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Study of etiology and prevalence of gingival recession in mandibular incisors in school children

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ABSTRACT

Considering the adverse effects of the gingival recession, the aim of this study was to determine the prevalence and causes of mandibular incisors gingival recession in students aged 6-12 years, in Hamadan, Iran. In this cross-sectional study, a sample of 1200 students were randomly selected. Demographic data (age and gender), tooth type, clinical crown length and form, keratinized gingiva width, frenal involvement, dental plaque, gingivitis, manner and frequency of brushing per day, anterior crowding and history of orthodontic treatment were variables which their association with gingival recession were examined. The prevalence of the gingival recession was 18.25 percent. The prevalence was higher among female in comparison with male children and was increased, as age increased. The majority of children with gingival recession did not applied a correct technique of brushing. All the variables investigated in the present study such as tooth type and clinical crown length, manner and frequency of brushing had a significant association with the occurrence of the gingival recession (p -value <0.05). Several factors are associated with gingival recession. High prevalence of this disorder, its complications and the fact that its prevalence increases with students aging, make the design and implementation of training programs for students and their parents essential to prevent gingival recession.

Keywords: etiology, gingival recession, prevalence, students

INTRODUCTION

Gingival recession refers to the apical movement of the gingival tissue toward the cemento-enamel junction [CEJ][1]. This disorder can give rise to other problems; it has a negative effect on the individuals' esthetic, it makes an individual prone to dental caries, and it also can cause dentinal hypersensitivity [2].

The main reason individuals would like to treat gingival recession is the adverse effect of the disorder on the esthetic. Nowadays, there are several surgical methods for root coverage of teeth suffering from gingival recession. Most of these methods use connective tissue grafts from the palate [3].

Gingival recession is a multifactorial disorder and there are several factors contributing to its development. Bacterial inflammation, traumatic brushing, dental malposition, high tension of frenum and related tissues, osseous dehiscence, inadequate gingival width, over eruption, and age are some factors have reported by different studies to contribute to this disorder [4, 5]. In addition to the mentioned factors, systemic diseases such as leukemia and anemia are other important factors that should be taken into account in this regard [4].

The localized gingival recession creates many difficulties for children so that they might be unable to keep their oral hygiene.

A high volume of studies has been carried out to find the factors influencing the gingival recession. Sognaes reported a significant correlation between gingival recession and factors such as the presence of tooth caries, traumatic brushing habit, improper positioning of teeth in the dental arches, gingival erosion, gingival inflammation, and the tension of frenum. Trauma is another factor hypothesized to be important in this regard, however, the mechanism describing how trauma can cause gingival recession has not been investigated yet [6]. The tooth movement during orthodontic treatment also can cause gingival recession because of the loss of marginal bone and related connective tissues [7]. Lafzi et al [8] observed a significant relationship between the gingival recession and the gingival thickness. Brushing habits, frenum tension, the presence of calculus, and mechanical and chemical trauma were other important factors reported by this study. Dodwad also reported the same causes for gingival recession [7].

The aim of the present study was to assess the risk factors contributing to gingival recession in the mandibular incisors among children aged 6-12 years in Hamadan, Iran in 2014.

MATERIALS AND METHODS

1.1 Participants

1200 participants of the study, were randomly selected among the students of primary schools located in two regions of Hamadan, Iran. Equal number of boys and girls were chosen. At the beginning of the study, the informed consent stating the details of the study was obtained from the schools' principals and the parents of students participated in the study. All participants were aged from 6-12 years and had all four central and lateral mandibular incisors.

1.2 Clinical examination

Clinical examination was carried out with William's periodontal probe and interchangeable mirror.

Gingival recession was called when participants had at least class I Miller's gingival recession classification (9). Clinical crown length was measured at the labial midline from the gingival crest to the incisal surface, using William's periodontal probe. Gingival inflammation was assessed using bleeding points index (BPI) (10). Loe and Sillness index was used for measuring the dental plaque (11).

