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## MENINGITIS AND ENCEPHALITIS IN POLAND IN 2013\*

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### ABSTRACT

**AIM OF THE STUDY.** The aim of this study was to assess the epidemiology of meningitis and/or encephalitis in Poland in 2013

**INTRODUCTION.** In the last three years in Poland, about 3000 cases of meningitis and/or encephalitis of viral or bacterial etiology were recorded annually.

**MATERIALS AND METHODS.** Assessment of the epidemiological situation of meningitis and/or encephalitis in Poland in 2013, was based on the results of the analysis of epidemiological reports sent to the NIZP-PZH by the Regional Sanitary-Epidemiological Stations published in the annual bulletin “Infectious diseases and poisonings in Poland in 2013” and “Preventive immunizations in Poland in 2013”.

**RESULTS.** In 2013 in Poland 3 116 cases of bacterial meningitis and/or encephalitis were recorded. Almost 50% of these were viral infections.

**SUMMARY AND CONCLUSIONS.** The epidemiological situation of meningitis and/or encephalitis in Poland in 2013 compared to 2012 did not change significantly.

**Keywords:** *meningitis, encephalitis, epidemiology, Poland, 2013*

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### INTRODUCTION

In the last three years in Poland, about 3000 cases of meningitis and/or encephalitis of bacterial, viral and/or aseptic etiology were recorded annually. While inflammation of the brain is the most common for of the diseases of the central nervous system (CNS), bacterial meningitis is believed to be the most severe of all neuroinfections.

Among the laboratory confirmed cases of bacterial meningitis with known etiology, *Neisseria meningitidis* and *Streptococcus pneumoniae* are the dominant pathogens. Tick-borne encephalitis is the most common type of viral neuroinfections.

### AIM OF THE STUDY

The aim of the study was to assess the epidemiology of meningitis and/or encephalitis in Poland in 2013 and compare it to the situation in previous years.

### MATERIALS AND METHODS

Assessment of the epidemiological situation of meningitis and/or encephalitis in Poland in 2012, was based on analysis of epidemiological interviews sent to the NIZP-PZH by the Regional Sanitary-Epidemiological Stations published in the annual bulletin “Infectious diseases and poisonings in Poland in 2013” and in the bulletin “Preventive Vaccinations in Poland in 2013” (Czarkowski MP et al., Warsaw, 2014, NIZPH and GIS). Definitions of cases used in surveillance were based on the document “Definitions of cases of communicable diseases developed for epidemiological surveillance used in years 2012-2013” (Department of Epidemiology, NIZP-PZH). Analysis of vaccine coverage against particular pathogens was based on the recommendations “Immunization Program for the year 2013” (Annex to the Statement of the Chief Sanitary Inspector from 30 October 2012).

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## RESULTS

In 2013 in Poland, 3 116 cases of meningitis and/or encephalitis were recorded (incidence rate 8,09 per 100 000 population), which is higher by 0,9% compared to 2012 (Tab. I). Meningitis cases constitute 62,32% of all disease cases. Viral infections were cause of 46,1% of all registered neuroinfections. Among all viral neuroinfections with known etiology, the most common was tick-borne encephalitis (68,79%).

## MENINGITIS AND ENCEPHALITIS OF BACTERIAL ETIOLOGY

In 2013 in Poland, 863 cases of bacterial meningitis and/or encephalitis were recorded (incidence rate 2,24 per 100 000 population) (Tab. II), which is more by 13,7% than in 2012. Cases of disease occurred in all regions of the country. The highest number of cases was recorded in Mazowieckie province- 108 cases (incidence rate 2,03 per 100 000 population), the lowest number in Opolskie province- 17 cases (incidence rate 1,69 per 100 000 population). In 2013, incidence rate was the highest in the Pomorskie province- 3,53 per 100 000 population, and the lowest rate was in Lubuskie province- 1,66 per 100 000 population (Tab. II).

