

Risk factors and selected aspects of pathogenesis and treatment of acute otitis media in children: A clinical and audiological analysis of 311 cases

Czynniki ryzyka i wybrane aspekty patogenezy i leczenia dzieci z ostrym zapaleniem ucha środkowego: kliniczno-audiologiczna analiza 311 przypadków

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Introduction. Acute otitis media (otitis media acuta, OMA) is, according to epidemiological studies, one of the most frequently occurring childhood diseases, affecting small children in particular. OMA usually represents a complication of upper respiratory tract infection.

Aim. The aim of the study is to determine the frequency of exposure to risk factors, analyse acute otitis media in children, and evaluate the treatment and complications of the disease.

Material and methods. The questionnaire study comprised a group of 311 Polish children, age range 0-18, with the diagnosis of acute otitis media, treated in Pediatric Outpatient Clinics in central Poland, selected at random. After completion of treatment a check-up was carried out including otolaryngological examination and assessment of the organ of hearing.

Results. OMA occurred most often in children at pre-school age, in children with recurring infections of the upper respiratory tract, as well as in children living in infant communities. OMA catarrhal nature was observed in 25% of the subjects, and it did not require treatment with antibiotics. The treatment of OMA in case of most of the children was within the accepted standards (stage I and II antibiotics). The most frequently occurring complications comprised recurrence of the disease (17.3%) as well as hearing loss (15%); while in 15% of OMA cases the disease eventually evolved into a chronic condition – serous otitis media - SOM.

Conclusions. OMA occurred most often in children at preschool age. The patients with OMA should be monitored for serous otitis media.

Key words: acute otitis media, serous otitis media, epidemiology, conductive hearing loss, children

Wstęp. Ostre zapalenie ucha środkowego (otitis media acuta, OMA) jest według badań epidemiologicznych jedną z najczęściej występujących chorób wieku dziecięcego, szczególnie u dzieci małych. Schorzenie to jest zazwyczaj powikłaniem infekcji górnych dróg oddechowych.

Cel pracy. Celem pracy jest określenie częstości narażenia na czynniki ryzyka, analiza przebiegu ostrego zapalenia ucha środkowego u dzieci, ocena stosowanego leczenia oraz powikłań choroby.

Materiał i metody. Badaniem ankietowym objęto grupę 311 dzieci polskich w wieku 0-18 r.ż., z rozpoznaniem ostrego zapalenia ucha środkowego leczonych w poradniach dziecięcych na terenie miasta Częstochowy, wybranych losowo. Po zakończeniu leczenia przeprowadzono badania kontrolne tj. badanie otolaryngologiczne oraz ocenę narządu słuchu.

Wyniki. OMA najczęściej występowało u dzieci w wieku przedszkolnym, u dzieci z nawracającymi infekcjami górnych dróg oddechowych oraz u dzieci ze zbiorowisk dziecięcych. OMA o charakterze nieżytowym obserwowano w 25% i nie wymagało ono antybiotykoterapii. Leczenie OMA większości dzieci mieściło się w granicach przyjętych standardów (antybiotyki I i II rzutu). Najczęstsze powikłania to: nawrót choroby (17,3 %) oraz niedosłuch (15%); w 15% przypadków OMA przechodziło w stan przewlekły – wysiękowego zapalenia ucha.

Wnioski. OMA jest wciąż częstym problemem zdrowotnym, zwłaszcza u dzieci w wieku przedszkolnym. Pacjentów tych trzeba monitorować w kierunku wysiękowego zapalenia ucha środkowego.

Słowa kluczowe: ostre wysiękowe zapalenie ucha, epidemiologia, niedosłuch przewodzeniowy u dzieci

INTRODUCTION

Acute otitis media (otitis media acuta, OMA) is, according to epidemiological studies, one of the most frequently occurring childhood diseases, affecting small children in particular [1]. Newborns and small children are particularly prone to OMA, due to immature anatomic structures and immune system [2]. In accordance with US statistics, some 95% of children under 7 years of age suffer from otitis media at least once, while as many as 70% of those children suffer from that disease 3 times [3]. The disease is usually a complication of upper respiratory tract infections caused by adenoviruses, bocaviruses, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catharalis* [4].

Serous otitis media, where the middle ear and mastoid process air cavities are filled with thick or sticky fluid, is the most common cause of conductive hearing loss in children [5,6]. The efficiency of the hearing organ is particularly important in children, as it is a precondition for correct development of voice and speech, as well as getting familiar with language forms, but also influences in a decisive way the child's general intellectual development, which enables keeping correct relations with the surroundings.

