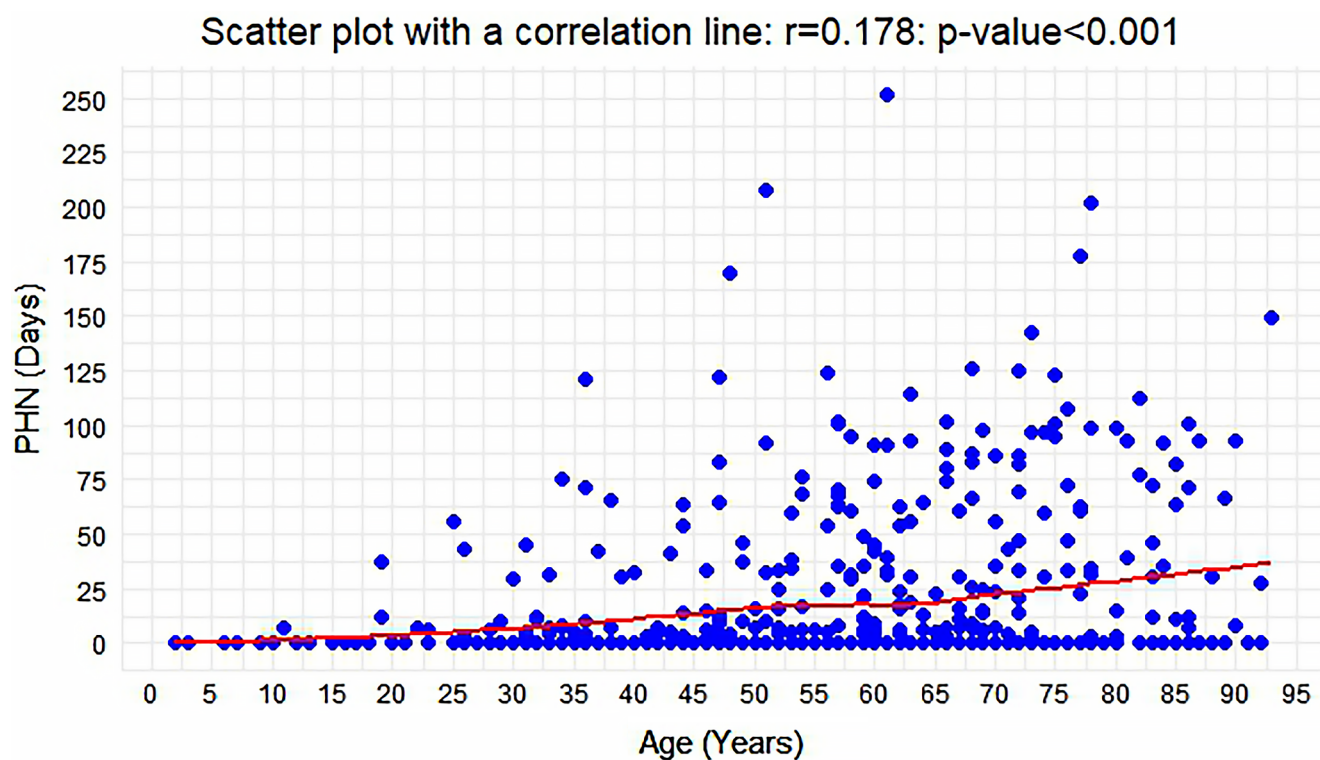


Fig. 3. Association between age and postherpetic neuralgia (PHN) risk

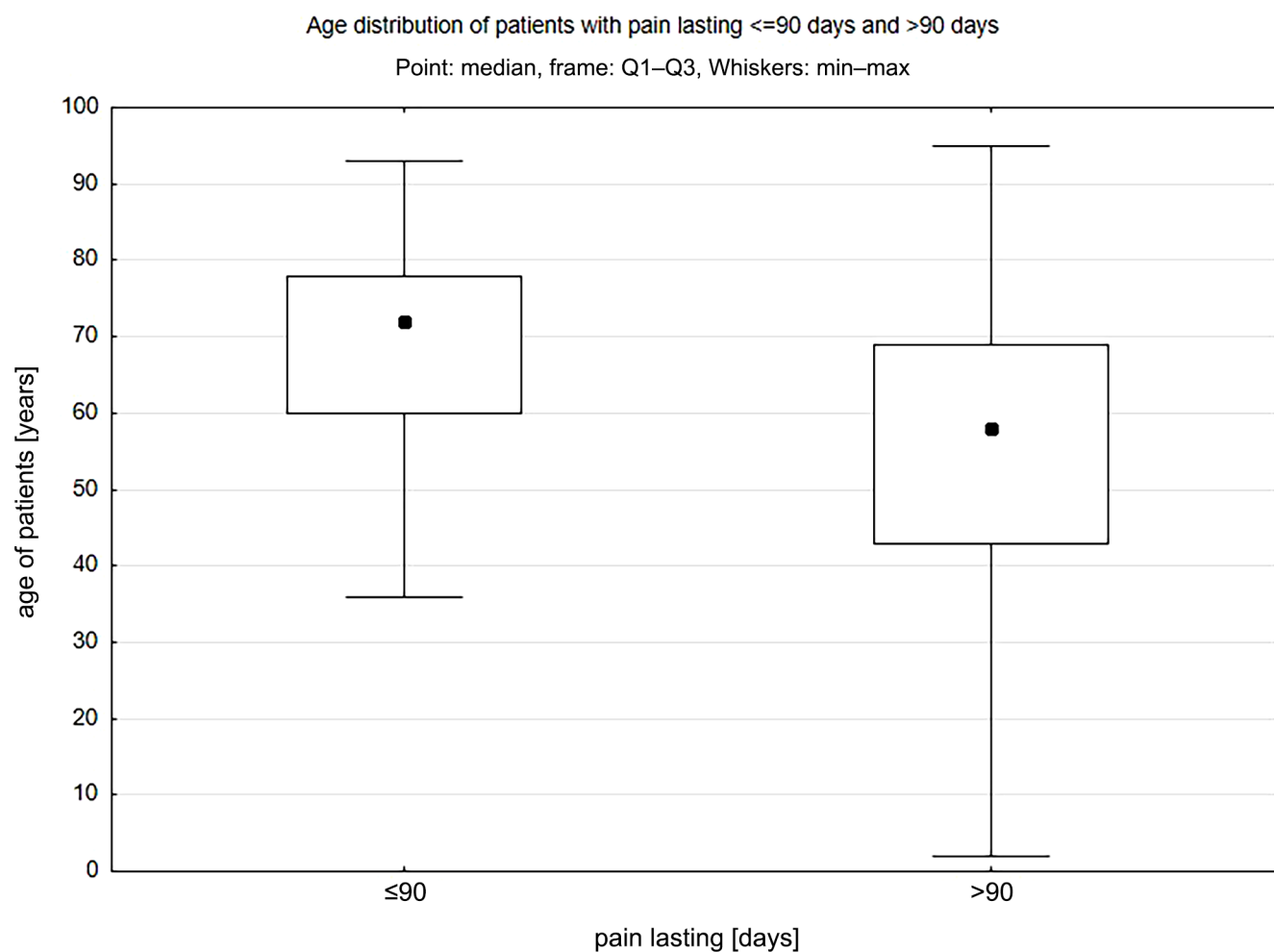


Fig. 4. Age distribution of patients with pain lasting ≤ 90 days and >90 days (postherpetic neuralgia (PHN))

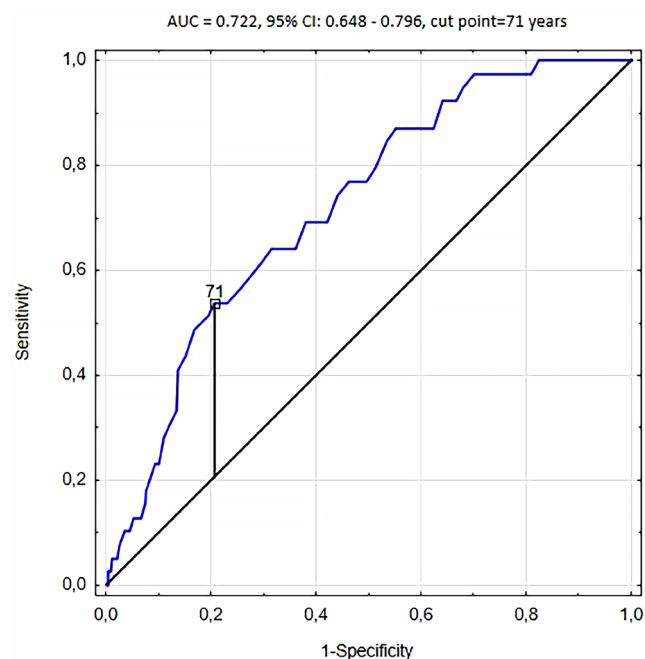


Fig. 5. Receiver operating characteristic (ROC) curve evaluating the performance of age as a predictor of prolonged pain duration (>90 days)

