

## Review Article

### Oral infection and immunity: A systematic review

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#### ABSTRACT:

**Aim:** The purpose of the present research was to evaluate the association between various oral infections and immunity. **Methodology:** Databases of PubMed and Wanfang to include the articles related to oral disease and immunity were searched from year 2000-2022. Case-control study or cohort studies were included. The correlation between oral diseases and immunity association was demonstrated by OR and its corresponding 95% CI.  $P < 0.05$  was statistical significance. **Results:** Eleven case control studies were included in our present study. We found significant statistical heterogeneity was existed in our present meta-analysis ( $I^2 = 99.8\%$ ,  $P < 0.05$ ). The pooled results indicated a significant correlation between oral diseases and innate immunity was found. **Conclusion:** There was a strong co-relation between innate immunity and various oral diseases especially periodontitis.

**Keywords;** oral diseases, periodontitis, oral immunology

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#### INTRODUCTION

The oral cavity has been described as “the window to general health.”<sup>1</sup> According to Seymour, statements such as “You cannot have good general health without good oral health” and “The mouth is part of the body” are now considered obvious.<sup>2</sup> The oral cavity is also the intersection of dentistry and medicine, semi-independent professions that share the same common goal of improving the health and quality of life of patients. At the heart of each profession is the basic concept that appropriate interventions within the framework of that discipline will have an overall positive impact on patients’ health, welfare, and quality of life.<sup>3</sup> It has been estimated that more than 100 systemic diseases and upward of 500 medications have oral manifestations, which are typically more prevalent in the older population. Hippocrates reportedly cured systemic conditions by pulling infected teeth. Despite this, the relationship and impact of oral conditions on systemic conditions has not been fully appreciated until recently.<sup>4</sup> Is there direct causality between oral and systemic health conditions, or is it just coincidence? This is the main question that may have slowed the understanding of these processes as well as the interaction and collaboration between dentistry and medicine.

Bidirectional relationships between oral and systemic conditions are becoming better understood, but more research into this area is needed.<sup>5</sup> As the impact of oral health on systemic health is clarified and proven, dental and medical professionals need to develop closer ties. Whether causal or coincidental, the impact and importance of oral health on overall health has been the focus of multiple surgeons general of the United States as well as the World Health Organization.<sup>6</sup> Access to dental and medical care is a complicated issue; availability of care, cost of care and insurance, cultural issues, and fear are all factors that keep patients out of the office. From a population health perspective, it should not matter who initially examines the patient and identifies a risk factor or early evidence of a disease; what matters is that the patient gets the care he or she needs. The oral cavity harbours a complex community of microbes including viruses, fungi, protozoa, archaea and bacteria. However, bacteria are the most common microbial agents for causing oral diseases in human. Both arms of the immune system provide host protection and are major contributors to the integrity and viability of host tissues.

**AIM OF THE PRESENT STUDY**

The purpose of the present research was to evaluate the association between various oral infections and immunity.