In 2013, as in 2011, the incidence rate among men (2,62 per 100 000 population) was higher than the incidence rate among women (1,89 per 100 000 population). Incidence rate in rural and urban areas was similar (2,24 per 100 000 population) (Tab. III). The highest incidence rate was recorded in the group of children under 4 years of age- 9,05 per 100 000 population, with the observed increase by 5,78% compared to 2012. The lowest incidence rate was recorded among 10-14 years old- 0,97 cases per 100 000 population.

Out of 863 cases of bacterial meningitis and/or encephalitis 362 (41,95%) was caused by three pathogens: *Neisseria meningitidis*, *Streptococcus pneumoniae* and *Haemophilus influenzae* (Tab. II). In this group meningococcal and pneumococcal infections constitute 97,5%. Among children and adolescents up to 19 years dominated disease etiology was *N. meningitidis* (100 cases, 61,35% of meningococcal total cases). More than 50% of pneumococcal infections were recorded in people over 45 years (109 cases, 57,37% of pneumococcal total cases) (Tab. IV).

***Neisseria meningitidis***. In 2013, there were 163 cases of meningococcal meningitis (incidence rate 0,42 per 100 000 population). Compared to 2012 (165 cases) it is a decrease of 1,2%. Incidence rate in urban and rural areas was similar- 0,41 and 0,45 per 100 000 population, respectively. The highest number of disease cases- 21 was observed in Mazowieckie province (incidence rate 0,4 per 100 000 population). The lowest number- 1 was in Lubuskie province (incidence rate 0,1 per 100 000 population). The highest incidence rate was in Pomorskie province and Warmińsko-Mazurskie province -0,83 per 100 000 population and lowest in Lubuskie- 0,1 per 100 000 population (Tab. II). Most cases occurred in January (17,2%) and February (13,5%).

Serological group of *N. meningitidis* was identified in 137 cases (84%). As in previous 4 years, the most frequently isolated serogroup was type B- 116 cases (71%). Serogroup C was detected in 42 cases (26%). In 3 cases serogroup W135 was recorded (including one mix infection C/W135). For 26 cases (16%) serotype was not determined.

In 2013, 48 000 people were vaccinated against *N. meningitidis*, which is more by 2,5% than in 2012 (46 810 people). The majority of vaccinated individuals were children and young people up to 19 years of age (90,19%).

Table I. Meningitis and encephalitis in Poland in 2009-2013. Number of cases and incidence per 100 000 population by etiological agent

Etiological agent	median 2004-2008		Meningitis and encephalitis									
	no of cases	inc. rate	2009		2010		2011		2012		2013	
			no of cases	inc. rate	no of cases	inc. rate	no of cases	inc. rate	no of cases	inc. rate	no of cases	inc. rate
<i>Neisseria meningitidis</i>	148	0.39	190	0.50	146	0.38	193	0.50	165	0.43	163	0.42
<i>Haemophilus influenzae</i>	39	0.10	13	0.03	11	0.03	11	0.03	11	0.03	9	0.02
<i>Streptococcus pneumoniae</i>	119	0.31	163	0.43	180	0.47	192	0.50	145	0.38	190	0.49
bacterial specified	161	0.42	127	0.33	148	0.39	139	0.36	128	0.33	145	0.38
bacterial unspecified	512	1.34	372	0.98	361	0.95	353	0.92	310	0.80	356	0.92
viral specified*	308	0.81	412	1.08	371	0.98	284	0.74	344	0.89	330	0.86
viral unspecified	1215	3.18	832	2.18	1248	3.26	1154	3.01	1271	3.30	1108	2.88
postvaccinal	1	0	0	0	0	0	0	0	0	0	0	0
other and unspecified	374	0.98	408	1.07	598	1.57	589	1.53	714	1.85	815	2.12
total	2877	7.53	2517	6.60	3063	8.03	2915	7.59	3088	8.01	3116	8.09

\* including encephalitis transmitted by ticks

Source: Infectious diseases and poisonings in Poland in 2013, Warsaw, 2014. NIPH- NIH, CSI.

