

Review Article

An overview of predisposing factors in causation and progression of root caries

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Abstract

Root surface caries is a prevalent condition among the elderly, reported across the globe in all ethnicities and classes. Literature evidence shows bimodal incidences of dental caries. The first in the childhood period, with fresh surfaces exposed to the environment. The second peak of incidence was noted in the senile ages. An interesting fact to note is the window period of infectivity for root caries is less than that for childhood caries. The current review reported that age, previous exposure to root caries, recent episodes of root surface exposure, and tobacco use were all positively correlated with dental root caries. Furthermore, it was found that oral hygiene and socioeconomic status were found to be negatively correlated. Older adults, those with lower socioeconomic positions, tobacco users, and those with more root caries experience, gingival recession, and dental plaque were found to be at higher risk of developing new root caries. An understanding of the risk factors helps us to facilitate better oral health care services to the elderly population.

Keywords: Dental caries; epidemiology; root exposure; tobacco; gingival recession; elderly

Introduction:

In many nations across the world, life expectancy and the percentage of older persons in the population have significantly increased in recent decades¹. According to a recent analysis of the worldwide burden of untreated dental caries, most of the older persons had dental caries, and both the incidence and prevalence of the condition rose after the age of 40². It is anticipated that a significant percentage of new caries in elderly persons will develop in the tooth roots. For instance, in China's most recent national oral health survey, more than half of individuals between the ages of 65 and 74 had root caries³.

Root caries is expected to rise over time as people age and keep more teeth. Dental root caries can cause pain and tooth loss, as well as have an impact on an older person's overall health and quality of life. Effective prevention programs are therefore much sought after, and managing this illness in the aging adult population is a significant concern in dental public health⁴.

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The exposed root surface beneath or at the cemento-enamel junction is typically where dental root caries is seen⁵. The primary methods for diagnosing root caries lesions are touch and visual. For a comprehensive analysis, lesion site, texture (soft or penetrable following mild probing with a blunt probe), colour (often discoloured), cavitation, and root surface contour are all taken into account⁶. Cariogenic bacteria that ferment carbohydrates on the exposed root surface are the source of root caries. Dentin and a thin layer of cementum make up the tissues of the tooth root. Dentin has significantly more organic material and less mineral than the enamel that covers the tooth's crown. As a result, the risk variables and risk predictors for coronal caries may differ from those for root caries. Developing successful preventative strategies and applying them to people with higher caries risk will be made easier by identifying the underlying caries risk factors.

RISK FACTORS IN ROOT CARIES

The Root caries is a complex condition caused by a range of biological, behavioural, and socio-environmental factors. A number of risk factors are included in this review, including sociodemographic factors, general health conditions, general health behaviours, oral health behaviours, existing oral health conditions, and oral microbiotas, which are further detailed below.

Socio-demographic Factors

Age Most of the studies reported a positive association between root caries and age, whereas only few studies found the opposite. Given that dental caries develops gradually over time and that the DF-root score is an irreversible, cumulative measure, this result is not surprising. Conversely, the longitudinal investigations did not consistently find a relationship between age and new root caries.

Gender Few research found the contrary, over half of the studies found a higher prevalence among men, and several more found no statistically significant link. The majority of the cohort studies that looked at this topic found no statistically significant relationship between the incidence of root caries and gender. Therefore, it is impossible to form a firm conclusion about how gender and root caries are related.

Area of residence persons who lived in the capital city or in metropolitan regions had a lower prevalence of or less root caries than persons who lived in towns or rural areas, according to slightly more than half of the included cross-sectional studies. Therefore, it appears that adults who live in rural areas are more likely to suffer from root caries.

Education level Majority of the data indicated that there is no meaningful relationship between root caries and education level. According to certain research, those with less education had a higher incidence or prevalence of root caries. Therefore, one cannot anticipate that the root caries situation among older individuals will greatly improve despite the fact that the adult population's level of education has gradually increased in the majority of countries worldwide in recent years.

General health condition the quantity of medications or pharmaceuticals a person used was utilized as a proxy for their overall systemic health status in the examined research. Adults with poorer self-care skills had greater root caries, according to the majority of cross-sectional research. It should be mentioned that overall health conditions and the ability to take care of oneself typically decline with age. Given that age and DF-root are positively correlated, it becomes sense that a weaker capacity for self-care and a worse overall state of health would be linked to a higher incidence of root caries. Additionally, there were no noteworthy associations found between the incidence or prevalence of root caries and

depression, body mass index, or systemic disorders.

General health behaviour

Use of Tobacco Half of the research indicated that tobacco users had greater root caries. Consistent with the findings of the surveys, in majority of the investigations, tobacco use was positively connected with the growth of new DF-root or D-root. The foregoing findings may be explained in part by smokers' higher levels of dental plaque, severe periodontal disease, and exposed root surfaces⁷. Thus, in addition to the benefits for overall health, assisting older persons in quitting smoking may have a preventative effect on root caries. In order to promote health, dental and general health care workers should work together more closely.

Alcohol consumption

In terms of the relationship between root caries and alcohol intake, some research revealed a favourable correlation⁸, while others found no meaningful relationship. Thus, there is insufficient evidence to draw a decision on this point.

Sugar intake

In terms of sugar consumption, half of the examined surveys found a positive link with root caries, whereas the other studies did not. Few studies found a negative correlation between increasing DF-root and sugar consumption⁹. These findings are consistent with those regarding the link between dietary sugars and dental caries¹⁰, while the evidence for root caries is less.

