

MEASLES OUTBREAK IN THE NIŠAVA AND TOPLICA DISTRICTS FROM 2017 TO 2018

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Measles was the leading cause of death among children under 5 years of age before the introduction of mandatory vaccination.

The objective of the paper was to describe the epidemiological and clinical characteristics of the affected individuals in the large measles outbreak in 2017-2018 in the Nišava and Toplica Districts.

Descriptive study was done. For the investigation of the outbreak, the general principles of the case definition of the European Union (EU) Commission Decision of 2012 were used. Laboratory investigations of initial patients were conducted at the Center for Control and Prevention of Diseases in the Institute of Public Health Niš, and all specimens were sent for anti-measles IgM/IgG antibody tests to the reference laboratory of the Institute of Virology, Vaccines and Sera "Torlak" in Belgrade.

A total of 1327 (584 males and 743 females) cases were reported from 23 November 2017 to 28 July 2018, when it ended. The average age was 35 years (range from < 1 to 70 years). The highest number of patients (510; 38.4%) were in the 30–39 year age group and the lowest number (34; 2.6%) was in the 15-19 year age group. Infants represented 5.3% of all affected and children from primary schools accounted for 4.4% out of all affected. One-fourth of the outbreak cases (338; 25.5%) were unvaccinated. Only 37 (2.8%) patients received two doses of the combined vaccine against measles, mumps, and rubella (MMR) and 50 (3.8%) received one dose. For the majority of affected cases (902; 68.0%) vaccination status was unknown. Measles-related complications were registered in 962 (72.5%) patients. Complications were the most common in infants (92.9%) and among children 1-6 years of age (88.2%). Malnutrition was the most frequent complication (823 cases; 62.0%) followed by diarrhea (590 cases; 44.5%) and pneumonia (122 cases; 9.2%); encephalitis was reported in 1 case. Measles-related deaths in the observed outbreak were confirmed in four patients (all laboratory-confirmed, three unvaccinated and an immune compromised child). The case-fatality rate of 0.3 per 100 measles cases was determined.

The probable causes of this large measles outbreak were insufficient vaccination and low vaccine coverage with MMR vaccine and accumulation of a high susceptible population. Four measles-related deaths were registered. Monitoring of the vaccination status, high vaccine coverage and effectiveness of MMR vaccine are essential for the prevention of measles outbreaks.

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Key words: measles, outbreak, vaccination coverage, complications, deaths

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Introduction

Measles is a highly contagious acute respiratory viral illness characterized by fever, malaise, rash, cough, coryza, and conjunctivitis (1). Measles is a vaccine-preventable disease (2) and before the introduction of measles vaccination, measles primarily affected children under the five years of age (3) and mortality due to measles-related complications was high up to 10% (3).

The most common measles-related complications are: diarrhea (in 8% of cases), otitis media (7-9%), pneumonia (1-6%), and encephalitis (1-2 per 1000 cases). Measles-related death occurs in 1-

3 per 1000 cases (4). Measles is still common and often fatal disease in developing countries (5), and incidence has decreased substantially in regions where vaccination has been instituted. Measles occurs predominantly in areas with low vaccination rates, particularly in the developing parts of the world (6).

In 2000, the United States of America (USA) has maintained measles elimination but as measles outbreaks continue to occur globally, the USA remains at risk of imported measles and potential spread (7). Also, imported cases still occur and the highest incidence is in infants, young children and in unvaccinated persons (8). Measles vaccines are live attenuated and are among the most highly effective vaccines available (providing 97% protection with two doses, given at 12 to 15 months and 4 to 6 years of age), with a proven safety record.

In 2000, measles vaccination has prevented an estimated 21 million deaths worldwide (9). Despite these substantial gains, global elimination goals have not been met, and previous studies are now being threatened by a 31% increase in the number of measles cases reported globally between 2016 and 2017.

