Oral Health Status and Oral Hygiene Habits of an Adult Turkish Population on Dialysis

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Purpose: The present study was undertaken to evaluate the oral health status and oral hygiene habits of dialysis patients.

Materials and Methods: A total of 145 patients on dialysis were evaluated in two centres. Evaluation included oral examination of soft and hard tissues and completion of a questionnaire that was used to gather information about demographic, socioeconomic, medical and dental status and oral hygiene attitudes of patients. Awareness of the importance of oral health was also determined by four yes/no questions within this questionnaire.

Results: Of the 145 patients, 89 (61.4%) were presently candidates for renal transplantation. Nineteen patients (13.1%) were edentulous and nearly half of the patients (n = 69, 47.6%) had 15 or fewer remaining teeth. Dentate patients who regularly brushed twice a day and flossed were few (n = 18, 14.3%; n = 3, 2.4%, respectively). In addition, plaque score was more than 50% in most of the dentate patients (93.7%). Gingival bleeding was reported by about two thirds of dentate patients (67.5%). None of the patients were referred to a dentist or were attending regular dental care. The percentage of patients who were aware of oral cavity-related infections and importance of oral hygiene following renal transplantation was very low (20.7% and 9.7%, respectively).

Conclusions: Poor oral health, unsatisfactory daily oral hygiene habits and insufficient awareness of the importance of oral health is frequent among Turkish dialysis patients. Dentists and nephrologists should work in close cooperation in order to raise awareness and encourage regular dental controls.

Key words: chronic renal failure, dialysis, oral health

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Chronic renal failure (CRF) is progressive impairment of kidney function associated with deterioration of nephrons mostly occurring as a consequence of diabetes, chronic glomerulonephritis and hypertension (Erek et al, 2002). When untreated CRF progresses to an irreversible stage known as end-stage renal disease (ESRD), it necessitates renal replacement therapies, i.e. dialysis or renal transplantation. Since dialysis can compensate about 20% of impaired total kidney function, renal transplantation, which has become an effective and alternative therapy with medical and technological progress, seems to be the ultimate replacement solution (Davidovich et al, 2004).

CRF-ESRD patients represent a compromised population that is in need of comprehensive medical as well as dental care and treatment, since these patients have both systemic and oral manifestations (Davidovich et al, 2004, 2005; Proctor et al, 2005). Dental treatment of CRF-ESRD patients is somewhat complex due to accompanying systemic conditions such as diabetes and hypertension, and immunosuppressive,

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anticoagulant, anti-aggregant and antihypertensive drug usage, and requires greater attention (Kerr, 2001). Oral changes may be observed in this patient group as a result of CRF-ESRD itself or related medications and treatment regimens, including reduced salivary flow (Kao et al, 2000; Bayraktar et al, 2004), oral malodour and/or bad taste (Kho et al, 1999), mucosal lesions (King et al, 1994; Klassen and Krasko, 2002) and gingival overgrowth (Thomason et al, 1993). The extent of gingival overgrowth induced by immunosuppressive and/or antihypertensive drugs is generally related to gingival inflammation and therefore to dental plaque (Thomason et al, 1993; Hallmon and Rossmann, 1999; Trackman and Kantarci, 2004). In addition, improvement of daily plaque control leads to reduction of gingival inflammation and thereby to reduction of drug-induced overgrowth (Somacarrera et al, 1994; Ilgenli et al, 1999; Kantarci et al, 1999).

Complications such as infection and allograft rejection, which are related to immunosuppressive therapy, remain major causes of morbidity and mortality following organ transplantation. Long-term use of immunosuppressant drugs following renal transplantation in order to reduce the risk for organ rejection causes this compromised patient group to be more prone to infection (Varon and Alangaden, 2004). On the other hand, the presence of an infection focus has the potential to induce rejection via triggering immune reactions (Almond et al, 1993; Heemann et al, 1996; Bishop, 2001). Therefore, elimination of active infection before renal transplantation including those related to the oral cavity is of pivotal importance. Moreover, application of proper oral hygiene methods by CRF patients undergoing renal transplantation should be constituted before surgery in order to maintain the optimal oral health for extended periods (Axelsson et al, 2004). In this way, removing and reducing the possibility of oral infection in patients undergoing renal transplantation before surgery is performed worldwide (Yamalik et al, 1993).

