Evaluation of Adults' Knowledge on Dental Caries, Oral Habits and Perception on Oral-systemic Relation

Bireylerin Diş Çürüğü Gelişimi ve Oral Hijyen Alışkanlıkları Hakkındaki Bilgi Düzeyleri ile Genel Sağlık-ağız ve Diş Sağlığı İlişkisinde Farkındalık Düzeylerinin Değerlendirilmesi

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Abstract

Objective: The purpose of this study is to investigate patients' awareness on the relation between oral and general health associated with oral hygiene habits and knowledge.

Materials and Methods: A 21-item survey was prepared and delivered to 500 patients who had applied to Istanbul University Department of Restorative Dentistry. Surveys consisted of detailed questions to specify the sociodemographic values, to evaluate the frequency of oral habits, and to examine the existing systemic diseases. All of the surveys were carried out as interviews by one dentist. Surveys were statistically evaluated using Chi-square tests.

Results: Of the 500 patients aged between 18 and 78, deficiencies in tooth brushing (70.6%) and diet (50.2%) were related to dental caries. The results on inadequate tooth brushing on caries development were not significantly different in gender and age groups ($p>0.05$), whereas statistically significant results were observed in educational status ($p<0.05$). 19% of the patients indicated that oral symptoms did not play an important role in the early diagnosis of general health problems, whereas 41% stated that it was important and 40% had no idea. Patients' awareness of the relation of general and oral health is significantly different according to educational status ($p<0.001$).

Conclusion: Patients had inadequate knowledge on the relation of oral and general health. Patients should be educated on the importance of oral health awareness as an inseparable part of general health. Referrals from health professionals to dentists may improve patients' easy access to dental care.

Öz

Amaç: Bu çalışmanın amacı, bireylerin ağız hijyeni alışkanlıklarına ve diş çürüğü gelişimine ilişkin bilgi düzeylerinin ölçülmesi ve genel sağlık- ağız ve diş sağlığı ilişkisi hakkındaki farkındalıklarının incelenmesidir.

Gereç ve Yöntemler: İstanbul Üniversitesi Restoratif Diş Tedavisi Anabilim Dalı'na başvuran 500 hasta, 21 sorudan oluşan anketi cevaplamıştır. Tüm anketler bir dişhekimisi tarafından röportaj şeklinde gerçekleştirilmiştir. Anket, katılımcıların sosyo-demografik değerleri belirlemek, oral alışkanlıkların sıklığını değerlendirmek

ve mevcut sistemik hastalıklarını incelemek için ayrıntılı sorular içermiştir. Sonuçlar ki-kare testleri kullanılarak istatistiksel olarak değerlendirilmiştir.

Bulgular: 18-78 yaş arasındaki 500 hastaya göre, yetersiz diş fırçalama (% 70,6) ve beslenme (% 50,2) diş çürüğü gelişimi ile direkt ilişkilidir. Yetersiz diş fırçalamanın diş çürüğü gelişimine neden olacağını belirten bireyler, cinsiyet ve yaş grupları açısından anlamlı olarak farklılık göstermezken ($p>0,05$), eğitim durumları istatistiksel olarak anlamlı farklılık göstermiştir ($p<0,05$). Katılımcıların % 19' u genel sağlık sorunlarının erken teşhisinde oral semptomların önemli bir rol oynamadığını belirtirken, % 41'i bunun önemli olduğunu belirtmiştir. Bireylerin genel sağlık- ağız ve diş sağlığı ilişkisindeki farkındalık düzeyleri eğitim durumlarına göre anlamlı derecede farklılık göstermiştir ($p<0,001$).

Sonuç: Bireylerin genel sağlık-ağız ve diş sağlığı ilişkisi hakkında yeterli bilgiye sahip olmadığı görülmüştür. Ağız-diş sağlığının, genel sağlığın ayrılmaz bir parçası olarak görülmesi ve bu bilincin yaygınlaştırılması konusunda bireylerin eğitilmesi gerekmektedir. Bu hususta özellikle sistemik hastalığa sahip olan bireylerin teşhisi ile birlikte tıp hekiminden, diş hekimine yönlendirilmesi büyük önem taşımaktadır. Sağlık profesyonellerinden diş hekimlerine sevk ile bireylerin dental hizmetlere erişimi kolaylaşacaktır.