The measles vaccine was introduced in Serbia in 1971 as a monovalent preparation (10) and the combined against measles, mumps, and rubella (MMR) vaccine has been widely used since 1994 by the National Immunization Program (NIP) in Serbia. The combined MMR vaccine has been given as the first dose from 12 to 15 months of age with additional booster shot before starting school at the age of seven. Since 2010, there have been problems in the distribution and therefore lack of MMR vaccine, which led to the accumulation of highly sensitive unvaccinated or incompletely vaccinated children (10).

For the period 2012-2015, the estimated national vaccine administrative coverage with the first MMR vaccine dose coverage was suboptimal in the Nišava District (ranging between 44.3% for the first dose and 80.4% for the second dose during the period 2007-2016) (11-13).

The objective of the paper was to describe the epidemiological and clinical characteristics of the affected individuals in the measles outbreak in the period from 2017 to 2018 in the Nišava and Toplica Districts.

Materials and methods

Descriptive study was done. Data covering the period from 23 November 2017 to 28 July 2018 were retrospectively analyzed.

Case-Definition

For the investigation of the outbreak, the general principles of the case definition of the European Union (EU) Commission Decision of 2012 were used (14). Laboratory investigations of initial patients were performed at the Center for Control and Prevention of Diseases in the Institute of Public

Health Niš. All blood samples collected from measles cases were sent for anti-measles IgM/IgG antibody tests in the reference laboratory of the Institute of Virology, Vaccines and Sera "Torlak" in Belgrade.

Data Analysis

During the measles outbreak, case-based reports provided data for the date of disease onset, gender, and date of birth, age, and date of vaccination against measles, vaccination status, laboratory confirmation, hospitalization, complications, and death. Incidence was calculated per 100,000 inhabitants with the number of measles cases as the numerator and the number of the population by Census 2011 as the denominator. The case fatality rate was calculated as the number of measles-related deaths per 100 cases. Data are presented as frequencies and percentages. Chi squared tests were used to compare characteristics between groups.

The p value was set at $p < 0.05$. Statistical analysis was performed in EPI INFO v7.2.2.6 (CDC, Atlanta, USA).

Laboratory data

The laboratory confirmation of the measles was carried out by detecting measles IgM antibodies in serum samples from the National Reference Laboratory "Torlak". The blood specimens were taken from all case-patients suspected to the measles.

The Ethics Committee of the Faculty of Medicine, University of Niš approved this investigation by Decision Number 12-3782/5 of 13 April 2018.

Results

A total of 1327 cases were reported from the beginning of the measles outbreak on 23 November in 2017 to 28 July 2018 when it ended. The total number of 1045 measles cases (78.7%) were laboratory confirmed, and 282 (21.3%) were epidemiologically connected (Table 1).

The first three measles cases were recorded on the 23 November, 2017. These were unvaccinated children from the city of Niš, who were in the same room at the Pediatric Clinic of the Clinical Center of Niš, and were infected by an imported case. Almost all patients lived in the Nišava and the Toplica Districts or the neighboring rural places and had many contacts with the urban population.

The monthly incidence increased from 15 cases registered in November to a peak of 297 cases in January. The highest number of cases (638) were in the municipalities of Niš (Figure 1).

Laboratory confirmed diagnosis of the disease was found in 78.7% of the patients, mostly in the 15-19 year old age group (85.3%), in older than 30 years old and in infants (80%). The epidemiological relationship was most present in children aged 1-6 years (29.7%) and in persons aged 20-29 years (Table 1).

The number of new cases ranged from 2 to 106 per week. The highest number of cases was

reported from 9th to 11th week of January 2018 (Graph 1). The average number of new measles cases was 40 per week. Majority of patients, 953 (71.7%) were older than 20 years. The median age of the cases was 35 years (Min < 1 year, Max 70 years). The highest number of patients, 510 (38.4%) were in the 30-39 year age group, 306 (23.1%) patients were in the 40-49 year age group, and 212 (16.0%) were children aged 1-6 years. The lowest number (34; 2.6%) were in the 15-19 year age group. Infants represented 5.3% of all affected and children from primary school accounted for 4.4% out of all affected.