Thirty-nine patients (7%) developed PHN, defined as chronic pain lasting more than 90 days. Spearman's correlation analysis showed a significant positive association between age and PHN ($r = 0.178$, $n = 570$; $p < 0.001$, $p\text{-sm.monotonic} = 0.380$) (Fig. 3). When the duration of postherpetic pain was treated as a binary variable (≤ 90 days vs > 90 days), the Mann–Whitney U test revealed that patients with PHN were significantly older ($n = (39, 531)$; $p < 0.001$). Table 3 presents the descriptive statistics for pain duration and the results of the Mann–Whitney U test, while Fig. 4 illustrates the age distribution of patients with pain lasting ≤ 90 days vs those with pain persisting for > 90 days. Receiver operating characteristic analysis identified an optimal age cutoff of 71 years (area under the ROC curve (AUC) = 0.722, 95% CI: 0.648–0.796; $p < 0.001$; Fig. 5). Patients aged ≥ 71 years had 4.47 times the odds of developing PHN compared with patients aged < 71 years (OR = 4.47, 95% CI: 2.30–8.67; $p < 0.001$).

Impact of the COVID-19 pandemic on the burden of herpes zoster

The incidence of HZ during the pandemic period (2020–2021) and the post-pandemic period (2022–2024) is shown in Table 5. The average annual rate of change from 2020 to 2024 was -6.78% . The duration of HZ symptoms, as well as patient age and sex, did not differ significantly between the pandemic and post-pandemic periods. The median and mean age, as well as the mean time between the first and last HZ-related visits, are presented in Table 3 and Supplementary Fig. 2. As most patients attended only a single visit, the median interval between the first and last visits was 0 in both the pandemic and post-pandemic periods. The incidence of HZO, HZ oticus, and disseminated HZ did not differ significantly between these 2 periods (Mann–Whitney U test, $n = (189, 381)$; $p = 0.761$).

The incidence of HZ differed significantly between the pandemic and post-pandemic periods in rural areas (two-proportion test: $f = (1.542, 3.151)$; $p = 0.005$), but not in urban (two-proportion test: $f = (2.236, 1.769)$; $p = 0.452$) or semi-urban areas (two-proportion test: $f = (1.260, 1.235)$; $p = 0.952$) (Supplementary Fig. 3). Overall HZ incidence did not differ significantly between the 2 periods (two-proportion test: $f = (1.991, 1.774)$; $p = 0.717$).

Discussion

This study provides a comprehensive analysis of HZ epidemiology and its complications in the Polish population. We confirmed that HZ incidence increases markedly with age, that women are affected more frequently than men, and that PHN remains the most common complication, with the risk strongly associated with age. Although overall HZ incidence did not differ significantly between urban and rural areas, reporting patterns varied during the pandemic period. These findings are consistent with international data and provide important evidence from Central and Eastern Europe, where population-based analyses remain limited.

Table 5. Incidence of herpes zoster (HZ) in the pandemic (2020–2021) and post-pandemic (2022–2024) periods

Period	Years	Number of patients with HZ	Total number of patients	Incidence per 1,000 persons per year	Mean of incidence per 1,000 persons per year in periods
Pandemic	2020	94	43,949	2.14	2.00
	2021	95	50,976	1.86	
Post-pandemic	2022	124	61,958	2.00	1.79
	2023	126	71,736	1.76	
	2024	131	81,090	1.62	

Impact of the COVID-19 pandemic on HZ diagnosis and healthcare access

Overall, HZ incidence did not differ significantly between the pandemic and post-pandemic periods in our study, but rural areas showed a lower incidence during the pandemic, likely reflecting reduced healthcare access, diagnostic delays, and underreporting during the pandemic.^{41,42}

The COVID-19 pandemic disrupted healthcare systems globally,^{43–46} causing reduced access to specialists, lower hospitalization rates, and fewer diagnoses of, e.g., chronic diseases,^{47,48} sexually transmitted infections,^{49,50} dermatological diseases,⁵⁰ and oncological disorders,^{51–60} as well as a decline in the number of transplantations.^{61–64} Access to primary care facilities was also affected during the pandemic.⁶⁵ Rural areas experienced additional challenges, including limited access to technology, mobility constraints, and fewer healthcare resources.^{66–71} Difficulties in accessing public transport in rural areas may have limited people's mobility in less-developed regions.^{72,73} Fear of contracting COVID-19 also contributed to delayed healthcare-seeking behavior.⁶⁷ In our study, there was no significant difference in overall incidence between the pandemic and post-pandemic periods; however, the incidence in rural areas was significantly lower during the pandemic than during the post-pandemic period, likely for the reasons mentioned above.