Table II. Meningitis and encephalitis in Poland in 2013. Number of cases and incidence per 100 000 population by etiological agent and province

Province	Bacterial meningitis and encephalitis										Viral meningitis and encephalitis				Meningitis and encephalitis: specified and unspecified	
	<i>Neisseria meningitidis</i>		<i>Haemophilus influenzae</i>		<i>Streptococcus pneumoniae</i>		specified and unspecified		total		specified and unspecified*		tick-borne encephalitis			
	number	inc.	number	inc.	number	inc.	number	inc.	number	inc.	number	inc.	number	inc.	number	inc.
POLAND	163	0.42	9	0.02	190	0.49	501	1.30	863	2.24	1211	3.15	227	0.59	815	2.12
1. Dolnośląskie	16	0.55	1	0.03	13	0.45	32	1.10	62	2.13	75	2.58	13	0.45	60	2.06
2. Kujawsko-pomorskie	5	0.24	0	0	11	0.53	25	1.19	41	1.96	89	4.25	1	0.05	26	1.24
3. Lubelskie	9	0.42	0	0	10	0.46	20	0.93	39	1.81	30	1.39	6	0.28	26	1.20
4. Lubuskie	1	0.10	0	0	3	0.29	13	1.27	17	1.66	8	0.78	0	0	5	0.49
5. Łódzkie	8	0.32	0	0	19	0.75	26	1.03	53	2.11	47	1.87	2	0.08	37	1.47
6. Małopolskie	5	0.15	0	0	18	0.54	52	1.55	75	2.23	87	2.59	9	0.27	88	2.62
7. Mazowieckie	21	0.40	3	0.06	28	0.53	56	1.06	108	2.03	231	4.35	21	0.40	156	2.94
8. Opolskie	2	0.20	1	0.10	4	0.40	10	0.99	17	1.69	58	5.76	7	0.70	32	3.18
9. Podkarpackie	9	0.42	1	0.05	6	0.28	27	1.27	43	2.02	59	2.77	1	0.05	53	2.49
10. Podlaskie	6	0.50	0	0	3	0.25	29	2.42	38	3.18	59	4.93	111	9.28	28	2.34
11. Pomorskie	19	0.83	3	0.13	13	0.57	46	2.01	81	3.53	141	6.15	0	0	46	2.01
12. Śląskie	19	0.41	0	0	22	0.48	64	1.39	105	2.28	79	1.72	2	0.04	94	2.04
13. Świętokrzyskie	3	0.24	0	0	5	0.39	20	1.57	28	2.20	19	1.50	1	0.08	32	2.52
14. Warmińsko-mazurskie	12	0.83	0	0	10	0.69	26	1.80	48	3.31	79	5.45	53	3.66	16	1.10
15. Wielkopolskie	19	0.55	0	0	17	0.49	32	0.92	68	1.96	108	3.12	0	0	97	2.8
16. Zachodniopomorskie	9	0.52	0	0	8	0.47	23	1.34	40	2.33	42	2.44	0	0	19	1.10

\*neuroinfections viral excluding TBE

Source: Infectious diseases and poisonings in Poland in 2013, Warsaw, 2014. NIPH- NIH, CSI.

Table III. Meningitis and encephalitis in Poland in 2012-2013 - incidence per 100 000 population by gender and location (urban/rural)

Diagnosis	Year	Total	Gender		Location	
			male	female	urban	rural
Bacterial meningitis and encephalitis	2012	1.97	2.46	1.51	1.92	2.05
	2013	2.24	2.62	1.89	2.24	2.24
Viral meningitis and encephalitis*	2012	3.70	4.39	3.05	3.61	3.84
	2013	3.15	3.64	2.68	3.25	2.98
Tick-borne encephalitis	2012	0.49	0.62	0.37	0.40	0.63
	2013	0.59	0.71	0.48	0.52	0.69

\*aseptic neuroinfections except TBE

Source: Infectious diseases and poisonings in Poland in 2013, Warsaw, 2014. NIPH-NIH, CSI

Table IV. Meningitis and encephalitis in Poland in 2013. Number of cases and incidence per 100 000 population by etiology and age group.

