

# An investigation into the effect of multimedia training on the knowledge and self-efficacy of children with asthma

## Abstract

**Introduction:** Asthma is one of the most common chronic diseases among children is a global health issue and its rising trend has caused concern about the health system. Therefore, this study was conducted to investigate the effect of multimedia education on the knowledge and self-efficacy of children with asthma in Bushehr.

**Method:** semi-experimental study. The research community included all children under the age of 12 years with asthma. The samples were selected by available method of 50 people and then divided into two experimental and control groups by simple random method. The data collection tools included questionnaires of demographic data, knowledge and self-efficacy in children with asthma. Validity and reliability of the instruments were measured and then multimedia training was run for the experimental group. Data analysis was performed by SPSS 18 and Mann-Whitney U test.

**Findings:** the mean scores of knowledge and self-efficacy of the research samples in the experimental group increased after multimedia training, so there was a statistically significant difference between the two groups ( $p < 0.001$ ).

**Conclusion:** Education of children with asthma through multimedia has led to increasing knowledge and self-efficacy. Therefore, considering the effectiveness of multimedia education in children training with asthma, it is recommended that this educational method is used for other chronic childhood diseases.

**Keywords:** self efficacy, knowledge, multimedia, asthma, children

Volume 1 Issue 5 - 2018

**Morteza Alibakhshikenari**

Martyr Beheshti University of Medical Sciences and Health Services, Tehran, Iran

**Correspondence:** Morteza alibakhshikenari, Martyr Beheshti University of Medical Sciences and Health Services, Tehran, Iran, Email Morteza.alibakhshikenari@gmail.com

**Received:** August 13, 2018 | **Published:** October 23, 2018

## Introduction

Chronic pulmonary diseases are among the commonest diseases causing the death and disablement of human societies which asthma is one of the commonest.<sup>1</sup> According to the statistics, 3-35% of people in the world (300 million individuals) suffer from asthma<sup>2,3</sup> that 100 million more patients may be added to this statistic until 2025.<sup>4,5</sup> In a report released by WHO (World Health Organization) in 2003, the prevalence rate of asthma in the whole population of Iran was about 5.5% and the prevalence rate of asthma in childhood was reported as 10%. According to the statistics of the Ministry of Health and Medical Education in 2008, 10% of the population (about 5.6-6.5) suffered from asthma<sup>6</sup> and this number for children of Bushehr is equal to 6.7%.<sup>7</sup> Asthma is the commonest chronic disease during childhood, the first reason of receiving in emergency operation centers and the third reason of hospitalizing children under 15.<sup>8</sup> Furthermore, this disease is the important factor of absence from school among chronic diseases.<sup>9</sup> Children with asthma are more absent from school and more awake during the night.<sup>10</sup> Asthma is the chronic inflammatory disease of airways that causes allergy in airways and mucous membrane edema and produces mucus. Inflammation in airways causes the recurrence periods of asthma symptoms<sup>11</sup> and its intensity can be variable in a person, therefore patients may experience wheezing attacks, cough, shortness of breath, and chest discomfort that these symptoms may intensify due to some factors such as dust, activity, cigarette, and air pollution.<sup>2</sup> In asthma, due to bronchospasm, mucous membrane edema, and the accumulation of mucus as well as air

trapping behind the obstructive area, airways become narrower, moreover, spending energy to breathe leads to fatigue, reduction in breath quality, and increase in oxygen consumption and cardiac output, thus shortness of breath, cyanosis, and tachypnea occur due to disruption to gas exchange and cardiac output. If the obstruction intensifies, alveolar ventilation reduces, carbon dioxide is trapped, and hypoxemia, acidosis, and finally respiratory failure occur. One of the other common symptoms of asthma is cough during the night that can cause sleep disorder and fatigue during the day and weaken child's performance.<sup>4</sup> Treating children with asthma is not just limited to drug treatment and strengthening the body against allergens, since the role of training is much more important and teaches children and their parents how to control the disease.<sup>12</sup> One of the factors that can influence these patients' quality of life is their lack of knowledge about asthma. In this regard, Yang et al. report that knowledge increase of patients with asthma about their disease can improve their quality of life,<sup>13</sup> however, in spite of the report on knowledge increase of patients with asthma and their healthcare providers as well as health consequences by others, patient's educational programmes to improve their behaviors such as satisfaction at receiving medicine, fewer absences from school, and self-management behaviors are often ineffective.<sup>8</sup> Wrong training leads to failure to cure and control the disease and physical and mental disability in the person. Training is the factor of society development and allows the clients to live well in their social environment by learning preventive care.<sup>14</sup> The continuation of weak results in treating children with asthma has led to various educational interruptions in order to improve the

