

Prevalence of *Trichomonas tenax* Infection among Individuals With and Without Oral Disease in a Rural Community South of Baghdad, Iraq

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Abstract

Trichomonas tenax is an anaerobic flagellated protozoan that inhabits the human oral cavity and has been increasingly associated with periodontal diseases. Although it has traditionally been regarded as a commensal organism, accumulating evidence suggests that *Trichomonas tenax* may contribute to oral inflammation and tissue destruction, particularly in individuals with poor oral hygiene and periodontal disease. Information regarding the epidemiology of *Trichomonas tenax* in Iraq remains limited. This study aimed to determine the prevalence of *Trichomonas tenax* infection among residents of a rural community south of Baghdad and to evaluate its association with oral disease, gender, and smoking status. Among participants without oral disease, *Trichomonas tenax* was detected in 20 of 175 males (11.4%) and 35 of 175 females (20.0%). In contrast, infection was identified in 100 of 175 males (57.1%) and 125 of 175 females (71.4%) with oral disease. Smoking was also associated with a higher prevalence of infection. Only 2 of 72 non-smoking males (2.8%) and 8 of 150 non-smoking females (5.3%) were infected, whereas infection was detected in 118 of 278 male smokers (42.4%) and 155 of 200 female smokers (77.5%). The prevalence of *Trichomonas tenax* was substantially higher among individuals with oral disease and among smokers than among healthy individuals and non-smokers. These findings support the growing evidence that *Trichomonas tenax* is associated with poor oral health and highlight the need for improved oral hygiene practices and further molecular investigations to clarify the parasite's role in periodontal disease.

Keywords: Oral health; Smokers; Oral microbial ecosystem; Epidemiology

Received: July 2026; **Revised:** August 2026; **Accepted:** September 2026; **Published:** October 2026

1. Introduction

Oral health is an essential component of general health and quality of life. Periodontal diseases, including gingivitis and periodontitis, are among the most common chronic inflammatory disorders affecting humans worldwide. These diseases result from complex interactions between the oral microbiota, host immune responses, and environmental and behavioral risk factors such as smoking, poor oral hygiene, diabetes mellitus, and socioeconomic status. If left untreated, periodontal disease can lead to progressive destruction of the supporting tissues of the teeth and eventual tooth loss (Kinane et al., 2017; Papapanou et al., 2018).

Although bacteria have long been recognized as the primary etiological agents of periodontal disease, increasing attention has been directed toward the potential contribution of oral protozoa. Among these, *Trichomonas tenax* is an anaerobic flagellated protozoan that colonizes the oral cavity, particularly dental plaque, periodontal pockets, tonsillar crypts, and other anaerobic niches. The parasite is transmitted primarily through direct saliva exchange, contaminated utensils, or close interpersonal contact. Historically, *Trichomonas tenax* was considered a non-pathogenic commensal; however, recent molecular and clinical studies suggest that it may play a role in the initiation or progression of periodontal inflammation (Marty et al., 2017; Eslahi et al., 2021).

Several investigations have reported a significantly higher prevalence of *Trichomonas tenax* among patients with gingivitis and periodontitis compared with healthy individuals. The organism has been associated with increased periodontal pocket depth, clinical attachment loss, and poor oral hygiene. Experimental studies have demonstrated that *Trichomonas tenax* is capable of producing proteolytic enzymes, degrading extracellular matrix proteins, and interacting with periodontal bacteria, thereby potentially enhancing tissue destruction and inflammatory responses (Eslahi et al., 2021; Shan et al., 2019).

Smoking represents one of the most important modifiable risk factors for periodontal disease and may also facilitate colonization by oral protozoa. Tobacco smoke alters the oral microbial ecosystem, suppresses local immune defenses, impairs neutrophil function, and reduces gingival blood flow, creating favorable conditions for the persistence of anaerobic microorganisms, including *Trichomonas tenax*. Several studies have suggested that smokers are more likely to harbor oral protozoa than non-smokers, although the magnitude of this association varies among different populations (Leite et al., 2023; Nor Azmi et al., 2025).

The epidemiology of *Trichomonas tenax* varies considerably across geographical regions, largely due to differences in diagnostic methods, oral hygiene practices, socioeconomic conditions, and study populations. Most available data originate from Europe, Asia, and South America, whereas epidemiological information from the Middle East, particularly Iraq, remains scarce. Establishing local prevalence data is essential for understanding the burden of infection and identifying population-specific risk factors that may contribute to oral disease.

Therefore, the present study aimed to determine the prevalence of *Trichomonas tenax* among residents of a rural community south of Baghdad, Iraq, and to investigate the association of infection with oral disease, sex, and smoking status.

