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A proposed Habilitation Program to Improve Some Respiratory Signs Using Aqua-aerobic Exercises to Reduce the Intensity and Severity of Asthma Attacks among Children

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ABSTRACT

The aim of this study was to propose a rehabilitation program using aqua-aerobic exercises and to determine its effect on some respiratory indicators (forced Expiratory Volume in first Second Fev1, Peak Expiratory Flow PEF, and the Forced Vital Capacity FVC), and improve the respiratory functions to reduce the intensity and severity of asthma attacks for asthmatic children. This program was applied to a sample of 09 children with light to severe asthma and who are involved in the Asthma Association in Mostaganem. The application period lasted 20 weeks, with three training units per week. We relied on the experimental approach and used one group as a sample. Moreover we adopted pre and post measurements in addition to interstitial measurements at the end of each month using a Spirolab device. The results showed statistically significant differences between the pre and post measurement in the values of respiratory indicators, in favor of the latter. This proves that aqua-aerobic exercises improve the function and efficiency of the respiratory system, and thus reduce the severity of asthma attacks for asthmatic children.

Keywords: Rehabilitation program - respiratory indicators – aqua-aerobic exercise - intensity and severity - asthma attacks.

INTRODUCTION

Asthma is a chronic inflammatory disorder in the air paths, accompanied by hyper-neuropathy, leading to repeated episodes of cough, muscle, respiratory distress and pressure on the chest (GINA, 2016, p. 06), where the lungs become infected and the ducts that carry air from and to the lung, and thus causing difficulty to breathe. The air paths of an asthmatic person are very sensitive to certain factors called irritants. When stimulated by irritants, the inflows inflame, swell, increase their secretion to the mucus and contract their muscles, thereby obstructing the normal flow of air (Swinkey, 2017).

As defined in the clinical medical dictionary, it is a recurrent respiratory disease characterized by an overstatement response due to a variety of aerobic pulmonary embolism, translated into obstructive phenomena of the lower air paths that are associated with convulsions and localized bronchial esophageal reflux and a typical attacks with epilepsy, reflecting spontaneously or under the influence of therapies (Belair, 1974, p 253).

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Anyone can get asthma, a non-contagious disease that affects millions of people all over the globe regardless of race, culture, age, or sex. About 532 million people are infected all over the world (AFAA, 2017). It is one of the most common diseases affecting people of all ages, and is the most common chronic disease (long term), covering twice the number of adults and six times of children, with one child out of 8 children suffering from it. Doctors receive more than 18,000 consultations per week, and hospitals count about 74,000 emergency cases every year, and so is the case for all European countries (Yongs, 2005, p. 07).

As for Algeria, over the past 20 to 30 years, respiratory diseases and allergic diseases have increased dramatically, with an estimated number of 8.7% of patients with asthma (Anane, 2010, P 07). It has become increasingly common in non-developed countries, where inadequate diagnosis and treatment are common, and effective medicines may not available or affordable, and it considered as one of the most common causes of hospitalization, especially among children. (Manino et al. 2002, p. 52).

Under these circumstances and problems, including the lack of medical care and early diagnosis and lack of centers and specialized competencies and the high costs of treatment which depend on medicines, it became necessary to find other ways or alternatives to help patients and their families to alleviate their daily suffering because of the disease, which hinders their normal practice of daily life activities out of fear of having asthma attacks or crises that are sometimes fatal, while exacerbating the disease.

In this regard, some studies have shown that good physical fitness helps asthma patients reduce the chances of respiratory crises that are due to physical exertion, as physical activity contributes to the discharge of mucous discharge of the lung better, and also increases the depth of breathing, which improves the patients' condition and increases their well-being, this is what Dr. Helman, a member of the German Association of Respiratory Specialists in Heidenheim, confirms as he said that good overall fitness helps patients reduce the chances of attacks. However, he stressed the need for asthmatic patients to exercise properly and with a moderate load on the body to reduce the risk of asthma attacks in cases of physical exertion. He pointed out , also, that it is possible for patients to exercise all types of sports provided that the increase of the loads is gradual, and make of the physical activity a therapeutic supplement prescribed by doctors in various areas of disease, especially respiratory patients.

