

COMPARATIVE ASSESSMENT OF PERCUSSION THERAPY AND VIBRATION THERAPY ON PULMONARY FUNCTION TESTS IN PATIENT WITH CHRONIC BRONCHITIS

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ABSTRACT:

Objectives: The aim of this study was to compare the effect of percussion therapy and vibration therapy on pulmonary function in patients of chronic bronchitis.

Methods: This Quasi-experimental study included 42 patients between age 35-65 years with chronic bronchitis. Pregnant, lactating and patients with uncontrolled medical conditions were excluded from the study. Participants were divided into two groups: 21 received percussion therapy and 21 received vibration therapy. Pulmonary function tests, including FEV₁, FVC, and FEV₁: FVC. were measured before and after applying therapy. Therapy was applied for 1 minute with rest interval of 30 seconds. This whole procedure was done for 5 minutes

Results: Statistical tests indicated an increase in FVC by 0.8L post-therapy in both groups, with varying FEV₁ values and no significant inter-group difference. Mean ranks for vibration and percussion therapy differed by 10 points pre- and post-treatment.

Conclusion: The findings of this study showed that patients receiving percussion therapy showed better results as compared to that receiving vibration therapy.

Key Words: Chronic bronchitis, forced expiratory volume, forced vital capacity, percussion therapy and vibration therapy.

INTRODUCTION:

In chronic bronchitis (CB) is chronic cough and sputum production for at least three months per year for two consecutive years(1, 2), leading to increased exacerbation rates, accelerated lung function decline, and worse health-related quality of life(3, 4). It is the third leading cause of death worldwide, with 90% of COPD deaths in those under 70 years old occurring in low- and middle-income countries(5, 6). The primary causes of CB are long-term exposure to irritants, such as tobacco smoke, which damage lungs and airways(7). As the disease worsens, symptoms become more severe, including frequent coughing, wheezing, whistling, shortness of breath, and chest tightness(8). Physiotherapy aims to improve lung functioning(9), using techniques like breathing exercises, physical training for peripheral and respiratory muscles(10, 11). Percussion and vibration therapies play crucial roles in managing CB(12, 13), particularly in improving pulmonary function test outcomes(14-16).

Chronic bronchitis, a subtype of COPD, is characterized by chronic inflammation and excessive mucus production, leading to impaired pulmonary function. Effective mucus clearance is crucial for improving respiratory outcomes. Percussion therapy, involving rhythmic chest tapping, and vibration therapy, using oscillations, are two common physiotherapeutic techniques employed to enhance airway clearance. This study aims to evaluate the impact of percussion and vibration therapies on pulmonary function test parameters in chronic bronchitis patients. By comparing these interventions, the research seeks to provide evidence-based recommendations to optimize respiratory therapy, improve lung function, and enhance patient care.

There is a lack of direct comparative studies evaluating percussion versus vibration therapy on tests in chronic bronchitis. Long-term effects and standardized treatment protocol are underexplored. Additionally, mechanistic insights and patient-centered outcomes are insufficient.

MATERIALS AND METHODS:

This study was conducted in Jinnah Hospital Lahore, Pakistan, after receiving approval from the Research Committee of the University of South Asia, Pakistan. The study design was quasi experimental study. Total 42 Patients suffering from chronic bronchitis of both genders of age between 35-65 years were included in the study. Sample size was calculated through G power with 21 patients in each group and effect size of 0.79.(12) The following were the inclusion and exclusion criterias:

Inclusion Criteria:

- Individuals clinically diagnosed with chronic bronchitis as per established criteria (e.g., persistent cough, sputum production for at least three months in two consecutive years(17).
- Participants aged between 35 to 65 years old.
- Participants with stable chronic bronchitis without exacerbations within the last three months prior to recruitment.

Exclusion criteria:

- The presence of concurrent respiratory conditions like chronic obstructive pulmonary disease (COPD) other than chronic bronchitis.
- Uncontrolled comorbidities such as cardiovascular diseases, unmanaged hypertension, severe heart disease, or any medical condition that could interfere with participation in therapy sessions or assessment procedures(18).
- Individuals are unable to comply with the therapy sessions or study due to physical, cognitive, or logistical limitations.
- Pregnant or lactating individuals due to potential risks associated with therapy sessions and assessments.
- Participants with recent respiratory infections or exacerbations of chronic bronchitis within the last three months preceding recruitment(19).
- Individuals with a history of thoracic surgery within the past year as this might interfere with therapy effectiveness or assessment accuracy.

Pregnant, lactating and patients with serious complications like uncontrolled pulmonary and cardiac complication were also excluded from the study. The patient's family members gave their informed consent. Patients were split into two groups (Group A and Group B), receiving percussion and vibration therapy. Baseline readings were taken 10 minutes before giving therapy. Chest percussion therapy was administered to the patient in group A while mechanical chest vibration therapy was administered to the patient in Group B. Therapy was applied for 1 minute with rest interval of 30 seconds. This whole procedure was done for 5 minutes. Outcome measures were noted down by the researcher as the researcher was observer.

