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Original Article

Clinical assessment of deleterious oral habits and dental caries–periodontal parameters among Turkish twins

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Abstract *Background/purpose:* Twin studies are crucial to assess the relative contribution of genetic and environmental factors. This study was conducted to evaluate association between deleterious oral habits and dental caries–periodontal parameters among Turkish twins.
Materials and methods: The study comprised 143 pairs of dizygotic (DZ) twins and 59 pairs of monozygotic (MZ) twins aged 3–15 years. Twins were examined for dental caries, plaque index, gingival index, bleeding on probing and deleterious oral habits. Mann Whitney U test was used to examine the data.
Results: The MZ twin pairs consisted of 60 male and 58 female twin pairs, whereas the DZ twin pairs consisted of 144 male and 142 female. The mean age of the twins was 9.63 ± 3.0 in MZ twins and 9.47 ± 3.2 in DZ twins. The mean DMFS value of MZ twins with bruxism is higher than those of MZ twins without bruxism ($P = 0.001$). The mean DMFS value of DZ twins with pacifier sucking is lower than those without ($P = 0.007$). A statistically significant difference was found between MZ twins with and without nail biting in terms of bleeding on probing and dmfs values ($P = 0.035$; $P = 0.012$). The mean values of the plaque index increased due to the mouth breathing in DZ twins ($P = 0.024$). Regarding the bleeding on probing, there was a statistically significant difference between MZ twins with and without atypical swallowing ($P = 0.016$).

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Conclusion: These findings suggest that dental caries—periodontal parameters are similarly affected by deleterious oral habits in MZ and DZ twins.

Introduction

The common problems in pediatric dentistry are dental caries, periodontal problems and malocclusion. Although these problems have multifactorial etiologies, it may influence susceptibility degree due to genetic and environmental factors.[1,2] Twin studies are used to determine genetic variance of conditions with multifactorial etiologies.[3] They are a powerful tool in understanding the contribution of genetic variation to a particular trait or disease.[4]

Deleterious oral habits are defined as learned patterns of muscular contraction and affect the functions of the stomatognathic system.[5] If break the habits or treated until a certain age, they may cause malocclusions, intraoral defects and deformations in the surrounding tissues.[6] Besides, it has been reported that deleterious oral habits may increase the risk of dental caries and periodontal problems as changes in tooth positions and flow of saliva.[7]

There may be a possible association between malocclusion and dental caries in both direction, malocclusion as a cause for dental caries, dental caries as a cause for malocclusion. It can be explained in two ways.[8] According to reports, malocclusion can be considered as a predisposing factor for dental caries since inadequate alignment of the teeth cause accumulate of bacterial plaque and hinder its removal.[9–11] On the contrary, the expansive untreated dental caries and its complications change the functional occlusal contact distribution by causing a decrease in function of mastication and asymetric mastication. Prolonged unilateral mastication may affect the growth and development, causing malocclusion and dental facial developmental deformities.[12]

In terms of genetic research, twin studies contrasting monozygotic (MZ) and dizygotic (DZ) twins are quite helpful. MZ twins share all of their genes equally, but DZ twins often only share 50% of their segregating genes. These genetic discoveries aid in the prediction, prevention, and limitation of treatment for oral disorders.[13] Accordingly, our hypothesis is that the effect of deleterious oral habits on dental caries—periodontal parameters is more evident in MZ twins due to genetic similarity. The objective of this study, therefore, was to assess the association between deleterious oral habits and dental caries—periodontal parameters in Turkish twins.

Materials and methods

Ethical approval for this study was obtained from Istanbul University Faculty of Medicine Clinical Research Ethics Committee (2014/278) according to Declaration of Helsinki. Each children's parents who included in the study were signed informed consent forms.

The study included 59 pairs of MZ and 143 pairs of DZ who referred to Department of Pediatric Dentistry at Istanbul University between 2014 and 2017. At first, twin zygosities were noted as family declarations, and twins of a different gender were recognized as DZ.

Clinical examination

The dental examinations were conducted by two trained pediatric dentist for calibration (YK, MK). It was discovered that the kappa value was >97%, signifying perfect agreement between the examiners.

