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Effect of High-Frequency Chest Wall Oscillation Vest Device Versus Chest Physiotherapy on Chronic Obstructive Pulmonary Disease Patients outcome

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is a varied lung disease resulting in persistent respiratory symptoms with subsequent persistent, progressive airflow obstruction. Pulmonary rehabilitation including mainly chest physiotherapy and more recently high frequency chest wall oscillation vest device (HFCWO) which both aim to clear the airway and improve pulmonary function. **Aim**: evaluate the effect of HFCWO vest device versus chest physiotherapy on COPD patient's outcome. **Method**: a quasi-experimental research design was used , ninety patients with COPD were randomly allocated into two equal groups of forty five each (study and control) at Chest department at Specialized Medical building; Mansoura University Hospital. **Tools**: The study's data was gathered using three tools.: Tool I: structured interview Questionnaire (Part 1: Patient's Demographic Data sheet, Part 2: Health Relevant Data), II: Modified Medical Research Council's dyspnea scale, III: 6-minute walking test. **Results**: a highly statistically significant difference was detected between both groups in relation to expectorated sputum, which increased in study group than control group where (p-value<0.001), dyspnea severity increased in control group than study group but without any significant statistical difference and patients' ability to walk distance improved in study and control group at posttest and follow-up test but without any significant statistical difference. There is a significant association had been found between the severity of dyspnea and patient's ability to walk distance where (p=0.048,p<0.003 respectively). **Conclusion**: HFCWO vest device was an effective way to enhance COPD patient outcome than conventional chest physiotherapy but without statistically significant difference.

Keywords: Chest Physiotherapy, Chronic Obstructive Pulmonary Disease, High-Frequency Chest Wall Oscillation Vest

Introduction:

Chronic Obstructive Pulmonary Disease (COPD) is a varied lung condition which resulting in chronic respiratory symptoms (dyspnea, cough and sputum) secondary to diseased airways and/or alveoli that associated with continuous, progressive, airflow obstruction.(**Celli et al., 2019).**

Recent researches documented that COPD is the 3rd foremost reason of death worldwide by 2020. The international organization Global Initiative for Chronic Obstructive Lung Disease (GOLD) estimates the occurrence worldwide at over 6% COPD resulting in increased hospitalization rate and death of approximately 3,000,000 people (**Balkissoon, 2020**).

In Egypt COPD is considered a significant health problem but prevalence, morbidity, and mortality of COPD are absent, and its occurrence was valued to be approximately 10% per global (**Said, Ewis, Omran, Magdy & Saleeb, 2015).**

Smoking, viral and bacterial infection, are the common reasons of COPD, which resulting in increased degranulation and increased sputum secretion (**Brightling, 2016 and Wang et al., 2020),** with trouble clearing it due to impaired ciliary function, occlusion of lower airway, unsuccessful cough, limited peak expiratory flow with gradual decrease in lung function (**Nicolini, Grecchi, Ferrari-Bravo & Barlascini, 2018).**

Non-pharmacological therapy is important for managing COPD in addition to pharmacological components. By severing the chain of complaints, a skilled nurse can assist COPD patients in regaining their physical health and improving their breathing patterns. (**Luckett et al., 2022**).

Critically significant non-pharmacological therapy for COPD patients are chest physiotherapy and assisted mucus-clearing techniques (**Bourbeau, McIvor, Devlin & Kaplan, 2019**). Pulmonary rehabilitation for patients with COPD including mainly chest physiotherapy (breathing and coughing exercise, postural drainage, percussion and vibration). The objectives of rehabilitation are to improve lung function, open the airway, and get rid of clinical symptoms like shortness of breath and copious sputum, which can delay thoracic development, lower oxygen saturation, and lengthen the hospital stay for the patient. (**Kuhajda, Obradović & Ciobanu, 2022).**