Among the recommended practices for asthmatic people are exercises in the aquatic environment where no swimming skills are required, these exercises can be performed in deep and non-deep basins using certain means and tools for fixing and carrying the body to take floating positions. Aqua-aerobic programs are programs that have started to be used recently, and became a new widespread pattern in the programs of physical activity for their positive effects on the physiological, physical and psychological side of patients. They depend on fat as a source of energy for the production of air (Dhamiri, 2014, p. 162). Professor Harald Moore, president of the Lung Association, says that warm and humid air, especially in heated swimming pools, helps soothe sensitive bronchial asthma, and reduces the risk of asthma attacks that occur only as a result of physical exertion, as in case of running under low temperatures. Water activities are becoming more and more common in modern societies due to the availability of facilities and services to perform various activities, in addition to the availability of qualified personnel to supervise these water

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activities and to follow up the situation of practitioners. These aerobic exercises, such as aqua-aerobics, burn more calories, lower blood cholesterol, and boost the strength of the respiratory muscles. (Bhaskarabhtla k, 2002, p13-17).

If we come to observe aquatic exercises we remark that they are very similar to aerobic exercises, the latter have been modified to aqua-aerobic exercises for their effectiveness and health benefits to patients, such as increasing lung volume, improving breathing and overall fitness of patients. (E.Gelinas, 1997, p.1). Schill notes that the lack of physical activity is due to respiratory fatigue or fatigue of the diaphragm in particular, where it is ascertained that the performance of respiratory functions depends largely on diaphragm functions (Sheel W, 2002. P. 282) .Diving in the water and neck dipping help the breathing process up to 60%. This is due to two main factors: pressure on the chest, and high blood pressure in the body. Therefore, these two factors help in the development of breathing muscles leading to good breathing (Kasee Hildenbrand, 2010, p 28).
Several studies, including the study of Abeer Abdel Rahman and Samar Abdel Aziz (1999), concluded that aqua-aerobic exercise improves the efficiency of respiratory and circulatory systems and decreases weight and psychological pressure in patients with some chronic diseases.

In addition, the study of k. Betata et al. (2009) which was carried out for one year on 13 school children with partial or uncontrolled asthma, following a treatment program, within which the researchers conducted a set of measurements by L'ACT and PEAK-FLOW before and after each training session, it was noted that there was a remarkable development in many indicators at varying degrees: PEF, 53%, Fev1 with 30%, and 46% for FVC. It was remarked that 8% of the children's asthma became controllable and that swimming is beneficial for asthmatic children, as it contributes to the improvement of respiratory functions and daily life. Among other researches that dealt with the topic of our research, the one of Beggs 2013, it showed that simple and complex aqua-aerobic exercises improve breathing for asthmatic people and reduce the severity of asthma attacks, especially in the case of children.

In the light of all these data, we proposed a habilitation program that includes aqua-aerobic exercises and applied to asthmatic children in order to determine the level of the impact of this program on the respiratory system, and precisely the work of the muscles of the diaphragm, the ability to perform good exhalation and improve breathing functions, and develop the values of respiratory indicators, in addition to the extent of its impact on the severity of asthma for children.
The problematic of the research lies in the two following questions is:

1. Does aqua-aerobic exercise have a role in the development of the respiratory muscles, especially the diaphragm, and thus, in increasing the efficiency of the respiratory system?
2. Does aqua-aerobic exercise have a positive effect on the respiratory system and improve some respiratory indicators to reduce the severity of asthma attacks for children?

METHOD

The nature of our study required the use the experimental method. We designed the sample group in addition to pre and post measurements. The sample of the study included (09) children from asthmatic patients, with different degrees of infection, ranging from light to severe. As for the sample's age, it ranges from 07 to 12 years, 18% of them were enrolled in the Asthma Association in the Wilaya of Mostaganem, i.e. (50%) of the total number.

