

GENERAL, EPIDEMIOLOGICAL PARAMETERS AND IMMUNIZATION COVERAGE OF CHILDREN SUFFERING FROM MORBILLI IN CENTRAL KOSOVO AND METOHIJA

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Morbili is a viral, highly contagious droplet infection belonging to the group of rashcausing fever. The virus enters humans via the respiratory route. The disease starts with a rise in body temperature, "facies morbillosa" cough, catarrhal changes of the mucous membrane of the upper respiratory tract followed by maculopapular rash.

The aim of the paper was to analyze epidemiological parameters and the vaccination status of affected children in central Kosovo and Metohija enclaves.

The study enrolled 91 children (57.1% boys and 42.9% girls), in the period October 2017-March 2018 in the enclaves where Serbs, Roma, Albanians, Gorani, and Turks live. The diagnosis was established according to epidemiological and clinical parameters, blood count, and findings of specific IgM antibodies. The children were grouped according to gender, ethnicity, age, the origin of the infection, and vaccination status. Numerical properties and attributes are shown. The Student's t-test was used for comparing sets of presented numerical values. The Chi squared (χ^2) test and Fisher's exact test were used to illustrate and compare the difference in the frequency of attributive characteristics.

The mean age of children was 9.74 ± 4.23 years. The greatest number of patients was in December, 34.1%. The majority of children were of Roma ethnicity. The number of affected unvaccinated Roma children (49.4%) was three times higher in comparison to Serbian children (17.6%) and five times higher in comparison to children of Albanian ethnicity (9.9%), which is a statistically significant difference (χ^2 : $p < 0.05$). A great number of children (30.7%) got infected in healthcare facilities. The majority of children who received one dose of vaccine were among Serbian children (16.5%). The number of children with nosocomial infections (30.7%) was 6 times higher in comparison to children with unknown source of infection (5.5%) (χ^2 : $p < 0.05$).

In the enclaves of central Kosovo and Metohija, the majority of Roma children were affected because of non-vaccination, inadequate living conditions and migrations. The incidence of nosocomial infections indicates that the morbillivirus spreads rapidly. Morbilli can be eradicated by conducting healthcare education and complete immunization, primarily of Roma children.

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Key words: Morbilli, children, general and epidemiological parameters, vaccination

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Introduction

Morbili, or measles, is a viral, highly contagious disease belonging to the group of rashcausing fever. The virus enters humans via the respiratory route. The disease starts with a rise in the body temperature, as well as with catarrhal changes of the conjunctiva and mucous membrane of the upper respiratory tract. It is manifested by cough, runny nose and conjunctivitis, as well as by characteristic facial expression, "facies morbillosa" associated with characteristic maculopapular rash (1).

Morbili is a cosmopolitan disease caused by RNA morbillivirus from the family *Paramyxoviridae*.

Morbillivirus has a RNA genome with two glycoprotein envelopes: surface glycoprotein—the hemagglutinin (H) and the fusion protein (F).

A membrane glycoprotein CD-150 and an adhesion molecule Nectin-4 are key cellular receptors for virus binding, thus mediating the infection. CD-150 regulates the synthesis of CD-46 regulatory molecule and protein F (1).

The presence of viral antigen in the body initiates immunological reactions in the lymphatic tissue. The virus initially inhibits the induction of type I interferon and interferon-stimulated antiviral genes. The innate immune response, regulated by the nuclear factor kappa β (NF- $\kappa\beta$), characterizes the expression of CD-150, nectin-4 and CD-46 molecules on host cells. They are major cell receptors which bind the virus. Binding of the virus to the host cells is mediated through protein F, CD-150 molecules, nectin-4 and CD-46 molecules, leading to cellular infection and resulting in systemic infection. CD-150 is human signaling lymphocytic activation molecule (Ly). It is primarily distributed on mononuclear cells of the lymphoid tissue and in the circulation. During morbillivirus replication in the regional lymph nodes, the fusion proteins are released causing infected cells fuse with uninfected cells. From the lymph nodes the virus is carried by mononuclear cells into the lymphatic system, and then into the circulation. Nectin-4 is distributed on the epithelial submucosa and epidermal keratinocytes. In the acute phase of the disease pathological changes primarily involve the skin, tonsils, and the mucous membrane of the throat and respiratory airways, as well as gastrointestinal tract epithelium. CD-150 is also expressed on thymocytes, macrophages, activated T Ly (CD4 and CD8), as well as on B Ly of the lymph nodes (2-5).

