ANALYSIS OF THE CORRELATION BETWEEN CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) AND PULMONARY TUBERCULOSIS

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Abstract:

Objective: The progression of chronic obstructive lung disease and pulmonary tuberculosis (TB), according to several studies (COPD). Hence, the goal of this research was to examine the incidence of TB-associated COPD in COPD patients.

Methods: 500 individuals having an accurate COPD diagnosis who werepresented to Mayo Hospital between January 2022 and March 2023, were enrolled in this trial. It has been proven in people who have had pulmonary or extra-pulmonary TB in the past. The patients were split into two equal groups, one with 50 patients who had COPD and TB, and the other with 50 patients who had COPD but no prior TB infection. A thorough medical evaluation, an arterial blood gas analysis, chest x-ray, and pulmonary function tests were given to each of the patients who were selected for the study.

Results: Of the 500 COPD patients, 16% of them had TB-related COPD. The smoking behavior of the two groups differed significantly (P-value = 0.001) from one another. Despite the fact that smokers made up the majority of COPD patients without TB, nonsmokers tended to be in the TB-associated COPD category. As compared to individuals with COPD who did not have TB, there was a statistically significant rise in exacerbations in the TB-associated COPD group (P-value=0.02). The PaCO2 of the group with TB-associated COPD increased significantly in comparison to the other group (P=0.02) as well. A significant relationship between the start of COPD and the amount of anti-TB courses was also seen in this research (P-value=0.001), and a higher number of anti-TB courses was linked to an earlier onset of COPD. As compared to individuals who typically only get one course, the authors saw a substantial decrease in PFTs in patients who had two or more courses.

Conclusions: Patients with COPD should be tested for TB, and even in the absence of any other risk factors, COPD may result from TB. As compared to individuals who already have COPD due to other risk

factors, those with COPD-associated TB have more frequent exacerbations, worsening pulmonary function tests, and an earlier onset of the disease.

Keywords: tuberculosis, disease, chronic obstructive pulmonary disease
DOI Number: 10.48047/nq.2023.21.6.NQ23021 **NeuroQuantology2023;21(6):175-182**

Introduction:

The economic and social impact of chronic obstructive pulmonary disease (COPD), a leading cause of illness and death globally, is substantial and growing. 90% of all fatalities take place in low- and middle-income nations, where tuberculosis (TB) incidence is still high [1]. Many studies have shown a connection between TB and the rise in COPD. In the PLATINO trial, which examined COPD patients with and without a history of tuberculosis, it was found that airway obstruction was found in 30.7% of patients with a positive history, despite the prevalence being only 13.9% in the patients with a negative history [2,3]. Similar findings showed that women and men with a history of TB had an increased likelihood of airway blockage of 2.3 times and 4.1 times, respectively [4,5]. According to a study conducted in Colombia, there is a higher correlation between airway blockage and tuberculosis (TB) than there is between smoking cigarettes and airway obstruction [6]. The majority of well publicized research that have been published in the research have been devoted to examining the impact of TB history on the incidence of COPD. On the other hand, there is relatively little information available about how TB history affects morbidity and death.

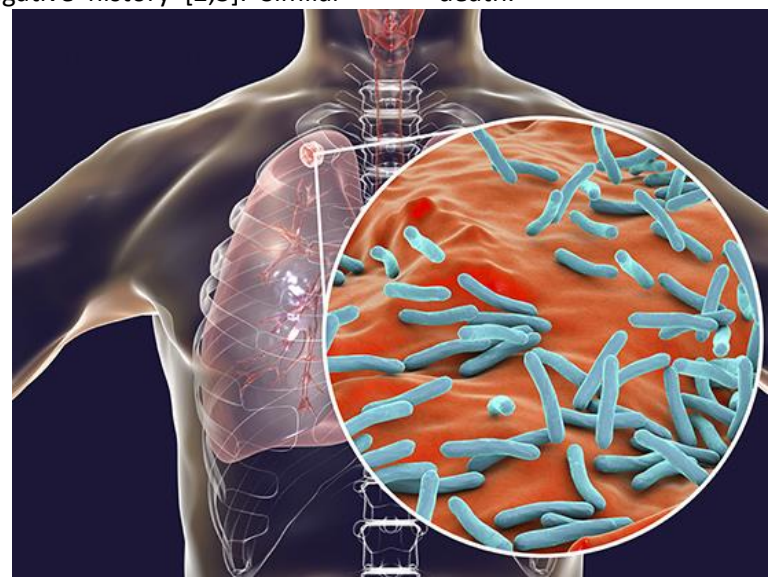

Figure 1: Tuberculosis

This study's objectives were to determine the occurrence of TB-associated COPD among COPD patients and to compare COPD patients according to their history of TB in terms of exacerbations, symptoms, spirometry, and arterial blood gases.

