

## Review Article

# A Review on Anti-tuberculosis Properties of Medicinal Plants


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	International Archives of Integrated Medicine, Vol. 10, Issue 10, October, 2023. Available online at <a href="http://iaimjournal.com/">http://iaimjournal.com/</a> ISSN: 2394-0026 (P) ISSN: 2394-0034 (O)
	Received on: 11-9-2023 Accepted on: 17-9-2023 Source of support: Nil Conflict of interest: None declared. Article is under creative common license CC-BY
<b>How to cite this article:</b> Fiza Amjad, Rida Zainab, Muhammad Akram, Umme Laila, Momina Iftikhar, Adonis Sfera, Pragnesh Parmar. A Review on Anti-tuberculosis Properties of Medicinal Plants. IAIM, 2023; 10(10): 1-9.	

## Abstract

Tuberculosis remains a global health challenge with millions of individuals affected and significant morbidity and mortality rates. Great variety of treatments provide by health care system. In ancient times this disease affects a large number of population but within the time by making great research and by making advancement in its medication, treatment, diagnosis, and by doing some preventive measurements now we are able to control this disease. Now a day there is great inventions in its herbal, allopathic and other treatments. Data were constructed; issues were reviewed to illustrate the effects of these on the outcome and correlate on the reduction in the burden of disease across different population.

## Key words

Tuberculosis, Mortality rate, Medication, Herbal, Population.

## Introduction

Mycobacterium tuberculosis is a bacterial bacillus that cause an infectious disease called tuberculosis. Severe increase in death cases occur due to this most dangerous bacterial infection. In 1882 a German physician and microbiologist

Robert Koch discovered bacterial tuberculosis bacillus. From different surveys it is signifying that tuberculosis is a frightening disorder from ancient times. In the past tuberculosis was commonly known as “consumption” due to the characteristic wasting and rapidly decline in the

health of individuals who were infected with this disease [1]. One of the chronic granulomatous infectious diseases is tuberculosis. Infection of tuberculosis occurs via inhaling few droplets that contain mycobacterium tuberculosis bacilli or via aerosol [1, 2]. One third of total global population is infected with the bacteria that are responsible for causing tuberculosis (TB). In Asia (59%) and Africa (26%) highest number of incidents was reported. This disease is also found in large number of children population. Death rate from tuberculosis is highest in Asia and Africa. From China, Indonesia, Pakistan, South Africa and India in year 2011 largest number of tuberculosis cases was reported. About 26% and 12% global cases of tuberculosis were reported from India and China [2]. Mycobacterium tuberculosis cause TB and people who are infected with tuberculosis are the cause of this infection. It is a common disease that is widespread throughout the world. Mycobacterium tuberculosis cause specific chronic inflammatory infectious disease in humans called tuberculosis [3].

### **Tuberculosis infection**

Bacteria that cause tuberculosis are taken up by alveolar macrophages, where they resist being killed and continue to multiply by dodging the fusion of phagosomes and lysosomes. Additional macrophages and surviving immune cells are then limited to the infection site, resulting in the formation of granulomas, which are directed cellular structures. Although aggressively reproducing bacilli are well-established in granuloma, there are also non-replicating persistent (NRP) (dormant) forms of Mtb that are influenced by the environment. Resistance to anti-TB medications and the presence of non-dividing bacilli with low metabolic rates are two characteristics that set Mtb in the NRP state apart. The best chance to reduce or eliminate relapse and length of therapy is likely to be with anti-TB medications that can destroy bacilli inside the habitat of granuloma [4, 5].

Characteristics of mycobacterium tuberculosis:

- It is rod shape bacteria. Its diameter is 0.2-0.5 inch. Its length is 2-4.
- Due to presence of mycolic acid in its cell wall makes it acid fast.
- Alcohol and acid decolorization resist by it.
- It is non motile and aerobic.
- It can multiply slowly.
- For decades it can remain dormant [1, 3].

