

Who Are Paediatric Speleo Therapy Patients?

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Abstract: Speleo therapy is a climatic therapy method using the specific cave climate as a natural source for complementary treatment of asthmatic patients reducing their complex pharmaceutical therapy to minimum.

The purpose of this contribution is to present the socio-demographic profile of the patients attending speleo therapy in the Paediatric Sanatorium with Speleo Therapy at Ostrov u Macochy, and define their regional distribution across the Czech Republic.

The patient profile is based on data of randomly selected (733) patients of the Paediatric Sanatorium with Speleo Therapy at Ostrov u Macochy (by descriptive statistics and graphic visualisation of data).

The profile shows prevalence of boy (58.9%) over girl (41.1%) patients, in the most common age group of 5–10 and under repeated therapy in nearly half of the sample cases (48.3%). The most frequent diagnoses include bronchial asthma, recurrent respiratory infections and exercise induced asthma and a considerable part of the patients also suffer from various forms of allergies (74.4%). A prevailing majority of the children shows improvement of their health condition after a speleo therapy session cycle (95.5%) with recommended repetition of the therapy (98.9%). The geographic structure of the patients attending the sanatorium shows prevailing patient recruitment from South Moravia, Moravian Silesia, South Bohemia, Central Bohemia, Vysočina and Prague regions.

The results demonstrate the importance of speleo therapy for improving the health of patients.

Key words: health, speleo therapy, asthma, geographic structure, Moravian Karst

As shown by epidemiology studies, the global count of patients with diagnosed bronchial asthma exceeds 300 million, with different prevalence and significant geographic variability (Hübelová, Kozumplíková, & Überhuberová 2018). The development of the numbers of patients under pharmaceutical therapy for asthma diagnosis in the Czech Republic shows a slightly growing long-term trend. In the Czech Republic the health care of asthmatic patients is very high-standard with availability of nearly all known drugs, diagnostic and therapeutic procedures. The main risk factor applicable under our conditions is underestimation of the disease and insufficient quality of long-term preventive therapy (Pauk, 2016).

Bronchial asthma is a chronic respiratory disease belonging to the group of diseases whose progress and development can be affected by preventive care. Bronchial asthma is a “complex disease” with chronic inflammation of the airways as the basic mechanism of the disease. The airways are conceived for this purpose as a unified system beginning in the nose and ending in the lungs. The variability of clinical manifestations of asthma is given by the variability of the inflammatory mechanisms with a role played not only by eosinophils but also other cell populations including structural cells (epithelium, endothelium and smooth muscle cells) and

neural effects. Activation of these cells causes release and generation of biologically active substances (histamine, leukotrienes, cytokines, NO), which then strongly affect the clinical symptoms. The largest risk group for asthma onset is represented by patients with atopic manifestations or with already clinically manifested allergies (Lau et al., 2016). The complex factors affecting development of asthma can be classified as primarily genetically influences factors and factors of the environment. Individual genetic predispositions take about two-third share in the etiology and clinical phenotype of asthma (Noutsios & Floros, 2014). The variable clinical image of asthma with chronic inflammation, reversibility of bronchial obstruction and variable bronchial hyper reactivity results from interactions of genes with environmental factors, including allergens with their specific immunological effects (Di Novi, 2013; Šrám et al., 2013). And last but not least, the patient's way of life plays an important role too (Hazenkamp-von Arx et al., 2004). All these effects not given by the genetic predisposition must be considered in the therapy management.

In more than a third of all cases asthmatic symptoms already appear in the course of the first five years of life but their onset can be experienced in any age group. The prevalence of asthma has shown a growing trend in the current quarter century: in 1996 the percentage of asthmatic patients in the age group under 17 reached 3.8% (Robertson et al., 1998), in 2001 rising to 6.7% and the present qualified estimate is 8.0% (GINA, 2018). There is an assumption that by 2025 there will be another 10 million new asthmatic patients. The growing prevalence of asthma is connected with increasing atopic prevalence, currently ranging between 30 and 40%, and parallel growth of occurrence of other allergic diseases such as allergic rhinitis and eczema (GINA, 2018).

