

# Tuberculosis: The Interrelationship with Oral Health

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## Abstract

One-fourth of the population globally is infected utilizing a bacterial infection-tuberculosis (TB). TB remains the most contagious killer disease globally having 10 million people falling ill with TB. The transmission route of TB is through the air and when symptoms occur, Therefore, as a dentist we need to be aware of oral tuberculosis such that proper protocol can be followed in our daily practice. This article highlights the important oral manifestation of tuberculosis and its confirmed diagnostic criteria so that a dentist can follow all the guidelines for proper management of a tuberculosis-infected dental patient.

**Keywords:** Dental protocols, Oral manifestations, Tuberculosis.

## Introduction

Tuberculosis (TB) kills five thousand people every day. About 25% of the population is infected with tuberculosis globally whereas, in India, the TB incidence is 199 recent cases per 100000 population per year, with the global average being around 130. However, TB remains the most contagious killer disease worldwide having 10 million persons falling ill with TB as per report till 2018.<sup>1</sup> Maximum counts of current TB cases have been found in Southeast Asia, Western Pacific regions and Africa. Recently 8 countries were reported which were meant for 2/3<sup>rd</sup> of the new Tuberculosis cases globally.<sup>2</sup>

The bacteria usually attack the lungs, but they can also damage other parts of the body. Oral cavity provides a variety of surfaces for bacterial colonization, and each environment supports a characteristic bacterial population. The composition and quantity of the bacterial population on mucosal and tooth surfaces are influenced by many factors, such as the integrity of the soft-tissues, oral hygiene, saliva, diet, and the host's immune and inflammatory responses. Transmission of TB occurs very frequently in the dental clinics either from doctor to patient or from patient to dental staff. Therefore, as a dentist we need to be aware of oral tuberculosis such that proper protocol can be followed in our daily practice.

Microorganisms responsible for this disease is Mycobacterium Tuberculosis and the transmission route of TB is through the air and when symptoms occur, they generally consist of cough (sometimes blood-tinged), weight loss, night sweats, and fever. The majority of people infected with the bacteria results in tuberculosis don't have symptoms and, in such cases, it is known as latent tuberculosis.<sup>3</sup> Secondary tuberculous lesions of the mouth are more commonly found. An oral manifestation is observed as a painless ulcerated lesion in the palate, lips, or tongue, along with persistent

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cervical lymphadenopathy. Although most cases of oral TB manifests with a chronic ulcerative mucosal lesion, it may also present as a granuloma, osteomyelitis, or salivary gland disease.<sup>3</sup>

The social and economic impacts are devastating, including poverty, stigma and discrimination. The world has committed to end the TB epidemic by 2030<sup>4</sup> so we need a dynamic, global and multisectoral approach to reach this goal. Hence, this review article focuses on the oral manifestations of tuberculosis and guidelines for management by the dentist.

### **Oral Manifestations of Tuberculosis:**

**Tuberculous ulcer** presents as single or multiple, superficial, or deep, painful or painless ulcers with an irregular border which tends to increase slowly in size. Usually develop as a small tubercle which then softens to form a shallow, ovoid ulcer with undermined margins and is lined with pale granulation tissue.<sup>5</sup> Tiny single or multiple nodules called “sentinel tubercles” may be seen surrounding the ulcer. Tongue is most commonly affected. However, lesions also occur on the floor of the mouth, gingiva, palate, and lips.<sup>6</sup> Provisional analysis of an ulcer in the mouth because of tuberculosis can be traumatic ulcers, syphilitic ulcers, aphthous ulcers as well as various carcinomas like squamous cell carcinoma, lymphoma etc.<sup>7</sup>

**Tuberculous gingivitis** may appear as nodular or it can be seen as the papillary proliferation of gingival tissues which is diffuse along with hyperaemic.<sup>8</sup> There may be an absence of any clinical attachment loss, alveolar bone loss or significant cervical lymphadenopathy. Sometimes tuberculous gingivitis can be seen simultaneously with marginal periodontitis and enlarged cervical lymph nodes or may present as periodontal loss of tooth shore up leading to loose teeth and gingival overgrowth.<sup>4</sup> A biopsy of the lesion is mandatory for arriving at the diagnosis of TB.

