

Review Article

To study the risk factors of relapse pulmonary tuberculosis and evaluate the effectiveness of pulmonary rehabilitation strategies on clinical profile and quality of life of patients with relapse pulmonary tuberculosis: A review study

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ABSTRACT:

Tuberculosis (TB) is still a global public health problem, with more than 1.3 million fatalities projected in 2021. Despite the fact that nearly 20 million patients completed specific anti-TB treatment and survived in 2020, little is known about their pulmonary sequelae, quality of life, and need for rehabilitation services as researchers shifted their focus to proper diagnosis and treatment rather than analysing post-disease development. Understanding the underlying immunologic and pathogenic mechanisms during mycobacterial infection, which have remained largely unknown up to this point, as well as the development of novel anti-TB agents, could lead to the proper application of rehabilitation care, as TB sequelae are caused by interactions between the host and Mycobacterium tuberculosis. Body mass index and population density were inversely associated with pulmonary tuberculosis relapses in Cali. On the contrary, alcohol consumption increased the likelihood of tuberculosis relapses. People successfully completing treatment for tuberculosis remain at elevated risk for recurrent disease, either from relapse or re-infection. Identifying risk factors for recurrent tuberculosis may help target post tuberculosis screening and care.

Keywords: tuberculosis; antituberculous drugs; pulmonary rehabilitation

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INTRODUCTION

One issue with tuberculosis (TB) control is that individuals who have been effectively treated sometimes return, needing a second treatment. At 24 months, reported rates of recurrence following conventional 6-month therapy for drug-susceptible pulmonary TB varied from 1 to 2%.¹ Host factors², illness factors³, and treatment factors are examples of variable parameters. The numbers^{4,5} have been linked to higher relapse rates. The most crucial of these are likely positive acid-fast bacilli (AFB) cultures at the end of the 2-month intense phase and cavitation on the first chest radiograph (CXR).⁶ Based on the revelation that the presence of these two risk factors might raise the chance of recurrence by up to 20%, the American Thoracic Society (ATS) has suggested that the minimum period of therapy for

patients with these two risk factors be increased to 9 months.

Patients completing treatment for tuberculosis (TB) in high prevalence setting face a risk of developing recurrent disease. This has important consequences for public health, given its association with drug resistance and a poor prognosis. Previous research has implicated individual factors such as smoking, alcoholism, HIV, poor treatment adherence, and drug resistance disease as risk factors for recurrence. However, little is known about how these factors co-act to produce recurrent disease.⁷

Tuberculosis (TB) remains a major cause of morbidity and mortality worldwide, despite increased disease notification rate, spreading of antitubercular programmes. It is also a sociological, economical, and mental burden for a society. The

World Health Organization (WHO) estimates that one-third of the population of the world is infected with *Mycobacterium tuberculosis*. Globally more than 9.8 million new cases of active TB are notified annually and 2-3 million deaths occur in every year. In 2011, 2.3 million new TB cases and 43000 retreatment pulmonary TB cases were notified in India. Patients, who fail, default, or relapse after completion of standard first-line TB treatment and present for retreatment, are grouped together as Category II cases by the World Health Organization (WHO).⁸

STUDY AREA

This study was done in the department of medical surgical nursing, R.D. Memorial college of nursing, Bhopal (M.P).

REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAM

In India, under the Revised National Tuberculosis Control Program (RNTCP), the percentage of smear-positive re-treatment cases out of all smear-positive cases is 24%, causes of re-treatment include relapse, failure, and default in treatment. RNTCP does not follow up the patients for any period of time after successful completion of treatment to determine whether they relapse. Given the high cost of treatment for each patient under RNTCP and the potential for spread of disease from these patients, it is crucial for the success of program and control of the disease in the country to find out more about the reasons behind this.

RELAPSE PULMONARY TUBERCULOSIS

TB relapse is defined as a patient who has become (and remained) culture negative while receiving therapy but after completion of therapy becomes:

Culture positive again or has clinical or radiographic deterioration that is consistent with active tuberculosis. Every effort should be made to establish a diagnosis and to obtain microbiological confirmation of the relapse to enable testing for drug resistance. Most relapses occur within the first 6–12 months after completion of therapy. Patients whose initial tuberculosis was drug susceptible and who were treated with rifamycin containing regimens using DOT, relapse with susceptible organisms in nearly all cases. In patients who received self-administered therapy or a non-rifamycin regimen and who relapse, the risk of acquired drug resistance is substantial. The selection of any empirical TB treatment for patients with relapse should be based on the prior treatment regimen and severity of disease.⁹

DRUG SUSCEPTIBILITY OF THE PATIENTS

For patients with tuberculosis caused by drug susceptible organisms and who received DOT, initiation of the standard four-drug regimen is appropriate until the results of drug susceptibility

tests are available. For patients who have life threatening forms of tuberculosis, at least three additional agents to which the organisms are likely to be susceptible should be included even if the criteria in 1) are fulfilled. For patients with relapse who did not receive DOT, and/or who were not treated with a rifamycin based regimen, or who are known or presumed to have had irregular treatment, or poor adherence then it should be assumed that drug resistance is present and to treat with isoniazid, rifampicin, and pyrazinamide plus an additional two or three agents. Such agents would include a fluoroquinolone, an injectable agent such as streptomycin or amikacin, with or without additional oral drugs such as para-aminosalicylic acid (PAS), cycloserine, prothionamide and clarithromycin. Treatment failure is the presence of continued or recurrently positive cultures during the course of antituberculosis therapy. After 3 months of multi-drug therapy for pulmonary tuberculosis caused by drug susceptible organisms, 90–95% of patients will have negative cultures and show clinical improvement. All patients with positive cultures after 3 months of appropriate treatment must be evaluated carefully to identify the cause of the delayed conversion. Patients whose sputum cultures remain positive after 4 months of treatment should be classified treatment failures.¹⁰

RISK FACTORS

The independent variables collected were grouped as follows:

Socio-demographic factors: sex, age, self-reported ethnic group (indigenous, mestizo or afro-descendant), socio-economic status, marital status, level of education, job, vulnerability condition (street dweller or displaced), commune (an administrative subdivision of the city), overcrowding, and social security affiliation regime.

