World Conference on Technology, Innovation and Entrepreneurship

A Research for People to Determine the Relationship between Oral Hygiene and Socio-Economic Status

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Abstract

In this study, we aimed to investigate the relationship between oral hygiene and socio-economic status. Study data were obtained from 160 patients admitted to a private dental clinic within one month using a questionnaire which consisted of socio-economic variables. Dental examination was performed by a dentist and oral hygiene was assessed by hygiene sticks using the Quegley-Hein Index. Statistical analysis was performed using *t* test, variance analysis, and Kruskal-Wallis test. Our study results suggest that increased education status is positively associated with oral hygiene and poor oral hygiene is associated with reduced income per capita. Preventive dentistry should be supported to increase the awareness of the individuals with low and moderate income.

Keywords: oral hygiene; Quigley-Hein Index; adult dental care; socio-economic status

1. Introduction and Literature Review

Oral and dental health is of utmost importance for speaking function and cosmetic appearance, as well as overall health (Moynihan, 2005). Poor oral and dental hygiene remains one of the major health problems for the society.

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Bacterial plaque, which is one of the indicators of poor oral hygiene, is an aggregate of germs on teeth. It is often localized in the collum dentis, fissures, and calculus on the prostheses (Tuncer, 1994). Several studies conducted in Turkey have shown poor oral and dental health in the society (Erdemir&Farımaz, 1992; Tunalı, 1991). In a study performed by H. Ömürlü, H. Deniz Arısu, E. Eligüzeloğlu, M.B. Üçtaşlı, O. Bala in 2010, namely "Evaluation of the Clinical Success of Direct Restorations of the Patients who Applied the University of Gazi Faculty of Dentistry Department of Operative Dentistry", the authors evaluated the clinical performance of 612 tooth restorations in 305 patients aged between 16 to 85 years according to the marginal adaptation, marginal dislocation and secondary caries using imaging studies. The majority of the patients (77.5%) visited a dentist in the presence of pain, while 78.8% had a dietary habit of sweet foods and beverages, 50.8% had an eating habit of snacks, and 84.8% brushed their teeth twice a day (Gömeç, Soltani, Yaman, 2010).

In another study carried out by M. Kara, E. Gürbüz, A. Mete, T. Şahin, Ç. Çelik, K. Yamanel in 2009, namely "The Relationship between Dietary Habits and Oral Health Status of Dental Students", a total of 71 students were asked to complete a questionnaire concerning their dietary habits and oral hygiene for three consecutive days. The authors reported that the majority of the patients had regular main meals with a very high rate of snacking, while the most frequently consumed drinks were acidic beverages with desserts between main meals. Most students brushed their teeth twice a day. The authors concluded that, despite frequent sugar and snack consumption, DMFT scores were within an acceptable range for young adults, which might be associated with good oral hygiene behaviors (Kara et al. 2009).

Dental caries, which may be related to several factors, are one of the major indicators of oral and dental health. Hygiene is critical for a good oral and dental health. Poor oral hygiene is the main factor for various chronic diseases. In addition, dental caries may cause pain and discomfort and reduce quality of life and social activities, thereby, affecting psychological well-being adversely.

In a study performed by US National Center for Health Statistics, Division of Health Survey Statistical Operations in Washington in 1981, namely "Decayed, Missing, and Filled Teeth Among Persons 1-74 Years of Age in United States", estimations were based on examinations conducted on 20.749 persons according to age, race, sex, and demographic characteristics. Among those, 16.9% between 18 to 74 years had decayed and missing teeth, including 1.4% untreated decayed teeth (Miller, 1981).

There are several factors which affect the access to the dentistry including welfare, social class, employment status, and rural-urban residency (Kwan, Petersen, 2010). Brushing is known to reduce the risk of dental caries. It is well-documented that brushing twice a day and encouraging an early habit of tooth brushing are protective factors against dental caries. In addition, socio-economic status of the parents plays an important role in the latter (Güngör, Tüter, Bal, 1999; Isokangas, Söderling, Pienhakkinen, 2000; Öztunç vd., 2000; Vehkalahti, Helminen, Rytomaa, 1990).