In the pathogenesis of OMA – besides the factor of infection, disturbed function of Eustachian tube, weakening of the body's defense mechanisms – one should also take into consideration the risk factors that may induce development of the disease, such as: age, prematurity, allergy, or genetic predispositions [1,7,8]. Environmental factors also play a vital role [8]. Knowledge, identification, and modification of those factors may, to a large extent, reduce the incidence of OMA. It is of importance in prevention of OMA complications. Therapeutic management of children with recurring acute otitis media should comprise not only the treatment of acute phase, but also getting rid of the environmental threats [9,10].

Studies devoted to analysis of causes of the acute otitis media, the assessment of its course and treatment results in children from Eastern Europe are rather scarce.

In connection with the above, the aim of our study has been to assess selected aspects of the pathogenesis and treatment of acute otitis media in Polish children. For that purpose, the frequencies of exposure to risk factors responsible for the incidence of OMA have been determined, the course of disease in children has been analyzed, along with the treatment applied, as well as assessment of disease complications.

MATERIAL AND METHODS

The questionnaire study was conducted in 14 pediatric outpatient clinics in the city of Częstochowa (located in central Poland – 250 000 inhabitants), between early May 2011 and end of May 2012. The study comprised a group of 311 children, selected at random, in the age range between 0 and 18, who were diagnosed with, and treated for acute otitis media. The study was carried out with the participation of pediatricists and family doctors working in those outpatient clinics. The parents of patients have been requested to provide answers to some of the questions contained in the questionnaire developed for the purpose of this study.

The questionnaire contained data concerning: age of the child, incidence of upper respiratory tract infections, occurrence of risk factors of developing OMA (environmental and individual ones), namely: exposure to tobacco smoke, staying in communities of children (crèche, kindergarten), prematurity, bottle feeding, occurrence of atopy. In the questionnaire the doctor, on the basis of history taking, assessed the social and economic conditions of the children. OMA was classified as follows: acute form (up to 3 weeks of disease duration) and chronic form (over 3 weeks of disease duration). Also the presence of generalized symptoms as well as local ones, found in the patient, results of otoscopy, length of ailment occurrence, treatment applied, manifestations accompanying the disease, as well as complications that occurred.

The number of acute otitis media has been classified as follows: 1 inflammation a year, 2-3 inflammations a year, and more than 3 inflammations a year.

Written consent of parents/foster parents has been obtained for performing the examination.

Check-ups have been performed in the laryngological outpatient clinic, in the group of 51 children who suffered from acute otitis media. During the check-up the laryngologist, having taken the history, carried out otoscopic examination, performed tympanometry, as well as audiometry in children over 4 years of age.

The data concerning form of OMA have been analyzed in 4 age groups: <3 years of age, 3-6 years of age, 6-9 years of age, and 9-18 years of age. The data concerning risk factors have been analyzed on the basis of the form of OMA.

Statistical analysis

For each analyzed group the quantity and frequency of occurrence of individual parameters

examined have been calculated. For comparison of occurrence frequency of factors analyzed in a given group, as well as between groups of patients, the test χ^2 or χ^2 with Yates` correction (applied in low sample size) have been used. Statistical significance was set at $p < 0.05$.

RESULTS

Frequency of OMA occurrence

It results from the studies performed heretofore that the highest incidence of OMA was among the children of 3-6 years of age (41.48%). Also the in same age group (3-6 years) the highest recurrence of the disease was found – 65.53%. In the youngest children, under three years of age, the occurrence of 1 otitis media per year prevailed, with statistical significance. In children under 6 years of age, the frequency of acute otitis media occurrence was higher, with statistical significance (65.53%, $p=0.003$). In the remaining age groups, no statistically significant differences in the frequency of OMA occurrence has been observed (Tab. I). The average age in the study group, for the occurrence of acute otitis media was 5.76 years \pm 3.89, regardless of the number of occurrences per year.

Assessment of risk factors

The mostly frequently occurring risk factors of acute otitis media, in the group of children we examined, were the recurring infections of upper respiratory tract in 71.7% of examined children. The second most prevalent risk factor was the fact that children stayed in a child care facility (crèche, kindergarten) – OMA was diagnosed in 51.45% of examined patients. Bottle feeding and exposure to tobacco smoke contributed to development of the disease (in 46.62% and 45.66% of children, respec-

tively). Of least importance for the development of OMA in the group of patients we analyzed were: poor social and economic conditions, as well as prematurity (Fig. 1).

