

## Prevalence of Root Caries among Patients Attending RAKCODS Hospital

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### Abstract

Root caries is one of the most significant dental problems among older adults. In order to prevent tooth loss due to root caries, the risk factors must be identified. The objectives of the study were to evaluate the prevalence of root caries and the associated risk factors among patients attending Ras Al-Khaimah College of Dental Sciences (RAKCODS) hospital.

Cross-sectional descriptive study was done in RAKCODS based on random sampling using 212 participants, both genders with age 35 and above, during 6 months period, the risk factor associated with root caries were analyzed by multiple regression assay.

The prevalence of root caries was 39.6% among the tested patient. Among the independent factors age, educational qualification, fluoride-containing toothpaste, smoking habit, dry mouth syndrome, plaque index and number of missing teeth showed a statistically significant influence on root caries Prevalence.

According to the result of our study root caries is one of the significant oral health problems among patients attending RAKCODS hospital and the above mentioned factors play an important role in root caries prevalence.

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### Introduction

According to the World Bank data, the average life expectancy has been increased significantly around the globe over the past few decades. Due to an increasing life expectancy of the dentition, older adults are experiencing root caries and gingival recession, putting them at even higher risk for periodontal disease. Root caries is the major cause of tooth loss in older adults, and tooth loss is the most significant oral health-related negative variable of quality of life for the elderly<sup>1</sup>. Nearly half of all individuals aged 75 and older have root caries<sup>2,3</sup>. One prominent goal of the dental profession is to preserve and maintain dentitions throughout the life.

Root caries is a preventable disease. However, available population-based prevention methods (e.g. water fluoridation, fluoridated dentifrices) are not effective on all people equally<sup>3-5</sup>. Office- and home-based intensive root caries prevention measures are more effective than the current population-based prevention measures<sup>1,6,7</sup>, but access to care, compliance issues and cost preclude the use of many of the existing intensive prevention measures on the entire population. It is known that about a third of the older adult population bears most of the root caries burden<sup>3-5</sup>. Risk-based prevention has been advocated by researchers to reduce the prevalence of diseases. If these high-risk individuals could be identified prior to experiencing the disease, or prior to experiencing advanced disease, they could be targeted with intensive prevention measures and the disease could largely be prevented and/ or mitigate<sup>8-14</sup>.

The results of studies of risk indicators and of their contribution to disease incidence using regression modeling have successfully informed targeted prevention in medicine and in some dental disciplines for many years<sup>15,16</sup>.

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A 2010 systematic review<sup>17</sup> on the risk indicators of root caries suggested that future research should focus on variables which they found to be significant across a number of studies. These included age, gender, number of teeth at baseline, plaque index, lactobacilli counts, mutans streptococci counts, smoking, saliva flow rate, saliva buffer capacity, dental visit pattern, race/ethnicity, interdental cleaning, attachment loss, partial denture wearing, and gingival recession<sup>18</sup>

Ras Al-Khaimah College of Dental Sciences (RAKCODS) is the only teaching dental hospital in emirate of Ras Al-Khaimah of United Arab Emirates which provides oral health care to a large number of residences. The aim of this cross-sectional study was to estimate the prevalence of root caries and the risk factors associated with the root caries among patients attending RAKCODS Hospital.

## Materials and methods

### 1. Study design

The data reported in the present study was a cross-sectional study conducted on the prevalence root caries and the associated risk factors among the patients attending to RAK Dental College Hospital. The study protocol was submitted and given full ethical approval by the RAKMHSU Research and Ethics Committee and RAK Research and Ethics Committee (RAKMHSU-REC-36-2017-UG-D). A written informed consent was obtained from each participant.

### 2. Recruitment

The sample was selected based on random sampling among patients coming to RAKCODS hospital above 35 years old for both genders following inclusion /exclusion criteria. No financial rewards were offered to patients. Recruitment commenced in December 2017 and was completed in May 2018.