Pulmonary rehabilitation also has other various equipment and strategies for secretion management that are critically important in COPD patients which might encourage secretion and increase the effectiveness of coughing, and improve the clearing of the airway. These include modified postural drainage, position, and percussion, positive expiratory pressure devices, breathing technique, intrapulmonary percussive ventilation, and, more recently, high-frequency chest wall oscillation (HFCWO) (**Coppolo, Schloss, Suggett & Mitchell, 2021).**

High-frequency chest wall oscillation is a non-assisted airway clearance device that applies positive and negative trans-respiratory pressure excursions to create high velocity, low amplitude oscillatory airflows. It consists of an inflatable soft and flexible vest covering the torso and flexible plastic hoses connecting it to an air pulse generator (**Quissesa, Juhdeliena& Gultom, 2021).**

Significance of the study

The occurrence of COPD increased with age. The Burden of Obstructive Lung Diseases (BOLD) reported an overall prevalence of COPD of 11.8% for men and 8.5% for women) and a substantial prevalence of COPD of 3%-11% among never-smokers.) (**GOLD,2023**). COPD is highlighted in Egypt as a major state of public pathology. The prevalence of COPD among high - risk people in Egypt was calculable. Accordingly, Healthy People 2020 objectives aim to reduce hospitalization rates and reduce hospital emergency department visit (**Sobeh, Hafez & Mohammed., 2019).**

Aim of the Study

The present study aimed to Evaluate the effect of HFCWO vest device versus chest physiotherapy on COPD patient's outcome.

Hypothesis:

To fulfill the aim of this study, the following research hypothesis was formulated:

H1: Patients with COPD who receive HFCWO vest will exhibit better health outcome than who receive chest physiotherapy.

H2: patients with COPD who receive chest physiotherapy intervention will exhibit better health outcome than who receive HFCWO.

Method

Design

Quasi-experimental research design will be used to attain the aim of the study.

Setting

This study was be carried out in Chest department at Specialized Medical Building: Mansoura University Hospital, provide services for COPD patients.

Study sample

A purposeful sample of 90 COPD client hospitalized in the previously cited department. They were randomly assigned into two groups:

Study group: was consisted of 45 patients was received HFCWO.

Control group: was consisted of 45 patients was received conventional chest physiotherapy.

Selection criteria:

Inclusion criteria: Adult conscious patients at age of 20-60 years, Both genders, able to communicate and understand instructions, and hemodynamically stable

Exclusion criteria: Patients with significant musculoskeletal disorders and those suffer osteoporosis, hiatus hernia, episode of significant hemoptysis, pneumothorax, or acute cardiac event

Sample size:

A purposive sample of 90 adult patients of both sexes with COPD admitted to chest department were included in the study taking based on the whole number of admitted COPD patients (during year 2019), alpha error 5% (= confidence level=95%) Beta error 20% (=study power= 80%). the sample size is 45 patients/group.

Study tools

The instrument for data collection included three tools:

Tool I: A structured interview Questionnaire:

The researchers developed this tool after reviewing national and international reviews. It included two parts:

Part 1: this part consisted of seven questions, including those about the patients name, age, gender, marital status, level of education, occupation and past medical history.

Part 2: this part consisted of three questions, including those about sputum volume measuring, hematological test and C- reactive protein test.

Tool II: Modified Medical Research Council's dyspnea scale (mMRC) (Cazzola et al., 2015).

This scale was developed by the American Thoracic Society as a modification of the originally proposed British Medical Research Council dyspnea index (scale 1–5). This tool used to establish the severity of dyspnea in relation to various physical tasks.

