



## THE EPIDEMIOLOGICAL CHARACTERISTICS OF MEASLES IN VARNA REGION FOR 2005-2016

Elyana P. Ivanova<sup>1</sup>, Gabriela St. Tsankova<sup>2</sup>, Tatina T. Todorova<sup>2</sup>, Neli M. Ermenlieva<sup>2</sup>, Rumen P. Konstantinov<sup>1</sup>, Yanka V. Draganova<sup>3</sup>, Milena Petkova<sup>4</sup>

1) Department of hygiene and epidemiology, Faculty of public health, Medical University Varna, Bulgaria.

2) Department of Preclinical and Clinical Sciences, Faculty Pharmacy, Medical University, Varna, Bulgaria.

3) Regional Health Inspectorate, Varna, Bulgaria

4) TRS Medical laboratory assistant, Medical College, Medical University-Varna, Bulgaria.

### ABSTRACT

**Purpose:** Measles is a highly contagious disease, and despite the presence of an effective and safe vaccine, it is still a leading cause of child mortality. During 2009-2010, the most serious European outbreak of measles occurred in Bulgaria and killed 24 children.

The severity of the recent epidemic outbreak prompts us to investigate the epidemiology of measles in Varna Region from 2005 to 2016. We also tried to assess the prevention measures analyzing the vaccine coverage during the post-outbreak period.

**Materials and methods:** We performed a retrospective study (2005-2016) on the base of the epidemiological data for the measles incidence from the Regional Health Inspectorate - Varna.

**Results:** During 2010 the incidence of measles in Varna Region reached 289.47 cases per 100000 inhabitants. The disease showed a typical winter-spring seasonality and affected people of all ages but the highest incidence was reported among children < 1 year (4288.90 cases per 100000) and among the Roma ethnic group. The analysis of the number of performed immunizations during the period after the outbreak (2011-2015) showed a low immunization coverage (around and under 90%).

**Conclusions:** The epidemiological analysis of the recent measles outbreak and its dimension in Varna Region showed alarming results: failure to vaccinate the required number of individuals led to the accumulation of a significant number of unvaccinated people and therefore to possible re-emergence of measles in the near future.

**Keywords:** Measles, Children mortality, Incidence rate, MMR vaccine, vaccine coverage

### INTRODUCTION

Measles is a highly contagious disease, and despite the presence of an effective and safe vaccine, it is still a leading cause of child mortality. Before the introduction of

the mass immunization, 2.6 million children in the world were dying annually [1]. Due to the discovery of an alive attenuated vaccine in the 1960s [2] and the wide implementation of the two-dose MMR (Measles, Mumps, Rubella) vaccine, the recorded lethality dropped with 84% for the period 2000-2016 [3].

The disease re-emerges in some Regions of Europe, mainly because of the existing gaps in the immunization programs [4]. The biggest outbreaks happened in Bulgaria (2009-2010), France (2009-2011), Romania (2011-2012) and Ukraine (2012). The highest annual number of cases was reported in 2011 (37073 cases for the European WHO Region) [5].

The presence of a non-immune population, unvaccinated or partially vaccinated people, as well as of parents who refuse to vaccinate their children, decreases the overall vaccination coverage under 95%, which is the required one for the disease elimination. According to the European Center for Disease Prevention and Control, 3969 measles cases were reported for 2015 in the EU/EEA countries, and 84.8 % of them were among unvaccinated individuals [6].

The eradication of measles and rubella is of high priority for the European Vaccine Action Plan 2015-2020. The European Regional Verification Commission for Measles and Rubella Elimination concludes in 2015 that the endemic spread of measles and rubella is interrupted in 70% and 66% of the 53 countries in the Region, respectively [7].

In Bulgaria, before the vaccine introduction, the measles morbidity had reached epidemic levels of up to 469.8‰ (1960) and lethality of 7.4%. The mass immunization from 1969 resulted in a low disease prevalence and rapid interruption of the virus circulation after accidental importation of the infection.

Unfortunately, during 2009-2010, a serious outbreak occurred with an average incidence of 322.3‰ (24208 cases) and lethality of 0.32‰ (24 cases). Peoples of different ages were affected, but the highest mor-

bidity was registered among newborns and babies younger than 13 months (the age for the first vaccine dose). The reported complications in this age group often resulted in hospitalization and death [8, 9].