### **Transmission of TB:**

TB is an infectious communicable disease that is transferred from one person to another. The symptoms do not always show that a person is infected with TB. Few symptoms from all of these symptoms also allied with other diseases like cancer, asthma and ordinary cough. TB is also linked with dysfunction of metabolism and immune system [4, 6].

Mainly it is transmitted from an infected person with TB disease to another person by air. Very often it is transmitted by consuming unpasteurized milk products because they contain mycobacterium bovis bacteria that cause TB. Very rarely it is transmitted by the transplacental route. It is also transmitted by skin inoculation tuberculosis.

### **Sites of infection:**

- ❖ Genito-urinary tract
- ❖ Intestine
- ❖ Bones and joints
- ❖ Skin
- ❖ Lymph node
- ❖ Extrapulmonary sites
- ❖ Meninges
- ❖ In all TB cases 85% of pulmonary site involved for action [1].

### **Risk factors for Tuberculosis:**

Here we listed few risk factors that are responsible for causing the tuberculosis disease.

- i) Drug induced immunosuppression
- ii) Nutrition
- iii) Immunity

- iv) Poverty
- v) Age
- vi) Sex[4, 7].

#### **Pathogenesis of tuberculosis:**

- Inside the lungs IV hypersensitivity immune reaction starts by mycobacterium tuberculosis that kills the foreign microorganism that damage the lung tissue.
- The development of hypersensitivity in organization with the host's protective immune response gives rise to pathological features of tuberculosis, such as caseating granulomas and cavitation.
- Mycobacterium tuberculosis infected the primary cells that are macrophages [3].

#### **Morphology of Tb Primary tuberculosis:**

- This disease condition emerges in an individual who has not been previously exposed.
- It always begins from the lungs.
- In the upper part of lower lobe or lower part of upper lobe the bacilli that are inhaled implant in the distal airspaces.
- In the mid zone of the lung, it forms small sub pleural parenchymal.
- The tubercle bacilli drift to the nearby lymph node, frequently leading to the existence of caseous necrosis in that node.
- In which parenchymal lung lesion and Nodal involvement cause Ghon complex [1, 3].

#### **Symptoms:**

If the patient complains about these symptoms, he may have tuberculosis. Some main symptoms that are totally associated with tuberculosis are blood-stained sputum, cough, weight loss, fever and chest pain. Other symptoms that may escort these include fatigue, anorexia, dyspnea, and recurrent colds. Some other diseases may also show these same symptoms. So, for the confirmation of tuberculosis sputum inspection is essential [4, 7]. Here are also some important Respiratory Symptoms that are Arrhythmia, Tiredness, Sputum, Amenorrhea, Cough,

Hoarseness, Blood-spitting [1]. If a patient complains about from one of these symptoms consider him as a “tuberculosis suspect”. Symptoms of cough and sputum is very common everywhere and also associated with other disease. If these symptoms last for one or two weeks these may be due to the acute respiratory tract infections. This is called chronic obstructive pulmonary disease. This is caused by atmospheric pollution and from tobacco smoking [1, 8].

#### **Diagnosis:**

Here are some main, primary and quick test for the diagnosis of TB.

Some important and main tests are Histopathology and some primary tests for diagnosis of TB are chest radiography, sputum smear microscopy and tuberculin skin tests. Some important quick procedures for the diagnosis of TB are specific probe, analysis of lipid, ribosomal RNA sequencing, and polymerase chain reaction [4, 7].

