

Association of Tooth Loss with Systemic Health of Saudi Population residing in Al-Qassim Region– a Retrospective Study

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Abstract

Objective: The purpose of the study to assess the relationship between oral health and the general health of individuals especially tooth loss and the systemic illness. **Materials and Methods:** A retrospective study of 804 digital orthopantomograms (OPGS) taken of patients, age ranging between 20 and 70 years, who presented to treatment at the Regional Dental Center, AL-Qassim, Saudi Arabia between 2018 and 2019. The OPGS and dental records were reviewed for missing teeth among patients with systemic illness. **Results:** We found a high prevalence of tooth loss in hypertension (10.63), DM (9.62), hypothyroidism (6.79) and Asthma (6.35). **Conclusion:** This study reported a high prevalence of tooth loss among the patients with systemic illness rather than the patients with no systemic illness. The presence of more than one illness and older age patients showed a high prevalence of tooth loss. These findings clarify the importance of the effect of the systemic health on the oral health.

Keywords: tooth loss, systemic illness, oral health Saudi.

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INTRODUCTION

Tooth loss is one of the most prevalent oral conditions and ranks as one of the hundred adverse health conditions that affect the population of the world. Among all oral conditions, tooth loss is also the leading cause of disability-adjusted life years (DALYs) accounting for 7.6 million DALYs. Untreated caries affects 2.5 billion people in the world and is considered as the most common Global Burden of Diseases (GBD) worldwide [1]. This is a cause for concern as caries and periodontal disease are also the most common prequel of tooth loss in adults [2]. A study conducted in 2014 reported that 2.3% of the world's population around 158 million people was edentulous. The study also reported that even though the global prevalence of age-standardized for tooth loss has decreased from 4.4% to 2.4% from 1990 to 2010, which presented as 45% reduction in the number of the entire population. The limited reports from the developed countries which directly make possible attempts to correctly quantify tooth loss are difficult and very limited data become typically emerged from the developing world [3]. Although conservation is the predominant philosophy in dental education and practice, it is often unavoidable to remove teeth due to the time-dependent progression of oral diseases that increase the likelihood of tooth loss during adulthood [3, 4]. It is incessantly not only a

debilitating condition in used terms of personal function and esthetics but also has a psychological impact and adversely affects the personal quality of life [5, 6].

Oral diseases that lead to tooth loss like periodontitis and caries provide well-established links with the systemic health of individuals. Enough evidence reports the possible association of periodontitis with cardiovascular disorders [7], diabetes mellitus (DM) [8, 9], and other systemic conditions [10-13]. Tooth loss itself has been attributed as a comorbidity risk factor for many systemic diseases and the number of teeth present in the mouth has been identified as a reliable predictor of disease-specific mortality. For example, a prospective study conducted over 12 years on a large cohort of 7,674 subjects reported a direct correlation between the number of teeth and cardiovascular disease mortality [14]. Another study conducted on a large Chinese population reported the association of tooth loss with increased risk of death from upper gastrointestinal cancer, heart disease, and stroke [15]. Similarly, a long-term prospective study done in Japan tried to examine the relationship between functional teeth numbers in the mouth and 15-year mortality in the sample. The study reported a significantly higher mortality rate in people who had 10 or less than 10 functional teeth [16]. Another long term

prospective study done on 48,375 male participants in the US with a median follow up of 17.7 years reported that fewer teeth in the mouth were associated with an increased risk of lung cancer [17]. These studies simply indicate there is an association between tooth loss and the systemic health of an individual.