The initial T-cell response includes CD8-T cells and T-helper 1 CD4-T cells important for control of infectious virus. Then, the virus is released from the surface of T Ly antigen carrier into extracellular fluid where viral antigen comes in contact with B Ly. During the acute phase of the infection there is a shift of T-helper 1 to T-helper 2 CD4-T cell response that stimulates the humoral immune response. It promotes B Ly maturation, production of antibodies and mitigation of the disease (6). In case of persistent viral replication, modulation of the immune response occurs. Suppression of immune responses may suppress macrophage activation and T-helper 1 CD4-T response to new viral infections. Thus, the disease progresses and the infection is spread throughout the body (7).

The diagnosis of measles is based on medical history, epidemiological data, clinical manifestation, characteristic blood count, and findings of specific IgM antibodies in serum (ELISA test). Isolation of the virus from blood, nasopharyngeal aspirates, or liquor may be performed as well (PCR method) (1).

In the late 2017 and early 2018, mainly in the region of central Kosovo and Metohija, the cases of measles reemerged. According to the number of affected individuals in the study, it can be said that measles still represents a serious social and health

problem in the regions where adequate and complete vaccination coverage has not been reached.

Aim of the paper

The aim of the paper was to analyze general and epidemiological parameters and the vaccination status of the patients suffering from morbilli in Serbian enclaves in central Kosovo and Metohija.

Methods

This retrospective study was performed on 91 children suffering from measles in Serbian enclaves of central Kosovo and Metohija. There are different ethnic groups in the enclaves, including Serbs, Albanians, the Roma population, Turks, the Ashkali, Gorani and others. The study was conducted from October 2017 to March 2018. The children were treated at the Pediatric Clinic of the Clinical Hospital Center Priština. The diagnosis of measles was established according to epidemiological and clinical characteristics, blood count, and findings of specific IgM antibodies in serum (ELISA test). In two thirds of affected children the disease was also confirmed by laboratory findings. Descriptive epidemiological and statistical methods of analysis were used for providing statistical data analysis. T-test was used for the presentation of numerical measurements. The Chi squared test was used to compare frequencies of numerical measurements. Accepted level of significance less than 5% risk level ($p < 0.05$) was the threshold for statistical significance.

The patients were divided according to age, gender, ethnicity, and the origin of the infection. They were also grouped depending on their vaccination status.

The study was conducted after Ethics Committee approval and written informed consent for each patient had been obtained.

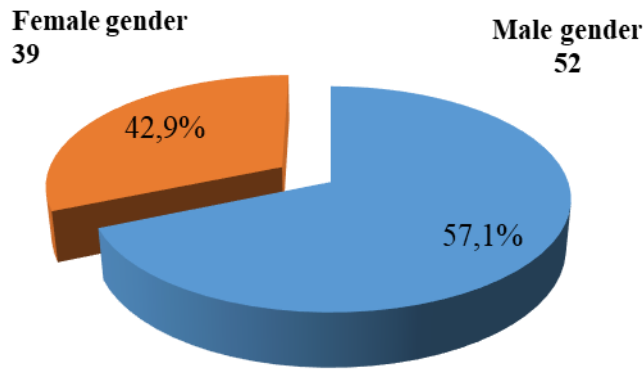
Results

The experimental group included 91 children diagnosed with measles. There were 52 (57.1%) male and 39 (42.9 %) female patients (Graph 1). They were between the ages of 8 months to 18 years. The mean age of the children was 9.74 ± 4.23 years. The male children were older than female children for 2.15 years. The study also included children predisposed to malnutrition and obesity. Records of affected children were performed in the period of six months (Graph 2).

