



Actions undertaken by parents in prevention of acute respiratory infections in children

Działania podejmowane przez rodziców w zakresie profilaktyki ostrych zakażeń układu oddechowego u dzieci

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Abstract

Introduction and Objective. Acute infections of the respiratory system in children constitute a significant health, epidemiological and social problem. Due to the high frequency of infections in children and their repeated severe course, prophylactic measures are of particular importance. The aim of the study was to analyze and evaluate the efforts undertaken by parents in the prevention of acute respiratory infections in children.

Materials and method. Research was carried out among 122 parents of children diagnosed with acute respiratory infection. The study used the method of own diagnostic survey.

Results. The vast majority of parents (95.4%) confirmed that their children were vaccinated in accordance with the current vaccination schedule. The majority of respondents (55%) indicated that their children were not breastfed until 6 months of age. The results revealed that the mean incidence of pneumonia was higher in those who were not breastfed (0.44 ± 0.89) than in the group of children breastfed up to 6 months of age ($p=0.0412$). In almost half of the children, the duration of walks / regular physical activity during the day was only 60 minutes – 48.1% of the respondents.

Conclusions. In the group of factors increasing the risk of acute respiratory infections in children, the attendance to nurseries / kindergartens dominated. The most frequent actions taken by parents to reduce the risk of acute respiratory infections in children included: observing the vaccination schedule, adequate number of hours of sleep in the child, administration of vitamin D, and parents who do not smoke cigarettes.

Key words

preventive actions, risk factors, acute respiratory infections

Streszczenie

Wprowadzenie i cel pracy. Ostre zakażenia układu oddechowego u dzieci stanowią istotny problem zdrowotny, epidemiologiczny oraz społeczny. Ze względu na dużą częstość występowania zakażeń u dzieci oraz wielokrotnie ich ciężki przebieg szczególnego znaczenia nabierają działania profilaktyczne. Celem pracy było poddanie analizie i ocenie działań podejmowanych przez rodziców w zakresie profilaktyki ostrych zakażeń układu oddechowego u dzieci.

Materiał i metody. Badania przeprowadzono wśród 122 rodziców dzieci, u których zdiagnozowano ostre zakażenie układu oddechowego. Wykorzystano w nim metodę sondażu diagnostycznego własnego autorstwa.

Wyniki. Zdecydowana większość rodziców – 95,4% badanych – potwierdziła fakt, iż ich dzieci zostały zaszczepione zgodnie z obowiązującym kalendarzem szczepień. Większość ankietowanych – 55% badanej grupy – wskazała, że ich dzieci nie były karmione piersią do 6. miesiąca życia. Wyniki ujawniły, iż średnia częstość występowania zapalenia płuc była większa u dzieci niekarmionych piersią ($0,44 \pm 0,89$) niż w grupie dzieci karmionych do 6. miesiąca życia ($p=0,0412$). U prawie połowy dzieci czas trwania spacerów/regularnej aktywności ruchowej dziecka w ciągu dnia wynosił tylko 60 minut – takiej odpowiedzi udzieliło 48,1% respondentów.

Wnioski. W grupie czynników zwiększających ryzyko występowania ostrych zakażeń układu oddechowego u dzieci dominowało uczęszczanie do żłobka/przedszkola. Do najczęściej podejmowanych przez rodziców działań zmniejszających ryzyko występowania ostrych zakażeń układu oddechowego u dzieci należały: przestrzeganie kalendarza szczepień, podawanie witaminy D, odpowiednia liczba godzin snu u dziecka, niepalenie przez rodziców papierosów.