Treatment protocol:

Group 1:

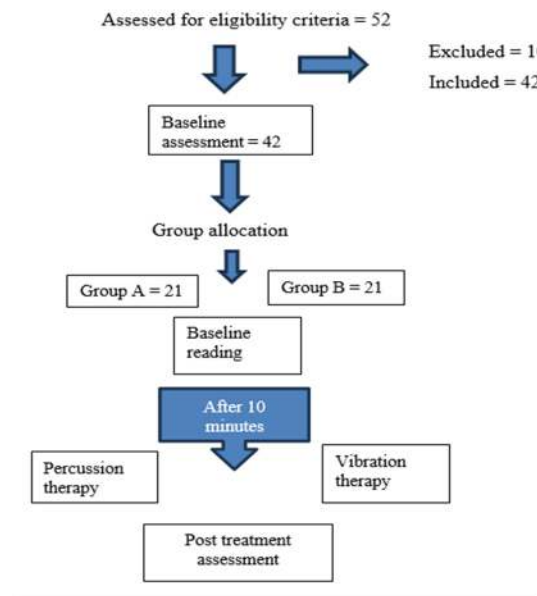
The patient was ensured to be in comfortable and in relaxed sitting position. Warm up session for 1 minute was provided and gradually the therapy was started and the focus was on areas where mucus was accumulated. The therapy was given for 1 minute with rest of 30 seconds. Readings were recorded before and after applying therapy.

Therapy	Frequency	Intensity	Time
Percussion therapy	1 time/ day	upon endurance level of patient	5 minutes

Group 2:

The patient was ensured to be in comfortable and in relaxed sitting position. Warm up session for 1 minute was provided and gradually the therapy was started and the focus was on areas where mucus was accumulated. The therapy was given for 1 minute with rest of 30 seconds. Readings were recorded before and after applying therapy.

Therapy	Frequency	Intensity	Time
vibration therapy	1 time/ day	upon endurance level of patient	5 minutes



Statistical Analysis:

Statistical analysis was conducted using IBM SPSS Statistics version 29.0 (SPSS Inc., Chicago, IL, USA). Descriptive data was conveyed using measures such as mean \pm standard deviation (SD), median (min-max), or amount and frequency. Normality of data was assessed using Shapiro Wilk. For within in group analysis Paired T test and Wil Coxin test were used. For between group analysis Independent T test and Mann-Whitney test were used. Statistically significant was defined as having P values less than 0.05.

Results:

This research included 42 participants with 34 males and 8 females. Descriptive statistics illustrating study variable show the mean age of patients in group 1 was 57.9 ± 8.75 years. And mean age participants in group 2 was 57.66 ± 7.04 years. Psychosocial variable suggests that 92% proportion of participants were smokers and 62% were taking snuff. Normality of data was checked sing Shapiro wilk test. FEV1 and FVC were normally distributed, whereas FEV1: FVC was not normally distributed. Independent T test, paired T test and Mann-Whitney test were applied on the data.

Between group analysis: FVC for between group analysis Independent T test was applied as data was normally distributed. The mean value for group 1 before therapy was 3.09 ± 0.47 and after treatment was 3.1905 ± 0.36 . The mean value for group 2 before treatment was 3.07 ± 0.43 and after treatment was 3.02 ± 0.40 , with p value < 0.05 which means there was significant difference between the groups.

For FEV1, the mean value for group 1 before therapy was 1.81 ± 0.47 and after treatment was 1.29 ± 0.35 . the mean value for group 2 before treatment was 1.56 ± 0.41 and after treatment was 1.57 ± 0.41 , with p value > 0.05 which means there was no statistical difference between the groups.

Wilcoxon test was used for with in group comparison of FEV1: FVC as data was not normally distributed. The test showed baseline reading of (Median=54.2, IQR = 3.03) and post treatment reading (Median=55.0, IQR = 3.06) for percussion therapy and for vibration therapy, baseline readings were (Median= 51, IQR= 9.55) and post treatment reading were (Median=51.03,IQR=9.54).

TABLES:

Age of participants

Variables	Group	Mean ±SD
Age	Percussion	57.9±8.75
	Vibration	57.66±7.04

FVC:

Between group analysis:

Variables	Group 1 Percussion therapy	Group 2 Vibration therapy	P value	Mean difference
Baseline assessment FVC	3.09± 0.47	3.07±0.43	0.73	-0.76
Post treatment FVC	3.19±0.36	3.02±0.40	0.49	-0.11

With in group analysis:

Variables	Mean ±SD Group 1 Percussion therapy	Means ±SD Group 2 Vibration therapy	P value Group 1 Percussion therapy	P value Group 2 vibration therapy
Baseline FVC	3.0986±0.47	3.02±0.40	0.061	0.067
Post treatment FVC	3.1905±0.36	3.07±0.43	<0.001	<0.001

