

## Review

# An Overview of Assessment Tools Used in Periodontics

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### Abstract

Periodontal diseases refer to the diseases of gums or bone resulting in inflammation and loss of teeth. The disease affects adults more commonly, but children are also at risk of development of disease. Both modifiable and non-modifiable risk factors play a vital role in progression of disease. Risk assessment is of utmost importance in periodontics as it contributes to early prevention and management of the disease thus decreasing rate of progression and associated complication. For the purpose of risk assessment various assessment tools are available that are routinely used by dental practitioners. The aim of this research is to review the available information regarding the assessment tools used in periodontics. American academy of periodontology self-assessment tool, oral health information suite, periodontal risk assessment hexagonal diagram, periodontal risk assessment model by Chandra, are some risk assessment tools used by dentists. Almost 20% of patient population who require treatment to prevent or slow the course of severe periodontal disease can be identified by utilization of a risk assessment questionnaire. The risk assessment findings can aid in clinical diagnosis and designing of an effective treatment strategy which can enhance the quality of dental care for patients. Well-established theoretical literature is present regarding these assessment tools but data about their clinical use and patient outcome is very limited. In future more clinical research is needed regarding the use of assessment tools in periodontics as they are quite important due to their role in early identification and intervention and also in predicting future outcome.

**Keywords:** *periodontal, disease, risk, assessment, tool*

## **Introduction**

Periodontal diseases are a set of inflammatory conditions that affect the gums, bone, and periodontal ligament, inevitably progressing to loss of teeth and leading to systemic inflammation. Chronic periodontitis is more common in adults, yet children can still acquire aggressive periodontitis. Disruption of the commensal oral microbiota which leads to dental plaque and further interacts with the host's immune system, causing inflammation is responsible for causing periodontal disease. This pathophysiological condition persists via phases of activity and pacification until the infected tooth is extracted, the microbial biofilm is surgically removed, and the inflammation subsides. The severity of the periodontal disease is greatly impacted by both non-modifiable factors including genetic predisposition, and modifiable risk factors such as smoking (1).

Periodontal disease progression rates differ greatly amongst people. Periodontal disease prevention and treatment are focused on accurate diagnosis, removing or reducing causative determinants, risk mitigation, and rectifying the disease's unfavourable outcomes. Risk assessment will be an integral part of all general dental examinations and periodontological assessments, according to the American Academy of Periodontology. Treatment options for changing, reducing, or eliminating most of the risk factors for periodontal disease can be determined with a better understanding of the underlying causes and factors. Risk assessment is the process of providing quantitative or qualitative evaluation for adverse events that occur as a result of exposure to certain health threats or deficiencies (2).

The emergence of periodontal disease is due to various risk factors. Since plaque biofilm and poor dental hygiene are quite well-known determinants of periodontal disease, any other disorders that obstruct proper biofilm removal are also considered risk factors. Such factors include anatomical abnormalities, tartar, and restoration-related problems. Furthermore, periodontal disease is linked to smoking, diabetes, and a low socioeconomic level. All of these risk factors can be changed, but some others, such as age, gender, and ethnicity, cannot. After completing active periodontal therapy, most patients with periodontitis are still at risk of further disease progression or recurrence (3). Disease risk assessment scores integrate several variables with risk scales to provide a synthetic prediction value for every patient as well as a patient-risk stratification at a given follow-up time. As a result of which clinical decision-making and oral health are aided. The

periodontal risk calculator, perio risk, and the periodontal risk assessment are examples of periodontal scoring instruments that have been developed and revised over time. The reliability of each of these tools has been established over long-term periodontal follow-up for estimating tooth loss and periodontitis relapse and advancement, and they are largely used to change periodontal maintenance frequencies after active periodontal therapy (4). The purpose of this research is to review the available information about the assessment tools used in periodontics.

## **Methodology**

This study is based on a comprehensive literature search conducted on April 29, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about the assessment tools used in periodontics. There were no restrictions on date, language, participant age, or type of publication.