Słowa kluczowe

czynniki ryzyka, działania profilaktyczne, ostre infekcje układu oddechowego

INTRODUCTION AND OBJECTIVE

Acute respiratory infections in children constitute a significant health, epidemiological and social problem in the spring

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and autumn-winter period. The most important etiological factors responsible for the emergence of respiratory tract infections are viruses and bacteria. Acute respiratory infections include: acute pharyngotonsillitis, acute otitis media, acute rhinosinusitis, acute subglottic laryngitis, acute bronchitis, acute bronchiolitis and pneumonia. Clinical symptoms of the indicated diseases depend primarily on the location of the infection. Diagnostics is based on the physical examination of the child and on the interview, less often on laboratory and imaging tests. In most cases, children require symptomatic treatment, rarely antibiotic therapy [1,2,3]. Due to the high frequency and often severe course of the infections, including the hospitalization of the child, preventive measures are of particular importance. Professional child health care focuses on health-promoting behaviours, disease prevention activities, mainly by preventive vaccinations. The level of parents' knowledge of the factors reducing the risk of acute respiratory infections also plays an important role, and these include: adequate sleep hours for a child, regular physical activity, breastfeeding a child over 6 months old, no exposure to tobacco smoke and air pollution, following the correct diet and keeping optimal body weight, avoiding stress and adequate housing conditions [3,4,5].

The aim of the study was to analyze and evaluate the actions undertaken by parents in the prevention of acute respiratory infections in children.

MATERIALS AND METHOD

The research was carried out among parents (n=122) and their children (n=131) hospitalized in the children's diseases department in the Pleszew Medical Centre and the L. Perzyna Provincial Polyclinical Hospital in Kalisz, central Poland, and during paediatrician's appointments at the Primary Health Care Clinics in Pleszew, north-west of Kalisz. In the study group, nine parents completed the questionnaire twice (they had two children). The survey was conducted from November 2020 – February 2021. Participation in the survey was voluntary and anonymous.

The method of a diagnostic survey was used in the study. The research tool was a proprietary survey consisting of demographics and 15 thematic questions: 11 closed (containing from 2–4 distractors) and 4 open ones. The open-ended questions concerned the dose of vitamin D given to the child, the number of hours of sleep, drugs that improve immunity, and the occurrence of immunodeficiency syndromes. The demographics concerned the socio-demographic characteristics of the respondents; the thematic questions focused on issues such as the frequency and the type of acute respiratory infections in children, and the factors that increase / decrease the risk of disease. The Pearson chi-square test of independence, the Yates correction chi-square test, the likelihood-ratio chi-square test, and the Kruskal-Wallis test were used. Due to the fact that the incidence of respiratory system infections is a discrete measurable variable described on the ordinal scale, the Mann-Whitney U test was also used. A p value <0.05 was considered statistically significant. Statistical calculations were performed using the STATISTICA 10 PL statistical package.

RESULTS

The parents of the surveyed group were aged from 21–53; average age – 31.9±7.3 years, median – 30 years. The vast majority of parents were women – 92.6%. Slightly more than half of the respondents lived in the countryside – 54.1% and had two children – 51.6%. Half of the parents had secondary education – 50.0%; the majority of respondents declared very good housing conditions – 69.7%; parents most often had children aged 4–6–38.5%. The average age of the children was 5.4±4.2 years, median – 4.5 years.

The surveyed parents answering the question: 'Which of the following respiratory infections occurred in your child?' indicated: acute pharyngotonsillitis – in 42.7% of children; acute bronchitis – in 32.1% and pneumonia – in 25.2% of children. There was a total of 226 acute respiratory infections among 131 children (1 child had 1–7 infections) (Tab. 1). On the other hand, when asked: 'How often did your child have acute respiratory infections in the last year?', the parents mentioned: acute subglottic laryngitis – on average, 2.30±1.92 times a year (0–7 times); acute rhinosinusitis – on average, 2.10±1.35 times a year (0–5 times); acute pharyngotonsillitis – on average, 1.88±1.51 times a year (0–8 times).

