

Effect of physical activities and sport among patients with asthma on their life

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ABSTRACT

Objectives: The aim of this study was to analyse active level of lifestyle among asthmatic patients and their participation on physical activities and sports. Another goal was to find out whether asthmatic patients are limited when performing physical activities or sports because of the medical condition and how physically active lifestyle influences the medical condition and whether it takes part on improving their quality of life.

Methods: A survey was used for data collection. To gather information, our own survey form was developed – a self-reported tool which clinically compares and measures physical activity (such as other standardised and international forms: International Physical Activity Questionnaire and St. George's Respiratory Questionnaire). A questionnaire was distributed to people working with asthmatic patients, to different sports clubs and among university students. The research group consists of 125 respondents. The obtained data was processed into tables and charts via Microsoft Office Word 2016, Microsoft Office Excel 2016 and SPSS program. A verification of hypotheses was carried out according to the results of the survey and the independence test - chi-squared test.

Results: According to the chosen data processing methods, the limitation of asthmatic patients in physical activities or sports was not confirmed – physical activities on regular basis perform 100 respondents (80%), 69 respondents (55.2%) stated no limitation within physical activities due to asthma and e.g., in patients with most severe asthma were 66.7% (n = 4) of them without limitation when being active. The positive effect of regular physical activity on reducing clinical manifestations of the asthma, on reducing medication doses and also on improving the quality of life of patients has been confirmed. Physical therapy has proven to be effective, but more emphasis is needed on educating asthmatics by healthcare professionals about this treatment method.

KEYWORDS

bronchial asthma; physical activity; exercise; sport; survey

DOI

10.14712/23366052.2022.8

INTRODUCTION

Distribution of asthma is global. Number of patients is growing which creates serious economic burden and global public health problem. Treatment cost is high – especially expenses for medication (hospital admissions) but also indirect costs (time lost from work, premature death). In fact, medication represents only part of the whole asthma management. Important part of asthma treatment includes also physiotherapy, especially physical activities and exercising which can decrease cost management of this worldwide disease (Dharmage, Perret & Custovic, 2019; Douglas & Elward, 2011).

Many patients suffering from asthma feel that their condition prevents them from being physically active and exercising. This condition is associated with increased morbidity and decreased patient's quality of life. However, if asthma is controlled there is no limitation in patient's active life style and exercising is appropriate.

THEORETICAL BACKGROUND

Asthma is a common chronic inflammatory airway disease characterized by variable symptoms (Barrecheuren et al., 2020). It is estimated that over 300 million people in the world have asthma, both children and adults, with high morbidity and relatively low mortality compared with other chronic diseases (i.e., prevalence is around 5% and varies between different ethnic and social groups). Despite there has been significant improvement in asthma management, there are still gains to be made in enhancing patient's education, implementing new diagnostic approaches and case management (Dharmage, Perret & Custovic, 2019; Douglas & Elward, 2011).

There is clear evidence showing that asthmatic patients benefit from physically active lifestyle. Asthmatic patients believe that their medical condition prevents them from performing physical activities and adopt sedentary lifestyle. Physical activity often provokes asthma-related symptoms reflecting the nature or insufficient control of asthma. Thus, asthmatic patients may often intuitively or purposely avoid exercise (Panagiotou et al., 2020). Lack of information provided by medical staff may also be a reason for avoiding physical inactivity. A negative attitude towards physical activity and aversion to exercise lead to low physical fitness, reduced maximal oxygen consumption (VO_{2max}), lower anaerobic threshold and oxygen pulse creating and creates thus a vicious circle (Panagiotou et al., 2020; Turner et al., 2011). On the other hand some studies show opposite as according to Mackintosh's study youth with controlled asthma was equally physically active and/or inactive as their healthy peers.

In fact, patients whose asthma is under control are not limited in physical activities. Rasmussen (2000) focused in his study on severe asthma – a type which requires treatment with high dose inhaled corticosteroids plus a second controller (and/or systemic corticosteroids) to prevent it from becoming 'uncontrolled' or which remains 'uncontrolled' despite this therapy, e.g., spirometric lung parameters – persistent airway obstruction $FEV_1 < 80\%$ (Ahmed & Turner, 2019; Edginton et al., 2019). Rasmussen (2000) stated in his study that patients with severe asthma can thanks to aerobic training reach normal cardiopulmonary values (heart rate, maximal oxygen consumption (VO_{2max}), anaerobic threshold, oxygen pulse, ventilation, FEV_1 , etc. (Panagiotou et al., 2020). Strengthening physical fitness is essential in patients, as their VO_{2max} values

