**Original article**

**Investigating the relationship between decay of the first permanent molar and other teeth among 18-20-year-old young adults**

Running title: relationship between decay of the first permanent molar and other teeth

**Abstract:**

**Background**: The first permanent molar, with its large occlusal surface and early eruption time, plays a pivotal role in maintaining oral health. This study was designed to recognize the status of the first permanent molar and its relationship with an individual's dental caries of the second molar, second premolar, and other teeth, highlighting its clinical significance.

**Materials and Methods:** We assessed the clinical status of the first molar and its association with the decay of primary second molars and second premolars among 18-20-year-old young adults through clinical examination and radiographic evaluation using a standardized checklist. We analyzed the data using Chi-square and Spearman correlation.

**Results:** There was a relationship between the status of the first permanent molar and the second premolar and second permanent molar, and if someone has dental caries in the first permanent molar, it is more likely that their second permanent molar and second premolar will be decayed. The relationship between individuals' DMF and DMF6 reveals that these two variables are correlated, and by increasing the DMF6 index, the DMF index also increases.

**Conclusion:** The status of the first permanent molar is not only a reflection of an individual's general oral health and final DMFT, but it also holds potential as a predictive variable for the status of other teeth, a finding that may be of considerable interest of dental researchers and professionals.

**Keywords:** First Molar, Dental Caries, DMF.

**Introduction :**

The first molar teeth are the first permanent teeth that begin to erupt at about the age of six. These are the most substantial teeth in the human chewing system because of their sizeable occlusal surface and eruption time. The first permanent molar’s anatomical shape is such that it encompasses fissures and deep pits, making it vulnerable to decay. (1) Losing permanent first molar teeth leads to impaired chewing and occlusion and reduced vertical facial height. In addition, this tooth has constantly played a significant role in the calculation of the decayed, missing, and filled (DMF) index as the most crucial dental index because it is more likely to undergo decay due to its early eruption. (2)

Recognizing the pattern and influential factors associated with dental caries in adolescents is crucial from several aspects. On the one hand, around 18 years of age, individuals are in their first years of permanent teeth period, and positive health interventions and recognizing of factors causing decay will be enormously influential in maintaining their oral health in the upcoming years. (3) On the other hand, this issue is of great importance in the health economy because promoting health at this age culminates in reducing health costs individually and socially. Decreasing the level of oral and dental health at lower ages heightens the probability of getting toothless in later years; these dental problems can be a process lowering individuals’ quality of life and, in some cases, a pathogenic agent in other diseases. (4)

Despite some drawbacks, the DMF index is widely regarded as an appropriate criterion for diagnosing oral health status. Previous studies have shown a strong relationship between the DMF for tooth 6 (DMF6) and the DMF index for other teeth, indicating its reliability. Observing the first permanent molar status as the first grown tooth can predict the individual’s future status to some extent, providing a solid foundation for our study.

Finding the relationship of dental caries can be a model to predict the future status of an individual’s oral and dental health (6). Accordingly, considering the importance of the first permanent molar as a central tooth and the importance of the factors influencing the development or prevention of decay, this study was designed to recognize the status of the first permanent molar and its relationship with an individual’s dental caries of the second molar and other teeth so that we can achieve this hypothesis that whether the first permanent molar’s decay can be related to the caries of the second molar tooth and other teeth, and whether DMF6 is related to general DMF or not?

**Materials and Methods**

This cross-sectional study was conducted in 2023 on 18-20-year-old adolescents referring to dental centers in Qazvin, Iran. Ethical approval for the present study was obtained from the Qazvin University of Medical Sciences Ethics Committee. (IR.QUMS.REC.1401.223)

The inclusion criteria included age 18-20 years, consent to participate in the study, having a relevant orthopantomogram (OPG) prepared in the last thirty days and the lack of systemic disease. Individuals with non-eruption or developmental defects of tooth eruption and a history of jaw trauma were not included in the study. The exclusion criteria included withdrawal from the study and incomplete completion of the checklist. In addition, the study did not include patients who were in an emergency and could not cooperate with the researcher because of abscess or pain.