Table 1. The number and frequency of acute respiratory infections among children (multiple responses)

„Which of the following respiratory infections occurred in your child?“ n=131	n	% responses	% cases
Acute pharyngotonsillitis	56	24,8	42,7
Acute otitis media	30	13,3	22,9
Acute rhinosinusitis	30	13,3	22,9
Acute subglottic laryngitis	23	10,2	17,6
Acute bronchitis	42	18,6	32,1
Acute bronchiolitis	12	5,3	9,2
Pneumonia	33	14,6	25,2
Overall	226	100,0	172,5

Analysing the occurrence of factors increasing the risk of developing acute respiratory infections in children, 3 questions were formulated to verify the above issue. Answering the question: 'Is your child a premature baby?' – the vast majority of respondents confirmed the lack of prematurity – 90.8%. In reply to the question: 'Do you have immunodeficiency syndromes in your child?' – respondents confirmed them in 3 children – 2.3%. Next, in reply to the question: 'Has your child attended / attends a nursery / kindergarten?' – the respondents stated that the majority of children attended / attend a nursery / kindergarten – 60.3%.

10 questions were constructed for examining the presence of factors reducing the risk of acute respiratory infections among children. The responses to the question: 'Has the baby been breastfed for at least 6 months?' – revealed that 55% of the respondents did not confirm this fact. When asked: 'Do you comply with the obligatory protective vaccinations in your child in accordance with the vaccination schedule?' – the vast majority of parents indicated that 95.4% of children were vaccinated in accordance with the current vaccination schedule. In the group of respondents, only 8.4% declared additional vaccination against influenza in children.

Answering the question: 'How many hours does your

child sleep? – parents reported that more than half of the children slept 8–10 hours – 50.4%; 19.8% of children slept 10–12 hours and 19.1% of children slept at least 12 hours; the remaining children slept from 7–8 hours – 10.7%. Answers to the question about ‘The duration of walks / regular physical activity of your child during the day?’ – indicated that 48.1% of children are physically active for 60 minutes during the day; 35.2% for 90 minutes and longer.

Answering the question: ‘Do you give your child vitamin D?’ – the respondents indicated that the vast majority of children were administered vitamin D – 71.8%. On the other hand, the administration of drugs (in the opinion of parents) to children to improve immunity, such as fish oil, vitamin C, multivitamin, inosine preparations, was confirmed by parents in 49.6% of children. Answering the question: ‘Do you smoke cigarettes?’ – the majority of parents declared that they did not smoke – 77.9%; on the other hand, in answer to the question: ‘Do household members smoke cigarettes in the apartment?’ – similarly, the majority did not do so – 93.1%.

Analysing the relationship between the age of children and the type of acute respiratory infections, the results revealed that acute otitis media was the most common among children aged 7–18–42.5%); in turn, acute bronchitis was most often diagnosed in children aged 4–6–43.2%, and in children aged 7–18–37.5% ($p=0.0018$; $p=0.0190$). Moreover, there was a statistically significant difference in the incidence of infections between children of different ages only for acute otitis media ($p=0.0062$); the average incidence of the disease was the highest in children aged 7–18 years (0.60 ± 0.93).

The study additionally assessed the impact of socio-demographic factors that could have a negative / positive impact on parents taking preventive measures. By verifying factors such as: parents’ age, education, housing conditions and the presence of premature birth in the child, a statistically significant relationship was revealed only in relation to parents with higher education ($p=0.0245$). When examining the relationship between the frequency and type of respiratory system infections among children, it was confirmed that acute bronchitis was the most common in the group of premature babies – 58.3% ($p=0.0489$); the average incidence of acute bronchiolitis was higher than in other children – 0.67 ± 1.23 ($p=0.0019$). Statistical analysis showed a significant correlation between the parents’ place of residence and children’s attendance at nursery schools / kindergartens ($p=0.0116$). Among the respondents whose child attended / attends a nursery / kindergarten, the percentage of people living in the city was higher – 72.4%. The study revealed that the mean incidence of acute pharyngotonsillitis was higher in children who attended nursery / kindergarten (1.00 ± 1.54) ($p=0.0280$). On the other hand, the average incidence of pneumonia was higher in non-breastfed children (0.44 ± 0.89) than in the group of children breastfed up to 6 months of age ($p=0.0412$) (Tab. 2).

