



Effectiveness of breathing exercises on physiological and psychological variables of patients with pulmonary tuberculosis: A Systematic Review

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ABSTRACT

TB is a 7th killer disease in the world. Tuberculosis (TB) is one of the top 10 causes of death and the leading cause of a single infectious agent. Globally, 10.0 million people developed TB disease in 2017; 5.8 million men, 3.2 million women, and 1.0 million children. India has been ranked 17th among 22 high burden countries in terms of TB incidence rate.^[1]

Objectives: To collect the data and review various studies.

Methodology: The study design was systematic review the study includes the studies those who were related to physiological (dyspnea, SpO₂, BP, heart rate, RR) and psychological (anxiety, quality of life) variables of patients with pulmonary tuberculosis and the studies showed the effect of breathing exercises on the physiological and psychological variables, and excludes the studies those discussed about the other method to deal with the physiological and psychological variables.

Analysis: The data was grouped and analyzed in terms of Meta analysis. Studies were identified through searches of MEDLINE, PUBMED, Elsevier and Google Scholar. Abstracted information is about the study design, population characteristics, interventions and outcomes.

Conclusion: Physiological (dyspnea, SpO₂, BP, heart rate, RR) and psychological (anxiety, quality of life) variables are the major problems which causes significant impairment while patient having pulmonary tuberculosis. Several studies came out with the conclusions that the breathing exercises are effective in reducing the dyspnea, heart rate, respiratory rate, and anxiety. Breathing exercises are effective in increasing the SpO₂ level and improving the QOL among PTB patients.

Keywords: Breathing exercises, physiological variables, psychological variables, pulmonary tuberculosis patients

INTRODUCTION

As per the Global tuberculosis report 2017, the expected incidence of tuberculosis in India was approximately 28,00,000 accounting for about a quarter of the world's tuberculosis cases.^[2] There were cases in all countries and age groups, but overall ninety percent were adults, ten percent were people living with HIV (72% in Africa) and two third were in eight countries: India (21%), China (14%), Indonesia (6%), the Philippines (3%), Pakistan (3%), Nigeria (5%), Ethiopia (3%), Bangladesh (4%) and (5%) in South Africa.^[3] Pulmonary tuberculosis (PTB) remained a main health problem worldwide, most common in developing countries. In 1882, Robert Koch discovered the tubercle bacillus, who was a microbiologist, at a time when 1 of every 7 deaths in Europe was caused by tuberculosis. In previous times tuberculosis was known as "consumption", "Phthisis pulmonary is" and "white plaque". In 19th century, it was also known as "the captain of all men of death".^[4] Tuberculosis is a communicable disease that can affect almost every organ of the body but mostly affected the lungs in 75% of cases. Tuberculosis can be pulmonary as well as extra-

pulmonary based on the invasion of tubercular infection in the lungs or in other parts of the body. It can be latent and active infection based on the patient's capacity to transmit infection.^[5]

MATERIALS AND METHODS

Research Design: Systematic Review

Inclusion Criteria: The study includes the studies those who were related to Physiological (dyspnea, Spo₂, BP, heart rate, RR) and psychological (anxiety, quality of life) variables of patients with pulmonary tuberculosis and the studies showed the effect of breathing exercises on the physiological and psychological variables.

Exclusion criteria: The study excludes the studies those discussed about the other method.

Data Analysis: The data was grouped and analyzed in terms of Meta analysis. Relevant articles based on the topic of Physiological (dyspnea, Spo₂, BP, heart rate, RR) and psychological (anxiety, quality of life) variables of patients with pulmonary tuberculosis were identified by search of significant articles PubMed/ Medline, SCOPUS, Elsevier and Google Scholar with the following key words: "Breathing exercises", "physiological variables", "psychological variables", "pulmonary tuberculosis patients"

RESULTS

A systematic review related to the effect of breathing exercises on physiological and psychological variables of patients with pulmonary tuberculosis. Total 170 studies were selected for review, out of which 24 were found appropriate for systematic review. Data was divided into two different sections:

Section I: Literature related to impact of pulmonary tuberculosis on physiological and psychological variables of pulmonary tuberculosis patients.

Section II: Literature related to effect of pulmonary rehabilitation on physiological and psychological variables of pulmonary tuberculosis patients.

Literature related to impact of pulmonary tuberculosis on physiological and psychological variables of pulmonary tuberculosis patients.