Furthermore, family income and social class have been associated with dental caries (Cleaton et al. 1994). In a study conducted by Ş. Bilgili in 2009, namely "Evaluation of Dental Health in Children and Parents Admitted to Our Clinic and Relationship between Dental Health and Socio-Demographic Factors", data collection forms were used and face-to-face interviews were performed on 300 parents. Dental examination was done by a single dentist. The authors reported better oral and dental health among the children and parents with a high socio-economic status with more frequent visits dentistry clinics.

The prevalence of dental caries has been dramatically reduced among the children and young adults in developed Western countries including Finland, Norway, and Germany since 1970 and 80s (Paunio et al. 1993). It can be attributed to the development of fluoride toothpastes, reduced sugar intake, increased socio-economic status, increased access to dental services, and improved personal hygiene (Paunio et al. 1994, Petersen, Danila, Samolia, 1993). However, oral and dental health has a major economic and social burden in many developing countries where preventive dentistry is limited (Stacey, Wright, 1989).

In another study conducted in Erzurum in 1975, Oktay assessed the possible association between periodontal diseases and oral hygiene based on age, sex, dietary habits, and socio-economic status. The author suggested that the prevalence of periodontal diseases increased with age and socio-economic status affected the disease severity. The periodontal health improved among the patients with protein-rich dietary habits (Oktay, 1975).

2. Methodology

2.1. Research Goal

The aim of this study was to assess oral hygiene among the patients admitted to a private dental clinic, as examined by a dentist and investigate the relationship between oral hygiene and tooth brushing and socio-economic status.

2.2. Sample and Data Collection

The study was performed in the the Yenibosna neighborhood of Bahcelievler, Istanbul among the individuals with varying socio-economic status. Between the mid-November and mid-December term, a total of 160 adult volunteers including 87 women and 73 men aged 18 to 50+ years were included. Individuals under the age of 18 were excluded. Initially, 15 patients were administered the questionnaire. Amendments were made and the final version of the questionnaire was applied, thereafter.

The questionnaire consisted of questions in three sections. In section one, the volunteers were asked to answer questions related to demographic characteristics including education status, occupation, age, economic status, and marital status). In section two, habits of the participants were examined including dietary habit, brushing habit and its frequency, and visiting a dentist. In section three, oral and dental health were assessed by dental examination and hygiene bacterial plaque index method based on the examination results, the hygiene status of the mouth, restorated and missed teeth, and dental caries. Wisdom teeth were excluded.

Quigley-Hein Index

The Quigley-Hein Index is a screening tool for oral hygiene. It also helps to identify bacterial plaques which are not culprits for gingival inflammation. Teeth are stained with a bacterial plaque stain and facial and oral surfaces are assessed. It does not require using a catheter or any other tool (Tuncer, 1994).

To illustrate, the index score is calculated by the following formula:

QH Index = total score / number of surfaces examined = 125/56 = 2.19

The index assesses four surfaces of the tooth (buccal, distal, lingual, and mesial). The periodontal plaque index system is as follows:

<0-1   : Excellent oral hygiene
<1-2   : Good oral hygiene
<2-3   : Moderate oral hygiene
<3-4   : Poor oral hygiene
<4-5   : Very poor oral hygiene

The amount of hygiene was variably assessed during the study. Independent variables included age, sex, marital and education status, number of family members, brushing habit, and dietary habits.

2.3. Analyses and Results

A total of 160 volunteers including 87 women and 73 men were included. No missing data were present. Statistical analysis was performed using SPPS software. Descriptive statistical methods expressed in mean, standard deviation, frequency distribution, and percentage were used to assess study data. One-way variance analysis was used to compare the data between the groups, whereas Tukey multiple comparison test was performed to analyze subgroup differences. Independent *t* test was used to compare the means of two independent groups. The chi-square test was performed to analyze quantitative data. A *p* value of <0.05 was considered statistically significant.