are quantitatively lower compared to healthy individuals. However, the disease does not prevent them from performing physical activities. The reason for the negative results when comparing the VO_{2max} values of healthy and asthmatic people is reduced physical activity or a sedentary lifestyle. Therefore, the asthma management should include strength and endurance training, which improve both physical condition and increased load tolerance. Diagnosis of bronchial asthma should not prevent from performing sport even on top level performance. According to Kilpeläinen et al. (2006) asthma is even more common among elite athletes than in the general population. In the present asthma is estimated to affect 339 million people worldwide (Kuder et al., 2021). According to Allen et al. (2019) in recent studies of elite-level athletes is asthma frequently reported as the most common medical condition indicating with a prevalence of 25–75% in susceptible cohorts (Ahmad & Edwards, 2015; Irewall et al., 2021; Smolíková & Máček, 2006).

OBJECTIVES OF THE WORK

Reason for the study was the lower level of physical activities among patients suffering from asthma and also assumption of exercising on regular basis helps patients to decrease clinical manifestation of disease, to get better overall asthma control, less exacerbations, lower healthcare use and helps to increase their quality of life. It also normalize maximal oxygen consumption (VO_{2max}), anaerobic threshold and oxygen pulse, airflow and lung function (FEV_1) (Kuder et al., 2021; Panagiotou et al., 2020; Turner et al., 2011). The aim of the work was to obtain and to analyse data of the current state of physical activity levels and sport of asthmatic patients. We were as well interested whether the asthma creates an obstacle in exercising or doing sports. The partial goal was to discover the impact of active lifestyle on patient's medication management of disease.

METHODS

The work is an empirical quantitative study. To obtain require information an anonymous self-reported survey was used. It was developed to meet the needs for further survey research.

The research group consisted of 125 respondents who were diagnosed with asthma disease (which was a major condition to take part in the survey) regardless gender or age. Not all facilities that have been asked agreed on cooperation. At the end there were 3 spa rehabilitation institutes, a pulmonology specialist and a sports specialist interested in collaboration. Thus, we reached respondents of wide age scale. Survey distribution continued among university students (Prague, Brno, Olomouc, and Ostrava). Assumption was an active lifestyle of young people. There were also different sports clubs in Prague, Olomouc and Zlin which agreed on taking part in the research. Based on variety of distribution, results of the survey can be used for wider sample population.

All subjects included in the research group signed informed consent and the project was approved by the ethics committee FTVS UK. The time schedule for data collection took place from December 2017 to February 2018.

Data collection method

When developing our own form of survey, we used former international standardized questionnaires as inspiration (International Physical Activity Questionnaire, St. George's Respiratory Questionnaire) along with information found in literature and discussed the final draft with specialists (Apfelbacher et al., 2012; Agarwal, Gupta & Sood, 2017).

The format of survey contained combination of types – both open-format and closed-format items. The survey consists of 25 questions, divided into four parts. The first one focuses on respondent's details such as age, gender, severity of asthma and its management. Next part provides information about patient's physical activity and sports. Following questions collect facts about impact of active lifestyle on participant and last fourth part of survey form asks about respondent's relation to activities and sports.

There were two methods of collecting survey data: web-based survey and mailed form of survey. The environment for online data collection was provided by the Google Docs service. Mailed version was implemented via traditional postal service deliveries. Obtained data were converted to tables for further analysis.

Data processing

Returnability of mailed version survey was lower than 10%. Web-based survey showed greater return reliability. After excluding incorrectly completed forms the total number of participants for further analysis was 125 ($n = 125$).

Data analysis

Obtained information was analysed using the Microsoft Office environment – MS Word 2016 and MS Excel 2016 and SPSS program. These were used to create tables and graphs, or to calculate mean values. Data missing numerical values were processed by written text.

A verification of hypotheses was carried out according to the results of the survey and the independence test – chi-squared test. The significance level was maintained at its standard value of $\alpha = 0.05$ (5%).

RESULTS

File characteristics

Altogether 125 people completed survey correctly therefore that is the total number of participants in our survey. Majority represents women ($n = 101$; 80.8%) compared to men group ($n = 24$; 19.2%). Only 8% ($n = 10$) were children. They youngest respondent was 3 years old, the oldest one was 69 years old. There were 3 spa rehabilitation institutes, a pulmonology specialist and sports specialist interested in collaboration. Therefore, the respondent age scale is wide. The average age of cohort was $\bar{x} = 29.25$ years. Due to the large age group variance, statistical units were calculated: Mod (x) = 23 years; Med (x) = 24 years.