Among the parents who did not comply with the compulsory immunization of their child, the highest percentage concerned those with primary and vocational education – 16.7%. Moreover, a statistically significant correlation was confirmed between the parents’ place of residence in the city (13.8%) and the additional child’s vaccination against influenza ($p=0.0472$). Analysis of the impact and importance of the correct number of hours of sleep in reducing the risk of infection, confirmed a statistically significant relationship between the age of the parents and the number of hours of

Table 2. Descriptive statistics of the incidence of acute respiratory infections in breastfed and non-breastfed children and the results of the Mann-Whitney U test

The type of respiratory infection Yes n = 59	Breastfed baby		Z	p
	No n = 72			
Acute pharyngotonsillitis	M±SD	0,97±1,47 0,67±1,24	1,49	0,1373
	Me (Q25-Q75)	0 (0-2) 0 (0-1)		
Acute otitis media	M±SD	0,31±0,62 0,32±0,75	0,27	0,7855
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Acute rhinosinusitis	M±SD	0,44±0,99 0,51±1,17	-0,13	0,8958
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Acute subglottic laryngitis	M±SD	0,34±1,04 0,46±1,29	-0,09	0,9292
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Acute bronchitis	M±SD	0,32±0,57 0,43±0,78	-0,53	0,5982
	Me (Q25-Q75)	0 (0-1) 0 (0-1)		
Acute bronchiolitis	M±SD	0,12±0,59 0,15±0,43	-1,39	0,1653
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Pneumonia	M±SD	0,19±0,47 0,44±0,89	-2,04	0,0412
	Me (Q25-Q75)	0 (0-0) 0 (0-1)		

sleep ($p < 0.0001$). Among parents whose child slept for up to 8 hours, the highest percentage was among those aged over 35 (23.7%).

In the group of children who did not receive vitamin D, acute pharyngotonsillitis (1.08 ± 1.32) ($p=0.0438$) and acute bronchitis (0.65 ± 0.95) were more frequent ($p=0.0168$) (Tab. 3).

Table 3. Descriptive statistics of the incidence of acute respiratory tract infections in children taking and not taking vitamin D and the results of the Mann-Whitney U test

The type of respiratory infection Yes n = 94	Administering vitamin D to a child		Z	p
	No n = 37			
Acute pharyngotonsillitis	M±SD	0,69±1,36 1,08±1,32	-2,02	0,0438
	Me (Q25-Q75)	0 (0-1) 1 (0-2)		
Acute otitis media	M±SD	0,32±0,64 0,30±0,81	0,70	0,4820
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Acute rhinosinusitis	M±SD	0,41±0,99 0,65±1,32	-1,12	0,2620
	Me (Q25-Q75)	0 (0-0) 0 (0-1)		
Acute subglottic laryngitis	M±SD	0,33±1,10 0,59±1,36	-1,51	0,1314
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Acute bronchitis	M±SD	0,28±0,57 0,65±0,95	-2,39	0,0168
	Me (Q25-Q75)	0 (0-0) 0 (0-1)		
Acute bronchiolitis	M±SD	0,15±0,57 0,11±0,31	-0,32	0,7475
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		
Pneumonia	M±SD	0,33±0,72 0,32±0,78	0,31	0,7562
	Me (Q25-Q75)	0 (0-0) 0 (0-0)		

The obtained results confirmed a significant correlation between parental age and cigarette smoking ($p=0.0086$). Among parents who smoked cigarettes, the largest percentage was among those aged up to 25 (41.9%). On the other hand, those over 35 years of age dominated (86.8%) in the group of parents who did not smoke cigarettes.

DISCUSSION

The preventive health care of children and youth in Poland has several decades tradition, dating back to the 1950s. Currently, the health condition of the population of children and adolescents is maintained at a high level, thanks to the intensive development of medicine, better organized health care and preventive medicine. However, the complexity and professionalization of childcare is not without the problem of excessive medicalisation and the parents / guardians ignoring the importance of activities enhancing the proper development of the child. Acute respiratory infections still dominate among the most common health threats in the population of children, causing frequent hospitalizations and the occurrence of many complications. Many authors point to the need for systematic observation of the course of hospitalization of children due to selected respiratory diseases as an important element in shaping public health policy. [3,4,5,6].