2. Materials and Methods

A cross-sectional study was conducted among residents of a rural village south of Baghdad. Oral samples were collected from participants with and without oral disease and examined for *Trichomonas tenax*. The prevalence of infection was compared according to sex, oral health status, and smoking habit

2.1 Macroscopic Examination

This involves observing the white layer coating the tooth surfaces, as well as the color and texture of the gums (Mitchell et al., 1999).

2.2 Microscopic Examination

Direct Smear Method

A sample is collected from the patient's mouth, placed directly onto a glass slide, and examined under a light microscope. Examinations are conducted using both low and high magnification; phase-contrast microscopy may also be used to facilitate the observation of the parasite's motility. (Gharavi, M.J., 2004).

Wet Mount Preparation Method

Samples are collected from the mouths of patients, whether diabetic or non-diabetic, suffering from oral diseases. The saliva-moistened sample is placed on a clean, sterile slide and mixed without additives; this preserves the parasite's cellular structure, which would otherwise be altered, making diagnosis difficult, by the addition of other substances. A coverslip is then applied, and the sample is examined under high magnification (400x), (Van Winkelhoff et al., 2001)

3. Results

3.1 Prevalence of *Trichomonas tenax* according to oral health status

A total of 700 participants were categorized according to sex and oral health status. Among males without oral disease, 20 of 175 individuals (11.4%) were positive for *Trichomonas tenax*, whereas 35 of 175 females (20.0%) were infected. In contrast, infection was markedly higher among participants with oral disease, where 100 of 175 males (57.1%) and 125 of 175 females (71.4%) tested positive.

Overall, the prevalence of *Trichomonas tenax* was substantially greater in individuals with oral disease than in healthy controls, suggesting a strong association between oral pathology and parasite colonization. Females exhibited a higher prevalence than males in both healthy and diseased groups.

3.2 Association between smoking and *Trichomonas tenax* infection

Smoking was associated with a markedly increased prevalence of *Trichomonas tenax*. Only two of 72 non-smoking males (2.8%) and eight of 150 non-smoking females (5.3%) were infected. Conversely, infection was detected in 118 of 278 male smokers (42.4%) and 155 of 200 female smokers (77.5%). Female smokers demonstrated the highest infection rate among all study groups.

Table (1) Prevalence of *Trichomonas tenax* Infection Among in healthy individuals and those with oral diseases, across both genders

Person's status	Male			Female		
	Total	No. of Infection	Rate %	Total	No. of Infection	Rate %
Healthy	175	20	11.4%	175	35	20.0%
Patients	175	100	57.1%	175	125	71.4%

Table (2) Prevalence of *Trichomonas tenax* Infection among smokers compared to non-smokers of both genders

Person's status	Male			Female		
	Total	No. of Infection	Rate %	Total	No. of Infection	Rate %
smokers	72	2	2.8%	150	8	5.3%
non-smokers	278	118	42.4%	200	155	71.4%

4. Discussion

The present study demonstrated a considerably higher prevalence of *Trichomonas tenax* among individuals with oral disease than among apparently healthy participants. These findings support previous evidence suggesting that *Trichomonas tenax* preferentially colonizes inflamed periodontal tissues and may contribute to the progression of periodontal disease rather than merely existing as a harmless commensal (Eslahi et al., 2021). Our results also showed that females had higher infection rates than males in both healthy and diseased groups. Although sex differences have been inconsistently reported in previous studies, several investigations have suggested that behavioral factors, oral hygiene practices, and periodontal status may contribute more strongly to parasite prevalence than biological sex alone (Dybicz et al., 2018). Smoking emerged as one of the strongest risk factors for *Trichomonas tenax* infection in the present study. Smokers exhibited substantially higher prevalence than non-smokers, particularly among female smokers. Tobacco smoking is known to impair host immune responses, reduce gingival blood flow, alter the oral microbiome, and promote periodontal destruction, thereby creating favorable conditions for colonization by oral protozoa (Aciöz et al., 2025). The high prevalence observed in individuals with oral disease is consistent with recent systematic reviews reporting that *Trichomonas tenax* infection is significantly associated with gingivitis and periodontitis worldwide. Meta-analytic evidence indicates that patients with periodontal disease are considerably more likely to harbor *Trichomonas tenax* than healthy individuals, supporting its potential role as an opportunistic pathogen involved in periodontal inflammation (Eslahi et al., 2021). Although the cross-sectional design prevents establishment of causality, these findings suggest that *Trichomonas tenax* may serve as a useful biological indicator of poor periodontal health. Further molecular investigations are warranted to clarify its pathogenic mechanisms and interaction with the oral bacterial microbiome (Nor Azmi et al., 2025).

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