The teeth were examined and caries was recorded according to the WHO[14] criteria using DMFS/dmfs (Decayed, Missing and Filled Surfaces) Index. Periodontal examination was performed using Plaque Index given by Silness and Löe[15], Gingival Index given by Löe and Silness,[15] and Bleeding on Probing Index given by Ainamo and Bay.[16] Parents were asked about the presence/absence of deleterious oral habits including bruxism, thumb sucking, pacifier sucking, nail biting, mouth breathing and atypical swallowing. Children were assessed for their swallowing patterns while ingesting modest amounts of water. The first thing that was seen during swallowing were the mandibular movements and the use of the perioral muscles. After that, while the patient performed an unconscious swallow because this could diverge from the swallow on command, the examiners palpated the temporalis and masseter muscles.[17] Regarding deleterious oral habits, those who had these habits in the past but break them now and children who still have these habits were defined as having deleterious habits.

Statistical analysis

The data were statistically analyzed using the SSPS (version 20; IBM SSPS Inc, NY, USA). Since no normality was observed in any of the variables in both groups, the mean comparison was calculated with the non-parametric Mann Whitney U test.

Twin siblings were separated into two distinct groups using the permutation block randomization approach in order to compare similarities. The first group was referred to as the first sibling, and the second group as the second sibling. Since the variables were not normally distributed in any of the sibling groups, the mean of variables of those with and without deleterious oral habits were compared with the non-parametric Mann Whitney U test.

Results

A total of 202 twin pairs (59 MZ and 143 DZ) were included in the study. The MZ twin pairs consisted of 60 male and 58 female twin pairs, whereas the DZ twin pairs consisted of 144 male and 142 female.

Bruxism was diagnosed in 24 of 118 MZ twins and 59 of 286 DZ twins. A statistically significant difference was found between the DMFS values of MZ twins with and without bruxism ($P = 0.001$). Accordingly, the mean DMFS value of MZ twins with bruxism is higher than those of MZ twins without bruxism (Table 1).

Pacifier sucking was determined in 1 of 118 MZ twins and 16 of 286 DZ twins. A statistically significant difference was found between the DMFS values of DZ twins with using and not using pacifier sucking ($P = 0.007$). Accordingly, the mean DMFS value of DZ twins with pacifier sucking is lower than those without (Table 1).

Nail biting was recorded in 28 of 118 MZ twins and 58 of 286 DZ twins. A statistically significant difference was found between MZ twins with and without nail biting in terms of bleeding on probing and dmfs values ($P = 0.035$; $P = 0.012$). It was indicated that the mean values of bleeding on probing and dmfs decreased due to nail biting (Table 2).

Mouth breathing was recorded in 42 of 118 MZ twins and 47 of 286 DZ twins. A statistically significant difference was found between DZ twins with and without mouth breathing in terms of plaque index ($P = 0.024$). Accordingly, the mean values of the plaque index increased due to the mouth breathing (Table 2).

Atypical swallowing was determined in 5 of 118 MZ twins and 13 of 286 DZ twins. There was a statistically significant difference between MZ twins with and without atypical swallowing with regarding to the bleeding on probing ($P = 0.016$). Therefore, bleeding on probing increased due to atypical swallowing. In DZ twins, a statistically significant difference was found between plaque index values of those with and without atypical swallowing ($P = 0.006$). Therefore, plaque index increased in DZ twins with atypical swallowing (Table 2).

When the difference between the variables were evaluated among siblings within the zygosity groups, a statistically significant difference was found between the DMFS values and those with and without bruxism in the 1st sibling group of MZ twins ($P = 0.003$). The mean values of DMFS increased due to the bruxism. In the 2nd sibling group of MZ twins, there was no significant difference between bruxism and DMFS. In this respect, MZ twin siblings differ from each other (Table 3). In the 1st sibling group of MZ twins, a statistically significant difference was found between the dmfs values and those with and without nail biting ($P = 0.012$) in contrast to 2nd sibling group of MZ twins. Accordingly, MZ twin siblings differ from each other (Table 4).

A statistically significant difference was found between the DMFS values and those using and not using pacifier

Table 1 Comparison of zygosity groups with the bruxism, thumb sucking and pacifier sucking in terms of dental caries–periodontal parameters.