care, therefore, the need to provide innovative methods to improve asthma care is increasingly felt.<sup>15</sup> Educational media is one of these innovative methods. The most important reasons of using educational media are as follows: "developing effective communication", "providing motivation for learning", "forming faster, deeper, and more stable learning", "economizing teaching and learning time", "adapting to multiple intelligences", and "forming impossible learning experiences". The term multimedia was proposed since 1950 and it was attempted to combine several mediums to enhance the quality of training.<sup>16</sup> Multimedia training as a new educational method is easily, widely, and attractively performed by transferring educational concepts and contents along with text, voice, image, and video and today, it is widely used in order to transfer concepts during childhood and teenage years (14). This new educational programme can facilitate the process of decision-making by empowering patients to have an active role in selecting health-based programmes.<sup>17</sup>

## Methods

The present study is quasi-experimental and it was conducted on 50 children with asthma in Bushehr. The population included all children with asthma under 12 and sampling was first of convenience type, then samples were divided into two groups of intervention and control using random allocation. The entry criteria to this study include all children with asthma (girl and boy) under 12 with the final diagnosis of a doctor, the tendency of children and their parents to participate in the study, having no history of chronic heart, vascular, liver, and kidney diseases, and being able to participate in the empowerment plan. The exit criteria to this study include the tendency of children and their parents to exit the study, the membership of parents in the health team, and the participation of study samples in similar researches. The sample volume for alpha 0.05 and power of the test (80%), for standard deviation of 10, and detecting the difference of 8 scores between two groups was equal to 25 in each group. The tools of this research include the 15-question questionnaire of demographic information about the child and their parents completed by the child as well as their parents if needed, the 8-question questionnaire of measuring the knowledge of child with asthma, and the 10-question questionnaire of measuring the child's knowledge about allergens including 3 video questions and the checklist of assessing child's self-efficacy about using the asthma spray. The validity and reliability of these questionnaires were evaluated in a research aimed at investigating the effect of family-centered empowerment model on the quality of life in school-age children with asthma.<sup>4</sup> This study was conducted through three stages:

### A. The stage before intervention:

After receiving the letter of introduction from the vice chancellor for research of Bushehr University of Medical Sciences, first, the research samples were selected from the whole population using convenience sampling, then they were divided into two groups of intervention or control using simple random allocation. Afterwards, visiting the sampling centers and getting to know the parents, they were invited to participate together with their children in the research. When the parents participated, the researcher introduced himself and explained the aims, importance, and method of the study and by giving them written consent based on how to intervene and complete the questionnaires the researcher assured them that the data and information are confidential and obtained parents' written consent and children's verbal consent. After obtaining the consent of parents and children, pre-test was performed. The intervention was conducted on the test group and the control group did not receive any intervention.

In order to achieve the aims in this study, the method of multimedia training was applied.

### B. The intervention stage

The research-made CD contained teaching the two essential steps of knowledge increase and self-efficacy increase as well as some information about pathophysiology of disease, physiology, symptoms, environmental and indoor allergens, proper use of spray, nutrition, medicine, etc. Then the CD was granted to some allergy and asthma specialists in order to determine its validity and their viewpoints were evaluated. After the confirmation of allergy and asthma specialists and scientific editing by one of the faculty members of Bushehr school of Nursing and Midwifery, the CD was applied to the samples through two steps.

**First step knowledge increase:** In order to increase knowledge, educational sessions using multimedia training (CD) were held, i.e. one session for each person was held individually and separately and its time was about 30 minutes depending on child's tendency. In this session, in addition to learning how to use the software, educational topics were taught to them using the multimedia software (CD) including

1. Physiology, pathophysiology, symptoms, complications, prognosis,
2. Exacerbating factors of asthma attacks,
3. Nutrition and exercise,
4. Drug treatment, and
5. Environmental and indoor allergens.