**METHODOLOGY**

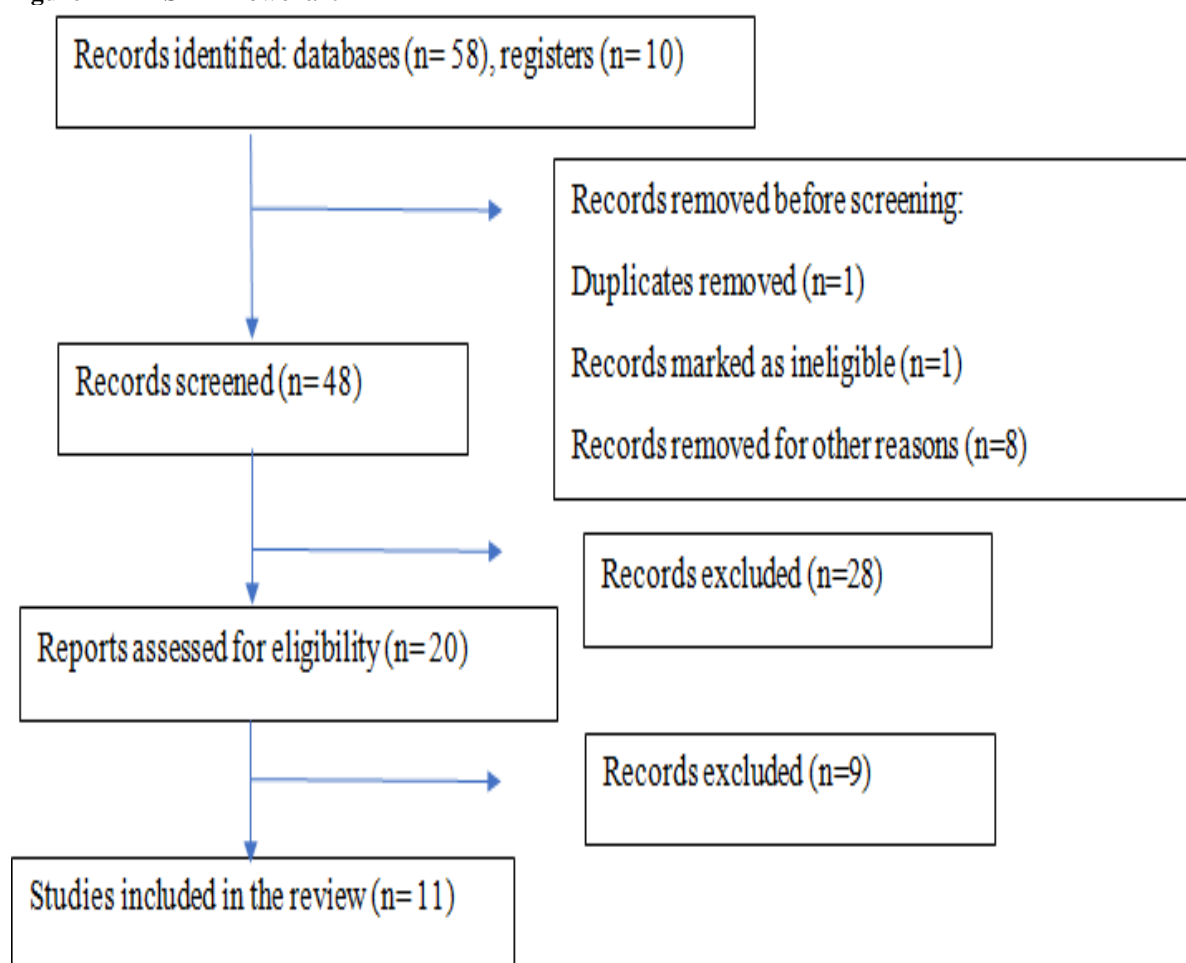
We searched the electronic databases of PubMed and Wanfang to include the articles related to oral disease and immunity using the text word of “oral diseases,” “dental caries,” “oral squamous cell carcinoma,” and “periodontal disease.” The searching process was performed by two reviewers independently. Inclusion criteria as follows: (1) study type was case–control

study or cohort study; (2) the odds ratio (OR) and its 95% confidence interval (CI) was provided by each include studies. Data of each included studies were extracted by two reviewers independently. The author name, year of the paper published, number of cases included in each study, study type, OR, and its corresponding 95% CI and adjusted factors were extracted. The data analysis was performed by STATA12.0 software (Stata Corporation, College Station, TX, USA). The correlation between orals diseases and immunity association was demonstrated by OR and its corresponding 95% CI.  $P < 0.05$  was statistical significance.

**RESULTS**

Eleven papers were included in our present study. (Figure 1)