Zygosity		Bruxism	Mean ± SD	P^a	Thumb sucking	Mean ± SD	P^a	Pacifier Sucking	Mean ± SD	P^a
Monozygotic twins	dmfs	Absent	7.61 ± 9.35	0.383	Absent	7.68 ± 9.52	0.379	Absent	7.38 ± 9.4	0.661
		Present	6.58 ± 9.57		Present	2.17 ± 2.56		Present	9 ± 0	
	DMFS	Absent	1.51 ± 3.31	0.001*	Absent	2.05 ± 3.68	0.076	Absent	1.96 ± 3.63	0.661
		Present	3.67 ± 4.25		Present	0 ± 0		Present	1 ± 0	
	Bleeding on probing	Absent	0.024 ± 0.05	0.149	Absent	0.021 ± 0.047	0.274	Absent	0.021 ± 0.046	0.102
		Present	0.01 ± 0.03		Present	0.024 ± 0.033		Present	0.104 ± 0	
	Gingival index	Absent	0.062 ± 0.102	0.707	Absent	0.071 ± 0.15	0.491	Absent	0.068 ± 0.144	0.068
		Present	0.102 ± 0.256		Present	0.057 ± 0.06		Present	0.41 ± 0	
	Plaque index	Absent	0.157 ± 0.184	0.115	Absent	0.17 ± 0.206	0.089	Absent	0.175 ± 0.207	0.271
		Present	0.253 ± 0.272		Present	0.302 ± 0.214		Present	0.41 ± 0	
Dizygotic twins	dmfs	Absent	5.78 ± 8.43	0.352	Absent	6.05 ± 8.81	0.707	Absent	5.6 ± 7.89	0.070
		Present	6.76 ± 9.64		Present	4.3 ± 3.74		Present	12.5 ± 16.46	
	DMFS	Absent	1.66 ± 3.52	0.232	Absent	1.55 ± 3.35	0.640	Absent	1.64 ± 3.38	0.007*
		Present	1.1 ± 2.29		Present	1.3 ± 2		Present	0 ± 0	
	Bleeding on probing	Absent	0.031 ± 0.073	0.730	Absent	0.034 ± 0.08	0.773	Absent	0.033 ± 0.079	0.432
		Present	0.045 ± 0.099		Present	0.028 ± 0.054		Present	0.048 ± 0.082	
	Gingival index	Absent	0.071 ± 0.158	0.992	Absent	0.078 ± 0.173	0.998	Absent	0.079 ± 0.173	0.898
		Present	0.109 ± 0.219		Present	0.088 ± 0.173		Present	0.081 ± 0.164	
	Plaque index	Absent	0.171 ± 0.204	0.056	Absent	0.19 ± 0.237	0.590	Absent	0.179 ± 0.21	0.053
		Present	0.256 ± 0.324		Present	0.14 ± 0.205		Present	0.358 ± 0.479	

SD: standard deviation.
[a] Mann Whitney U Test.

Table 2 Comparison of zygosity groups with the nail biting, mouth breathing and atypical swallowing in terms of dental caries–periodontal parameters.