Etiological agent	Age group (years)									
	0-4	5-9	10-14	15-19	20-24	25-44	45-64	+65	total	
<i>Neisseria meningitidis</i>	66	12	3	19	22	10	27	4	163	
<i>Haemophilus influenzae</i>	1	1	0	0	0	2	2	3	9	
<i>Streptococcus pneumoniae</i>	18	9	4	2	1	47	71	38	190	
other bacterial specified and unspecified	98	16	11	26	20	111	147	72	501	
bacterial total	number	183	38	18	47	43	170	247	117	863
	inc.rate	9.05	1.99	0.97	2.16	1.62	1.44	2.34	2.1	2.24
Viral specified and unspecified	60	85	104	140	135	390	205	92	1211	
Tick-borne encephalities	3	2	4	16	17	68	91	26	227	

Source: Infectious diseases and poisonings in Poland in 2013, Warsaw, 2014. NIPH- NIH, CSI.

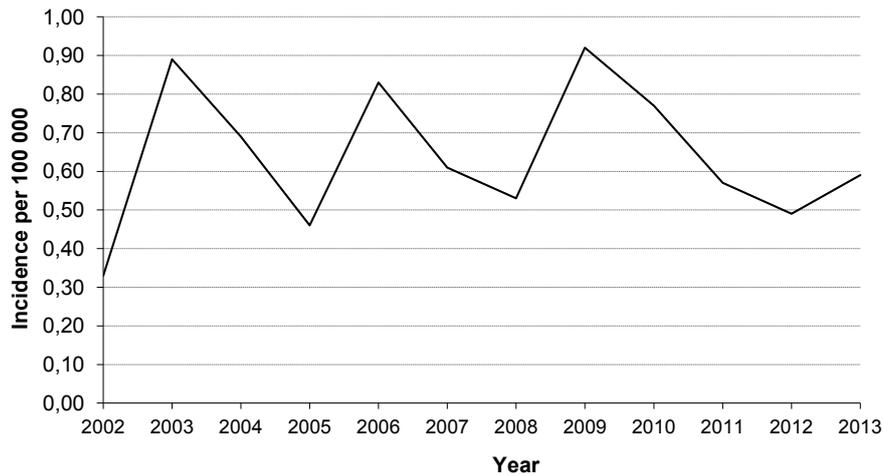


Fig. 1. Tick-borne encephalitis, Poland, 2002-2013. Incidence per 100 000 population

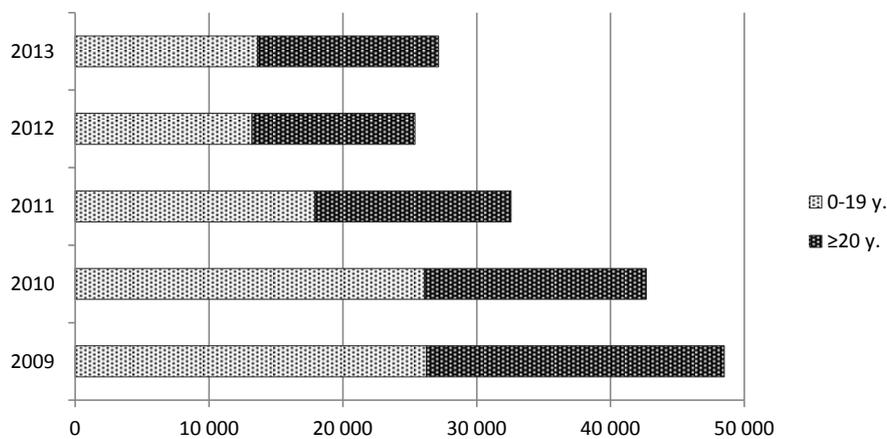


Fig. 2. Number of persons by age, which in the years 2009-2013 were given a dose of a vaccine against TBE-ending cycle of primary vaccination or booster dose.