According to national registries, there were more than 20,000 CRF-ESRF patients on renal replacement therapies in Turkey by the end of 2003 (Registry Report, 2003). The number of CRF-ESRD patients requiring dental treatment is likely to increase parallel to the increasing incidence of CRF-ESRD worldwide as well as in Turkey (Registry of Nephrology, Dialysis and Transplantation in Turkey, 2002). Thus, detailed dental assessment is warranted for this exceptional patient group. Regular dental care is indicated in these patients to reduce the risk of oral infections or transient bacteraemia (Naylor et al, 1988). In addition, a significant association has been reported between plaque scores and gingival inflammation in renal dialysis patients (Naugle et al, 1998). However, CRF-ESRD patients seem to neglect dental care and regular dental visits (Naugle et al, 1998; Gavalda et al, 1999; Klassen and Krasko, 2002; Al-Wahadni and Al-Omari, 2003). At present there are limited data regarding oral health status and oral hygiene attitudes of dialysis patients in Turkey. Therefore, in the present study the aim was to evaluate the oral health status and oral hygiene habits of dialysis patients.

MATERIALS AND METHODS

A total of 145 CRF-ESRD patients receiving haemodialysis (n = 139) or peritoneal dialysis (n = 6) were examined in two dialysis centres. Dialysis centres were randomly selected among the centres located in the residential area of the School of Dentistry, Ege University, which refer their CRF patients scheduled for renal transplant for elimination of oral infection foci. Prior to participation, the purpose of the study was fully explained to all patients and informed consent was signed for an oral examination and completion of a questionnaire. The questionnaire was used to gather information about the demographic (sex, age, smoking habit), socioeconomic (education, economic status), medical and dental status (presence of systemic diseases, infection focus, dialysis duration, candidacy for transplantation, history of failed renal transplantation, regular dentist control and dentist referral) as well as oral hygiene habits (brushing frequency, interdental cleaning) of dialysis patients. The questionnaire was completed at bed-side in a question and answer manner by a clinician (AG). The awareness of dialysis patients of the importance of oral health was also determined by four yes/no questions within this questionnaire (see Table 4). Oral soft and hard tissue examination, including remaining teeth (excluding third molars), gingival overgrowth, oral malodour and oral ulcerations was performed by the aid of a light source also at bed-side. Gingival bleeding was assessed and recorded for the dentate patients in response to the question 'Do your gums bleed spontaneously or during tooth brushing or chewing?' Supragingival plaque accumulation was assessed by a plaque disclosing agent applied by sponges and was recorded from four sites per tooth for the whole mouth. Correlation of education, dialysis duration and history of renal transplantation with positive answers to awareness questions were determined by using Chi square test. A level $p < 0.05$ was chosen for significance.

Table 1 Demographic and socioeconomic characteristics of study patients

Characteristics	n (%)
Male/Female	74/71 (51/49)
Smokers	32 (22.1)
Light smokers	18 (12.4)
Heavy smokers	14 (9.7)
Age range	
<35	24 (16.6)
35–50	30 (20.7)
50–65	57 (39.3)
>65	34 (23.4)
Education status	
None	28 (19.3)
Primary school	68 (46.9)
Secondary school to High school	35 (24.1)
University	14 (9.7)
Economic status	
Poor	92 (63.5)
Average	38 (26.2)
Good	15 (9.3)