Data of the Institute of Health Information and Statistics of the Czech Republic show that the mean number of asthmatic patients under therapy at the age of 15–19 years in the Czech Republic in 2013 ranged around 1,200 patients/100 thousand people in the given age group. Above-average numbers of these patients are registered in the following regions: Zlínský (more than 1,800/100 thousand inhabitants), Moravian Silesia (1,500/100 thousand inhabitants), Liberecký and Prague (identically around 1,400/100 thousand inhabitants; IHIS CR, 2014). Overall prevalence of asthma in the Czech Republic is estimated to be 8% (800 thousand individuals), with the values of over 10% in the paediatric population. Despite this relatively high proportion a great number of patients are assumed not to be diagnosed at all yet. A number of undiagnosed cases in the Czech Republic occur among the lowest age groups, among seniors and among patients with persistent allergic rhinitis (Pohunek & Svobodová, 2007).

The percentage of asthmatic patients places the Czech Republic among the group of countries with asthma prevalence ranging between 7.6 and 10.0%. The lowest percentages are reported for India, Indonesia, Iran, Malaysia, Albania, China and Greece (Asher et al., 2006). Prevalence over 10% is shown by the U.S.A. (10.9%), Brazil (11.4%), Canada (14.1%), Ireland (14.6%), Australia (14.7%), New Zealand (15.1%), England (15.3%) and Scotland in the lead (18.4%; Patel, Järvelin, & Little, 2008).

Speleo therapy is one of the climatic therapy methods (Simionka et al., 2009; Rashleigh, Smith, & Roberts, 2014; Kendrova et al., 2016). It is based on the unique features of underground environment, especially karst caves. In the Czech Republic speleo therapy of paediatric patients has been provided since 1979 and in 1982 the Paediatric Sanatorium with Speleo Therapy was established to assist treatment of asthmatic and allergic patients under therapy at Ostrov u Macochy. The sanatorium was involved in various research projects in 1980s, defending the positive effect of speleo therapy on paediatric patients with bronchial asthma (the research was managed by doctors of medicine, Mr. Řičný and Mr. Slavík, MDs, and titled *Studies of Use of Speleo Therapy in Complex Care of Asthmatic Patients* and *Role*

of Speleo Therapy in Complex Treatment of Bronchial Asthma). The purpose and results of speleo therapy were also subject of earlier research implemented in the then Czechoslovakia, as well as in Poland and Hungary, and mentioning significant health improvement in one fifth of paediatric patients with bronchial asthma (Kessler et al., 1969; Bichonski & Skumlowski, 1971; Paskova, Kolesar, & Siposova, 1976). The research performed in Bystrá cage in Czechoslovakia and enrolling 80 asthmatic children at the age of 4–15 years proved considerable success of the therapy, especially in the 4–6 age group (Timova, Beer, & Svac, 1977).

Speleo therapy both improves clinical and immunological parameters and changes the image of functional examination of the lungs of asthmatic patients. The published results show that permanent improvement was achieved by speleo therapy in children with mild to moderate progress of asthma (Abdullaev, Gadzhiev, & Eiubova, 1993). So far no summary of the social profile of the patients attending speleo therapy has been published. This is partly given by the scope of care defined by the health insurance companies paying for the stays of paediatric patients in the therapeutic facilities and also by the fact that the statistics generally describe patients with chronic respiratory diseases.

1 Objectives

The purpose of the research was to find the socio-demographic profile of paediatric patients enrolled in speleo therapy in the Paediatric Sanatorium with Speleo Therapy at Ostrov u Macochy and to define their regional distribution across the Czech Republic. The information was taken from archived data of patients undergoing the therapy with a focus on the past decade and on the basis of random selection.

2 Methods

Data were collected from November 2017 to March 2018, the total number of selected patients was 733 and the number of edited indicators was 16 in total (including socio-demographic and medical indicators). This contribution deals with 10 of the total 16 mentioned indicators, including:

- 1) gender;
- 2) age;
- 3) place of residence according to the post code;
- 4) year of the first admission of the child in the sanatorium;
- 5) number of treatment cycles;
- 6) principal admission diagnosis;
- 7) condition after speleo therapy;
- 8) therapy continuation;
- 9) allergies;
- 10) occupations of mother and father of the child.

