

# Dyspnea in Children as a Symptom of Acute Respiratory Tract Infections and Antibiotic Prescribing

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## Abstract

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**BACKGROUND:** Dyspnea is an unpleasant feeling of breathing difficulty, shortness of breath and inability to satisfy the hunger for air. The role of family physicians is to be prepared to recognise dyspnea as a symptom of acute respiratory infections (ARI), to perform triage and managing of children with acute dyspnea and make continuous education of parents. In the treatment of acute dyspnea more important is to treat dyspnea as a symptom than the prescribing of antibiotics (AB). Nowadays, even more often large amount of children, because of the noncompliance in the treatment and the pressure from the parents, unnecessary is hospitalised and frequently used antibiotics: According to the guidelines, a small percentage of children with ARI should be treated with AB. The rate of antibiotic prescription should be around 15-20% and lower.

**AIM:** To assess doctor's AB prescriptions in Primary care practices in Macedonia, for ARI and dyspnea in children we use the data from a National project about antibiotic prescribing for acute respiratory tract infections, which has been run in 2014 November as a part of E - quality program.

**METHODS:** Eighty-six general practitioners from Macedonia have taken participation in it. The group of 3026 children, from 0-5 years of age, with symptoms of dyspnea, was analysed. We have found a rate of 54.6% antibiotic prescriptions (AB). From 3026 children with dyspnea, AB got 1519 children, 852 of which were prescribed by a specialist.

**RESULTS:** The children were mostly diagnosed with upper ARI, in 57.7%. The most used AB is amoxicillin + clavulonic acid. We concluded that there was an increased and inappropriate prescribing of antibiotics in children with ARI, presented with dyspnea in Macedonia.

**CONCLUSION:** Perceptions and the parent's attitudes do not correlate with the severity of clinical picture of the disease in children and lack of use Evidence-based medicine (EBM), insecurity, fear, loss of patients effect on antibiotic prescribing of the doctors.

## Introduction

Dyspnea is an inability to satisfy the hunger for air and leads to increased activity of the respiratory muscles, stimulation of neurotransmitter receptors and increased pCO<sub>2</sub> concentration. The most frequent aetiology for dyspnea in children are acute respiratory infections (ARI) and other diseases, such as asthma triggered by viruses, enlarged tonsils, allergic rhinitis, foreign body aspiration and other less frequent diseases, such as large tongue, choanal atresia, tracheomalacia, cystic fibrosis, bronchiectasis, dysfunction of the vocal cords, bronchial atresia, chest

wall diseases, chest deformations, weakness of the respiratory muscles etc. However, some of these can rapidly become life-threatening and therefore require rapid pre-hospital management [1]. Dyspnea is recognized by physical examination of the child and manifested with different severities of signs such as: child taking special sitting position that allows him an easier breathing, stridor, stertor (obstruction of the level of pharynx), increased body temperature, coughing, inter/subcostal retractions, wheezing, moaning, cyanosis [2]. In acute dyspnoic children, assessment of dyspnea severity and treatment response is frequently based on clinical dyspnea scores [3]. The role of family physicians is to be prepared to recognise and manage children with

dyspnea. Therefore, using an algorithm for assessment of stridor and bronchospasm could be helpful. Also, they should make continuous education of parents to change their attitudes and overcome prejudices. Because of the noncompliance in treatment, lack of use of Evidence-based medicine (EBM), lack of time, doctors fear of complications, diagnostic insecurity, the pressure from parents, tradition of uncontrolled use of antibiotics (AB) and the connotation that AB is for all diseases, a large number of children with dyspnea and acute ARI unnecessary are hospitalized and frequently used antibiotics [4]. Use of AB for dyspnea in most of the cases is ineffective and inappropriate. The rate of antibiotic prescriptions should be around 15-20% and lower [5]. Necessary and beneficial treatment with AB is needed only for acute tonsillopharyngitis caused by Group A beta-hemolytic streptococcus (GAS), bacterial tracheitis and pneumonia. The use of the guidelines plays a big role in helping physicians to manage children with dyspnea better and avoid unnecessary AB prescribing [6]. The most important thing for the doctors is to recognise urgent life-threatening symptoms of acute dyspnea, to be skilled in performing CPR, and determine the number of respirations, O<sub>2</sub> saturation with a pulse oximeter, to organise quick and safe referral [7]. Dyspnea and stertor are connected with large tonsils and needs a consultation with ENT specialist. Dyspnea, agitation and drooling are symptoms of the epiglottitis and need securing airways and referral. Dyspnea and stridor are the signs of laryngitis and ambulatory treatment of mild and moderate laryngitis with oral or intramuscular Dexamethasone, or inhaled Budesonide is useful [8]. Dyspnea, intoxication and fever associated with bacterial tracheitis need securing airways and referral. Dyspnea and wheezing in children > 2 years with a history of paroxysmal coughing associated with childhood asthma. A lot of children with asthma are mostly not recognised and are prescribed a lot of AB [9] [10]. Children < 2years with a dry cough, fever, nose secretion, crepitation and wheezing are associated with bronchiolitis. Dyspnea, cough, fever or moaning, choking and increased respiration, are signs of pneumonia. Mild or moderate pneumonia can be treated ambulatory with antibiotics and follow up. AB of the first choice is Amoxicillin. There is no need for making a chest x-ray (except for children < 2months, if there is no improvement after treatment or in recurrent pneumonia) [11].