Tooth loss is a problem that has also affected the Saudi population but studies assessing the prevalence of tooth loss in adults are very rare. A five-year survey conducted by Shinawi in 2012 on patients in Jeddah, Saudi Arabia did not shed light on the prevalence of tooth loss as much as it did on the pattern although it did report that the most common type of tooth loss pattern was partial edentulous with Kennedy's Class III being the most common of them in both genders and both arches [28]. The most important study that attempts to present tooth loss prevalence in adults was conducted in 2017 in the city of Dammam. This study reported that out of 479 participants aged above 25 years, 74% were partially edentulous, 6% were completely edentulous, 8% had one edentulous arch and 12% had no missing teeth. This study reported correlations of tooth loss with systemic disorders e.g DM and heart diseases as well as with smoking [18]. However, studies involving large samples that sufficiently establish a direct correlation of tooth loss with systemic disorders in the Saudi population do not exist. Our present research aims to evaluate the used effect of general health on oral health and the possible association between tooth loss and systemic health in Al-Qassim Region, Saudi Arabia.

MATERIALS AND METHODS

The present study is a retrospective study conducted in the Al-Qassim Regional Center in Al-Qassim, Saudi Arabia. Ethical approval for the study was obtained from the Institutional Review Board

(Regional research Ethics committee, Registered at the National Committee of Bio, Med Ethics (NCBE) with IRB no. H-04-Q-001. The sample in this study consisted of patient records that included 804 digital Orthopantomograms (OPGs) and files stored in the Care Stream R4 Clinical and Practice Management Database (the filing software used by the center). The Inclusion criteria included the files of patients aged between 20-70 years and Only OPG and files from 2018 to 2019 were selected. The exclusion criteria files those are incomplete. The Patients were divided into groups based on age and number of missing teeth. Data were analyzed comparing the number of missing teeth and gender and whether they were systemically healthy or not. Data were coded and entered into a spreadsheet using Microsoft Excel 16.0. Descriptive statistics were used to obtain the frequency distribution of data. Inferential analysis was performed using Statistical Package for Social Sciences (SPSS, IBM Version 22.0). Student's t-tests and one-way ANOVA were used to compare the means and establish an association between variables. All p values below an alpha level of 0.05 at 95% confidence interval (CI) were considered statistically significant.

RESULTS

A total of 804 were records met the inclusion criteria and were reviewed. Table 1 shows us the distribution of the patients by age, gender, systemic health, and number of missing teeth. The majority of the patients were (29.5%) of age group 20-30 followed by the age group of more than 50 years (28.5%). More than half (57.1%) of patients were females while (42.9%) were males and half of them (50%) had a systemic illness compared to 50% without systemic illness. The majority of the patients (72.4%) had 1 to 10 missing teeth (mean 6 ± 6).

Table-1: Patients characteristics (age, gender, systemic health, and number of missing teeth) (N = 804)

| Variable | Category | No | % |
|-------------------------|--------------------|-----|-------|
| Age | 20 - 30 years | 237 | 29.5% |
| | 31 - 40 years | 179 | 22.3% |
| | 41 - 50 years | 159 | 19.8% |
| | more than 50 years | 229 | 28.5% |
| Gender | Female | 459 | 57.1% |
| | Male | 345 | 42.9% |
| systemic illness | No | 402 | 50.0% |
| | Yes | 402 | 50.0% |
| Number of missing teeth | No missing teeth | 106 | 13.2% |
| | 1 - 10 teeth's | 582 | 72.4% |
| | 11 - 20 teeth's | 85 | 10.6% |
| | 21 - 32 teeth's | 31 | 3.9% |

Table2: Show us the distribution of different patients systemic illness from the overall sample (n=804). DM was the most common disorder found in patients with systemic illness (22.1%) followed by hypertension (16.3%), other systemic illness (12.4 %),

hypothyroidism (8.8%) asthma (7.5%) heart disorders, elevated cholesterol, liver/kidney diseases and hyperthyroidism (4.2%, 1.7%, 1.2%, and 0.6% respectively).