Tool III: 6-minute walking test (Giannitsi S, Bougiakli M, Bechlioulis A, Kotsia A, Michalis LK., 2019)

The 6MWT is an assessment to measure the distance a person is capable of walking on a flat, hard surface in 6 minutes. It is a useful test to measure the exercise tolerance in people with various health conditions and monitor the effectiveness of the current treatment plan and see

whether it is improving a person's condition **(Giannitsi S, et al ., 2019).**

Validity

A team of seven experts possessing specialised knowledge five in medical-surgical nursing, and two medical biostatistics assessed the validity of the content. The tools were amended by the experts to improve their clarity, relevance, thoroughness، simplicity, and application. Tools were first independently evaluated, after which contentious issues were thoroughly debated until an agreement was reached. Up until the final format employed in the current study was obtained, all proposed alterations were made to increase the validity of the questionnaire. Cronbach's alpha of the suggested study tools (0.85-0.92).

Pilot study

An initial pilot study was conducted, involving a sample of 10% (9) of the target population of patients, who were subsequently excluded from the study. The purpose of this preliminary investigation was to assess the clarity, feasibility, and applicability of the research tools as well as to estimate the time required for completing and submitting them. Drawing from the findings of the preliminary investigation, necessary improvements and alterations were implemented in advance of the data accrual process.

Ethical considerations and human rights:

The participants were informed of the voluntary nature of their participation in the study and were assured of their unrestricted prerogative to withdraw from the activity at any point without incurring any adverse consequences. Each subject was given the opportunity to give their verbal informed permission before the study began after being fully informed of its purpose, advantages, risks, and methodology. The data's confidentiality and anonymity were guaranteed, and it was solely used for study.

Fieldwork and Data collection:

Fieldwork consisting of three distinct phases:

Phase I: Preparatory phase

- Ethical approval was and an official permission to conduct the study was obtained.
- study tools developed through a thorough examination of scholarly literature, research articles and internet.
- The tool was disseminated to the jury committee to check the content validity and their suggestions were considered.
- Further the reliability and content validity of the tools were assessed using Cornbrash's Alpha Test.
- Subsequent to the ultimate rendition of the tool in English, it underwent the process of being translated into the Arabic language and was subsequently subjected to the process of back translation into the English language.
- obtaining a written approval from the patients to participate in the study after clarifying the aim of the study and confidentiality was preserved.

Phase II: Implementation phase:

- All participants who satisfied the specified parameters for inclusion were incorporated into the study and socio demographic data and health relevant data were collected.
- The researcher started by introducing herself to the patients and giving them a brief idea about the aim and nature of the study and then, an oral consent from each participant was obtained.
- The researcher attended to inpatient chest department daily from 9 AM to 2 PM. The researcher trains the resident nurse on how to do the sessions, and the specific sessions are done for the patient during the day, and this is followed up through telephone communication between the researcher and the resident nurse. the time of sessions were 9am,1pm,5pm,9pm,1am and 5am.

Control group receiving chest physiotherapy by resident nurse consisting of chest percussion and vibration, breathing and coughing exercises and postural drainage.

Study group receiving HFCWO device by resident nurse by applying the vest around patient chest.

(1) Control group:

chest physiotherapy includes postural drainage, chest percussion and vibration, and coughing and deep breathing exercise. Together, these techniques mobilize secretions, aid to expand alveoli, and promote efficient use of respiratory muscles.

(2) Study group:

- The study group receive HFCWO. It was set to an optimum oscillating frequency of 10-15 Hz, with a slight pressure on the chest.
- Both treatments were given every 4hours per day and last 30 minutes for each session for two weeks. Patients' condition was monitored for both groups during procedures and sputum was collected before therapy. Patients were asked to avoid swallowing and expectorate into the sputum cups and to continue expectorating if they felt the need to cough using part 2 tool1.
- The researcher assessed changes in hematological, c-reactive protein tests before therapy using tool I (part2).
- The researcher assessed changes in dyspnea before therapy using tool II.
- The researcher assessed patient ability to walk distance using six-minute scale tool III.

Phase III: Evaluation phase:

The effect of HFCWO vest device on COPD patient's outcome was assessed through comparison between the study and control group one week and two weeks after implementation of proposed therapy through the assessment using tool I (part2), tool II and tool III.