## Material and Methods

We used the data from the National project about antibiotic prescribing for ARI run in November 2014, as a part of E - quality program, supported by International Primary Care Respiratory Group (IPCRG). 86 general practitioners from different areas

of the Republic of Macedonia took part in the project. Both written informed consent from each doctor and verbal informed consent from every patient or parent were obtained, before fulfilling the project questionnaires. Socio-demographic and medical data were obtained using personal or parental interviews. A group of 3036 children, from 0-5 y old, presented with symptoms of dyspnea, was analysed.

The obtained data were analysed by using STATISTICA for Windows version 7.

## Results

A total number of 3036 children from 0-5 years old, presented with dyspnea as a symptom of ARI were analysed, (Min. 0.1, Max. 5, Mean 2.57, St. Deviation 2.33).

Our analysis has shown that 63.8% of children with dyspnea were taken to the doctor's office, after day 2 of symptoms. Anamnestic data of an average duration of symptoms is 3.5 days without AB and 4 days with AB. In the first visit, there were 2412 children, 1228 of them got an AB, of whom only 59 children got an AB under the pressure of parents? The leading symptoms in the first 3 days are: coughing 69.6%, runny nose 46.3%, fever 40.3%, swallowing difficulties 16.3%, stuffed nose 22.6% and sore throat 11.1%. Control checkups were made in the case of 581 children, 308 of them received AB, and only 4 children got an AB under the pressure of parents. Average symptoms duration in 308 children was 5.5 days. After 4 days the leading symptoms were: coughing 73.5%, running nose 42%, increased temperature 36%, wheezing 16.5%, expectoration of sputum 15.7%, and difficulties in breathing 10.3%.

The rate of AB prescriptions for ARI presented with dyspnea in children is 54.6%, 3.16 % of the data were irrelevant due to improper fulfilling. From 3036 children presented with dyspnea, 1519 children got AB, 852 of which from a specialist (56%). Only 140 children had a complication (9.2%). 63.8% of children with dyspnea were taken to the doctor's offices after day 2. The children with ARI who were presented with dyspnea after physical examination were diagnosed mostly like upper ARI: acute rhinitis, pharyngitis, tonsillitis, streptococcal tonsillitis, laryngitis, croup and epiglottitis (J00, J02, J03, J03.0, J04) in 57.7 %. The children with lower ARI were diagnosed with acute bronchitis (J20) in 19.3%, tracheitis 2.25%, bronchiolitis 3.73%, pneumonia 3.21%. The percentage of complications needed antibiotic treatment was 9.2%. The data also showed that, the most prescribed antibiotic for dyspnea in children is amoxicillin + clavulonic acid 29.69%, amoxicillin 26.33%, Penicillin G 3.88%, cephalosporin's first and second generation 23.37%,

cephalosporin's third generation 2.76%, macrolides 6.25%, ampicillin therapy 3.09%, unknown antibiotics 1.18%, aminoglycosides 0.33%. 1968 children were presented as upper respiratory tract infection, and 1047 of them received antibiotic (35.6% of total patients), only 962 are presented as low ARI, of whom 557 (18.9% of total patients) were given AB. 54.6% of all children presented with dyspnea as a symptom of ARI received AB, 45.5% did not receive any. In both groups we found increased AB prescribing.

**Table 1: Gender, parents' educational level, low and upper ARI are among children with dyspnea who did or did not receive antibiotics**

Characteristics	N/% of children with dyspnea and without AB	p*	N/% of children with dyspnea and with AB
Girls	596 (21.09%)	0.008	751(26.58%)
Boys	728 (25.76%)		751(26.58%)
Mothers' educational level:			
Primary school	282 (21.28%)	0.014	421 (31.77 %)
Secondary school	615 (33.01%)	0.78	626 (33.60%)
University degree	304 (16.32%)		318 (17.07%)
Fathers' educational level:			
Primary school	246 (21.77%)	0.13	327 (28.94%)
Secondary school	731 (35.49%)	0.61	772 (35.49%)
University degree	264 (12.82%)		293 (14.22%)
Lower ARI	557 (18.95%)	0.036	415 (33.06%)
Upper ARI	1047 (35.6%)		921 (31.32%)
Attending daycare	420 (15.78%)	0.358	510 (19.17%)
Not attending day care	814 (30.59%)		917 (34.46%)

\*X<sup>2</sup>-test.