**Tuberculous dental periapical granuloma:** Three routes can be perceived to be entry portals for the tubercle bacillus. Incursion into the dental pulp throughout a very deep carious lesion by the acid-fast bacilli in the saliva is one route. The second route is hematogenous and the third is a deep periodontal pocket. The lesions are usually painless and sometimes involve a considerable amount of bone by relatively rapid extension.<sup>9</sup>

### **Tuberculous involvement of extraction sockets of**

**teeth:** Healing of the tooth extraction sockets is delayed and the socket gets filled with “tuberculous granulation tissue” consisting of many pink to red elevations.<sup>10</sup>

### **Tuberculous osteomyelitis of maxilla and**

**mandible:** Rate of occurrence of tuberculous osteomyelitis is less than 2% of skeletal TB.<sup>11</sup> The mandibular association is more frequent than maxilla and alveolar and angle regions have maximum affinity.<sup>12</sup> Tuberculous osteomyelitis commonly affects the adults; however, in some cases children are also affected. The spread of infection may be by direct transmission from infected sputum, throughout a tooth socket because of extraction or mucosal opening coupled with a completely erupted tooth or by regional extensions of soft tissue lesions and also it can be through hematogenous spread. Diagnosis of tuberculous osteomyelitis is a significant challenge as the smears for acid-fast bacilli usually do not yield positive results.<sup>11-13</sup>

**Tuberculosis of maxillary sinus** – It is usually a disease of adults and remains an underdiagnosed entity. It is usually secondary to pulmonary or extrapulmonary TB resulting from the bloodstream or by direct extension.<sup>14</sup> It is found as nasal discharge, stuffed nose and formation of crust along with epistaxis. It resembles as fluctuant swelling, i.e. Pott’s puffy tumor as well as a malignant lesion. 3 varieties of sinonasal TB : (i) There can be involvement of mucous which can result in the formation of poly using minimal pus discharge, this type is more common; (ii) There can be involvement of bone with the occurrence of fistula and rich discharge of acid-fast bacilli (AFB); this type can lead to midfacial defect; (iii) the third type is hyperplastic that has presence of granuloma and mimics a malignancy.<sup>15</sup> The confirmation of Tuberculosis sinusitis is generally decided on the nonexistence of reaction to regular common antibiotics as well as by bacteriological culture or polymerase chain reaction assay. Sinus surgery may be required for sinus drainage and specimen collection. CT or magnetic resonance imaging can be helpful to figure out the extent of disease. Appearance of calcification in sinuses on CT scans can be indicative of sinonasal TB, and imaging findings are mostly nonspecific.<sup>16</sup>

### **Tuberculosis of temporomandibular joint:**

Tuberculosis of the TMJ is very rare in occurrence; therefore, only a few cases have been reported.<sup>16,17</sup> The clinical manifestation of TB infection of TMJ is unspecific and can resemble osteomyelitis, arthritis, cancer or any kind of chronic joint disease. Therefore,

TMJ TB should be taken as a confirmed diagnosis when patients present with pain and stiffness of the joint or with chronic joint diseases.<sup>10,11</sup> The presence of signs and symptoms is menacing like Nocturnal type of muscular spasm can lead to soft and elastic joint tumefaction, typically without erythema and with edema that will be resulting in early to severe and localized periarticular muscle atrophy.<sup>12</sup> Treatment of TMJ TB consists of conventional drug therapy.

**Tubercular sialadenitis:** TB of the salivary gland is a rare condition even in countries like India, where the disease is rampant.<sup>18</sup> The most common salivary glands involved in primary TB are parotid glands, whereas in systemic TB submandibular glands are most commonly involved.<sup>19</sup> There are two clinical forms of tuberculous parotitis. First is the localized form which is common and involves intraglandular/periglandular lymph nodes. It may be secondary to nodal infection. It presents as slow-growing, non-tender localized swelling in front and below the ear.<sup>15</sup> Diagnosis of tubercular parotitis is very difficult because of the absence of symptoms and may often be misdiagnosed as a benign parotid tumor.<sup>16</sup> A detailed history, examination and FNAC have been advocated for diagnosis of tubercular parotitis.<sup>14</sup>

**Tuberculous lymphadenitis:** Tuberculous lymphadenitis in the cervical region, also known as scrofula, is considered as the common site of extrapulmonary TB which accounts for up to 5% of the cervical lymphadenopathy. It often affects children and young adults in the age range of 30–40 years and shows female predilection.<sup>20</sup> It can be manifested as multiple neck mass which can affect deep lymph nodes and may relate with supraclavicular and axillary node involvement. Patients present with slowly enlarging asymptomatic lymph nodes in the persistent neck. Fine - needle aspiration cytology (FNAC) and direct microscopic screening for acid-fast bacilli (AFB) are recommended intended for the usual daily diagnosis of tuberculous lymphadenopathy along with the culture that remains the gold standard for diagnosis.<sup>21</sup> Diagnosis often requires biopsy. Therapy includes various types of anti-TB chemotherapy, surgical excision, or a combination of surgery and chemotherapy.<sup>21</sup>