### 3. Inclusion and exclusion criteria

The inclusion criteria for entering this study were: healthy individual of both genders who are aged 35 or over and present a minimum of 12 natural teeth. The exclusion criteria for this study were: patients under the age of 35, patients present with less than 12 natural teeth, patients taking certain medications and patients having any systemic disease.

### 4. Data collection and oral examination

A brief history of medical condition was taken for each patient prior to examination. A single trained and calibrated examiner performed a baseline oral exam in a standard dental operatory equipped with a dental light and air-water syringe. Patients diagnosed with root caries were further examined to fill the root caries assessment form. The presence of dry mouth syndrome was measured by salivary flow rate. Plaque scores were recorded at baseline using the mucosal plaque score (MPS) index<sup>19</sup>. A WHO basic periodontal examination (BPE) probe was used to evaluate the periodontal condition, the presence of calculus and loss of attachment. The diagnostic threshold for periodontal disease was any pocket in the patient's mouth where the black-band of a BPE probe (3.5–5.5 mm) partially or totally disappeared (i.e. BPE code 3 or greater). Denture wearing was recorded at baseline. Teeth were cleaned with an ultrasonic scaler, rubber cup, and prophylaxis paste and were washed and dried prior to caries detection. Decayed, missing and filled teeth (DMFT) were recorded. Root surfaces were anatomically defined as those surfaces apical to the cement-enamel junction (CEJ).

### 5. Data analysis

The collected data were analyzed using statistical software SPSS (version 16.0). The prevalence of root caries was calculated by the formula: Prevalence of root caries = the total number of patients having root caries/ the total number of patients examined X 100. The influence of the risk factors over root caries was analyzed for patients with root caries (n=85) by multiple regression assay. Pearson correlation assay was performed to determine the correlation of individual independent factor with the dependent factor tested in the study. The strength of correlation was calculated according to the following criteria 80% - 100% (very strong), 60 % - 80% (strong) 40% - 60% (moderate), 20% - 40% (weak) 0% - 20% (very weak).

## Results

In our study 39.6% of the participants have a minimum of 1 root caries. Multiple regression assay reveal that, the predicted factors have a good co-efficiency to predict the prevalence of root caries among the tested population (R= 0.855). Among the predicted variables 73% of them independently regulate

the co-efficiency to predict root caries among the tested population. The independent variables statistically significantly predict the dependent variable  $p < 0.001$ . The characteristics of study population have been described in table 1. Among the independent factors the following showed a statistical significant influence on root caries: age ( $p=0.004$ ), educational qualification of the patient ( $P=0.014$ ), use of fluoride containing toothpaste ( $P=0.006$ ), smoking habit ( $P=0.009$ ), dry mouth syndrome ( $P=0.009$ ), plaque index ( $P=0.047$ ), and number of missing teeth ( $P=0.009$ ). The Pearson correlation assay revealed that age ( $R=0.465$ ) and plaque index ( $R=0.460$ ) have a moderate correlation with root caries. Other factors like tongue cleaning ( $R = 0.236$ ), smoking ( $R = 0.249$ ), the number of missing teeth ( $R = 0.304$ ) and the number of exposed root surfaces ( $R = 0.223$ ) have a weak correlation with root caries (figure 1).

## Discussion

The objective of this study was to determine the prevalence of root caries and the variables associated with root caries with the ultimate goal of helping to identify individuals who needs to be targeted root caries prevention strategies. These individuals will also be followed up in a prospective study to observe new root caries development and identify associated risk indicators.

In our study root caries incidence was observed in patients as young as 35 years old. It is understood that root caries risk is a concern with the elderly people due to a number of age-related factors that might contribute to this incidence; however, the incidence of root caries in early age might make the population more prone to early edentulousness. A recent study by Ilhan., *et al* 2017 reported that the percentages and severity of the periodontal disease increase with age<sup>20</sup> which could be a contributing factor for increased root caries rate in these population<sup>21, 22</sup>

The educational qualification of the patient influences the oral health care knowledge of the patient which plays an important role in preventive medical and dental care of each individual<sup>21</sup>. A similar study was carried out by Moreno *et al.*, 2017 where the author reported that root caries incidence is influenced by the education and socio-economic status of the individual<sup>23</sup>.