Table 2 Medical and dental status of study patients

Medical/dental status	n (%)
Patients with systemic disease(s)	54 (37.2)
Diabetes	28 (19.3)
Hypertension	20 (13.8)
Atherosclerosis	5 (3.5)
Hyperthyroid	4 (2.8)
Anaemia	2 (1.4)
Cardiac valve disease	2 (1.4)
Familial Mediterranean fever	2 (1.4)
Aortic aneurysm	1 (0.7)
Rheumatoid arthritis	1 (0.7)
Raynaud's phenomenon	1 (0.7)
Lupus erythematosus	1 (0.7)
Pemphigus	1 (0.7)
Asthma	1 (0.7)
Dialysis duration	
<1 year	54 (37.2)
1–3 years	33 (22.8)
>3 years	58 (40)
Patients queued for renal transplantation	89 (61.4)
Patients with a history of failed renal transplantation	11 (7.6)
Patients referred to dentist during dialysis	0 (0)
Patients under regular dentist control	0 (0)

RESULTS

Data including demographic/socioeconomic and medical/dental characteristics of patients are outlined in Tables 1 and 2, respectively. Fifty-four (37.2%) patients had one or more systemic diseases such as hypertension, atherosclerosis, diabetes and hyperthyroidism (Table 2). Oral findings and oral hygiene habits of patients are shown in Table 3. Eighty-nine patients (61.4%) were presently candidates for renal transplantation and awaiting a suitable donor. The present population also included 11 (7.6%) patients who had previously received dialysis until a suitable renal trans-

Table 3 Oral findings and oral hygiene habits of study patients

Oral findings and oral hygiene habits	n (%)
All patients (n = 145)	
Remaining teeth	
0–5	33 (22.8)
5–15	36 (24.8)
>15	76 (52.4)
Presence of oral malodour	83 (57.2)
Presence of oral ulcerations	6 (4.1)
Edentulous patients only (n = 19)	
Presence of oral malodour	1 (5.3)
Presence of oral ulcerations	0
Dentate patients only (n = 126)	
Presence of gingival bleeding	85 (67.5)
Presence of gingival overgrowth	23 (18.3)
Presence of oral malodour	82 (65.1)
Presence of oral ulcerations	6 (4.1)
Brushing frequency	
None	21 (16.7)
Irregular	50 (39.7)
1 times a day	37 (29.3)
2 times a day	18 (14.3)
Patients performing interdental cleaning	3 (2.4)
Patients with plaque % >50	118 (93.7)

plant donor was found. However, these patients were receiving dialysis again for renal replacement at the time the investigation was carried out since transplanted renal allografts had failed. None of the 145 patients were referred to a dentist or were attending for regular dental visits. Of the 145 evaluated patients, 19 (13.1%) were edentulous, so periodontal parameters including gingival bleeding, gingival overgrowth, oral hygiene habits and plaque scores were determined only for 126 dentate patients. In edentulous patients only oral malodour and oral soft tissue pathologies were evaluated. Nearly half of the patients (47.6%) had remaining teeth equal to or less than 15, nearly corresponding to having an edentulous single arch. The percentage of dentate patients with no or irregular tooth brushing habits was found to be very high (56.4%). Dentate patients that regularly brushed twice a day were few (n = 18, 14.3%). Only three (2.4%) of the dentate patients reported using dental floss for interdental cleaning. Plaque score was more than 50% in most of the dentate dialysis patients (93.7%). Self reported gingival bleeding, indicating a periodontal problem, at least gingivitis, was detected in about 2 out of 3 patients (67.5%). Oral malodour was a frequent oral finding among dentate dialysis patients (65.1%). The percentage of patients who were aware of oral cavity-related infections and the importance of oral hygiene following renal transplantation was found to be very low (20.7% and 9.7%, respectively) (Table 4). Positive significant associations were found between education and positive answers to question B (If you experience kidney transfer, may gum disease, i.e. bleeding and swollen gums, harm your overall health?) ($p = 0.002$, $\chi^2 = 15.10$, Contingency coefficient = 0.31) and question C (If you experience kidney transfer, may neglecting toothbrushing and interdental cleaning (flossing, interdental brushing) harm your overall health?) ($p = 0.001$, $\chi^2 = 15.83$, contingency coefficient = 0.31), and between dialysis duration and positive answers to question A (If you experience kidney transfer, may lack of proper oral hygiene, i.e. toothbrushing, flossing and interdental brushing, influence gum swelling?) ($p = 0.000$, $\chi^2 = 16.43$, contingency coefficient = 0.32), question B ($p = 0.003$, $\chi^2 = 11.50$, contingency coefficient =0.27), and question C ($p = 0.006$, $\chi^2 = 10.28$, contingency coefficient = 0.26).