Zygosity		Nail Biting	Mean ± SD	P[a]	Mouth Breathing	Mean ± SD	P[a]	Atypical Swallowing	Mean ± SD	P[a]
Monozygotic twins	dmfs	Absent	8.63 ± 10.03	0.012*	Absent	8.03 ± 9.39	0.185	Absent	7.26 ± 9.1	0.550
		Present	3.43 ± 5.21		Present	6.26 ± 9.31		Present	10.6 ± 15.22	
	DMFS	Absent	1.96 ± 3.83	0.306	Absent	1.72 ± 2.98	0.960	Absent	2.04 ± 3.67	0.107
		Present	1.93 ± 2.84		Present	2.36 ± 4.55		Present	0.00 ± 0.00	
	Bleeding on probing	Absent	0.026 ± 0.052	0.035*	Absent	0.023 ± 0.051	0.806	Absent	0.02 ± 0.047	0.016*
		Present	0.005 ± 0.017		Present	0.018 ± 0.038		Present	0.041 ± 0.029	
	Gingival index	Absent	0.081 ± 0.162	0.223	Absent	0.07 ± 0.166	0.363	Absent	0.069 ± 0.149	0.034
		Present	0.036 ± 0.066		Present	0.071 ± 0.102		Present	0.101 ± 0.067	
	Plaque index	Absent	0.184 ± 0.209	0.293	Absent	0.176 ± 0.209	0.986	Absent	0.171 ± 0.208	0.065
		Present	0.153 ± 0.205		Present	0.178 ± 0.206		Present	0.296 ± 0.152	
Dizygotic twins	dmfs	Absent	6.28 ± 8.88	0.137	Absent	6.02 ± 8.88	0.997	Absent	6.01 ± 8.74	0.863
		Present	4.83 ± 7.87		Present	5.81 ± 7.72		Present	5.54 ± 7.69	
	DMFS	Absent	1.57 ± 3.44	0.760	Absent	1.66 ± 3.51	0.454	Absent	1.59 ± 3.37	0.733
		Present	1.43 ± 2.74		Present	0.96 ± 1.92		Present	0.69 ± 1.32	
	Bleeding on probing	Absent	0.034 ± 0.078	0.788	Absent	0.032 ± 0.081	0.119	Absent	0.032 ± 0.078	0.197
		Present	0.032 ± 0.084		Present	0.041 ± 0.073		Present	0.059 ± 0.098	
	Gingival index	Absent	0.078 ± 0.168	0.928	Absent	0.072 ± 0.165	0.104	Absent	0.073 ± 0.165	0.103
		Present	0.08 ± 0.19		Present	0.114 ± 0.203		Present	0.192 ± 0.268	
	Plaque index	Absent	0.187 ± 0.241	0.562	Absent	0.176 ± 0.235	0.024*	Absent	0.18 ± 0.232	0.006*
		Present	0.196 ± 0.215		Present	0.252 ± 0.229		Present	0.367 ± 0.255	

SD: standard deviation.
[a] Mann Whitney U Test.

sucking in the 1st sibling group of DZ twins ($P = 0.048$). The mean values of DMFS decreased due to the using pacifier sucking (Table 5).

There was a statistically significant difference was found between the bleeding on probing, gingival index and those with and without mouth breathing in the 2nd sibling group of DZ twins ($P = 0.010$; $P = 0.028$). The mean values of two variables increased due to mouth breathing. There was a significant difference between DZ twin siblings in terms of relationship between the bleeding on probing, the gingival index and mouth breathing (Table 6).

A statistically significant difference was found between the periodontal parameters of those with and without atypical swallowing in the 2nd sibling group of DZ twins ($P = 0.004$; $P = 0.016$; $P = 0.002$). The mean values of periodontal parameters increased due to the atypical swallowing. There was a significant difference between DZ twin siblings in terms of the relationship between periodontal parameters and atypical swallowing (Table 6).

Discussion

Twin researches are important to assess the relative contribution of genetic and environmental factors. Present study indicated that the role of heritability in the changing dental caries–periodontal parameters due to deleterious oral habits.

Bruxism, defined as the habitual nonfunctional and forceful contact between occlusal surfaces, can occur while awake or asleep.[18] Several studies have reported that there is significant relationship between bruxism and malocclusion.[19–21] Malocclusion is considered as a risk factor for dental caries because of the difficulty removal of plaque. Therefore, it may conclude that the reason for the increase in DMFS value due to the bruxism may be malocclusion. The authors have stated that significant relationships were found between bruxism and food impaction and dental caries[22] in accordance with our study. In this study, DMFS value due to bruxism is high in MZ with bruxism. The reason for this may be due to malocclusion as mentioned above, or it may also be due to the contribution of the genetic factors of MZ twins. Therefore, since genetic affinity is high in MZ twins, the effect of bruxism on DMFS may seem more evident.