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The study took a period of five months. The sample was subjected to aqua-aerobic exercises in the period between the pre and post measurements, it took place in the swimming pool of Sport and Physical Education Institute of Mostaganem University. For the measurement we adopted the spirobankΠ tool to measure some important respiratory indicators which are used by specialists to diagnose and know the severity of the disease in an objective way, and to know the strength of the breathing muscles: (forced expiratory volume in one second fev1), Peak Expiratory Flow (PEF), and the Forced Vital Capacity (FVC). We have also adopted criteria that determine the levels of asthma severity (Severe Persistent , Moderate Persistent ,Intermittent and mild persistent), which is the division of the Global Initiative of Asthma (GINA). In order to analyze the data we used the statistical program (Statistical Packafor Social Sciences IBMSPSS Statistics 22).

RESULTS

Pre-test and post-test results for FVC:

Table 01: shows the pre and post measurement of the forced vital capacity (FVC) according to severity.

Measurement / Severity.	forced vital capacity (FVC)			
	Pre-test		post-test	
	Number	%	Number	%
Severe Persistent	04	44.4	01	11.1
Moderate Persistent	03	33.3	02	22.2
Intermittent and mild persistent.	02	22.2	06	66.6
TOTAL	09	100	09	100

According to table (01) that shows the results of the FVC according to severity, there is an improvement in the FVC after the application of the rehabilitation program using aqua-aerobic exercises, regarding the differences between the frequencies and percentages of the pre and post measurements according to the defined levels of severity of asthma. The pre measurement showed that most of the children of the sample suffer a severe continuous asthma with a rate of (44.4%), followed by 33.3% of children Intermittent and mild persistent, and a small group (22.2%) with a Intermittent and mild persistent, while the post measurement showed that the majority of the children in question (66.6%) became at the level of Intermittent and mild persistent asthma.

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Figure 01: shows the pre and post measurements of the forced vital capacity (FVC) according to severity.

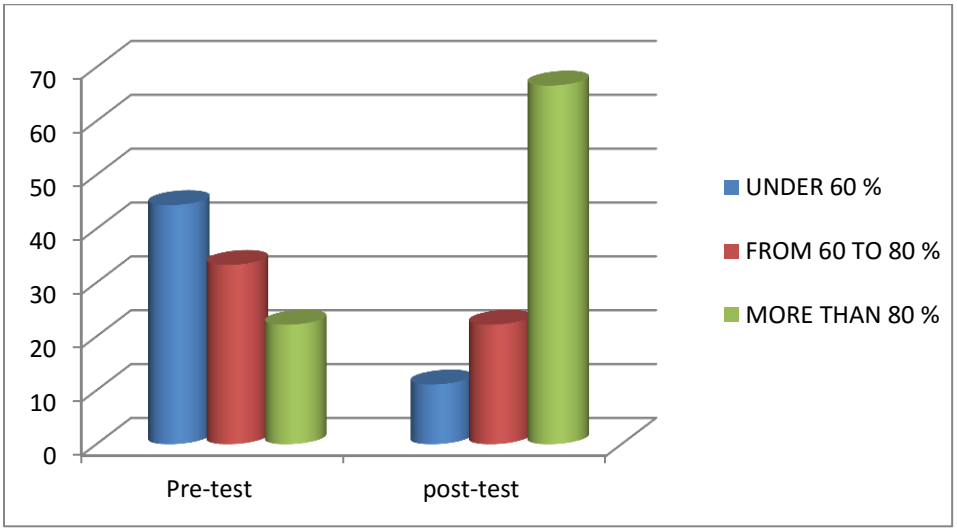

Table 02: shows the results of t-test for the forced vital capacity (FVC) for the pre and post measurements.

measurement	M	SD	DF	t-test	significance	SIG
Pre-test	59.55	20.20	08	-2.784	sig	0.02
post-test	80.66	14.64				

According to the results shown in Table 02, which shows the t-test calculated values of the first and second dimensions forced vital capacity (FVC), which were estimated at-2.784 at the significance level of 0.05 and the freedom level of 8, and the incorporeal value of 0.02, indicating statistical differences in the pre and post measurement of forced vital capacity (FVC).