DISCUSSION

Medically necessary oral health care is integral to comprehensive treatment to ensure optimum health care

Table 4 Awareness questions and positive answers

Question	Yes n (%)
A) If you experience kidney transfer, may lack of proper oral hygiene, i.e. toothbrushing, flossing and interdental brushing, influence gum swelling?	9 (6.16)
B) If you experience kidney transfer may gum disease, i.e. bleeding and swollen gums, harm your overall health?	30 (20.7)
C) If you experience kidney transfer, may neglecting toothbrushing and interdental cleaning (flossing, interdental brushing) harm your overall health?	14 (9.7)
D) Are you willing to attend regular dental controls?	143 (98.6)

outcomes and has the potential to reduce the efforts and costs of complications in medically compromised patients. Renal dialysis and transplantation are listed among the medical conditions in which oral health care is fundamental (Rutkauskas, 2000). However, oral problems including gingival bleeding, high numbers of missing teeth and poor oral hygiene were prevalent in the present CRF population receiving dialysis, indicators of insufficient oral health care. The high prevalence of oral problems among this population necessitates dental preventive and corrective procedures.

The prevalence of oral ulcerations has been reported to be 1.2% in Turkish population (Mumcu et al, 2005). When the data were stratified for gender and age groups, the percentage of oral ulcerations was found to be 0.8–1.6% and 0.8–10.1%, in 5- to 64-year-old females and males, respectively. The frequency of oral ulcerations in the present sample of dialysis patients was found to be higher than the general population. The mean percentage of gingival bleeding was reported to vary between 21.2% and 35.5% (total 25.5%) in subjects aged 35 to 44 and 33.0% and 50.7% (total 42.3%) in subjects aged 65 to 74 when categorised according to the education, income level, living area and gender (Krustrup and Petersen, 2006). In the present study, the percentage of gingival bleeding (67.5%) was found to be higher than that of the previous report (Krustrup and Petersen, 2006). Epidemiological studies carried out in different populations have suggested that prevalence of oral malodour ranges between 2.4% and 28% (Loesche and Kazor, 2002). Oral malodour was also a frequent clinical finding, particularly in dentate dialysis patients (65.1%). As was revealed by previous studies, the percentage of oral ulcerations, gingival bleeding and oral malodour was higher in the present sample of dialysis patients than in the Turkish population or other populations. However, it should be noted that some of the observed oral problems might have been produced or aggravated with systemic conditions that patients have and medications used in conjunction with CRF (Thomason et al, 1993; King et al, 1994; Kho et al, 1999; Kao et al, 2000; Klassen and Krasko, 2002; Bayraktar et al, 2004). There is accumulated evidence indicating the influence of diabetes on periodontal condition and periodontally relevant cellular, vascular and mucosal alterations (Ryan et al, 2003; Nassar et al, 2007). Diabetes could influence all clinical periodontal parameters including gingival bleeding (Bridges et al, 1996). In addition, xerostomia and oral malodour are other oral manifestations of diabetes (Rees, 2000; Sanz et al, 2001). Therefore, oral ulcerations, gingival bleeding and oral malodour might be in part related to diabetes, since it is the most frequent systemic disease among the present population.