Of the participants, 54.4% were women. 27.5% were within 18-25 years of age, 22.5% within 26-33 years of age, 19.4% within 34-41 years of age, 22.5% within 42-49 years of age, and 8.1% were above 50 years of age. Among these, 42.5% graduated from primary school, 22.5% from high school, and 35% from college. A total of 60% were married, 28.8% were laborers, 27.5% were unemployed, 26.9% were freelance workers, 10.6% were working as civil servants, and 6.3% were retired. A total of 35% earned between 0-1000 TL, 20.6% earned between 1001-2000 TL, and 28.8% earned between 2001-3000 TL, whereas 15.6% had an income of more than 3000 TL. The number of family members was ≤2 in 12.5%, 3-5 in 66.9%, and ≥6 in 20.6%.

2.3.1. Relationship between oral hygiene and socio-economic characteristics

Of 160 participants, none had an excellent or very poor oral hygiene, as evidenced by the Quigley-Hein Index. Results were assessed in three groups, namely as good, moderate, and poor. The possible relationship between oral hygiene and socio-economic status was analyzed using the chi-square test. The results are shown in Table 1.

The level of oral hygiene varied according to all variables except sex (p=0.624) and age (p=0.506).

Table 1: Relationship between the level of oral hygiene and socio-economic characteristics

		Good oral hygiene		Moderate oral hygiene		Poor oral hygiene		p
		f	%	f	%	f	%	
Sex	Female	27	49,09	40	57,14	20	57,14	0,624
	Male	28	50,91	30	42,86	15	42,86	
Marital status	Married	27	49,09	42	60,00	27	77,14	0,030
	Single	28	50,91	28	40,00	8	22,86	
Age	18-25 years	18	32,73	19	27,14	7	20,00	
	26-33 years	10	18,18	19	27,14	7	20,00	
	34-41 years	12	21,82	12	17,14	7	20,00	0,569
	42-49 years	9	16,36	17	24,29	10	28,57	
	>50 years	6	10,91	3	4,29	4	11,43	
Profession	Laborer	10	18,18	20	28,57	16	45,71	
	Civil Servant	11	20,00	5	7,14	1	2,86	
	Retired	4	7,27	5	7,14	1	2,86	0,002
	Freelance worker	22	40,00	16	22,86	5	14,29	
	Unemployed	8	14,55	24	34,29	12	34,29	
Monthly income	0-1000 TL	14	25,45	30	42,86	12	34,29	0,003
	1001-2000 TL	7	12,73	13	18,57	13	37,14	