Table 03 : The pre and post measurement of the forced expiratory volume in one second (Fev1) according to severity.

Measurement / **Severity of Asthma**	**forced expiratory volume in the first second (Fev1)**			
	Pre-test		**post-test**	
	Number	**%**	**Number**	**%**
Severe Persistent	04	44.4	01	11.1
Moderate Persistent	02	22.2	02	22.2

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Intermittent and mild persistent	03	33.3	06	66.6
TOTAL	09	100	09	100

According to table (03) that shows the results of pre and post measurements of the (forced expiratory volume in one second (Fev1) according to severity, there is an improvement in the volume of expiratory volume in one second (Fev1) after application of the rehabilitation program using aqua-aerobic exercises. The results of the pre measurement showed that the majority of the children were suffering from severe or moderate asthma, while the results of the post measurement showed that the majority of the children in question (66.6%) became at the level Intermittent and mild persistent asthma.

Figure 02: The pre measurement of the forced expiratory volume in one second (Fev1) according to severity.

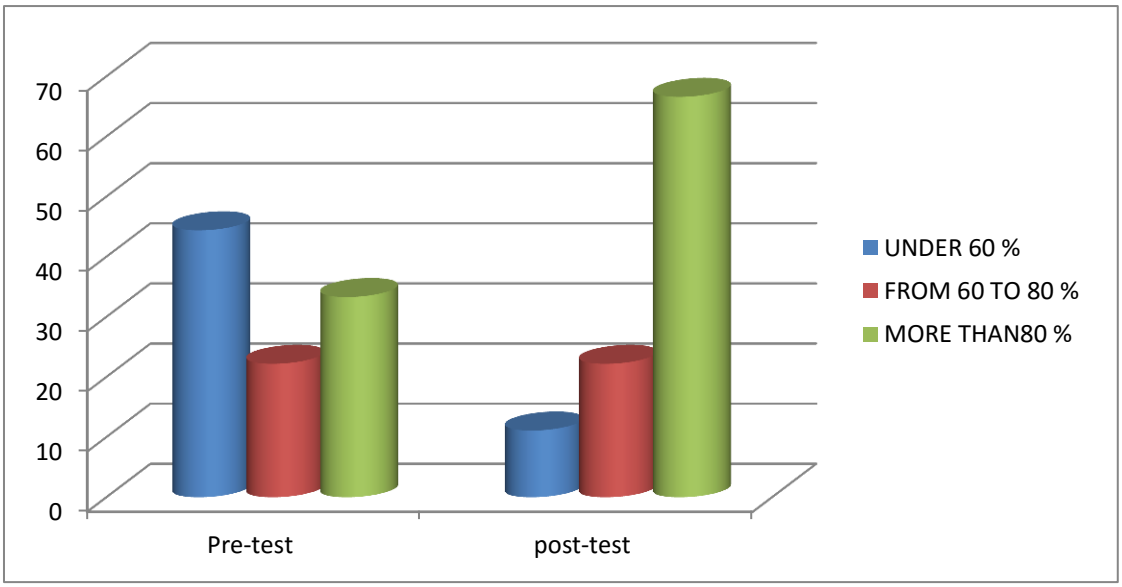

Table 04: shows the results of t-test for the forced expiratory volume in one second (Fev1) for the pre and post measurements.

measurement	M	SD	DF	t-test	significance	SIG
Pre-test	67.11	22.21	08	-2.625	sig	0.03
post-test	89.33	16.75				

According to the results shown in Table 04, which shows the t-test calculated values of the first and second dimensions of forced expiratory volume in one second (Fev1), which were estimated at_ 2.625 at the significance level of 0.05 and the freedom level of 8, and the incorporeal value of

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0.03, indicating statistical differences in the pre and post measurement of forced expiratory volume in one second (Fev1).

Results of the pre and post peak expiratory flow (PEF):

Table (05): shows the pre and post measurements of Peak expiratory flow (PEF) according to severity.