There were patients with all 4 subdivided asthma categories in our survey (we followed classification according to GINA (Global Initiative for Asthma)). Table 1 shows that more than half of respondents ($n = 72$; 57.6%) were patients with second type of asthma – mild persistent type.

Table 1 Overview of the asthma classification subcategories of participants in our survey

Asthma classification	Percentage of participants
1. intermittent asthma	57.6% (n = 72)
2. mild persistent asthma	23.2% (n = 29)
3. moderate persistent asthma	14.4% (n = 18)
4. severe persistent asthma	4.8% (n = 6)

To obtain detailed characteristics of survey's sample participants answered questions regarding management of asthma, too. The total sum of answers significantly exceeds the number of respondents due to the possibility of multiple choice. Majority (n = 100; 80%) is controlled by an allergy specialist. Among other choices of health care providers were a pulmonologist (n = 40; 32%), a sports doctor (n = 10; 8%), a physiotherapist (n = 5; 4%), a psychologist (n = 4; 3.2%), a dietitian (n = 4; 3.2%). There were 4 respondents (3.2%) from the whole sample who do not require any medical follow up.

Medical management of asthma is choice of 116 participants (n = 92%), 2 patients (n = 1.6%) need to use medical treatment only during asthma attack. It can be usually well managed with the use of maintenance inhaled glucocorticoids (e.g., Beclometasone) and inhaled short-acting β_2 -agonists (e.g., Salbutamol) which provide quick relive and get asthma under immediate control (Panagiotou et al., 2020). Physical activities as part of asthma treatment use 30 respondents (n = 24%). The sum of answers again exceeds number of respondents due to the possibility of multiple choice.

Physical activities

One of the key questions shows that more than half of interviewed are physically active (n = 69; 55.2%) without feeling any limitation due to asthma disease. Physical activity is comprised of bodily movements produced by the skeletal muscles that result in an increased metabolic rate over that of resting energy expenditure (Panagiotou et al., 2020). Table 2 represents detailed answers according to asthma severity of GINA classification. Patients from second and third categories seem to feel less restricted when being active.

Physical activities on regular basis perform 100 respondents (80%). There was no difference shown between percentage of physically active women (n = 81; 80.2%) and men (n = 19; 79.1%). Rest of the participants (n = 25; 20%) did not take part in any physical activities other than activities of daily living. Only in 5 cases (4%) asthma represents limitation to be active, 2 other participants stated different health condition which did not allow them to do physical activities. Another 18 patients (14.4%) lead rather sedentary lifestyle with decreased physical activity (physical activity in our survey represents a specific cyclic endurance activity (lasting 30–40 mins) where walking

Table 2 Limitation of patients (according to GINA subcategories) during physical activities

Asthma classification	Do you feel any limitation during physical activities?		Percentage/number of participants
	Yes	No	
1. intermittent asthma	29.2% (n = 21)	70.8% (n = 51)	57.6% (n = 72)
2. mild persistent asthma	62.1% (n = 18)	37.9% (n = 11)	23.2% (n = 29)
3. moderate persistent asthma	83.3% (n = 15)	16.7% (n = 3)	14.4% (n = 18)
4. severe persistent asthma	33.3% (n = 2)	66.7% (n = 4)	4.8% (n = 6)

means the main physical activity (Bilyamin et al., 2022; Zatloukal & Neumannová, 2012). Due to that were these 25 answers excluded from further research involving physical activities and new total number of participants became 100.

Volume of physical activities is shown in Table 3. In 34 causes (n = 34%) were activities performed 1–2× week. According to literature (Ahmad & Edwards, 2015; Panagoitou et al., 2020; Smolíková & Máček, 2006) this frequency shows no development on human's health. About a third of asked (n = 60; 60%) enjoys aerobic activities (to increase aerobic performance (Rokyta et al., 2016) – e.g., dancing, handball, swimming, volleyball) in 24 cases (24%) were activities mostly strength oriented (to increase muscle strength, which is for the most part represented by static muscle contraction and the dynamic component participates to a lesser extent (Smolíková & Máček, 2006) – e.g., crossfit, gymnastics, rugby) and 16 (16%) respondents marked option of interval activities (an intermittent periods of effort interspersed by recovery periods (Viana et al., 2019) – e.g., crossfit, hockey).