		n	%	n	%	n	%	p
	2001-3000 TL	18	32,73	21	30,00	7	20,00	
	>3000 TL	16	29,09	6	8,57	3	8,57	
Education status	Primary school	8	14,55	31	44,29	29	82,86	
	High school	12	21,82	19	27,14	5	14,29	0,000
	College	35	63,64	20	28,57	1	2,86	
Number of family members	<2 members	10	18,18	8	11,43	2	5,71	
	3-5 members	40	72,73	49	70,00	18	51,43	0,002
	>6 members	5	9,09	13	18,5	15	42,86	
Total family income	1000-3000 TL	13	23,64	36	51,43	21	60,00	
	3001-4000 TL	14	25,45	18	25,71	11	31,43	0,000
	>4001 TL	28	50,91	16	22,86	3	8,57	
Snack type between main meals	Bread-Sandwich	10	18,18	13	18,57	8	22,86	
	Fruit	29	52,73	28	40,00	6	17,14	0,016
	Cookies/Sweet-Chocolate	16	29,09	29	41,43	21	60,00	
Beverage type	Milk-ayran	28	50,91	20	28,57	8	22,86	
	Fruit juice	14	25,45	20	28,57	5	14,29	
	Acidic beverages	8	14,55	19	27,14	16	45,71	0,008
	Tea	5	9,09	11	15,71	6	17,14	
The frequency of a dentist visit	In case of discomfort	24	43,64	41	58,57	30	85,71	
	Once a year	12	21,82	10	14,29	0	0,00	0,006
	Twice a year	11	20,00	13	18,57	4	11,43	
	Once a quarter	8	14,55	6	8,57	1	2,86	
Brushing habit	Infrequent	4	7,27	11	15,71	20	57,14	
	Every other day	6	10,91	10	14,29	1	2,86	
	Once a day	18	32,73	23	32,86	8	22,86	0,000
	Twice a day	21	38,18	23	32,86	5	14,29	
	≥3 times a day	6	10,91	3	4,29	1	2,86	
Changing the tooth brush	>7 months	2	3,64	10	14,29	13	37,14	
	Once in 5-6 months	13	23,64	20	28,57	12	34,29	
	Once in 3-4 months	29	52,73	29	41,43	4	11,43	0,000
	Once in 1-2 months	11	20,00	11	15,71	6	17,14	
Utilization of other hygiene tools	Dental floss	20	36,36	13	18,57	4	11,43	
	Mouthwash	16	29,09	22	31,43	3	8,57	0,000
	None	19	34,55	35	50,00	28	80,00	
Smoking status	Yes	19	34,55	34	48,57	24	68,57	
	No	36	65,45	36	51,43	11	31,43	0,007
Systemic disorder	Cardiac	3	5,45	2	2,86	3	8,57	
	Gastrointestinal	7	12,73	19	27,14	7	20,00	
	Diabetes	4	7,27	3	4,29	8	22,86	0,014
	No	41	74,55	46	65,71	17	48,57	
Awareness of oral hygiene associated with systemic	No	0	0,00	5	7,14	2	5,71	
	No idea	7	12,73	10	14,29	18	51,43	0,000
	Yes	23	41,82	37	52,86	11	31,43	

		N	%	N	%	N	%	sig
disorders	Strongly yes	25	45,45	18	25,71	4	11,43	
Awareness of oral and dental health	None	5	9,09	15	21,43	5	14,29	0,000
	No idea	5	9,09	13	18,57	16	45,71	
	Yes	26	47,27	34	48,57	13	37,14	
	Strongly yes	19	34,55	8	11,43	1	2,86	
Awareness of oral hygiene necessity	No idea	1	1,82	9	12,86	11	31,43	0,000
	I disagree	18	32,73	25	35,71	16	45,71	
	I strongly agree	36	65,45	36	51,43	8	22,86	
Localization of dental caries	Smooth surface	1	1,82	3	4,29	3	8,57	0,000
	Occlusal	4	7,27	9	12,86	3	8,57	
	Approximal surface	12	21,82	28	40,00	14	40,00	
	Whole surface	2	3,64	8	11,43	9	25,71	
	None	36	65,45	22	31,43	6	17,14	
Visible plaque	Yes	31	56,36	60	85,71	33	94,29	0,000
	No	24	43,64	10	14,29	2	5,71	
Gingivitis	Yes	29	52,73	58	82,86	33	94,29	0,000
	No	26	47,27	12	17,14	2	5,71	
Number of teeth		25,87±5,50		24,97±4,71		22,20±4,14		

2.3.2. Analysis of the relationship between oral hygiene findings and socio-economic characteristics

Of 160 participants, oral hygiene findings were assessed by the Quigley-Hein Index and dental examination. Table 2 shows the relationship between oral hygiene findings and socio-economic characteristics. Based on independent *t* test results in the presence of two independent groups, whereas ANOVA was performed to compare more than two groups. In case of abnormally distributed data, Kruskal-Wallis test was performed as a non-parametric analytical method.

