Prevalence of Scabies in Sisak-Moslavina County, Croatia, from 2019 to 2023

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Abstract

Introduction: Scabies is a highly contagious skin infestation caused by *Sarcoptes scabiei* and remains an important public health concern worldwide. The epidemiology of scabies can be influenced by social crises, such as pandemics and natural disasters. This study aimed to analyze the prevalence of scabies in Sisak-Moslavina County (SMC), Croatia, from 2019 to 2023, with emphasis on sex- and age-specific distribution and the impact of the COVID-19 pandemic and the Banovina earthquake.
Materials and Methods: A retrospective epidemiological study was conducted using anonymized surveillance data from healthcare institutions and the Institute of Public Health of Sisak-Moslavina County. All reported scabies cases from January 2019 to December 2023 were included. Data were analyzed descriptively and comparatively according to year, sex, and age groups, and were compared with national epidemiological trends. Statistical analyses included descriptive measures and chi-squared tests, with significance set at $p < 0.05$.
Results: Scabies incidence in SMC showed relative stability compared to pronounced national fluctuations. The highest number of cases in SMC was recorded in 2019, followed by a decline during 2020–2021. No significant sex-related differences were observed. Children aged 0–10 years and adults older than 50 years were the most affected age groups throughout the study period.
Conclusions: Scabies prevalence in SMC remained stable during major crisis periods, suggesting effective public health measures. Targeted prevention and continuous surveillance are essential, particularly for vulnerable age groups, to prevent outbreaks during both routine and emergency conditions.

Keywords: scabies, Sarcoptes scabiei, COVID-19 Pandemic, epidemiology

Sažetak:

Prevalencija svraba u Sisačko-moslavačkoj županiji, Hrvatska, od 2019. do 2023. godine
Uvod: Svrab je vrlo zarazna infestacija kože koju uzrokuje Sarcoptes scabiei te i dalje predstavlja važan javnozdravstveni problem u cijelom svijetu. Na epidemiologiju svraba mogu utjecati društvene krize, poput pandemija i prirodnih katastrofa. Cilj ovog istraživanja bio je analizirati prevalenciju svraba u

Sisačko-moslavačkoj županiji (SMŽ), Hrvatska, od 2019. do 2023. godine, s posebnim naglaskom na raspodjelu prema spolu i dobi te na utjecaj pandemije bolesti COVID-19 i potresa na Banovini.
Materijali i metode: Provedeno je retrospektivno epidemiološko istraživanje na temelju anonimiziranih podataka sustava nadzora prikupljenih iz zdravstvenih ustanova i Zavoda za javno zdravstvo Sisačko-moslavačke županije. Uključeni su svi prijavljeni slučajevi svraba od siječnja 2019. do prosinca 2023. godine. Podaci su analizirani deskriptivno i komparativno prema godini, spolu i dobnim skupinama te su uspoređeni s nacionalnim epidemiološkim trendovima. Statističke analize uključivale su deskriptivne pokazatelje i hi-kvadrat testove, uz razinu statističke značajnosti postavljenu na $p < 0,05$.
Rezultati: Incidencija svraba u SMŽ-u pokazala je relativnu stabilnost u usporedbi s izraženim oscilacijama na nacionalnoj razini. Najveći broj slučajeva u SMŽ-u zabilježen je 2019. godine, nakon čega je tijekom 2020. i 2021. uslijedio pad. Nisu utvrđene statistički značajne razlike povezane sa spolom. Djeca u dobi od 0 do 10 godina i odrasle osobe starije od 50 godina bile su najpogođenije dobne skupine tijekom cijelog razdoblja istraživanja.
Zaključci: Prevalencija svraba u SMŽ-u ostala je stabilna tijekom razdoblja velikih kriza, što upućuje na učinkovitost javnozdravstvenih mjera. Ciljane preventivne aktivnosti i kontinuirani epidemiološki nadzor ključni su, osobito za ranjive dobne skupine, kako bi se spriječilo izbijanje epidemija u redovitim i izvanrednim okolnostima.

Ključne riječi: svrab, Sarcoptes scabiei, pandemija bolesti COVID-19, epidemiologija

Introduction

Scabies is a globally widespread, contagious ectoparasitic infestation caused by the mite *Sarcoptes scabiei var. hominis*. The condition affects millions of individuals annually and represents a significant public health burden in settings with high population density and limited access to healthcare (1). Transmission occurs primarily through prolonged direct skin-to-skin contact, although indirect spread via objects such as bedding or clothing has been documented, particularly in institutional outbreaks. The mite's life cycle, which is completed entirely on the human host, is fundamental to its persistence and transmissibility within communities (2).

