

Knowledge, Attitudes and Performance of Iranian Endodontists to Patients with Kidney Diseases

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ABSTRACT

Objective: The high prevalence of chronic kidney disease in the community, especially in older patients, makes their management an important aspect of clinical practice. The aim of this study was to evaluate the knowledge attitudes and performance of Iranian endodontists regarding patients with chronic kidney disease (CKD).

Methods: This cross-sectional, descriptive-analytical study involved 100 Iranian endodontists (41 M, 59 F), who completed questionnaires with 21 items on CKD. Responses were analyzed by SPSS, using Chi-square or Fisher's exact tests.

Results: Overall levels of knowledge were rated as optimal in 55% of subjects, while attitudes to care were favourable in 83%. This cohort of specialist clinicians had strong scores for optimal attitude and performance. Awareness of issues around prescribed analgesics, antibiotic cover, bleeding risk and hypertension was high. Proximity to specialist training (younger specialists, and less years in practice) and female gender were associated with significantly higher scores across the three domains measured.

Conclusion: Most specialists were aware of requirements for safe care of dental patients with CKD. Continuing professional education should target older clinicians who may have had less exposure to formal training in this topic during their clinical training.

Keywords: Chronic kidney disease, clinical performance, dialysis, endodontics, renal failure

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HIGHLIGHTS

- Management of patients with CKD by this cohort of endodontists was generally done well, with sufficient knowledge of basics of CKD, as well as a positive attitude to their care, and performance in line with current literature.
- More recent specialist training gave higher scores across the three domains measured, indicating that younger specialists were better informed of current CKD management issues than older specialists. Care of patients with CKD should be included in continuing professional development programs for endodontists.
- Clinicians need to be aware of the many impacts of CKD on clinical endodontic care, including issues with hypertension, diabetes mellitus, and bony pathology, as well the importance of medical advice for anticoagulated patients, and the need to monitor blood pressure and coagulation status.

INTRODUCTION

Chronic kidney disease (CKD) is a common medical condition in most parts of the world, especially in older adults, with strong causal

links to hypertension and diabetes mellitus. The implications of CKD for clinical care are substantial, including in more advanced stages of CKD such as end stage renal disease (ESRD),

increased drug toxicity, anaemia, and greatly elevated risks of bleeding and infection (1–6). These issues make CKD one of the most important systemic disorders to be aware of. The risk of complications during and after treatment means that dentists must be aware of how to identify and manage patients with CKD, especially as the number of patients on dialysis or kidney transplantation who need important considerations grow. (1, 2) Due to major health risks posed by infections in these patients, endodontic treatment not only preserves teeth but addresses dentoalveolar infections, thus improving the quality of life of patients with CKD.

One of the most common challenges for specialist endodontists in their clinical work is dealing with patients with systemic diseases that cause CKD or as a consequence of it, such as hypertension, ischemic heart disease, and cerebrovascular disease. Patients with CKD are at greater risk of myocardial infarction, depending on the severity or stage of the disease. In advanced stages of CKD, patients need frequent dialysis or a kidney transplant to survive. If such patients require root canal treatment, a range of alterations to normal clinical care are needed to avoid complications (7–10). Patients with CKD have elevated risks from bacteremias, which can cause bacterial endocarditis (11). They are also at increased risk of increased blood loss during endodontic surgery, or from incision and drainage, because of the administration and use of heparin during dialysis (12).

Due to the rising prevalence of CKD worldwide (8), it is likely that clinicians will encounter these patients in their clinics in increasing numbers over the coming years, since therapies to halt or slow the progression of the disease have not been successful (7). As gradual destruction of nephrons occurs, with reduced kidney function, the problems of infection and bleeding rise, as well as those caused by the effects of CKD on other body systems (9). Patients with ESRD or those undergoing hemodialysis who are prescribed medicines are at greater risk of toxicity for those medicines excreted through the kidneys. This is an issue for certain anti-inflammatory drugs such as ibuprofen, which could cause further hypertension, and aspirin, which would worsen the bleeding tendency. The safe prescribing of medicines to treat pain and inflammation in patients with CKD is challenging (10, 13).

Endodontists must have enough knowledge about CKD and its implications to treat patients safely. This includes the importance of treating active endodontic infections, since the most common cause of death in patients with ESRD is cardiac arrest triggered by an infection (10). Apical periodontitis (AP) is common in patients with ESRD, and needs to be treated properly as part of the overall management of the condition (14). Around 90% of CKD patients are likely to experience oral symptoms (9), and those who die from kidney failure have fewer teeth and more oral infections than those without CKD age matched cohorts (15).