Table 2: Analysis of the relationship between oral hygiene findings and socio-economic characteristics

Hypotheses	Analysis Performed	Test Statistics	Decision
H_1: Oral hygiene level differs according to the sex.	Independent t test	t=,254 df=158 sig.=0,800	Red
H_2: Oral hygiene level differs according to the total income value of the family.	Anova	F=14,532 df=159 sig.=0,000	Kabul
H_3: Oral hygiene level differs according to the education status.	Anova	F=30,227 df=159 sig=,000	Kabul
H_4: Oral hygiene level differs according to the marital status.	Independent t test	t=2,096 sig=,038 df=158	Kabul
H_5: Oral hygiene level differs according to the number of family members.	Kruskal Wallis	Chi-Square=16,111 df=2 Asympsig=,000	Kabul
H_6: Oral hygiene level differs according to the brushing habit.	Kruskal Wallis	Chi-Square=28,155 df=3 Asympsig=,000	Kabul
H_7: Oral hygiene level differs according to the smoking status.	Independent t test	t=3,144 Sig=,0002	Kabul
H_8: Oral hygiene level differs according to the age.	Kruskal Wallis	Chi-Square=,860 df=4	Red

		Asympsig=,930	
H_9: Oral hygiene level differs according to the profession.	Kruskal Wallis	Chi- Square=24,254 df=4 Asympsig=,000	Kabul
H_{10}: Oral hygiene level differs according to the frequency of the visit a dentist.	Kruskal Wallis	Chi- Square=14,983 df=3 Asympsig=,002	Kabul
H_{11}: Oral hygiene level differs according to the snacking habit between the main meals.	Anova	F=7,591 df=159 Sig=,001	Kabul
H_{12}: Oral hygiene level differs according to the beverage intake.	Kruskal Wallis	Chi- Square=13,983 df=3 Asympsig=,004	Kabul
H_{13}: Oral hygiene level differs according to the frequency of changing a tooth brush.	Kruskal Wallis	Chi- Square=18,202 df=3 Asympsig=,000	Kabul
H_{14}: Oral hygiene level differs according to the awareness of the individuals on oral and dental health.	Kruskal Wallis	Chi- Square=27,678 df=3 Asympsig=,000	Kabul
H_{15}: Oral hygiene level differs according to the utilization of other hygiene tools.	Anova	F=9,483 df=159 Sig=0,000	Kabul

As shown in Table 2, all hypotheses except "H_1: Oral hygiene level differs according to the sex." and "H_8: Oral hygiene level differs according to the age." were accepted (p<0.05).

One-way variance analysis was used to test the hypothesis "H_2: Oral hygiene level differs according to the total income value of the family." Based on the *post-hoc* Scheffe test results, the participants with an income of 1000-3000 TL and 3001-4000 TL (2.6281 and 2.440, respectively) had a moderate oral hygiene, whereas those with an income of more than 4001 TL had a good oral hygiene (1.8553).

One-way variance analysis was used to test the hypothesis "H_3: Oral hygiene level differs according to the education status." The *post-hoc* Scheffe test was performed to analyze the difference between the groups. The results showed that increased education status was positively associated with improved oral hygiene (college=1.8396, high school=2.2414, primary school=2.8316).

One-way variance analysis was used to test the hypothesis "H_{11}: Oral hygiene level differs according to the snacking habit between the main meals." Based on the *post-hoc* Scheffe test results, there were differences between those who ate fruits between main meals (2.0492) and those who ate bread-sandwich (2.4726) and cookies/sweet-chocolate.

One-way variance analysis was used to test the hypothesis "H_{15}: Oral hygiene level differs according to the utilization of other hygiene tools." Based on the *post-hoc* Scheffe test results, those who used dental floss (1.9962) and mouthwash (2.1500) had a better oral hygiene, whereas those who did not use any tools had a poor oral hygiene (2.6218). In addition, the participants using dental floss were in good oral hygiene category.

3. Conclusion

In this study, we investigated the possible relationship between oral hygiene and socio-economic status. According to our study results, oral hygiene did not differ according to the age and sex. The majority of the participants in poor oral hygiene category were married, suggesting that single participants paid more attention to oral hygiene.

In addition, 45.71% laborers had poor oral hygiene, whereas 40% freelance workers had a good oral hygiene. It indicates that freelance workers pay more attention to the oral hygiene than others.

In the present study, the participants with a monthly income of <2000 TL had poor oral hygiene, indicating that high level of income is positively associated with good oral hygiene. Similarly, in a study conducted by B. Şengül, high socio-economic level was associated with improved oral and dental hygiene with more frequent visits a dentist (Bilgili, 2009).