The clinical manifestations of scabies are mainly caused by a hypersensitivity reaction to mite antigens, eggs, saliva and feces. Typical symptoms include severe itching, often worse at night, and a characteristic rash consisting of papules, vesicles, and serpiginous depressions. The most commonly affected sites include the interdigital spaces, wrists, elbows, axillae, groin, and genital areas. In infants and young children, lesions may also affect the scalp, face, and soles of the feet. Crusted (Norwegian) scabies, a severe variant most commonly seen in immunocompromised individuals and the elderly, is characterized by extensive hyperkeratosis and carries a high risk of transmission and secondary bacterial infection (3). Scabies is sometimes under-recognized by physicians due to its clinical similarity to other dermatoses and allergic conditions, including eczema, urticaria, atopic dermatitis, and allergic contact dermatitis (4).

Scabies affects individuals of all ages, but is most common among children, the elderly, and those living in institutional or overcrowded settings. Effective prevention relies on early diagnosis, rapid treatment of affected individuals and close contacts, and appropriate decontamination of the environment (5). In endemic regions, mass drug administration and public health education have been shown to significantly reduce disease prevalence and associated complications (6).

The aim of this study is to analyze the prevalence of scabies in Sisak-Moslavina County (SMC) from 2019 to 2023, with particular emphasis on differences according to patients' sex and age. Additionally, the study seeks to assess changes in scabies prevalence during the COVID-19 pandemic and following the Banovina earthquake (end of December 2020) in order to evaluate the impact of these crisis events on disease distribution.

Materials and Methods:

Subjects

This retrospective epidemiological study included all reported cases of scabies recorded in SMC between January 2019 and December 2023. The initial number of reported cases included in the analysis was 253. As all available records met the inclusion criteria, no cases were excluded, and the final dataset also comprised 253 cases. The study population consisted of patients of all ages and both sexes diagnosed with scabies (*Sarcoptes scabiei* infestation) and registered in healthcare institutions within the county. A scabies case was defined in accordance with established clinical and epidemiological criteria, based on the presence of characteristic symptoms (e.g., pruritus, particularly nocturnal) and typical skin lesions (such as burrows, papules, or nodules in characteristic distribution), and physician diagnosis. Individual patient data were anonymized prior to analysis, and no personal identifiers were used.

Materials

Data were obtained from the epidemiological surveillance records of the Institute of Public Health of Sisak-Moslavina County, which routinely collects mandatory notifications on infectious diseases from health institutions operating within the county, including primary health care, outpatient clinics and hospitals.

Scabies cases were identified through official infectious disease reporting forms and epidemiological records maintained by the county epidemiological service. Data extraction was performed retrospectively from the surveillance database and accompanying medical documentation archived at the Institute of Public Health of Sisak-Moslavina County.

The extracted variables included year of diagnosis, patient sex, age at diagnosis, and place of residence. Prior to analysis, all patient data were anonymized and processed without personal identifiers. Approval for access to the required data was granted by the Director of the Institute of Public Health of Sisak-Moslavina County.

For comparative purposes, aggregated national epidemiological data on scabies incidence in Croatia were obtained from the Croatian Health Statistics Yearbook published by the Croatian Institute of Public Health.

Methods

A descriptive and comparative analysis was conducted to assess trends in scabies prevalence over the five-year study period. Cases were stratified according to sex and age groups to evaluate demographic differences in disease occurrence. Temporal trends were analyzed with particular focus on periods corresponding to the COVID-19 pandemic and the aftermath of the Banovina earthquake, in order to assess the impact of these crisis events on scabies prevalence.

Statistical Analysis

Descriptive statistical methods were used to summarize scabies incidence and demographic characteristics of the study population. Data were organized according to year of diagnosis, sex, age group, and place of residence. Categorical variables were presented as frequencies and percentages, while continuous variables were described using means, medians, minimum and maximum values, and standard deviations.

Temporal trends in scabies occurrence were assessed through year-to-year comparisons at both the national level and within SMC. Differences in prevalence according to sex and age groups were analyzed using chi-squared tests for categorical variables. Age-specific measures included minimum, maximum, median, and mean values to characterize the distribution of cases. Variability over time was quantified using standard deviation in order to compare fluctuations in scabies occurrence between national and county-level data during the study period. A p-value of <0.05 was considered statistically significant.