Geographic and age-related patterns in herpes zoster incidence

Population-based studies show variable urban–rural patterns. In urban settings, Chan et al. reported a prevalence of 2.03–2.21 per 1,000 persons, highest among individuals aged 70–79.⁷⁴ In contrast, Lionis et al. reported a crude incidence of 1.4 per 1,000 persons in rural Greece.⁷⁵ Li et al. found a markedly higher incidence of HZ in urban than in rural areas (7.65 vs 2.06 per 1,000 persons).⁷⁶ However, other studies, such as Cebrián-Cuenca et al., observed the opposite – rural incidence was significantly higher (8.8 per 1,000 persons vs 3.1 per 1,000 persons in urban populations).⁷⁷ According to the authors, the higher incidence of HZ in rural settings could be biased by higher consultation rates per patient in these areas, owing to the lower number of individuals assigned to each general practitioner outside cities compared with urban areas. In our study, overall incidence did not differ significantly between urban and rural areas, although rural incidence during the pandemic years was significantly lower than during the post-pandemic years.

Multiple recent meta-analyses have identified age as one of the strongest independent predictors of HZ.^{78–82} Internationally, HZ incidence in the general population ranges from 1.2 to 3.4 per 1,000 persons per year,⁸³ increasing to 6–8 per 1,000 persons in adults aged 60 years and to 8–12 per 1,000 persons in those aged 80 years.¹ Similar trends

were reported by Li et al.,⁷⁶ who observed an incidence of 3.43 per 1,000 persons in individuals aged ≥ 50 years and 8.55 per 1,000 persons in those aged ≥ 80 years. In Poland, 70% of hospitalized HZ patients are aged >60 years.⁸⁴

Official Polish data on HZ incidence have been available since 2024 and range from approx. 2.86 to 5.56 per 1,000 persons per year.⁴⁰ The IR observed in our study were slightly lower than those reported in the official Polish data but were consistent with international trends, ranging from 2.14 in 2020 to 1.61 in 2024. Age-related declines in VZV-specific cellular immunity and the presence of comorbidities likely contribute to these outcomes.^{78–80,85–89} In our study, the incidence of HZ per 1,000 persons per year increased with age and was highest in patients aged >80 years in every year except 2020.

Complications of herpes zoster: Incidence and risk factors

Postherpetic neuralgia risk follows a similar pattern. It rarely occurs in individuals younger than 50 years but increases substantially with age, reaching up to 21% in persons aged 80–85 years.^{90,91} In the systematic review by Giannelos et al.,²⁵ PHN incidence varied widely (2.6–46.7%) depending on the population and definitions used. Studies based on primary care databases generally reported lower PHN rates (2.6–13.7%) due to underrecognition of mild and moderate cases.²⁵ Several retrospective analyses support these trends^{91–96}; e.g., Gauthier et al.⁹¹ observed PHN lasting 3 months in 13.7% of patients aged ≥ 50 years, while Alicino et al.⁹² reported PHN in 12.7% of HZ cases (up to 28.57% in those aged ≥ 85 years). Our data similarly demonstrated significantly higher PHN rates in older adults, with 4.47 times the odds of persistent pain in those aged ≥ 71 years.

Herpes zoster ophthalmicus carries a risk of severe ocular complications, including keratitis, uveitis, corneal disease, and stroke.^{97,98} In the general population, ocular involvement occurs in 1.4–15.9% of HZ cases,²⁵ with higher rates in immunocompromised patients (up to 11.4% among patients with solid organ malignancies and 11.3% among those with hematologic malignancies)^{99,100} compared with 4.8% in immunocompetent individuals.¹⁰¹

Our findings align with these reported ranges. Herpes zoster oticus is associated with facial nerve palsy,¹⁰² hearing impairment (24% of adult cases),³⁰ and vertigo.¹⁰³ Although studies on its incidence are limited, estimates range from 1.4% to 1.7%,¹⁰⁴ with values as high as 18%.¹⁰⁵ In our cohort, HZ oticus accounted for 2.28% of all cases, consistent with these values. Disseminated HZ is the rarest but most severe form, occurring in 0.3–8.2% of the general population²⁵ and in 0–0.5% of immunocompetent individuals.^{25,100,101,106} Incidence is higher among patients with hematologic malignancies (0.65–19.3%), among those with solid organ malignancies (0.04–8.5%),^{100,107,108} and among transplant recipients (0–14%).^{100,109} In our study, only 3 cases (0.54%) were identified, likely due to underreporting, as patients

with severe disease or immunocompromise often present directly to hospital units.^{14,110–112} However, this value is consistent with rates reported in other studies.

