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The correlation between measles vaccination rate of children in Poland and incidence rate of this disease from 1998 to 2017 and in Italy from 2012 to 2017

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Abstract

Introduction. Measles is a highly contagious disease capable of inducing epidemics, which strike every 2 to 3 years. Before implementing the vaccine in 1963 measles was devastating communities leading to 135 million of victims and 6 million died because of the disease around the world. Nowadays in Europe we observe a disturbing rise of the measles incidence rate and even deaths from the disease. The epidemiologic analysis will allow to draw attention to how important and prevailing this problem is in the polish health care system.

The aim of the study is to analyse the current epidemiologic situation concerning the relationship between the vaccination and incidence rate of measles in Poland from 1999-2017 and Italy from 2012-2017.

Materials and methods. The data used for the epidemiologic analysis was taken from “Choroby zakaźne i zatrucia w Polsce” and “Szczepienia ochronne w Polsce” reports conducted by the National Hygiene Institute. Moreover data from the World Health Organization reports.

Results. The dropping immunization rate among children correlating with a more frequent measles outbreaks in the last years is disturbing. Immunization rate for the basic dose and booster dose for Poland is about 94% and for Italy about 92% (2017 data). Incidence rate totals respectively 8,4 per 100 thousand for Italy and 0,16 per 100 thousand for Poland.

Conclusions. We need to draw parents attention to the fact that measles is still a huge and real threat. We also need to educate them that the most effective way to protect their children from getting sick is the vaccine. Moreover, awareness in society regarding the herd immunity must be increased because the contagious diseases like measles are the most dangerous to people who cannot be vaccinated.

Keywords: measles, epidemic, vaccines, herd immunity

Introduction

The infectivity of measles is very high – it exceeds 95 % [1,2], what is the reason of rapid spread of the epidemic and causes approximately 20 million of cases globally every year [3]. Furthermore, the epidemic is favoured by fact that people become infectious to others two days before the first symptom occur and the virus is present in the secretions and blood of infected people. The majority of cases affect children under the age of fifteen. Infants up to the age of six months do not suffer if their mothers have suffered or have received vaccination against measles. Around 95% infants of mothers who have suffered from measles lose passive immunity at the age of 11-12 months and mothers' children who have been vaccinated – at the age of about 8 months [4]. Although measles is called one of the childhood illnesses, adults are about 40% of infected during epidemics in Europe. The level of mortality is from less than 0,01% (in developed countries) to over 5% (in developing countries; can be high as 20-30% among infants) [5]. The survival of measles gives permanent immunity.

The vaccination against measles was introduced in Poland in 1975. The level of morbidity and amount of death cases has decreased significantly since this time. Since 2004, the measles vaccine is used in form of three-part MMR vaccine (measles, mumps and rubella) and is given in two doses. The first dose is usually given at 13-14 months and the second one

at the age of ten. It is also recommended to vaccinate people who were not vaccinated in their childhood, their status of immunization is not clear, who are in constant contact with children, are health care workers, travel to countries where epidemic outbreaks were noted or level of herd immunity is low [6]. In Italy, due to low level of population immunity, mandatory vaccinations against ten infectious diseases, including measles, have been introduced in 2007. Measles vaccination is compulsory to children born in 2001 and includes the first dose of vaccine given at the age of two and the second one given after six years [7]. World Health Organization defines herd immunization level as safe when 95% of population of every country is vaccinated by two doses of MMR vaccine [8]. In Poland, the vaccination level of prime and booster dose of measles vaccine is about 94% and 93%, respectively (NIZP-PZH data for 2017) [6]. Currently, epidemic of measles have been recorded in several European countries, including Germany, France, Austria, the Czech Republic, Slovakia and Sweden, with an increase of number of patients. The biggest danger is, however, the epidemic in Romania where 5 290 new cases were recorded, including 25 deaths from measles in the period from January to May 2017 [9].