Results

Time trends in the prevalence of scabies

An analysis of scabies incidence in the Republic of Croatia and SMC from 2019 to 2023 revealed marked temporal variations associated with broader epidemiological and local crisis conditions such as the coronavirus pandemic and local conditions in the county affected by the earthquake. In 2019, the highest number of scabies cases was recorded both nationally (2,453 cases) and in SMC (100 cases) (7). A substantial decline followed in 2020 and 2021, with national case numbers decreasing to 1,435 and 874, respectively, while SMC reported 47 cases in 2020 and 34 in 2021 (7).

In 2022, a moderate increase in national cases was observed (1,221), whereas the number of cases in SMC remained relatively stable, with 37 cases reported (7). A pronounced rise occurred at the national level in 2023, reaching 2,350 cases, nearly doubling compared to the previous year (7). In contrast, SMC showed no comparable increase, with 35 cases reported, indicating relative epidemiological stability at the county level.

Descriptive statistical analysis demonstrated consistently higher absolute values and variability at the national level compared to SMC. The mean annual number of cases was 1,666.6 in Croatia and 50.6 in SMC. Variability over time was considerably greater nationally (SD = 627.04) than in SMC (SD = 25.13), suggesting more pronounced fluctuations at the country level, as shown in Table 1 (7).

Distribution by Sex

In SMC, scabies affected both sexes throughout the study period, with no substantial overall sex-related differences (Figure 1). In 2019, cases were nearly evenly distributed between males (45 cases) and females (55 cases). During 2020 and 2021, a decline was observed in both sexes, with slightly higher numbers among males in 2020 and minimal differences in 2021.

In 2022, a modest increase occurred in both sexes (19 males and 18 females). In 2023, a higher number of cases was recorded among females (22) compared to males (13). Across the entire study period, differences between sexes remained small, with annual discrepancies ranging from 1 to 10 cases.

Age Distribution

Age-specific analysis revealed that scabies predominantly affected younger and older age groups. A summary of the comparative statistical indicators of scabies occurrence by age in SMC and Croatia is presented in Table 2. The lowest recorded age was 13 years in males and 16 years in females, while the highest recorded age was 45 years in males and 55 years in females. The median age for both sexes was 19 years, indicating that half of all cases occurred in individuals younger than 19 years. The mean age was 24.6 years for males and 26.0 years for females.

Across all five years, individuals older than 50 years consistently

represented the most affected age group. In 2019, this group accounted for 34 cases, followed by children aged 0-10 years (30 cases). While younger age groups showed a marked decline after 2020, cases among individuals older than 50 years increased again in 2022 and 2023, reaching 22 cases in the final year of observation (Figure 2).

Overall, the results demonstrate stable scabies occurrence in SMC compared to notable national fluctuations, with comparable distribution between sexes and a persistent burden among older adults and younger populations.

Discussion

This study analyzed the occurrence of scabies in SMC during the period from 2019 to 2023, with particular emphasis on age, sex distribution, and the impact of major disruptive events, namely the COVID-19 pandemic and the 2020 Banovina earthquake. The findings indicate that scabies incidence was highest among individuals older than 50 years and among children aged 0-10 years, while sex-related differences were relatively small and context-dependent.

The results demonstrate that the highest incidence of scabies occurred consistently in two vulnerable age groups: children aged 0-10 years and adults older than 50 years. This pattern is consistent with previously published studies, which identify children and older adults as high-risk populations for scabies due to biological, social, and environmental factors (8,9).

In children, increased incidence can be attributed to frequent close physical contact in kindergartens and schools, shared use of toys and facilities, and limited awareness or adherence to hygiene measures. In addition, the immaturity of the immune system in young children may contribute to increased susceptibility to infestation. Similar findings have been reported in epidemiological studies conducted in Iran, Bangladesh, and Fiji, where scabies outbreaks are frequently associated with childcare institutions and environments characterized by close and prolonged physical contact among children (10-12).