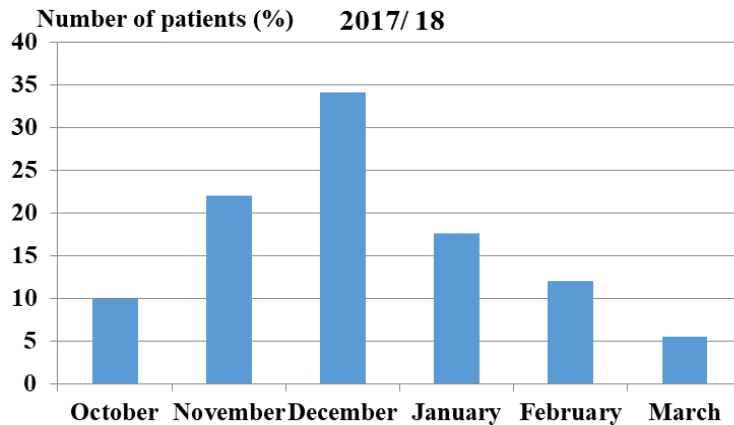
The first cases of the disease were registered in October 2017, 9 cases (9.9%). The greatest number of patients was in November, 20 patients (22%), and December 2017, 31 patients (34.1). A reduction in the incidence has been observed in 2018, 16 patients in January (17.6%), 11 patients in February (12.1%) and 5 patients in March (5.5%). There was a statistically significant difference in the number of patients in December compared to the number of patients in October, February and March (χ^2 : $p < 0.05$).

The number of affected children was analyzed in relation to gender, ethnicity and vaccination status (Table 1). The majority of infected children were among Roma population, 45 (49.4) followed by Serbian children, 35 (38.5%). Children of other ethnicities were significantly less infected, 11 children

(12.08%). There was a statistically significant difference between the number of Roma and Serbian affected children in comparison to children of other ethnicities (χ^2 : $p < 0.05$).



Graph 1. Number of patients by gender



Graph 2. Number of affected children distributed by months

Table 1. Distribution of affected children according to ethnicity

Ethnicity	Male gender	Female gender	Number of patients (%)		Vaccination status
Roma	24	21	45	49.4	0
	0	0	0	0	1
	0	0	0	0	2
Serbian	10	6	16	17.6	0
	7	4	11	12.1	1
	5	3	8	8.8	2
Others	4	5	9	9.9	0
	2	0	2	2.2	1
	0	0	0	0	2

Vaccination status 0 – unvaccinated, 1 – incompletely vaccinated, 2 - fully vaccinated

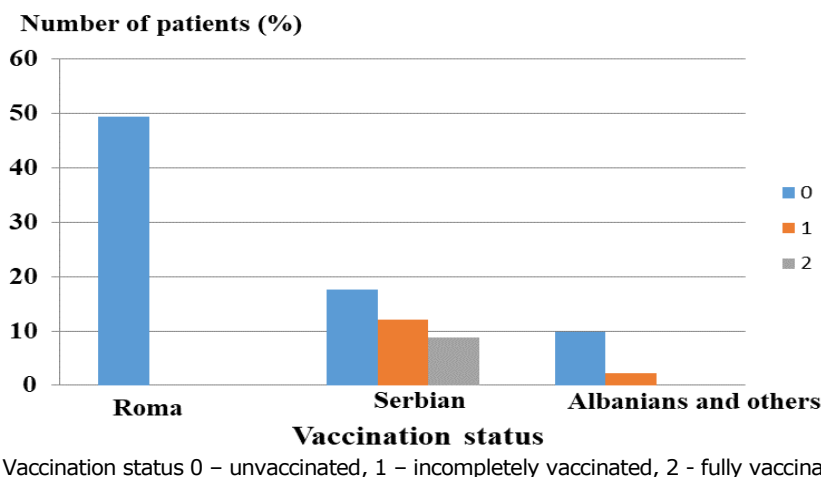
The number of affected children in relation to vaccination status has been analyzed. (Graph 3)