Two clinics with a high number of patients in one of the districts in the city of Qazvin were selected by simple random sampling, and the clinic manager’s consent was obtained before the study to conduct the present research.

A researcher-made checklist was provided in which the individual’s status was precisely recorded, and each individual’s first molar teeth status was assessed and recorded, entitled the DMF6 index. The DMF6 index is a number between 0 and 4. The checklist contained demographic information and also the individual’s dental status.

In order to definitively diagnose the decay, the World Health Organization (WHO) standards were used, including (1) the lesion is clinically visible, (2) the probe tip penetrates deeply into the soft material, and (3) the presence of discoloration or enamel normal transparency loss.

The examination was performed by a researcher who was a senior dentistry student. All examinations were performed on the dental unit using a probe and a mirror. A separate chart was also designed for the individual’s first molar teeth, in which the status of this tooth was recorded separately.

The researcher first checked the individual’s OPG, examined the teeth using a probe and a mirror carefully, and recorded the status of all teeth as a DMF index and the status of teeth number 5, 6, and 7 separately. Interdental caries were registered using the individual’s OPG. Ultimately, the status of tooth 6 was recorded as DMF6 and the status of all teeth as DMF. In the case of having a crown or implant, the patient’s tooth status was recorded separately entitled crown or implant. If each tooth was under the crown as pontic, it was recorded as an extracted tooth.

Finally, the statistical relationship between the DMF components and the first molar tooth with the second premolar tooth and the second molar tooth was assessed; the relationship of the DMF6 index with the individual’s total DMF index was also measured.

Pearson’s correlation coefficient was employed to measure the relationship between dental caries, and the data were analyzed using SPSS version 26 software.

**Results:**

The results showed 311 women and 321 men (age range = 18-20 years) participated in the study. The mean DMF of all participants was 5.57, with a mean DMF6 score of 2.28 (out of a maximum of 4). (Tab.1)

*Table1: Demographic information of participants in the study*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| variable | subgroup | N. | MEAN DMF | Mean DMF6 | General Mean DMF | General  Mean DMF6 |
| Gender | Female | 311 | 5.51 | 2.27 | 5.57 | 2.28 |
| Male | 321 | 5.63 | 2.29 |
| Age(years old) | 18Y.o | 201 | 5.41 | 2.27 |
| 19y.o | 253 | 5.53 | 2.28 |
| 20y.o | 178 | 5.79 | 2.92 |

*Table 2: Distribution of first permanent molar among participants in the study*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| variable | Upper right first molar | Upper left first molar | Lower left first molar | Lower right first molar |
| Missed(hopeless or pontic) | 79 | 83 | 99 | 95 |
| Implant | 1 | 1 | 3 | 4 |
| crown | 29 | 34 | 40 | 33 |
| decay | 242 | 240 | 278 | 284 |
| sound | 181 | 169 | 138 | 136 |
| filled | 100 | 105 | 74 | 80 |

The most recorded status in individuals’ first permanent molar was dental caries, followed by healthy and restorative teeth. The lowest tooth status was related to dental implants, observed only in 9 out of 2528 teeth. (Table 2)

*Table 3: Distribution of dental status in first molar, second premolar and second molar in the participants in the study*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| tooth | decay | missed | filling | Implant | crown | sound |
| First molar | 1054 | 356 | 349 | 9 | 136 | 624 |
| Second premolar | 622 | 181 | 203 | 1 | 24 | 1497 |
| Second molar | 638 | 153 | 189 | 0 | 23 | 1525 |

The highest status observed in the second premolar and second molar teeth was healthy, followed by decay. On the other hand, the lowest status observed was implant teeth, which was observed only in one case in the second premolar and none in the second molar. (Table 3)

*Table 4- Association of the decayed primary second and permanent first molar*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| variable | Mean decay in the first  molar | Mean decay in the second premolar | Mean decay in the second premolar | coefficient | p-value |
| Correlation between second premolar and first molar | 0.41 | 0.24 | 0.025 | 0.65 | 0.021 |
| Correlation between first molar and second molar | 0.41 | 0.24 | 0.025 | 0.616 | 0.024 |

Pearson’s correlation coefficient indicated a relationship between the status of the first permanent molar and the second premolar and second molar teeth. If someone has caries in the first permanent molar, it is more likely that their second molar and second premolar teeth will be decayed.