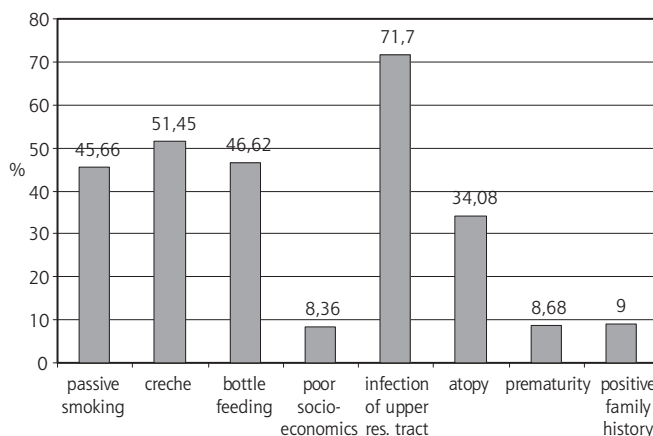


Fig. 1. Risk factors for OME in the study group children (n=311)

When analyzing the frequency of OMA during the year, depending on the risk factors in the study group, it has been demonstrated that exposure to tobacco smoke, staying in a child care facility such as crèche, kindergarten, bottle feeding and atopy are the risk factors having statistically significant importance for the development of OMA. Passive smoking contributes to significantly more frequent occurrence of 2-3 otitis media incidents over a year (56.06% of children, $p=0.002$), whereas attending crèche, kindergarten, bottle feeding and atopy are the risk factors having statistically significant influence on the increased risk of more than 3 episodes of OMA over one year (71.88%, 75.00%, and 50.00%, respectively) (Tab. II).

Table I. Number of OMA incidents per year versus the age of children

	1 incident of OMA a year		2-3 incidents of OMA a year		more than 3 OMA incidents a year		Σ	
	N	%	N	%	N	%	N	%
under 3 years	53	36.05	32	24.24	4	12.50	89	28.62
	$\chi^2= 9,28 p= 0,019$							
3.1-6 years	50	34.01	58	43.94	21	65.53	129	41.48
	$\chi^2= 11,39 p= 0,003$							
6.1-9 years	14	9.52	22	16.67	2	6.25	38	12.22
	NS							
9.1-18 years	30	20.41	20	15.15	5	15.63	55	17.68
	NS							
Total	147	100	132	100	32	100	311	100

N – number of children, NS- not significant

Table II. Number of OMA incidents per year versus risk factors

	1 incident of OMA a year n=147		2-3 incidents of OMA a year n=132		more than 3 OMA incidents a year n=32	
	N	%	N	%	N	%
Passive smoking	52	35.37	74	56.06	16	50.00
	$\chi^2 = 12.27$ p=0.002					
Crèche, kindergarten	54	36.73	83	62.88	23	71.88
	$\chi^2 = 27.99$ p<0.001					
Bottle feeding	49	33.33	72	54.55	24	75.00
	$\chi^2 = 24.12$ p<0.001					
Poor socio economic conditions	14	9.52	9	6.82	3	9.38
	NS					
Infections of upper resp. tract	103	70.07	96	72.73	24	75.00
	NS					
Atopy	36	24.49	54	40.91	16	50.00
	$\chi^2 = 12.37$ p=0.002					
Prematurity	12	8.16	13	9.85	2	6.25
	NS					
Positive family history	15	10.20	8	6.06	5	15.63
	NS					

N – number of children, NS- not significant

Clinical manifestations

In the study group, the most frequent clinical manifestation was earache – a dominating manifestation, found in 84.24% of the children. It was followed, in the descending order of occurrence frequency, by such clinical manifestations as rhinitis, developed in 83.6% of the children, fever – in 66.56% of the children, and irritation, in 61.41% of the pediatric patients examined. Statistical analysis of the connection between the number of OMA episodes in children over a year and disease manifestations revealed that the manifestations connected with frequency of disease occurrence included: fever, hearing loss, rhinitis, and cough (Tab. III).

In children who suffered 2-3 episodes of OMA a year, fever and rhinitis occurred, with statistical significance, more frequently (75.76% and 90.91%, respectively), whereas in children who had more incidents of otitis media over a year, hearing loss occurred more frequently, with statistical significance (74.88%), followed by cough (68.75%) (Fig. 2).