The tongue is one of the important sites of harboring cariogenic bacteria. Insufficient cleaning of the tongue may lead higher occurrence of most common oral diseases like dental caries and periodontitis<sup>24</sup>. Fluoride is a good preventive aid for dental caries through elevating the buffering capacity of saliva thus preventing tooth structure de-mineralization. Additionally, fluoride helps in re-mineralization of early caries lesion by enhancing calcium and phosphate absorption from saliva and by forming fluoro-apatite crystals that resist further de-mineralization<sup>25</sup>.

It has been corroborated the influence of smoking in active root caries prevalence, being tobacco the main factor associated with periodontal disease<sup>26 27</sup>. A previous cross-sectional study on found a positive relationship between root caries and the daily number of cigarettes consumed<sup>28</sup>, as well as other studies have published the relationship of tobacco consumption and root caries different age groups<sup>22 29</sup>.

Plaque is the early manifestation of dental caries which consists of bacteria and an extracellular matrix that contains lipids, proteins, and polysaccharides. Teeth are more vulnerable to an increase in bacterial plaque when carbohydrates in the food are left on teeth after every meal. In the presence of sugar and other carbohydrates, bacteria in the mouth produce acids that can demineralize enamel, dentin, and cementum. The more frequent the exposure to this environment, is the more likely caries is to occur<sup>30</sup>

In our study, the number of missing teeth showed to have a significant influence on root caries prevalence. The area of a missing tooth usually shows bone resorption which makes the adjacent area susceptible to root caries. A previous study by Gilbert *et al.*, 2001 has reported similar finding<sup>31</sup>. Another factor associated with, it is the number of exposed root surface. The area of exposed root surface is the site of root caries incidence.

Denture wearing was found to be significantly associated with root caries experience in univariate testing in this study but it did not emerge as a significant variable in the multivariate testing or the final prediction model. Previous studies have identified removable prosthesis wearing as a risk factor for root caries<sup>32</sup>. It is possible that close proximity to a

removable prosthesis is a tooth level risk factor rather than a patient level risk indicator and warrants further investigation.

### Conclusions

Within the limitation of our study, we could conclude that root caries is one of the significant oral health problems among patients attending RAKCODS hospital. Age, educational qualification, use of fluoride containing tooth

paste, smoking habit, dry mouth syndrome, plaque index, and number of missing teeth are the risk factor leading the root caries formation among the tested population.

### Declaration of Interest

The authors report no conflict of interest and the article is not funded or supported by any research grant.