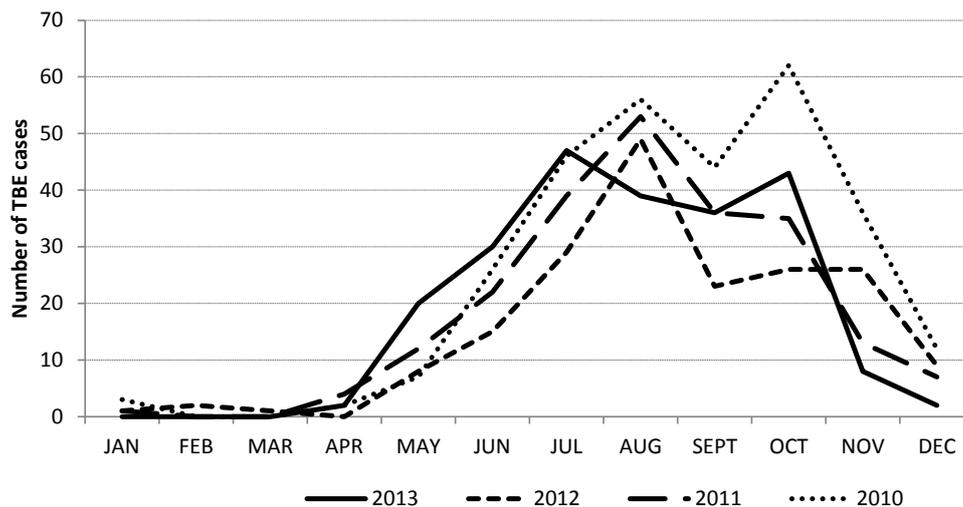


Fig. 3. Seasonal distribution of tick-borne encephalitis in Poland in 2010-2013.

In Poland, three types of vaccine against *N. meningitidis* are available: monovalent C, bivalent A+C and quadrivalent A+C+Y+W135. According to the Immunization Program for the year 2013, vaccination against *N. meningitidis* was recommended and can be used from 2 months of age.

***Haemophilus influenzae type B.*** The number of meningitis and/or encephalitis due to *Haemophilus influenzae type B* remains at low level- 9 cases (incidence rate 0,02 cases per 100 000 population) (Tab. II). Registered cases occurred in 5 provinces. The highest number of cases was recorded in Mazowieckie and Pomorskie

Table V. Serotypes of *Neisseria meningitidis* in 1993-2013 in Poland

Year	<i>Neisseria meningitidis</i>		Confirm serotypes (%)	Serotypes of <i>Neisseria meningitidis</i>					
	number			A*	B	C	D	other	mixed
	of cases	serotypes							
1993	168	13	7.7	-	10 (77%)	3 (23%)	-	-	-
1994	163	37	22.7	5	24 (65%)	8 (22%)	-	-	-
1995	151	49	32.5	2	38 (78%)	8 (16%)	1	-	-
1996	144	43	29.9	3	30 (70%)	10 (23%)	-	-	-
1997	140	51	36.4	-	40 (78%)	9 (18%)	-	2	-
1998	129	54	41.9	-	47 (87%)	5 (9%)	-	2	-
1999	121	47	38.8	1	40 (85%)	5 (11%)	-	1	-
2000	110	39	35.5	-	32 (82%)	7 (18%)	-	-	-
2001	100	25	25.0	2	16 (64%)	7 (28%)	-	-	-
2002	90	22	24.4	2	13 (59%)	7 (32%)	-	-	-
2003	76	39	51.3	3	20 (51%)	14 (36%)	-	2	-
2004	119	69	58.0	6	41 (59%)	19 (27%)	-	3	-
2005	135	77	57.0	2	37 (48%)	35 (45%)	-	3	-
2006	148	83	56.1	2	35 (42%)	41 (49%)	-	5	-
2007	224	170	76.0	1	77 (46%)	80 (48%)	-	6	6
2008	220	186	85.0	1	87 (46%)	89 (47%)	-	1	8
2009	190	164	86.3	2	79 (48%)	74 (45%)	-	4	5
2010	146	129	88.4	-	67 (52%)	56 (43%)	-	5	1
2011	193	154	79.1	-	89 (46%)	62 (32%)	-	3	-
2012	165	135	77.0	-	68 (41%)	54 (33%)	-	5	2
2013	163	137	84.0	1	116 (71%)	42 (26%)	-	3	1

