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Assessment of knowledge and practice of internal medicine postgraduate students and patients with chronic kidney disease (CKD) regarding the association of oral health with CKD in Isfahan, Iran, in 2018

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Original Article

Abstract

BACKGROUND AND AIM: This study was conducted with the aim to evaluate the knowledge and practice of internal medicine postgraduate students and patients with chronic kidney disease (CKD).

METHODS: To measure the knowledge and practice of internal medicine postgraduate students and patients with CKD, 2 validated and reliable questionnaires were used. Each questionnaire included the 3 sections of demographic characteristics form, knowledge measurement, and performance assessment. The questionnaires were distributed among 50 internal medicine postgraduate students of Alzahra Hospital and 150 patients with CKD at Alzahra and Hojatieh Hospitals who were selected randomly. The mean scores of knowledge and practice were extracted from the responses provided in the questionnaires. Knowledge and performance of individuals in each questionnaire were quantified and based on this, the average score of knowledge and performance of individuals was calculated. Data analysis was carried out in SPSS software using the Pearson correlation coefficient, Spearman's correlation coefficient, and independent t-test.

RESULTS: The mean score of knowledge and practice of the postgraduate students were 65.1 ± 16.02 and 39.8 ± 16.9, respectively. Furthermore, of the 150 patients with CKD with a mean age of 52.7 ± 16.8 years, 56.2% were men and 45.3% had primary education. The patients' mean score of knowledge regarding the association of CKD and oral health was 45.1 ± 18.8 and that of their practice was 44.04 ± 20.8 out of 100.

CONCLUSION: The findings of this study indicated that internal medicine postgraduate students and patients with CKD had moderate level of knowledge and performance with regard to the association of oral health with CKD. Moreover, the results showed no significant relationship between the internal medicine postgraduate students' knowledge and age, year of residency, and clinical experience, but there was a significant reverse association between the postgraduate students' knowledge and the number of patients with CKD they visited during a week.

KEYWORDS: Knowledge; Oral Health; Chronic Kidney Disease

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Oral cavity reflects the health status of an individual and acts as a primary alarm system.[1] Oral cavity is important in that a number of systemic diseases are only diagnosed through oral manifestations.[2] Periodontal diseases and dental caries have always been considered the most common oral health problems worldwide.[3] Periodontal disease is defined as a chronic, infectious, and inflammatory oral condition that occurs due to dental plaque accumulation, and environmental and genetic factors. It can lead to the destruction of tooth-supporting tissues and may cause tooth loss if not treated.[4]

Chronic kidney disease (CKD) is defined

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as a reduction in glomerular filtration rate (GFR) to below 60 ml/min/1.73 m^2 or evidence of renal failure such as albumins, abnormal urinary sediment, etc. for at least 3 months. This disease is commonly caused by diabetes, hypertension, glomerulonephritis, and polycystic kidney disease.[5] Patients with CKD are classified into 5 categories based on their GFR. In the end-stage phase, the GFR of the patient is usually 7-8 ml/min/1.73 m^2, renal function is terminated, and patients require therapies such as kidney transplantation or hemodialysis for the rest of their lives.[6]

Many studies have shown the association of poor oral health and periodontal diseases with systemic diseases such as cardiovascular diseases (CVDs), cardiac arrest,[7] and preterm delivery.[8] Recent studies have also reported the influential role of oral health in diabetes,[9] respiratory diseases such as pneumonia, and chronic obstructive pulmonary disease (COPD).[10] Furthermore, numerous studies have suggested the interaction of periodontal disease and CKD.[7-12]

Poor oral health has also been reported to be higher in patients with CKD than in healthy individuals. Poor oral health in dialysis patients can be due to the depression caused by the difficult conditions of the disease or long stay in dialysis centers.[13,14] Most people suffering from renal diseases have shown symptoms of moderate-to-severe periodontitis. Periodontitis is closely associated with a decrease in serum albumin to below 3.6 g/dl, and increased systemic inflammatory factors such as C-reactive protein (CRP) and interleukin-6 (IL6), both proposed to be risk factors for increased disability and mortality in patients under dialysis. These conditions highlight the necessity of monitoring the periodontal conditions of patients who are candidates for kidney transplantation.[11,13]