Statistical Analysis

- All statistical analyses were performed using SPSS (version 20.0)
- Continuous data were expressed in mean ± (SD).
- Categorical data were expressed in number and percentage.
- (ANOVA) test was used for comparison between more than two for variables with continuous data.
- Chi-square test (or fisher's exact test when applicable) was used for comparison of variables with categorical data.
- Correlation co-efficient test was used to test for correlations between two variables with continuous data.
- The reliability (internal consistency) test for the questionnaires used in the study was calculate. Statistical significance was set at $p<0.05$.

Result

Table (1) About one half (48.9%) of study group and two thirds (62.2%) of control group were in the age group of 51- 60 years, more than half (55.6%) of control group and about two thirds (62.2%) of study group were male, about one third (40.0%) of control group and study group (35.6) were graduated from secondary schools. Most od studied groups were married, engaged in work required exertion, and obese.

Table (2) show that, three forth (73.3%) of control group were suffering from chronic diseases compared to about two thirds (64.4%) in the study group, mostly CVD and diabetes mellitus.

Figure (1) the mean expectorated sputum volume in study group was (13.89 ± 5.97) compared to (7.84 ± 2.19) in control group in posttest and (7.67 ± 2.22) in study group compared to (3.78 ± 0.91) in control group in follow-up test, where (p-value <0.001).

Figure (2) mean C Reactive protein level in control group was (6.67 ± 2.13) compared to (2.80 ± 1.02) in study group in posttest and (1.73 ± 0.63) in control group compared to (0.93 ± 0.32) in study group in follow-up test, where (p-value <0.001).

Table (3) At post intervention evaluation slightly less than one third (31.1%) in control group compared to (24.4%) in study group suffering grade 3 dyspnea, (57.8%) in control group compared to (51.1%) in study group suffering grade 2 dyspnea and only (11.1%) in control group compared to (24.4%) in study group suffering grade 1 dyspnea, where (p-value <0.399). Whereas in follow-up test grade 2 dyspnea suffered by (48.9%) in control group compared to (37.8%) in study group, and percentage of patients suffering grad 1 dyspnea decrease to (37.8%) in control group compared to (40.0%) in control group, where (p-value <0.399).

Table (4) patients' ability to walk distance using 6-minute walking test (6MWT) improved in study and control group at posttest and follow-up test. At post intervention and follow-up test mean distance (meters) in control group (195.11 ±70.90 and 220.73 ±82.09 respectively) and study group (192.22 ±72.48 and 210.22 ±78.67 respectively) without any abnormal changes in normal physiological parameters. there was no statistically significant difference where (p-value <0.537).

Table (5) show a significant association had been found between the severity of dyspnea and the 6MWT one week after therapy (0.043). in study group the severity of dyspnea showed significant association with the respiratory symptoms one week after therapy and two weeks after therapy (p=0.048, p<0.003 respectively).

Table (1). A frequency distribution of the studied groups regarding their demographic data (N=90)

	Control		Study			
	N	%	N	%	X2	P
Age (years)						
20 – 30	3	6.7	5	11.1		
31 – 40	4	8.9	5	11.1		
41 – 50	10	22.2	13	28.9		
51 – 60	28	62.2	22	48.9	1.722	0.632
Mean ±SD	49.2 ±7.5		48.9 ±6.9		0.197	0.843
Gender						
Male	25	55.6	28	62.2		
Female	20	44.4	17	37.8	0.413	0.520
Educational Level						
Illiterate	10	22.2	6	13.3		
Read and write	11	24.4	14	31.1		