The severity of the recent epidemic outbreak prompts us to investigate the epidemiology of measles in Varna Region from 2005 to 2016. We also tried to assess the prevention measures analyzing the vaccine coverage during the post-outbreak period.

### MATERIALS AND METHODS

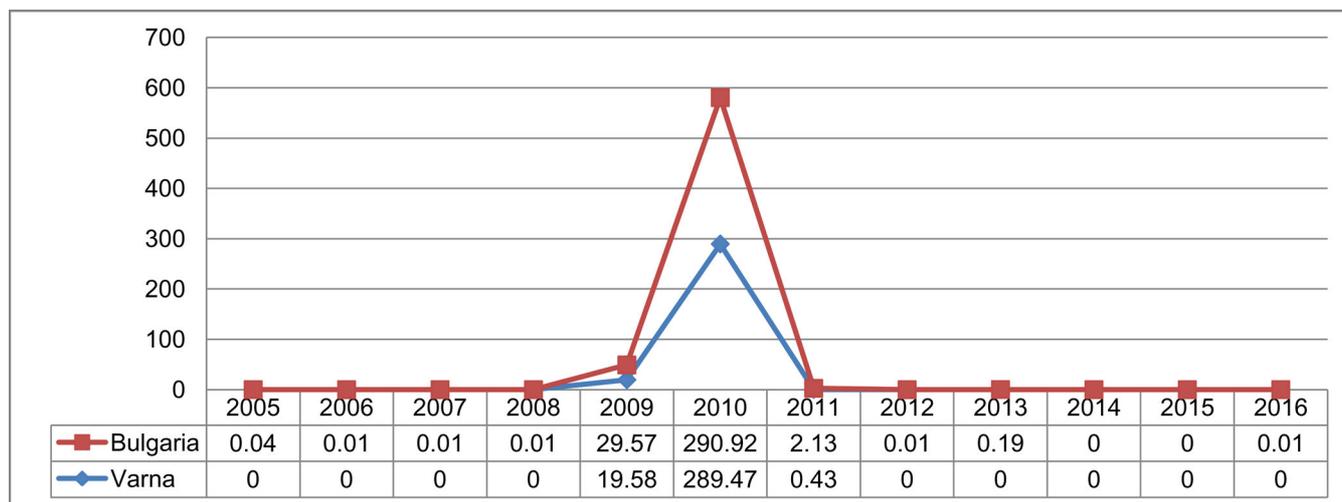
We performed a retrospective study (2005-2016) on the base of the epidemiological data from the Regional Health Inspectorate – Varna. Incidence rates at a national and Regional level were calculated using the annual number of reported new measles cases as the numerator and the official annual estimates for the total population number as the denominator. The resulted figures were multiplied by 100000 to present the incidence as an annual rate per 100000 inhabitants. Laboratory confirmation of the cases (via ELISA IgM detection or PCR) was done in

the virological laboratory of the Regional Health Inspectorate – Varna or in the National Reference Measles, Mumps, Rubella Laboratory of the National Center of Infectious and Parasitic Diseases.

### RESULTS

From 2005 to 2008, no cases of measles were reported in Varna Region. The first cases in the region appeared in June 2009 among the Roma communities. In Varna Region, 90 cases were registered until the end of 2009, and the calculated incidence (19.58‰) was lower than the average incidence in Bulgaria (29.57‰). During 2010 the incidence of measles in Varna Region increased fourteen times and reached 289.47‰ – similar to the average morbidity for the country (290.92‰) (Figure 1). During 2011-2016, no cases of measles were registered in Varna Region and only sporadic cases of not vaccinated Roma patients were reported in the country. The highest post-outbreak incidence was in 2013 – 0,19‰ (Figure 1).

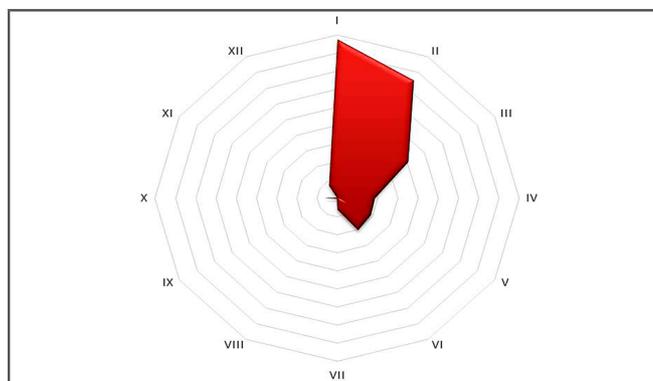
**Fig. 1.** Incidence (cases per 100000 inhabitants) of measles in Varna Region and in Bulgaria for 2005-2016.



