DOI: https://doi.org/10.2298/SARH161020085R
UDC: 616.995.42-036.22(497.113)"2006/2015"

ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Frequency and distribution of scabies in Vojvodina, Serbia, 2006–2015

Mioljub Ristić[1,2], Mirjana Štrbac[1], Nataša Dragić[1,2], Zorica Šeguljev[1], Gorana Dragovac[1,2], Svetlana Ilić[1], Vladimir Petrović[1,2]

[1]Institute of Public Health of Vojvodina, Novi Sad, Serbia;
[2]University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

SUMMARY

Introduction/Objective Scabies is a major dermatological and a public health concern worldwide. The aim of this study was to evaluate the trend of scabies, the age-specific incidence and seasonality of scabies in Vojvodina Province, Serbia.

Methods We investigated the epidemiological characteristics of scabies in Vojvodina (northern region of Serbia). We carried out a descriptive study over a 10-year period (from 2006 to 2015) and covered 21,996 patients.

Results The average incidence rate of scabies was 113.9/100,000 inhabitants with the evident increasing trend among all age groups, and especially among patients 15–19 years old. The highest incidence rate (323.9/100,000 inhabitants) was registered among children younger than 14 years. Most cases of scabies were registered during the cold months of the year, with peak activity throughout December (14.4/100,000; 95% CI: 12.2–16.6).

Conclusion A high frequency and increasing trend of scabies in Vojvodina indicates that more attention should be paid to this problem.

Keywords: scabies; epidemiology; surveillance; infection control

INTRODUCTION

Due to high morbidity, scabies is a major dermatological and a public health concern worldwide [1, 2]. Scabies occurs globally each year, leading to about 300 million cases [3]. Although scabies is considered a ubiquitous parasitism, the highest incidence rates of scabies have been registered in tropical regions [4, 5]. Taking this into consideration, the World Health Organisation has recognized scabies as one of 17 most neglected tropical diseases since 2013 [6]. In developing countries, the highest prevalence of scabies is evident among children with an average prevalence of 5–10% [7].

Low socioeconomic standard and overcrowding have contributed to the spreading of infestations. Therefore, the epidemic is more likely to occur in different collectives and refugee camps [5].

Despite the fact that scabies can be a major public health concern, in most European countries it is underappreciated, as the burden of scabies by country is unknown [4].

In our country, registration of scabies was required from 1975 to 2015, but scabies has no longer been subject to mandatory reporting since 2016 [8, 9].

The burden of scabies is also reflected in potential disease complications by secondary bacterial infections, most commonly caused by *Streptococcus pyogenes* and *Staphylococcus aureus*, with the possibility of invasive skin infection occurrence, or even sepsis [1].

Due to the global sub-registration and neglecting of the disease, the International Alliance for the Control of Scabies (IACS) was formed in 2012. IACS is a scientific forum consisting of experts from five continents with the main goal of scabies control through establishing quality monitoring of the disease through an advisory role of specialists in different areas, especially in countries with high prevalence of the disease [1].

The main goal of this study was to evaluate the trend of scabies, the age-specific incidence and seasonality of scabies in the Autonomous Province of Vojvodina (Vojvodina).

METHODS

Study area and population

Vojvodina is located in the northern part of the Republic of Serbia (situated at the crossroads between Central and Southeast Europe), with a population of almost two million. Vojvodina is bordered by Croatia to the west, Romania to the east, Hungary to the north, and Bosnia and Herzegovina to the southwest. It has a multiethnic and multi-cultural identity, with some 26 ethnic groups and six official languages. Overall, the climate is moderate continental with a mean maximum temperature in July (the average monthly temperature is 21.4°C) and mean minimum temperature during January (the average monthly temperature is -1.3°C) [10].

Примљено • Received: October 20, 2016
Ревизија • Revised: November 30, 2016
Прихваћено • Accepted: December 6, 2016
Online first: March 21, 2017

Correspondence to:
Mioljub RISTIĆ
Institute of Public Health of Vojvodina
Futoška 121, 21000 Novi Sad
Serbia
mioljub.ristic@mf.uns.ac.rs

Collection of data

A retrospective, observational study was conducted. The data for this study were obtained from the Communicable Disease Registration of the Institute of Public Health of Vojvodina in a 10-year period (from 2006 to 2015) [11]. Since 2005, individual registration (medical record) of scabies cases has been replaced by the aggregate reporting [8]. In accordance with law, the aggregate notification of scabies contains the data on the number of all reported cases classified by age groups (0–4, 5–9, 10–14, 15–19, 20–59, and ≥ 60 years old) during a one-week period, but do not contain information on the gender of affected people.