**Lupus vulgaris:** It is the most common form of cutaneous TB found in individuals with moderate immunity and a high degree of tuberculin sensitivity that spreads through a hematogenous or lymphatic route.<sup>22</sup> Eighty percent of the lesions are on the head and neck

and most often on the face around the nose, eyelids, lips, cheeks, ears. Females are affected two to three times more often than males.<sup>22</sup> Lupus vulgaris skin lesions are of five types – (a) plaque, (b) ulcerative or mutilating, (c) vegetating, (d) tumor-like and (e) papulonodular. Commonly found LV form is the plaque form that accounts for 32% of cases, whereas the destructive and deforming of all lesions is the ulcerative form.<sup>20</sup> The distinctive lesion is a reddish-brown plaque, containing nodules which show an “apple-jelly” color when pressed with the help of a glass spatula (diascopy).<sup>23</sup>

Apart from the above-mentioned oral manifestations, droplets from the contaminated sputum may result in tuberculous tracheitis and laryngitis resulting in hoarseness, coughing, and pain along with tuberculous ulcers on the tonsils resulting in dysphagia.<sup>11</sup>

#### Diagnosis Confirmation:

1. Recording detailed medical history including general and local signs and symptoms of the patient.
2. Symptoms that might help to distinguish oral tuberculosis from other varieties are fever along with lymph nodes enlargement and gastrointestinal disorders. Also, chronic cough and excessive fatigue can be seen.
3. Incisional biopsy is required to be done for each oral ulcer that lasts for more than 3 weeks.<sup>11,17,18,22</sup>
4. The existence of granulomatous seditious access with Langhans giant cells along with lymphocytes can be found along with foci of caseous necrosis of the tissue during histopathological assessment.
5. For confirmed diagnosis microbiological culture of sputum should be done<sup>7,11,12,21</sup> and also Ziehl-Nielsen stain of sputum swab to be done for acid-fast bacilli which can be positive.<sup>11-13,22</sup>
6. Its mandatory for are all individuals suspected of TB to do posterior-anterior (PA) and lateral view chest radiograph. The positive findings suggestive of TB are disseminated infiltrations, nodules, fibrotic scars and cavities in the lungs and also pleural effusion.<sup>12,19</sup>
7. One of the common Tuberculosis diagnostic tests is the Mantoux tuberculin skin test however its positive result cannot always mean active TB. There might be an indication of previous contamination or intake of the BCG vaccine.<sup>3,5</sup>

8. Currently interferon-g release assays (IGRAs) are now in use as a substitute of the Mantoux test because of its higher sensitivity and specificity.<sup>9</sup> But in suspicious patients, molecular tests (PCR) may be helpful.<sup>1,7,13</sup>

**Protocols for management of tuberculosis patients in dental settings:** A detailed medical history and physical examination of patients, specifically high-risk people should permit the dentist to make out Tuberculosis patients who can then refer for medical conduct. Sputum culture should be done for the patients who are already on anti-tuberculous treatment (ATT) to make certain that disease is not in active state.<sup>11</sup>

**Budding routes of transmission of contamination include:**

- Contact transmission through blood, oral fluids or other body fluids.
- Contaminated objects like instruments or equipment or any environmental surfaces by indirect transmission.
- Transmission route through eyes, nose, mouth and/or mucous membranes with droplets/splatter containing microorganisms.
- Breathing of microorganisms present in the air which can float for a longer period.

**Recommended protocols for tuberculosis patients:**

1. Limiting the utilization of ultrasonic scalers as well as very good speed handpieces in actively infected patients. Aerosolized *M. tuberculosis* can also survive more than nine hours. High volume suction should be mandatory for carrying out any procedure to minimize aerosol generation.
2. Rubber dam isolation should be used to have high vacuum suction but to be avoided in case the patient has a productive cough.
3. Proper hand hygiene should be maintained and individual protective things like eye shields, facemasks, head caps, gloves as well as surgical gowns needs to be followed.
4. Properly constructed, soft pleated, high filtration face masks have to be used and face masks should have at least 95% Bacterial Filtration Efficiency (BPE) for particles more than 3µm diameter.
5. Dilution of contaminated operating air/aerosols should be done for dental operatories. TB rooms

should have effective air evacuation with either exhausted or HEPA-filtered if recirculation is necessary.

6. Standard fumigation of dental operatories should be done along with cleaning and disinfecting significant and contact surfaces like Dental chair and accessories. Anti-bacterial sprays can be utilized.
7. Barrier method and high valued filters otherwise UV light in the exhaust air ducts.
8. All hospitals and clinics definitely should conduct an annual report on risk assessment for Tuberculosis infection.