Clinical and biological factors: BMI, chest radiological findings, coinfection with HIV, diabetes, and kidney disease.

Lifestyle factors: tobacco use, alcohol consumption, and use of illicit drugs such as marijuana, heroin, and cocaine.

Healthcare-associated factors: variables related to the intake of antiretroviral drugs, rotation of control program officials, and duration of the tuberculosis symptoms.¹¹

REASONS FOR TREATMENT FAILURE

There are many reasons for treatment failure in patients receiving appropriate regimens. These include:

- Non-adherence
- Drug resistance
- Malabsorption of drugs
- Laboratory error and less investigations

A few patients take a long time to respond as part of extreme biological variation.

If treatment failure occurs the case should be referred to a regional centre. *M. tuberculosis* isolates should be sent to a reference laboratory for drug susceptibility testing to both first and second line agents.

One of the fundamental principles in managing patients with treatment failure is never to add a single drug to a failing regimen, as this leads to acquired resistance to the new drug. Instead, at least two, and preferably three, new drugs to which the patient has not been exposed and susceptibility thought likely should be added.

Empirical regimens usually include a fluoroquinolone and an injectable agent such as streptomycin and an oral agent such as para-aminosalicylic acid (PAS), cycloserine, prothionamide or clarithromycin. Once drug susceptibility test results are available, the regimen should be adjusted according to the results.

TB resistant to at least isoniazid and rifampicin (multi-drug resistant [MDR]) are at high risk of further acquired drug resistance. All such patients whatever their HIV status should be referred to regional treatment centres.

Although patients with strains resistant to rifampicin alone have a better prognosis than patients with MDR strains, they are also at increased risk for treatment failure and additional resistance and should be managed in consultation with an expert.

There are no definitive randomized or controlled studies to establish the best regimens for treating patients with various patterns of drug resistant tuberculosis. Such treatment recommendations are based on expert opinion. Surgical resection in the management of patients with pulmonary MDR tuberculosis has had mixed results and its role has not been established in randomized studies.^{12,13}

RECURRENCE OF TUBERCULOSIS (TB)

Recurrence of tuberculosis (TB) can be due to a regrowth of the same strain of *Mycobacterium tuberculosis* that caused the previous TB episode, known as relapse, or reinfection through a different strain. The data reported suggests that recurrence rate is low in countries with a low TB incidence and mainly caused by relapse of a previously cured TB episode. The recurrence rate in countries of high TB incidence is elevated and reinfection is the principal cause, especially in the presence of high prevalence of coexisting human immunodeficiency virus (HIV). Studies carried out in countries of medium incidence suggest that relapse more commonly causes recurrence, although the rate of reinfection could still play an important role. Therefore, the relative contribution of recurrent TB on the overall annual TB incidence and the influence of relapse or reinfection is likely to vary depending on epidemiological features of the area.¹⁴

DRUG SUSCEPTIBILITY TESTING (DST)

In India where individual drug susceptibility testing (DST) settings are not universally accessible till now, these patients are often treated with a standard retreatment regimen of first-line agents (a regimen that adds a single drug to the standard initial TB treatment regimen). Retreatment case's outcomes often are found poor as MDRTB, especially in patients with treatment failure or default cases. Inappropriate implementation of the Revised National Tuberculosis Control Programme (RNTCP) causes precipitation of MDR-TB cases in the community. In this situation, India is not well equipped to prevent the propagation and dissemination of MDR-TB cases. So a new re-emerging threat is slowly growing within the Indian population that may arise as a big challenge in future. MDR-TB is a man-made phenomenon; poor treatment, poor drugs, and poor adherence lead to the development of MDR-TB.¹⁵

QUALITY OF LIFE

Pulmonary TB constitutes a global healthcare burden with substantial negative effect on QoL of patients. Pulmonary rehabilitation which is an evidence-based multidisciplinary comprehensive non-pharmacological intervention has been recognized as a recommended standard therapy and core component for the management of patients who have chronic respiratory diseases. There has been growing proof and literature that supports the value of PR in patients suffering from chronic lung impairment after treated from PTB it refers to "a broad range of human experiences related to one's overall well-being. It implies value based on subjective functioning in comparison with personal expectations and is defined by subjective experiences, states and perceptions."^{16,17}

PULMONARY REHABILITATION STRATEGIES

The pulmonary rehabilitation strategies related to therapy is individualized and involves physical training, psychological counselling, and nutritional support, along with compliance with TB drug treatment. In selected patients, PR program improve symptoms, exercise capacity and social integration.

CONCLUSION

The study is currently underway, and the results of the empirical evaluation of risk factors for relapse pulmonary tuberculosis and the effectiveness of pulmonary rehabilitation strategies on the clinical profile and quality of life of patients with relapse pulmonary tuberculosis will be beneficial to patients. People who successfully complete TB treatment are at an increased risk of recurring illness, whether through relapse or re-infection. Identifying risk factors for recurrent tuberculosis may aid in the targeting of post-TB screening and management. It is critical to raise patient knowledge of pulmonary

rehabilitation techniques. As a result, health care institution planning and policy-making are critical.

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