Thumb sucking is a normal behavior in the first two-three years of life because they are born with a natural sucking instinct. Researchers have examined the relation between thumb sucking and dental caries, but their findings have been inconsistent. Children with thumb sucking are more likely to be free of dental caries by the age of 3 years old, according to Yonezu and Yakushiji, because thumb sucking increases the interdental space between the teeth.[23] However, in line with Kolawole et al., which is also suggested that thumb sucking may have been protective due to increased salivary flow as a result of the behavior, our study

Table 3 Comparison of the MZ twin siblings with bruxism, thumb sucking and pacifier sucking in terms of dental caries–periodontal parameters.

Zygosity		Bruxism	Mean ± SD	P[a]	Thumb sucking	Mean ± SD	P[a]	Pacifier sucking	Mean ± SD	P[a]
1st Sibling	dmfs	Absent	8.09 ± 10.34	0.226	Absent	7.65 ± 10.13	0.790	Absent	7.43 ± 10.09	0.610
		Present	5 ± 8.52		Present	2 ± 0		Present	9 ± 0	
	DMFS	Absent	1.45 ± 3.6	0.003*	Absent	1.98 ± 3.72	0.400	Absent	1.93 ± 3.71	0.678
		Present	3.75 ± 3.55		Present	0 ± 0		Present	1 ± 0	
	Bleeding on probing	Absent	0.027 ± 0.057	0.198	Absent	0.023 ± 0.053	0.566	Absent	0.022 ± 0.052	0.136
		Present	0.009 ± 0.03		Present	0.042 ± 0.059		Present	0.104 ± 0	
	Gingival index	Absent	0.054 ± 0.099	0.622	Absent	0.06 ± 0.109	0.731	Absent	0.055 ± 0.098	0.068
		Present	0.088 ± 0.14		Present	0.08 ± 0.113		Present	0.41 ± 0	
	Plaque index	Absent	0.158 ± 0.192	0.062	Absent	0.177 ± 0.198	0.281	Absent	0.177 ± 0.196	0.271
		Present	0.271 ± 0.201		Present	0.305 ± 0.148		Present	0.41 ± 0	
2nd Sibling	dmfs	Absent	7.13 ± 8.33	0.984	Absent	7.71 ± 8.93	0.405	Absent	7.34 ± 8.76	
		Present	8.17 ± 10.65		Present	2.25 ± 3.3		Present		
	DMFS	Absent	1.57 ± 3.04	0.112	Absent	2.13 ± 3.66	0.270	Absent	1.98 ± 3.57	
		Present	3.58 ± 5.02		Present	0 ± 0		Present		
	Bleeding on probing	Absent	0.021 ± 0.041	0.475	Absent	0.019 ± 0.041	0.570	Absent	0.019 ± 0.039	
		Present	0.012 ± 0.031		Present	0.016 ± 0.02		Present		
	Gingival index	Absent	0.071 ± 0.105	0.254	Absent	0.083 ± 0.183	0.805	Absent	0.08 ± 0.177	
		Present	0.116 ± 0.343		Present	0.045 ± 0.034		Present		
	Plaque index	Absent	0.156 ± 0.178	0.713	Absent	0.163 ± 0.215	0.257	Absent	0.172 ± 0.219	
		Present	0.236 ± 0.338		Present	0.3 ± 0.263		Present		

SD: standard deviation.
[a] Mann Whitney U Test.

Table 4 Comparison of the MZ twin siblings with nail biting, mouth breathing and atypical swallowing in terms of dental caries–periodontal parameters.