This aggregate registration of scabies covered only the patients who completed their first medical examination due to scabies and who were diagnosed by doctors at the primary health care level (medical examinations carried out in general medical units, occupational medicine units, dispensaries for skin diseases, and public health dispensaries for children, schoolchildren, students and adolescents).

The diagnosis of scabies is usually based on the clinical signs and symptoms with a characteristic localization of the pruritic papules, or with known epidemiological link to the person who had a similar clinical feature among the close contacts.

Confirmation of diagnosis by microscopic parasite identification is only utilized among atypical clinical cases. The participation of microscopically confirmed cases in the total number of reported cases of scabies retroactively could not be determined.

We conducted a retrospective data collection using only registration forms of patients, and the approval of an ethics committee was not required.

Statistical analysis

Incidence rates were calculated using the annual number of registered cases as a numerator and the number of inhabitants in Vojvodina according to the two censuses for the Republic of Serbia (in years 2002 and 2011) as a denominator and multiplied by 100,000 inhabitants.

Numerical data are presented through the arithmetic mean, median, minimum, maximum value, and the standard deviation. The normality assumption was checked using the Kolmogorov–Smirnov test, along with the skewed statistics. Examining the differences between the age-specific incidence rates, appropriate parametric tests such as one-way ANOVA was used, the Bonferroni post hoc test. Line chart as well as linear regression was used for estimating how the age-specific incidence rate changes over the examined period. The results were expressed through an equation of regression: $y = at + b$, where "a" is the beta coefficient of regression, "t" is the time, and "b" is the intercept of regression. The winter period (cold months of the year) was coded as "1" (October–March), while the summer period (warm months of the year) as "2" (April–September). To determine if there is a significant difference in the incidence rate of scabies between summer and winter periods over a 10-year study period, the most appropriate statistical test was the Mann–Whitney U-test, while the date (incidence rate of scabies per month) was skewed (the p-value of the Kolmogorov–Smirnov test was 0.024). The results were considered statistically significant when the p-value of the all applied models was < 0.05 and corresponded 95% confidence interval (95% CI) did not include 1. The data were analyzed using IBM SPSS Statistics for Windows, version 21 (IBM Corp., Armonk, NY, USA), and MS Office Excel (Microsoft Corporation, Redmond, WA, USA).

RESULTS

Trend of scabies in Vojvodina

During the observed period, a total of 21,996 cases of scabies were reported. The annual incidence rates of scabies ranged from 86.8/100,000 (2006) to 154.8/100,000 inhabitants (2015). In the study period, an increasing trend of the incidence rate of scabies was reported (Figure 1).

Differences in incidence rate of scabies according to age group

Table 1 shows the incidence rate of scabies by age groups. The average values of the age-specific incidence rates in patients aged 0–4, 5–9, and 10–14 years old were the highest and approximately equal (331.4/100,000, 338.3/100,000, and 302.2/100,000, respectively). A slightly lower average of incidence rate was registered among the adolescents (230.8/100,000). The lowest value of age-specific inci-

Table 1. Descriptive statistics for the incidence rate of scabies according to age group throughout the analyzed 10-year period

Age group (years)	2002 census	2011 census	Mean incidence rate of scabies	SD	95% confidence interval for mean incidence rate of scabies		Minimum incidence rate	Maximum incidence rate	ANOVA	
					Lower bound	Upper bound			F	p
0–4	92,584	88,727	331.4	42.5	301	361.9	262.5	413.6	64.8	0.000
5–9	107,834	94,809	338.3	63.7	292.7	383.9	267.1	470.4		
10–14	121,796	93,934	302.2	60.7	258.8	345.7	228.3	415.2		
15–19	137,777	109,832	230.8	77.6	175.3	286.3	125.6	355.1		
20–59	1,127,742	1,087,781	68.8	16.5	57.1	80.6	52.1	107.9		
≥ 60	444,268	456,726	45.1	14.7	34.5	55.6	33.5	81.9		

Table 2. Differences of incidence rates of scabies according to the three age groups throughout the analyzed 10-year period