Introduction

According to WHO, dental caries and periodontal pathologies are still the most common diseases all over the world which could be due to the lack of oral hygiene habits and dental knowledge (1). In the USA, 85% of the adults older than 18 years and 44% of the 5-year-olds are affected by dental caries (2). Likewise, the prevalence of dental caries was 73.8%, and the rate of periodontal diseases was 62% among adults aged between 35 and 44 in Turkey (3). As dental problems affect patients without any age or gender exceptions and could only be solved by basic oral hygiene procedures, the higher ratios show deficiency in promoting oral health. Generally, prevalence was taken from nationwide surveys so that there could be greater numbers when these surveys investigate only special populations such as patients with systemic diseases.

The FDI first defended oral health as a fundamental human right and an inseparable part of general health in 2013 (4). Then, in 2016, it was made clear that oral health reflected the physiological, social, and psychological attributes essential to a quality life (5). Recent studies proved there are systemic diseases with probable oral symptoms as well as oral diseases that could affect the general condition of the body (6-8). Today, many systemic diseases are connected to oral problems such as cardiovascular diseases (9), diabetes (10), rheumatoid arthritis (11), asthma (12), and respiratory diseases (13). Thus, dentists and physicians should work collaboratively in order to increase patients' quality of life. That approach would ensure the health, economy, and social needs of the population.

Furthermore, it is crucial to implant the idea of

maintaining optimum oral health to provide better general health; also, good oral knowledge could lead to early diagnosis of oral and systemic diseases. Last but not least, with the knowledge of oral diseases, patients could first change their oral beliefs into actions and later into oral habits.

The purpose of the present cohort study was to measure the oral behavior, knowledge, and perception on the oral and general health relation of a group of dental patients who applied for a public dental service. This is the first study to investigate the factors affecting caries development among adults and to compare the results over age, gender, and educational levels. The present survey's hypotheses include the following; (1) There were no significant differences in the knowledge on factors affecting dental caries among participants' gender, age, or educational status; and (2) there was significant difference in the participants' age, gender, and educational status with regard to their perceptions of general and oral health.

Materials and Methods

The present cohort study was designed as a survey and was approved by the local research and ethics committee of İstanbul University Faculty of Dentistry (protocol no: 2013/369).

Subjects

A sample size of 471 was calculated based on the probable knowledge rate of 20% on oral and general health relation with margin of error of 5% (confidence interval of 95%) using G*Power programme (G*Power v3.1.9.2., Heinrich-Heine-Universität, Düsseldorf, Germany). Regarding the probable missing data and exclusions, the total number of the subjects were determined as 500. The present study was conducted

between April and June of 2013 at Istanbul University faculty of dentistry. Subjects aged between 18 and 78 were included in the study from whom applied to Department of Restorative Dentistry clinics. Pregnants, lactating mothers and patients with emergency had excluded from the study. Written consents from participants had taken and kept in files separated for each one.

Questionnaire

21- item surveys (Appendix 1) were prepared. Surveys consisted of detailed questions in order to specify the sociodemographic values of the patients such as age, gender and occupation in the first part. In the second part, there were questions on subjects' own oral habits, existing systemic diseases and daily medicaments. The last part was aimed to measure awareness on their own oral health and to understand participants' oral knowledge on caries development and relation between oral and systemic health. All of the surveys were carried out as interviews by one dentist and numbered in sequel.

Statistical Analysis

All data with no missing answers were delivered to Microsoft Excel program at first then evaluated by SPSS 17.0 (SPSS Inc., Chicago, IL, USA). Analysis had done using frequency counts, percentages and comparisons were evaluated by Chi-square Exact Test. The significance was assessed at $p < 0.05$.