#### **Types:**

Here are following types of tuberculosis [9]

- 1: Extrapulmonary tuberculosis
- 2: Miliary Tuberculosis
- 3: Lymph Node Tuberculosis
- 4: Osteoarticular Tuberculosis
- 5: Gastrointestinal and Peritoneal Tuberculosis
- 6: Central Nervous System Tuberculosis
- 7: Urinary Tuberculosis
- 8: Genital Tuberculosis
- 9: Laryngeal Tuberculosis
- 10: Tuberculous Pericarditis
- 11: Pleural Tuberculosis
- 12: Skin and Soft Tissue Tuberculosis

#### **Extra-pulmonary tuberculosis:**

WHO defined the extra-pulmonary tuberculosis as an infection caused by mycobacterium tuberculosis that damages the lungs parenchymal tissues and organs. From all the TB cases 20-25% cases reported as the cases of extra-pulmonary tuberculosis [9, 10]. Extra-pulmonary TB (EPTB) arises due to the dissemination of M.

tuberculosis bacilli through the bloodstream and lymphatic system. This spread triggers the activation of specific cell-mediated immune responses. The onset is often associated with disruptions in the immune response mechanisms responsible for maintaining control over the infection. Factors contributing to these disruptions include extreme age that adversely affect cell-mediated immunity [9, 11]. The chances for the evolution of EPTB are high in those individuals who have high age, already infected with HIV infection, in females and its risk factors also increase with the association of other diseases such as diabetes mellitus, immunosuppression and chronic renal disease. Individuals who are infected with EPTB has higher life time than the patients of pulmonary TB. This occurs in young age as compare to the other types of TB. Symptoms and signs may be somewhat indistinct and occasionally appear normal on chest X-rays, especially in patients with negative sputum smears, making it challenging to consider the disease during initial evaluation [9].

#### **Miliary tuberculosis:**

The word "miliary" defines frequent minor pulmonary nodules disseminated throughout the lung, similar to the size and circulation of millet seeds within a pathology illustration. Today, it also characterizes the liberal and extensive forms of tuberculosis (TB) [9, 11, 12].

#### **Lymph node tuberculosis:**

Tuberculosis primarily impacts children and young adults, constituting approximately 30 to 40% of all extra-pulmonary tuberculosis cases [11]. Typically, it results in cervical and supraclavicular lymph nodes swelling with a firm, painless texture and usually does not entail systemic involvement. Over time, it may lead to necrosis, fluctuation, and the development. Open biopsy is reserved for cases where FNAB fails to provide a diagnosis (with a sensitivity of 80%). The presence of caseous granulomas is highly indicative of tuberculosis [9, 13].

#### **Osteoarticular Tuberculosis:**

According to published series [14], it comprises 11% of extra-pulmonary tuberculosis (EPTB) forms. Between 20% and 40% of cases have concurrent TB infections in other locations. Surgical intervention may be necessary in cases where spinal compression symptoms are present [11, 15, 16].

#### **Gastrointestinal and Peritoneal Tuberculosis:**

Though it most frequently happens in the ileocecal region, tuberculosis enteritis can affect any section of the digestive tract. There are four potential causes of tuberculosis enteritis [12, 15].

#### **Central Nervous System Tuberculosis:**

This manifestation of tuberculosis is notably severe, resulting in high morbidity and mortality rates. Approximately 25% of patients experience some form of long-term complications, while mortality rates range from 15% to 40%. Intracranial tuberculoma, periarteritis, and vascular thrombosis lead to ischemic stroke, as well as proliferative arachnoiditis with the potential for obstructive hydrocephalus and increased intracranial pressure, can also occur. Tuberculosis meningitis typically follows a sub-acute, insidious course, initially presenting with symptoms such as headache, malaise, and lassitude. A headache, seizures, or other neurological abnormalities may be present in intracranial tuberculoma patients or they may not have any symptoms at all. Early intervention is essential to avert problems, and the gold standard for spotting early lesions is MRI. Other MRI abnormalities could include cerebral ring-enhancing lesions, peripheral edema, and vascular infarctions, whereas the presence of meningeal hyperseptation strongly implies TB meningitis [11]. Cerebrospinal fluid examination is necessary for the diagnosis of TB meningitis and often shows high protein levels, decreased glucose levels, and mononuclear pleocytosis [9, 12, 17].