The basic socio-demographic profile of the patients was obtained by descriptive statistics and graphic visualisation of data. The geographical distribution of the patients was specified on

the basis of post codes from depersonalised patient data. For some municipalities, especially in the case of big cities, several post codes were grouped into a single whole to keep the basic settlement structure in the Czech Republic. For every resulting post code group the total number of patients treated in the paediatric sanatorium in the past decade was summarised. These data were subsequently visualised in a simple map.

3 Results

Descriptive statistics showed that the total number of the selected 733 paediatric patients included a higher percentage (58.9%) of male patients (boys) versus a lower percentage of female patients (girls, 41.1%). The age spectrum of the patients was broad, ranging from 2 to 16 years. The largest age group was represented by children from 5 to 10 years old, making nearly 80% of all the patients (Figure 1). The representation of this age group reflects the trend of the fastest growing prevalence of asthmatic patients at that age.

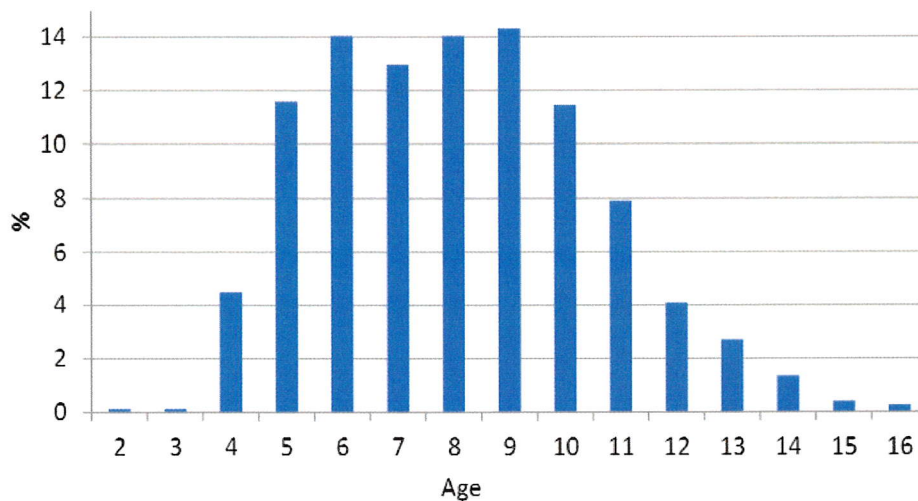


Figure 1. Percentages of patients by age (N = 733).

Geographic (spatial) distribution of paediatric patients treated in the sanatorium was based on usual place of residence of the children (defined by post code). Clearly most of the children taking part in the therapy were recruited from South Moravia, Moravian Silesia, South Bohemia and Central Bohemia, Vysočina and Prague regions (Figure 2).

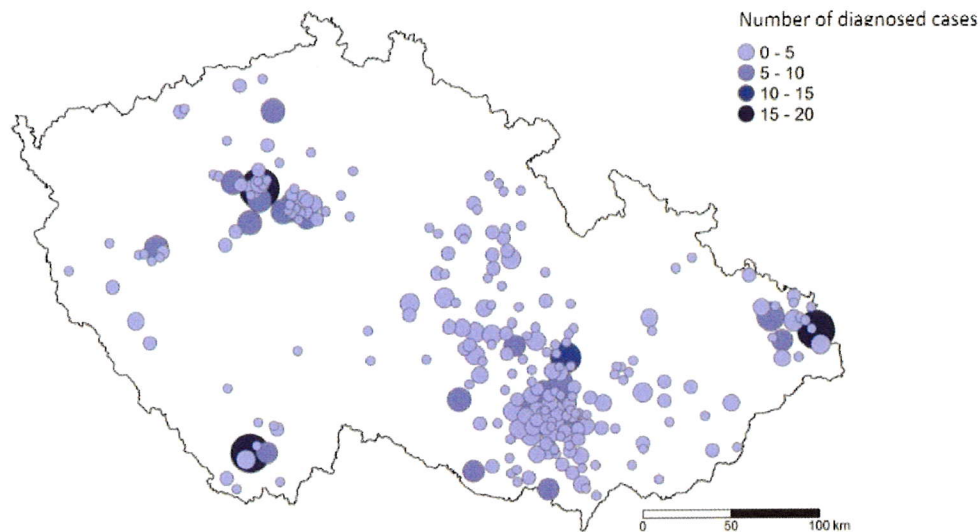


Figure 2. Geographic distribution of the patients based on their usual place of residence (numbers; N = 733).