The aim of the study is to analyse the current epidemiologic situation concerning the relationship between the vaccination and incidence rate of measles in Poland from 1999-2017 and Italy from 2012-2017.

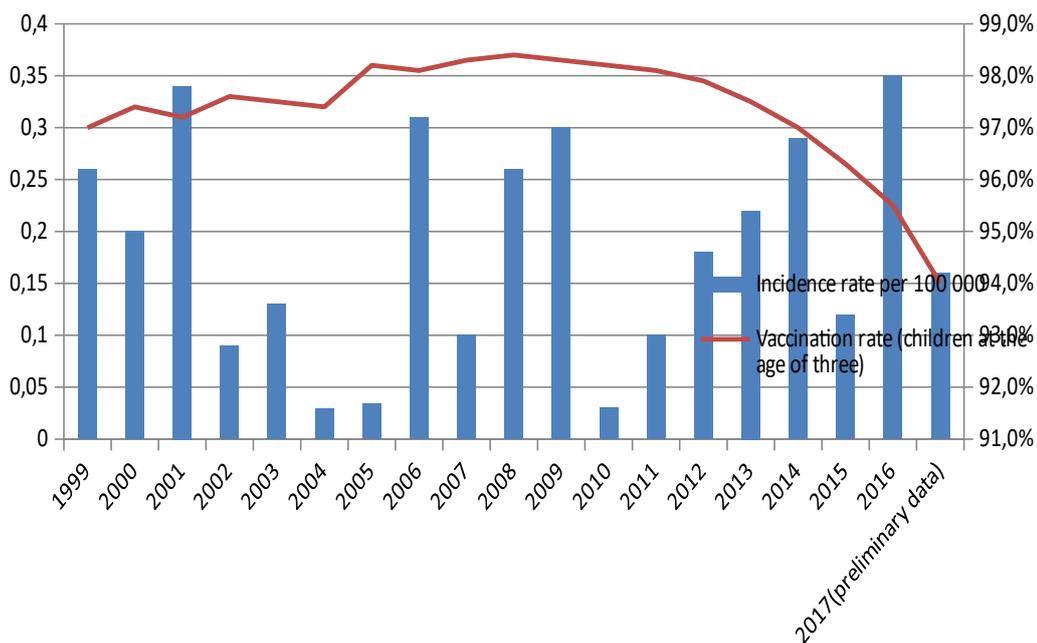
Materials and methods:

The data used for the epidemiologic analysis was taken from “Choroby zakaźne i zatrucia w Polsce” and “Szczepienia ochronne w Polsce” reports conducted by the National Hygiene Institute. Moreover, data from the World Health Organization reports.

Results

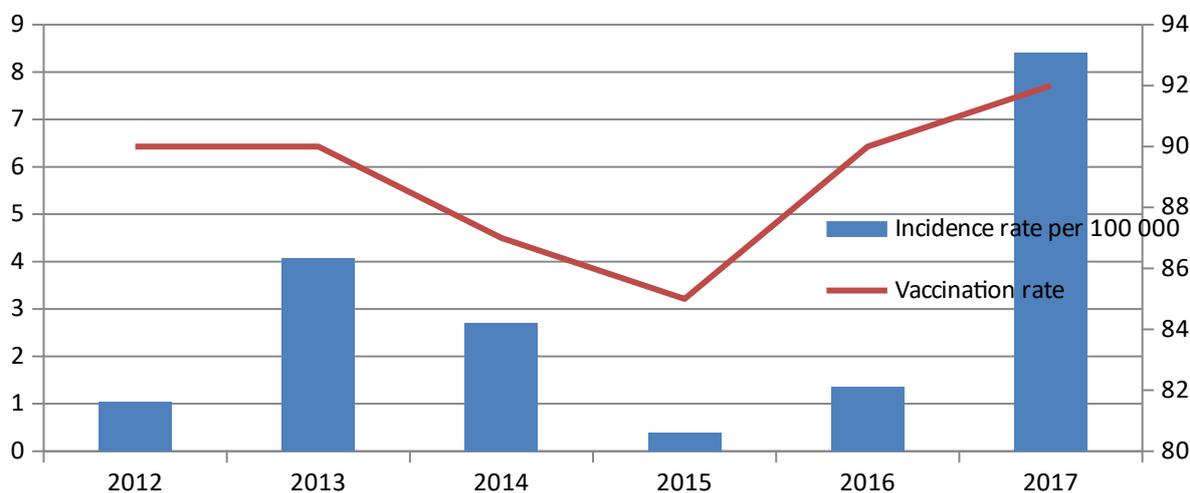
The results of analysis are not clear. Epidemics of measles occur every 2-3 years independently of vaccination rate. In 2001, the vaccination rate was 97,2% and incidence rate was 0,34. Almost the same maturity factor (0,35) was recorded in 2016 with vaccination rate amounting 95,5%.