Thus, the timely provision of care by endodontists is important in reducing morbidity and preventing mortality as a result of CKD complications. Accordingly, the present study explored the background knowledge and attitudes of a cohort of endodontists in Iran regarding caring for patients with CKD.

MATERIALS AND METHODS

This cross-sectional descriptive-analytical study was conducted with endodontists in Iran as the subjects. The research was conducted from 2019 to 2020. The study was approved by the Research Council of the Student Research Committee of the Kerman University of Medical Sciences (approval No. IR.KMU.REC.1398.248).

As there have been no prior studies of this topic, the sample size for the survey ($n=100$) was estimated from a pilot study using 10 endodontists drawn from a range of backgrounds.

Questionnaire

The survey was distributed to endodontists attending the Symposium of the Iranian Endodontists Association in Kerman, and to endodontists working at seven universities in Iran (Tehran University, Shahid Beheshti University, Tehran Islamic Azad University, Mashhad University, Isfahan University, Shiraz University, and Shahed University). A total of 110 questionnaires were distributed.

Based on the literature on dental implications of CKD, a total of 21 items were included (Table 1). These were based on the latest considerations regarding the dental management of patients with kidney disease, and were drawn from several keynote references on this subject (9–11). The items were designed to assess knowledge of CKD, attitudes and provision of care to CKD patients. Responses to each item were rated on a 5-point Likert scale from strongly disagree to strongly agree for each statement.

The questionnaire was tested in a pilot study with 10 endodontists, to ensure both face validity and content validity, to ensure that all important aspects of the topic of CKD were covered. The test-retest reliability was assessed by repeating the pilot test after 2 weeks, yielding an intra-cluster correlation coefficient (ICC) of 0.9, confirming its reliability.

There were 7 questions related to performance. The mean score across this section was used to categorize performance, as follows: from 1 to 2.5: Undesirable performance; from 2.51 to 3.5: Acceptable performance; and from 3.51 to 5: Optimal performance. There were 4 questions related to attitudes. The mean scores were again used to categorize attitudes, using the same boundaries, into Undesirable, Acceptable and Optimal. Finally, there were 10 questions related to knowledge. Using the same approach, the mean scores were used to categorize this into Undesirable, Acceptable and Optimal. SPSS software (version 22) was used for statistical analysis, with frequency data compared using Chi-square and Fischer's exact tests. A significance level of 5% was used for all tests ($P=0.05$).

The survey also collected demographic data on the respondents, namely age, work experience, nature of employment (university faculty, private office or clinic, etc) and the number of working hours per week. No private or identifying information was collected.

RESULTS

From the 110 questionnaires that were distributed, there were 100 valid questionnaires returned within the prescribed re-

TABLE 1. Questionnaire items**Knowledge domain**

Acetaminophen is the best analgesic for these patients
 Lesions mimicking the appearance of periapical lesions may be observed in radiographs of these patients
 The maximum number of analgesic cartridges containing epinephrine 1:1000 % should be two
 The appropriate INR for endodontic procedures is 4-6.
 The best time to work on patients on hemodialysis is one day after hemodialysis
 Peritoneal dialysis does not cause additional problems in dental procedures
 Antibiotic prophylaxis is required during incision and drainage
 In patients who undergo hemodialysis, if an IV injection is needed, it is best given in the arm with the shunt
 Diabetes and cardiovascular disease are common in people on dialysis
 Gingival enlargement may be seen in patients who have had a kidney transplant

Attitude domain

I consider it necessary to consult a specialist before starting treatment.
 I consider the treatment of such patients troublesome.
 Since a patient undergoing hemodialysis may be a carrier of diseases, I will refuse to accept such cases as much as possible
 I consider the doctor's advice on dosage and intervals of medication

Performance domain

I check the patient's blood pressure during treatment
 I request a platelet count test and screening for all these patients
 I will only change the dose if the patient is on hemodialysis
 If a patient is on hemodialysis, I will make an appointment the day before the hemodialysis.
 I will prescribe NSAIDs for these patients
 I refuse to prescribe drugs that suppress CNS activity
 Antibiotic prophylaxis is not necessary if incision and drainage are necessary.

INR: International Normalised Ratio, NSAIDs: Non Steroid Anti Inflammatory Drugs, CNS: Central Nervous System

sponse time with all questions answered fully. The 100 respondents to the survey were endodontists working across different geographical areas of Iran. The gender distribution was 41 males and 59 females. The demographic characteristics and working patterns of the respondents are shown in Table 2. The most dominant group of respondents were university faculty members (78%), aged 45 years or less (76%) with 15 years or less of work experience (78%), and working 20 hours or less in a private office or public dental clinic (69%).