Anterior crowding was determined based on the position of each mandibular incisor according to the regular curve of the arch as classified by Stoner and Mazdyasna (12). (0=correctly positioned/instanding, 1= labially/lingually positioned/absent)

Powell and McEntry classification was applied in evaluating frenal involvement (13). (0= No Frenal involvement, 1= Frenalinsertion close to the gingival margin but no retraction ofgingiva, 2= Narrow Frenal insertion with retraction of gingiva,3= Broad Frenal insertion with retraction of gingiva)

Width of keratinized gingiva, was measured using the William's periodontal probe. The clinical crown form was classified as tapered or squared.

The day before clinical examination, the children were asked to bring their toothbrushes to the school. In the cases that they had forgotten to do, they were excluded from the study. The brushing technique of the children were categorized as correct or incorrect by observing them when they were brushing in front of the examiner. The horizontal scrubbing was assigned as the correct brushing technique. Traumatic brushing was evaluated among children with correct brushing technique. The brushing technique was categorized as traumatic if the bristles of tooth brush was irregular. Children were also asked about the frequency of tooth brushing per day.

Present orthodontic treatment with fixed or removable appliances were also recorded during clinical examination of students.

Statistical analysis

The data were analyzed using chi squared test which was performed by SPSS software package version 19. A P-value less than 5% ($p < 0.05$) was considered to be statistically significant.

RESULTS AND DISCUSSION

The average age of participants was 9.16±2.43 years, and half were female. Gingival recession was observed in 219 (18.25%) of 1200 students. The participants suffering from gingival recession differed significantly from the other in terms of both age and sex (p-value<0.05). The percentage of students having recession increased significantly with age, rising from 1.36% in age of 6 to 30.34% in age of 12. Among students with gingival recession, 63.01% were female and the difference was statistically significant (p-value=0.01). The data are presented in Table 1.

Moreover, it was observed that participants who suffered from gingival recession, mostly, had incorrect brushing techniques, and also they brushed once or less per day so that there was a significant association between the gingival recession and the frequency of brushing per day and also between the gingival recession and the brushing technique (p-value<0.001). Data related to these variables are presented in Table 2.

The most frequent affected tooth with gingival recession was mandibular central incisor. Furthermore, the prevalence of gingival recession was observed to be significantly higher in students with a tapered crown form than that of the students with a squared crown form (p-value= 0.019). It was also observed that most of the affected teeth had crown length of 7mm and the differences of gingival recession prevalence between various crown lengths were statistically significant (p-value=0.001). Dental plaque index and BPI of 0% was not observed among the participants and students who suffered from gingival recession, mostly, had dental plaque index and BPI more than 10% (p-value<0.001). These data are provided in table 3.

Table 4 represents the association of gingival recession with the frenal involvement, anterior crowding, keratinized gingiva width and present orthodontic treatment. The results outlined that the majority of students with gingival recession had frenal involvement (82.18%) and anterior crowding (75.34%). Among participants suffering from gingival recession, 43.83% had keratinized gingiva width≤2mm which was significantly higher than other groups (p-value<0.001). Moreover, gingival recession was observed in all the students with present orthodontic treatment and its prevalence was significantly higher in students with fixed orthodontic appliance than that of students with removable orthodontic appliance (p-value=0.027).

Table 1, the association of the gingival recession with age and gender of the participants

Variable	State	Gingival recession			p-value
		Yes (percent)	No (percent)	Total (percent)	
age	6	3 (1.36)	99 (10.15)	102 (8.5)	<0.001
	7	6 (2.72)	120 (12.22)	126 (10.5)	
	8	18 (8.21)	204 (20.77)	222 (18.5)	
	9	21 (9.59)	198 (20.17)	219 (18.25)	
	10	45 (20.55)	174 (17.73)	219 (18.25)	
	11	60 (27.23)	117 (11.93)	177 (14.75)	
	12	66 (30.34)	69 (7.03)	135 (11.25)	
	total	219 (100)	981 (100)	1200 (100)	
gender	male	138 (63.01)	462 (47.09)	600 (50)	0.01
	female	81 (36.99)	519 (52.91)	600 (50)	
	total	219 (100)	981 (100)	1200 (100)	