Out of the 733 patients the highest number was admitted for the first therapeutic cycle in 2015 (16.6%). Further years with a significant proportion of children first attending speleo therapy were 2016 (12.8%) and 2014 (11.9%). A certain trend is manifested in the development of the proportion of patients admitted to the sanatorium for their first speleo therapy: while in the period of 2004 to 2015 the numbers of the treated children tended to increase, the following period was marked by a certain drop in their numbers (Figure 3). This decrease is given by the overall reduction of the total number of patients by those with completed therapy and improved condition, compensated by increased standards of the therapy and higher comfort, especially for younger children, represented by the presence of their mothers during their stay in the sanatorium. Improvement of treatment quality was mainly represented by extension of most of the therapeutic cycles from three- to four-week cycles.

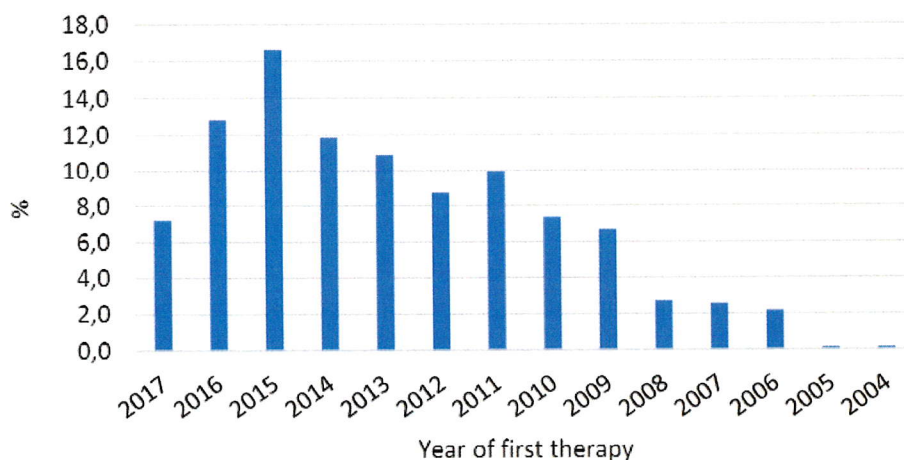


Figure 3. Proportion of patients admitted to their first therapy in the years 2004–2017 (N = 733).

More than a half took one speleo therapy cycle (51.7%). Repeated therapy was undergone by 48.3%, with the highest proportion of two (24.0%) and three (11.9%) speleo therapy cycles. Four and more repetitions were not so significant in the overall proportion of the patients, but still there were children in the study population who took up to nine cycles of speleo therapy (Figure 4).

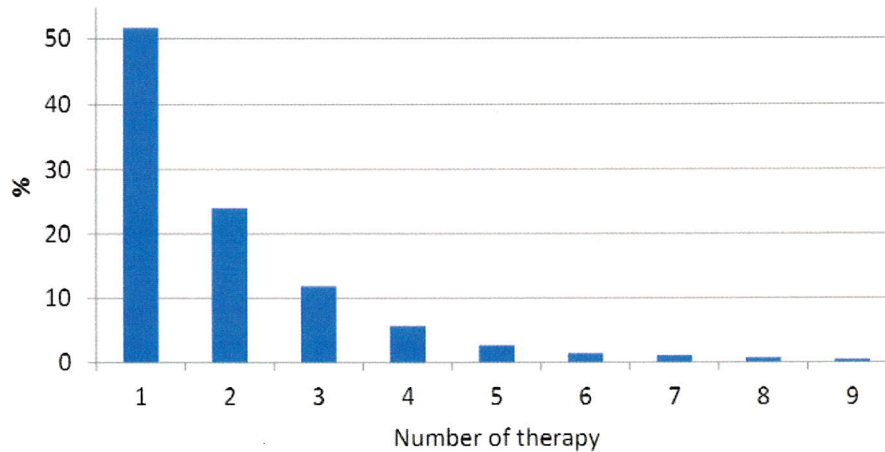


Figure 4. Proportions of patients according to the numbers of speleo therapy cycle repetitions (N = 733).