Measurement / Severity of asthma	Peak expiratory flow (PEF)			
	Pre-test		**post-test**	
	Number	**%**	**Number**	**%**
Severe Persistent	03	33.3	01	11.1
Moderate Persistent	01	11.1	03	33.3
Intermittent and mild persistent	05	55.5	05	55.5
TOTAL	09	100	01	100

In Table 05, which shows the results of the pre peak and postoperative maximum runoff (PEF) according to severity, there appears to be a slight improvement in maximum exhalation (PEF) after application of the rehabilitation program using aqua-aerobic exercises. This improvement appears through the differences that emerged between the frequency and percentages of the pre and post measurements according to the levels of asthma severity, where the results showed that two of the three children with severe asthma improved and became at the level of moderate asthma.

Figure 03: shows the pre and post measurements of Peak expiratory flow (PEF) according to severity.

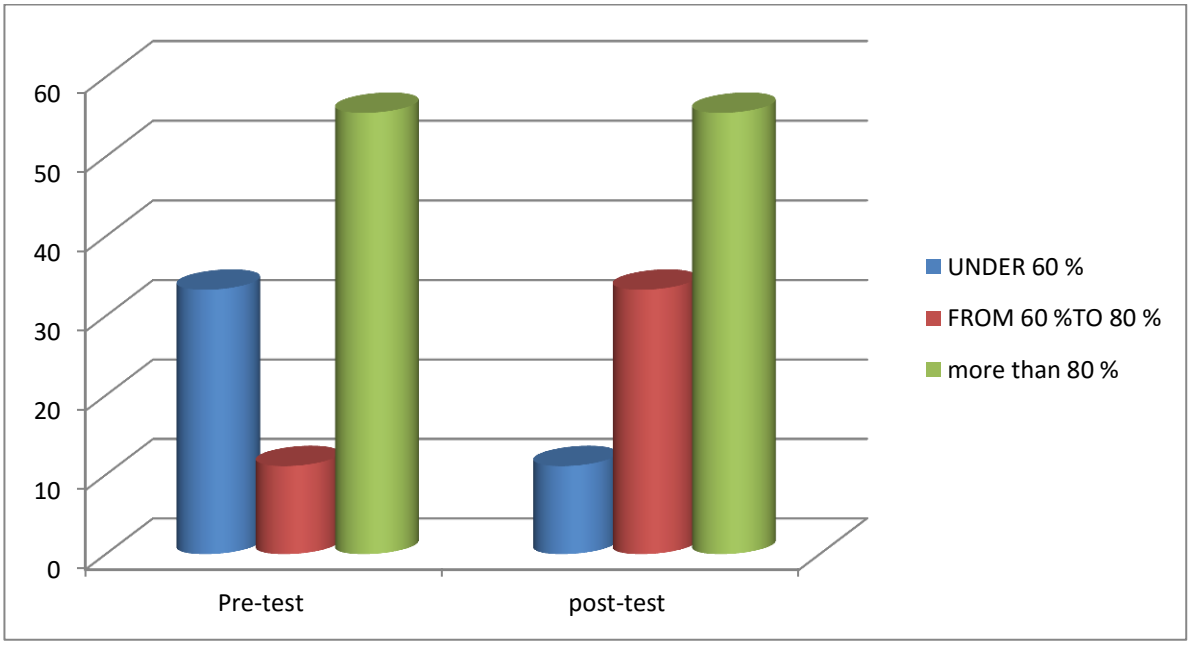

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Table 06: shows the results of the t-test of the Peak expiratory flow (PEF) of the pre and post measurements.

Measurement	M	SD	DF	t-test	significance	SIG
Pre-test	76.00	22.54	08	-1.705	nsig	0.12
post-test	76.00	22.54				

The results shown in Table 06 indicate the calculated value T of the pre and post measurements of the Maximum Exhaustion Flow (PEF) which was estimated at 1.705 at the significance level of 0.05 and the freedom degree of 8, and reached the incorporeal value of 0.12 which is greater than 0.05, indicating that there no statistically significant differences in the pre and post measurements of the maximum expiratory flow (PEF).