Sex as a determinant in herpes zoster

Sex differences in HZ risk have been consistently reported. A meta-analysis by Kawai and Yawn found a higher incidence among women (pooled risk ratio (RR) = 1.31; 95% CI: 1.27–1.34).⁸⁰ Li et al. also demonstrated a higher incidence in women in primary care populations (3.95 per 1,000 persons in women vs 2.89 per 1,000 persons in men).⁷⁶ Many studies confirm that women are more likely to develop HZ,^{10,78,81,113–118} though the explanation remains multifactorial. Health-seeking behavior may differ between sexes. Biological mechanisms, such as immune or hormonal modulation, may contribute,^{80,119} and diagnostic biases have also been suggested.^{118,120}

Polish hospital data similarly report a female predominance (58% of HZ hospitalizations).⁸⁴ Our study supports these findings, with women developing HZ more frequently than men; the difference was statistically significant in 2020 (two-proportion test: $f = (2.74, 1.47)$, $p = 0.048$). In that year, the IR per 1,000 persons was 2.74 for women (95% CI: 2.13–3.54) and 1.47 for men (95% CI: 1.02–2.12). However, no significant differences were observed during 2021–2024, likely due to an insufficient sample size; this finding warrants further investigation.^{121,122}

Implications for practice

The strong age-related increase in the risk of HZ and PHN underscores the importance of targeted prevention in older adults. The recent reimbursement of the RZV (Shingrix) in Poland provides an opportunity to reduce disease burden, particularly in high-risk groups such as individuals aged ≥ 60 years, immunocompromised patients, and those living in rural areas with limited healthcare access. Strengthening primary care screening and patient education may further mitigate PHN by enabling earlier diagnosis and treatment. Pandemic-related fluctuations in reporting also highlight the need to reinforce surveillance systems to improve trend monitoring and guide vaccination policies.

Limitations of the study

Several limitations must be acknowledged. First, we lacked access to data prior to 2020, as the electronic health record system was fully implemented at the participating clinics only in mid-2019. Consequently, we were unable to compare our findings with data from the pre-pandemic period. Furthermore, although the study involved several clinics, they were all part of the same primary care network, which may limit the generalizability of the findings to other regions or healthcare systems. In addition,

the retrospective design and reliance on electronic health records may have led to diagnostic errors or underreporting, particularly among patients with mild or moderate symptoms. Moreover, due to the factors outlined in the Materials and methods section, the influence of comorbidities and HZ vaccination coverage could not be evaluated, and these aspects require further investigation.

Conclusions

Our study provides an updated analysis of the incidence of HZ and its complications in the primary care population in Poland. We found that age was significantly associated with the incidence of HZ, PHN, and HZO. Moreover, further investigation into the pandemic's impact on rural healthcare is warranted, as we observed differences in HZ incidence between the pandemic and post-pandemic periods in rural areas. It is particularly important for general practitioners to inform patients about the risk of HZ, especially older adults, given that HZ vaccination is available and fully reimbursed for eligible patients in Poland.

Supplementary data

The supplementary materials are available at <https://doi.org/10.5281/zenodo.20718265>. The package contains the following files:

Supplementary Table 1. Demographic distribution of HZ cases by year (2020–2024): number of cases (n) and incidence per 1,000 persons per year (IR) with corresponding 95% CIs.

Supplementary Table 2. Results of normality tests for clinical and demographic variables in HZ patients.

Supplementary Fig. 1. Incidence by area of residence in 2020–2024.

Supplementary Fig. 2. Time between first and last visit in the pandemic and post-pandemic periods.

Supplementary Fig. 3. Incidence by area of residence in the pandemic and post-pandemic periods.

Data Availability Statement

The datasets supporting the findings of the current study are openly available in Zenodo at <https://doi.org/10.5281/zenodo.20689609>.

Consent for publication of personal information

Not applicable.

Use of AI and AI-assisted technologies

Not applicable.

ORCID iDs

Michał Oleszko  <https://orcid.org/0000-0002-2635-0856>
 Lech Zareba  <https://orcid.org/0000-0002-2221-614X>
 Aleksandra Łoś  <https://orcid.org/0009-0000-5094-1157>
 Nikola Król  <https://orcid.org/0000-0002-5524-6476>
 Hanna Czajka  <https://orcid.org/0000-0001-8104-7967>

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