Table-2: Show us the distribution of different patients systemic illness from the overall sample (n=804)

| Variable | | Number | % |
|--|-----|---------------|----------|
| | no | 388 | 48.3% |
| Cholesterol | Yes | 14 | 1.7% |
| | no | 224 | 27.9% |
| DM | yes | 178 | 22.1% |
| | no | 271 | 33.7% |
| Hypertension | yes | 131 | 16.3% |
| | no | 342 | 42.5% |
| Asthma | yes | 60 | 7.5% |
| | no | 368 | 45.8% |
| Heart disorder | yes | 34 | 4.2% |
| | no | 397 | 49.4% |
| Hyperthyroidism | yes | 5 | 0.6% |
| | no | 392 | 48.8% |
| Liver and kidney disease | yes | 10 | 1.2% |
| | no | 331 | 41.2% |
| Hypothyroidism | yes | 71 | 8.8% |
| | no | 302 | 37.6% |
| Others, not specified systemic illness | yes | 100 | 12.4% |

Table 3: show us Patients with more than one systemic illness had a greater number of missing teeth (mean 8.51 ± 6.61) than compared to 6.31 ± 5.53 patients

who have only one systemic illness which was statistically significant.

Table-3: Relationship between number of missing teeth and patient who have one systemic illness and others who have more than one systemic illness (N = 402)

| Nature of medical disordered patients | | N | Mean | Std. Deviation | t-value | Sig. |
|--|--------------------------------|----------|-------------|-----------------------|----------------|-------------|
| Number of missing teeth | Only one systemic illness | 51 | 6.31 | 5.533 | -2.262- | .024 |
| | More than one systemic illness | 351 | 8.51 | 6.605 | | |

t-test, P-value significant at .05 level

Table4: show us Statistical significance was seen in the number of missing teeth in patients with systemic illness at ($p=0$), where the mean number of

missing teeth in patients with systemic illness were higher (i.e. 8.23 compared to 3.34) in patients without systemic illness.

Table-4: Mean number of missing teeth of patients with systemic illness or not (N = 804)

| | Systemic illness | N | Mean | t-value | Sig. |
|-------------------------|-------------------------|----------|-------------|----------------|-------------|
| Number of missing teeth | No | 402 | 3.34 | -12.763- | .000 |
| | Yes | 402 | 8.23 | | |

t-test, P-value significant at .05 level

The association of the number of missing teeth with different systemic illness is illustrated in Table 5. The results showed that type of patients with systemic illness who suffered from DM, hypertension, asthma,

and hypothyroidism had a higher number of missing teeth than compared to patients without those illnesses at ($P\text{-value} \geq 0.05$).

Table-5: The relationship between the number of missing teeth and the different type of systemic illness

| Number of missing teeth | Mean | t-value | Sig |
|------------------------------|-------|---------|------|
| Cholesterol | 7.86 | .219 | .827 |
| DM | 9.62 | -3.871- | .000 |
| Hypertension | 10.63 | -5.313- | .000 |
| Asthma | 6.35 | 2.441 | .015 |
| Heart disorders | 9.26 | -.967- | .334 |
| Hyperthyroidism | 7.00 | .425 | .671 |
| liver and kidney disease | 8.70 | -.230- | .818 |
| Hypothyroidism | 6.79 | 2.065 | .040 |
| Others not specified illness | 8.83 | -1.061- | .290 |

t-test, P-value significant at .05 level

Table6: The correlation between number missing teeth and different age groups is illustrated in table 6 which is statistically significant ($p \leq 0.05$). These results indicate that older patients had more missing teeth, with patients more than 50 years old

having the highest number of missing teeth; mean = 10.71 ± 7.31 than compared to 6.33 ± 4.68 for 41 to 50 years, 4.21 ± 3.28 for 31 to 40 years and lowest mean for 20 to 30 years of age (mean 1.85 ± 2.29).

Table-6: Relationship between number missing teeth and different age groups

| Age groups ad number of missing teeth | No | Mean | Std. Deviation | F | Sig. |
|---------------------------------------|-----|--------------------------|----------------|---------|------|
| 20 - 30 years | 237 | 1.85 ^{b, c, d} | 2.296 | | |
| 31 - 40 years | 179 | 4.21 ^{a, c, d} | 3.287 | | |
| 41 - 50 years | 159 | 6.33 ^{a, b, d} | 4.682 | | |
| more than 50 years | 229 | 10.71 ^{a, b, c} | 7.314 | 137.483 | .000 |

ANOVA test, P-value significant at .05 level

DISCUSSION

Systemic health stands as one of the most important aspect for the population of the whole world. The systemic health of individuals is considered as a priority by each dental and medical staff during their procedures. There seems to be an association between systemic health and oral health as supported by different studies [10-13]. The different types of systemic health conditions have been associated between missing teeth and periodontal disease in the literature. Poor oral health has also shown to have a clear effect on the systemic health of individuals [19].