The majority of unvaccinated children and those with unknown vaccination status were in the Roma population, 49.4% of them. They are followed by children of Serbian ethnicity, 17.6%. There were 12.1% incompletely vaccinated children. There was a statistically significant difference in the number of unvaccinated children of Roma and Serbian ethnicity (χ^2 : $p < 0.05$)

Statistically significant difference was registered in the incidence of incompletely vaccinated children of Serbian population in comparison to children of other ethnicities (χ^2 : $p < 0.05$). There

were 8.8% fully vaccinated, but still affected Serbian children (χ^2 : $p < 0.05$). Statistically significant difference was noted between the incidence of fully vaccinated Serbian children and children of other ethnicities (χ^2 : $p < 0.05$). Statistically significant difference was registered in the incidence of affected children of Albanian ethnicity (11.1% of them) in comparison to children of Roma ethnicity (49.4% of them) and Serbian ethnicity (38.5% of them), (χ^2 : $p < 0.05$).

Affected children were divided into six age-related, gender-related, and vaccination status related groups (Table 2).



Graph 3. The number of affected children according to ethnicity and in relation to vaccination status

Table 2. Age-related and vaccination-related status of affected children

Age groups	Age	Male gender	Female gender	Number of patients (%)		Vaccination status
First	< 1	3	2	5	5.5	0
		0	0	0	0	1
		0	0	0	0	2
Second	< 2	6	2	8	8.8	0
		0	1	1	1.1	1
		0	0	0	0	2
Third	2- 4	2	1	3	3.3	0
		0	0	0	0	1
		0	0	0	0	2
Fourth	5- 9	10	7	17	18.8	0
		2	2	5	5.5	1
		2	2	4	4.4	2
Fifth	10- 14	16	8	24	26.4	0
		4	3	7	7.7	1
		1	0	4	4.4	2
Sixth	15- 18	7	4	11	12.1	0
		2	1	3	3.3	1
		1	0	1	1.1	2

Vaccination status 0 – unvaccinated, 1 – incompletely vaccinated, 2 - fully vaccinated

The majority of affected children, 76 of them (83.7%), was in the fourth, fifth and sixth groups (between 5 and 18 years of age). Statistically significant difference was recorded in the incidence of affected children in the fourth, fifth and sixth group in comparison to the number of patients in the first three groups (χ^2 : $p < 0.05$).

The greatest number of unvaccinated affected children was in the fourth and fifth group, (between 5 and 14 years of age), 52 children (57.3%). Statistically significant difference was noted in the inci-

dence of affected unvaccinated children in the fourth and fifth group in comparison to incidence in the first three groups. Statistically significant difference was also registered in the incidence of affected incompletely vaccinated children in the fourth, fifth and sixth group in comparison to the first three groups (χ^2 : $p < 0.05$).

The number of affected children according to source of infection and gender was analyzed in relation to vaccination status (Table 3).

Table 3. Distribution according to source of infection and in relation to vaccination status

Source of infection	Male gender	Female gender	Number of patients (%)		Vaccination status
Healthcare facility	15	7	22	24.2	0
	1	2	3	3.3	1
	2	1	3	3.3	2
Preschool institution	5	4	9	9.9	0
	1	1	2	2.2	1
	0	0	0	0	2
School institution	9	7	16	17.6	0
	1	1	2	2.2	1
	2	2	4	4.4	2
Household contacts	8	10	18	19.8	0
	1	1	2	2.2	1
	0	0	0	0	2
Catering facilities	0	0	0	0	0
	3	0	3	3.3	1
	0	2	2	2.2	2
Unknown origin	4	0	4	4.4	0
	0	1	1	1.1	1
	0	0	0	0	2

Vaccination status 0 – unvaccinated, 1 – incompletely vaccinated, 2 – fully vaccinated

The majority of children got infected within healthcare facilities, 28 of them (30.7%), followed by those affected at schools, 22 (24.2%), and by household epidemics, 20 (21.9%). Catering facilities and unknown sources accounted for the minority of affected children, 5 children respectively (5.5%). A statistically significant difference was observed between the number of patients affected within school institutions in comparison to pre-school institutions (χ^2 : $p < 0.05$).