Zygosity		Nail biting	Mean ± SD	P[a]	Mouth Breathing	Mean ± SD	P[a]	Atypical swallowing	Mean ± SD	P[a]
1st Sibling	dmfs	Absent	9.18 ± 10.79	0.012*	Absent	7.13 ± 9.27	0.709	Absent	7.09 ± 9.42	0.378
		Present	2.4 ± 4.55		Present	8.1 ± 11.54		Present	14.33 ± 19.66	
	DMFS	Absent	2.05 ± 4.03	0.681	Absent	1.69 ± 2.64	0.846	Absent	2.02 ± 3.75	0.276
		Present	1.53 ± 2.45		Present	2.35 ± 5.2		Present	0 ± 0	
	Bleeding on probing	Absent	0.029 ± 0.059	0.220	Absent	0.023 ± 0.056	0.838	Absent	0.022 ± 0.054	0.058
		Present	0.008 ± 0.023		Present	0.024 ± 0.047		Present	0.055 ± 0.024	
	Gingival index	Absent	0.068 ± 0.117	0.494	Absent	0.049 ± 0.096	0.367	Absent	0.058 ± 0.109	0.083
		Present	0.04 ± 0.077		Present	0.084 ± 0.128		Present	0.12 ± 0.069	
	Plaque index	Absent	0.203 ± 0.205	0.129	Absent	0.154 ± 0.173	0.226	Absent	0.177 ± 0.199	0.436
		Present	0.117 ± 0.161		Present	0.233 ± 0.234		Present	0.247 ± 0.189	
2nd Sibling	dmfs	Absent	8.11 ± 9.33	0.275	Absent	8.97 ± 9.56	0.119	Absent	7.42 ± 8.85	0.821
		Present	4.62 ± 5.84		Present	4.59 ± 6.51		Present	5 ± 7.07	
	DMFS	Absent	1.87 ± 3.68	0.310	Absent	1.76 ± 3.35	0.828	Absent	2.05 ± 3.62	0.468
		Present	2.38 ± 3.28		Present	2.36 ± 3.98		Present	0 ± 0	
	Bleeding on probing	Absent	0.024 ± 0.043	0.075	Absent	0.023 ± 0.045	0.587	Absent	0.019 ± 0.04	0.645
		Present	0.002 ± 0.006		Present	0.013 ± 0.028		Present	0.021 ± 0.029	
	Gingival index	Absent	0.093 ± 0.197	0.286	Absent	0.092 ± 0.217	0.745	Absent	0.08 ± 0.18	0.468
		Present	0.032 ± 0.055		Present	0.06 ± 0.073		Present	0.073 ± 0.074	
	Plaque index	Absent	0.166 ± 0.213	0.963	Absent	0.199 ± 0.242	0.189	Absent	0.165 ± 0.219	0.095
		Present	0.195 ± 0.247		Present	0.127 ± 0.168		Present	0.37 ± 0.057	

SD: standard deviation.
[a] Mann Whitney U Test.

Table 5 Comparison of the DZ twin siblings with bruxism, thumb sucking and pacifier sucking in terms of dental caries–periodontal parameters.

Zygosity		Bruxism	Mean ± SD	P[a]	Thumb sucking	Mean ± SD	P[a]	Pacifier sucking	Mean ± SD	P[a]
1st Sibling	dmfs	Absent	5.27 ± 7.49	0.093	Absent	5.79 ± 7.84	0.697	Absent	5.58 ± 7.7	0.195
		Present	7.5 ± 8.63		Present	4.5 ± 0.71		Present	9 ± 9.04	
	DMFS	Absent	1.84 ± 3.47	0.065	Absent	1.63 ± 3.21	0.454	Absent	1.7 ± 3.26	0.048*
		Present	0.81 ± 1.8		Present	0 ± 0		Present	0 ± 0	
	Bleeding on probing	Absent	0.033 ± 0.078	0.558	Absent	0.039 ± 0.088	0.553	Absent	0.039 ± 0.089	0.959
		Present	0.055 ± 0.115		Present	0 ± 0		Present	0.031 ± 0.07	
	Gingival index	Absent	0.078 ± 0.17	0.653	Absent	0.091 ± 0.189	0.473	Absent	0.092 ± 0.192	0.666
		Present	0.129 ± 0.238		Present	0 ± 0		Present	0.05 ± 0.107	
	Plaque index	Absent	0.174 ± 0.201	0.132	Absent	0.193 ± 0.212	0.157	Absent	0.186 ± 0.211	0.185
		Present	0.248 ± 0.241		Present	0 ± 0		Present	0.27 ± 0.226	
2nd Sibling	dmfs	Absent	6.28 ± 9.25	0.677	Absent	6.32 ± 9.75	0.830	Absent	5.62 ± 8.1	0.195
		Present	5.89 ± 10.82		Present	4.25 ± 4.23		Present	16 ± 21.69	
	DMFS	Absent	1.49 ± 3.58	0.858	Absent	1.47 ± 3.49	0.240	Absent	1.57 ± 3.51	0.067
		Present	1.44 ± 2.75		Present	1.63 ± 2.13		Present	0 ± 0	
	Bleeding on probing	Absent	0.028 ± 0.069	0.872	Absent	0.029 ± 0.071	0.395	Absent	0.027 ± 0.068	0.224
		Present	0.032 ± 0.076		Present	0.035 ± 0.059		Present	0.066 ± 0.093	
	Gingival index	Absent	0.064 ± 0.145	0.579	Absent	0.066 ± 0.153	0.579	Absent	0.065 ± 0.152	0.533
		Present	0.084 ± 0.195		Present	0.11 ± 0.189		Present	0.113 ± 0.21	
	Plaque index	Absent	0.169 ± 0.208	0.271	Absent	0.188 ± 0.26	0.736	Absent	0.172 ± 0.21	0.171
		Present	0.266 ± 0.405		Present	0.175 ± 0.216		Present	0.445 ± 0.65	