The results show significantly increased prescribing of AB in children with dyspnea in the group of mothers with primary education level and the group of children with upper ARI. In the group of children with upper ARI, we found significant increased AB prescribing as compared with children with low ARI ( $p < 0.05$ ). Boys more frequently have dyspnea and significantly use more AB, than girls. There are no significant differences in prescribing of AB in children with dyspnea in the groups of mothers with secondary education level and the ones with the university degree. Attendances of a daycare centre have no significant influence on AB prescribing in children with dyspnea (Table1).

**Table 2: Dyspnea in children with ARI and Spearman rank correlation (R)**

Variable	Variable	Spearman rank correlation (R)	P<0.05
Dyspnea	Age of children	0.056	0.002
Dyspnea	Education of the mothers	0.130	0.00
Dyspnea	Asthma	0.2135	0.00
Dyspnea	Coughing	0.069	0.00
Dyspnea	Prolonged inspiration	0.075	0.00
Dyspnea	Wheezing	0.5238	0.00
dyspnea	Use of bronchodilators (relievers)	0.334	0.00
Referral to specialist	Antibiotic prescribing	0.065	0.00

Statistical analysis of Spearman Rank Correlation (R) shows a significant correlation ( $p < 0.05$ ) between dyspnea and age, educational level of the mothers, the presence of asthma, symptoms of coughing, stridor, wheezing and the use of bronchodilators and strong correlation between referral to a specialist and antibiotic prescribing. Visits

to a daycare centre haven't got a significant impact on antibiotic prescribing (Table 2).

## Discussion

The most predominant reasons for dyspnea are ARI in children, coming with different severities and treatment. The most of those diseases should not be treated with antibiotics [12]. The rate of AB prescription in Macedonia is higher and inappropriate than in the countries of northern Europe and does not comply with EBM [5]. The most of the children were taken to the doctor's office after the second day of the disease and received AB, even though most of them (> 80%) had virus upper ARI and mostly didn't have the benefit of it. The symptoms last for 3.5 - 4 days with or without AB, but the parents have a fear of complications and lack of medical education [13]. Even the percentage of complications is low and small number of children got an AB under the pressure of parents( which counts low and unusual), the most of the children received AB after the first visit, bring to conclusion that the doctors prescribe more AB than the willingness of the parents to receive antibiotics [14]. The possible reasons for that are as follows: fear of complications, easy approach of the parents to the specialists for minor diseases especially for the children, lack of parent's education and [15]. The results showed increased AB prescriptions in children with upper ARI and lowered ARI by GP,s and specialist in the hospitals even though most of them, according to guidelines and EBM didn't need AB treatment [13]. Increased AB prescriptions appear in both groups, especially in the one with upper ARI even when the doctors know to recognise the aetiology of dyspnea [16]. The main reasons for that are the doctor's and parent's attitudes [17] [18]. The parents have not been properly educated and prepared to be able to recognise dyspnea in children and often have fears which do not help to develop a critical attitude. They strongly believe in the effectiveness of various AB, thinking that AB is a cure for treatment of all diseases and make a strong pressure to the doctors' decision making, which in fact is not so obvious, but just their mere attitude and the filling of parent's fear can effect on the doctors' decision to prescribe AB [18]. Under that kind of pressure, fear of complications, uncertainty in diagnosis and willingness to protect themselves by law, doctors unnecessary prescribe an AB. According to the results, doctors rather than the parents are more likely want to prescribe AB, even though they have made a true diagnose and know that there is no need for an AB [4] [19]. The results of use bronchodilators indicated that doctors have excellent diagnostic abilities and can recognise and treat symptoms of dyspnea in children [20]. Boys with ARI are more predisposed to dyspnea than girls and

received more AB; perhaps this is in correlation with the structural differences between boys and girls similar to the Croatian study results [21]. Education of the mothers has a significant influence on AB prescribing only in the group of the mothers with primary educational level. We also found a statistically significant correlation between AB prescribing for dyspnea and referral to a specialist. There is no significant difference in the rate of prescribing AB between the groups of children who are attending or not attending in the daycare centres [21].

We can conclude that there is an increased and inappropriate prescribing of AB in children 0-5 years old with ARI presented with dyspnea in Macedonia. Dyspnea in ARI is significantly in correlation with the age of the children from 0-5 years old, the primary level of mother's education, wheezing, coughing, prolonged inspiration, asthma and the use of bronchodilators. The majority of the children presented with dyspnea are diagnosed mostly as upper respiratory tract infections. Perceptions and the parent's attitudes don't correlate with the severity of the clinical picture of the disease in children. The specialists also prescribed a lot of AB. Possible reasons for increased AB prescribing for dyspnea in ARI by the doctors in Primary health care practices are as follows: insufficient use of EBM, doctor's fears of complications, burning out, overload of patients, lack of time, need to meet the parent's demands, unmotivated, with no reward. On the other side, parents have high expectations and requirements, insufficient education, fears, prejudices and misconception. This conclusion can and should raise the need to implement new strategies in term of changing attitudes of both, doctors and parents.

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