Moreover, CKD has adverse effects on teeth, oral cavity, periodontium, and salivary glands.[11] Gingival enlargement due to drug therapy is the most prevalent oral manifestation in patients with kidney transplantation.[12] There are signs of dry mouth in hemodialysis patients due to a decrease in liquid intake. Chronic dry mouth predisposes the patients to sialadenitis, dental caries, inflammation, and oral infection.[11,12] Anemia is also a very common problem in patients with CKD, which occurs as a result of interference with the production of erythropoietin.[13] A study reported abnormal lip pigmentation as the most prevalent manifestation in patients with CKD.[14] Moreover, white, red, and gray spots and ulcers are seen in the mouth of many dialysis patients. Furthermore, enamel hypoplasia, root calcification, abnormal salivary pH, delayed eruption of permanent teeth, and loss of non-carious teeth have been observed in patients with CKD.[12,15]

Some studies on the analysis of internal medicine doctors' knowledge of the relationship between periodontal diseases and systemic diseases indicated that they had good knowledge of the significance of dentistry and oral manifestations of systemic diseases, which facilitated the early diagnosis of the disease and reduced the risk of disability and mortality. Moreover, the majority of these doctors had appropriate performance in recommending patients for routine periodontal examinations.[1,16] However, another study showed 42.2% of nephrologists and 38% of nephrology nurses did not ordinarily examine the oral status of their patients, and only 30% of patients were advised to go to a dentist.[17] In another study, 147 patients under peritoneal dialysis and hemodialysis were investigated using a questionnaire and non-invasive oral examination. Most patients reported they brushed their teeth once a day or more, but scarcely or never used dental floss. Furthermore, most of the patients reported that they had dental checkup less than once every 5 years.[13] However, another study showed 55% of dialysis patients received usual dental care every 6 months, 24% visited a dentist only when they felt pain or had a problem, and 21% never used dental services.[12]

Since few studies have been conducted to assess the knowledge and performance of renal patients and health personnel regarding the oral manifestations of renal patients as well as the effect of oral health on patients with CKD, the present research was conducted with the aim to study the knowledge and performance of internal medicine postgraduate students and patients with CKD with respect to the association of oral health with CKD. It was hypothesized in the present study that internal medicine postgraduate students and patients with CKD have a high level of knowledge and suitable performance regarding the relationship between oral health and CKD.

Methods

This research was designed as a descriptive-analytical, cross-sectional study to assess the knowledge and practice of internal medicine postgraduate students and patients with CKD in 2018. The participants were selected through simple sampling method. The data were collected using questionnaires which were designed based on the objectives of the study and the questionnaires used in relevant studies.[3,10,11,13,14,18]

Each questionnaire consisted of 3 sections, including demographic characteristics form, knowledge measurement, and practice assessment. The first section collects data on the demographic characteristics of the participants. The demographic characteristics questions for the internal medicine postgraduate students included questions related to age, gender, year of residency, clinical experience, the number of patients with CKD visited during a week, and knowledge about oral diseases. The demographic characteristics questions for patients with CKD included questions on age, gender, place of residence, education, occupation, type of renal disease, history of renal disease, and other renal diseases.

The second section of the questionnaire measures the participants' knowledge. The content validity of the items on knowledge measurement was confirmed by a group of experts including 3 periodontists and 2 academic research experts. Finally, 15 items were constructed for internal medicine postgraduate students and 14 items for patients with CKD. The reliability of the questionnaires was determined using Guttman's reliability coefficient. A correct response to each item received a score of 1 and an incorrect response received a score of 0, yielding a possible total scoring range of 0–100.

