

Immediate Effect of Chest Wall Kinesio Taping on Pulmonary Functions in Individual with Chronic Obstructive Pulmonary Disease

Dr. Anita Prajapat¹, Dr. Hardini Prajapati²

¹ Assistant Professor, Faculty of Physiotherapy Department, Sigma University, Vadodara, Gujarat

² Senior Lecturer & Pg Guide, Physiotherapy Department, Ahmedabad Institute of Medical Sciences, Gujarat University

Abstract—Background: The primary cause of COPD is cigarette smoking, which results in hyperinflation and increased lung mucus secretion, which impairs gas exchange and results in dyspnea. The patient's general health and ability to function are affected by these abnormalities. Prevention and treatment are therefore of utmost importance. A type of traditional alternative medicine called Kinesio taping has been used in clinical settings to treat pulmonary issues. This highlights the need for further research into the potential benefits of Kinesio taping in chronic obstructive pulmonary disease. **Materials and Method:** The sample size consisted of 27 patients who were diagnosed with chronic obstructive pulmonary disease (GOLD CLASSIFICATION – GRADE – I & II) with help of digital spirometer. Pre-intervention evaluation from spirometry done. All participants then received Kinesio Taping rested for 1 hour. Then post evaluation and outcome measures were measured again after the Kinesio Taping.

Result: The result of this study showed significant statistical improvement in pulmonary function- FEV_1 ($p=0.000$), FVC ($p=0.001$), FEV_1/FVC ($p=0.000$), and not improved in PEF ($p=0.008$) with treatment of Kinesio taping.

Conclusion: It can be concluded from study that Kinesio taping can clinically improve the pulmonary functions (FEV_1 , FVC, FEV_1/FVC) in COPD.

Index Terms—Chronic Obstructive Pulmonary Disease, Kinesio Taping, Pulmonary Functions, Spirometry.

I. INTRODUCTION

Chronic obstructive pulmonary disease is a progressive condition characterized by airflow limitation which is not fully reversible. (WHO).^[1] By 2024, COPD is expected to be the third greatest cause

of mortality globally, with 90% of deaths occurring in poor and middle-income nations. Worldwide the most frequent risk factor for COPD is smoking, however air pollution from burning wood and biomass fuels has also been linked to the disease in several countries.^[1] Chronic obstructive pulmonary disease is a leading source of illness and mortality worldwide.^[1] The term COPD typically includes chronic bronchitis and emphysema. Asthma is also one type of chronic obstructive disease classified separately as it is reversible and mostly triggered by allergens or irritants. Chronic inflammation leads to structural changes, constriction of the tiny airways, degradation of the lung parenchyma, and loss of alveolar elasticity, reducing lung elastic recoil. Inflammation narrows the airways, causing premature closure of expiration causes air trapping in the distal airways, resulting in hyperinflation of the lungs.^[5] The impact of treatment on disease development is measured using criteria such as PFT (Pulmonary function test).

In patients with COPD, changes in the PFT test are seen reduced FEV_1 (force expiratory volume in 1st second), reduced FVC (force vital capacity) and decreased FEV_1/FVC ratio, reduced TLC (Total lung capacity), increased RV (residual volume), reduced DLCO (Diffusion capacity).^[3, 5, 8]

A pulmonary function test can reveal critical details about each of these crucial separate processes that facilitate gas exchange. The two methods of recording the FVC test are ^[8] Volume-time curve-the most common measurements made from this curve are the force expiratory volume in 1 second (FEV_1). Flow-volume curve-the most common measurement from this curve is peak expiratory flow (PEF).

The method of Kinesio tape was developed by Dr. Kenzo Kase, in between 1973 and 1979 with the intention of providing support for the musculoskeletal structure without immobilization and its associated adverse effects.^[12] Kase commercialized the tape for KT in 1982, with elastic, cohesive, lightweight, and ventilation properties. The initial objective was to manage oedema, provide soft tissue support, preserve joints, and relieve the heat caused by active inflammation.^[12]

However, due to a lack of scientific research, it is still unclear how kinesiology taping may alter respiratory function and provide relief from dyspnea. The elastic nature of kinesiology tape produces traction, convolutions and mechanical deformation of the skin and superficial layers of viscoelastic connective tissue matrix (fascia) and striated muscle fibers.^[14,15] It is believed to stimulate low threshold mechanoreceptors in the skin, fascia, muscle spindles, and Golgi tendon organs, resulting in an influx of impulses in myelinated nerve fibers, kinesthetic awareness, muscular tone, and strength all influence proprioceptive perception..^[13,14,15] Kinesiology taping may also alleviate breathlessness by providing mechanical support to the structures associated with breathing, i.e., the rib cage, upper abdomen and neck where the primary and accessory inspiratory muscles are located.^[13]