Otoscopy image

The most frequently observed was uniform congestion of the tympanic membrane, which occurred in 70% of patients. Local congestion only in the area of manubrium mallei was diagnosed in 30% of the patients, bulging of the tympanic membrane – in 10.6% patients, while perforation of the tympanic membrane with discharge was noted in 8% of examined children (Fig. 3).

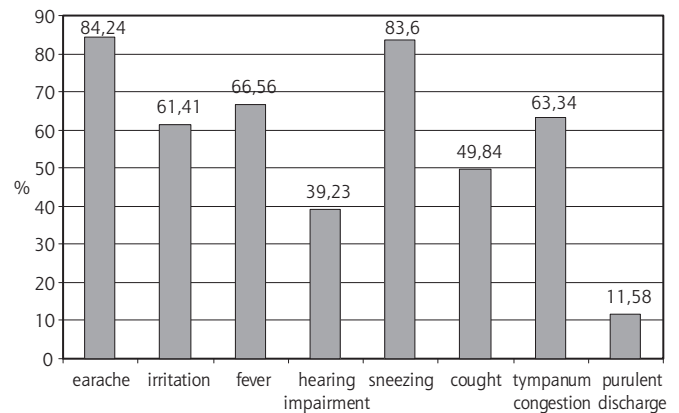


Fig. 2. Clinical symptoms in the study group children (n=311)

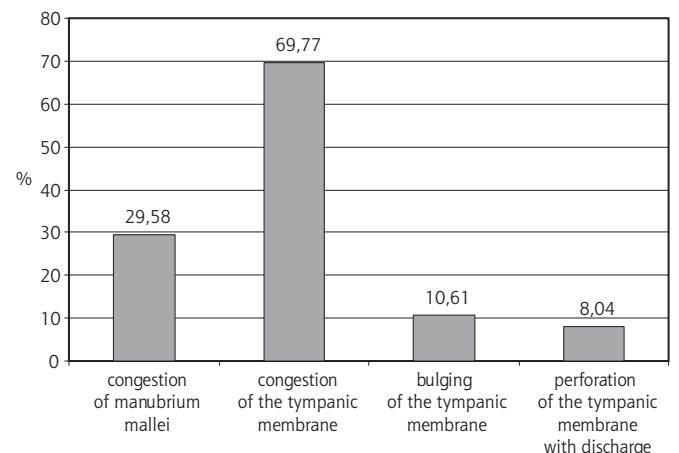


Fig. 3. Otoscopic results in the study group children (n=311)

Table III. Number of OMA incidents per year versus clinical symptoms

	1 incident of OMA a year n=147		2-3 incidents of OMA a year n=132		more than 3 OMA incidents a year n=32	
	N	%	N	%	N	%
Earache	121	82.31	112	84.85	29	90.63
	NS					
Irritation	83	56.46	90	68.18	18	56.25
	NS					
Fever	85	57.82	100	75.76	22	68.75
	$\chi^2=10.13$ p=0.006					
Hearing impairment	49	33.33	50	37.88	23	71.88
	$\chi^2=16.55$ p=0.003					
Sneezing	112	76.19	120	90.91	28	87.50
	$\chi^2=11.39$ p=0.003					
Cough	61	41.50	72	54.55	22	68.75
	$\chi^2=9.84$ p=0.007					
Congestion of tympanium	69	46.94	100	75.76	28	87.50
	$\chi^2=33.84$ p<0.001					
Purulent discharge	13	8.84	19	14.39	4	12.50
	NS					

N – number of children, NS- not significant

Treatment and complications

In the examined group of children, only symptomatic treatment of acute otitis media was applied in 25% of the children. Treatment with antibiotics was applied in 75% of the children, in that group it was necessary to change the chemotherapeutic agent in 7.7% of the treated children. Among the antibiotics administered, the most frequently prescribed one was cephalosporin of the second generation (52.6%), while first treatment with antibiotic (amoxillin) in 44% of the patients.

The most frequently occurring complication of OMA in our study material was the recurrence of the disease, which occurred in 17.3% of treated children. Other complications, in the order of frequency of occurrence, were: hearing loss persisting for over 3 weeks – in 10.39% of the children, persisting perforation of tympanic membrane in 1.61% of the children, as well as irritation of the inner ear, in 1.29% of the study group population. The inflammatory condition of the inner ear, with exudate, persisted in 15.4% of the children (Fig. 4).