Table 2, the association of gingival recession with the frequency of brushing and brushing technique

Variable	State	Gingival recession			p-value
		Yes (percent)	No (percent)	Total (percent)	
frequency of brushing per day	once or less	159 (72.59)	435 (44.34)	594 (47.5)	<0.001
	twice	57 (26.05)	372 (37.89)	429 (35.75)	
	thrice or more	3 (1.36)	174 (17.77)	177 (14.75)	
	total	219 (100)	981 (100)	1200 (100)	
Brushing technique	incorrect	194 (88.58)	556 (56.67)	750 (62.5)	<0.001
	correct/normal	22 (10.06)	323 (32.92)	345 (28.75)	
	correct/traumatic	3 (1.36)	102 (10.41)	105 (8.75)	
	total	219 (100)	981 (100)	1200 (100)	

Gingival recession is known as a prevalent health problem among children. It has negative effects on the individual's beauty and also makes individuals vulnerable to dental caries and dentinal hypersensitivity [2]. In the present study, it was determined that the prevalence of the disorder is 18.25 percent in Hamadan, Iran. 12-year old children were the most vulnerable group, while the disorder prevalence was observed to be the least among 6-year old children.

Table 3, the association of gingival recession with the tooth type, the crown length, crown form, dental plaque, and BPI

Variable	State	Gingival recession			p-value
		Yes (percent)	No (percent)	Total (percent)	
Tooth type	central	720 (82.19)	1776 (45.25)	2496 (52)	0.001
	lateral	156 (17.81)	2148 (54.75)	2304 (48)	
	total	876 (100)	3924 (100)	4800 (100)	
The crown length	4	0 (0)	12 (0.3)	12 (0.25)	0.001
	5	0 (0)	12 (0.3)	12 (0.25)	
	6	60 (6.84)	756 (19.26)	816 (17)	
	7	588 (67.12)	1620 (41.28)	2208 (46)	
	8	228 (26.04)	1344 (34.25)	1572 (32.75)	
	9	0 (0)	180 (4.61)	180 (3.75)	
	total	876 (100)	3924 (100)	4800 (100)	
crown form	tapered	144 (65.75)	120 (12.23)	264 (22)	0.019
	squared	75 (34.25)	861 (87.77)	936 (78)	
	total	219 (100)	981 (100)	1200 (100)	
Dental plaque	0 percent	0 (0)	0 (0)	0 (0)	<0.001
	<10 percent	60 (27.39)	534 (54.43)	594 (49.5)	
	>10 percent	159 (72.61)	447 (45.57)	606 (50.5)	
	Total	219 (100)	981 (100)	1200 (100)	
Gingival inflammation (BPI)	0 percent	0 (0)	0 (0)	0 (0)	<0.001
	<10 percent	42 (18.92)	60 (6.11)	102 (8.5)	
	>10 percent	177 (81.07)	921 (93.89)	1098 (91.5)	
	Total	219 (100)	981 (100)	1200 (100)	

Table 4, the association of gingival recession with the frenal involvement, anterior crowding, keratinized gingiva width, present orthodontic treatment

Variable	State	Gingival recession			p-value
		Yes (percent)	No (percent)	Total (percent)	
Frenal involvement	Grade 0	39 (17.82)	969 (98.78)	1008 (84)	<0.001
	Grade I	135 (61.64)	12 (1.22)	147 (12.25)	
	Grade II	45 (20.54)	0 (0)	45 (3.75)	
	Total	219 (100)	981 (100)	1200 (100)	
Anterior crowding	yes	165 (75.34)	123 (12.53)	288 (24)	<0.001
	no	54 (24.66)	858 (87.47)	912 (76)	
	total	219 (100)	981 (100)	1200 (100)	
Keratinized gingiva width	≤ 2 mm	96 (43.83)	3 (0.3)	99 (8.25)	<0.001
	3 mm	57 (26.02)	15 (1.52)	72 (6)	
	4 mm	60 (27.42)	603 (61.46)	663 (55.25)	
	5mm	6 (2.73)	360 (36.72)	366 (30.5)	
	total	219 (100)	981 (100)	1200 (100)	
Present orthodontic treatment	fixed	31 (14.15)	0 (0)	36 (3)	0.027
	removable	5 (2.28)	0 (0)	0(0)	
	No treatment	183 (83.57)	981 (100)	1164 (97)	
	Total	219 (100)	981 (100)	1200 (100)	