Oral health behaviour

Tooth brushing

In cross-sectional investigations, the relationship between teeth brushing frequency and root caries yielded conflicting results, with some research revealing a negative link and others reporting no significant effect. In contrast, evidence from longitudinal studies was more consistent, with the majority finding that increased tooth brushing frequency was related with a lower risk of new root caries. Furthermore, certain cohort studies found that regular use of mouthwash was associated with a decreased incidence of developing root caries. Overall, our data show that improved oral hygiene practices, particularly consistent tooth brushing and the use of mouthwash, may help to avoid the development of root caries over time.

Dental visit

The claimed link between dental attendance and root caries was inconsistent. One cross-sectional study discovered that patients who visited the dentist on a regular basis had a higher prevalence of DF-root, whereas three surveys revealed the opposite. The association discovered in the majority of the included cohort studies was not statistically significant. Most of the examined publications did not specify whether the study participants' dental appointments were for routine check-ups or dental treatment. People who visit the dentist for dental problems are more likely to have root caries than those who see the dentist on a regular basis for checkups. Topical fluorides and other preventive measures will also lower the latter group's risk of root caries¹¹.

Existing Oral health condition

Clinical conditions

There were no consistent findings on the number of teeth and root caries, with the majority of cross-sectional studies reporting a negative association and a few reporting a favourable relationship. The association discovered in this new assessment is less clear than that revealed in a previous review¹². This could be due to differences in how the number of teeth was measured in different studies, such as using a continuous scale or categorizing the number of teeth. The relationship between root caries and exposure of tooth root surfaces appears to be consistent across studies. Evidence from both cross-sectional and longitudinal research

indicates that greater gingival recession¹³ and increased exposure of root surfaces are associated with a higher risk of root caries and the development of new lesions. This is expected, as root caries occurs on exposed root surfaces where plaque accumulates. These findings also help explain the higher susceptibility observed in older adults, who commonly present with more gingival recession.

A strong and consistent association has also been observed between coronal caries and root caries. Studies indicate that individuals with existing coronal caries or prior root caries experience are more likely to develop new root caries, suggesting that past caries experience is an important predictor. This highlights the need for targeted preventive strategies in patients with a history of caries.

Oral hygiene status shows a clear relationship with root caries. Most studies report that individuals with lower plaque levels have reduced prevalence and incidence of root caries, while higher plaque accumulation is associated with increased risk. This reinforces the role of plaque control in the prevention of root caries.

Denture wearing has also been associated with an increased occurrence of root caries in several studies. This may be attributed to the plaque-retentive nature of dentures, particularly around exposed root surfaces, emphasizing the importance of enhanced preventive care in denture wearers.

Oral microbiotas

Several studies have demonstrated associations between higher levels of cariogenic microorganisms¹⁴—such as *Streptococcus mutans*, *Lactobacilli*, *Streptococcus sobrinus*¹⁵, and *Candida*¹⁶—and increased prevalence and incidence of root caries. Conversely, the presence of certain bacteria like *Prevotella* has been linked with a lower incidence in some analyses. While these associations are consistent with existing knowledge on dental caries, they may not necessarily indicate a direct cause–effect relationship, and further experimental and clinical studies are required to better understand these interactions

Saliva

Some of the included studies found a positive association between root caries and xerostomia, while others did not. Some surveys revealed that increased salivary flow rate and saliva pH were inversely connected with root caries. Some investigations discovered a higher risk of developing new root caries among participants with a reduced salivary flow rate¹⁷. Although saliva in the mouth is an important environmental component in dental caries, a recent systematic study found no obvious association between salivary flow, buffer capacity, and root caries. One probable explanation is that these assessments excluded epidemiological studies on populations with specific health concerns, such as salivary gland illnesses.

Discussion

A comprehensive assessment of cross-sectional epidemiological research revealed links between root caries and a variety of parameters. It is found that older adults, smokers, people with lower socioeconomic position, those with poor dental hygiene, and those with more exposed root surfaces are more likely to develop root caries. The assessment of risk factors assists oral health care professionals and public health workers in determining which demographic groups should be given priority for root caries prevention interventions. These folks should also receive additional oral health information on how to prevent root caries. The government and dental public health workers should make effective use of the data when developing community-based preventative strategies for root caries, particularly among the elderly.

In a recent systematic analysis of cohort studies, the above-mentioned risk variables were also identified as predictors of new root caries. These characteristics can be utilized to estimate root caries risk. The information is also useful for developing root caries prediction models. Root caries assessment and prediction models can identify those who are more prone to develop root caries, allowing for additional preventive actions to be implemented. Root caries prevention and management techniques can be tailored to individual and demographic needs. The major considerations would be gingival recession avoidance, fluoride treatment, and effective plaque control, particularly on exposed tooth root surfaces.

In conclusion, because of its complex aetiology encompassing biological, behavioural, and socioeconomic factors, root caries continues to be a major oral health concern, especially for older persons. Both clinical practice and public health planning benefit from the identification of important risk variables and predictors. To lessen the burden of root caries, early risk assessment, focused preventative measures, and patient-specific therapies are crucial. Additionally, better management and long-term control of the condition can be achieved through enhancing oral health education and putting community-based preventive programs into place.

Conclusion:

Older adults, those with lower socioeconomic position, tobacco users, and those with more root caries experience, gingival recession, and dental plaque were found to be at higher risk of developing new root caries. To address the risk factors linked to root caries, more research in this area is needed.

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