DISCUSSION

Due to the frequency of occurrence, etiology – being subject of ongoing studies, as well as its consequences, otitis media still remains a major issue of infantile otolaryngology [11]. The studies we conducted, assessing 311 cases of acute otitis media, imply that most frequently (41.48%) the

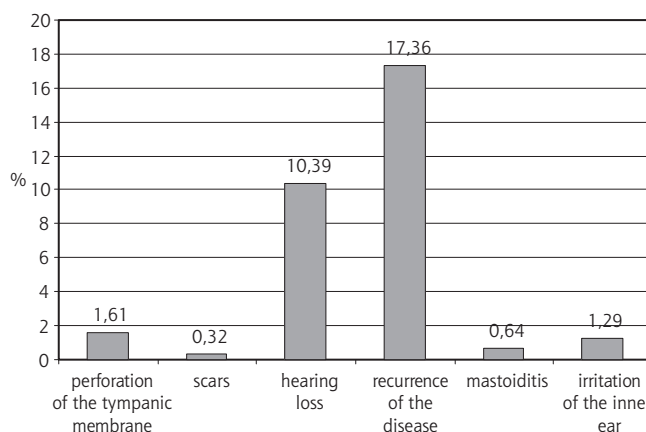


Fig. 4. OMA complications in the study group children (n=311)

disease affected children between 3 and 6 years of age. At that age range, also the highest incidence of recurrence of the disease has been noted – in over 65% of the patients more than 3 incidents of otitis media per year. The frequency of OMA incidence is lower after the 6th year of age (12.2%). Statistics provided by American researchers show that in the earliest months of life the incidence of OMA is the highest, with the peak between 6 and 36 months of life [3]. In the USA, some 95% of children suffer from otitis media at least once before they reach the age of 7 years of age, while 70% suffer from it at least three times [3]. The studies performed in Spain, in turn, when evaluating the questionnaires sent to pediatricians, show that the peak of OMA incidence is

between 1 and 5 years of age [12]. In the literature reporting on the population of Italian children, the frequency of OMA was 10.85%, of which 51% were incidents in children under 5 years of age [6].

Our studies revealed that the most frequently occurring factor responsible for acute otitis media is the upper respiratory tract infection, which we diagnosed in 71.7% of the examined children. Another risk factor of acute otitis media turned out to be the fact that patients stayed in child care (crèche, kindergarten), which was observed for 51.45% of the patients studied. Such factors as passive smoking and bottle feeding were present in 45.6% of the cases studied. Besides that, in bottle-fed children, the recurrence of acute otitis media increases – 75% of the examined patients had more than 3 incidents per year.

According to Norwegian researchers, OMA is more frequent in children of smoker parents and its incidence in the population is 6.0%, whereas in children not exposed to passive smoking it is reduced to 4.7% [13,14]. It results from the observations made by researchers that recurring otitis media occurs more often in humoral immunity deficient children, particularly in those with the deficiency of immunoglobulins of the IgG2 sub-class. Recurrence is three times higher in such cases than in children with normal immune system [15].

The next considered risk factor of acute otitis media was allergy, observed in 34% of the examined children. Its occurrence also predisposes to increased frequency of recurrence of the manifestations – more than 3 cases of OMA a year occurred in 50% of children with atopy. Mucous membrane of the ear rarely is a place of allergic reactions, however the mediators of inflammation released from mast cells during the atopic reaction cause – among other things – congestion, increased production of mucus, Eustachian tube swelling that impairs ventilation, and inflammatory condition in the middle ear [5]. It is believed that asthma and allergic rhinitis are risk factors of OMA, not recognized so far, in particular in case of recurring or protracting inflammations [16].

Other risk factors that had less influence on the development and recurrence of acute otitis media include: family predispositions – occurring in 9% of the examined children, prematurity – in 8.6% of the children, as well as poor social and economic conditions, noted in some 8.3% of the children.

Knowledge of environmental/community and individual factors that predispose to the occurrence of otitis media enables prevention of recurrence of the disease, e.g. abstaining from tobacco smoking by parents at home [3,8,13].