Among individuals older than 50 years, the elevated occurrence of scabies is likely multifactorial. Age-related immune decline, reduced mobility, and chronic comorbidities increase vulnerability to infestation. Furthermore, a substantial proportion of this population resides in long-term care facilities, where overcrowding, frequent close contact, staff shortages, and insufficient isolation capacity facilitate transmission. These findings are consistent with a study from the United Kingdom by Cassell *et al.*, who identified long-term care facilities as high-risk environments for scabies transmission, primarily due to overcrowding, frequent close contact, and limited isolation capacity among residents (13).

Regarding gender distribution, this study found only minor differences between males and females, with fluctuations observed over the years analyzed. Higher incidence among women was observed in 2019 and 2023, while men predominated during the crisis years (2020–2022). Overall, these findings suggest that gender alone is not a determining factor in the occurrence of scabies. The higher incidence among females in non-crisis years may be explained by gender-related social and occupational roles. Women more frequently act as caregivers within families and are disproportionately represented in professions involving close physical contact, such as nursing, caregiving, and social work, which increases exposure risk. Additionally, most long-term care institutions in SMC primarily accommodate female residents, further contributing to increased transmission within the female population. In contrast, the increased incidence among men during the pandemic and the post-earthquake period may be related to changes in behavior and society. During quarantine, men reportedly engaged more frequently in informal social gatherings in private settings, increasing exposure to close contact. Moreover, after the Banovina earthquake, men were more likely to engage in collective manual labor, reconstruction activities, and shared temporary housing, all of which may have facilitated scabies transmission. Delayed health care seeking among men, often described in the public health literature, may have further contributed to prolonged undiagnosed cases and continued transmission (14,15).

Recent evidence suggests a global increase in the incidence of scabies over the past two decades, with the highest prevalence observed in tropical and low- to middle-income regions, particularly in parts of Asia, Oceania, and Latin America. However, increasing trends have also been observed in several European countries, particularly among vulnerable populations such as refugees, migrants, and individuals living in overcrowded or socioeconomically disadvantaged conditions (16). Historical and epidemiological evidence indicates that scabies has been continuously present in Croatia throughout the 20th and 21st centuries, with variations in incidence largely influenced by socioeconomic conditions, population density, and institutional settings. In addition, ethnomedical literature from Eastern Croatia highlights the long-standing presence of scabies in rural communities, where it was commonly associated with poverty, stigma, and reliance on traditional treatment practices (17). A six-fold increase in the incidence of scabies was observed in Croatia between 2007 and 2017, with the highest burden among children and young adults. The increase was particularly pronounced in border counties involved in migration flows and in the capital city of Zagreb, highlighting significant regional disparities and a growing public health concern (18). A further increase in transmission has been observed during the COVID-19 pandemic, likely related to changes in close contact behavior. These findings highlight the need for increased surveillance, timely diagnosis, public health coordination, and improved access to health care to effectively control community transmission (16).

The impact of the COVID-19 pandemic and the Banovina earthquake on scabies occurrence was observed during the study

period, with a reduction in reported cases during the crisis years. While our data indicate changes in occurrence patterns during the crisis years, findings from other settings have shown an increased prevalence of scabies during the COVID19 pandemic. For example, a retrospective analysis from Turkey by Akaslan *et al*. demonstrated a statistically significant rise in scabies cases during the first six months of the pandemic compared to the corresponding period in 2019 (19). Similarly, another study from Turkey by Etiz and Altunsu reported that the prevalence of scabies increased throughout the COVID19 pandemic, with higher incidence rates observed across multiple age groups and a shift in sex distribution during the pandemic period (20).

The lower incidence may be attributed to the implementation of public health measures, including social distancing, lockdowns, restricted gatherings, school closures, and visitation bans in healthcare and long-term care facilities, which substantially limited close interpersonal contact essential for scabies transmission. In addition, increased awareness of personal hygiene, more frequent handwashing, and the widespread use of disinfectants may have indirectly contributed to reduced transmission.

However, it is important to consider that reduced access to health services during the pandemic and the post-earthquake period likely contributed to underdiagnosis and underreporting. Damage to health infrastructure, population displacement, and limited availability of routine medical examinations further impacted the accuracy of surveillance.