DISCUSSION

The first hypothesis was that there were statistically significant differences in the FVC , since the incorporeal value was statistically significant and was estimated at (0.02), as this value represents 98.0% of the sample of the study, it had differences in the pre and post measurements, indicating that the applied aqua-aerobic exercise program had an impact and effectiveness on the children of the sample, therefore the first hypothesis was proved, and these results were identical to those of the study of Bentata, B.Ziane and Y. Brabah, 2009, through which they noted a significant development in the measurement of the Forced Vital Capacity (FVC) which developed with a rate of 46% , While the Forced Vital Capacity (FVC) measurements in this study increased with a rate of 21.1%.
These results are also identical to the results of the 2013 Beggs study, which demonstrated that simple and complex aqua-aerobic exercises may also improve breathing for asthma patients and reduce the severity of asthma attacks for children.

The second hypothesis was that there were statistically significant differences in the measurement of the forced expiratory volume in one second (Fev1). After being statistically tested, the incorporeal value was statistically significant with a value of (0.03) . Thus, the second hypothesis was confirmed, and these results were identical to the results of the study of K. Bentata, B. Ziane, and Y.Barabah, 2009, but fairly close rates, through which they remarked a significant development in the measurement of forced expiratory volume in the first second (Fev1), which developed by 30%, while the measurement of forced expiratory volume in the first second (Fev1) in this research by 22.2%.

CONCLUSION

The use of aqua-aerobic exercises has contributed to the development and efficiency of the respiratory system. This fact reflects the improvement of the strength of the respiratory muscles which increased the rates of respiratory indicators (FVC) Forced Vital Capacity, forced expiratory volume in one second (Fev1) and the maximum expiratory flow (PEF) for asthmatic children, while reducing the severity of the asthma attacks.

In the light of the results above, the researcher recommends that asthmatic patients participate in aqua-aerobic exercises programs, regarding their effectiveness and the health benefits

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they offer through increasing the size of the lung, improving breathing, and enhancing their overall fitness.

REFERENCES

Akinbami lj ,Houma dm .Manino dm. (2002) .Control of Asthma. The United States of America: summary of Morbidity and Mortality Weekly Report.

Anane, b. e. (2010). guide sue le diagnostic et la prise en charge de l'asthme de l'enfant. algérie: société algérienne de pédiatrie.

bhaskarabhtla k, b. r. (2002). physical activity and type 2, diabetes physician and sports medecine.

connel, r. m., & jones. (2002). improuvedathletic performance in the generale population.

dictionnair emedical clinique pharmacologie et therapeutique-ed-5.

E.Gelinas, j. (1997). the developmental validity of traditional learn to swin progressions for children with physical disabilities. canada: national library.

Global Initiative for Asthma. (2016). global strategy for asthma management and prevention.

Ibrahim Hilmi ,Lili Alsaid Farhat . (1998)). Physical Education and Recreation for the handicapped. Cairo: Dar El Fikre Al Arabi.

Mahfoud Djaoudet . (2008) .Statistical analysis using (SPSS),298. Amman - Jordan: Dar Wael for publication and distribution.) - First Edition

Robert Yongs .(2005). How to coexist with asthma. Cairo: Dar El Farouk For Publication and distribution, First Edition

Samira Med Arabi ,Hiba Hacen ElDomeiri .(2014) . The impact of the water exercises on some physical and physiological variables and blood sugar level to infected with type 2 diabetes in Jordan. (University of Jordan, the editor) Studies of Educational Sciences, First Edition.

sheel A.W, d. P. (2002). threshold effects of respiratory muscle work on limb vascular resistance. american journal of physiology-heart and circulation physiology .

america, a. a. (s.d.). Consulté le juin 02, 2017,at www.afaa.org/page/asthma.

swinkey, l. (s.d.). chronic respiratory diseases. Consulted in may 15, 2017. www.who.int/respiratory/asthma.

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