The "muscle facilitatory" kinesiology taping technique involves stretching adhesive kinesiology tape and applying it to the skin overlying the muscles of inspiration. It is said that this modifies myofascial tone and muscle contraction by causing tactile stimulation and concentric pull on superficial soft tissues.^[13]

Aim is to investigate the immediate effect of chest wall Kinesio taping on pulmonary functions and six-minute walk distance and chest expansion in patient with chronic obstructive pulmonary disease:

II. MATERIALS AND METHOD

This experimental study conducted at various department of pulmonary clinic and hospital. All consecutive patients who diagnose with GOLD Stage 1 and 2 COPD between September 2024 and January 2025 were included.

Inclusion criteria:

- subjects who are diagnosed with COPD (according to gold classification grade 1 & 2)
- males with age group between 40-60 years.
- smokers, non-smokers, ex-smokers
- patients who were willing to participate.

Exclusion criteria:

- patients with unstable vital parameters.
- patients with any pulmonary conditions other than COPD.
- patients with cardio-pulmonary surgeries.
- patients with cardiac condition except hypertension.
- patients with any skin conditions and infections.
- patients with neuro-psychiatric conditions
- patients who have received bronchodilator less than 6 hours prior to data collection.
- patients with any systemic dysfunctions

outcome measures:

pulmonary functions (FEV₁, FVC, FEV₁/FVC, PEF_R) by digital spirometry.

The whole procedure of the study was explained to the individuals and if they were willing to participate in the study they were asked to sign the consent form. Written consent informed was taken. 27 subjects were chosen for data collection. Subjects who were found according to inclusion and exclusion criteria were selected and assigned for the study. On first visit a complete assessment was done. Skin patch test was done to rule out the skin allergy and hypersensitivity. Pre evaluation and Kinesio taping was done after at least 2 hours of meal and 6 hours of bronchodilators. The atmosphere of the room in which evaluation and Kinesio Taping session was done was soothing, quiet and well ventilated. Pre-intervention evaluation from spirometry according to GOLD classification [Grade-1 & II COPD] was done. All participants then received Kinesio Taping rested for 1 hour. Then post evaluation and outcome measures were measured again after the Kinesio Taping.

Measuring Pulmonary Function Test: Before the measuring pulmonary functions of individuals, the Calibration of spirometer was done. The spirometry procedure was carried out as per the American Thoracic Society of standardization of spirometry guidelines. The procedure was explained to the subjects. Test was performed with the subjects in the sitting position with the nose clip. The test was

repeated 3 times after adequate rest of 5 min to avoid the exertion. Average of all three repetitions is taken into consideration. These parameters included FVC, FEV₁, FEV₁/FVC, and PEF.

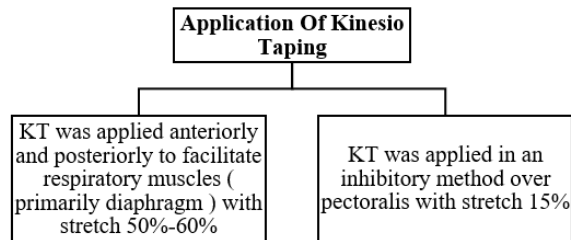


Figure No.1



Figure: -1

Figure: -2



Figure: -3

Figure No.2

III. STATISTICAL ANALYSIS

The statistical analysis was done in Microsoft Excel 2016 and IBM statistical package for social sciences (SPSS) Version 20.0. The results are expressed in mean, standard deviation and percentage. Descriptive statistics were used to summarize the demographics and procedural details of the study population. P value of < 0.05 was considered statistically significant, and all P values presented with the Paired t test and Wilcoxon signed rank test was used.