Analysis of correlation between measles incidence rate and vaccination rate of children at the age of three in Poland, 1999-2017



Analysis of similar data for Italy showed a correlation between maturity rate and vaccination rate. In 2012, the level of vaccination oscillated around 90% and the incidence rate was 1,04. In 2017, after an emphatic increase of vaccination rate in 2015, maturity rate was 8.4.

Analysis of correlation between measles incidence rate and vaccination rate in Italy, 2012-2017



Comparing the results of analysis of both countries: the relationship between incidence rate of measles and vaccination rate is definitely more visible in case of Italy. For Poland the results of analysis are not clear; probably the decrease of vaccination rate is not sufficient to induce a significant increase of incidence.

Discussion

The relationship between the decrease of population immunity and increase of measles cases in Poland is not possible to unambiguous assessment. However, the decrease of amount of vaccinated children is significant. The responsibility for this tendency is probably the matter of anti-vaccine movements, which are gaining increasing popularity (3437 refusals in 2010, 23 147 refusals in 2016) [10]. Those groups are very active in others European countries as well. In Italy, where demands of anti-vaccine movements are supported by political parties [11], WHO recommended level of vaccination of 95% has not been achieved since 1990 (the vaccine was introduced in 1976, no data of vaccination in 1976-1989) [12]. The result of this state are epidemics, which are qualified as one of the largest in Europe. 5004 patients get sick of measles in Italy in 2017 – it places this country in second place among European countries in respect of measles incidence (Romania – 5560 cases) [13]. Among all cases of measles in Italy in 2017, about 88% of patients were never vaccinated and 6% were given only one dose of MMR vaccine. Measles affected all age groups, the majority of them (57%) were at the age of 15-39, whereas 6% of patients were children under the first year of life [14], therefore infants who could not receive the vaccine given at the age of 13-14 months for the first time. Previous epidemic took place in 2011, when outbreaks were reported in 36 of 53 countries of European Region according to World Health Organization. At the time over 5 000 cases of measles were registered in Italy [15]. However, this epidemic did not affect Poland, where the percentage of population immunity emphatically exceeded the recommended threshold of 95%. These data clearly show how important is to maintain high public vaccination rate. Herd immunity protects children who are too young to receive the vaccine but also protects people who cannot be given live vaccine, including MMR, because of contraindications. To this group belong patients keeping in the state of immunosuppression and patients with acquired or congenital immunodeficiency. The risk of transmission of measles as a result of frequent migrations within European countries should also be taken into consideration. Epidemic outbreaks were reported in countries which are Poland's proximate neighbors and the epidemic in Ukraine is the third in terms of the number of patients in Europe in 2017 [16]. Therefore, Polish and European health care workers are faced with the challenge of opposing to anti-vaccine movements and educating the community about the necessity of vaccinations.

Conclusions

A significant increase of measles cases in Italy barely two years after the decrease of vaccination rate is a negative prognostic factor for Poland. Although incidence rate of measles is constantly on a similar level, the decreasing vaccination rate is worrying.

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