Results

Table 1 shows participants' demographic data. Among 500 patients, the average age was found to be 34.5 ± 13.5 . The number of female (50.6%) and male (49.4%) subjects was similar with no statistical difference ($p > 0.05$).

Of the 500 subjects, 240 (48%) reported brushing their teeth once a day, 176 (35%) brushed their teeth 2 or 3 times a day, and 34 (7%) brushed only once a week. Among all participants, 34 (8%) of them brushed irregularly, and 9 (2%) of them never brushed (Graphic 1). Most of the subjects (86%) did not attend routine dental recalls or use dental floss. Evaluating their toothpaste choices, subjects specified that they rely on their own experiences (35%) rather than dentists (28%).

Of the subjects, 55.4% had gingival bleeding while brushing, and 44.6% had spontaneous gingival

bleeding. To add more, 46.6% of the subjects had a toothache in the last 6 months. In the last 6 months, 24.8% of the subjects had tooth scaling.

According to the data, most of the subjects specified that inadequate tooth brushing (70.6%) was one of the main factors affecting caries development, while diet was the second most reported factor (50.2%). Participants were asked about their knowledge on factors affecting dental caries, and the majority of subjects were unaware of the effective factors other than tooth brushing (Graphic 2).

Table 2 summarizes the multiple comparisons on subjects' knowledge on factors of caries development and their demographic data.

According to Table 2, participants, who determined genetics as a factor for caries development, were significantly different in terms of their gender, age, and educational status. Participants who described

Table 1. Demographic structure of the subjects	
Characteristics	Number (%)
Gender	
Male	247 (49.4%)
Female	253 (50.6%)
Age	
18-30	229 (46%)
31-50	193 (39%)
51+	78 (15%)
Education Level	
Primary School	123 (25%)
Middle School	37 (7%)
High School	244 (49%)
University	96 (19%)

Graphic 1. Toothbrushing frequency of the subjects

regular dental visits and who were affected by caries development were not significantly different by age ($p>0.05$); however, they were different in terms of gender and educational status ($p<0.05$). Participants determined that inadequate tooth brushing is a factor for caries development, and they were statistically significant with regard to their educational status only. Diet was found to be a factor for caries development, and it was highly significantly different with regard to participants' gender ($p<0.001$). Participants who described a lack of dental knowledge affecting their caries development were not significantly different by gender, age, or educational status ($p>0.05$).

The present survey determined that no patients were suffering from Multiple sclerosis (MS) or any neurological diseases. Table 3 summarizes subjects' situation of systemic diseases and habits. Only 25% of the subjects with at least one systemic disease had their conditions under a physician's control. Of all the systemically disordered subjects, only 22.2% had regular medications according to their illnesses. To add more, subjects with systemic diseases or conditions who were visiting their physicians regularly

Graphic 2. Subjects' knowledge on factors of caries development

and taking daily medicines had statistically significant difference compared to those who were not ($p<0.05$).

Evaluating the awareness and knowledge on the oral symptoms of systemic diseases, a majority of the subjects (65%) were found to have halitosis as a result of a systemic disease. Graphic 3 shows the results of the related question.

19% of the subjects declared that oral symptoms were not important in the early diagnosis of a systemic disease. 41% had the opposite answer, and 40% had no idea on the issue. In addition, 24% of the subjects specified that systemic diseases could not affect dental treatments, while 45% declared the contrary. Graphic 4 summarizes subjects' answers on their awareness of the general and oral health relation.

In terms of age and gender, there was no statistically significant difference in subjects' awareness on the general and oral health relation ($p=0.113$), but there was a statistically significant difference among subjects' educational status ($p<0.05$).