## **Discussion**

In the current times of periodontal practice, risk assessment is essential. By emphasizing on early detection and prevention of dental problems, especially in the case of periodontal disease, dentists can improve the results of oral health care among the general public and special groups of people also termed as target population. It would simply take a few minutes for a dentist to incorporate a risk assessment tool into routine practice. Some of the clinical manifestations that are investigated during risk assessment include assessment of the pocket depth, any bleed while probing, compromised oral hygiene, prolonged inflammation, attachment loss, smoking, pregnancy, and diabetes. Utilization of the risk assessment questionnaire can help identify about 20% of people who need treatment to prevent or reduce the course of severe periodontal disease (5). Risk assessments occur at several levels, including risk assessment at the patient level, risk evaluation at mouth and teeth level and site risk assessment. Although the various stages of the risk assessment process include clinical and radiographic examination of tissues, as well as plaque biofilm-related issues, systemic, genetic, clinical, and social factors are all considered, and these findings are then used to

establish diagnostic and therapeutic efficacy, followed by recording, precisely the first and subsequent data as part of a planned treatment, and finally a comparison of the outcome of the treatment with the baseline (6). Self-assessment tool of the American Academy of Periodontology, oral health information suite, periodontal risk calculator, periodontal hexagonal diagram for risk assessment, Chandra periodontal risk assessment model, Union of European Railway Industries periodontal risk assessments, Dentorisk, and risk assessment based on individualized treatment are examples of the various tools used in the field of periodontics for the purpose of risk assessment.

#### ***American Academy of Periodontology Risk Assessment Tool***

This tool includes a web-based self-assessment questionnaire and consists of 13-items that assesses individual risk factors by collecting information about a person's age, flossing habits, family history of gum disease, whether teeth are loose or not, suffering from any ailment or health conditions such as heart disease, osteoporosis, osteopenia, major depression, or diabetes, any dental appointment or consultation over the past two years, have been ever diagnosed to have gum problems, gum disease or inflammation of the gums, and a few others. The website informs users that they can use the self-assessment tool to determine and assess their risk of periodontal disease by answering questions. The responses of each individual are then categorized into three risk strata low-risk, medium-risk, and high-risk. The purpose of the tool is not solely to provide information on risk factors, but also play a significant role in patient education and decision-making by creating awareness regarding factors and severity of the disease (7).

#### ***Oral Health Information Suite***

This tool is not only responsible to determine the current state of periodontal disease, but also the likelihood of future disease can be assessed. Risk and disease scores are calculated, and diagnosis is established. Treatment and interventions are assessed based on these scores, and color-coded as most likely to succeed, less likely to succeed, and most unlikely to succeed. After treatment procedures, risk and disease assessments are conducted and also during re-examination. Changes in risk and disease status are also analysed and used to review risk and disease scores in addition to contributing to the development of efficacious treatment strategies that are most appropriate for each disease group (5, 8).

#### ***Calculator for Periodontal Risk***

Risk factor testing is performed with a multi-step approach that utilizes a combination of mathematical algorithms and nine-item risk criteria that includes information about demographic factors such as age, smoking history, patient diabetic profile, periodontal surgery history, and clinical features such as pocket depth, any involvement in a fusion, lower than the gingival margin, any retrieval or calculus, radiographic measurements of bone length and vertical bone lesions. The pocket depth and radiographic bone height are evaluated on the basis of a three-scale point. In order to estimate the severity of the problem an algorithm was built which was based on the measurements of height of bones and depth of pockets. Findings which connect disease severity to age are used to calculate the fundamental risk score. The history of periodontal surgery, uncontrolled diabetes and smoking more than 10 cigarettes a day significantly contribute to the rise in the risk score while in case of risk score as four the contribution of certain factors such as the occurrence of furcation involvements, lesions of vertical bone, subgingival restorations, or calculus increases the risk (9).

#### ***Periodontal Risk Assessment***

This risk for each individual is calculated by evaluation of the six parameters: the proportion of locations that bled when probed, the proportion of periodontal pockets still present, tooth loss, an estimate of lost periodontal support, an evolution of the environmental or behavioural factor, and an evolution of the systemic and genetic state. The risk is then quantified or calculated by categorizing it into three groups: Low-risk individuals include: Only one parameter is in the moderate-risk range, or all parameters are in the low-risk. Moderate-risk individuals include: At least two factors are moderately risky, but only one is extreme while Individual in high-risk category include at least two factors imply for high-risk (10). It is also commonly referred as hexagonal diagram for periodontal risk assessment. **(Figure 1)** Findings from a systematic review published in 2015, concluded that patient-based risk assessments such as the periodontal risk calculator and the periodontal risk assessment have successfully predicted periodontal progression and tooth loss among the treatment communities.