In the third section of the questionnaire, 3 items were constructed for the internal medicine postgraduate students and 11 items for the patients with CKD, of which, 6 items are scored on a rating scale, 2 items are merely reported, and 3 items are related to demographic characteristics and are presented in this section because of closeness to the items on the patients' practice. The items on the practice of postgraduate students and patients were rated as high, moderate, and low. High, moderate, and low level of performance was given a score of 3, 2, and 1, respectively, and the other items received a score of 0. The total score of practice was then adjusted to 100. Finally, the mean scores of the knowledge and practice of internal medicine postgraduate students and patients with CKD regarding the relationship between oral health and CKD were calculated. The mean scores of 0-33, 33-66.5, and 66.6-100 indicate poor knowledge/practice, moderate knowledge/practice, and high level of knowledge/practice, respectively. The reliability of the questionnaires was evaluated using Guttman's reliability coefficient and the test-retest model. Sample size for postgraduate students' group was obtained using the following formula:

$$n = \frac{N.Z^2.\delta^2}{d^2(N-1) + Z^2.\delta^2}$$

For 50 postgraduate students, the mean score of knowledge and practice was estimated at 95% confidence interval (CI) and maximum error of 0.25.

The following formula was used to determine the sample size for the patients' group:

$$n = \frac{Z^2.\delta^2}{d^2}$$

For 150 patients, the mean score of knowledge and practice was estimated at 95% CI and maximum error of 0.24. The questionnaires (relate to postgraduate students) were distributed among 50 internal medicine postgraduate students of Isfahan University of Medical Sciences, Iran, in 2018. The questionnaires related to patients were distributed among 150 randomly selected patients with CKD in the hemodialysis center of Hojatieh Hospital, Iran, as well as the department of nephrology of Alzaha Hospital, Iran, who met the inclusion criteria of the study (having a disease history of at least 6 months and 10 teeth) through simple sampling method. This study was approved by the Ethics Committee of Isfahan University under the code 396273. The objectives of the study and the questionnaires were explained to the participants. The researchers monitored the completion of the questionnaires until the end of the time allocated to filling out the questionnaires. Explanations were provided to the participants if they had any questions, and questions were read to those who were unable to read. The data obtained from the questionnaires were fed into SPSS software (version 22; IBM Corp., Armonk, NY, USA) and mean scores of knowledge and practice were extracted and measured accordingly. Data analysis was performed using the Pearson correlation coefficient, Spearman's correlation coefficient, and independent t-test.

Results

Table 1 shows the demographic data of internal medicine postgraduate students and the mean scores of knowledge and practice of postgraduate students and patients with CKD.

The results of the Pearson correlation coefficient test showed a direct correlation between the mean practice score of postgraduate students and their mean score of knowledge about the interaction of CKD and oral diseases (P = 0.03; r = 0.211). Moreover, there was no significant relationship between the postgraduate students' knowledge and age (P = 0.62; r = 0.076) and clinical experience (P = 0.66; r = 0.067), but there was a significant reverse relationship between their knowledge and the number of patients they visited per week (P = 0.04; r = - 0.208).

Table 1. Demographic data and mean scores of knowledge and performance in internal medicine postgraduate students and patients with chronic kidney disease (CKD)

Variable (internal medicine postgraduate students)	Mean ± SD
Age (year)	31.6 ± 6.1
Clinical experience (year)	4.4 ± 4.1
Number of patients visited during a week	6.2 ± 3.9
Knowledge	65.1 ± 16.0
Performance	39.8 ± 16.9
Variable (Patients with CKD)	
Age	52.7 ± 16.8
Knowledge	45.1 ± 18.8
Performance	44.0 ± 20.8

SD: Standard deviation; CKD: chronic kidney disease

In addition, there was a significant direct relationship between the postgraduate students' practice and age (P = 0.001; r = 0.230) and clinical experience (P = 0.044; r = 0.204), but there was no significant association between their practice and the number of patients they visited per week (P = 0.410; r = -0.119). The results of Spearman's correlation coefficient test indicated no significant correlation between the postgraduate students' knowledge and year of residency (P = 0.270; r = 0.159), but showed a significant direct correlation between their practice and year of residency (P < 0.001; r = 0.301). Furthermore, the results of independent t-test showed no significant difference between male and female postgraduate students in terms of the mean score of knowledge (P = 0.45). However, the

mean score of practice was significantly higher in male postgraduate students than in female students (P = 0.020).