In this measles outbreak, females were more affected than males. Of the total, 584 (44.0%) were males and 743 (56.0%) were females (Table 1). Majority of the affected males were from the age group of 15-19 and infants. Most affected females were from the 20-29 year age group. In the age group up to 20 years, males were more affected compared to females, but in age groups older than 20 years, females were more affected than males. We found that there was a statistically significant sex difference in relation to the age categories of the affected individuals ($p < 0.001$).

In relation to occupation, health workers, employees in health institutions, kindergartens, primary and secondary schools were significantly more affected. This can be explained by the fact that they were not vaccinated and that they were more exposed (Table 2).

One-fourth of the outbreak cases (338; 25.5%) were not vaccinated against measles and

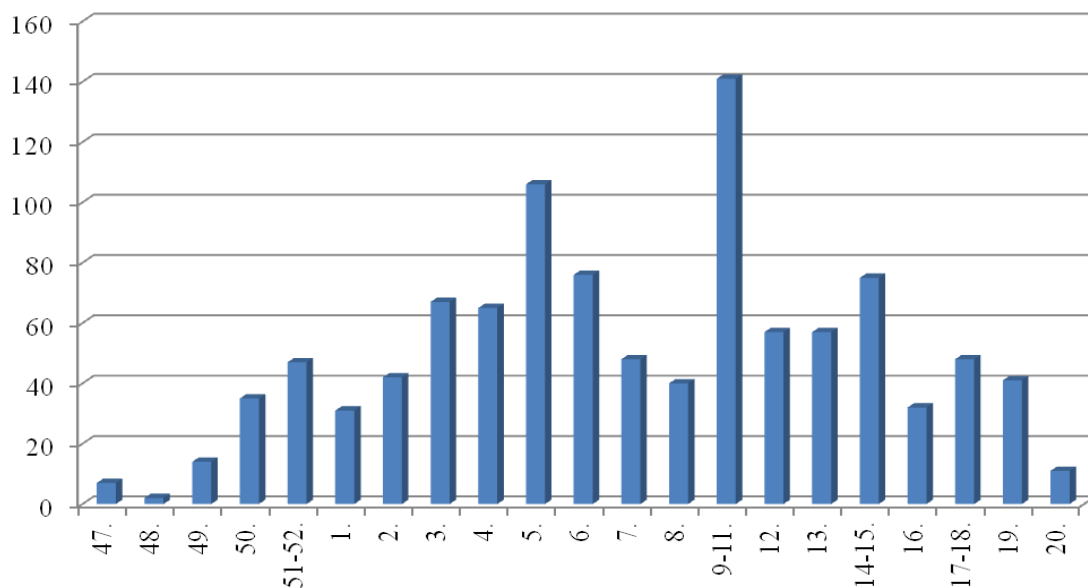
nearly one fifth of them were children under one year of age who were not eligible for vaccination (69 cases, 20.4%). Only 37 (2.8%) patients received a full course of vaccination, two doses of the MMR vaccine and 50 (3.8%) received one dose. For the majority of affected, 902 (68.0%) cases vaccination status was unknown.

The most unvaccinated children were infants (98.6%). The high percentage of unvaccinated children was recorded in the 1-6 year age group (89.6%), and in the 7-14 year age group (62.7%). These findings indicated that children had not been vaccinated or revaccinated. Non-vaccinated patients from all age groups were significantly more numerous than those who had one or two doses of vaccine (Table 1).

The highest number of vaccinated patients with two doses (approximately one-third) was in the 15-19 age group (32.4%) among all age groups. With age, the number of people with unknown vaccination status increased. We found that there was a statistically significant difference in the vaccinal status concerning age categories ($p < 0.001$).

Complications, hospitalization and mortality

Of the total number of measles cases, complications presented in 962 (72.5%) patients. Complications were the most common in youngest patients (92.9%) and among children 1-6 years old (88.2%). With age, the number of complications was statistically significantly decreased ($p < 0.001$) (Table 3).