Sport

Questions about sport show that from all 125 respondents, 80 of them (n = 64%) play sport. By Cohen et al. (2018) sport means all forms of physical activity which, through casual or organised participation, aimed at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all level. In 10 cases (8%) have respondents never played any sport, 3 patients (2.4%) stated asthma as limitation when exercising and 9 participants (7.2%) used to play sports before. The answers were evenly distributed between men and women groups too – 16 men (n = 66.7%) and 62 women (n = 61.4%) playing sport. As we can see in Table 4 number of patients who plays sport increases with severity of asthma. Types of sports vary.

Table 5 represents weekly frequency of sport performance. Numbers relate to 89 respondents who either play or used to play sports. About a third (n = 30; 33.7%) performs sports on competitive level. In 7 cases (7.9%) patients replied they observed that asthma makes them difficult to improve their performance.

Table 3 Volume of physical activities

Volume of physical activities	Percentage of participants
Several times a day	11% (n = 11)
Daily	18% (n = 18)
1–2× week	34% (n = 34)
3–4× week	25% (n = 25)
5–6× week	12% (n = 12)

Respondents were asked about details when being recognized with asthma. More than half (n = 47; 52.8%) stated asthma has been diagnosed before they started play sports. About a third (n = 32; 36%) received diagnosis when being already exercising. Asthma associated with sports performance was obtained in 10 cases (11.2%).

Restrictions of patients due to asthma from physical activity and sport

To determine the effect of asthma on physical activity, chi-squared test was performed. Data analysis was processed in Pivot tables. The value of qualitative features was calculated to clarify the statistical level of significance. Result $9.58 \cdot 10^{-10}$ is significantly lower than standard value of $\alpha = 0.05$ (5%) therefore the assumption that asthma causes restriction for patients when being physically active has not been confirmed ($9.58 \times 10^{-10} < 0.05$).

Table 4 Participants (according to GINA categories) performing sport

Asthma classification	Percentage of participants performing sport
1. intermittent asthma	55.5% (n = 42)
2. mild persistent asthma	69.0% (n = 20)
3. moderate persistent asthma	66.7% (n = 12)
4. severe persistent asthma	83.3% (n = 5)

Table 5 Volume of sports training

Volume of sports training	Percentage of participants
Several times a day	5% (n = 4)
Daily	10% (n = 9)
1–2× week	42% (n = 38)
3–4× week	30% (n = 26)
5–6× week	14% (n = 12)

Based on the answers related to sport was result of data valued 1.76×10^{-10} , which again is lower than determined standard value of $\alpha = 0.05$ (5%). Therefore, an assumption of sport meaning a restriction for asthmatic patients has not been approved either ($1.76 \times 10^{-10} < 0.05$).

Effect of activities on asthma

Regular physical activity helps about two thirds of group ($n = 72$; 72%)¹ to decrease symptoms (cough, shortness of breath, etc.). In 54 cases (54%)² regular activity contributes to decrease asthma medication. The investigated dependence on the frequency of physical activities on asthma management was most significant at volume of 3–4 times per week. Least efficient, based on answers, has been shown volume of physical activity performed 1–2 times per week, where also more than half of group ($n = 20$; 58.8%) did not see any correlation between exercising and medication decrease.

From collected data was shown major impact of physical activities on better quality of life (social life, psychological effect, activities of daily living, decrease of illness, etc.). In 3 cases (3%) patients quit medical treatment thanks to active lifestyle. Higher level of regular physical activity reduces the risk of asthma exacerbations, independent of asthma severity and is associated with lower health care use, medications and improves lung function, too (Panagiotou et al., 2020).

DISCUSSION

The objective of the presented study was to evaluate volume of physical activities and sport at asthmatic patients in Czech Republic and the effect it may have on asthma management. We expected people with asthma having decreased level of active life

¹ Numbers relate to sum of 100 respondents from a sample of physically active subjects.

² Related to sum of 100 respondents.

style and feeling restrictions when exercising. To achieve this objective, we have developed a survey form based on standardized International Physical Activity Questionnaire and St. George's Respiratory Questionnaire.

Globally, several studies recognize that there is a significant decrease in physical activities among asthmatic patients (Groth et al., 2016; Jago et al., 2017; Lang et al., 2004; Lucke et al., 2007; Williams et al., 2008) even though physical therapy is part of asthma management. However there have also been studies that have not found an evident of low level in the physical activity of people with asthma (Boas et al., 1998; Ford et al., 2003; Jerning et al., 2013; Teramoto & Moonie 2011). Some authors confirm correlation between asthmatic patients and inactivity which was dependent on sex. Yiallourous et al. (2015) proved in his study decreased volume of physical activities in female group.