**Second step self-efficacy increase:** in order to increase self-efficacy, a 30-minute session was held separately for each child. In this session, all the required capabilities were explained and taught by means of the software. For example in using the spray accurately: moving pictures showed the accurate use of spray to the child step by step (shaking the inhaled placebo, removing its cap, breathing deeply, placing the oral piece of the spray between the lips and puckering them around the oral piece, taking a deep breath and pushing the cylinder gently, holding the breath for 10 seconds, ...). After repeating the pictures, the researcher asked the child to perform each step, so that they had the opportunity to be self-efficacious and empowered through practice and repetition.

### C. The Stage after intervention

For measurement, the data was analyzed using spss 18. In this study, descriptive statistics included frequency, frequency percentage, mean, and standard deviation. Moreover, in order to compare the knowledge and self-efficacy scores of studied samples in both intervention and control groups, Non-Parametric Mann-Whitney Test was applied.

## Findings

The mean (and standard deviation) of children's age in the test group was 8.80 (and 1.936) years old and in the control group was 8.86 (and 1.406) years old and the mean (and standard deviation) of history of disease in the test group was 3.36 (and 0.810) years and in the control group was 3.36 (and 1.15) years. 72% of children were at the middle stage of disease severity and 28% were at the mild stage. Most children's families showed the history of asthma (52%), 54% reported that they smoked indoors, and 48% (the highest percentage) had the history of asthma for three years and more. Most children's

fathers in the test group (48%) and control group (36%) were self-employed. Moreover, most children's mothers in the test group (88%) and control group (96%) were housewives. Table 1 indicates the mean and standard deviation for the knowledge of children with asthma in the test group and control group before and after the intervention. In this regard, the results of Mann-Whitney Test between test group and control group before the intervention showed no significant statistical difference, however, after the intervention, a significant difference was found ( $p<0.001$ ). Table 2 indicates the mean and standard deviation for the self-efficacy of children with asthma regarding the use of inhaled spray in the test group and control group before and

after the intervention. In this regard, the results of Mann-Whitney Test between test group and control group before the intervention showed no significant statistical difference, however, after the intervention, a significant difference was found ( $p<0.001$ ). Table 3 indicates the mean and standard deviation for the knowledge of children with asthma regarding the recognition of allergens in the test group and control group before and after the intervention. In this regard, the results of Mann-Whitney Test between test group and control group before the intervention showed no significant statistical difference, however, after the intervention, a significant difference was found ( $p<0.001$ ).

**Table 1** Comparing the scores for the knowledge of children with asthma before and after the intervention using multimedia training method between the test group and control group

Component	Test		Control		p-value	
	Before the intervention		After the intervention			
	Mean (standard deviation)	Mean (standard deviation)	Mean (standard deviation)	Mean (standard deviation)		
Knowledge	4.28 (1.94)	7.28 (0.93)	4.04 (1.09)	5.04 (1.4)	p<0.001	

**Table 2** Comparing the scores for the self-efficacy of children with asthma regarding the use of inhaled spray before and after the intervention using multimedia training method between the test group and control group

Component	Test		Control		p-value	
	Before the intervention		After the intervention			
	Mean (standard deviation)	Mean (standard deviation)	Mean (standard deviation)	Mean (standard deviation)		
Self-efficacy	3.92 (1.70)	8.44 (1.04)	4.33 (1.73)	4.44 (1.58)	p<0.001	

**Table 3** Comparing the scores for the knowledge of children with asthma regarding the recognition of allergen before and after the intervention using multimedia training method between the test group and control group

Component	Test		Control		p-value	
	Before the intervention		After the intervention			
	Mean (standard deviation)	Mean (standard deviation)	Mean (standard deviation)	Mean (standard deviation)		
Knowledge (recognition of allergen)	9.75 (3.73)	16.60 (1.82)	10.84 (3.53)	12.16 (3.70)	p<0.001	