Secondary school	18	40.0	16	35.6		
Highly educated	6	13.3	9	20.0	2.078	0.556
Marital Status						
Single	15	33.3	13	28.9		
Married	30	66.7	32	71.1	0.207	0.649
Occupation Nature						
With exertion	19	42.2	25	55.6		
Without exertion	26	57.8	20	44.4	1.601	0.206
BMI						
Underweight	2	4.4	2	4.4		
Healthy weight	4	8.9	12	26.7		
Overweight	12	26.7	10	22.2		
Obese	27	60.0	21	46.7	4.932	0.177

BMI. Body Mass Index, P: probability X^2 Chi squared,

Table (2). A frequency distribution of the studied groups regarding their health relevant data (N=90)

	Control		Study			
	N	%	N	%	X^2	P
Chronic illness						
No	12	26.7	16	35.6		
Yes	33	73.3	29	64.4	0.829	0.362
If yes, what are they?	**(n=33)**		**(n=29)**			
CVD	17	51.5	13	44.8	0.276	0.599
Liver diseases	5	15.2	5	17.2	0.050	0.823
Renal diseases	3	9.1	5	17.2	0.912	0.339
Diabetes mellitus	12	36.4	14	48.3	0.900	0.343
Respiratory diseases	9	27.3	6	20.7	0.365	0.546
Others	18	54.5	22	75.9	1.289	0.256
Do you take any medications?						
No	13	28.9	16	35.6		
Yes	32	71.1	29	64.4	0.458	0.499
If yes, what do you take?	**(n=32)**		**(n=29)**			
Medications for CVD	18	56.3	15	51.7	0.125	0.723
Medications for Liver diseases	3	9.4	4	13.8	0.292	0.589
Medications for Renal diseases	3	9.4	4	13.8	0.292	0.589
Medications for Diabetes mellitus	9	28.1	11	37.9	0.664	0.415
Medications for Others	13	40.6	23	79.3	9.413	0.002*

P : probability, X^2 Chi squared, *: Statistically significant($p<0.05$)

Figure 1. Distribution of the studied groups according to volume of expectorated sputum through the study period

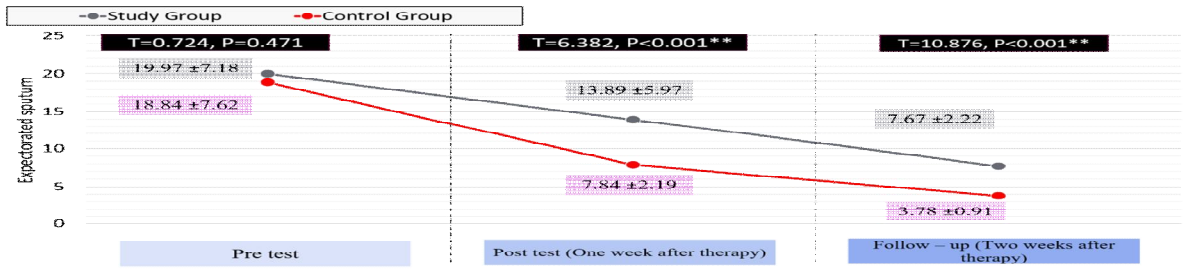

Figure 2. Distribution of the studied groups according to C Reactive protein level through the study period