Graph 1. Distribution of measles cases by the week

Table 1. Demographic, vaccination status and measles-related complications related to age category

Characteristics	Total (n = 1327)		< 1 (n = 70)		1-6 (n = 212)		7-14 (n = 59)		15-19 (n = 34)		20-29 (n = 136)		30+ (n = 816)		p value
Gender															
Male	584	44.0	40	57.1	108	50.9	30	50.8	20	58.8	60	44.1	326	40.0	0.002
Female	743	56.0	30	42.9	104	49.1	29	49.2	14	41.2	76	55.6	490	60.0	
Clinical symptoms															
Rash	1319	99.5	70	100.0	209	98.6	57	96.6	34	100.0	136	100.0	813	99.8	0.065
Temperature	1253	94.5	68	97.1	206	97.2	57	96.6	34	100.0	127	93.4	761	93.4	0.124
Cough	904	68.2	63	90.0	199	93.9	49	83.1	27	79.4	79	58.1	487	59.8	< 0.001
Coryza	573	43.2	53	75.7	174	82.1	42	71.2	16	47.1	52	38.2	236	29.0	< 0.001
Conjunctivitis	574	43.3	52	74.3	163	76.9	41	69.5	17	5.0	41	30.1	260	31.9	< 0.001
Vaccination status															
Unvaccinated	338	25.5	69	98.6	190	89.6	37	62.7	7	20.6	8	5.9	27	3.3	< 0.001
1 dose	50	3.8	0	0.0	10	4.7	1	1.7	1	2.9	4	2.9	34	4.2	
2 dose	37	2.8	0	0.0	0	0.0	5	8.5	11	32.4	14	10.3	7	0.9	
Unknown	902	68.0	1	1.4	12	5.7	16	27.1	15	44.1	110	80.9	748	91.7	
Complications	962	72.5	65	92.9	187	88.2	42	71.2	25	73.5	86	63.2	557	68.3	< 0.001
Diarrhea	590	44.5	44	62.9	127	59.9	31	52.5	13	38.2	52	38.2	323	39.6	< 0.001
Malnutrition	823	62.0	46	65.7	171	80.7	38	64.4	20	58.8	71	52.2	477	58.5	< 0.001
Pneumonia	122	9.2	21	30.0	29	13.7	8	13.6	2	5.9	11	8.1	51	6.2	< 0.001
Encephalitis	1	0.1													
Koplik spots	1	0.1													
Hospitalized	212	16.0	33	47.1	52	24.9	8	13.6	6	17.6	24	17.6	89	11.0	< 0.001
Laboratory findings															
Laboratory confirmed	1045	78.7	56	80.0	149	70.3	43	72.9	29	85.3	107	78.7	661	81.0	0.023
Epidemiologically linked	282	21.3	14	20.0	63	29.7	16	27.1	5	14.7	29	21.3	155	19.0	

Table 2. Demographic, clinical characteristics and vaccination status of the affected individuals in the outbreak

Characteristics	Vaccination status								p-value ¹
	0 dose (n = 38)		1 dose (n = 50)		2 dose (n = 37)		Unknown (n = 902)		
Gender									
Male	170	50.3	17	34.0	21	56.8	376	41.7	0.008
Female	168	49.7	33	66.0	16	43.5	526	58.3	
Clinical symptoms									
Rash	296	87.6	29	58.0	20	54.1	617	68.4	< 0.001
Temperature	199	58.9	17	34.0	9	24.3	365	40.5	< 0.001
Cough	260	76.9	27	54.0	14	37.8	522	57.9	< 0.001
Coryza	65	19.2	0	0.0	0	0.0	57	6.3	< 0.001
Conjunctivitis	1	0.3							
Hospitalized	105	31.3	2	4.0	0	0.0	105	11.7	< 0.001
Laboratory findings									
Laboratory confirmed	249	73.7	39	78.0	26	70.3	731	81.0	0.025
Epidemiologically linked	89	26.3	11	22.0	11	29.7	171	19.0	
Occupation									
Employees in health institutions	7	2.1	8	16.0	6	16.2	106	11.8	< 0.001
Health care personnel	7	2.1	8	16.0	6	16.2	88	9.8	< 0.001
Employees in kindergarten	33	9.8	1	2.0	0	0.0	9	1.0	< 0.001
Employees in Primary schools	28	8.3	1	2.0	5	13.5	24	2.7	< 0.001
Employees in Secondary schools	5	1.5	2	4.0	8	21.6	7	0.8	< 0.001

