

Protective Antibodies to Rubella Virus in Children Aged 1.5 to 3 Years and in Women of Childbearing Age

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Abstract

Background: Although immunization against rubella was introduced as routine practice in many European countries about 20 years ago, there are still epidemic outbreaks in some of them. This is a prerequisite for the continuous monitoring of population susceptibility to rubella. The aim of this study is to determine the proportion of people negative for the protective antibodies (IgG) to the rubella virus in terms of discretion of susceptibility to rubella and the risk of congenital rubella syndrome (CRS).

Methods: The study involved 180 subjects from two groups: children aged 1.5 - 3 years and women in childbearing age. Both groups, children and women, were divided into two subgroups: Bulgarian and Roma. The serological testing was performed with the kits Euroimmun (Medizinische Labordiagnostika AG) for quantitative determination of rubella antibodies (IgG).

Results: From the Roma children 17.65% (12 out of 68) was seronegative. From the Bulgarian children the seronegative were 4.76% (2 out of 42). Of all the involved children from both groups (110 in number) in 14 children (12.73%) the results were negative. Seronegative women from Roma origin were 8.33% (2 out of 24), and from the Bulgarian women - 13.04% (6 out of 46). The total number of women studied was 70, of them the seronegative were 8 (11.43%).

Conclusions: 1). We have found still relatively high proportion of seronegative persons among the Roma children and the Bulgarian women of childbearing age; 2). We consider it appropriate to introduce in medical practice periodic monitoring of susceptibility to rubella virus and at risk of epidemics to carry out timely immunization campaigns.

Keywords: Rubella; Protective antibodies; Women in childbearing age

Introduction

According to a decision of the European Commission from April 28, 2008 [1] rubella is defined as a sudden illness with maculopapular rash and at least one of the following clinical manifestations: 1). cervical adenopathy; 2). sub-occipital adenopathy; 3). post-auricular adenopathy; 4). arthralgia; 5). arthritis. According to WHO and CDC [2] rubella cases are classified as confirmed, probable and possible.

Since the licensing of the first rubella vaccine in the late 1960s, the goal of rubella immunization programs was preventing CRS as a complication of rubella infection during pregnancy [3-6]. In Bulgaria routine immunization against rubella was introduced in 1992 [7]. By 2001 all children were immunized with MMR at the age of 13 months. At the age of 12 years a second dose of mono-rubella vaccine was administered only to girls. Since 2001, two doses of MMR are being administered to all children at the age of 13 months and 12 years.

Some European countries (Belgium, Austria, Cyprus, Ireland) have introduced an antenatal screening test for rubella antibodies.

A seroepidemiological study of 17 countries in 2004 [8] classifies countries into three groups according to the percentage of seronegative people: 1 group - less than 5%; 2 group - 5 to 10%; 3 group - more than 10%. Bulgaria is from the third group with a total of 28.4 % seronegative children in the age group 2 - 14, and 11.3% for people aged 15 to 39 (11.8% for the women in this group).

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Table 1. Number of Cases and Incidence Rate Per 100,000 of Rubella in Some European Countries, 2006 - 2009

Country	2009		2008		2007		2006	
	cases	incid.	cases	incid.	cases	incid.	cases	incid.
Austria	308	3.69	5	0.06	14	0.17	0	0
Bulgaria	44	0.44	0	0	3	0.04	247	3.20
Italy	205	0.34	6,183	10.37	758	1.28	252	0.43
Poland	7,587	18.97	70	0.18	153	0.40	103	0.27
Romania	605	3.02	0	0	2,958	23.73	0	0
Spain	20	0.06	40	0.09	14	0.03	27	0.06
United Kingdom	10	0.02	36	0.06	34	0.06	36	0.06
Europe	8,827	2.51	6,354	1.86	3,968	1.17	690	0.21

According to data of ECDC [9] 17,821 cases of rubella have been reported from 1 January to 30 June 2012 from 26 European countries participating in the surveillance of rubella epidemic. Over the past 12 months (July 2011 - June 2012) 22,835 cases have been reported. About 99% of all cases are from Poland and Romania.

For the period after the introduction of immunization against rubella in Bulgaria a significantly increased incidence was registered in 2000 (28,449 cases, incidence 345.66/100,000) and the previous 1995 - 1997 (with morbidity 122.72 to 439.16/100,000) with a peak in 1996. A minor increase was registered in 2005 (25.46/100,000).