In the second part of this study, 150 patients with CKD aged 18-90 years, with a mean age of 52.7 ± 16.8 years, were recruited. Among the patients, 56.7% were men, 81.3% lived in the city, and 45.3% had primary education. The frequency distributions of the type of renal disease and the duration of the disease are presented in table 2.

Table 2. Frequency of type of renal disease and duration of disease

Variable	n (%)
Type of renal disease	
Kidney dialysis	95 (3.63)
Kidney transplantation	21 (14.00)
Other renal diseases	34 (7.22)
Duration of disease	
Less than 1 year	38 (3.25)
1-5 years	55 (7.36)
More than 5 years	57 (38.00)
Other diseases coinciding with renal disease	
Diabetes	54 (36.00)
Hypertension	75 (50.00)
Heart failure	32 (21.30)
Respiratory diseases	26 (17.30)
other diseases	22 (14.70)

As shown, 22.7% of CKD patients had renal disorders other than dialysis and kidney transplantation. These disorders included high creatinine, proteinuria, hematuria, and polycystic kidney. The frequency distribution of the coexistence of other diseases with renal disease is also presented. The highest frequency was related to hypertension (50%).

The patients' mean score of knowledge of the relationship between CKD and oral health was 45.1 ± 18.8 and that of their practice was 44.04 out of 100. The results of the Pearson correlation coefficient showed a significant direct correlation between the patients' practice score and their knowledge score concerning the association of oral health with CKD (P = 0.004; r = 0.236). There was no significant relationship between the patients' knowledge and their age (P = 0.820; r = 0.019), but there was a significant inverse relationship between their performance and age (P = 0.010; r = - 0.206).

The results of Spearman's correlation coefficient test showed no significant correlation between the patients' knowledge and their education (P = 0.250; r = 0.095), but showed a direct correlation between their practice and education (P < 0.001; r = 0.321). Moreover, there was a significant direct correlation between the patients' duration of disease and knowledge (P = 0.020; r = 0.196) and practice (P < 0.001; r = 0.288). In addition, the results of independent t-test indicated no significant difference between male and female patients in terms of their practice (P = 0.990), but the mean score of knowledge was significantly higher in women compared to men (P = 0.044). Furthermore, there was no significant difference between urban and rural patients in terms of the mean scores of knowledge (45.1 ± 18.3 and 43.9 ± 20.8, respectively) (P = 0.75) and practice (44.9 ± 20.9 and 39.6 ± 19.2, respectively) (P = 0.210); 122 (81.3%) and 28 (18.7%) patients were residents of urban and rural areas, respectively.

As shown in table 3, the results of one-way ANOVA showed a significant association between the patients' type of renal disease and their mean scores of knowledge (P = 0.040) and practice (P = 0.002). The mean scores of knowledge and practice were both higher in the kidney transplantation patients than in the dialysis patients and those with other renal diseases (Table 4).

Table 3. Mean scores of patients' knowledge and performance by type of disease

Score	Kidney dialysis (mean ± SD)	Kidney transplantation (mean ± SD)	Other renal diseases (mean ± SD)	P
Knowledge	43.6 ± 17.7	53.7 ± 23.2	43.6 ± 18.7	0.040
Performance	41.9 ± 19.7	57.9 ± 21.2	40.2 ± 18.2	0.002

SD: Standard deviation
*One-way ANOVA

Table 4. Two-by-two comparisons of mean ± standard deviation (SD) of patients' knowledge and performance due to their type of disease

Score	Kidney transplantation/Other renal diseases	Kidney dialysis/Other renal diseases	Kidney dialysis/kidney transplantation
Knowledge	0.006	0.901	0.015
Performance	0.001	0.692	0.002

*LSD test

Discussion

The present study evaluated the knowledge and practice of internal medicine postgraduate students and patients with CKD regarding the relationship between oral health and CKD. The participants of this study comprised of 50 internal medicine postgraduate students and 150 patients with CKD. The mean score of knowledge in postgraduate students was calculated to be 65.1 out of 100, indicating that they had moderate knowledge about the symptoms of oral diseases, prevention of oral diseases, and association of oral diseases with systemic diseases, especially CKD. Most of the postgraduate students asserted the need for further studies on oral diseases.