Acute respiratory infections in children are the most common cause of outpatient consultations and account for approximately 50–60% of all out-of-hospital infections. The indicated infections appear seasonally with varying frequency depending on the age of the child and the presence of risk factors. Respiratory tract infection in newborns and infants occur most often as haematogenous pneumonia or as a complication in the course of immunodeficiency syndrome, heart defects or gastroesophageal reflux. Younger children, up to 5 years of age, are the group particularly exposed to respiratory system infections, due to the physiological immaturity of the immune system, environmental risk factors and allergies. It is worth emphasizing that unjustified administration of antibiotics in children favours the occurrence of the phenomenon of increasing resistance [7]. The main causes of acute respiratory infections are viruses (rhinoviruses, adenoviruses, coronaviruses, influenza and parainfluenza viruses, RS virus and enteroviruses), less often bacteria (*Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Streptococcus pyogenes*) [1,2].

Szczukocka-Zych and Makowska report that pre-school children may become ill 8 times a year, while the number of infections in children attending nursery schools may be 12–14 per year [3]. Our own research confirmed that 226 acute respiratory infections occurred in a group of 131 children in total; the most common diagnoses were: acute pharyngotonsillitis (42.7%), acute bronchitis (32.1%) and pneumonia (25.2%). In the study group, children had 1–7 infections. In the current study carried out on 122 parents, the problem of prematurity concerned only 9.2% of children and was statistically significant with the parents' higher education – 17.4%. Moreover, in the group of premature babies, acute bronchitis was the most common – 58.3%, while the average frequency of acute bronchiolitis was higher than in the group of other children (0.67 ± 1.23). On the other hand, Durlak and Kwinta report that children born between 34–37 weeks of pregnancy are more prone to severe respiratory infections in the first years of life. It was found that they required hospitalization due to RSV infection much more often (57/1,000) compared to children born at physiological term of delivery [8].

Modern knowledge and scientific views on natural feeding indicate that mother's milk is the food with the highest nutritional value. Breast milk contains biologically active ingredients, such as specific antibodies, enzymes, hormones, growth modulators and living cells, which support the

immature biological and immune functions of the infant. Breastfeeding purely up to 6 months of age and then maintaining it up to 2 years of age, with the gradual introduction of additional foods, reduces the risk of respiratory and gastrointestinal tract infections, and reduces the risk of death as a result of infection. The conducted research shows that breastfeeding during the first 4 months of life reduces the number of episodes of otitis media, due to bacterial and viral infections, in the first year of life by half. Bednarek and Mazurkiewicz surveyed a group of 100 mothers of children aged 12–24 months and indicated that slightly less than half of all respondents (42%) breastfed their children only from birth to 6 months of age. Moreover, the obtained results revealed that in the group of breastfeeding mothers, the incidence of respiratory tract infections in children was lower than in the groups of children whose mothers used artificial and mixed feeding. It should be emphasized that among children who are exclusively breastfed, no cases of pneumonia have been reported [8,9]. In the authors' own research, 59 children (45.0%) reported breastfeeding for 6 months. In addition, the mean incidence of pneumonia was higher in the non-breastfed children than in the group of breastfed children up to 6 months of age (0.44 ± 0.89).

The problem of acute respiratory infections is also associated with certain environmental factors. One of them is the attendance of children at a nursery / kindergarten, and thus an easy droplet route of infection between healthy and sick children. In a literature review, the authors repeatedly emphasize the importance of such activities as: covering the mouth and nose when coughing or sneezing; washing / disinfecting hands after using the toilet, rinsing the mouth with water, and surface disinfection (handles, handrails) [7]. The results of own research revealed that most of the children (60.3%) attending a nursery / kindergarten lived in the city (72.4%). Moreover, children who attended the nursery / kindergarten more often suffered from acute pharyngotonsillitis (1.00 ± 1.54).