\*A serotype non confirmed in reference laboratory

province- 3 (incidence rate 0,06 and 0,13 per 100 000 population, respectively). A total of 7 cases (77,8%) was reported among people >24 years of age, of which 85,7% were individuals living in urban areas. Similar to 2012, incidence rate among 0-4 years old was 0,05 per 100 000 population (Tab IV)

In 2013, vaccine coverage of 2 years old (primary vaccination) against *Haemophilus influenzae* ranged from 97,5% (Małopolskie province) to 99,7% (Warmińsko-Mazurskie province). Moreover, vaccination against *H. influenzae* (not included in the recommendations of "Immunization Program in 2013") was performed in 6 795 persons (decrease by 10,3% compared to 2012), of which 78,25% were children under 4 years.

Vaccination against *Haemophilus influenzae* type B had been introduced as mandatory vaccination in 2007 for children below 2 years of age and children up to 6 years from high risk groups who were not vaccinated according to the normal schedule after 7 weeks of age. According to the Immunization Program for 2013 full vaccination course includes 4 doses: at 2, 4 and 6 months (primary vaccination) and one booster dose given at 2 years of age. For children younger than 6 years who were not vaccinated according to normal schedule, vac-

ination against *N. meningitidis* was recommended to prevent meningitis, sepsis and epiglottitis. For people with immunodeficiency, vaccination was recommended according to individual medical indications.

***Streptococcus pneumoniae***. In 2013, 190 cases of meningitis and/or encephalitis caused by *Streptococcus pneumoniae* were recorded (incidence rate 0,49 per 100 000 population), and was more by 31% in comparison to 2012 (145 cases) (Tab. I). The highest number of cases-28 was recorded in Mazowieckie province (14,7%). The highest incidence rate was observed in Łódzkie province (0,75 per 100 000 population) (Tab. II). The lowest incidence rate (below 0,3 per 100 000 population) was recorded in Podlaskie and Podkarpackie province- 0,25 and 0,28 per 100 000 population, respectively. For all age groups, except 0-4 years old, number of meningitis and/or encephalitis cases due to *Streptococcus pneumoniae* was higher in urban areas (63,2%, incidence rate 0,52 per 100 000 population).

As in years 2010-2012, people over 25 years of age accounted for the majority of cases (82,1%), of those, persons 45-64 years old accounted for 44,7% of cases. Cases in the age group 0-4 years amounted to 9,5% and

incidence rate in this age groups was the highest- 0,89 per 100 000 population (Tab. IV).

In 2013, in Poland 201 231 people were vaccinated against *Streptococcus pneumoniae*, which is higher by 5,84% in comparison to 2012. Predominated among those vaccinated were children under 4 years (92,1%). The highest vaccine coverage was in Mazowieckie province (0,83).

According to the Immunization Program for 2013, vaccination against *Streptococcus pneumoniae* was mandatory only for babies age 2 months- 5 years of age within high-risk groups with specific medical indications. However, it was recommended for people over 65 years of age, children up to 5 years of age in other groups at-risk and adults at risk.