The views of endodontists on the management of patients with CKD are summarized in Table 3, which shows responses for agree and strongly agree combined, with items arranged by theme and ranked from most frequent to least. In terms of prescribing, the majority of practitioners were aware of issues with prescribing analgesics and situations where antibiotic cover was warranted. The majority of respondents were aware of issues with diabetes and cardiovascular disease in CKD patients (84%), and that the best time to undertake clinical work on patients undergoing dialysis was the day after dialysis (84%). Some 68% of respondents would check a patient's blood pressure during treatment.

A summary of the categories of practitioners for performance, attitude and knowledge is provided in Table 4. The most common categories were acceptable performance (61%), optimal attitude (83%) and optimal knowledge (55%). Only 3% had inadequate performance, and 2% had an inadequate attitude.

There was a statistically significant relationship between attitude and gender, with female endodontists being more likely

TABLE 2. Characteristics of the 100 valid respondents

Parameter	Category	%
Faculty member	Yes	78
	No	22
Workplace type	Private office	56
	Public dental clinic	44
Age (years)	45 years and less	76
	46 years or more	24
Work experience (years)	15 years or less	78
	16 years for more	22
Working hours per week	20 hours or less	69
	21 hours or more	31

to have optimal attitude than male endodontists (88.1% versus 57.6%, $P=0.043$). There was also an effect of age on performance, when the respondents were dichotomized into those aged 45 years or less, versus more than 45 years. Younger endodontists were more likely to have optimal performance than older endodontists (42.1% vs. 16.7%, $P=0.026$). This same effect was also seen when respondents were dichotomized by years of work, into 15 years or less, versus more than 15 years. The group with less years of practice were more likely to have optimal performance (41.0% vs. 18.2%), and less likely to have inadequate performance (1.3% vs. 9.1%, $P=0.036$).

There were no significant effects of gender on performance or knowledge. Furthermore, there was no effect of work setting (faculty membership, workplace status) or working hours per week on the distributions of respondents in any of the 3 categories.

TABLE 3. Extent of agreement on CKD patient management

Use of medicines

- 84% Acetaminophen is the best analgesic for these patients
- 59% Antibiotic prophylaxis is required during incision and drainage
- 50% I will change the dose of what I prescribe if the patient is on hemodialysis
- 47% No more than 2 cartridges of local anaesthetic containing adrenaline should be used
- 34% I will not prescribe drugs that suppress CNS activity
- 7% I will prescribe NSAIDs for CKD patients

Systemic health

- 84% Diabetes and cardiovascular disease are common in people on dialysis
- 84% The best time to work on patients undergoing dialysis is one day after dialysis
- 68% I check the patient's blood pressure during treatment
- 29% For patients on dialysis, I will make their appointment the day before dialysis.
- 28% Dialysis does not cause additional problems in dental procedures
- 23% In patients who undergo hemodialysis, if an IV injection is needed, it is best given in the arm with the shunt
- 17% The appropriate INR for endodontic procedures is 4-6.

Oral lesions

- 77% Lesions mimicking periapical pathology lesions may be observed in radiographs of CKD patients
- 76% Gingival enlargement may be seen after a kidney transplant

Medical advice

- 97% I consider the doctor's advice on dosage and intervals of medication
- 89% I consider it necessary to consult a medical specialist before starting treatment
- 52% I request a platelet count for all CKD patients

Willingness to treat

- 31% I consider the treatment of such patients troublesome
- 4% I refuse to accept such cases because they may be a carrier of diseases

CKD: Chronic kidney disease, CNS: Central Nervous System, NSAIDs: Non Steroid Anti Inflammatory Drugs, INR: International Normalised Ratio

TABLE 4. Summary of practitioners by category

Parameter	Category	Percentage all endodontists	Percentage males (n=41)	Percentage females (n=59)	Percentage Age <45 yr	Percentage Age >45 yr
Performance	Inadequate	3	5	1	1	8
	Acceptable	61	66	58	57	75
	Optimal	36	29	41	42	17
Attitude	Inadequate	2	0	3	3	0
	Acceptable	15	24	9	13	21
	Optimal	83	76	88	84	79
Knowledge	Inadequate	0	0	0	0	0
	Acceptable	45	44	46	45	46
	Optimal	55	56	54	55	54

DISCUSSION

The results of the present study show that most Iranian endodontists have a good grasp of the major issues that arise for providing safe and timely care to patients with CKD. This cohort of specialists had better knowledge about CKD patients than was reported in a previous study of general dentists, within which many general dentists were unfamiliar with the management issues for CKD patients who had undergone renal transplantation (16).