The patients were also classified by their first diagnosis on admission to the sanatorium. The largest prevalence was shown by bronchial asthma (54.8%) and recurrent respiratory infections (22.0%). Other diagnoses were considerably lower in numbers (exercise induced asthma 8.7%; bronchitis recidivas 5.0%; atopic eczema (pre-asthma condition) 2.5%; chronic rhinitis (pre-asthma condition) 1.9% and rhinosinusitis a sinusitis 1.5%; Figure 5). There were also other diagnoses with insignificant representations in the cohort under 1 percent.

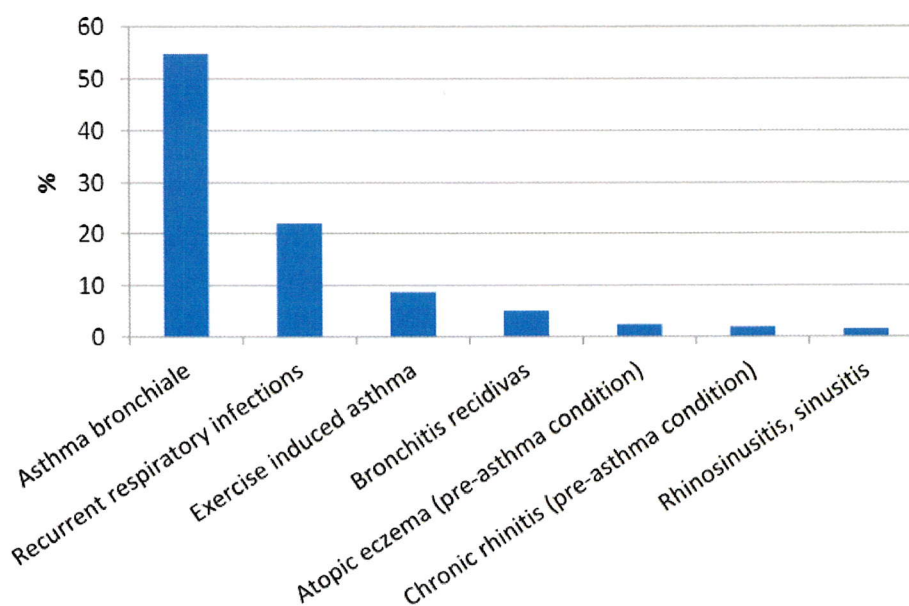


Figure 5. Proportion of patients by first diagnosis on admission to speleo therapy (N = 733).

The results of the medical reports and the indicators monitored in the course of speleo therapy (spirometry at rest and under load in the cave, repeated in the course of the PEF day, immunological parameters – mainly Ig E, ECP, initial kinesiological analysis by physiotherapist, nasopharyngeal swabs etc.) document a clearly positive impact of speleo therapy on the patient health condition. The final reports report health improvement in 95.5% of the patients, with stagnation reported for only 4.5%. These data correspond to the standard of 5% of individuals with symptoms hard to affect by the speleo therapeutic method (what needs to be realised is that strong genetic predisposition contributes to the clinical image in up to two thirds of all cases). Success of speleo therapy is further conditioned by (family) environment factors forming the treated child's background, including the level of compliance with the way of life of asthmatic/allergic child before the speleo therapy commencement, such as incompliance with the drug dosage where the children are usually "underdosed" for fear of adverse effects of inhalation corticosteroids, controlling asthma before the therapy commencement. These individuals can just stabilise their condition by speleo therapy and its effect therefore cannot be that apparent.

The reports on the success of the speleo therapy are followed by recommendations for repeated speleo therapy sessions in 98.9% of cases, with just 1.1% of patients to whom repeated therapy is not recommended. The reasons mostly include psychiatric diagnoses of anxiety, autism etc. In the case of these children the cause of limitation of speleo therapy is their behaviour and safety in the cave. These children find it hard to cope with the group of children around them and with the stay in the dark cave and thus the risks of speleo therapy for them outweigh the benefits of its effect on their airways.

Allergies of different kinds represent the most frequent cause of asthma for speleo therapy indication. Nearly three quarters of the study cohort suffered from an allergic disorder (74.4%), the rest were children with non-allergic disease or other causes of their asthma (25.6%).

