*Research Article*

*National Journal of Medical and Health Sciences (NJMHS)*
*2020, Volume 2, No.1, pp. 31-37*

# Effects of Chronic Obstructive Pulmonary Disease on Cervical and Lumbar spinal mobility

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## Abstract

***Objective:***

Chronic obstructive pulmonary disease is an inflammatory disease with airway obstruction that can affect breathing pattern and posture. The study's objective was to measure the effects of chronic obstructive pulmonary disease on cervical and lumbar spinal mobility**.**

***Material and Methods:***

It was an analytical cross-sectional study, consists of 75 patients with COPD. An inclinometer was used to assess a range of motion, and the Dutch Musculoskeletal Questionnaire (DMQ) was used for assessing musculoskeletal overload and potential hazards. Analysis of data done by using SPSSv20. Percentage and frequency were used for categorical variables, age, and gender.

***Results:***

Majority of participants had limited lumber ranges and mild limitation in cervical ranges. Patients felt much trouble in moving heavy load and little trouble when working in an uncomfortable posture.

***Conclusion:***

This study's findings indicate that most patients had limited lumber ranges, and they felt trouble in doing activities.

***Key Words:*** *COPD, Posture, Inclinometer, Range of motion*

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## INTRODUCTION

Chronic obstructive pulmonary disease is a progressive disease with inflammation and airflow obstruction. It is the third leading cause of death worldwide. (Beauchamp et al., 2010). A major contributing factor is smoking, including cigarette smoking, hookah and marijuana. Work-related activities and environmental factors may also be responsible for the disease. The smoke produced due to biomass has also been considered as the cause of COPD. Obstructive disease caused by biomass differs from that caused by tobacco because it causes more air retention in the lungs than emphysema. (López-Campos et al., 2016)

Shortness of breath, mucus production and cough are major clinical features of COPD. Other features are decreased muscles strength and endurance, poor respiratory function, postural abnormality, joint stiffness and gait problems. (Wang, 2015). In 2011 United States, the prevalence of the chronic obstructive disease in adults was above 2.7 million with 135,000 deaths. World Wide prevalence of chronic obstructive pulmonary disease was 10.7% in 1990, including 30 years or more. In 2010 World Wide prevalence of COPD enhanced up to 11.7%. (Adeloye et al., 2015). In the Rotterdam Study, the prevalence of COPD was 4.7%. In Europe, the prevalence of COPD above 40 years of age varies between 15-20%, more in men than women. (Terzikhan et al., 2016) .Two types of diseases that commonly occur in COPD patients are bronchitis and emphysema. Diagnosis of obstructive pulmonary disease is based on clinical presentation and spirometry. Various health-related issues can develop from obstructive disease due to which clinician find difficulty to make a diagnosis. Incidence of psychological issues was 10-42% and 10-19%. (van der Molen, 2010)

The chronic obstructive disease can be treated by inhaled bronchodilators, supplemental oxygen, steroids, antibiotic therapy, noninvasive ventilation and home-related program. Its severity can lead to increase stay in hospital and mortality. (Wedzicha et al., 2017). To examine posture thoracic kyphosis and lumbar lordosis are two variables that are commonly assessed. These changes increase the chance of low back pain. Most of the researchers have preferred inclinometer for postural assessment. (Van Blommestein et al., 2012). Increased muscle work in obstructive disease leads to a lack of balance in the body, which affects posture and these changes put extra load on the spine, which induces pain and affects daily activities. Various methods may be used to measure postural changes involving goniometer, Flexi curve and topography. (Lee et al., 2017).

Pectoralis minor muscle is a major muscle involved in postural abnormality due to its shortening.

Additional muscles like Sternocleidomastoid and Scalene may also affect lung functions. While doing daily functional activities like the lifting of the arm may result in an increased oxygen requirement. COPD patients present with forwarding head posture and thoracic kyphosis. (Morais et al., 2016) . Non-medical way to treat chronic obstructive disease is to stop smoking. Oxygen use for a prolonged time can enhance the quality of life and improve symptoms of shortness of breathing. The main goal of pulmonary rehabilitation is to improve physical health, functional status, participation in activities, and improve the quality of life. Aerobic and resistance exercises are helpful for pulmonary rehabilitation. (Safka and McIvor, 2015).

The study's main objective was to assess the postural changes among COPD patients by using an inclinometer and Dutch Musculoskeletal Questionnaire (DMQ). The study aimed to evaluate COPD effect on muscles and joint range of motion in the suffering patients.