Methods:

Study Design: The aim of this case-control research was to examine the association between chronic obstructive pulmonary disease (COPD) and tuberculosis (TB) (COPD). 500 individuals with proven COPD who visited Mayo Hospital between January 2022 and March 2023 were included in the research. The Mayo Hospital's ethics committee gave the research its approval.

Clinically and spirometrically proven COPD patients were required for inclusion. Individuals

were only labelled as having TB-associated COPD if their COPD symptoms developed after a TB episode. Individuals with other pulmonary comorbidities such ischemic heart disease, lung cancer, interstitial lung disease, and obstructive sleep apnea were not included in the research. Those who had active pulmonary TB were also disqualified.

According to GOLD 2017 criteria, which is focused on respiratory function and the existence of chronic airflow restriction, COPD was diagnosed. This was established by a post-bronchodilator FEV1 improvement of less than or equal to 12% and a post-bronchodilator forced vital capacity (FVC)/forced respiration flow in the first second (FEV1) ratio of less than 0.70. Individuals having a prior TB diagnosis were included in the trial by self-reporting and/or by reviewing medical history files. From these COPD patients, the research created two matched groups, each with 50 participants. Patients in group 1 had both COPD and a prior history of TB (TB-associated COPD), whereas those in group 2 had no such history.

The nominated patients received a thorough medical history interview, a thorough clinical examination, arterial blood gases, and chest radiography, measurements of the FVC%, FEV1%, and FEV1/FVC% before and after using a straightforward spirometer. The levels and structure of COPD were noted, and the degree of airway restriction was rated according to the updated GOLD 2017 recommendations. The purpose of the research was to look at the relationship between COPD and TB and how it affects the severity and patterns of both diseases.

Statistical Analysis: SPSS v. 26 was used to conduct all statistical analyses. For describing quantitative data for categorical variables, frequencies and percentages were utilized instead of the mean and standard deviation (SD). Categorical variables were compared between groups using Chi Sqr(χ2) statistics. The quantitative characteristics comparing COPD with and without TB were compared using the unpaired t-test, and the FEVV/FVC ratio was compared using the Mann-Whitney test. The FEVV1/FVC ratio was compared across the three groups using the Kruskal-Wallis test, and quantitative variables were compared between extrapulmonary TB, pulmonary TB, and COPD without TB using the one-way ANOVA (analysis of variance). In order to find characteristics that might predict the individuals' type of COPD, logistic regression analysis was used. All statistical tests have a significance threshold of P 0.05.

Results:

80 (16%) of the 500 individuals included in our trial had a history of TB. There was no observable difference between the two groups (P-vale=0.24 and P-vale=0.81, respectively), and the age and sex distribution of the patients in groups 1 and 2 were also uniform (Table 1). Both research groups' smoking habits differed considerably (P-value=0.001) from one another, with 64% of the participants in the TB-associated COPD group being nonsmokers, 22% being smokers, 6% being passive smokers, 4% being ex-smokers, and 4% being Goza smokers. Nevertheless, only 8% of COPD patients without TB smoked, 54% smoked, 10% were ex-smokers, 10% were Goza smokers, and 10% were passive smokers (Table 2).

Table 1: Gender and age comparisons between the groups under study

	Age (Years)	**Gender (%)**	
	Mean±SD	**Male**	**Female**
Group 1	52.1±5.35	74	26
Group 2	53.44±5.98	76	24
***P* value**	0.24	0.81	

Table 2: Comparison of smoking rates between the study groups

	Goza-smoker	Ex-smoker	Passive smoker	Smokers	Nonsmokers
Group 1 (%)	4%	4%	6%	22%	64%
Group 2 (%)	10%	10%	8%	54%	18%
Chi Sqr	22.72				
***P* value**	0.001				