The family background is one of the social indicators of health, with type of occupation indicative for example of the financial standing of the family with "hidden" reflection in the health conditions of the family members. Nearly about half of the parents of the paediatric patients under research (50.1% of mothers and 42.0% of fathers) were employed in the third sector of economy (office, finance, public administration, education, science etc.). A lower proportion was represented by the second economic sector (22.0% of fathers and 13.2% of mothers; processing industry, commerce, transport, building etc.). These data may be somewhat biased, though, for around one fifth of the parents did not mention their occupations at all (21.7% of fathers and 17.6% of mothers). One tenth of the mothers with one child in speleo therapy were on maternity leave with a sibling of the treated child (9.7% of mothers; no father on parental leave). In 8% of cases the family had no father, and in 1.5% there was no mother in the family (Figure 6).

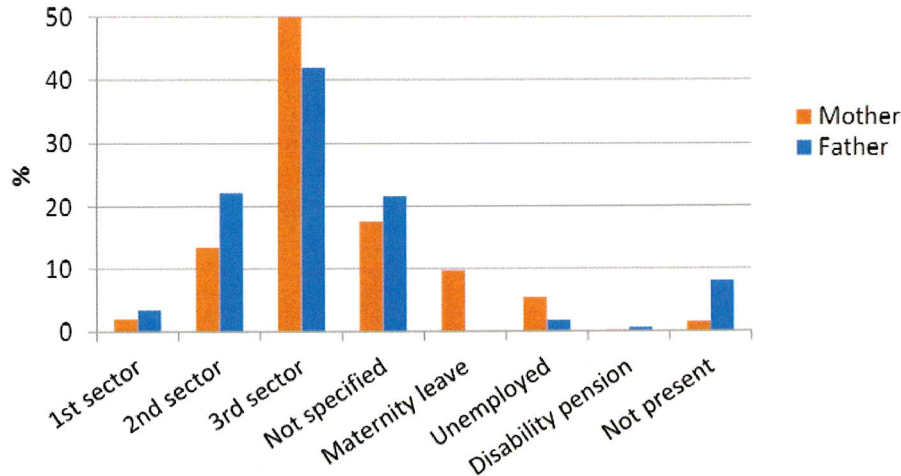


Figure 6. Patient percentages by mother's and father's occupations (N = 733).

4 Conclusion

The patient profile is based on data obtained by random selection (of 733 patients) in the Paediatric Sanatorium with Speleo Therapy at Ostrov u Macochy. The findings show prevalence of boy (58.9%) over girl (41.1%) patients, in the most common age group of 5–10 and under repeated therapy in nearly half of the sample cases (48.3%). The most frequent diagnoses include bronchial asthma, recurrent respiratory infections and exercise induced asthma. The reports on the success of the speleo therapy after its finish mention health improvement in 95.5% of all paediatric patients and are followed by recommendations for repeated speleo therapy sessions (in 98.9% of cases). The geographic structure of the patients attending the sanatorium shows prevailing patient recruitment from South Moravia, Moravian Silesia, South Bohemia, Central Bohemia, Vysočina and Prague regions.

The drop of the number of patients recruited for their first therapy in the recent years is given by extension of the cycles from three-week, fixed until 2014, to four-week cycles, largely prevailing since 2015. Since 2015 children with higher morbidity rates at the age of 4–6 years have been prioritised in admission and a parent (mostly mother) has been allowed to stay with his/her child throughout its stay in the sanatorium. Although the current sanatorium capacity requires reduction of the number of treated children due to the parental stay as the total number of beds is limited, the effect of the therapy in the case of children at this age has been increased considerably thanks to this measure. The advantages of treatment/repeated treatment of preschool children include long-term improvement of their health condition not requiring further therapy repetitions at their school age. This is especially beneficial in cases where defence of long-term absence from school for the reason of asthmatic therapy is hard despite the fact that the sanatorium operates its own elementary school which the paediatric patients attend daily during their stay.

The results of our research in the role of speleo therapy in improvement of health condition of asthmatic patients are consistent with the commonly presented effectiveness of speleo therapy. Generally in 75–80% of individuals speleo therapy is able to positively affect their health condition already in the course of their first therapeutic cycle. Repeated cycles show positive effects on the remaining patient percentage (20%). The about 5% of patients without improvement are represented by patents with symptoms hard to affect by this therapeutic method, mainly due to the strong genetic predisposition of these individuals.

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