## MATERIALS & METHODS

The study design of this work is an analytical cross-sectional study. Data was collected from the department of the chest at Gulab Devi chest hospital Lahore. Seventy-five patients with COPD were enrolled in the study by convenience sampling technique. Inclusion criteria were the patients of COPD of both gender and clinically diagnosed COPD cases, including the patients of emphysema and chronic bronchitis. The exclusion criteria were the patients of COPD with other pulmonary diseases such as bronchiectasis, lung cancer or restrictive lung diseases, patients with age less than 35 and more than 60, patients of COPD with other cardiac diseases, infants, pediatric population, pregnant females, patients with congenital and acquired disabilities, developmentally disabled patients and patients who had undergone previous surgeries. Informed consent was taken from patients. DMQ was used to collect data. A digital inclinometer was used to take a reading from the spine. Information was taken based on history that contained information about the address, socioeconomic status and gender according to DMQ. The data was entered and analyzed using SPSS 20 (statistical package for social sciences 20). Qualitative variables were expressed as percentages and frequencies. Quantitative variables are expressed as percentages and frequencies.

## RESULTS

The majority of the subjects were male (73%) and female (27%) with a mean age of 52 years. A majority of participants had lumbar flexion 10-12$^{o}$, lumbar extension 9$^{o}$, right lumbar

**Table No. 1: Descriptive statistics of the lumbar spine**

| Parameters | Mean | S.D. |
|---|---|---|
| Lumbar flexion | 20.3867 | 8.19508 |
| Lumbar extension | 11.2133 | 3.75713 |
| Lumbar right lateral bending | 17.64 | 3.90993 |
| Lumbar left lateral bending | 16.80 | 4.75622 |

**Table No. 2: Descriptive statistics of the cervical spine**

| Parameters | Mean | S.D. |
|---|---|---|
| Cervical flexion | 39.32 | 5.73552 |
| Cervical extension | 43.2667 | 10.31443 |
| Cervical right lateral bending | 32.92 | 5.68488 |
| Cervical left lateral bending | 32.8667 | 5.48296 |
| Cervical right rotation | 56.5333 | 9.38995 |
| Cervical left rotation | 55.32 | 9.46853 |

lateral flexion 20$^{o}$, left lumbar lateral flexion 16-18$^{o}$ (Table 1). Furthermore, the majority had neck flexion 42$^{o}$, neck extension 52$^{o}$, right neck lateral bending 34$^{o}$, left neck lateral bending 34-36$^{o}$, right neck rotation 60-62$^{o}$, left neck rotation 62$^{o}$ (Table 2). Furthermore, most participants had low back pain once in the past 12 months; they did not consult any physiotherapist, chiropractor or osteopath. The patients felt much trouble in moving heavy loads, little trouble when working in uncomfortable postures. Majority of participants had neck/shoulder pain 2-4 times in past 12 month, they were on sick leave 1-7 days due to neck/shoulder pain, and they did not take any medical treatment for that pain, they feel little trouble when performing jobs which require exertion of arms and hands and little trouble when working in an uncomfortable posture.

## DISCUSSION

In this study, the COPD patients' mean age was 52 years, and the mean age for the male population was 55, and for female, the mean age was 45, in contrast, Claudia S Dias and fellows in (2009) stated in their study that average age was 74 years. (Dias et al., 2009) Nicola R Heneghan and fellows in (2015) stated that their study was one of the first ones to examine musculoskeletal changes in patients with COPD and evaluated thoracic axial rotation in COPD. The results showed that musculoskeletal changes were evident in the cervicothoracic region. Participants had reduced cervical and thoracic spinal motion in comparison to the control group. This is following our study, which concluded that neck rotation and side bending is reduced in COPD patients. (Heneghan et al., 2015). According to this study, the right lateral lumbar flexion is 20$^{o}$,

left lumbar lateral flexion is between 16-18$^{o}$, the neck right side bending is 34$^{o}$ and neck left side bending is 34-36$^{o}$, in contrast, the work of Marcia Aparecida Goncalves and fellows in 2017 stated that COPD patient had altered lateral head tilting and lateral trunk tilting. (Gonçalves et al., 2017). Our results indicated that neck extension is limited in COPD patients; this is following Kirkwood RN's research work (2007). Kirkwood worked with mouth breathing children and concluded that mouth breathing children had smaller ROM for neck extension (59.0° ± 10.79°) than the nose-breathing group. The range of cervical flexion remained unchanged; this result contradicts our study, which concluded that neck flexion is limited in addition to neck extension. (Neiva and Kirkwood, 2007)

Neck extension came out to be limited in this research; this result opposed the work done by Annemarie L. Lee and fellows in 2018. They used photogrammetry to assess the cervical ranges. Their research work concluded that cervical ranges remained more or less the same. (Lee et al., 2018). According to this study cervical ranges are limited and there is also the incidence of cervical pain while lifting heavy loads, this result is an agreement with Adriana Claudia Launardi (2010) work which concluded that 21.5% of asthmatic patients suffer from cervical pain (Lunardi et al., 2011).