## Conclusions

Tuberculosis is highly contagious and infectious transmitted disease which have created a rank in the list of deadliest disease globally. Since the route of transmission and all its causative factors are common especially in the hospital and dental settings, therefore detailed information and its oral manifestation need to be aware of among the health care professionals for its prevention. As per the motto of this review, the dental health professionals should follow all the protocols for the management of any tuberculosis patient. Diagnosing the disease at the early period will increase the morbidity and mortality of tuberculosis-infected patients. Hence, it becomes the responsibility of the dentist to consider tuberculosis in the provisional diagnosis of suspicious oral lesions to avoid unwanted delay in the treatment of this disease.

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## References

1. Global Tuberculosis Report 2019, World Health Organization. Available at <https://apps.who.int/iris/bitstream/handle/10665/329368/9789241565714-eng.pdf?ua=1> and accessed on Jan 12, 2020.
2. Raviglione M, Sulis G. Tuberculosis 2015: Burden, Challenges and Strategy for Control and Elimination. *Infect Dis Rep* 2016;8(2):6570.
3. Sulis G, Centis R, Sotgiu G, et al. Recent developments in the diagnosis and management of tuberculosis. *NPJ Prim Care Respir Med* 2016; 26:16078.

4. Nair N, Wares F, Sahu S. Tuberculosis in the WHO South-East Asia Region. *Bull World Health Organ.* 2010;88(3):164.
5. Sezer B, Zeytinoglu M, Tuncay U, Unal T. Oral mucosal ulceration: A manifestation of previously undiagnosed pulmonary tuberculosis. *J Am Dent Assoc* 2004; 135:336-40.
6. Ebenezer J, Samuel R, Mathew GC, Koshy S, Chacko RK, Jesudason MV. Primary oral tuberculosis: Report of two cases. *Indian J Dent Res* 2006; 17:41-44.
7. Ajay GN, Laxmikanth C, Prashanth SK. Tuberculous ulcer of the tongue with oral complications of oral antituberculosis therapy. *Indian J Dent Res* 2006; 17:87-90.
8. Cleveland JL, et al. TB infection control recommendations from the CDC, 1994: considerations for dentistry. United States Centers for Disease Control and Prevention. *J Am Dent Assoc* 1995;126(5):593-599.
9. Petti S. Tuberculosis: Occupational risk among dental healthcare workers and risk for infection among dental patients. A meta-narrative review. *Journal of Dentistry* 2016;49(Supplement C):1-8.
10. Cleveland JL, Robison VA, Panlilio AL. Tuberculosis epidemiology, diagnosis and infection control recommendations for dental settings: an update on the Centers for Disease Control and Prevention guidelines. *J Am Dent Assoc* 2009;140(9):1092-1099.
11. Pekiner FN, Erseven G, Borahan MO, Gumru B. Natural barrier in primary tuberculosis inoculation: oral mucous membrane. *Int J Tuberc Lung Dis* 2006;10(12):1418.
12. Mignogna MD, et al. Oral tuberculosis: A clinical evaluation of 42 cases. *Oral Dis.* 2000; 6:25-30.
13. Eng HL, Lu SY, Yang CH, Chen WJ. Oral tuberculosis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996; 81:415-420.
14. Sosa LE, et al. Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC, 2019. *MMWR Morb Mortal Wkly Rep* 2019;68(19):439-443.
15. Randy S, et al. Tuberculosis a growing concern for dentists. *J Am Dent Assoc* 1993; 124:60-65.
16. Woodruff PS. Tuberculosis and the dentist. *Aust Dent J* 1957;2;61-66.
17. Kohn WG, Collins AS, Cleveland JL, Harta JA, Eklund KJ, Malvitz DM; Centers for Disease Control and Prevention (CDC). Guidelines for infection control in dental health care settings - 2003. *MMWR Recomm Rep Center Dis Control Prev* 2003;52(RR17):1-61.
18. Akhtar K, Ara A, Khan S, Siddiqui SA. Oral Tuberculosis: A Rare Case Presentation. *J Den Max Surg* 2018;1(1):90-93.
19. Ebenezer J, Samuel R, Mathew GC, et al. Primary oral tuberculosis: report of two cases. *Indian J Dent Res* 2006; 17:41-44.
20. Krawiecka E, Szponar E. Tuberculosis of the oral cavity: an uncommon but still a live issue. *Postepy Dermatol Alergol* 2015;32(4):302-306.
21. Ram H, Kumar S, Mehrotra S, Mohommad S. Tubercular ulcer: mimicking squamous cell carcinoma of buccal mucosa. *J Maxillofac Oral Surg* 2012; 11:105-108.
22. Mukta V, Jayachandran K. Lung and lupus vulgaris. *Lung India* 2011;28(2):127-129.
23. Brennan TF, Vrabec DP. Tuberculosis of the oral mucosa. Report of a case. *Ann Otol Rhinol Laryngol* 1970; 79:601-605.