To the best of the readers' knowledge, this research is the first of a kind in Saudi Arabia that studies a large sample to examine the associations of tooth loss with the systemic health of patients. These types of studies are important because trends in results that are presented as associations indicate risk factors for systemic conditions. This means that loss of teeth in patients can indicate to the dental practitioner that there might be an underlying systemic condition that the patient is not aware of and the dental practitioner can recommend appropriate referrals. Conversely, some systemic conditions can be considered as early indicators of periodontal diseases in the patients and general physicians can recommend dental examinations for patients who have DM, cardiovascular and pulmonary diseases as well as other diseases associated with increased risk of tooth loss [10-13] and this can help prevent tooth loss by early initiation of

conservative therapies. Our research presents some important trends in tooth loss among the Saudi population. Even though 50% of the sample was healthy, 86.9% of them had missing teeth. This is similar to another study conducted in Dammam where 88% of the sample had missing teeth. However, that study did not include healthy participants [19]. The NCHS data brief of 2015 presented tooth loss trends among adults in the United States. The report stated that 52% of the sample had missing teeth which is much less than our sample [20]. Similarly, another study conducted in the US reported missing teeth in only 42.4% of the sample [21]. A prospective study from Brazil reported a higher prevalence of tooth loss in 67.8% of the sample at baseline with a further 12.5% during follow-up [22]. Most of the patients (72.4%) had 1-10 missing teeth. This is almost similar to the study done in Dammam where 78.81 % of participants had 1-10 missing teeth. DM was the most common disorder found in this study but other studies have varied reports on the most prevalent systemic conditions among patients with tooth loss.

A study conducted by Hamasha *et al.* in 2018 reports hypertension to be the most common condition among the sample [23]. The same study reported the mean number of 5.8 missing teeth per person as compared to the mean number of missing teeth in our study which was 8.3 ± 6.51 in patients with systemic illness and 3.34 ± 4.08 in patients without systemic illness. Furthermore, a statistically significant

difference existed in the presence of missing teeth in individuals who had hypertension ($p=0$), DM ($p=0$), asthma ($p=0.015$), and hypothyroidism ($p=0.04$). The number of missing teeth was also associated with the presence of more than one systemic illness (8.51 ± 6.61 compared to 6.31 ± 5.53) for those who have only one systemic illness. This can be best explained by the fact that the presence of multiple illnesses in individuals can have a compounding effect on the risks for tooth loss as proven by several studies [7, 15, 16]. Tooth loss also had a significant association with age in this study. The group that had the highest mean number of missing teeth was the most elderly i.e. above 50 years (mean = 10.71 ± 7.31). This is confirmed by another study by Al-Shammary *et al.* (1998) where the group having the highest mean number of lost teeth was the most elderly group aged 65-74 years (mean = 15.79) [24]. There are several reasons why an advanced age can be associated with increased tooth loss. Issues with a dexterity that prevent proper brushing [25], increased incidence of dental diseases in advanced age [26] as well as barriers to access dental services [27] could be some of the reasons. Gender was not significantly associated with missing teeth in our study although other studies have reported the association of gender with missing teeth [18, 22].

CONCLUSION

The number of missing teeth in systemic illness patients was higher than in patients without systemic illness. The highest number of missing teeth was found in individuals with hypertension, DM, hypothyroidism and Asthma .The old aged individuals had more missing teeth than younger individuals. The gender of the individual didn't have any influence on the number of missing teeth either in patients with systemic illness or in patients without systemic illness. These findings clarify the importance of the effect of the systemic health on the oral health.

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