There was a statistically significant difference between the incidence of affected children within healthcare facilities and due to household epidemics in comparison to affected ones within catering facilities and unknown sources (χ^2 : $p < 0.05$).

The greatest number of affected unvaccinated children was registered within healthcare facilities, 22 (24.2%) and family epidemics, 18 (19.8%). Statistically significant difference was found between the incidence of unvaccinated children within healthcare facilities and family epidemics in comparison to affected ones within catering facilities and unknown sources (χ^2 : $p < 0.05$).

Discussion

According to the World Health Organization (WHO) data, infectious diseases are still a leading cause of death worldwide. Morbillivirus is transmitted by aerosol droplets and is one of the most contagious pathogens of infectious diseases. Before the introduction of measles vaccine there were between 2 and 3 million deaths caused by measles (1). In the period between 1990 and 2010 vaccination reduced the number of deaths by measles from 0.63 to 0.13 million (9). Also, the WHO data suggest that in the period between 2000 and 2012 there was a 78% drop in measles deaths worldwide, and a 95% drop in 2015. However, according to the data of a study by Muscat M et al., there has been a growing tendency of measles cases in Europe and worldwide in the second decade of the 21st century. The World Health Organization set the Global Measles Strategic Plan 2012-2020 for achieving measles elimination (10, 11).

The epidemic of measles in Kosovo emerged in early October 2017 in Priština. The majority of affected individuals was identified within the Roma

population, followed by children of Albanian ethnicity. There were 98 registered cases of measles infection at that time. Most of affected persons were not vaccinated (12).

Our study showed the results of morbilli epidemics in the regions of Serbian enclaves in central Kosovo and Metohija in the period of six months, when 91 affected children were registered. The affected individuals were dominantly males. Similar to our results, Giefing-Kröll C. et al. also showed in their study the predominance of younger male patients. One of the reasons is poor immune response toward infectious diseases in males in comparison to females (13). The immune and endocrine systems show age-related interactions in patients with infectious diseases. Out of the total number of patients in Africa and Asia in the period 2013-2107, two-thirds were male patients (14). Contrary to these results, Garenne et al. showed in their study that in big regions of the world, such as Europe, North and South America, the morbidity of females was higher than morbidity in males (15).

The first cases of the disease in the regions of Serbian enclaves in October 2017 were registered in Kosovo Polje. In this Serbian enclave, there were over 70% cases of unvaccinated children, representing 'a large critical mass for an outbreak'. In November and December 2017, a two-fold and a four-fold increase in the number of affected children was observed. The greatest number of affected children was registered in December, 34.1%. In the last four years there has been a significant increase in measles incidence in Europe. Over 20.000 cases of measles, dominantly in children, were registered in Europe in 2017 (16). The Centers for Disease Control and Prevention reported in 2017 over 20 million of measles cases worldwide in 2017 (8). Our study revealed a significant decrease in the incidence of measles. In January 2018 there was a two-fold decrease in the number of affected children, and in February a three-fold reduction. A significant reduction in affected children was registered in March 2018. The main reason for decreasing measles incidence is intensive supplementary immunization of unvaccinated and incompletely vaccinated children. The vaccination included children up to the age of 14 as well (12).