Although medication treatment became option selected by majority of our study sample, physical activity (physical activity of moderate-intensity performed regularly) was picked as second most frequent choice for asthma management. Questions concerning volume of physical activities in our survey were based on literature recommendation. The authors differ slightly, as the frequency of physical activities (household, occupational, transportation, conditioning, athletics, sports, or other daily activities) lasting at least 30 minutes at least 3 times a week seems to be optimal (Ahmad & Edwards, 2015; Haskel, 2007; Panagiotou et al., 2020; Tucker et al., 2011). Turner et al. (2011) showed that established recommended physical activity programs for asthmatic patients reduce the incidence of symptoms and improve patients' quality of life. For fear of overexposure to irritating stimuli and subsequent exacerbations, children with asthma are often restricted from experiencing daily activities as their peers, such as laughing, swimming, playing with pets, etc. According to Máček & Radvanský (2011) more than 30% of children with asthma are significantly limited in physical and social activities due to excessive parental concern or a passive lifestyle more than asthma itself.

In assessing the effectiveness of physical activities on asthma, several previous studies demonstrated positive impact (Lucas & Platts-Mills, 2005). Longitudinal study by Garcia-Aymerich et al. (2009) recognized that regular physical activity causes decrease of asthma attacks. Lucke et al. (2007) focused his research on women in Australia, in which he confirmed highest prevalence of asthma disease among inactive women or the ones with low physical activities. Kilpeläinen et al. (2006) found an association between the level of physical activity and the prevalence of asthma. However, according to his study, mild physical activity reduces the risk of asthma in men, but not in women. Likewise, Yiallourous et al. (2015) confirmed reduced physical activity only in the female group. These statements do not meet the results of our research, as women ($n = 81$; 80.2%) and men ($n = 19$; 79.1%) proved to be almost equally active.

Brumpton et al. (2016) studied diversity of the effects of physical activity on asthma and talked about possible hidden subgroup effects depending on the age period. If we analyse the impact of physical activities in relation to the age period among children/adults, 60% of children ($n = 6$) in our study stated that physical activity helps them to reduce symptoms of the disease. There is 73.3% ($n = 66$) among adults benefiting from physical activity. Comparing the benefits of physical activity in children and adults in

our study, it can be confirmed that there is only slight difference between these age groups.

Eighty percent ($n = 100$) of the respondents stated that they regularly perform physical activity lasting at least 30 minutes. Physical daily activity encompasses household, occupational, transportation, conditioning, athletics, sports, or other activities in the context of daily, family, and community activities (Panagiotou et al., 2020). Although 80% appears to be a satisfactory result, the frequency of the activities should be considered. 34% ($n = 34$) of these respondents perform physical activities 1–2× week, which seems insufficient according to global recommendations because physical activities do not have a stimulating effect on patients' health (Haskell, 2007; Smolíková & Máček, 2006; Tucker et al., 2011). The remaining 66% ($n = 66$) of physically active subjects reported a volume of at least 3 times a week, thus meeting the recommended criteria for physical activities. A study by Ahmad and Edwards (2015) showed that 78% of patients out of 128 respondents do not meet the prescribed physical activity program (i.e., 150 minutes per week). In our study, it was 59% of respondents ($n = 59$) who were physically active for less than 150 minutes per week.

As mentioned, diagnosed asthma does not represent limitation for sports, even at the top level (Boas et al., 1998). According to Kilpeläinen et al. (2006) asthma is even more common in elite athletes than in the general population. According to Price et al. (2014), the airways of elite athletes show an abnormal response to air exposure during intense exercise. Especially in swimmers and cross-country skiers, there is a transient narrowing of the airways in more than half of the cases. Endurance athletes are prone to developing airway dysfunction (Price et al., 2014). In our survey, we asked about the connection between the diagnosis of bronchial asthma and sports. 11.2% of subjects ($n = 10$) stated that they were diagnosed with asthma in this connection, but did not stop exercising. Whether it is top performance or just recreational sports have not been shown to affect the asthma diagnosis according to research analysis, as well as the frequency of sports. The connection between a certain type of sport and the prevalence of asthma has not been proven from the obtained data either.

LIMITATIONS

An anonymous survey relies on self-reported information from participants rather than information taken by researchers. An assumption of the survey approach is that patients will provide accurate information about their health and activities.

CONCLUSION

As positive results of our study we can see that people with asthma does not seem to feel that limited when performing physical activities or sports. On the contrary, the results suggest how important is frequency of exercising which is taken as beneficial to human's health.

Physical activity plays important approach of asthma management and it is therefore necessary to keep asthmatics as active as possible, to involve them in social life and to enable them to participate equally in physical and sports activities as healthy individuals.

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