Age group (year)	Mean incidence rate	Minimum incidence rate	Maximum incidence rate	95% confidence interval for mean		ANOVA	
				Lower bound	Upper bound	F	p
0–14	323.9	228.2	470.4	302.7	345.1	157.8	0.000
15–19	230.8	125.5	355	175.3	286.2		
≥ 20	56.9	33.5	107.9	47.8	66.0		

dence rate was registered among patients in the oldest age group (45.1/100,000). One-way ANOVA analysis (multiple comparison – Bonferroni test) indicated that the only age-specific incidence rate of scabies, comparing to all other age-specific incidence rates, was in patients aged 15–19 years old ($p = 0.000$). The incidence rates among the first three observed age groups (0–4, 5–9 and 10–14) did not show a significant difference between them ($p > 0.05$), and for the rest of the research we considered all three groups as one (0–14 years). For the same reason ($p > 0.05$), the similar approach was applied for age groups 20–59 and above 60, coding them as one group.

The incidence rates of scabies obtained statistically were significantly different ($p = 0.000$) among three age groups (0–14, 15–19, and ≥ 20 years old). The highest incidence rate (323.9/100,000) was registered in children 0–14 years old, followed by the incidence rate (230.8/100,000) in adolescents 15–19 years old, and by the incidence rate (56.9/100,000) in patients ≥ 20 years old (Table 2).

Trend of scabies in Vojvodina according to age groups

The steepest slope of the trend line with the highest coefficient of determination was in patients 15–19 years old, according to the annual incidence rate for the 10-year study period (2006–2015), using the equation of linear regression (the independent variable was time – year). In the subgroup analysis of trend (0–14, 15–19, and ≥ 20 years), statistically significant differences at the level $p < 0.05$ were determined for each age group. Based on the coefficients of time in the figure of linear trend, the estimated regression equation in patients 0–14 years old was $y = 14.7t + 241.7$; $p = 0.003$. In patients 15–19 years old, the equation was $y = 23.6t + 100.9$; $p = 0.000$. Among patients older than 20 years the equation was $y = 3.9t + 40.3$; $p = 0.012$. These equations and line charts indicate that during the study period, the incidence rate of scabies, at the statistically significant level, grew in 0–14-, 15–19-old patients, and in patients aged 20 years and older (Figure 2).

Seasonality of scabies in Vojvodina

Incidence rates of scabies in the period from October to March (median = 10.8; mean rank = 82.6) were higher than incidence rates of scabies in the period from April to September (median = 6.0; mean rank = 38.4). These differences were found to be statistically significant (Mann–Whitney $U = 471.5$, $p < 0.01$). The lowest average incidence rate of scabies was registered in August (5.0/100,000; 95% CI: 3.7–6.3), but peak activity was registered throughout December (14.4/100,000; 95% CI: 12.2–16.6) (Figure 3).

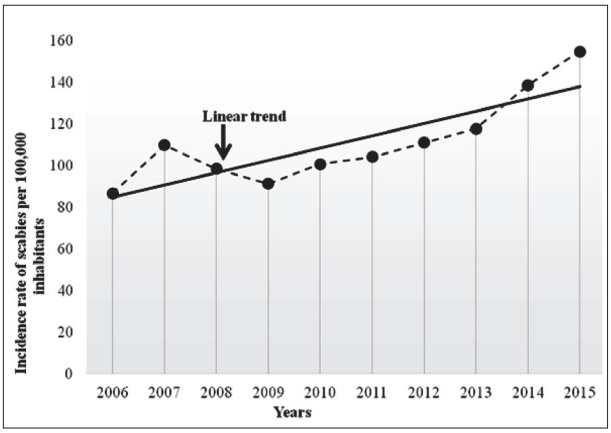

Figure 1. Incidence rate of scabies in Vojvodina, 2006–2015

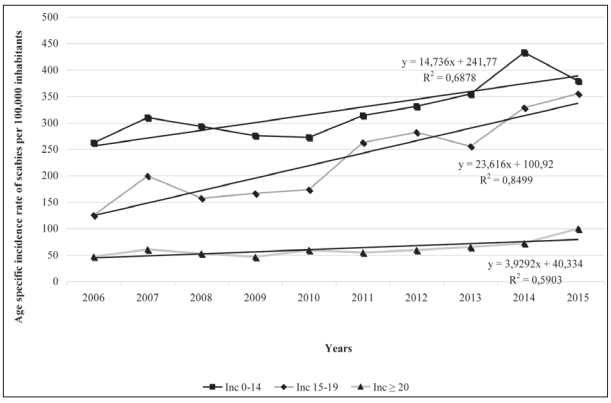

Figure 2. Age-specific incidence rate with the trend of scabies in Vojvodina, 2006–2015