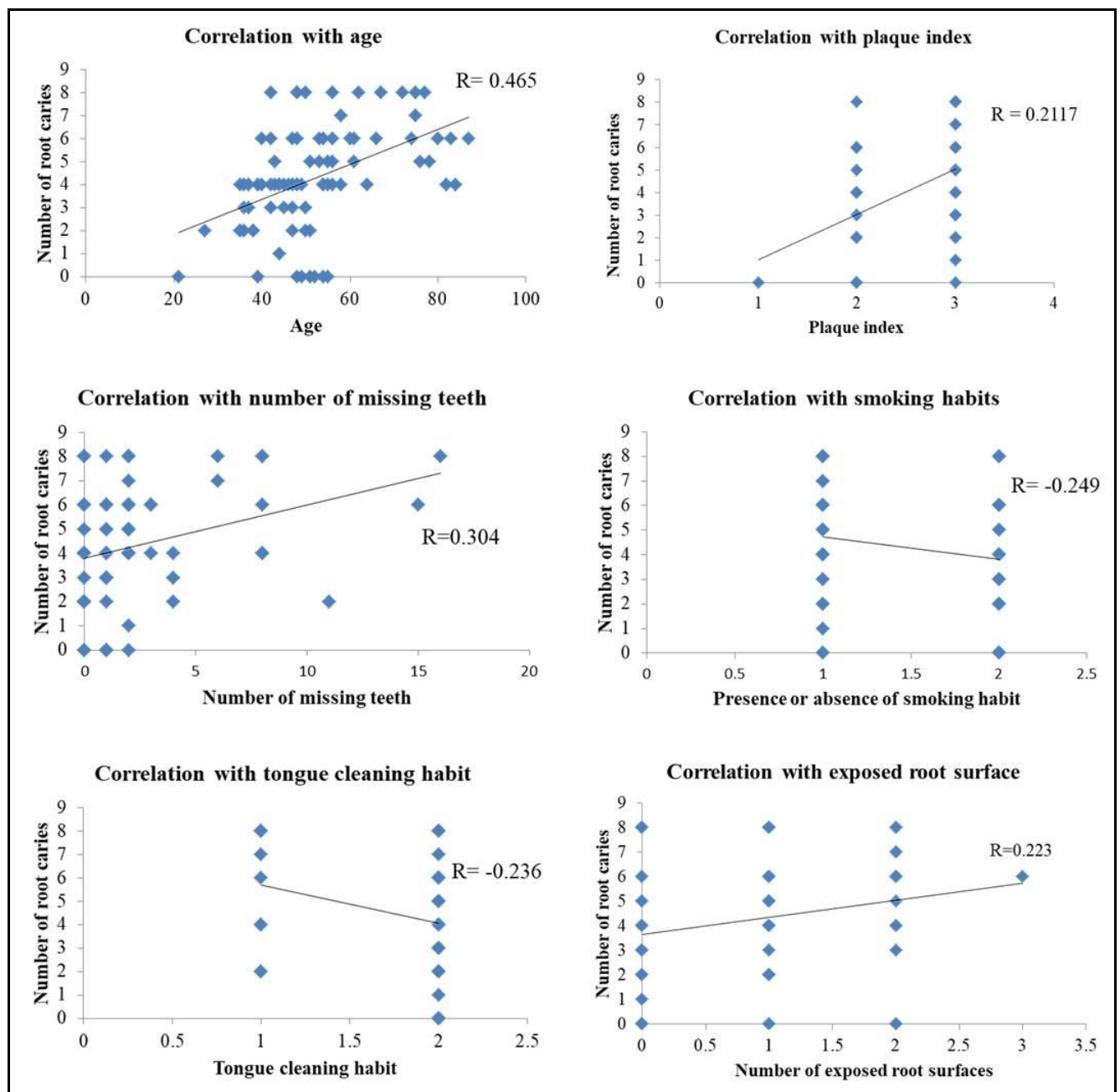


Figure 1. Weak correlation with root caries.



Variable	Category	N	%
Gender	Male	68	80.95
	Female	16	19.04
Level of education	School	4	4.8
	College	80	95.2
	Professional	0	0
Brushing frequency	Once a day	11	13.0
	Twice a day	68	81.0
	Three times a day	5	6.0
Inter dental cleaning	Yes	7	8.3
	No	77	91.7
Tongue cleaning	Yes	10	11.9
	No	74	88.1
Smoking habits	Yes	43	51.2
	No	41	48.8
Betel nut chewing	Yes	2	2.4
	No	82	97.6
Alcohol consumption	Yes	0	0
	No	84	100
Dry mouth	Yes	3	3.6
	No	81	96.4
Denture wearing status	Yes	3	3.6
	No	81	96.4
Plaque index	Good	1	1.2
	Fair	30	35.7
	Poor	53	63.1
Periodontitis	Absent	9	10.7
	Localized	68	81.0
	Generalized	7	8.3
Continuous variable	Average	SD	
Age	52.06	13.73	
Number of missing teeth	2.14	3.09	
Crown surface caries	3.52	1.58	
Number of exposed root surfaces	0.89	0.71	

**Table 1.** Characteristics of study participants.

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