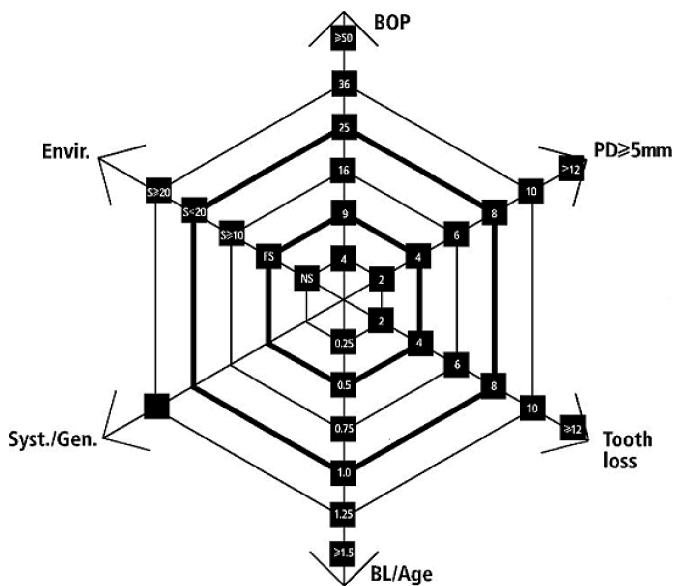


Figure 1: Hexagonal periodontal risk assessment model (11)

However, the authors also suggest that further research on the efficacy and application of risk assessment clinically can aid in improving patient management and is need of time (11). Chandra has proposed a new risk assessment tool, commonly referred to as the Chandra periodontal risk assessment model, which includes information on the number of deep pockets in areas less than 5mm, the number of missing or lost teeth, bone loss and age, average, ratio of loss of attachment with age, diabetes status, smoking status, dental condition, and other system components and risk determinants. Each factor is given a rating on scale of five, and the risk is calculated accordingly (2) (Figure 2).

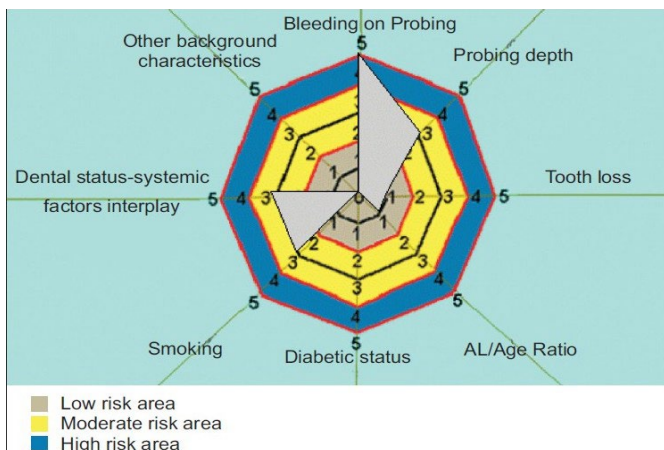


Figure 2: Chandra Risk Assessment Model (2)

**Clinical Applications**

The ideal dental practice is to identify patients and populations who are at increased risk of development of periodontal disease and treat them with the right intervention, which not only helps to prevent the

progression of disease but also aids in reducing the severity load. As dental practitioners attempt to enhance therapy and patient outcomes, risk assessment and management is now becoming increasingly important. Risk assessment is used in clinical practice to identify patients who are at a higher risk of disease exposure, predict future disease outcomes, and, as a result, reduce the need for intrusive periodontal therapy, improve patient treatment outcomes, and, ultimately, minimize oral health care costs. Patients suffering or at risk of periodontal diseases should brush, floss, and rinse their mouths with an antimicrobial mouthwash on daily basis (12).

Results from a qualitative study in 2018 revealed that dental practitioners were convinced that detection of risk factors could help them forecast periodontal disease and improve their patients' habits. An effective risk assessment tool could help them educate and change their patients' behaviours so that they can play a significant role in their patients' overall health. However, in order to attain this aim, all dental professionals, not only dentists, must be educated on how to perform risk assessments and translate the results into practical recommendations for patients. According to survey participants, the research community has concentrated more on translating research findings into a risk assessment tool, rather than how clinicians would use these tools during patient encounters and whether it affects the risk or outcome of patients (13). More research studies in literature discuss the theoretical aspect of the risk assessment tools used in periodontics and very limited and scarce literature is available regarding the clinical application and patient outcome, more research studies are needed to signify their use clinically.

**Conclusion**

Periodontal treatment necessitates a detailed risk assessment. The patient's case history should include risk factors assessments in addition to diagnosis. By focusing on early detection and prevention of dental problems, especially in periodontal disease, dentists can aid to improve the provision of quality oral health services to the general public and to certain communities. Various risk assessment techniques and tools are available and employed for this purpose; however, future research should focus on the clinical implications of these tools as well as patient outcomes.

## Disclosure

### Statement

The authors declare no conflict of interest.

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### Ethical consideration

Non-applicable.

### Data availability

Data that support the findings of this study are embedded within the manuscript.

### Authors' contribution

All authors contributed equally to the drafting, writing, sourcing, article screening and final proofreading of the manuscript.

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