The area of Serbian enclaves in central Kosovo and Metohija is a multiethnic community. The structure of the population in Serbian enclaves is different in comparison to other regions. There is a variety of ethnicities living in Serbian enclaves, such as Serbs, Roma, Albanians, Ashkali, Gorani, Turks and others populations. Ethnic structure of the enclaves is different from other regions in Serbia. The main reason of measles epidemics is a rise in unvaccinated children. Parental fear and skepticism of possible side effects of the MMR vaccination contributed to inadequate immunization. Concerns were related to the vaccine preservative thimerosal being involved in this multivalent live attenuated vaccine, weakening the immunological system and causing autism (17). Due to inadequate vaccination among the populations in Kosovo, it has always been an endemic region for measles outbursts. Epidemic waves up to 2000 were registered in epidemic cycles

every 3-4 years (18). Factors also leading to the emergence and development of the disease in some areas of Kosovo include: malnutrition, vitamin A and zinc deficiency, resulting in reduced function and modulation of T- and B-lymphocytes and immune response deficits (19). Similar to our results, Gignoux E et al. demonstrated that in DR of Congo vulnerable rural families, poverty and micronutrient deficiency during measles epidemics significantly affected the development of complications and fatal outcome (20). Prolonged modulation and suppression of cellular and humoral immune response enhance exposure to pathogens, viruses and bacteria. The contagious pathogen-related morbidity is increased, causing development and spreading of the infection through the population (21).

Constant migration and immigration of all populations from/in Kosovo is an additional cause for the disease spreading, regarding the fact that different morbillivirus genotypes are characteristic for specific geographic regions. Rima BK et al. Demonstrated in their study that the movements of different ethnic groups due to migrations, trade and wars throughout centuries have played a critical role in transmission of infectious diseases (22). Demographic characteristic of specific populations, such as genetics, culture, ecology and epidemiology may have an impact on the spread of the disease in different populations (23). As for environmental factors, air pollution has the potential to affect mutations, sustainability and virulence. Morbillivirus is highly resistant in an immunosuppressive organism, it survives several rounds of autophagy and may contribute to a new infection (24). According to epidemiological data it has been observed that the Roma population was a primary source of infection among affected children. The study results show that the majority of affected Roma children, 49.4% of them, were not vaccinated or they were with unknown vaccination status. One of the factors of a great number of affected, unvaccinated Roma children is economic instability-induced early-age migration to countries with economic stability (25). Factors including poverty, overpopulation, poor hygiene, and the absence of vaccination against infectious diseases contributed to rapid spread of the disease among them (26). European Roma Society pointed out a poor socioeconomic and nutritional status, as well as inadequate immunization among the Roma population. The lack of healthcare education of the Roma population is a reason for high rates of contagious and chronic diseases (27). Mobility of the Roma population groups contributed to transmission of the virus among other populations in Kosovo that were unvaccinated or incompletely vaccinated. According to the results of our study, the next most affected children were of Serbian population, 38.5%, and there was a significantly lower number of children from other ethnicities, 12.1% of them. "Dr Milan Jovanović Batut", Institute of Public Health in Serbia, according to the data of the Center for Disease Control and Prevention, Institute of Public health Kosovska Mitrovica, recorded first dose coverage of 84.6% and second-dose coverage of 14.3% in the region of Serbian enclaves in the central region of Kosovo and Metohija (28).

One of the factors that contributes to morbilli disease and its evolution is the age of subjects (29). The results of our study showed that in 83.7% of cases affected children were between 7 and 18 years of age. The youngest patient was 8 months old and the oldest one was 18 years old. During the first six months of life infants are protected by maternal passive measles immunity. Protective antibodies (immunoglobulin γ) are transplacentally transferred during the pregnancy or through breast milk if the mother had morbilli or if she is fully vaccinated (30). In 67.2% of cases affected children were between 8 and 18 years of age. They comprised a sensitive group for two reasons. The first one is that they were more socially active, and the other one is inadequate vaccination in the post-war period. Children aged 0-4 years were significantly less affected (five-fold). The lowest number of affected children was between 2 and 4 years of age, 3.3% of them. The greatest number of patients, 67.4% of them, was between 10 and 14 years of age. A study by Garenne M. et al. also confirmed that children of the same age were more affected in the Philippines and Thailand (15). Similar to our results, in certain regions of the USA, the majority of diseased children were between 5 and 14 years of age (31). Lee KY et al. showed in their study no difference in age distribution in Korea. Children under the age of 5, as well as those over 10 years of age were equally affected (29). Contrary to our results, it has been observed that children aged up to 2 and 4 years get affected more commonly in some regions of Europe, North and South America and Australia (15, 32). Within our region in different geographical environments, age distribution of the disease is different. In Foča, in the period between October 2014 and February 2015, age distribution of affected individuals was different than in our study. The majority of patients were between 18 and 22 years of age, the youngest patient was 13 years old (33). In Tuzla, in the period 2014-2015, 57.2% of affected children were up to 6 years of age due to absence of immunization. They are followed by 27.1% of children aged between 11 and 18 years and 15.6% children aged between 6 and 10 years. These children were inadequately vaccinated in the war and postwar period due to parental hesitation and the anti-vaccination movement (34). Waaijenborg showed that children who have lower concentrations of maternal antibodies are at greater risk of infection (35).