Figure 1, inflammation and dental plaque of a student suffering from gingival recession

There was a significant association between the age and the prevalence of gingival recession, so that the gingival recession prevalence increased as age increased [p<0.001]. The finding is in line with what reported by Mathur et al [6], Slutzkey et al [14], and Kassab et al [15].

Furthermore, in the present study, it was found that the prevalence of gingival recession was significantly higher in female children in comparison with male children [p-value=0.01], which is in agreement with the results obtained by Ainamo et al [16] and Amran et al [17].



Figure 2, fixed orthodontic treatment and the resulted plaque of a student suffering from gingival recession



Figure 3, a sever inflammation with bleeding observed in a student suffering from gingival recession

In the present study, it was observed that most teeth with gingival recession were central incisors [82.19 percent of them] than lateral incisors. The finding is similar to what has been reported by previous studies such as Marini *et al* [18].

In addition, the present study demonstrated that there is a positive correlation between prevalence of gingival recession and the crown length [p-value=0.001]. These results match those observed earlier by Mathur *et al* [6].

Another important finding was the significant association between the prevalence of gingival recession and the crown form [p-value=0.019], so that most of participants suffering from gingival recession had teeth with the tapered crown form [65.75 percent of them].

Moreover, the current study found an association between the gingival recession and dental plaque; all participants that their gingiva were recessed had a dental plaque index [Loe and Sillness index] lower than ten percent [27.39 percent] or higher than ten percent [72.61 percent]. The finding supports the results of the previous similar study conducted by Dodwad *et al* [7]. Likewise, the bleeding points index, another index related to oral hygiene, was found to be an important factor in determining the prevalence of gingival recession. The finding matches those reported by Mathur *et al* [6] and Dowad *et al* [7].

As expected, there was observed a significant association between the brushing technique and gingival recession. Most participants who suffered from gingival recession [88.58 percent] did not applied a correct brushing technique. Moreover, the frequency of brushing among children with the recessed gingiva was significantly lower than that of healthy ones. Chrysanthakopoulos *et al* [19] also obtained the same results in this regard.

Furthermore, 82.18 percent of children who suffered from gingival recession had the frenal involvement Grade I, moreover, there was a significant association between the frenal involvement and the prevalence of gingival recession. The results are compatible with the results reported by Mathur *et al* [6] and Dodwad *et al* [7].

Moreover, a significant association was found between the prevalence of gingival recession and anterior crowding. This finding corroborates the results obtained by Staufer *et al* [20].

The width of keratinized gingiva was significantly lower in children who suffered from gingival recession. The results are comparable with those reported by Lafzi *et al* [8] and Dodwad *et al* [7]. Likewise, Lang *et al* [21] in their study, which was conducted to assess the relationship between the width of keratinized gingiva and gingival health, concluded that gingival inflammation was a common disorder in the regions which the width of keratinized gingiva was lower than 2 mm.

In the present study, we observed that 16.43 percent of participants who suffering from gingival recession had a present fixed or removable orthodontic appliance. Moreover, there was a significant association between the orthodontic treatment and the occurrence of gingival recession. The finding matches with what reported by Lafzi et al [8].

CONCLUSION

According to the results of the present study, the prevalence of the gingival recession was found to be 18.25 percent and all the variables investigated had a significant association with the occurrence of the gingival recession (p-value<0.05).

As all the students suffering from gingival recession had dental plaque and gingival inflammation in clinical examination and from them the majority had incorrect brushing techniques, and also they brushed once or less per day (88.58% and 72.59% respectively), so it seems essential to design and implement oral hygiene based training programs for students and their parents to prevent gingival recession.

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