¹ Chi-squared test

Table 3. Measles-related complication

Characteristics	Complications				p-value ¹
	No (n = 338)	Yes (n = 50)	No (n = 338)	Yes (n = 50)	
Gender					
Male	168	46.0	416	43.2	0.395
Female	197	54.0	546	56.8	
Age					
< 1	5	1.4	65	6.8	< 0.001
1-6	25	6.8	187	19.4	
7-14	17	4.7	42	4.4	
15-19	9	2.5	25	2.6	
20-29	50	13.7	86	8.9	
30+	259	71.0	557	57.9	
Clinical symptoms					
Rash	361	98.9	958	99.7	0.182
Temperature	324	88	929	96.7	< 0.001
Cough	161	44.1	743	77.3	< 0.001
Coryza	85	23.3	488	50.8	< 0.001
Conjunctivitis	70	19.2	504	52.4	< 0.001
Hospitalized	32	8.9	180	18.8	< 0.001
Laboratory findings					
Laboratory confirmed	279	76.4	766	79.6	0.233
Epidemiologically linked	86	23.6	196	20.4	
Occupation					
Employees in health institutions	37	10.1	90	9.4	0.743
Health care personnel	28	7.7	81	8.4	0.740
Employees in kindergarten	5	1.4	38	4.0	0.028
Employees in Primary schools	14	3.8	44	4.6	0.662
Employees in Secondary schools	8	2.2	14	1.5	0.485
Employees at University	6	1.6	14	1.5	1.000

¹ Chi-squared test

Malnutrition was the most frequent complication (823 cases; 62.0%) followed by diarrhea (590 cases; 44.5%), and pneumonia (122 cases; 9.2%); encephalitis was reported in 1 case (> 0.1%). Diarrhea and pneumonia were most common in the youngest patients (62.9% and 30.0%, respectively). Malnutrition was the most common among children aged 1-6 (80.7%). It was found that all complications were statistically significantly different among age categories ($p < 0.001$ for all).

Among all clinical symptoms - cough, corneas and conjunctivitis (signs of catarrhal inflammation of the upper respiratory tract, which is the site of the virus entry) were significantly more frequent in patients of all age groups, while rash as a typical clinical sign of this rash fever and elevated temperatures were less present in affected patients.

Among minor complications, diarrhea and malnutrition were significantly present, and pneumonia was registered among severe complications. Diarrhea and malnutrition were significantly more often observed in infants as well as pneumonia compared to other age groups.

Measles-related complications were significantly more common in unvaccinated patients - both

less complicated (diarrhea and malnutrition) and pneumonia as a severe complication. The unvaccinated patients were significantly more frequently hospitalized.

The least complication was in patients who received two doses of vaccine (54.1%). The incidence of complications significantly varies with the vaccine status ($p < 0.001$). All complications were the lowest in people who were fully vaccinated. All individual complications were statistically significantly different in relation to sex ($p < 0.001$, for all). There was no fully vaccinated person who was hospitalized ($p < 0.001$) (Table 2).

Measles-related deaths in the observed period were confirmed in four patients (all laboratory-confirmed, three unvaccinated and an immune compromised children). The case-fatality rate of 0.3 per 100 measles cases was determined.