Out of 1431 cases during 2009 and 2010 in Varna Region, 59,6% (n=854) were laboratory confirmed (IgM ELISA or PCR analysis). The other 40,4% (n=579) of the cases were classified as probable, as the diagnosis was on the base of the clinical symptoms and signs.

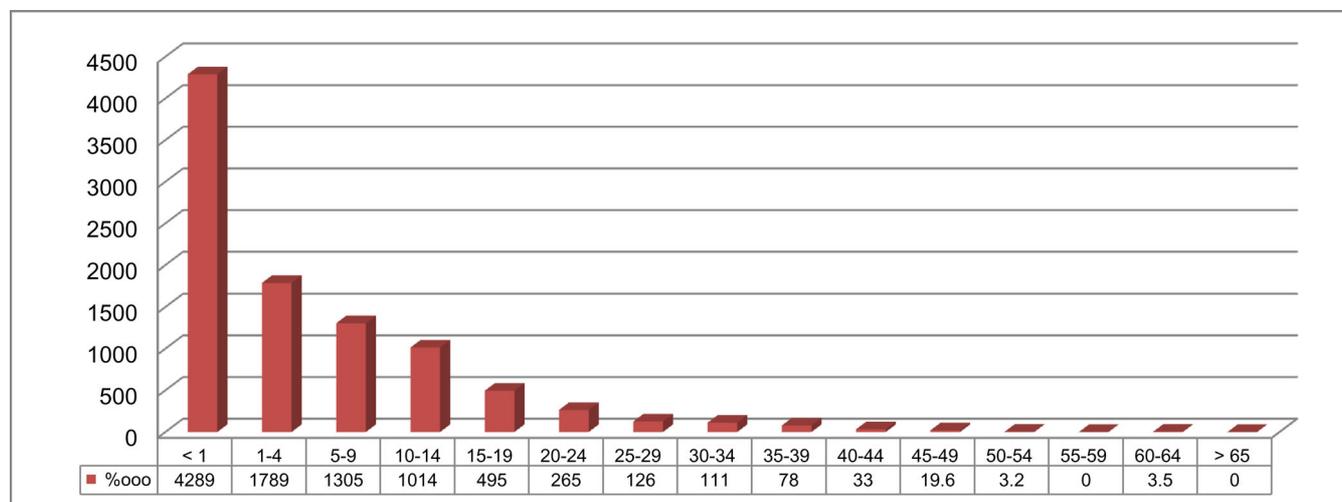
The disease showed a typical winter-spring seasonality with a pick in January-February (Figure 2).

**Fig. 2.** Seasonality of measles morbidity in Varna Region (2005-2016).



The disease spread through all age groups except 55-59 year-old and people over 65. The highest incidence was among the children < 1 year (4288,90 ‰), 1-4-year-old (1789,04 ‰) and 5-9-year-old (1305,27‰) (Figure 3).

**Fig. 3.** Incidence (cases per 100000) of measles among different age groups in Varna Region (2009-2010).



Most of the patients during the 2009-2010 outbreak were unvaccinated or with unknown immunization status (805 cases, 56,25%) or children of younger than the immunization age (229 cases, 16,01%). However, the disease affected 397 immunized individuals too.

The majority of the non-immune individuals was of Roma origin (71,2 %). For Bulgaria, their total proportion was 89,6%.

The analysis of the number of performed immuni-

zations during the period after the outbreak (2011-2015) showed a low immunization coverage with the MMR vaccine (around and under 90%), which was far from the minimal 95% needed for an effective disease control. During 2015, the vaccination coverage in Varna Region was 84.31% and 89.45% for the first and the second dose, respectively. During the same year, the national vaccination coverage was 91.5% and 86.6% for the first and the second dose, respectively (Table 1).