#### **Urinary Tuberculosis:**

A common extrapulmonary condition called genitourinary TB is thought to account for about 6.5% of all cases. Women are less impacted than

males by it. Hematogenous spread during the main pulmonary infection phase might result in renal involvement, which can also show up as late reactivation or miliary illness. Between 25 and 62% of people with miliary infection have renal lesions that are also present [18]. Up to 90% of individuals with genitourinary TB suffer symptoms like microscopic hematuria and sterile pyuria. It is possible for ureteral strictures to form, which could lead to obstructive uropathy and the emergence of hydronephrosis. Tubercle bacilli in urine must be identified using staining and culture in order to make a microbiological diagnosis. A single urine sample has a sensitivity of about 30%, but successive determinations raise sensitivity to 80–90%, hence it is advised to collect between 3 and 6 serial urine samples, particularly in the early morning, to improve diagnostic accuracy [19, 20].

#### **Genital Tuberculosis:**

In males, it is frequently observed that the prostate, epididymis, and testicles are affected. In females, bilateral involvement of the Fallopian tubes occurs in as many as 80% of cases [9, 11, 12].

#### **Laryngeal Tuberculosis:**

The primary symptom that frequently appears is voice changes, known as dysphonia, although it can also lead to coughing, stridor (a high-pitched breathing sound), and hemoptysis (coughing up blood). This form of tuberculosis is commonly associated with concurrent pulmonary tuberculosis [9, 15].

#### **Tuberculous Pericarditis:**

Mycobacterium TB infections of the pericardium can develop in a number of ways, such as by the spread of an infection from the lungs or the trachea bronchial tree, as well as from nearby lymph nodes, the spine, or the sternum. Widespread body-wide diffusion of an illness is another scenario. This syndrome is frequently accompanied by concurrent infections in other body areas. The diagnosis of this illness and the evaluation of probable side effects, such as constrictive pericarditis and cardiac tamponade,

both rely heavily on the use of echocardiography [9, 11, 21].

#### **Pleural Tuberculosis:**

Nearly 20% of cases of extrapulmonary tuberculosis (EPTB) are caused by the common symptom of tuberculosis pleural effusion. This syndrome develops as a result of pleural space hypersensitivity reactions to mycobacterial antigens. These microorganisms or their antigens most likely enter the pleural area through a subpleural illness focus that has leaked or ruptured. Tuberculosis pleural effusions are normally unilateral and likely to go away on their own without need for medication, while they can occasionally result in empyema. Additionally connected to pulmonary tuberculosis may be these effusions. Thoracentesis-obtained pleural fluid is examined to start the diagnostic process [22, 23].

#### **Skin and Soft Tissue Tuberculosis:**

There have been reported cases linked to Mycobacterium bovis and Bacillus Calmette Guerin. Moreover, as many as 28% of cases exhibit an association with visceral tuberculosis. The clinical presentations of cutaneous tuberculosis exhibit significant variation, contingent upon factors [9, 25, 27, 28].

Primary medications include oral drugs such as Rifampicin, isoniazid, rifabutin, pyrazinamide, and ethambutol. Secondary treatment options consist of injectable polypeptides.

We anticipate that these discoveries will enable researchers to design projects that will advance the study of natural products, which will ultimately aid in the creation and development of drugs [4]. Plants are always useful in various conditions [57-61] which required thorough study via proper funding [62] and application of its properties can be check via recent laboratory investigations [63-66].

#### **Conclusion**

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As mentioned above, tuberculosis was a worldwide problem that affects a large number of populations across the whole world. It can increase the death rate. It highly affects the population of developing countries. There are many therapeutic options across different practices of medicine which we can use to treat tuberculosis. Allopathic medicine has some side effects. That's why half of the population prefer to use herbal drugs because they have less adverse effects and they are also affordable for peoples of lower economy. Due to highly research and modern and different inventions in herbal medicines we expect that in the future, natural and herbal medicinal systems will compete with modern medicinal systems and as supportive therapy to prevent the further progress and decrease the prevalence of disease.

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