The study conducted by Umeizudike et al. showed that internal medicine postgraduate students had inadequate knowledge about periodontal diseases as risk factors for systemic diseases.[16] In another study, Mehrotra et al. found that doctors had good knowledge about the significance of dentistry and oral manifestations of systemic diseases.[1] Moreover, Bastos et al. reported that the majority of nephrologists and nurses dealing with renal diseases had good general knowledge about periodontal diseases.[17] Since the postgraduate students' knowledge score was in a high range in this study (65.1), it seems that they would gain better knowledge by visiting a greater number of CKD patients or by teaching the materials related to oral health.

The internal medicine postgraduate students' mean score of practice was 39.8 out of 100, indicating that they had moderate practice in oral examination of patients with CKD, patients' referral to the dentist, and tracking the oral problems of patients in follow-up examinations. Umeizudike et al. also reported that most of the internal medicine postgraduate students had good practice in patient referral for routine periodontal examinations.[16] Furthermore, Bastos et al. reported that 42.2% of nephrologists and 38% of kidney nurses did not perform oral examinations for their patients.[17] They also reported poor practice regarding patient referral for dental care.[17]

The present study showed a weak positive relationship between the knowledge score and performance score of internal medicine postgraduate students. This indicated that with an increase in knowledge about oral health among postgraduate students, their practice in oral examinations and patient referral was promoted, which prevented the progress of periodontal diseases in renal patients. Therefore, given the interaction of CKD and oral diseases, especially periodontal diseases, and their critical effect on the amelioration or exacerbation of the disease, further studies and training are required to improve the performance of internal medicine postgraduate students in dealing with oral diseases in renal patients.

In the present study, the mean score of knowledge of the patients with CKD was 45.1 out of 100, which indicated that they had moderate knowledge about the manifestations of oral diseases, prevention of oral diseases, and association of oral diseases with systemic diseases, especially CKD. The majority of patients had received information about oral health and felt they needed to enhance their knowledge about oral health. Potter and Wilson showed that 68% of dialysis patients were not aware of the significance of oral health and standard oral hygiene.[19]

Moreover, the mean score of the

performance of the patients with CKD was 44.04 out of 100, indicating moderate performance in oral health, solving oral health problems, and regular referral to a dentist. Impatience was the main reason for the low frequency of tooth brushing among renal patients. Moreover, the use of toothpick and impatience were the major reasons for the low frequency of dental flossing during the week. It seems that most of the patients had insufficient knowledge about the importance of tooth brushing, especially dental flossing. They seemingly gained sufficient motivation for maintaining their oral health by enhancing their knowledge about the significance of oral health in preventing systemic diseases. Chamani et al. also reported poor oral health in dialysis patients in Kerman, Iran.[20] Klassen and Krasko, in a study in Paul's Hospital in Canada, found that the majority of dialysis patients had a suitable performance in tooth brushing, but scarcely or never used dental floss.[13]

The current study indicated a significant positive and weak relationship between the performance of patients with CKD and their knowledge. This means that with a rise in the knowledge of renal patients, their practice in the maintenance of oral health and their annual dental visit was improved, which is indicative of the necessity of enhancing their knowledge to promote their practice. The knowledge of patients with CKD can be improved through mass media such as television and social networks so that their practice in oral hygiene can be improved and they have regular dental visits.