Based on education status, we observed a relationship between increased education status and improved oral hygiene; as such, those with a college graduation had a better oral hygiene than those graduated from primary school. In consistent with these results, in a study conducted in Belgium, the authors reported that the individuals with lower education status visited a general practitioner or nurse, while those with higher education status often visited a physiotherapist or dentist (van Der Heyden et al. 2003). In addition, Uzun and Çelenligil Nazlıel found an association between increased education status and improved oral hygiene (Uzun & Çelenligil, 2000). Another study investigating the effect of education status on oral hygiene, Güngör et al. (1999) demonstrated that increased education status was associated with improved tooth brushing and oral health, eventually (Güngör, Tüter, Bal, 1999).

Furthermore, we observed that there was an association between the increased number of family members and poor oral hygiene. Therefore, it suggests that reduced income per capita may adversely affect oral hygiene. We also found that incautious consumption of sweet foods affected oral hygiene adversely, while fruit consumption was associated with positive oral hygiene findings.

Depending on the beverage types, the majority of the participants consumed acidic beverages, whereas some preferred milk or ayran. Poor oral hygiene can be attributed to the acidic beverage intake.

For the Turkish population who does not visit a dentist on a regular basis, preventive measures cannot be appreciated in dental clinics alone. In the present study, we found that the participants who visited a dentist regularly had a better oral hygiene, compared to those who did not or did in case of discomfort. This finding emphasizes the importance of a regular dentist visit in our population.

In addition, we observed poor oral hygiene in participants who changed their tooth brush every ≥7 months and better oral hygiene in those who changed their tooth brush every 3-6 months, indicating a positive effect on oral hygiene.

We also showed that the participants who brushed their teeth twice or more a day had a better oral hygiene, compared to those who brushed their teeth rarer. This finding also suggests that daily brushing habit is of utmost importance for a good oral hygiene. We also believe that encouraging an early habit of tooth brushing has a positive effect on improved oral hygiene.

Moreover, we found that oral hygiene improved in those using dental hygiene tools other than a tooth brush including dental floss or mouthwash, suggesting that supportive tools may play an important role in the maintenance and improvement of oral hygiene.

One of the major findings of the present study was inadequate knowledge on oral and dental health among those with poor oral hygiene. We, therefore, recommend increasing awareness of individuals through education campaigns. In addition, we observed a significant difference in the awareness of oral hygiene necessity among those with poor and good oral hygiene.

In conclusion, our study result suggest that single individuals, laborers, those with a low income and low education status, those with a high number of family members, those with a dietary habit of acidic beverages, those who do not visit a dentist on a regular basis, those with a brushing habit of <2 times a day, those with a low awareness of oral hygiene and care, and those who do not aware of oral hygiene necessity have a poorer oral hygiene. However, further studies may be required to establish a conclusion, as our study sample is small (n=160).

Hence, the following proposals can be made:

- Married couples should be informed about their role-model being for their children to protect dental health.

- The communication between the family members and preventive dentists and oral and dental health should be focused for parents and children through educational programs and informative leaflets.

- A state policy on preventive dentistry should be followed to increase the public awareness and financial gain should be focused irrespective of the professions of the individuals. Of note, the economic burden of missing teeth and relevant problems should be projected.

- Education on oral hygiene provided by teachers of the subject should be included in the curriculum to encourage early habit of brushing.

- Awareness campaigns should be designed to maintain continuous education on oral and dental health in public.

- Dental hygiene tools should be introduced to the parents and children and education programs should be tailored to instruct how to use.

- Dentist visits on a regular basis should be scheduled at a very early age.

- Education programs should be prioritized among those with a low socio-economic status.

- Individuals should be informed regarding the hazardous effects of acidic beverages and snacking between the main meals and healthy dietary should be recommended.

- Regular tooth brushing twice a day, at least, should be instructed with proper brushing techniques.

- Each individual should be instructed to have a personal toothbrush and change it on a regular basis.

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