In a cross-sectional study (Christensen et al, 2003), frequency of brushing twice a day was reported by 68% of dentate subjects, while 32% brushed their teeth once a day or less frequently. Regular flossing was reported by 11% of the subjects (Christensen et al, 2003). In the present study, regular twice-a-day brushing (14.3%) or flossing (2.4%) was far less frequent when compared with the study of Christensen et al (2003). In addition, the percentage of patients brushing once a day, irregularly or never (85.7%) was dramatically high. However, in the present study 93.7% of the patients had teeth surfaces covered ≥50% with plaque. This finding may indicate the low quality of daily oral hygiene. Gavalda et al (1999) reported that dialysis patients had higher levels of plaque and calculus indices than healthy controls. In a previous study, Klassen and Krasko (2002) focused on the oral hygiene and oral problems among dialysis patients.

They reported that most of the dentate dialysis patients (77%) had teeth surfaces covered more than 50% with plaque, and 63% of the patients visited dentists at more than 5-year intervals. The authors concluded that oral care and dental health was insufficient in dialysis patients. Similarly, Atassi (2002) reported that dialysis patients had poor oral hygiene and almost all had visited dental clinics for treatment needs but not for preventive care. In the present study, renal transplantation candidate dialysis patients generally were performing insufficient daily oral hygiene, had poor oral health, and were unaware of the influence of oral hygiene on infection-related complications. These findings may reflect in part negligence by the patient, probably due to reduced life expectancy, diminished quality of life and depression (Dogan et al, 2005; Wuerth et al, 2005). However, in the present study although 91 (62.7%) patients were receiving dialysis for more than 1 year, none of the patients were referred to a dentist in order to benefit from oral care management. Another finding of the present study is the willingness of almost all examined patients to participate in regular dentist control. Referral of dialysis patients to dentists should be encouraged by nephrologists.

Microbial dental plaque serves as a reservoir for microorganisms. Microorganisms in the dental plaque could negatively influence systemic health by entering into circulation, even following tooth brushing, as well as causing periodontal, dental or mucosal problems in the oral cavity. Moreover, plaque-induced gingival inflammation exacerbates the amount and extent of immunosuppressive and antihypertensive drug-induced gingival overgrowth, which is the most reported oral manifestation of renal disease. Previous studies have confirmed that improvement in oral hygiene and resultant reduced inflammation limits the occurrence and recurrence of gingival overgrowth (Pernu et al, 1993; Ilgenli et al, 1999; Kantarci et al, 1999). Therefore, performing adequate tooth brushing and interdental cleaning, which are effective methods in plaque removal, is a considerable issue for renal transplant patients. However, prior to transplant surgery, due to time limitation dentists might perform only primary treatments. In addition, if the patient and the medical team are particularly focused on transplantation, motivation and constitution of the patient's awareness of the importance of meticulous oral hygiene may not be stressed enough during the pre-surgery assessments.

Awareness of the importance of oral health among dialysis patients appears to be positively related to education status and the years spent at dialysis clinics, indicating that awareness is self-informed. It is interesting to find that awareness is not even sufficiently constituted in dialysis patients who had experienced renal transplantation before. In fact, although most of the dialysis patients reported willingness to attend regular dental visits, this was not the case, which may indicate the lack of guidance towards the dentist.

In the present study, dialysis patients had an oral investigation that was rather superficial, including examination of supragingival plaque accumulation, number of remaining teeth and a few oral symptoms. In addition, lack of a control group with similar demographic features does not allow for comparison and may be the potential limitation of the present study. Moreover, comprehensive oral examination including recording of periodontal parameters, tooth mobility, presence and extent of carious lesions, electrical pulp vitality test and radiographic evaluation could not have been determined at bedside in this patient group. These preliminary results show the necessity of more detailed oral examination of CRF patients in the dental clinic.

It is documented that dialysis patients have poor oral health status and are not enlightened properly of the importance of oral hygiene. A possible reason may be the lack of collaboration between the nephrologists and the dentists. In this regard, more attention should be paid to the improvement of oral health of dialysis patients and to raise both patients' and the medical team's awareness. Dialysis patients may benefit from regular dental care and education programmes planned together with nephrologists and dentists that start simultaneously with the dialysis.

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