Interestingly, despite largescale population displacement after the earthquake, no scabies outbreaks were recorded in collective shelters such as the Petrinja military barracks. This may be attributed to organized accommodation, controlled hygiene conditions, and targeted public health interventions implemented during the emergency response. However, evidence from other natural disaster settings suggests that the risk of scabies and other parasitic infestations can increase in the aftermath of earthquakes when basic needs are not sufficiently met. Epidemiological reports from tent and container cities after the February 2023 Kahramanmaraş earthquakes in Turkey documented that scabies affected a notable proportion of people living in communal shelters, likely facilitated by disrupted infrastructure, limited access to clean water, and poor hygiene conditions, even though systematic preearthquake comparison data were not available in that study (21). Furthermore, screening conducted among earthquake survivors housed in student dormitories revealed elevated frequencies of scabies and other ectoparasitic conditions in the days immediately following seismic events, underscoring how overcrowding and unhygienic environments can contribute to parasitic transmission in disasteraffected populations (22).

Finally, it is important to acknowledge that scabies surveillance data may be subject to underreporting and incomplete registration in epidemiological databases, as case notification depends on reporting by healthcare providers and may vary in consistency across facilities and time periods. Furthermore, laboratory confirmation of scabies is not routinely performed in most clinical settings, and diagnosis is predominantly based on clinical and epidemiological criteria. This reliance on clinical diagnosis, together with potential variability in reporting practices, may impact the accuracy and completeness of recorded incidence data.

Conclusion

The present study highlights the epidemiology of scabies in SMC from 2019 to 2023, identifying children (0–10 years) and older adults (50+ years) as the most affected age groups. While overall incidence was similar between sexes, variations observed during crisis years underscore the influence of social behaviors, occupational roles, and emergency situations on disease transmission. The COVID19 pandemic and the Banovina earthquake significantly altered the context in which scabies spread, with public health measures, increased hygiene awareness, and organized emergency interventions likely mitigating large-scale outbreaks. Comparisons with international literature suggest that, in the absence of such interventions, crises often create conditions conducive to scabies transmission, highlighting the importance of proactive surveillance, hygiene management, and early treatment in vulnerable populations. These findings emphasize the need for targeted prevention strategies in institutional settings, particularly among children and older adults, to reduce scabies incidence during both normal and crisis periods.

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Tables and Figures

Table 1: Comparative statistical indicators of scabies occurrence in Sisak-Moslavina County and Croatia (7)

Statistical indicator	Republic of Croatia (number of cases)	Rate of change (%)	Sisak-Moslavina County (number of cases)	Rate of change (%)
Minimum (Min)	874	—	34	—
Maximum (Max)	2453	0	100	0
Mode (Mod)	874	- 41,5	34	-53,0
Median	1435.0	39,09	37.0	27,66
Mean (Arithmetic mean)	1666.6	39,7	50.6	8,82
Standard deviation	627.04	92,47	25.13	5,41

— not applicable

Table 2: Comparative statistical indicators of scabies occurrence by age and sex in Sisak-Moslavina County

Statistical indicator	Males (years)	Females (years)
Minimum (Min)	13	16
Maximum (Max)	45	55
Mode (Mod)	13	16
Median	19.0	19.0
Mean (Arithmetic mean)	24.6	26.0
Standard Deviation	11.29	14.63