IV. RESULTS

A total of 27 subjects participated in this study. The sociodemographic parameters of the participants are shown in Table 1 & 2. All parameters were homogenous at the baseline assessment. Pulmonary function tests showed an increase in FEV₁ values after KT, compared to the values prior to KT ($p=0.001$). There was no statistically significant difference

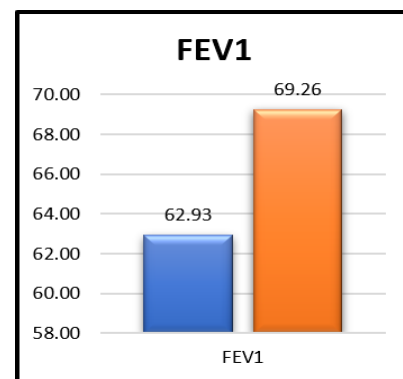
between PEF values ($p>0.05$). Statistically significant difference was seen concerning FVC ($p=0.001$), FEV₁/FVC ($p=0.001$)

Table No.1

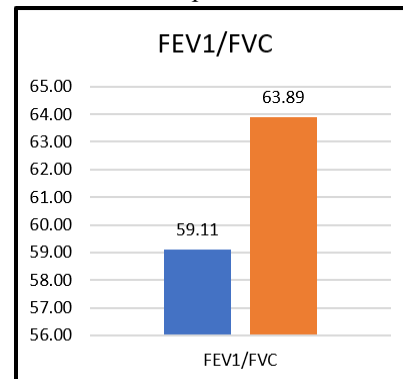
No. Of Participants	27
AGE	54.19 $\pm$ 4.76
BMI	24.01 $\pm$ 1.32

Table No.2

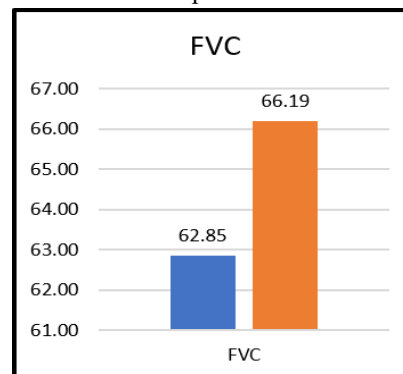
Parameters	KT mean	KT SD	P Value
FEV ₁	62.9 $\pm$ 5.51	69.2 $\pm$ 5.20	0.001*
FVC	63.0 $\pm$ 7.75	66.3 $\pm$ 7.77	0.001*
FEV ₁ /FVC	59.2 $\pm$ 9.18	64.0 $\pm$ 7.88	0.001*
PEF	76.8 $\pm$ 19	80.5 $\pm$ 20	0.008



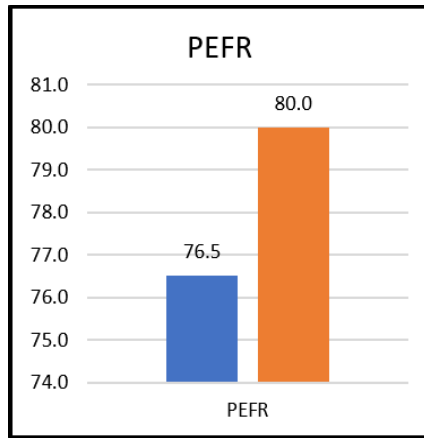
Graph No.1



Graph No.3



Graph No.2



Graph No.4

V. DISCUSSION

This study was conducted to find the immediate effect of Kinesio taping on pulmonary functions in chronic obstructive pulmonary disease (COPD). An interventional study was conducted on 27 individuals ageing between 40-60 years having Grade I & II stable chronic obstructive pulmonary disease assessed by digital spirometry according to GOLD CLASSIFICATION. Kinesio taping was given where pre and post outcome measured with the help of Spirometry. Kinesio taping proved significant statistical improvement in FEV₁, FVC, FEV₁/FVC. Skeletal muscle deterioration in patients with COPD has a direct impact on functional exercise capacity.^[42]^[43] Because respiratory muscles are anatomically similar to striated muscles, they become exhausted after prolonged use. The continuing weariness generates inhibitor signals and reduces motor commands, resulting in respiratory insufficiency in COPD patients.^[44] Dynamic hyperinflation is also a primary cause of functional exercise restriction in COPD.^[45] Increased lung volume shortens the length of the inspiratory muscles and produces functional weakening. The diaphragm's effect on the rib cage is particularly adversely affected.^[46]

This study found that applying KT to the diaphragm muscle improves the performance of FEV₁, FVC, and FEV₁/FVC in people with COPD shown in graph [1,2,3]. A method of stimulation was employed in present study to enhance the activity of the respiratory muscles. By stimulating the diaphragm muscle's fibres and activating the skin's mechanoreceptors that affect the diaphragm through the fascia, KT is a Muscle