Control measures

In order to prevent further spread and to control the epidemic, persons with measles were asked to stay at home. The vaccination of unvaccinated children was implemented. Active contact finding of

all suspected and laboratory-confirmed cases of measles in the areas most affected by the outbreak, as well as contact-tracing in hospitals and the community were the priorities.

Discussion

The latest measles outbreak in the Nišava and Toplica Districts of November 2017 with the total of 1327 patients was one of the largest measles outbreaks in Serbia since the introduction of mandatory vaccination against measles in 1971.

In this outbreak, there were 1327 reported cases and four measles-related deaths. We found that there were more affected females than males, the majority of all affected were over 20 years of age and the median age of the patients was 35 years, ranging from < 1 to 70 years. The highest number of patients were in the 30-39 years age group, more than one third. Infants represented 5.3% of all affected and children from primary school represented 4.4% out of all affected.

In measles outbreak in Bulgaria from 2009 to 2011 (15), out of the total number of patients, 51% were males and the median age of the cases was seven years. On the contrary, in the measles outbreak in the Nišava and Toplica District, females represented 56% of all affected and the median age of the patients was 35 years. In the measles outbreak in Bulgaria, infants had the highest age-specific incidence of 5,457 per 100,000 inhabitants, followed by 2,008 in children aged one to four years (15).

In measles outbreak in Italy in 2017, 50.7% of all affected were females and the median age was 27 years and these results were similar to ours (16). In Italy, 88.3% of all cases were unvaccinated, 6.5% received only one dose and 1.6% were fully vaccinated and 3.6% received an unknown number of doses.

We found that 25.5% out of all affected in this measles outbreak were unvaccinated, only 2.8% patients received a full course of vaccination, two doses of the MMR vaccine and 50 (3.8%) received one dose. For the majority of affected, 902 (68.0%) cases, vaccination status was unknown.

In Portugal, the country with high uptake of MMR vaccine, measles outbreaks were registered in two regions from February to May 2017 after 12 years without endemic transmission (17). One hundred fifty-six measles cases were notified and the most confirmed cases occurred in adults, two cases were adolescents, seven cases were children under 10 years and 13 cases were unvaccinated healthcare workers. Among the unvaccinated cases, five were infants under 1 year and thus too young to be vaccinated, the remaining eight cases were adults and three were unvaccinated healthcare workers. Such situation was expected in highly vaccinated communities and might be explained by the fact that MMR was not 100% effective, with about 7.5% and 5.0% non-respondents to the first and second doses (17).

In the measles outbreak in the Nišava and Toplica Districts, the most unvaccinated patients were infants (98.6%) because they were too young

to be vaccinated and this finding also indicated that their mothers didn't have antibodies against measles virus or were not vaccinated. Antibodies against measles are transmitted transplacentally, and they are maintained for a long time in the bloodstream of a newborn child.

The high percentage of unvaccinated children was also recorded in the 1-6 year age group, which means that the first dose of MMR vaccine was not taken. Sixty-two point seven percent of unvaccinated children from the age group 7-14 could indicate that children had not been vaccinated or revaccinated or both. We found that there were more males fully vaccinated (56.8%). The vaccine status was statistically significantly different in relation to sex ($p = 0.008$).

In our study of the outbreak in 2017, there were much more laboratory confirmed cases 78.7% and 21.3% were epidemiologically connected.

Most of patients in this measles outbreak were above 30 years of age. The epidemiological shift of disease incidence to the older age groups may potentially increase the rates of serious disease and complications (16). Some studies have attributed this effect to the continuing low vaccination coverage (18-20).

A shift in movement of incidence of measles to older age groups was already observed in the seventies (21-23), so the fact that the largest number of patients in this outbreak was at the age of 20 years and older is not surprising.

The lowest number of patients, above 2% was in the 15 to 19 year age group, the highest number of patients who were vaccinated with two doses were from this age group. Also, most took their last dose less than 10 years ago, so they had a solid immune system as well.

The majority of the patients, more than 65% had unknown vaccination status, about 25% of all reported were unvaccinated, and those who were vaccinated with a single dose or two doses together accounted for about 7% of patients.