Analyzing the symptoms of acute otitis media, it has been demonstrated that earache was a dominating one, as it occurred in 84.2% of the cases, as well as accompanying rhinitis, that occurred in 83.6% of the examined children. A next symptom, in the order of occurrence, was fever, present in 66.5% of the cases, followed by irritation – 61.4% of the treated children, cough – 49.8%, hearing loss – 39.2%. Purulent exudate from the ear occurred in 11.5% of patients. In the opinion of pediatricians, also the earache occurring in the course of catarrhal infection should be considered as the most specific manifestation of acute otitis media [17]. According to the same reports, nonspecific manifestations, such as: fever, vomiting, and loose stools occur in 10% of the ill children, whereas anxiety, sleep disturbances, bad temper, scratching and pulling the ear, lack of appetite, and nausea are present in 50% of the ill children [17]. They also demonstrated that the younger is the child, the less specific are the manifestations, while nearly half of the babies with OMA do not have specific manifestations at all. In most children with OMA (according to literature: 76-90%) there are symptoms of acute upper respiratory tract infection, which may be found even a week before diagnosing acute otitis media [18]. If fever occurs, it usually (90% of the cases) does not exceed 39°C, in less than 5% of the ailing children the body temperature exceeds 40°C [19].

On otoscopic examination, the congestion of tympanic membrane and its bulging definitely increase the credibility of diagnosis [17]. In the examinations we carried out, the dominating manifestation detected on otoscopy was the uniform congestion of tympanic membrane, observed in nearly 70% of the examined children, congestion only in the area of manubrium mallei occurred in nearly 30% of the cases, bulging of the tympanic membrane in 10.6% of the children, and perforation with effusion in 8% of the children.

According to literature data, the two most frequently found irregularities on otoscopic examination of OMA are: bulging of the tympanic membrane (various authors state it occurs in 51% to 92% of the cases) and reduced mobility of that membrane (92-95%). That is followed by reduced translucency (52-82%), reddening (18-70%), and presence of perforation (3-13%) [19].

In questionnaire studies, doctors recorded the duration of OMA complaints: 3-5 days; 5-7 days; 10-14 days, as well as possible follow up of serous otitis media – SOM. As a result, of the 311 children examined, otitis media with effusion protracted (SOM) in 15.4% of children. The research indicates that in case of recurrence of OMA, 50% evolve into

chronic condition, whereas in case of one incident of inflammation per year, some 10% of the cases were followed due to SOM.

Children with diagnosed acute otitis media underwent only symptomatic treatment, or treatment with antibiotics. Antibiotics were administered to 75% of the children, among them some required change of the antibacterial drug administered – 7.7% of the cases, 25% of the patients underwent only symptomatic treatment. It results from the research that in case of recurrent otitis media (over 3 incidents per year) antibiotics were included for treatment of 97% of the children, while changes of the chemotherapeutic agent were required for nearly 41% of the patients. Symptomatic treatment was applied most often, in 31% of the cases of one incident of OMA per year (often the first incident of that disease).

According to some researchers, in 30% to 80% of children with acute otitis media not treated with antibiotics, spontaneous improvement of autopathic curing occurs within 10 days from the diagnosis of the disease [20]. It can be assumed, from practical point of view, that each case of OMA is or may evolve into bacterial infection, and as such should be treated with antibiotics from the very beginning [21]. In Holland, where in the years 2002-2008 an increase of OMA incidence in children was observed, also a greater number of cases treated with antibiotics, most often amoxicillin, was noted [22].

The collected questionnaire data indicate that the most frequently used antibiotic was cephalosporin of the II-nd generation, thus: cefuroxime in nearly 30% of the cases, cefaclor in 22.6% of the cases. 27% of children suffering from acute otitis media were treated with amoxicillin with clavulanic acid, while pure amoxicillin was applied in 17% of the patients. Alternative antibiotics (most often the macrolids – clarithromycin and azithromycin) were administered to some 28% of patients, while sulphonamides (Bactrim) – in 4.7% of the examined children.

According to literature data, the medicine of choice in the early treatment of benign, rarely recurring forms of OMA is amoxicillin. Alternatives include: cephalosporins of the II-nd or III-rd generation, resistant to beta-lactamases, or amoxicillins with clavulanic acid. In case of allergy to beta-lactames, alternative medicines are the new macrolids (clarithromycin and azithromycin) [22].

Recently, one could notice the violent increase of *Streptococcus pneumoniae* strains development (the most important cause of acute otitis media) resistant to antibacterial drugs [1]. That made empirical therapy of infections more difficult, and caused an increase in failed therapies [9,15,23].

In recent years the literature points out a reduced incidence of complications in acute otitis media. Before introduction of antibiotics, the frequency of intracranial complications reached 2.3% to 6.4%, with mortality rate of 76.4% [21]. Introduction of therapy with antibiotics and surgical methods, which enable to prevent and treat intracranial complications of acute otitis media reduced their occurrence to 0.04-0.15%, while mortality rate was from 10% to 31% [6,10].