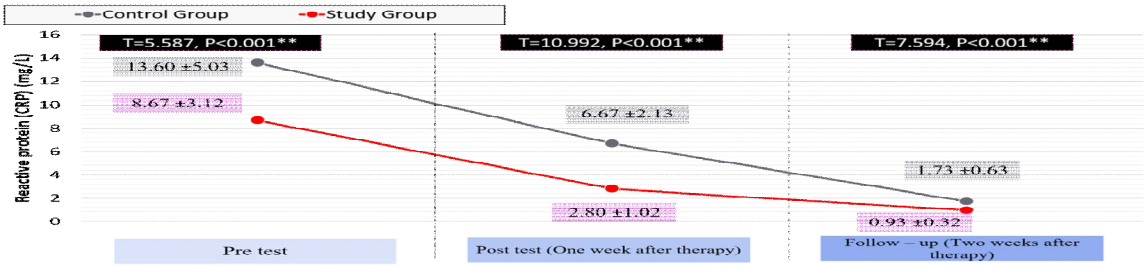

Table 3. Comparison between the studied groups according to Severity of Dyspnea

	Control		Study			
	n	%	n	%	X2	P
Pre – Therapy						
Grade 0	0	0.0	0	0.0		
Grade 1	0	0.0	0	0.0		
Grade 2	9	20.0	16	35.6		
Grade 3	21	46.7	21	46.7		
Grade 4	15	33.3	8	17.8	4.090	0.129
One week after therapy						
Grade 0	0	0.0	0	0.0		
Grade 1	5	11.1	11	24.4		
Grade 2	26	57.8	23	51.1		
Grade 3	14	31.1	11	24.4		
Grade 4	0	0.0	0	0.0	2.794	0.247
Two weeks after therapy						
Grade 0	6	13.3	8	17.8		
Grade 1	17	37.8	18	40.0		
Grade 2	22	48.9	17	37.8		
Grade 3	0	0.0	2	4.4		
Grade 4	0	0.0	0	0.0	2.955	0.399

P : probability, X^2 Chi squared

Table 4. Distribution of the studied groups according to patients' ability to walk distance using (6MWT)

Table 4. Comparison of the minute walking test between Control and Case Study groups									
	Pre – Therapy			One week after therapy			Two weeks after therapy		
	Control Mean ±SD	Study Mean ±SD	Student's T – test	Control Mean ±SD	Study Mean ±SD	Student's T – test	Control Mean ±SD	Study Mean ±SD	Student's T – test
Distance (meters)	154.51 ±64.09	156.67 ±68.97	T=0.154, P=0.878	195.11 ±70.90	192.22 ±72.48	T=0.191, P=0.849	220.73 ±82.09	210.22 ±78.67	T=0.620, P=0.537
SBP at rest	119.11 ±8.74	121.56 ±11.07	T=1.162, P=0.248	71.33 ±5.05	73.11 ±7.63	T=1.303, P=0.196	80.71 ±6.75	92.64 ±99.32	T=0.804, P=0.423
SBP Peak	109.11 ±8.74	109.13 ±18.57	T=0.007, P=0.994	104.22 ±5.43	108.67 ±8.94	T=2.849, P=0.005	106.89 ±7.33	107.33 ±9.15	T=0.254, P=0.800
DBP at rest	89.71 ±1.41	89.69 ±1.26	T=0.079, P=0.937	113.78 ±7.16	117.56 ±10.04	T=2.055, P=0.043	71.33 ±4.05	72.00 ±5.48	T=0.657, P=0.513
DBP Peak	69.78 ±2.60	69.58 ±2.45	T=0.525, P=0.601	68.67 ±5.48	69.07 ±5.05	T=0.360, P=0.719	68.67 ±5.48	67.78 ±5.17	T=0.791, P=0.431
HR at rest	82.53 ±5.09	81.42 ±4.85	T=1.061, P=0.292	90.00 ±1.68	89.93 ±1.51	T=0.198, P=0.844	117.11 ±8.15	116.44 ±9.08	T=0.366, P=0.715
HR Peak	85.64 ±6.53	84.78 ±5.66	T=0.673, P=0.503	86.29 ±5.35	86.09 ±4.18	T=0.198, P=0.844	87.62 ±6.62	86.51 ±5.61	T=0.859, P=0.393

SBP: Systole blood pressure, DBP : Diastole blood pressure, HR: Heart rate., SD: Standard deviation

Table 5. Association between Severity of Dyspnea and respiratory symptoms with patients' ability to walk distance using (6MWT)