An observational study was conducted to assess the clinical and socio-demographic characteristics of 112 tuberculosis patients in a tertiary care medical college hospital of Bangladesh in 2017. Inclusion criteria of the study were pulmonary and extra pulmonary tuberculosis cases diagnosed on the basis of sputum smear, culture, chest radiography, cytological and histopathological examination received anti-tubercular drugs therapy. More than half of the tuberculosis patients were female (55.4%) and less than half (44.6%) of tuberculosis patients were male. The most common symptoms observed in pulmonary tuberculosis patients were cough with expectoration (96.5%), weight loss (80.7%), fever (73.7%), loss of appetite (54.4%) and

breathlessness (22.8%); whereas in extra- pulmonary tuberculosis patients, majority had weight loss (79.6%), fever (67.3%) and loss of appetite (61.2%).^[6]

A comparative study was conducted to determine the severity of social anxiety in a group of 110 patients with pulmonary tuberculosis at pulmonary medicine inpatients clinic, Turkey in 2015. Researcher allocated the subjects in 2 groups, one group of pulmonary tuberculosis patients and other group of healthy person who were similar to the patients group in terms of demographic variables. Researcher used social anxiety scale and SF-36 health related QOL questionnaires. Findings of the study showed both groups were similar in terms of demographic variables. Most of the patients reported loss of appetite (93.6%), weight loss (91.5%) and night sweat (83%). When healthy person and pulmonary tuberculosis patients were compared in terms of level of their social anxiety symptoms and QOL. Patients with tuberculosis showed significantly higher level of anxiety and poor QOL.^[7]

A descriptive study was conducted to determine the clinical epidemiology and paraclinical finding of 212 tuberculosis patients at department of infectious disease, Iran in 2015. Patients demographic, clinical and radiologic characteristics picked up from tuberculosis patient's files were collected using a standard questionnaire format. The findings of the study showed that 62% were male and 38% were females. Cough was the most common symptoms (94.5%) that were productive in (84%). The other symptoms were fever (78.4%), weight loss (75.1%), decrease appetite (71.4%) and sweating (64.8%).^[8]

A cross-sectional survey was conducted to explore the prevalence of and associated factors of anxiety and depressive symptoms among 1252 pulmonary tuberculosis patients with and without tracheobronchial TB at three hospitals in Liaoning China in 2018. Researcher used structured questionnaire, hospital anxiety and depression scale and health questionnaire. Findings of the study showed that approximately 70% of patients with probable depression also had significant anxiety symptoms, and vice versa, 69.6% patients with anxiety symptoms were also diagnosed with probable depression. Depressive and anxiety symptoms were common among pulmonary tuberculosis patients, especially those with tracheobronchial tuberculosis.^[9]

A retrospective study was conducted to evaluate the differences in clinical characteristics and treatment outcomes between 271 younger and 199 older tuberculosis patients at Korea in 2013. Findings of the study showed that dyspnea and comorbid medical conditions were more frequent and positive tuberculosis culture rates were higher in older TB patients. In chest computed tomography scans of pulmonary tuberculosis patients, older patients were less likely to have micro nodules, nodules, masses and cavities compared with younger patients but were more likely to have consolidations. Adverse drug reactions did not differ between the two groups. There were no significant differences in favorable treatment outcomes between younger and older TB patients.^[10]

A cross sectional study was conducted to assess occurrence and correlate the anxiety and depression among four hundred seventeen patients with tuberculosis at university and hospital, Ethiopia in 2015. Anxiety and depression were checked through interviews by trained psychiatric nurses via HAD scale. Findings of the study revealed that the occurrence of anxiety and depression among tuberculosis patients were 43.4% and 41.5% respectively. Tuberculosis patients who were suffering from comorbid HIV infection, poor social support, perceived tuberculosis stigma and poor social support were more likely to have depression and anxiety as compared to who had no comorbid disease.^[11]

A cross sectional study was conducted to evaluate the HRQOL and prevalence of symptoms of depression and anxiety in 86 hospitalized patients at tertiary care hospital, Brazil in 2017. HRQOL was measured using the medical outcome short form-36 (SF-36) version 2. Hospital anxiety and depression scale was to record symptoms of anxiety and depression. Findings of the study showed that the 69.8% were male and 53.5% were female. 37.2% patients were HIV positive. 31.4% patients were having depression and 38.4% patients had anxiety. Tuberculosis patients may have a poor HRQOL.^[12]

Literature related to effect of pulmonary rehabilitation on physiological and psychological variables of pulmonary tuberculosis patients.