Facilitation treatment. Kinesiology taping is the primary method of cutaneous sensorimotor stimulation of the diaphragm, which also helps in retraining to function well. This result is supported by the similar study done by Burcu Metin Okmen et al 2019 in Turkey. According to it, Kinesio taping improved in the FEV₁ and FEV₁/FVC levels in spirometry tests in patients with COPD^[55]

PEFR shows no improvement in [graph 4] after applying KT. Given that it needs enough time to improve, the brief duration may be the cause of the lack of noticeable impact. The primary reasons of low PEFR include narrowing of the airways, decreased muscle strength, decreased lung elastic recoil, and limited movement of the chest wall.^[47] The authors believed that a single KT session would not result in a substantial change in the pulmonary function of these subjects. A study by HANY E. OBAYA et al. (2022) in Mansoura also examined the effects of KT treatment on pulmonary function and discovered no appreciable improvement in PEF values after KT administration in COPD patients^[56]

The improvement in chest expansion followed by the Kinesio Tape. which might be due to flexible system provided by KT, that promotes movement of the chest wall. As a consequence, the thoracic cage becomes more movable, allowing for a greater expansion during inhalation. maximize the posture and function of the intercostal muscles, which are crucial for the development of the rib cage. Which was supported by the Thailand study by Tadsawiya Padkao et al (2020), implies the contraction of the inspiratory muscles most notably the diaphragm and external intercostal muscles produce the force contact between the chest wall and the expansion of the chest wall and lungs. As a result, the pleural pressure decreases, creating a pressure gradient that allows air to enter the lungs.^[57]

The other study by Jan Szczegielniak January 2007: -^[53] in Kup. They examined on all patients with acute bronchial asthma by applying Kinesio Tex tape to improve efficiency, normalize extra breathing muscle tone, and correct inspiratory chest posture. Cough reflexes and secretions increased after one hour of Kinesio Tex treatment, making spiograph challenging. The patients' condition improved after 24 hours of treatment. All spirometry parameters improved in comparison to their original values. The capacity to cover even surface distance improved. As a result, the findings imply that Kinesio Taping can be

beneficial in physiotherapy for individuals with acute asthma. Even after giving participants with respiratory impairments a Kinesio taping session, some pulmonary functions (PEF) did not significantly improve. Kinesio tape works on Myelinated cells which are bombarded with impulses when Kinesio taping triggers low threshold mechanoreceptors in muscle spindles, fascia, Golgi tendon organs, and skin. Nerve fibres regulate proprioceptive and kinaesthetic perception, as well as muscle tone and strength. Additionally, by providing mechanical support to the rib cage and accessory inspiratory muscles, kinesiology tape can help with dyspnoea.

VI. CONCLUSION

It can be concluded from study that Kinesio taping can clinically improve the pulmonary functions (FEV₁, FVC, FEV₁/FVC), but there is no significant improvement in PEFR, with the treatment of Kinesio taping. Kinesio taping can be beneficial in treatment of relieving dyspnoea & acute excursion, improve lung functions, and improve muscle flexibility. So, in clinical practice Kinesio taping should be recommended for pulmonary rehabilitation in patient with COPD as non-pharmacological management along with conventional therapy.

Clinical Implication

The present study suggested that there is improvement in pulmonary functions (FEV₁, FVC, FEV₁/FVC), RR, 6MWD, and saturation level (SPO₂) in chronic obstructive pulmonary disease. Kinesio taping can be beneficial in treatment of relieving dyspnoea & acute excursion, improve lung functions, and improve muscle flexibility. So, in clinical practice Kinesio taping should be recommended for pulmonary rehabilitation in patient with COPD as non-pharmacological management along with conventional therapy.

Address for correspondence:

dr.anitaprajapat98@gmail.com, Physiotherapy Department, Sigma University, Vadodara, Gujarat (8529756172)

dr.hardini@gmail.com, Physiotherapy Department, Ahmedabad Institute of Medical Sciences, Gujarat University,

Abbreviations

WHO – World Health Organization

COPD – Chronic Obstructive pulmonary disease

PFT – Pulmonary Function Test

FEV₁ – Forced Expiratory Volume in 1 sec

FVC – Forced Vital Capacity

PEFR – Peak Expiratory Flow Rate

BMI -Body Mass Index

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