Discussion

Graphic 3. Subjects' knowledge on the oral symptoms of systemic diseases

Table 2. Significance between subjects' oral knowledge on caries development and demographic data

	Gender	Age groups	Educational status
Genetics	+	+	+
Regular dental visits	+	-	+
Inadequate tooth brushing	-	-	+
Diet	++	+	-
Lack of dental knowledge	-	-	-
Signs refers to (+): $p<0.05$, (++): $p<0.001$, (-): $p>0.05$			

As oral health is an inseparable part of general health, it is obvious that chronic problems in the oral environment could cause a systemic effect. Thus, by fulfilling oral habits, ideally with optimum knowledge on oral diseases, a healthy systemic condition can be reached. It is important for every individual of the public to consider the relation between oral and systemic health and to reach out to available health services. Using a 21-item survey, the present study assessed the oral behavior, knowledge, and perception of the 500 patients who were willing to attend a dental service. The present study showed that the knowledge on factors of dental caries changed significantly regarding participants' gender, age, and educational status. Therefore, the first hypothesis is rejected.

When evaluating the oral knowledge on caries development, the most common factor leading to caries development was tooth brushing. Even though

subjects knew that a lack of tooth brushing caused caries development, they did not practice proper oral habits. Thus, knowledge about the risk of a disease does not always integrate into habitual behavior. Studies evaluating this issue were mainly focused on the knowledge of periodontal diseases of diabetic patients (14-18). However, there are a few studies (18,19) evaluating patients' opinion on the risk factors of caries development. So, the present study is among the rare few investigating patients' knowledge on the factors causing dental caries.

Of the factors causing caries development, tooth brushing (70.6%) and diet (50.2%) were common answers among subjects. With a high percentage of knowledge on the effects of tooth brushing on caries development, the cause for the low ratio of tooth brushing among subjects was unclear. Furthermore, a diet consisting of refined carbohydrates and sugars had a crucial impact on bacterial nutrition and growth by increasing the acidic pH of oral cavities (20). Aside from this importance, nearly half of subjects (49.8%) described no relation between diet and caries development. On the other hand, regular dental visits were important to arrest white spot lesions that could be re-mineralized and to prevent caries progression. However, routine dental visits had no relation on caries development among subjects (63.8%). Moreover, dental knowledge was found to be irrelevant by most of the subjects (nearly 80%); however, with a clinical examination among the subjects, caries prevalence would have been high. Tafere et al. (18) showed statistically and significantly lower caries prevalence among subjects with better knowledge on dental caries. In the related study, subjects fulfilling oral hygiene procedures were found to have statistically

Graphic 4. Subjects' awareness on the relation between oral and general health

Table 3. Subjects' systemic diseases and habits

Diseases//Habits	No. of participants	Ratio among all participants
Cardiovascular diseases (CVD)	45	9%
Thyroid disorders	15	3%
Respiratory system diseases	13	2.6%
Rheumatic diseases	54	10.8%
Diabetes	53	10.6%
Anemia	70	14%
Hypertension	27	5.4%
Tobacco and/or alcohol use	149	29.8%

lower dental caries, and this would have been assumed in the present study as well. Another novel study by Francis et al. (19) showed that oral knowledge on both the cause and prevention of dental caries had a statistically significant increase among age. Although the mentioned study was conducted among high school students aged between 16 and 18, regarding whether subjects could learn from lessons in schools, the present study had the same result among adults as well. Having optimum oral knowledge could allow the public to improve oral habits and behaviors as well as lower the prevalence of dental caries in future generations.

As the link between oral and general health has been proven in recent years, it is not only physicians but also dentists' responsibility to popularize the scientific data and inform patients. In addition, such a responsibility is important to form proper oral habits and to be knowledgeable about oral hazards. 55.4% of all subjects had at least one systemic disease, and nearly 30% of the subjects used tobacco or alcohol. Unfortunately, only one-fourth (1/4) of the diseased subjects were under physicians' control and took regular medicines daily. It is clear from the results that subjects were neither interested in their oral health nor their systemic health. Since subjects had inadequate knowledge on the probable oral symptoms of systemic diseases, the ratio of halitosis (65%) was superior to others' symptoms such as caries (47.6%). Also, it is obvious from the results that most of the subjects had inadequate knowledge on the oral and systemic relation. Diabetes was prevalent among subjects (10.6%), and its relation between periodontal diseases was obvious; still, subjects did not relate either gingival bleeding (37.8%) or gingival recession (15.4%) as a symptom for diabetes. It should be taken into consideration that both physicians and dentists have a role in misguiding patients. In particular, physicians should direct patients with systemic diseases or habits to dentists immediately after the diagnosis or first appointment. The opposite is valid for dentists if the systemically ill patients' oral health status becomes worse. In the present study, educational status was shown to have a positive correlation with subjects' awareness on the oral and general health relation, similar to Shanmukappa's (17) and Tafere's (18) studies. It was clear from the results that a high amount of ratios were taken from