Similar data about vaccination status against measles have been reported from recent measles outbreaks (22-25) but the proportion of patients with unknown vaccination status was lower compared with our findings.

The number of notified measles outbreaks especially in Central and Western Europe has been increasing in the last five years, with a reported peak in 2011 (15, 22).

When measles outbreaks occur in a region in which measles has been eliminated, like in the USA (7), they occur in clusters of unvaccinated persons, including those in religious communities (8) such as the Amish, a Christian sect descended from the Swiss Anabaptists, who practice group solidarity and rejection of modern conveniences (19, 20).

In 2016, there was a large measles outbreak in Romania with more than 15,500 cases and a total of 59 deaths by the end of 2018 (21). Slovenia was measles free from 2000 to 2009 and then in 2010, several measles cases were reported in a hospital setting, in 2011 six measles cases were imported from Germany, Italy and Romania, and in November 2014, at the international dog show, measles

outbreak with 44 cases was registered (22). In both outbreaks, in 2011 and in 2014, the most affected were adults from 34 to 51 years of age (22).

In the outbreak of measles in the territory of Nišava and Toplica Districts in the period from March to August 2015, the number of cases was 250 compared to 1327 cases in the outbreak in 2017-2018 (24). Majority of cases in measles outbreak in 2015 were unvaccinated and patients with unknown vaccination status (24) which was similar to the vaccination status of the affected in the 2017-2018 outbreak.

Similarly to the patients in outbreaks in the USA, where in 23 outbreaks in 2014, there were 77% of unvaccinated, 15% of unknown status, 8% vaccinated and 8% were under the age at the time of vaccination (7, 8).

Further, in Serbia and especially in the Nišava and Toplica Districts, vaccination coverage of the predisposed population with MMR vaccine was less than 95% (10-13). According to the official reports, in the territory of Nišava District the lowest coverage was recorded with the first dose of MMR vaccine, only 34.5% in 2013. Then, the lowest coverage with the second dose was in 2014 and in 2015 the minimum coverage in the Republic was recorded both in the case of vaccination and revaccination (10-13).

It is estimated that at the time of the beginning of the 2017-2018 epidemic, in the territory of Nišava and Toplica Districts there were about 7,000 unvaccinated children. The reasons for this high number of the unvaccinated were numerous: MMR vaccine shortage of 2010; the influence of anti-vaccine lobby and propaganda that linked the MMR vaccination with autism morbidity; the lack of awareness of parents of the importance of immunization against measles in prevention of serious complications and death.

Mandatory vaccination against measles has been conducted in the territory of Nišava and Toplica Districts since 1971, and already in 1972 there was a significant decline in the incidence of measles. Despite the high coverage of vaccination, records show an increase in the incidence of measles and even their outbreaks. The success in coverage of vaccination carried out at the end of the seventies and eighties was 95%, and yet measles outbreaks occurred. Vaccinated patients accounted for about 30% of the total number of patients (24).

In all measles outbreaks in the territory of the Nišava and Toplica Districts since 1972, there was always 1/3 of completely vaccinated people who got sick. This was explained many years later. In the 70s and 80s, it was not obligatory to store vaccines in a cold chain regime as it is now. MMR vaccine contains live attenuated viruses which are very unstable in the higher temperature.

Approximately two thirds of reported measles cases in this outbreak had one or more complications. In the literature, measles-related complications approximately appear in one third of the affected and they are the most common among children younger than 5 years of age and immunocompromised individuals (6). Measles-related complications were the most common reason for hospitalization of the affected in the measles outbreak in 2017 and the most common complications were in infants, pre-school and school children up to 14 years of age.

In Serbia, as previously stated, the first dose of MMR vaccine is required for all children aged 12 to 15 months, and the other is required in the seventh year prior to enrollment in the first grade of primary school (10). Such vaccination schedule exists in most European countries, and already during the seventies and eighties of the XX century many countries carried out vaccination against measles in the period from 14 to 16 months of age because seroconversion was the highest (25). Study from the Netherlands showed that early MMR vaccine administration during an outbreak was safe to protect infants aged 6-14 months against measles (26).