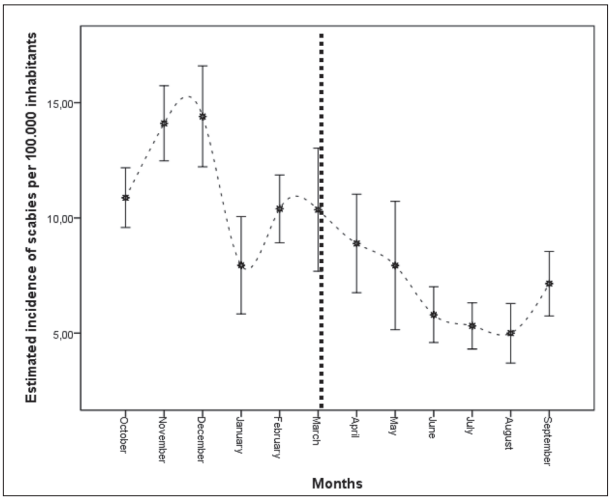

Figure 3. Seasonal distribution of scabies in Vojvodina according to 95% confidence interval for mean months' values, 2006–2015; the vertical dotted black line indicates the separation between the winter and summer period.

DISCUSSION

The prevalence studies of scabies across the world show that this disease is a major public health problem. Data from 18 published studies in the period from 1971 to 2001 show that prevalence of scabies ranged from 0.2–24% [7]. According to the recently published review of 48 publications, prevalence of scabies ranging from 0.2–71.4% [4]. The highest incidence rates of scabies have been found in the countries of tropical climate zones [4, 5, 12, 13]. Because the scabies is not included on the reportable diseases list in most countries, the real burden of scabies in European countries is unknown [3, 4, 7].

According to law, until 2015, scabies in the Republic of Serbia was included on the list of reportable diseases with obligatory monitoring [9]. During the study period, the average annual incidence rate of scabies in Vojvodina was 113.9/100,000 inhabitants.

In a study conducted in France between 2005 and 2009, Bitar et al. [14] reported that the estimated annual incidence rate of scabies was 328/100,000 inhabitants, and scabies has had an increasing trend. In 2011, the prevalence of scabies in homeless people, in those sleeping in shelters or in public places in Paris, was 0.4% and 6.5%, respectively [15].

Unlike under-reporting of scabies by passive surveillance (applied in Serbia and in most other countries), results of active (sentinel) surveillance of scabies, applied in England and Wales (with around 500,000 population) show that the average annual incidence rates of scabies during the 1994–2003 period ranged from 233/100,000 (2003) to 470/100,000 (2000) [16].

In contrast to these data, significantly lower incidence rates of scabies were registered in Belgium, although scabies was included on the list of reportable diseases since 1995. In 2005, the incidence rate of scabies was only about 3.8/100,000, which is an obvious result of under-reporting of the disease. In support to the fact of under-reporting is the additional conducted active surveillance of scabies, and this result shows that the rate of scabies was several times higher than the estimated rate of 28/100,000 inhabitants in the general population of Belgium, and a rate of 88/100,000 among the migrant population in this country [17]. However, due to implementation of the heterogeneous methodological approach in the surveillance of scabies, available data from different territories are not comparable [4, 5].

We found that the highest age-specific incidence rates of scabies were among children younger than 14 years, and the lowest rates for adults. The average age-specific incidence rates of scabies among adolescents (15–19 years old) and patients aged 20 years and older were in the ratio of 4:1, while the incidence rates in children aged up to 14 years compared to patients the same age group (≥ 20 years) were in the ratio of 5.7:1.

Data of a study carried out over a nine-year period for approximately 8.5% of the United Kingdom show that patients 10–19 years old had the highest infestation rates with slightly lower incidence among males than in females [18]. Similar to the results of the mentioned study, we found that the highest age-specific incidence rates were registered in childhood. In addition, the most evident increasing trend of scabies was among patients aged 15–19 years old. Similar results were obtained in other studies with a significant occurrence of the disease not only among younger, but even among the population aged older than 75 years [4].

In our territory, due to certain reporting procedures on scabies, all patients older than 60 years have been classified into one age group, and we could not show the trends and disease characteristics in the oldest population.