FEV1:

Between group analysis:

Variables	Group 1 Percussion therapy	Group 2 Vibration therapy	P value	Mean difference
Baseline assessment FEV1	1.81±0.442	1.56±0.416	0.710	-0.25
Post treatment FEV1	1.29±0.35	1.57±0.419	0.705	-0.22

With in group analysis:

Variables	Means ±SD	Mean ±SD	P value	P value
	Group 1	Group 2	Group 1	Group 2
Baseline FEV1	1.79±0.35	1.57±0.419	0.051	0.051
Post treatment FEV1	1.81±0.44	1.56±0.418	<0.001	<0.001

FEV1:FVC:

Between group comparison:

Variables	Mean SD	Median (IQR)	P- value	Mean rank Percussion	Mean rank vibration
Baseline FEV1:FVC	52 ±7.1	54(6.25)	0.301	24	19.55
Post treatment FEV1: FVC	54±7.2	55(5.25)	0.172	23	18.93

With in group comparison FEV1: FVC

Percussion therapy:

Variables	Mean rank	Median (IQR)	P value
Baseline FEV1 :FVC	13	55.6(5.85)	0.004
Post treatment FEV1	8	55.0(6)	

·FVC			
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Vibration therapy:

Variables	Mean rank	Median (IQR)	P value
Baseline FEV1: FVC	3.75	53(8)	0.528
Post-treatment FEV1:FVC	6.75	53(8)	

DISCUSSION:

This study employed a quasi-experimental design with placement of patients into two groups: one receiving percussion therapy and the other receiving vibration therapy. This design allowed us to compare the effects of both therapies on pulmonary function in individuals with chronic bronchitis. The findings of this study indicate that percussion therapy is more effective intervention than vibration therapy for improving FEV1:FVC in individuals with chronic bronchitis. The results of this study align with previous research that has demonstrated the efficacy of chest physiotherapy, including percussion therapy, in improving lung function in patients with respiratory conditions. The mechanisms underlying the benefits of percussion therapy may include improved mucous clearance, enhanced lung expansion, and increased collateral ventilation. Additionally, percussion therapy may help to loosen and clear mucus from the airways, reducing airway resistance and improving gas exchange.

In this study, FEV1 decreased from 1.81 to 1.29 in Group one, which was receiving percussion therapy and remain unchanged in Group 2. Whereas in other study conducted by Marks john et al., in 2019 it increased from 1.6 to 1.9 in percussion therapy group.(20) In another study., the FEV1 increased from 1.71 to 2.1 in vibration therapy group. And in a systematic review, it was mentioned that FEV1 increased from 1.6. To 1.9 in vibration therapy group.(21) The results of these studies are different from the results of this study, as there is an increase in FEV1 whereas in present study there is decrease in FEV1. In 2019, Lee conducted a study, in which FEV1 decreased from 1.8 to 1.5 in percussion therapy group.(22) The result matches the result of this study.

In this study FVC increased from 3.09 to 3.19 in Group one which was receiving percussion

therapy and decreased from 3.07 to 3.02 in group 2 that was receiving vibration therapy. John conducted a study in 2019 in which FVC increased from 2.9 to 3.3 in the group receiving percussion therapy.(20) The results of the study are in line with this present study. Whereas, the results of study conducted by Smith in 2020 shows an increase FVC from 3.1 to 3.4 in vibration therapy group which contradicts with result of this study. (21)

This study shows, significant increase in FEV1: FVC for the group receiving. Percussion Therapy. Previous study by Main et al., showed a significant improving in pulmonary function in patients receiving chest therapy. Showing that the results of this study and the previous study are similar. In conclusion, the difference in results can be due to various factors including population characteristics, studies design, and intervention protocol. The disappearances may also be due to varying degrees of lung function impairment and disease severity among the study population.

The limitations of this study include relatively short follow up period. Further studies should consider conducting longer follow-up assessment to provide more comprehensive insight into the efficacy and sustainability of percussion therapy. Additionally, incorporating other outcome measures such as oxygen saturation, pH level, and quality of life assessment. It will provide a more complete understanding of the benefits of the percussion therapy. Furthermore, future studies could investigate the optimal duration and frequency of percussion therapy session, as well as the potential benefits of combining percussion therapy with other therapies like exercise training. The use of percussion therapy in different populations, such as copious cystic fibrosis should also be explored.

In conclusion, this study suggests that percussion therapy may be a more effective intervention than vibration therapy for improving lung function in individuals with respiratory issue. The finding of this study unequivocally demonstrate the superiority of percussion therapy on FV1 ratio FVC over vibration therapy group.

ETHICS STATEMENT:

The study design was approved by research committee of University of South Asia. All participants were provided with a detailed written informed consent form explaining the study's purpose, procedures, potential risks and benefits, and their right to withdraw at any point.

Informed consent was confirmed by the IRB. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

NOTES:

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CONFLICT OF INTERESTS:

The authors have no conflict of interest to declare for this study.

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