The examinations we performed took into account the existence of otitis media complications within the temporal bone area. The most frequently noted complication turned out to be the recurrence of the disease, which affected 17.3% of the studied children. Such a high percentage of recurrences may be explained by the fact that all children reported through questionnaires were treated only in conservative manner, although it is known that performing myringotomy significantly reduces the frequency of acute otitis media recurrence.

Another complication of acute otitis media in children was hearing loss, experienced in 11% of the cases, detected in 43.3% in subacute otitis media conditions, and in over 40% of the cases – in the group of recurrent episodes of acute otitis media. It has been demonstrated in other studies that conductive hearing loss amounting to 15 dB occurred in 30-40% of the patients, while that amounting to 30 dB – in 25% of the patients suffering from OMA or otitis media with effusion (OME) [2,8,23]. Various degrees of conductive hearing loss occurs as secondary complication following the effusion present in the tympanic cavity [6,11].

In the entire group of examined children, there was no case of hearing loss having sensory-nervous character. In the cases discussed, perforation of tympanic membrane has been diagnosed only in 5 children of the 311 patients with OMA, which is 1.6%. Otitis interna in the course of acute otitis media is a rare complication in children, occurring most often during viral infections [4]. Toxins penetrate to the window of the labyrinth, and the infection is spread along the vessels [4,21]. In our material there were irritations of the inner ear – the labyrinth (dizziness, ear buzzing) that occurred in 4 children (1.3% of cases). Acute inflammation of the mastoid process occurred in 2 children from the group we examined. The frequency of occurrence of acute inflammation of the mastoid process in the population of children in Greenland is 7.4% in the age group from 0 to 10 years [24]. In Spain it occurred, on the average, in 14.5% of otitis media cases a year, while the average disease development time is 3 years of age [12]. In the group of children we studied, no case of facial

nerve palsy has been diagnosed. According to Elliott [25], it is the most frequent complication of OMA. Hearing loss, a consequence of OMA, is a major problem of the infantile otorhinolaryngology [26].

CONCLUSIONS

1. OMA occurred most often in children at pre-school age of 3-6 years (41.48%).
2. Also in the same age group (3-6 years) the highest percentage of disease recurrence has been found – 65.53%.
3. The most frequently occurring risk factor for acute otitis media in the group of children we examined was the recurrent upper respiratory tract infection – 71.7% of the examined children. The second most prominent risk factor was the fact that children stayed in a child care facility

- ty (crèche, kindergarten) – OMA was diagnosed in 51.45% of the young patients examined.
4. OMA having serous character has been observed in 25% of patients and did not require treatment with antibiotics.
5. Treatment of OMA in most of the children was within the limits of standards assumed (antibiotics of class I and II).
6. The most frequent complications include recurrence of the disease (17.3 %) as well as hearing loss (15%).
7. In 15% of the cases, OMA evolved into chronic SOM.

Conflict of interest

The authors confirm that this article content has no conflict of interest.