SD: standard deviation.
[a] Mann Whitney U Test.

Table 6 Comparison of the DZ twin siblings with nail biting, mouth breathing and atypical swallowing in terms of dental caries–periodontal parameters.

Zygosity		Nail biting	Mean ± SD	P[a]	Mouth Breathing	Mean ± SD	P[a]	Atypical swallowing	Mean ± SD	P[a]
1st Sibling	dmfs	Absent	6.08 ± 7.93	0.271	Absent	5.71 ± 7.79	0.803	Absent	5.8 ± 7.88	0.986
		Present	4.6 ± 7.24		Present	6.04 ± 7.89		Present	4.8 ± 5.07	
	DMFS	Absent	1.71 ± 3.41	0.682	Absent	1.78 ± 3.38	0.112	Absent	1.67 ± 3.24	0.122
		Present	1.23 ± 2.19		Present	0.85 ± 2.07		Present	0 ± 0	
	Bleeding on probing	Absent	0.036 ± 0.081	0.597	Absent	0.038 ± 0.089	0.838	Absent	0.04 ± 0.089	0.187
		Present	0.048 ± 0.109		Present	0.039 ± 0.084		Present	0 ± 0	
	Gingival index	Absent	0.084 ± 0.171	0.803	Absent	0.083 ± 0.177	0.824	Absent	0.088 ± 0.184	0.769
		Present	0.111 ± 0.243		Present	0.12 ± 0.232		Present	0.136 ± 0.304	
	Plaque index	Absent	0.176 ± 0.202	0.175	Absent	0.176 ± 0.204	0.160	Absent	0.187 ± 0.208	0.579
		Present	0.244 ± 0.239		Present	0.253 ± 0.239		Present	0.274 ± 0.318	
2nd Sibling	dmfs	Absent	6.48 ± 9.75	0.327	Absent	6.32 ± 9.83	0.764	Absent	6.21 ± 9.58	0.805
		Present	5.07 ± 8.62		Present	5.52 ± 7.69		Present	6 ± 9.27	
	DMFS	Absent	1.44 ± 3.48	0.400	Absent	1.55 ± 3.64	0.503	Absent	1.5 ± 3.51	0.348
		Present	1.64 ± 3.26		Present	1.1 ± 1,76		Present	1.13 ± 1.55	
	Bleeding on probing	Absent	0.032 ± 0.075	0.345	Absent	0.026 ± 0.072	0.010*	Absent	0.025 ± 0.065	0.004*
		Present	0.016 ± 0.039		Present	0.044 ± 0.057		Present	0.096 ± 0.112	
	Gingival index	Absent	0.073 ± 0.165	0.715	Absent	0.061 ± 0.153	0.028*	Absent	0.059 ± 0.143	0.016*
		Present	0.047 ± 0.106		Present	0.106 ± 0.165		Present	0.228 ± 0.258	
	Plaque index	Absent	0.197 ± 0.274	0.607	Absent	0.176 ± 0.263	0.071	Absent	0.173 ± 0.254	0.002*
		Present	0.146 ± 0.175		Present	0.25 ± 0.222		Present	0.424 ± 0.21	

SD: standard deviation.
[a] Mann Whitney U Test.