The importance of beneficial effects in reducing the risk of respiratory infections in children through the supplementation of vitamins and preparations that increase the body's resistance still raises much controversy. Hawke et al. indicate that the administration of homeopathic drugs does not have a beneficial effect on reducing the risk of respiratory infections and on the results of their treatment [10]. On the other hand, Garaiov et al. on the use of probiotics and vitamin C in the prophylaxis of upper respiratory tract infections in preschool children revealed that the administration of these preparations reduced the frequency of infections and the duration of treatment of infections [11]. Many clinical studies have confirmed that oral bacterial lysates minimize the risk of recurrent respiratory infections in adults and children [12] Hemilä emphasizes the role of vitamin C administration in the prevention / treatment of pneumonia [13]. Jurkiewicz points out that the administration of immune stimulating bacterial lysates minimizes the risk of recurrent respiratory infections and reduces the need for antibiotics [14].

In own research, just over half of the surveyed parents (50.4%) did not give their children any immunity-improving drugs, 49.6% of the respondents administered preparations such as: vitamin C, D, multivitamin supplements and fish oil. The role and importance of administering vitamin D to children in preventing infections is still not fully understood. Many authors indicate that children with low vitamin D levels are more likely to develop respiratory system infections,

and therefore recommend its supplementation [3]. Some reports indicate that vitamin D plays an important role in modulating the functions of the innate immune system and the body's response to microorganisms (it modulates the reaction of macrophages and monocytes) [15]. Martineau et al. report that vitamin D supplementation reduces the risk of acute respiratory infections [16]. Subsequently, et al. confirm that vitamin D may reduce the risk of illness and death from influenza [16]. In the current study, 94 children (71.8%) received vitamin D. Acute pharyngotonsillitis (1.08 ± 1.32) and acute bronchitis (0.65 ± 0.95) occurred more often among children who did not receive vitamin D.

Exposing children to tobacco smoke has been proven to increase the risk of acute respiratory infections. Smoking by one parent increases the risk of infections requiring hospitalization by 24%; the probable reason being the smaller diameter of the bronchi of babies born by smoking mothers. There is a 2.5-fold higher risk of developing bronchiolitis. Moreover, smoking in the environment of a preschool child causes more frequent colonization of the nasopharynx by pathogenic bacteria: *Moraxella catarrhalis* and *Streptococcus pneumoniae*. Smoking more than half a pack of cigarettes a day increases the risk of lower respiratory tract infection twice, as does smoking in a room other than the one where the child is present [7]. In the group of 122 parents surveyed in the current study, smoking was confirmed by 22.1%, while passive smoking was confirmed by 6.9%.

Preventive vaccination in children is one of the most effective methods of fighting infectious diseases, including respiratory system infections. An alarming fact is the increase in the number of unvaccinated children, which has been observed for several years. The number of parents not vaccinating their children or deliberately delaying their continuation is also increasing. In 2017 in Poland, according to data from the National Institute of Public Health, the number of unvaccinated children increased to over 30,000. Research by Duda et al. among 302 parents of children aged 0–6, confirmed that those who did not vaccinate their children (110 parents) most often lived in cities – 31%, had higher education – 71%, and described their situation as good – 60% [18]. Similarly, research by Faleńczyk et al. revealed that parents with higher education declared a negative opinion about vaccination [19]. In their work, Anderson et al. broadly discuss the role and importance of preventive vaccinations in combating bacterial infections of the respiratory tract in children, while emphasizing the limitations of the influenza vaccine due to the seasonal variability of virus strains [21]. Own research confirmed that the vast majority of children (95.4%) were vaccinated according to the vaccination schedule. Only 11 children took advantage of the additional vaccination against influenza – 8.4%; isolated respiratory tract infections were reported in the group of unvaccinated children.

Esposito et al. emphasize the importance of administering probiotics, vitamin D, immunization and washing hands in the prevention of recurrent respiratory tract infections in children [20].

CONCLUSIONS

1. In the group of factors increasing the risk of acute respiratory infections in children, the attendance to nurseries / kindergarten dominated.

2. The most frequent actions taken by parents to reduce the risk of acute respiratory infections in children included: observing the vaccination schedule, adequate number of hours of sleep in the child, administration of vitamin D, parents who do not smoke cigarettes.

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