Conclusion

This was the largest measles outbreak in Serbia and the probable causes of this large measles outbreak were insufficient vaccination and low vaccine coverage with MMR vaccine and accumulation of a high susceptible population. There were more than two thirds among affected older than 20 years of age and more females were affected than males. Four measles-related deaths were registered. Monitoring of the immunization status, high vaccine coverage and effectiveness of MMR vaccine are essential for the prevention of measles outbreaks.

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EPIDEMIJA MALIH BOGINJA U NIŠAVSKOM I TOPLIČKOM OKRUGU OD 2017. DO 2018. GODINE

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Male boginje su pre uvođenja obavezne vakcinacije bile glavni uzrok umiranja dece mlađe od 5 godina.

Cilj rada bio je da prikaže epidemiološke i kliničke karakteristike obolelih u epidemiji malih boginja, koja je počela 23. novembra 2017. godine i trajala sve do 28. jula 2018. godine, na teritoriji Nišavskog i Topličkog okruga.

Primenjena je deskriptivna metoda, kojom su retrospektivno analizirani podaci od novembra 2017. godine do jula 2018. godine. Primenjena je definicija slučaja, koju je dala Komisija Evropske unije (EU) 2012. godine. U Institutu za javno zdravlje Niš, uzimana je krv za određivanje antitela i svi uzorci su slati u referentnu ustanovu Zavod za vakcine i serume "Torlak" u Beogradu, gde su testirani na prisustvo IGM i IgG antitela. Statistička analiza izvršena je u programskom paketu EPI INFO v7.2.2.6.

Od 23. novembra 2017. godine do 28. jula 2018. godine, ukupno je obolelo 1327 osoba (584 muškarca i 743 žene), a prosečan uzrast obolelih bio je 35 godina. Najviše obolelih bilo je iz dobne grupe od 30 do 39 godina, 510 osoba (38,4%), a najmanje iz dobne grupe od 15 do 19 godina, 34 osobe (2,6%). Deca mlađa od jedne godine bila su zastupljena sa 5,3%, a deca iz osnovnih škola sa 4,4%, u odnosu na ukupan broj obolelih. Više od jedne četvrtine obolelih nije bilo vakcinisano, 338 osoba (25,5%); samo su 37 (2,8%) bolesnika primili dve doze kombinovane vakcine protiv malih boginja, zauški i rubele (MMR), a 50 osoba (3,8%) vakcinisano je samo jednom dozom. Za 902 (68,0%) bolesnika vakcinalni status nije bio poznat. Komplikacije su zabeležene kod 962 osobe (72,5%) i najčešće su bile kod dece mlađe od jedne godine (92,9%) i kod dece predškolskog uzrasta (88,2%). Najčešće komplikacije bile su: malnutricija (kod 823 osobe, 62,0%), dijareja (kod 590 osoba, 44,5%), pneumonija (kod 122 osobe, 9,2%), a encefalitis je zabeležen samo kod jednog deteta. Smrt zbog komplikacija potvrđena je kod 4 bolesnika; svi su imali laboratorijsku potvrdu oboljenja, troje nije bilo vakcinisano, a jedno dete bilo je imunokompromitovano. Letalitet je iznosio 0,3 na 100 obolelih.

Mogući uzrok ove velike epidemije bili su nedovoljna imunizacija i mali obuhvat MMR vakcinom osetljive populacije. Zabeležena su 4 smrta ishoda kod obolelih. Nadzor nad imunizacijom, visok vakcinalni obuhvat osetljive populacije, kao i efikasnost MMR vakcine, osnovni su preduslovi za prevenciju malih boginja.

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Ključne reči: male boginje, epidemija, vakcinalni status, vakcinalni obuhvat, komplikacije