## MENINGITIS AND ENCEPHALITIS OF VIRAL ETIOLOGY

In 2013, there were 1 438 cases of neuroinfections of viral etiology (incidence rate 3,63 per 100 000 population), which was less by 11% in comparison to 2012 (Tab. II). In this group the most common (75%) was viral meningitis (1 079 cases, incidence rate 2,8 per 100 000 population). Cases with known etiology constituted 22,9% of all neuroinfections, of these: 68,8% were cases of tick-borne encephalitis, 16,1% cases of enteroviral meningitis and 10,9% meningitis and/or encephalitis caused by herpes simplex viruses.

As in 2012, the highest incidence rate of neuroinfections of viral etiology was recorded in Podlaskie province (14,2 per 100 000 population). The incidence in rural areas (3,78 per 100 000 population) was higher than in urban areas (3,67 per 100 000 population) and incidence among men (4,35 per 100 000 population) was higher than among women (3,16 per 100 000 population) (Tab. III).

**Tick-borne encephalitis (TBE):** In 2013, there were 227 cases of tick-borne encephalitis reported in 12 of 16 provinces (Tab. II)- the incidence rate was 0,59 cases per 100 000 population. In comparison to 2012 it was an increase by 38 cases (20,1%). As in 2011-2012, the highest number of cases was in north-eastern part of Poland- in Podlaskie province (48,9% of total cases, incidence rate 9,28 cases per 100 000) and Warmińsko-Mazurskie province (23,3% of total cases, incidence rate 3,66 cases per 100 000 population). The incidence rate in other provinces was reported to be lower than 0,7 per 100 000 population (Tab. II). After peak 2009 (0,92 cases per 100 000 population), there is a decreasing trend in incidence (Fig. 1).

More cases were registered in summer and autumnal season- from May to November, with the peak in July-October. In 2013, similar like in 2010, two peaks in incidence were observed (Fig.2).

According to the case definition of tick-borne encephalitis, there were 136 confirmed cases (60%), 90 probable cases (39,6%), and 1 possible case (0,4%). Tick bite was reported by 126 cases (55,5%), and within this group confirmed cases accounted for 53%. The age of cases ranged from 3 months to 82 years (mean age- 43,7 years, median- 45 years). More cases occurred in men (58%).

In 2013, 27 143 people received full primary vaccination course against tick-borne encephalitis or booster dose, and it was 1 755 people more than in 2012 (Fig. 3). The highest number of vaccinated people was Mazowieckie province- 8 066, the lowest in Świętokrzyskie- 241 people. The vaccine coverage was highest in Podlaskie and Warmińsko-Mazurskie province- 0,22 and 0,11, respectively. The lowest vaccine coverage was in Świętokrzyskie province- 0,02.

In 6 provinces: Dolnośląskie, Lubuskie, Łódzkie, Małopolskie, Mazowieckie and Wielkopolskie, vaccine coverage was higher among children and youth (0-19 years) than in adults (>20 years)

According to the Immunization Program in 2013, vaccination against TBE (3 doses of primary vaccination and booster dose every 3-5 years) is recommended to people living in or traveling to endemic areas.

## SUMMARY AND CONCLUSIONS

In comparison to the previous year, the epidemiological situation of meningitis and/or encephalitis in Poland in 2013, has not changed significantly.

The continuing downward trend in the incidence of TBE indicates the effectiveness of nationwide project entitled "Active surveillance of viral neuroinfections", conducted in 2009-2010 by NIPH-NIH.

In view of the fact that the group B of *N. meningitidis* is the most frequently serologically isolated strain, should be considered the introduction of vaccines for serogroup B to vaccination schedule.

Given the severity of invasive diseases and increase in the number of meningitis and/or encephalitis caused by *Streptococcus pneumoniae*, introduction of vaccination against invasive pneumococcal disease for all children should be postulated.

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