Increase in the incidence of rubella was recorded in 2008 in Italy, in 2009 - in Poland and in 2007 in Romania (Table 1). The data show that in some countries, incl. Bulgaria, a cyclical increase in the incidence of rubella is registered.

The aim of this study is to determine the proportion of people seronegative for the protective antibodies (IgG) to the

rubella virus in terms of discretion of susceptibility to rubella and the risk of congenital rubella syndrome (CRS).

Materials and Methods

The survey covered 180 people from Plovdiv region (Bulgaria). Surveyed persons were divided into two groups: children from 1.5 to 3 years and women of childbearing age (25 - 35 years). Covered children belong to the age group 1.5 - 3 years as in 2010 in Bulgaria an additional immunization with MMR took place (in relation to the outbreak of measles). Our aim was to examine children who were not covered by this campaign. Both children and women were divided into two subgroups: Bulgarians and Roma. This is reasoned by gaps in immunizations often found in Roma population and reported in our other studies [10, 11]. Serologic testing was performed with Euroimmun kits (Medizinische Labordiag-

Table 2. Protective Antibodies Against Rubella Virus Among Children

Effect	Group	N (% ± Sp)	u	P
Positive	Bulgarian children	40 (95.24±3.29)	2.27	< 0.05
	Roma children	56 (82.35±4.62)		
Negative	Bulgarian children	2 (4.76± -)	2.27	< 0.05
	Roma children	12 (17.65±4.62)		

Table 3. Protective Antibodies Against Rubella Virus Among Women

Effect	Group	N (% ± Sp)	u	P
Positive	Bulgarian women	40 (86.96 ± 4.97)	0.63	> 0.05
	Roma women	22 (91.67 ± 5.64)		
Negative	Bulgarian women	6 (13.04 ± 4.97)	0.63	> 0.05
	Roma women	2 (8.33 ± -)		

nostika AG) for the quantitative determination of rubella antibodies (IgG).

Results

A total of 68 children of Roma origin have been examined. Of these, 12 (17.65%) were seronegative. Among children of Bulgarian origin out of 42 only 2 were seronegative (4.76%). From both groups 110 children were covered, of which in 14 (12.73%), the result was negative (Table 2).

Surveyed women of childbearing age and Roma origin were 24. Of these, 2 (8.33%) were seronegative. The group of Bulgarian women consisted of 46 subjects - six of them (13.04%) were seronegative. The total number of women studied was 70, of which eight were seronegative - 11.43% (Table 3).

Discussion

This study was conducted because we had unpleasant experience of outbreaks of other vaccine-preventable diseases in Bulgaria a few years ago. An example is the outbreak of measles in 2009 - 2010 [12, 13], which covered more than 24,000 cases. This outbreak occurred against the background of reported measles immunization coverage for the last 4 - 5 years of 95-97% (according to the National Institute for Infectious and Parasitic Diseases). During the epidemic only in Plovdiv region more than 2,700 people were infected. Several years earlier (2007/2008) an epidemic of mumps was registered in Bulgaria. Similar examples can be mentioned for other countries [14, 15]. There are probably some (subjective and objective) reasons due to which the reported and the officially recorded immunization coverage do not meet the real figures. The performance of sero-surveys to establish the susceptibility to an infectious disease can be an indicator of actual immunization coverage of the population in a country or region (when it comes to routine vaccine still in infancy). Furthermore, age and demographic distribution of the covered in the study can specifically target attention to the groups with gaps in immunization. Detected gaps in

these groups can be covered by additional immunization campaign carried out before the beginning of an outbreak. Recommendations for carrying out such sero-surveys are given both by WHO and ECDC. In many cases though, they are not sufficient in scope and remain largely the subject of research and activities of the national reference laboratories. For successful elimination and subsequent eradication of rubella constant maintenance of immunity is needed in a very high percentage of the population. Otherwise there is a risk of resurgence of rubella and CRS [16, 17].

Conclusions

1). We have found still relatively high proportion of seronegative persons in the Roma children and Bulgarian women of childbearing age; 2). We consider it appropriate to introduce largely in medical practice periodic monitoring of susceptibility to rubella virus and at risk of epidemics to carry out timely immunization campaigns.

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