found no significant connection between thumb sucking and dental caries.[24] On the other hand, a study done by Misbah et al. found that thumb sucking enhanced the severity of dental caries linked to malocclusion, making it challenging to clean teeth and allowing dental plaque to accumulate.[25] Regarding association between periodontal parameters and thumb sucking, no significant relationship was reported in our study contrast with findings of Misbah et al. who indicated that thumb sucking increased severity of periodontal disease.[25] Neverthless, Agbaje et al. assumed that thumb sucking has two positive effects; firstly, it impairs the harmful effect of bacteria associated with gingivitis by increasing saliva flow, secondly, the lips act as a self-cleaning mechanism by constantly moving against the anterior teeth during thumb sucking.[26]

Knowing the beneficial of pacifier sucking regarding calming and comforting of the children, ıt is also worthwhile to know adverse health effect of the pacifier sucking. These negative effects have been associated with increase risk of early weaning, candidal infection, otitis media, malocclusion and dental caries. Kamal et al. stated that since the pacifier serves as a reservoir for microorganisms in the environment, it plays a role in the entry of numerous of microorganisms into the oral cavity.[27] Similarly, Al Haidar et al. reported that presence of candida and coliform bacteria is higher in pacifier sucking children, and therefore the risk of dental as well as oral disease is higher.[28] In contrast to earlier studies, our research stated that while no significant difference was found in MZ twins, DMFS values of twins using pacifiers in DZ twins were statistically lower than those not using pacifiers. The reason for the lack of difference between MZ twins may be their genetic similarity and similar oral microbiomes. The reason for the difference for DZ twins may have been due to environmental factors.

Nail biting can cause damage to dental and oral structures. It is associated with gingival and dermatological problem, malocclusion of anterior teeth.[29] Kamal et al. reported that presence of nail biting habit indicated a higher plaque index.[27] Unlike, our study reported that the dmfs and bleeding on probing values of nail-biters in MZ twins are lower than those who do not.

The impact of mouth breathing on the oral cavity has shown conflicting outcomes. Mouth breathing did not affect gingival or dental health status, but it did increase the prevalence of gingivitis or caries in children who already had poor oral hygiene.[30] This result is in line with the findings of Koga-Ito et al., which is indicated that mouth breathing should not be taken into account as a risk factor for dental caries.[31] Findings from past study stated that the decrease in salivary flow may reduce the local antibacterial effects and cleansing effect of saliva, and may lead to an increase in dental caries, gingivitis and halitosis.[32] However, it has been demonstrated that there is no difference between nasal and mouth breathing in terms of salivary flow rates or the buffering capacity of saliva; the only distinction is the halitosis that results from saliva evaporation.[33] In our study, while the plaque index was significantly higher in mouth breathing in DZ twins, there was no significant difference between MZ twins.

Atypical swallowing is an important oral habit especially from the periodontal point of view and cause some orthodontic problems. There may be changes in oral hygiene associated with malocclusion due to plaque accumulation and difficulty in cleaning.[34] However, Patır et al. reported that no statistically significant correlation was found between atypical swallowing and bleeding index and plaque index.[35] Unlike Patır, our study reported that in MZ twins, the bleeding on probing was higher in twins with atypical swallowing than in those without and in DZ twins, the plaque index of twins with atypical swallowing is higher than those without.

The present study had the following limitations. First, genes associated with dental caries and periodontal parameters were not evaluated in the study. Second, the effect of deleterious oral habits on dental caries—periodontal parameters may not have been assessed directly, since our study included children who also had deleterious oral habits in the past but break the habits now and children who still have these habits were defined as having deleterious habits. Third, insufficient sample size with deleterious oral habits, which may affect the generalisability of the findings. Considering the strengths of the study, the clinical significance of the study is highly important in terms of being a twin research and comparing deleterious oral habits and dental caries—periodontal parameters.

In conclusion, as MZ twins had identical genes, we anticipated that the effects of deleterious oral habits on dental caries—periodontal parameters would be more pronounced. Nevertheless, in our study, both MZ and DZ twins experienced the same effects of bad oral habits on these parameters. This may be due to the effects of environmental factors on deleterious oral habits and dental caries—periodontal parameters.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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