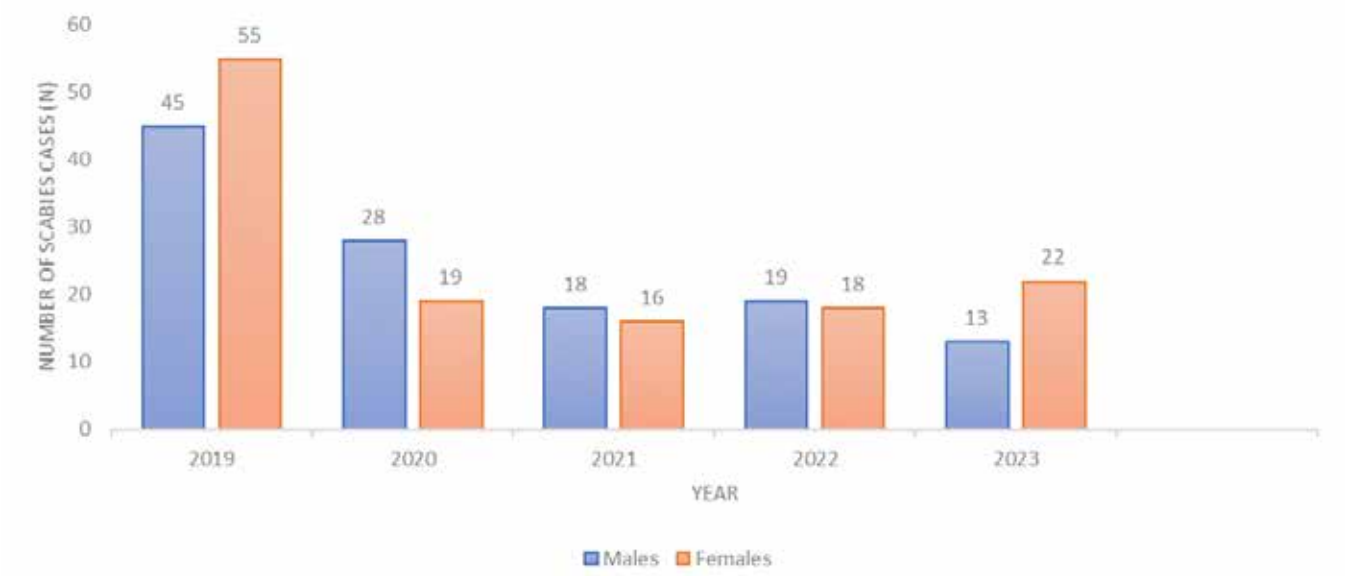

Figure 1: Annual scabies incidence in Sisak-Moslavina County by sex (2019–2023)

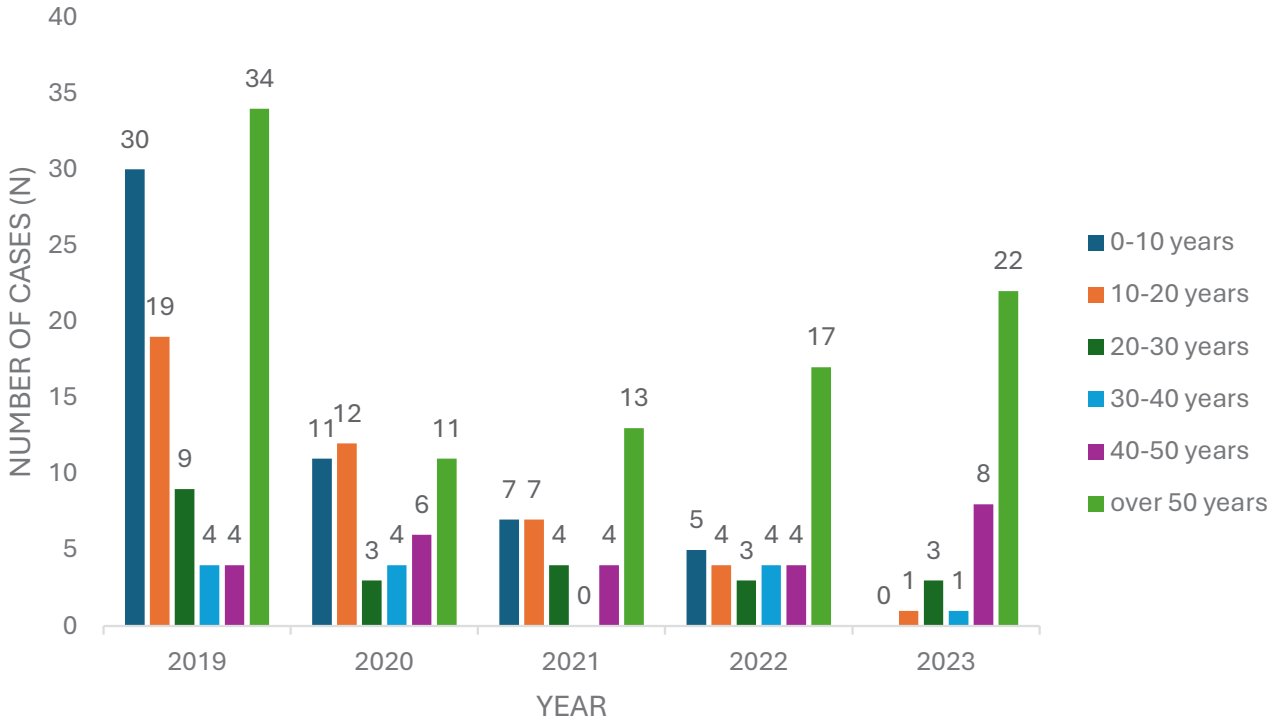

Figure 2: Annual scabies incidence in Sisak-Moslavina County by age (2019–2023)

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