subjects with "no idea." Subjects lacked knowledge; however, it could be concluded that consideration for the oral and general health relation existed among subjects. At most, pregnancy seemed to be linked with altered oral health among subjects. This part of the answers could be related with the higher educated portion of the subjects. That is why only the differences between participants' educational status had statistical significance in the perception of the general and oral health relation; thus, the present study's second hypothesis is partially accepted. When the educational status is increased, the awareness on general and oral health is higher. In addition, when the educational status is higher, subjects thought of more factors affecting dental caries such as genetics and dental visits, apart from the common answer of tooth brushing. In a study (21) conducted among 450 practitioners, dentists described that their knowledge on the effects of systemic diseases on oral health is inadequate. On the other hand, some studies (6,22) also showed that physicians recognize the importance of oral health; however, they had deficient perception on the effect of oral health on their general health. A common approach should be adopted by both physicians and dentists in order to guide systemically diseased patients.

The findings on oral behavior showed inadequate application of oral hygiene habits such as brushing and flossing. A majority of subjects brushed their teeth once a day (48%), and only 14% flossed. Even if the recommended brushing frequency is twice a day (23), only one-third of the subjects (35%) followed the general recommendation. In accordance and in contrast to the present study, several studies have evaluated the oral habits of the population conducted in many countries. In Nigerian studies (24) with more than 7,600 responders and in South American studies (25) with more than 1,600 responders, nearly 50% practiced tooth brushing twice a day. Although only 10.5% of Nigerian responders flossed, which was similar to the ratio of the present study, there were still more brushers than flossers. In a study (26) conducted in Italy with 2,200 adults aged between 18 and 98, more than 70% of the responders brushed once a day, and this was superior to the present study's results (48%); however, it showed the same flossing ratio. It is obvious from the different studies' scores that subjects brush their teeth more

than they floss. The present study detected that 9% brushed irregularly and 2% had never brushed before. A higher ratio was described in the Iranian population of 12,105 responders, with 32.5% having never brushed and 83% having never flossed (27). Although the size of respondents varied in many studies and the ratios changed with the participants' age, gender, and educational status, as well as the country's socioeconomic level (24,25,28), the ratio of ideal oral habits was low. Despite lacking oral hygiene procedures, subjects also demonstrated challenges meeting regular dental visits. Routine dental visits are important for early diagnosis of oral problems; also, if a systemic disease such as diabetes is present, it is crucial to detect oral lesions at their early stages (29). For the ratios of one dental visit a year, studies (30) from Germany (60%), Ireland (44%), and Spain (27%) showed superior results compared to the present study's subjects (14%). Furthermore, nearly half of the subjects (46.6%) had a toothache in the last 6 months, and half had spontaneous gingival bleeding (44.6%). Without fulfilling regular oral hygiene procedures, most of the oral problems become expectable. It is obvious that not only spontaneous gingival bleeding but also probable caries that lead to toothaches could simply be prevented by regular brushing. However, subjects showed inadequate oral habits, revealed excessive oral problems, and described rare dental visits. Therefore, it was clear that subjects were only applying to emergency clinics when there was a chronic oral problem or a toothache. Among all, subjects tend to rely on their own choices when selecting toothpastes rather than dentist' recommendations. Beginning with university clinics, a nationwide approach should be taken to generalize the importance of oral hygiene procedures. In addition, the oral health promotions of universities or public clinics should be easily accessible for all patients.