In contrast, in the current study the Iranian endodontists were aware of gingival enlargement caused by immunosuppressive drugs such as cyclosporine being common after renal transplantation.

Those endodontists in the present study who were younger and had less years in clinical practice were rated more highly for performance. This may reflect improvements in specialist training that have occurred over time, with greater empha-

sis being placed on the care of medically complex patients who present for specialist-level care. No past studies have explored the care of patients with CKD by endodontists. Hence, this study provides a baseline against which other cohorts of dental specialists can be compared. As well as information gained during specialist training, continuing education after graduation can also improve the knowledge, attitude, and performance of endodontists (17), and likewise general dentists. Such educational programs may, in addition to updating knowledge, also improve the attitudes of clinicians (18, 19).

Chronic kidney disease poses many implications for the safe provision of dental care, and the respondents in this study were, in general, aware of issues around prescribing analgesics, and challenges posed by hypertension. With an increasing number of patients with CKD who are having dialysis or who have undergone kidney transplantation (1, 2), it is important that clinicians are aware of issues, with bleeding, infection, and the co-morbidities associated with CKD. They also need to follow the principles of quality use of medicines and avoid prescribing certain medicines where renal impairment means toxicity is more likely to occur. This is especially the case for non-steroidal anti-inflammatory drugs, including ibuprofen, naproxen and aspirin. Respondents in the present study were, in general, well aware of the risks posed by this class of medicines. Nonsteroidal anti-inflammatory drugs should not be used in patients with CKD (20). Nevertheless, acetaminophen can be used safely for patients with advanced CKD (21).

A major management issue in patients with CKD is hypertension. This is a leading cause of death in kidney failure, and a significant cause of cardiovascular disease (22–24). The extent of the problems caused by hypertension relate to the extent of renal disease. Most respondents in this study were aware of issues related to hypertension. Some 84% were aware of the impacts of this on cardiovascular disease, and 68% of endodontists made the effort to check the patient's blood pressure during treatment. The position of the dental chair does not require special consideration unless kidney disease is associated with another complication (3).

A further major clinical concern with CKD patients is excessive bleeding. Given the severity of this issue, recommendations to seek results of platelet counts and platelet function assays have been made (3, 13). For the respondents in the present study, 89% considered it necessary to consult a medical specialist before starting treatment, and 52% requested a platelet count for CKD patients prior to starting treatment.

The present study shows that most endodontists understood the importance of timing, as 84% knew that the best time to undertake dental treatment on CKD patients undergoing dialysis was the day after dialysis. Dental treatment is best done the day after dialysis when the patient's blood has the lowest level of toxins (25).

Secondary hyperparathyroidism is common in CKD patients. It can cause radiolucent lesions in the jawbones that can mimic the appearance of an endodontic lesion (26). Some 77% of en-

dodontists were aware that CKD patients could present with lesions mimicking periapical pathology in radiographs.

The willingness of the endodontists in this study to provide treatment to patients with CKD has important implications for the general health of these patients, since patients with severe forms of CKD, such as end-stage renal disease, have an elevated risk of potentially life-threatening infections, and untreated endodontic infections may increase their comorbidities (27–29), with poor oral health being linked to early death (30).

Because of their medical complexity, CKD patients not only experience worse oral health, but also may struggle to access timely endodontic treatment (31, 32). Similar concerns apply for untreated dental caries, which will progress faster in CKD patients because of salivary gland hypofunction and enamel hypoplasia (33, 34). As a result, timely access to endodontic treatment can considerably impact upon the lives of CKD patients in a positive way. Studies conducted in Taiwan using real-world population-based data have documented improved survival in CKD patients undergoing dialysis when timely root canal treatment was undertaken (35).

Gaining access to such endodontic treatment for patients with CKD who live in rural and remote areas. An association between CKD and disadvantage has been reported (36), as have regional variations in the prevalence of CKD between urban and remote regions (37). This is a challenge given that around the world most dentists and endodontists are located in major urban centres, rather than in remote regions where rates of CKD in the population are higher.

CONCLUSION

The present results show that this cohort of specialist clinicians had knowledge that was rated as adequate or optimal knowledge, with strong scores for optimal attitude and performance. Proximity to specialist training (younger specialists, and less years in practice) was associated with higher scores across the domains measured. Continuing professional education could target older specialists who may have had less exposure to formal training in this topic during their specialist training.

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