In the 1990s measles was exclusively a disease of early-school and pre-school children (18). Our study showed that the majority of children acquired the infection within healthcare facilities, 30.8%. This indicates that healthcare workers, even without clinical manifestations of the disease, may be a source of infection transmission (36). Then, there are children who got infected in school institutions, 24.2% of them, followed by children who acquired infection within household epidemics, 21.9%. It has been observed that the number of affected children within healthcare facilities and household epidemics is significantly higher (five- and four-fold) in comparison to infected children within catering facilities or by unknown sources.

The number of affected Roma children was three times higher in comparison to affected Serbian children. The number of affected Albanian children was five times and two times lower in comparison to affected Roma and Serbian children, respectively. Non-vaccination and inadequate living conditions (inadequate hygiene, overcrowding) are responsible for high rate of affected Roma children (half of the total number of affected children). The main reason of non-vaccination among them is insufficient health-care knowledge on the importance of immunization in the prevention of infectious diseases. The lowest incidence of affected Albanian children and children of other ethnicities (a 10-fold less than the total number of affected children) was because they were treated at the Priština Pediatric Hospital. The affected children were also grouped according to vaccination status. There were 74.7% unvaccinated children or two thirds of affected children, 14.3% were incompletely vaccinated, 8.8% were fully vaccinated, while 3.2% had unknown vaccination status (37, 38). Similar to our results, in the USA there were 85% cases of affected unvaccinated children, 7.8% vaccinated affected children, and 4.7% of affected children with unknown vaccination status (31). In China in 2014, the vaccination coverage rate was also only 84 % (39). In our study the greatest number of unvaccinated children of the Roma population was between 10 and 14 years of age, followed by unvaccinated children of Serbian population, aged between 10 and 18 years. The majority of incompletely vaccinated children belonged to Serbian population, aged between 10 and 18 years. The reason for one-dose vaccination of Serbian children is related to vaccination failure during the war and postwar period after 1999. Parental hesitancy and concerns about adverse effects of the vaccines were also related to outbreaks of measles in the enclaves (38).

Among children of the Roma population there were no incompletely or fully vaccinated children. Roma children pose a risk for the spread of the infection among children of other populations in Kosovo. Morbilli can be eradicated in the region of Kosovo by employing epidemiological and health-care surveillance of Roma children, as well as by their isolation, immunization and treatment (40). Among the children affected by measles there were 8.8% atypical cases, meaning they were fully vaccinated, but still affected. However, atypical cases of affected children presented milder clinical manifestation. Le Baron et al. showed in their study that a titer less than 120 mIU/mL weakens immune response. Such a low antibody titer in the circulation indicates potential sensitivity to infection (41). The affected unvaccinated and incompletely vaccinated children of other ethnicities comprised a total of 11.1%. Infiltration of sporadic cases of patients with measles from the neighbouring countries of the region also facilitated the outbreak in Kosovo.