Subjects of the present study had inadequate knowledge about both caries development and the oral and general health relation. In addition, it was obvious that subjects had unfavorable interest in oral hygiene habits. There should be a mutual relationship between patients and dentists in improving patients' oral health knowledge and behaviors. Patients should learn the etiologies of not only dental diseases but also the outcomes of systemic conditions on dental

tissues; also, dentists should be trained to provide oral habits education. The public should learn where to access dental information or refer to a dental specialist on routine recalls and/or daily practices.

Common guidelines should be developed with medical organizations in order to inform systemically ill patients and to warn them about probable dental complications. To add more, academic institutions should educate on the value of scientific research and the oral and general health relation so that both medical and dental students can put these principles into practice.

Ethics

Ethics Committee Approval: The local research research and ethics committee of İstanbul University Faculty of Dentistry granted ethical approval for the study (protocol no: 2013/369).

Informed Consent: Informed consents were taken from the parents of the subjects that were below the age of 18.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: U.E., G.O., Design: U.E., Data Collection or Processing: G.O., L.E.G., Analysis or Interpretation: E.Y., Literature Search: G.O., L.E.G., Writing: U.E., G.O., L.E.G., E.Y.

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Appendix 1. The questionnaire of oral knowledge, oral habits and perception

Age: 2. Gender: Women Men

2. Neighborhood:
3. Educational Status:
a) Primary b) Middle School c) High School d) University/College e) None
4. Do you have health insurance?
a) SGK b) Retirement fund c) Private insurance d) Med-nased insurance e) None
5. How many times do your brush your teeth?
a) Once a day b) 2-3 times a day c) Once a week d) Irregular e) None
6. Do you have the habit of flossing?
a) Yes b) No
7. Do you follow your dental recalls?
a) Yes b) No
8. Did you have ever gum bleeding in the last 6 months?
a) Yes b) No
9. Did you have ever toothache in the last 6 months?
a) Yes b) No
10. Did you ever have tooth scaling in the last 6 months?
a) Yes b) No c) No idea
11. What is the leading factor on your decision on choosing toothbrush and toothpaste?
a) Advertisements b) My dentists opinion c) Price d) My own experience
12. What is/are the factor/-s that affects caries development?
a) Diet
b) Toothbrushing
c) Recalls
d) Lack of oral knowledge
e) Genetics
13. Do you have one or more of the below-mentioned conditions or diseases?
a) Cardiovascular diseases
b) Thyroid Diseases (Such as Goiter)
c) Pulmonary diseases (Such as Bronchitis, Asthma)
d) Rheumatic diseases
e) Diabetes (Type I or II)
f) Anemia
g) Multiple sclerosis
h) Hypertension
i) Neurological diseases (Such as Parkinson's, Stroke)

- j) Epilepsia
- k) Chronical kidney failure
- l) Alcohol / Tobacco use
- m) Others

14. If you have any of the above-mentioned conditions/diseases, is it under control of your physician?

- a) Yes b) No

15. Do you use a drug/medicament regularly?

- a) Yes b) No

16. Which of the following /-s could be seen in individuals dealing with a systemic disease?

- a) Gum bleeding while brushing
- b) Halitosis
- c) Xerostomia
- d) Gingival hyperplasia
- e) Dental caries
- f) Teeth loss
- g) Gingival recession
- h) Osteoporosis at jaw
- i) Toothache
- j) Malocclusion

17. Do you think that the oral symptoms could play a role on the early diagnosis of systemic diseases?

- a) Yes b) No c) No idea

18. Do you think that systemic diseases could affect oral environment?

- a) Yes b) No c) No idea

19. Do you think that systemic diseases could affect your dental treatments?

- a) Yes b) No c) No idea

20. Do you think that any oral problem could affect your systemic health?

- a) Yes b) No c) No idea

21. Do you think that any oral problem could affect pregnancy?

- a) Yes b) No c) No idea