	Control						Study					
Severity of Dyspnea	BCSS	BCSS Significance		6MWT	6MWT Significance		BCSS	BCSS Significance		6MWT	6MWT Significance	
	Mean ±SD	F	P	Mean ±SD	F	P	Mean ±SD	F	P	Mean ±SD	F	P
Pre – Therapy												
Grade 2	7.11 ±1.05			555.11 ±138.04			7.13 ±1.15			568.13 ±128.03		
Grade 3	8.57 ±1.50			517.52 ±80.51			7.81 ±1.12			541.29 ±84.68		
Grade 4	8.93 ±1.22	5.556	0.007*	497.87 ±116.36	0.822	0.446	8.25 ±1.67	2.547	0.090	580.13 ±106.57	0.512	0.603
One week after therapy												
Grade 1	3.80 ±0.84			630.20 ±116.22			4.18 ±1.08			588.64 ±132.60		
Grade 2	5.85 ±1.49			505.46 ±89.43			5.26 ±0.96			528.78 ±89.71		
Grade 3	5.57 ±1.45	4.314	0.020*	506.79 ±114.70	3.392	0.043*	5.18 ±1.66	3.260	0.048*	587.36 ±93.75	1.879	0.165
Two weeks after therapy												
Grade 0	2.67 ±0.52			562.83 ±167.54			2.50 ±0.76			607.13 ±164.30		
Grade 1	4.06 ±1.56			514.18 ±72.88			3.22 ±1.22			519.94 ±69.40		
Grade 2	4.14 ±1.52			509.86 ±109.26			3.71 ±1.31			561.29 ±93.10		
Grade 3	-	2.547	0.090	-	.607	0.550	6.03 ±0.02	5.347	0.003*	670.00 ±5.66	2.357	0.086

Discussion

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease of the airways, commonly afflicted by co-morbidity and systemic extrapulmonary manifestations causing deconditioning and physical inactivity. All chest physiotherapy practices for COPD patients should reflect increase of aeriation of airways. Furthermore, best ways to promote effective expiratory airflow, while maintaining airway patency should be learned to patients **(Grillo, Housley, Gangadharan, Majid and Hull, 2022).**

The study at hand pertains to evaluate the Effect of HFCWO Vest Device Versus Chest Physiotherapy on COPD Patients health outcome, suggested that if there was a significant change in patients' health outcome pre & post implementation of either HFCWO Vest or manual Chest Physiotherapy, there was a significant positive effect on health outcome among Chronic Obstructive Pulmonary Disease Patients**.**

As regard to age in our study, COPD Patients founded mostly in the fifth decade, that is may be related to that COPD disease is chronic disease and usually detected in young ages and gradually deteriorated due to pathophysiological changes that impairs airway function, which coincided with the studies by **Lutter etal., (2020)** who showed that the prevalence of COPD is increased in the same age group.

According to sex, in our study male gender prevailing among the majority of the studied groups may be accredited to smoking effect. Current evidence confirmed the difference between both genders in their vulnerability to COPD risk factors, due to biological and hormonal proprieties, which supported by results of **Bahremand et al., (2021) and Cheng et al., (2022)** stated that the prevalence of COPD was higher among males than females.

In reference to BMI, the majority of our studied groups were obese, which agreed with

Mara Paneroni et al., (2020) who showed that the most of their included sample have high body mass index. This result may be attributed to sedentary life style of those patients due to decreased lung capacity and impaired gas exchange. Our results are contradicted by the results of **Na et al., (2021)** who conveyed that most of their studied sample within normal weight and BMI

Concerning presence of chronic disease, most of our studied sample suffering from chronic diseases mainly CVD and DM, which supported by the results of **Cheng et al., (2022),** complicated with diabetes mellitus, cardiovascular diseases and hypertension

As regard to expectorated sputum volume, mean expectorated sputum volume increased in study group compared to control group with statistical significant difference, which described by patient's inability to expectorate sputum efficiently, sputum impaction, narrowed air passage and inflammation with its associated damage in addition to the aerodynamic changes that required to ease secretion movement which can be managed by HFCWO

In reference to mean C Reactive protein level Our study showed that, mean C-Reactive protein level increased in control group compared to study group documented statistical significant difference. Our results may be due to, HFCWO can realize more complete sputum removal compared to conventional physiotherapy which help in decreasing further damage to airway and reduce patients' liability infection.