This study showed that the mean score of practice was higher in male postgraduate students than in female students. Furthermore, there was no significant relationship between the postgraduate students' knowledge and age, year of residency, and clinical experience, and contrary to expectations, the knowledge of postgraduate students did not increase with an increase in age, year of residency, and work experience. In addition, there was a significant reverse correlation between the postgraduate students' knowledge and the number of patients they visited during a week. Normally, internal medicine postgraduate students should acquire more comprehensive information about all aspects of this systemic disease by visiting a greater number of patients, but they had less information in this regard, which can be due to the insignificance of oral knowledge for them, high workload and numerous shifts, and little chance to study. Umeizudike et al. also reported no association between Nigerian internal medicine postgraduate students' knowledge about periodontal diseases and gender, age, and year of residency.[16]

Moreover, there was a significant direct relationship between the postgraduate students' practice score and age, year of residency, and clinical experience. These scores indicated that the postgraduate students' performance improved with an increase in age, year of residency, and clinical experience. It seems that doctors' practice regarding the referral of patients to a dentist improves as they acquire more experience and visit more patients. Lack of significant association between the postgraduate students' knowledge and age, year of residency, and work experience, unlike their practice, can be due to the fact that they have gained practical experience through clinical work, but have not acquired sufficient knowledge because they have not studied enough in this regard.

Hamissi et al. showed that periodontal diseases were highly prevalent in dialysis patients with poor oral health and might be increased with the chronicity of the disease; hence, these patients need more comprehensive and professional dental care, and personal hygiene training irrespective of the duration of dialysis.[21] The current study also showed that the mean score of knowledge was higher in female renal patients than in male patients. There was no significant difference between the patients residing in urban and rural areas with respect

to their mean scores of knowledge and performance. Thus, urban residence did not lead to higher knowledge and better performance in the patients.

There was also no significant relationship between the patients' knowledge score and their age and education, indicating that even educated people had insufficient knowledge about oral health and its effect on their disease. However, there was a significant reverse relationship between the patients' practice and their age, which seems to be due to the fact that as the patients become older, they become less patient and able to observe their oral health and think they do not need to take care of their remaining teeth. Nevertheless, younger people are more patient and capable, and understand the importance of maintaining their teeth in good condition and having a beautiful smile as a result of the effect of society and mass media.

Moreover, there was a significant direct relationship between the patients' practice scores and their education. The patients' level of knowledge increased as their education increased, so they felt more responsible for taking care of their oral health. There was also a significant direct association between the duration of the disease and knowledge and practice in renal patients. The patients' knowledge and practice were enhanced with a rise in duration and chronicity of the disease. This might be because they observed the interaction of oral diseases and renal diseases over time, and therefore, gained more knowledge and improved their practice compared to newly diagnosed patients.

Furthermore, there was a significant relationship between the type of renal disease and knowledge and practice, with the mean scores of knowledge and performance being higher in the kidney transplantation patients than in the dialysis patients and patients with other renal diseases. The higher knowledge and better practice of the kidney transplantation patients may be due to the requirement to ensure complete oral-dental health in patients who are candidates for kidney transplantation because these patients are susceptible to localized and diffuse oral infections as a result of using immunosuppressive drugs, which can lead to transplantation rejection.[13]

Given the inadequate knowledge and poor practice of internal medicine postgraduate students and patients with CKD with regard to the association of oral health with CKD, it is suggested that the knowledge of these two groups about interaction of oral diseases with systemic diseases like CKD be increased through educational posters and brochures as well as mass media such as newspapers and television. Future studies are also recommended to recruit a greater number of postgraduate students and to study dialysis patients, kidney transplantation patients, and patients with other renal diseases separately. This study had a few limitations such as insufficient time for postgraduate students to complete the questionnaires and Inadequate physical condition of patients at the time of filling in the questionnaire. Hence, filling out all these questionnaires was rather difficult.

Conclusion

The findings of this study showed that internal medicine postgraduate students had moderate knowledge and practice regarding the interaction of oral health and CKD. There was a positive and weak relationship between the knowledge and practice of internal medicine postgraduate students and patients with CKD with regard to the interaction of CKD and oral diseases. Moreover, patients with CKD had moderate knowledge and practice regarding the interaction of oral health and CKD. There was no significant difference between the male and female patients in terms of their practice, but there was a direct relationship between the duration of renal disease and patients' knowledge and practice. There was also a significant association between the type of renal disease and patients'

knowledge and practice; the mean scores of knowledge and practice were significantly higher in the kidney transplantation patients than in the dialysis patients and patients with other renal diseases.

Conflict of Interests

Authors have no conflict of interests.

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