Scabies is usually spread by direct, skin-to-skin contact. In classic scabies, where 10–15 parasites are present on the skin, contaminated environment has no significant role in the transmission of these infestations, as opposed to crusted ("Norwegian") scabies, which is highly contagious and contains about two million parasites per patient [19, 20]. All of our cases were classified as classic scabies infections.

Overall, there is a trend of increasing scabies infestation. High values of age-specific incidence rates among children younger than 14 years can be regarded as a consequence of more efficient transmission through close contact in preschool and school communities. Also, the lack of maturity of children and deficit in education activity, especially in terms of scabies prevention, can be considered the main cause of this high frequency of the disease in this age group. We think that the reasons for the highest increasing trend of scabies among adolescents are perhaps in lifestyle. According to the data of one 15-year study, which was conducted at the Department of Sexually Transmitted Diseases, scabies infestation is related to lifestyle, more frequently detected in the MSM population, and among men who have sporadic sexual relations [21].

Our data showed that the average value of monthly rates of scabies was the highest during the cold months of the year (November and December, 14.1/100,000 and 14.4/100,000, respectively), similar to findings of other authors [21, 22].

Possible explanations for these seasonal variations could be related to closer contact in the population throughout cold months of the year, overcrowded rooms, and longer stay indoors, together with infrequent hygiene and change of clothes during winter months, and by the biological cycle of the mites, which prefer low temperatures for laying the highest number of eggs during the winter months. Our findings are in good agreement with those from previous studies [22, 23, 24].

As a basic preventive measure to control scabies transmission is the exclusion of patients from collectives until complete recovery [1, 5, 25]. Likewise, frequent visits to the doctor, the cost of applied therapy and the patients' contacts within the family and the collectives, as well as the social stigma, are a significant public health concern [1].

CONCLUSION

Although the results of our study come from the limited set of data, they indicate specific epidemiological characteristics of scabies that are recognized in other regions of the world,

especially among the younger population. Further studies are required to be conducted to assess the prevalence of scabies especially among the 15–19 years old age group considering that this group is the one with the most intensive increasing trend in the studied 10-year period.

Although the results of our passive surveillance clearly show that scabies are more common in younger people with an increasing trend of incidence, the future targeted research among the elderly may be focused on the estimation of potential scabies complications. Apart from primary health care doctors, this multicenter study should also include other doctors at secondary and tertiary health care level (cardiologists, rheumatologists, nephrologists).