Our results were confirmed by **Yang et al., (2019)** who documented that serum inflammatory indicators decreased significantly after 14 d of HFCWO treatment, suggesting the effectiveness of HFCWO in reducing the inflammatory reaction and improve cortisol function by Promoting lung deflation by opening the glottis, effectively reduce airway inflammation and relieve dyspnea.

Regarding **severity of dyspnea,** our results revealed that, dyspnea severity improved in study group than control group at post intervention and follow-up test but without any significant statistical difference between studied groups. From the researcher point of view this result may be due to mucus hypersecretion, deteriorated lung function and excessive sputum obstruction of the airway. In addition to short experimental periods.

These results were in line with the findings of **Byng et al., (2019) and Huang et al., (2022)** who found that, there was a non-significant improvement in severity of dyspnea in COPD patients following the HFCWO. These results also were in the same line with the findings of **Fawzy et al., (2018) and Ghobadi, Hosseini and Aslani, (2020)** reported that, nursing approaches and other medical treatment have synergistic effects, both can significantly improve patient's oxygenation coupled with chest physiotherapy, by drainig sputum effectively from the depth airways.

Concerning patients' ability to walk distance our results show that at post intervention and follow-up test mean distance (meters) improved in studied groups but without statistical significant difference, which agreed with the results of a study conducted by **Hussain , Shaikh and Ahmed, (2022)** Showed that standard physical therapy and HFCWO are effective in the management of COPD and significantly improved dyspnea, exercise capability and activities of daily living. Similarly**, Sheraz et al., (2022)** confirmed that HFCWO with traditional chest physiotherapy revealed a substantial improvement in lung capacities and volumes as well as in ADL's. another study by **Khan et al., (2018)** concluded that HFCWO is highly effective in the treatment of patients with COPD in terms of improvement in ventilatory function and oxygenation parameters with better exercise tolerance.

Our results documented a significant negative correlation between Severity of Dyspnea and patients' ability to walk distance in studied groups one week after therapy and two weeks after therapy, which agreed with the results of the study by **Huang et al., (2022)** who found a negative correlation between sputum production and FEV1. HFCWO and conventional therapies can maximize the tidal volume of COPD patients, strength inspiratory muscles, and support natural breathing.

Finally, both Chest physiotherapy and HFCWO have significantly desirable effects on health outcome among patients suffering COPD. But HFCWO vest present to be more effective than conventional chest physiotherapy but without statistical significant difference. Therefore, HFCWO vest should become an integral part of hospital management for hospitalized COPD patient in acute phase with attention to the importance of chest physiotherapy as easy and effective traditional method that can be used easily at home by the patient and his or her relatives to remove chest secretion, relive dyspnea, respiratory symptoms, decrease infection and improve exercise tolerance to prevent acute exacerbation state of COPD.

Conclusion

Crucially, the present study concluded that, comparison between chest physiotherapy and high frequency chest wall oscillation vest device showed that there were an effective way to enhance COPD patient outcome. But HFCWO vest presented to be more effective than conventional chest physiotherapy but without statistical significant difference.

Recommendations

1- Training program for nurses and physician about new advances related to COPD treatment modalities should be established.
2- Establishment of an outpatient office concerned with providing health education and training for the patients about non pharmacological therapy is highly recommended.
3- Replicate the study in a large probability sampling and several hospitals to generalize the results.

limitations

1. There is only one device in the hospital and we find it difficult to use it for more than one patient at the same time.
2. working with the device for a long period exposes the device to damage.
3. The study used a small sample size.
4. Limited time to see the effect of intervention.

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