**Table 1.** Immunization coverage (in %) with the MMR vaccine in Varna Region and in Bulgaria (2011-2016).

Year	Varna Region		Bulgaria	
	MMR I (%)	MMR II (%)	MMR I (%)	MMR II (%)
2011	90,9	88,9	94,5	93,9
2012	86,7	89,3	93,7	94,0
2013	91,2	93,9	95,1	93,5
2014	84,9	85,6	93,2	88,6
2015	84,3	89,5	91,5	86,9
2016	85,3	89,2	92,1	88,3

## DISCUSSION

The Epidemiological Characteristics of Measles in Varna Region Thanks to the effective surveillance and control, no indigenous cases of measles were reported in Varna Region during 2002-2009. The one of the most intensive outbreak in Bulgaria (as well as in Europe) started in April 2009 after the importation of morbillivirus from Germany. A significant number of cases were also found in Varna Region reaching an annual incidence rate of approx. 290 cases per 100000 for 2010. This rate was similar to those reported at the national level and during the

outbreaks in other European countries in the next few years [4]. As expected, most of the affected patients were small children where the whole immunization course had not been realized because of the young age. However, the disease touched all age groups showing that there is still a need to enhance the efficacy of the vaccination. The majority of the cases at both regional and national level was among the Roma community, and the outbreak proved the presence of foci of non-immune people, especially in this ethnic group [10]. Possible reasons can be found in the absence of adequate health care among the

Roma community, their ignorance of immunization schedule, as well as in their frequent migration and residence change.

Another important result of our study is the suboptimal vaccination coverage in our country and in our region in particular. The obtained data showed the vulnerability of the Bulgarian population to any new imported case of measles and the high possibility of new deadly epidemic outbreak.

## CONCLUSIONS

The epidemiological analysis of the recent measles outbreak and its dimension in Varna Region showed alarming results: failure to vaccinate the required number of individuals led to the accumulation of a significant number of unvaccinated people and therefore to possible re-emergence of measles in the near future.

---

## REFERENCES:

1. Hasan H. WHO Measles initiative partners gear up to tackle challenges ahead. *Glob Immun News*. 2011; 4:1-16.
2. Griffin DE, Pan CH. Measles: old vaccines, new vaccines. *Curr Top Microbiol Immunol*. 2009;330:191–212. [PubMed]
3. World Health Organization. Measles. 19 February 2018. [Internet]
4. Carrillo-Santistevan P, Lopalco PL. Measles still spreads in Europe: who is responsible for the failure to vaccinate? *Clin Microbiol Infect*. 2012 Oct;18 Suppl 5:50-6. [PubMed] [Crossref]
5. World Health Organization. Guidelines for measles and rubella outbreak investigation and response in the WHO European Region. Copenhagen; 2013.
6. European Centre for Disease Prevention and Control. Measles and rubella monitoring, January 2016 – Reporting on January 2015–December 2015 surveillance data and epidemic intelligence data until 31 January 2016. Stockholm; 2016.
7. O'Connor P, Jankovic D, Muscat M, Ben-Mamou M, Reef S, Papania M, et al. Measles and rubella elimination in the WHO Region for Europe: progress and challenges. *Clin Microbiol Infect*. 2017 Aug;23(8):504-510. [PubMed] [Crossref]
8. Kahtan A, Tiholova M, Mangarov A, Naydenova N, Tcherve-Niakova T. Complicated course of measles in hospitalized children during the epidemic in 2009/2010. *Sci Infectology Parasitol*. 2012; 1:37–9. [in Bulgarian]
9. Komitova R, Stoycheva M, Mihneva Z. Neonatal measles. *Sci Infectology Parasitol*. 2010;1:14–6. [in Bulgarian]
10. Marinova L, Kojouharova M, Mihneva Z. An ongoing measles outbreak in Bulgaria, 2009. *Eurosurveillance*. 2009 Jul 2;14(26):19259.

*Please cite this article as:* Ivanova EP, Tsankova V, Todorova TT, Ermenlieva NM, Konstantinov RP, Draganova YV, Petkova M. The Epidemiological Characteristics of Measles in Varna Region for 2005-2016. *J of IMAB*. 2018 Oct-Dec;24(4):2232-2235. DOI: <https://doi.org/10.5272/jimab.2018244.2232>

Received: 13/06/2018; Published online: 15/11/2018



### Address for correspondence:

Eliyana Panayotova Ivanova,  
Department of hygiene and epidemiology, Faculty of public health, Medical University Varna,  
3. Bregalniza Str., 9002 Varna, Bulgaria.  
E-mail: [elyiva@gmail.com](mailto:elyiva@gmail.com)