## Discussion

Asthma is one of the commonest chronic diseases in children. Although mortality from asthma has decreased at present, this disease is one of the commonest reasons for hospitalizing children in advanced countries and the recurrence symptoms of asthma have lowered children and their families' quality of life to a large extent.<sup>18</sup> The results of researches indicate that training programmes of asthma should be considered as a part of routine care in order to improve treatment care, reduce treatment costs, and lessen patients' unwellness.<sup>19</sup> The results of the present study indicated that there is a significant difference between the mean of child's knowledge before and after the intervention ( $p<0.001$ ), therefore, multimedia training increased child's knowledge in the intervention group after training. In the present research, comparing the scores of quality of general life before and after the intervention in the physical dimension indicated a significant difference in the direction of improving child's quality of general life (physical dimension) in the intervention group ( $p<0.001$ ). The knowledge about asthma refers to the ability to differentiate

irritants, understand the role of lifesaving treatments, and develop programmes to manage this disease when intensifies.<sup>20</sup> The results of researches around the world indicate that patients with asthma have little knowledge about their disease. In the study conducted by Gibson,<sup>21</sup> it was concluded that knowledge about asthma is little among students and teachers.<sup>21</sup> On the other hand, the findings of researches indicate that using new educational methods for training children with asthma can increase their knowledge.<sup>8</sup> For example, in a research conducted by Keulers et al.<sup>22</sup> the results showed that the scores of patients' knowledge were increased significantly after training using a computer-based programme ( $p=0.001$ ). Their results also indicated that training through computer is an excellent method to increase the knowledge about the disease and treatment.<sup>22</sup> In another study conducted by Krishna et al. on children with asthma, they found that using multimedia technology in training children with asthma improves the consequences of health in the intervention group.<sup>8</sup> By comparing the mean difference of children's self-efficacy scores regarding the use of inhaled spray between test group and control group before and after the intervention, the results showed that there

is a significant statistical difference in the direction of enhancing the self-efficacy of children with asthma in the test group ( $p<0.001$ ). The low levels of self-efficacy lead to more hospitalization,<sup>20</sup> however, using modern methods such as multimedia in training can enhance self-efficacy and performance.<sup>23</sup> According to Bandura, self-efficacy is related to previous successes in similar situations or experiencing other people's successes<sup>24</sup> and based on the theory of social learning, the knowledge and skill obtained in simulated environments are transferable to real situations and multimedia has the special capacity and potential to transfer the information for these patients.<sup>25</sup> Self-efficacy in relation to asthma refers to the self-confidence to interpret the disease and its symptoms exactly as well as following appropriate care programmes<sup>20</sup> and in our study, self-efficacy refers to children's empowerment to identify different environmental and indoor allergens, choosing good food, exercise, and medicine, in fact, the most important aspect emphasized in this study is how to use the inhaled spray accurately. Using the tool and spraying it accurately to release aerosol into airways is crucial. The results of studies indicate that usually the accurate technique of inhaling even after training children is often lower than the desired level.<sup>18</sup> The results of our study showed that multimedia training could motivate children with asthma to use the inhaled spray accurately. Furthermore, in a research conducted by Cheng et al.<sup>12</sup> on children with asthma, it was found that children who participate in asthma training programmes can improve their physical and social activities that lead to the enhancement of self-efficacy and self-management. In addition, according to their findings, training can reduce the symptoms of this disease and improve the quality of life.<sup>12</sup> In the research conducted by Robin et al., it was indicated that a computer-based educational programme enhances patients' performance and behavior, which is effective in reducing the number of visiting treatment centers.<sup>25</sup> Generally, asthma has a deep effect on patients' life and performance and influences their group activities and social performance,<sup>11</sup> however, children who participate in asthma training programmes can improve their social activities that lead to the enhancement of self-efficacy.<sup>12</sup> Regarding nurses' duties to increase awareness and self-efficacy in line with self-care, different studies have confirmed using educational multimedia<sup>26-31</sup>

## Conclusion

The results of this study indicate that training children with asthma with the multimedia approach led to knowledge and self-efficacy enhancement. According to the results, using the modern training methods such as the technology of multimedia training led to the enhancement of knowledge and self-efficacy in children with asthma about managing their disease. Therefore, regarding the modern, effective, and simple multimedia training in learning as well as its attraction for children and parents, performing this model in order to improve the results of other chronic diseases in childhood by means of multimedia training is recommended.

## Acknowledgements

This paper is adapted from a master thesis and conducted with the support of Bushehr University of Medical Sciences and the vice chancellor for research for covering research costs. The researcher acknowledges the help of all children and their parents whose friendly cooperation made this research possible. Furthermore, I deem it necessary to acknowledge the cooperation of all the personnel and doctors especially Dr. Mehrzad Bohtoui and Dr. Mahmood Moazzen.

## Conflict of interest

Author declares that there is no conflict of interest.

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