**CONCLUSION:**

In COPD patients, cervical rotation, lumbar extension and lumbar flexion are limited. Most patients experience trouble and pain while lifting heavy loads and feel some trouble in the neck when working in uncomfortable postures.

**Conflict of interest**

All the authors declare that there is no conflict of interest.

**Ethical approval**

Ethical and other necessary approvals were taken from the Ethical Committee of Gulab Devi Institute of Physical Therapy, Lahore, Pakistan.

**Consent for Publication**

All author approved the manuscript for publication.

## REFERENCES:

Adeloye, D., Chua, S., Lee, C., Basquill, C., Papana, A., Theodoratou, E., Nair, H., Gasevic, D., Sridhar, D. & Campbell, H. 2015. Global and regional estimates of COPD prevalence: Systematic review and meta–analysis. *Journal of global health*, 5.

Beauchamp, M. K., Brooks, D. & Goldstein, R. S. 2010. Deficits in postural control in individuals with COPD-emerging evidence for an important secondary impairment. *Multidisciplinary respiratory medicine*, 5**,** 417.

Dias, C., Kirkwood, R., Parreira, V. & Sampaio, R. 2009. Orientation and

position of the scapula, head and kyphosis thoracic in male patients with COPD. *Can J Resp Ther,* 45**,** pp.30-34.

Gonçalves, M. A., Francisco, D. D. S., Medeiros, C. S. D., Brüggemann, A. K. V., Mazo, G. Z. & Paulin, E. 2017. Postural alignment of patients with Chronic Obstructive Pulmonary Disease. *Fisioterapia em Movimento,* 30**,** pp.549-558.

Heneghan, N., Adab, P., Jackman, S. & Balanos, G. 2015. Musculoskeletal dysfunction in chronic obstructive pulmonary disease (COPD): An observational study. *International Journal of Therapy and Rehabilitation,* 22**,** pp.119-128.

Lee, A. L., Goldstein, R. S., Chan, C., Rhim, M., Zabjek, K. & Brooks, D. 2018. Postural deviations in individuals with chronic obstructive pulmonary disease (COPD). *Canadian Journal of Respiratory, Critical Care, and Sleep Medicine,* 2**,** pp.61-68.

Lee, A. L., Zabjek, K., Goldstein, R. S. & Brooks, D. 2017. Systematic review of postural assessment in individuals with obstructive respiratory conditions: Measurement and Clinical Associations. *Journal of cardiopulmonary rehabilitation and prevention,* 37**,** pp.90-102.

López-Campos, J. L., Tan, W. & Soriano, J. B. 2016. Global burden of COPD. *Respirology,* 21**,** pp.14-23.

Lunardi, A. C., Marques Da Silva, C. C. B., Rodrigues, M. F. A., Marques, A. P., Stelmach, R. & Fernandes-Carvalho, C. R. 2011. Musculoskeletal dysfunction and pain in adults with asthma. *Journal of asthma,* 48**,** pp.105-110.

Morais, N., Cruz, J. & Marques, A. 2016. Posture and mobility of the upper body quadrant and pulmonary function in COPD: an exploratory study. *Brazilian journal of Physical Therapy***,** 20(4): pp.345–354

Neiva, P. & Kirkwood, R. 2007. Measurement of neck range of motion among mouth-breathing children. *Brazilian Journal of Physical Therapy,* 11**,** pp.355-360.

Safka, K. A. & Mcivor, R. A. 2015. Non-pharmacological management of chronic obstructive pulmonary disease. *The Ulster medical journal,* 84**,** 13.

Terzikhan, N., Verhamme, K. M., Hofman, A., Stricker, B. H., Brusselle, G. G. & Lahousse, L. 2016. Prevalence and incidence of COPD in smokers and non-smokers: the Rotterdam Study. *European journal of epidemiology,* 31**,** pp.785-792.

Van Blommestein, A. S., Macrae, S., Lewis, J. & Morrissey, M. 2012. Reliability of measuring thoracic kyphosis angle, lumbar lordosis angle and straight leg raise with an inclinometer. *The Open Spine Journal*. 4: pp.10-15

Van Der Molen, T. 2010. Co-morbidities of COPD in primary care: frequency, relation to COPD, and treatment consequences. *Primary Care Respiratory Journal,* 19**,** pp.326-334.

Wang, J-S. 2015. Effect of joint mobilization and stretching on respiratory function and spinal

movement in very severe COPD with thoracic kyphosis. *Journal of Physical Therapy Science*, 27**,** pp.3329-3331.

Wedzicha, J. A., Miravitlles, M., Hurst, J. R., Calverley, P. M., Albert, R. K., Anzueto, A., Criner, G. J., Papi, A., Rabe, K. F. & Rigau, D. 2017. Management of COPD exacerbations: a European respiratory society/American thoracic society guideline. *European Respiratory Journal*, 49.