REFERENCES

1. Engelman D, Kiang K, Chosidow O, McCarthy J, Fuller C, Lammie P, et al. Members Of The International Alliance For The Control Of Scabies. Toward the global control of human scabies: introducing the International Alliance for the Control of Scabies. PLoS Negl Trop Dis. 2013; 7:e2167.
2. Fuller LC. Epidemiology of scabies. Curr Opin Infect Dis. 2013; 26:123–6.
3. World Health Organization, 2001. Water-related diseases, Scabies. Accessed: July 23, 2015. Available at: http://www.who.int/water_sanitation_health/diseases/scabies/en
4. Romani L, Steer AC, Whitfeld MJ, Kaldor JM. Prevalence of scabies and impetigo worldwide: a systematic review. Lancet Infect Dis. 2015; 15(8):960–7.
5. Hay RJ, Steer AC, Engelman D, Walton S. Scabies in the developing world – its prevalence, complications, and management. Clin Microbiol Infect. 2012; 18(4):313–23.
6. Kline K, McCarthy JS, Pearson M, Loukas A, Hotez PJ. Neglected tropical diseases of Oceania: review of their prevalence, distribution, and opportunities for control. PLoS Negl Trop Dis. 2013; 7:e1755.
7. World Health Organization. Epidemiology and menagement of common skin diseases in children in developing countries. Geneva: WHO 2005. WHO/FCH/CAH/05.12.
8. Zakon o zaštiti stanovništva od zaraznih bolesti, Službeni glasnik RS, 125/04.
9. Zakon o zaštiti stanovništva od zaraznih bolesti, Službeni glasnik RS, 15/2016.
10. Republic Hydrometeorological Service of Serbia (RHMS). Accessed July 15, 2015. Available from: http://www.hidmet.gov.rs/eng/meteorologija/klimatologija.php
11. Institute of Public Health of Vojvodina. Communicable diseases in Vojvodina, 2006–2015. Annual report. Novi Sad: Institute of Public Health of Vojvodina; 2016. (Serbian)
12. Carapetis JR, Connors C, Yarmirr D, Krause V, Currie BJ. Success of a scabies control program in an Australian aboriginal community. Pediatr Infect Dis J. 1997; 16(5):494–9.
13. Currie BJ, Connors CM, Krause VL. Scabies programs in aboriginal communities. Med J Aust. 1994; 161(10):636–7.
14. Bitar D, Thiolet JM, Haeghebaert S, Castor C, Poujol I, Coignard B, at al. Increasing Incidence of Scabies in France, 1999-2010, and public health implications. Ann Dermatol Venereol. 2012; 139(6-7):428–34. (French)
15. Arnaud A, Chosidow O, Détrez MA, Bitar D, Huber F, Foulet F, at al. Prevalences of scabies and pediculosis corporis among homeless people in the Paris region: results from two randomized cross-sectional surveys (HYTPEAC study). Br J Dermatol. 2016; 174(1):104–12.
16. Pannell RS, Fleming DM, Cross KW. The incidence of molluscum contagiosum, scabies and lichen planus. Epidemiol Infect. 2005; 133(6):985–91.
17. Lapeere H, Naeyaert JM, De Weert J, De Maeseneer J, Brochez L. Incidence of scabies in Belgium. Epidemiol Infect. 2008; 136(3):395–8.
18. Lassa S, Campbell MJ, Bennett CE. Epidemiology of scabies prevalence in the U.K. from general practice records. Br J Dermatol. 2011; 164(6):1329–34.
19. Angel TA, Nigro J, Levy ML. Infestations in the pediatric patient. Pediatr Clin North Am. 2000; 47(4):921–35.
20. Chosidow O. Scabies and pediculosis. Lancet. 2000; 355(9206):819–26.
21. Otero L, Varela JA, Espinosa E, Sánchez C, Junquera ML, del Valle A, et al. Sarcoptes scabiei in a sexually transmitted infections unit: a 15-year study. Sex Transm Dis. 2004; 31(12):761–5.
22. Mimouni D, Ankol OE, Davidovitch N, Gdalevich M, Zangvil E, Grotto I. Seasonality trends of scabies in a young adult population: a 20-year follow-up. Br J Dermatol. 2003; 149(1):157–9.
23. Downs AM, Harvey I, Kennedy CT. The epidemiology of head lice and scabies in the UK. Epidemiol Infect. 1999; 122(3):471–7.
24. Sokolova TV, Radchenko MI, Lange AB. The seasonality of scabies morbidity and the fertility of the itch mite Sarcoptes scabiei de Geer as an index of the activity of a population of the causative agent. Vestn Dermatol Venerol. 1989; (11):12–5. (Russian)
25. Management of scabies in long-term care facilities, schools and other institutions. New Jersey Departmant of Health, 2014. Accessed August 17, 2016. Available at: http://www.state.nj.us/health/cd/documents/faq/scabies_guidance.pdf

Учесталост и дистрибуција шуге у Војводини, Србија, 2006–2015

Миољуб Ристић[1,2], Мирјана Штрбац[1], Наташа Драгић[1,2], Зорица Шегуљев[1], Горана Драговац[1,2], Светлана Илић[1], Владимир Петровић[1,2]

[1]Институт за јавно здравље Војводине, Нови Сад, Србија;
[2]Универзитет у Новом Саду, Медицински факултет, Нови Сад, Србија

САЖЕТАК

Увод/Циљ Шуга представља велики дерматолошки и јавноздравствени проблем широм света.

Циљ рада био је да се процене тренд, узрасно специфична и сезонска дистрибуција шуге у Војводини.

Методе Истраживане су епидемиолошке карактеристике шуге у Војводини дескриптивном студијом у десетогодишњем периоду (2006–2015) са 21.996 болесника.

Резултати Просечна вредност стопе инциденције шуге је 113,9 на 100.000 становника са евидентним растућим трендом инциденције у свим узрасним групама, а нарочито у узрасту 15–19 година. Највиша стопа инциденције (323,9 на 100.000 становника) регистрована је међу децом млађом од 14 година. Већина случајева шуге регистрована је током хладних месеци у години са врхунцем активности током децембра (14,4/100.000; 95% *CI*: 12,2–16,6).

Закључак Висока учесталост шуге са све израженијим трендом раста у Војводини указује на то да се више пажње мора посветити овом проблему.

Кључне речи: шуга; епидемиологија; надзор; контрола инфекције