In all, 64% of patients in group 1 and 58% of patients in group 2 had frequent exacerbations. Exacerbations increased with a statistically significant difference between the two groups (P=0.02), and the FEV1 of the COPD without TB group increased significantly more than that of the COPD linked with TB (P-value=0.01). As compared to the other group, the TB-associated COPD group's mean and standard deviation (SD) PaCO2 values were 47.26 and 6.18 mmHg and 44.46 and 6.23 mmHg, respectively (Table 3). According to the GOLD stages, 10 (20%) of the patients in group 1 had mild blockage, 28 (56%) had moderate obstruction, 10 (20%) had severe obstruction, and two (4%) had very serious obstruction, while in the second group, 25 (50%) had light obstruction, 18 (36%) had moderate obstruction, and seven (14%) had serious obstruction (Table 4). The level of airflow restriction varied significantly between the two groups (P-value = 0.01). Regarding the TB treatment result in our study group, we discovered that 64% of patients got two or more anti-TB courses, compared to 36% of patients in the COPD group with TB. The time between the end of TB treatment and the onset of COPD symptoms was 11.6± 3.66 years, with a range of 20 years to 6 years; for patients who received only one anti-TB course, it was 15.27±2.6 years, and for those who received 2 or more anti-TB courses, it was 8.9 1.4 years. This variation was statistically significant (P-value = 0.001) (Table 5). Those who had one anti-TB course had a mean FEV1/FVC of 66.05±3.17 %, whereas those who received two anti-TB courses had a FEV1/FVC of 61.53±6.6 %. Nevertheless, the mean SD of FVC in patients who had one anti-TB course was 95.22±11.8%, whereas it was 84.28±11.9% in patients who received two anti-TB courses. Patients who had one anti-TB course had a mean FEV1 of 64.66± 8.76%, whereas those who received two or more anti-TB courses had a mean FEV1 of 53.56±11.75%. As compared to individuals who had received one anti-TB course, there was a substantial drop in the FEV1 in the patients who received two courses (Figure 1).

Table 3: Seriousness differences between the groups under study

Exacerbation	Yes (%)	No (%)	$PaCO_2$ (mmHg)	FEV_1%
Group 1	64	36	47.26±6.18	55.32±11.9
Group 2	58	42	44.46±6.23	62.84±12.22
***P* value**	0.02		0.02	0.01

Table 4: Degree of airway restriction between the two groups under study

Stages		Very severe	Severe	Moderate	Mild
Group 1	n	2	10	28	10
	%	4	20	56	20
Group 2	n	0	7	18	25
	%	0	14	36	50
Chi Sqr	11.13				
***P* value**	0.01				

Table 5: COPD onset and the number of anti-TB courses

	COPD onset
2 or more anti-TB	8.9±1.4
1 anti-TB	15.27±2.6
P-value	0.001

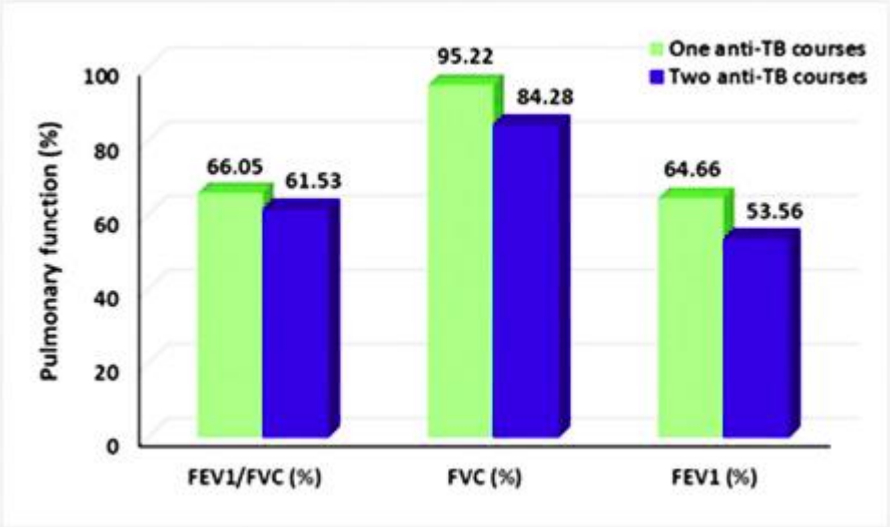

Figure 2: In individuals receiving one or more anti-TB regimens, pulmonary functions

Discussions:

The literature has little information about the impact of a TB history on the typical course of COPD. This investigation was done to determine the prevalence of TB-related COPD among COPD patients (those with recurrent airflow restriction and post-bronchodilator FEV1/FVC0.70 as a diagnosis). The research comprised 500 COPD patients who fulfilled the inclusion requirements. Eighty patients had a history of TB in the past. Next, with 50 patients each, we created two matched groups, one with a history of TB and the other without. In the present investigation, 16% of the sample group had COPD that was linked to TB. A study on 100 completely cured pulmonary TB patients found that 46% of cases had airflow restriction, and that prevalence increased with time [7]. In recent research, even after correcting for variables including sex, age, and smoking exposure, the presence of a prior history of tuberculosis (TB) was shown to be an independent predictor of airflow obstruction with an odd-ratio of 1.37. This result was in line with that of another research, which found that prior TB was a predictor of airflow restriction. Moreover, epidemiological studies assessing the burden of obstructive lung disease (BOLD) in post-TB patients indicate that nonsmokers had a greater link between TB and COPD. [8] Based on their smoking behaviors, as shown in Table 2, these results were seen in both TB-associated COPD patients and those with COPD without TB. [9] There was a statistically significant difference in exacerbations between the TB-associated COPD group and the other group (P-value=0.02), which is consistent with a study that found that the average hospitalization for COPD exacerbations was estimated to be 2.46 in the group with past TB, compared to 1.56 for the corresponding group without a history of TB. As a result, there is a high correlation (P=0.001) between having a history of TB and having frequent exacerbations [10]. Higher frequency of acute exacerbations were seen in COPD patients with prior TB lungs

in a retrospective cohort analysis of 159 individuals [11]. In our research, individuals with TB-associated COPD had lower FEV1 values and were more hypercapnic (Table 3). Patients with COPD who had a history of TB were shown to have decreased postbronchodilator FEV1 in case-control research that examined factors impacting lung functions and postbronchodilator responses in airways due to the TB effect [12]. It was hypothesized that these decreased FEV1 values were associated with an obstruction that was more severe due to inflammation and the effects of TB [13]. In general, PaCO2 was greater in COPD patients who had previously had TB. Issues including increased air trapping, an imbalance in ventilation and perfusion, blockage, and lower respiratory capacity may be the result of more severe inflammation brought on by the past presence of TB [14]. This inflammation may continue long after the therapy is successful, resulting in unending chronic parenchymal deterioration, similar to what is seen in COPD brought on by smoking. Similarities between the inflammatory profile seen in these circumstances and the elevated levels of Matrix MMPs (more particularly, MMP-1 and MMP-9) in the airways [15,16] corroborate this theory. Patients in group 1 reported a considerable degree of airflow restriction, compared to patients in group 2, who suffered a mild degree, with a greater percentage of patients in group 1 experiencing significant and extremely extreme blockage (Table 4). In our sample, 64% of TB-associated COPD patients had two or more anti-TB courses, compared to 36% of patients who only received one. The time between the end of TB treatment and the emergence of COPD symptoms varied statistically significantly between these patients when we compared the number of anti-TB treatments they received, with patients who only received one course of anti-TB experiencing a longer period of time than those who received two or more courses (Table 5). In a cohort study, it was shown that patients with several bouts of active TB had deteriorating lung function [17], with the decline in FEV1 after the third episode being three times larger than the decline after the first episode (-410 versus 153 ml). They observed that the number of anti-TB courses had a clear correlation with the severity of lung damage and the prevalence of obstructive pulmonary damage, with more anti-TB courses leading to more structural damage [18]. We discovered significant differences in spirometry results across participants, with patients who completed one course significantly doing better than those who did not (Figure 2). Another cohort study focused on pulmonary TB cases and a standardized control group discovered a dose-response relationship between postponing anti-TB treatment and the risk of developing COPD, as well as an increase in the severity of airway inflammation, accelerated lung destruction, and subsequent loss of lung function [19]. In areas where TB incidence is still high, it is particularly important to ignore TB-associated COPD in individuals who complain of dyspnea despite never having smoked [20].

Conclusions:

Patients with COPD should be tested for TB since COPD may result from TB even when there are no other risk factors. In contrast to individuals with COPD who already have the disease due to other risk factors, COPD-associated TB is accompanied with frequent exacerbations, a reduction in pulmonary function testing, and an earlier onset of the disease.

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