Piśmiennictwo

1. Daly KA, Hoffman HJ, Kvaerner KJ, Kvestad E, Casselbrant ML, Homoe P, et al. Epidemiology, natural history, and risk factors: panel report from the Ninth International Research Conference on Otitis Media. *Int J Pediatr Otorhinolaryngol* 2010; 74(3): 231-40.
2. Lambert E, Roy S. Otitis media and ear tubes. *Pediatr Clin North Am* 2013; 60(4): 809-26.
3. Auinger P, Lanphear BP, Kalkwarf HJ, Mansour ME. Trends in otitis media among children in the United States. *Pediatrics* 2003; 112(3 Pt 1): 514-20.
4. Pettigrew MM, Gent JF, Pyles RB, Miller AL, Nokso-Koivisto J, Chonmaitree T. Viral – bacterial interactions and risk of acute otitis media complicating upper respiratory tract infection. *J Clin Microbiol* 2011; 49(11) 3750-5.
5. Bjur KA, Lynch RL, Fenta YA, Yoo KH, Jacobson RM, Li X, Juhn YJ. Assessment of the association between atopic conditions and tympanostomy tube placement in children. *Allergy Asthma Proc* 2012; 33(3) 289-96.
6. Martines F, Bentivegna D, Maira E, Sciacca V, Martines E. Risk factors for otitis media with effusion: case-control study in Sicilian schoolchildren. *Int J Pediatr Otorhinolaryngol* 2011; 75(6): 754-9.
7. Lieberthal AS, Carroll AE, Chonmaitree T, Ganiats TG, Hoberman A, Jackson MA, et al. The diagnosis and management of acute otitis media. *Pediatrics* 2013; 131(3): 964-99.
8. Kong K, Coates HL. Natural history, definitions, risk factors and burden of otitis media. *Med J Aust* 2009; 191(9 Suppl): S39-43.
9. Mandel EM, Casselbrant ML. Treatment of acute otitis media in young children. *Curr Allergy Asthma Rep* 2012; 12(6): 559-63.
10. Salah M, Abdel-Aziz M, Al-Farok A, Jebrini A. Recurrent acute otitis media in infants: Analysis of risk factors. *Int J Pediatr Otorhinolaryngol* 2013; 77(10): 1665-9.
11. Bardach A, Ciapponi A, Garcia-Marti S, Glujovsky D, Mazzoni A, Fayad A, et al. Epidemiology of acute otitis media in children of Latin America and the Caribbean, a systematic review and metaanalysis. *Int J Pediatr Otorhinolaryngol* 2011; 75(9): 1062-70.
12. Croche Santander B, Porras Gonzales A, Obando Santaella I. Acute mastoiditis: experience in tertiary-care center in the South of Spain during 1999-2008. *An Pediatr* 2010; 72(4): 257-62.
13. Haberg SE, Bental YE, London SJ, Kvaerner KJ, Nystad W, Nafstad P. Prenatal and postnatal parental smoking and acute otitis media in early childhood. *Acta Paediatr* 2010; 99(1): 99-105.
14. Feldman C, Anderson R. Cigarette smoking and mechanisms of susceptibility to infections of the respiratory tract and other organ systems. *J Infect* 2013; 67(3): 169-84.
15. Arguedas A, Kvaerner K, Liese J, Schilder AG, Pelton SI. Otitis media across nine countries: disease burden and management. *Int J Pediatr Otorhinolaryngol* 2010; 74(12): 1419-24.
16. Akinpelu O. Otitis media in children: a third world experience presented at the 9th International Symposium on Recent Advances in Otitis Media (2007).
17. Uitti JM, Laine MK, Tähtinen PA, Ruuskanen O, Ruohola A. Symptoms and otoscopic signs in bilateral and unilateral acute otitis media. *Pediatrics* 2013; 131(2): e398-405.
18. Simpson SA, Thomas CL, van der Linden MK, Macmillan H, van der Wouden JC, Butler C. Identification of children in the first four years of life for early treatment for otitis media with effusion. *Cochrane Database Syst Rev* 2007; 24: CD004163.
19. Ting PJ, Lin CH, Huang FL, Lin MC, Hwang KP, Huang YC, et al. Epidemiology of acute otitis media among young children: a multiple database study in Taiwan. *J Microbiol Immunol Infect* 2012; 45(6): 453-8.
20. Uijen JH, Bindels PJ, Schellevis FG, van der Wouden JC. ENT problems in Dutch children: trends in incidence rates, antibiotic prescribing and referrals 2002-2008. *Scand J Prim Health Care* 2011; 29(2): 75-9.
21. Glasziou PP, Del Mar CB, Sanders SL, Hayem M. Antibiotics for acute otitis media in children. *Cochrane Database Syst Rev* 2004; 1: CD000219.

22. Hoberman A, Ruohola A, Shaikh N, Tähtinen PA, Paradise JL. Acute otitis media in children younger than 2 years. *JAMA Pediatr* 2013; 167(12): 1171-2.
23. Stevanovic T, Komazec Z, Lemajic-Komazec S, Jovic R. Acute otitis media: to follow-up or treat? *Int J Pediatr Otorhinolaryngol* 2010; 74(8): 930-3.
24. Homøe P, Jensen RG, Brofeldt S. Acute mastoiditis in Greenland between 1994-2007. *Rural Remote Health*. 2010;10(2): 1335.
25. Elliott CA, Zalzal GH, Gottlielo WL. Acute otitis media and facial paralysis in children. *Ann Otol Rhinol Laryngol* 1996; 105(1): 58-62.
26. Skarżyński H, Piotrowska A. Prevention of communication disorders – screening pre-school and school-age children for problems with hearing, vision and speech: European Consensus Statement *Med Sci Monit* 2012; 18(4): SR17-21.