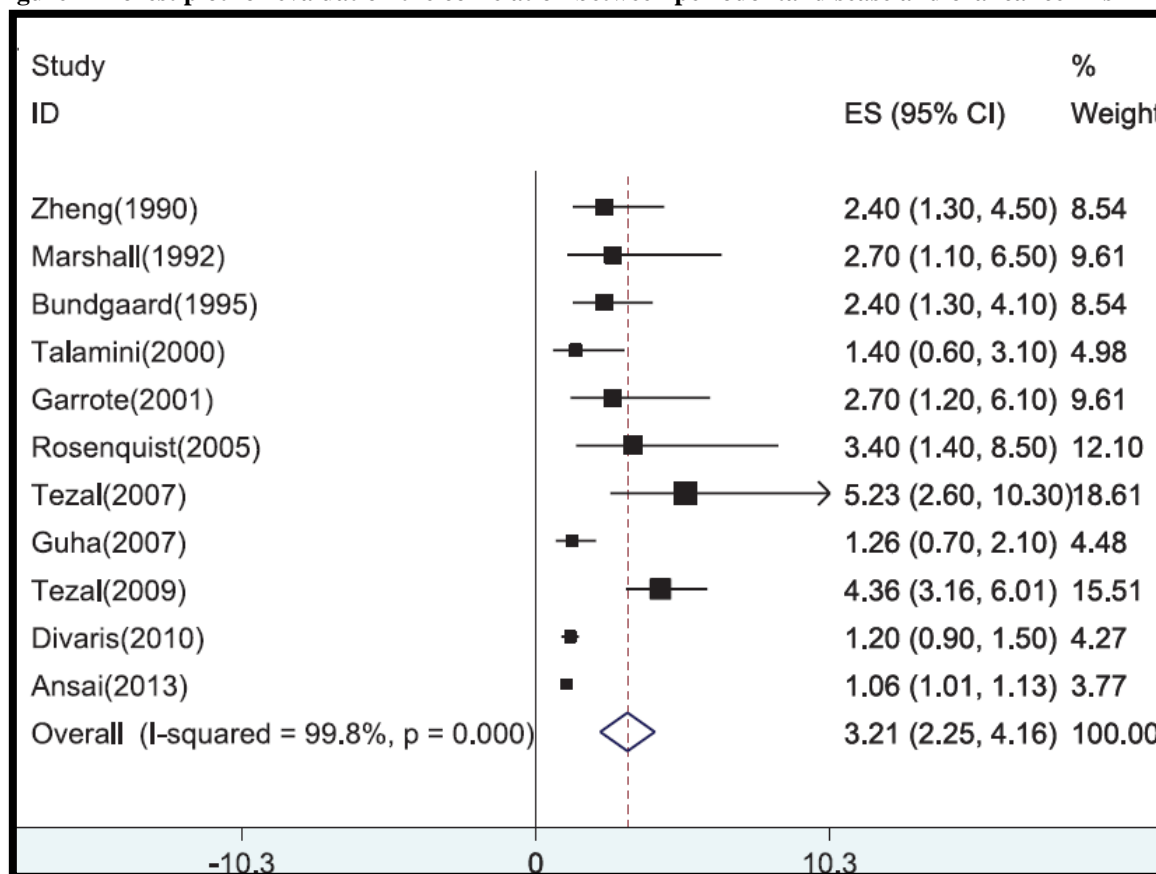
**Figure 1- PRISMA flowchart**



All the studies are designed as case–control study. All of the studies were published in English and carried out between 2000 and 2022. The subjects number range from 101 to 1361 with the highest OR of 5.23 and lowest of 1.06. we evaluated the statistical heterogeneity among the included 11 studies by Chi-square. We found significant statistical

heterogeneity was existed in our present meta-analysis ( $I^2 = 99.8\%$ ,  $P < 0.05$ ). Hence, the data were pooled by random effect model. The pooled results indicated a significant correlation between oral diseases and innate immunity was found with OR = 3.21 and the 95% CI = 2.25– 4.16 ( $P < 0.05$ ). (Figure 2)

**Figure 2- Forest plot for evaluation the correlation between periodontal disease and oral cancer risk**



**DISCUSSION**

The immune system is a complex, diverse, and dynamic biologic Network. Based on the rapidity of onset and the need for recombination of genes, it has two distinct though overlapping branches: innate immunity (congenital, rapid onset, without recombination, and less specific) and adaptive immunity (acquired, less rapid in onset, more specific due to genetic recombination). Recent reports reveal that innate immune-induced tolerance is crucial in constraining hyperinflammatory responses and protecting the host against harmful inflammatory complications. The reciprocal interaction between host immune system and the microbiota is an important part of a continuous training scheme by which the immune system is educated to be an ingenious, or more accurately, intelligent system, capable of maintaining both local and systemic homeostasis while preserving host biological integrity. To achieve such, a very finely regulated and highly coordinated interaction between both innate and adaptive arms of immune system on one side and microbiota on the other side is required. Patients with periodontal disease and poor oral hygiene suffer from frequent and severe gingival inflammation and frequent bacteremia, both of which activate the host inflammatory response.<sup>7</sup> Going forward, patients with gingivitis and early periodontitis should have tissue typing to determine if the personal HLA subtypes are

prone to excessive immune activations. Selective use of antibiotics and targeted alterations in innate immune profiles, tailored to each based on the above personal data, can permit the prevention in some and predicting disease progression in others, allowing for a personalized treatment to return to a more commensal microbiome with just the right immune, inflammatory response. However, we had a limitation of publication bias. The Begg’s funnel plot was obvious asymmetric indicating significant publication bias. Moreover, further Egger’s line regression test also indicated significant publications ( $t = 3.35, P < 0.05$ ).

**CONCLUSION**

The mucosal immune system defends against a vast array of pathogens, yet it exhibits limited responses to commensal microorganisms under healthy conditions. There was a strong co-relation between innate immunity and various oral diseases especially periodontitis. However, due to limitations, we suggest a well-designed cohort study is needed for further evaluate the correlation between various oral diseases and immunity.

**AUTHORS CONTRIBUTION**

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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