A prospective comparative study was conducted to find out the effectiveness of deep breathing versus segmental breathing exercises on chest expansion and pulmonary function in 30 individuals with pleural effusion in Parvana institute of medical science Loni in 2015. Chest expansion was measured with thumb method at different level of the chest which measures symmetry and extent of expansion. Forced expiratory volume is measured by the spirometry. Group A received breathing exercises and group B received segmental breathing exercise for two week of duration. The findings of the study showed significant difference between both the groups on chest expansion ($p=0.05$) and forced expiratory volume ($p=0.05$). The segmental breathing exercise has better effect on chest expansion and pulmonary function than deep breathing exercise in pleural effusion^[13].

A pre-experimental study was conducted to assess the effectiveness of pursed lip breathing exercise on selective physiological parameters among 50 chronic obstructive pulmonary disease patients residing in communities of Udupi district, Karnataka in 2013. Researcher used physiological assessment scale. After pretest, pursed lip breathing exercise was demonstrated and researcher encourage to do the exercise daily in 3-4 times with 8-10 repetitions on each cycle. Post test was done on the 8th day using the same physiological parameters assessment scale. The findings of the study revealed that pursed lip breathing exercise is effective in normalizing the physiological parameters such as respiratory rate, heart rate, peak expiratory flow rate among chronic obstructive pulmonary disease patients.^[14]

A quasi experimental study was conducted to find the immediate effect of deep breathing exercises on various cardiovascular variables in healthy 60 young individuals at Physiotherapy College, Ahmdabad in 2017. Experimental group was doing breathing exercise and comparison group did not do breathing exercises. The subjects were instructed to perform deep breathing exercises for 5 minutes. This was followed by recording of PR, RR, and SpO₂. The finding of the study showed that SpO₂ and breath holding time is found to be significantly increased ($p=0.00$) with significant decrease in pulse rate, respirator rate ($p=0.00$) in young adults of both gender^[15].

A prospective descriptive study was conducted to determine the effect of positioning and diaphragmatic breathing on respiratory muscle activity in 18 chronic obstructive pulmonary disease patients at Cape Town, South Africa in 2016. Prospective descriptive study recorded electromyography measurement at baseline, after upright positioning, during diaphragmatic breathing and 5 minutes thereafter. Vital sign (oxygen saturation, respiratory rate, heart rate, blood pressure) and level of dyspnea were recorded. Modified brog dyspnea scale was used to check the level of dyspnea. The findings of the study revealed that there was no change in the intercostals muscle activity at different time points ($p=0.8$). No adverse event occurred. There were no significant changes in vital signs except reduction in blood pressure. A single session of diaphragmatic breathing transiently improved diaphragmatic muscle activity, with no association reduction in dyspnea^[16].

A randomized control trial was conducted to assess the effect of yoga breathing on exercise tolerance in 43 patients with chronic obstructive pulmonary disease at private yoga practice, Burlington in 2017. Patients were divided into pranayama group and control group. 12 weeks of pranayama plus education versus education alone were given to patients. Two yoga professionals trained the research coordinators to conduct all pranayama teaching and monitored the quality of the teaching and the practice of pranayama by study participants. Researcher used modified medical research council dyspnea scale to find out dyspnea level. Findings of the study showed that the 6 minute walk distance increased in the pranayama group. Prnayama also resulted in small improvements in inspiratory capacity and trapping. Both groups had significant improvement in dyspnea^[17].

A randomized control trial was conducted to evaluate the effectiveness of integrated approach of yoga therapy in the management of dyspnea and fatigue in 81 coal miners with chronic obstructive pulmonary disease at swami Vivekananda yoga university, Karnataka in 2016. The yoga group received an module for obstructive pulmonary disease that included loosening exercises, breathing practices, pranayama, cycling meditation, yoga counseling and lectures 90 min/day, 6 days/week for 12 weeks. Brog dyspnea scale was used. Finding of the study showed that there was significant difference within group reduction in dyspnea ($p=0.00$), fatigue ($p=0.00$), pulse rate ($p=0.00$) and improvement in SpO₂ in yogagroup^[18].

CONCLUSION

The above studies describe the effect of pulmonary rehabilitation on physiological and psychological variables of pulmonary tuberculosis patients. Several studies came out with the conclusions that administration of Breathing exercise are effective in normalizing the physiological parameters such as respiratory rate, heart rate, peak expiratory flow rate and improving respiratory muscle strength and QOL.

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