The Center for Disease Control and Prevention in Europe has observed in the last 5 years that measles vaccination coverage rate was 90%. The WHO reported in 2016 that vaccination coverage in 8 European countries was in the range between 74% and 98% (42). In the countries of the region,

insufficient vaccination coverage results in sustainable transmission of the virus among the populations. Romania was affected with several thousand cases of infected children in the period 2016-2017 with 17 deaths (43). Such a vaccination status in the countries of the Region indicated the possibility of epidemics in our country. The results of Moss et al. demonstrated that morbillivirus is spread rapidly and easily and they suggested increasing the level of immunization globally for eradication of measles (44).

Conclusion

According to the study research it can be concluded that there are several factors responsible for measles outbreaks in Serbian enclaves in central Kosovo and Metohija. The main factor is a high

number of unvaccinated Roma children and incompletely vaccinated Serbian children. A lot of factors facilitated the eruption of the diseases among Roma children. They include inadequate healthcare education on the importance of immunization among the Roma population, inappropriate plan of vaccination in marginalized groups of the Roma population, poor living conditions, and their migration to socio-economically stable countries. A high incidence rate of nosocomial infections suggests that the morbillivirus spreads rapidly. It may be concluded that eradication of measles requires necessary realization of adequate prophylactic, epidemiological measures, and immunization. In this way measles outbreaks may be prevented in Kosovo, as well as regionally and globally.

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doi:10.5633/amm.2019.0405**OPŠTI I EPIDEMIOLOŠKI PARAMETRI I IMUNIZACIJA DECE OBOLELE OD MORBILA NA CENTRALNOM KOSOVU I METOHIJI**

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Morbili su virusna, veoma kontagiozna kapljična infekcija iz grupe osipnih groznica. Virus u organizam dospeva respiratornim putem. Bolest počinje povišenom telesnom temperaturom, plačnom maskom, kašljem, kataralnim promenama sluzokože gornjih delova respiratornih puteva i pojavom makulopapulozne ospe.

Cilj rada bilo je ispitivanje epidemioloških parametara i vakcinalnog statusa obolele dece u enklavama centralnog Kosova i Metohije.

Istraživanje je obuhvatalo 91 dete (57,1% dečaka i 42,9% devojčica), u periodu oktobar 2017. - mart 2018. godine, u enklavama u kojima žive Srbi, Romi, Albanci, Goranci i Turci. Dijagnoza je postavljena epidemiološkim i kliničkim parametrima, krvnom slikom i dokazom IgM antitela. Grupisanje je izvršeno po polu, etničkoj pripadnosti, starosti, poreklu infekcije i vakcinalnom statusu. Prikazana su numerička i atributivna obeležja. Za prikaz numeričkih obeležja rađen je Student t-test. Za prikaz i poređenje učestalosti atributivnih obeležja korišćeni su H_i^2 i Fišerov test.

Prosečna starost dece je 9,74 godine \pm 4,23 godine. Najviše obolelih bilo je u decembru (34,1%). Najviše je bilo romske dece. Broj obolele nevakcinisane romske dece (49,4%) bio je tri puta veći od broja srpske dece (17,6%), kao što je broj romske dece bio 5 puta veći od broja albanske dece (9,9%), što je statistički značajna razlika (χ^2 : $p < 0,05$). Veliki broj dece (30,7%) oboleo je u zdravstvenim ustanovama - najviše je srpske dece vakcinisane jednom dozom (16,5%). Broj dece oboleo u zdravstvenim ustanovama (30,7%) bio je 6 puta veći od broja dece obolele na nepoznat način - 5,5% (χ^2 : $p < 0,05$).

U enklavama centralnog Kosova i Metohije, najviše obolele romske dece bilo je zbog nevakcinacije, neadekvatnih uslova života i migracije. Najviše obolele dece u zdravstvenim ustanovama ukazuje na brzo širenje virusa morbila. Morbili se mogu eradikovati zdravstvenom edukacijom i potpunom imunizacijom, pre svega romske dece.

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Ključne reči: morbili, deca, opšti i epidemiološki parametri, vakcinacija