*Table 5: Relationship between mean Dmf and mean DMF6 in participants*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sig. | Pearson correlation | mean | Variable  component | Mean  DMF6 | Mean | Variable  component | Mean DMF |
| 0.001 | 0.81+ | 1.27 | D | 2.28 | 2.84 | D | 5.57 |
| 0.001 | 0.76+ | 0.48 | F | 1.52 | F |
| 0.001 | 0.64+ | 0.53 | M | 1.21 | M |

Table 5 shows the relationship between individuals' DMF and DMF6. It reveals that these two variables are correlated, and by increasing the DMF6 index, the DMF index also increases. The overall DMF was 5.57, and details were (D=2.84, F=1.52, M=1.21). The overall DMF6 score was 2.28, which consisted of (D=1.27, F=0.48, M=0.53). Pearson’s correlation was used to analyze the data.

**Discussion**

The current research was designed to investigate the status of DMF6 and DMF among 18-20-year-old individuals and the relationship between the status of the first permanent molar and its adjacent teeth. The study results demonstrated that the individuals’ mean DMF score was 5.57, and their mean DMF6 score was 2.28. Moreover, the first permanent molar status was associated with the general DMF status.

One of the most essential issues in oral health is an individual’s sociocultural status, which significantly contributes to their decay status. Furthermore, human behavior changes do not happen quickly, so it can be predicted that if an individual has a decayed tooth, he/she is more likely to have subsequent decay than someone with higher health care and literacy. (7,8)

The higher decay rate in the first permanent molar in this study compared to other teeth depends on the earlier eruption time and the anatomical shape of tooth 6, which has also been proven in similar studies. (2)

Also, having a restoration in the first permanent molar indicated a higher probability of restoration in the individual’s other teeth, which can also be attributed to their socioeconomic status. (9)

Regarding the second premolar and second molar teeth, the health status of these teeth was observed more than in other states due to their later eruption. (10)

However, the second rank of the status of these teeth is related to dental caries, indicating that the process of caries among the present study participants is gradually occurring. According to previous studies, genetics and heredity also contribute to dental caries; however, it is evident that the role of genetics in causing decay is the same in all teeth of a person, and the individual may face decay stemming from genetic conditions with the same probability in all teeth. Thus, in the current study, similar to previous studies, the role of socioeconomic factors is more highlighted than genetic issues. (11)

The individual’s nutritional status also plays a pivotal role in their oral and teeth health, one of the most important causes of dental caries, which remains the same over time, and one cannot simply leave their eating habits. Numerous studies have demonstrated that all the above factors, including the economic, nutritional, and cultural status, are factors that cannot be simply changed, and thus, it can be expected that if no sudden changes are made in an individual’s nutrition, or if healthcare interventions are not carried out, the decay process will continue in individuals predictably and gradually. (12)

The study results also indicate that an individual's status of the first permanent molar can reflect the status of dental caries in their second premolar and second molar teeth and other teeth, and the pattern of teeth status is predictable to some extent from the first permanent molar, which matches Oliver,s study. (13 ) Hence, dental caries in tooth 6 can be a predictor variable for caries of teeth 5 and 7 in an individual. (14)

Similar studies have indicated that the decay of deciduous teeth can be a predictor of the status of decay in permanent teeth; therefore, the decay pattern is predictable to some extent, so it is possible to implement interventions to reduce the decay rate. (15,16)

The strengths of this study included the large sample size, the standard clinical examination methods, and the use of OPG to improve the examination. Another strength of the study was equalizing the sample based on age and city of residence, allowing for a better simulation. The study's limitation was related to its method. The present research used a cross-sectional method, which had less power to present the causal relationship and describe the phenomena than other research methods.

**Conclusion**

The status of the first permanent molar is related to the individual's general oral health and final DMFT and can be used as a predictive variable for the status of other teeth.

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