American Journal of Medicine and Medical Sciences 2022, 12(9): 872-877
DOI: 10.5923/j.ajmms.20221209.04

Checking the Effectiveness of the Proposed Treatment Regimen for Dental Diseases in Patients with CKD

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Abstract The article describes the proposed treatment regimen for dental diseases in patients with chronic kidney disease (CKD), tested in 68 patients in Uzbekistan; its application is justified. The study involved 100 people, including 68 patients with CKD, of which 15 patients received hemodialysis. 32 practically healthy people made up the control group. The results obtained after the application of this scheme are presented: data on the intensity and prevalence of caries, the dynamics of the hygienic state, periodontal status and the state of the oral mucosa, assessment of the condition of fillings in patients with CKD.

Keywords Caries, Prevalence, Intensity, Non-carious lesions, Periodontal disease, COPD, Dentistry, Chronic kidney disease, CKD

1. Introduction

CKD is associated with clinical and radiological changes in the mouth. Radiological changes include thinning of the cortical plate, which is manifested during X-ray examination by transparent areas of the upper and lower jaw lesion. Clinical data in patients with CKD are basically the same as for oral cavity lesions in other systemic diseases. Unfortunately, attention to the oral cavity in CKD is not properly paid.

A causal relationship between oral infections and systemic diseases has not yet been established; however, significant improvements in major systemic diseases have been reported after treatment of associated oral lesions. This indicates the importance of oral care in the treatment of systemic diseases. Insufficient attention is paid to the needs of oral care in this group of patients, which further worsened the prognosis of the underlying disease. A contributing factor is the poor awareness of patients and some doctors of other specialties of dental aspects [1].

The state of organs and tissues of the oral cavity is closely interconnected with the general state of the body. Therefore, with various concomitant general somatic pathologies, teeth, periodontium and mucous membranes often suffer. Numerous studies have proven a change in salivation, microbiocenosis, the state of factors of nonspecific and specific protection in the oral cavity, and other indicators in this pathology. However, in the scientific literature there is practically no information about the state of acid-base balance in the oral cavity in general somatic diseases of the body.

Materials and methods of research. The study involved 100 people, including 68 patients with CKD, of which 15 patients received hemodialysis. 32 practically healthy people made up the control group. The age of the patients was 45-56 years. Men - 58, women - 42 people. The study took place in 2020-2022 on the basis of Samarkand State Medical University, Tashkent State Dental Institute.

Criteria for inclusion in the study: therapeutic patients with inflammatory diseases of the endo- and periodontium (acute and chronic pulpitis, chronic generalized catarrhal gingivitis and chronic generalized periodontitis) with concomitant chronic kidney pathology. Exclusion criteria: patients with a decrease in glomerular filtration rate <15 ml/min/1.73 m2.

The patients were divided into the following groups:

1. A group of people who do not have pathology from the urinary system - 32 people (group A);
2. Patients with chronic kidney disease who are not being treated on hemodialysis - 53 people (group B);
3. Patients with chronic kidney disease who are being treated on hemodialysis - 15 people (group B).

2. Research Results

Our study revealed that in people with CKD, diseases of the hard tissues of the teeth, periodontal and chronic obstructive pulmonary disease (COPD) occur more often and more intense than in people without diseases of the urinary

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Received: Aug. 4, 2022; Accepted: Aug. 29, 2022; Published: Sep. 15, 2022
Published online at http://journal.sapub.org/ajmms

system. In patients with CKD, periodontal diseases are significantly more often detected 92.45% in group B and 93.33% in group B, and among healthy individuals - 59.38%. Moreover, if periodontitis occurs in 37.5% of cases in healthy individuals, then in patients with CKD – in 77.3% and 80.0% (groups B and C, respectively), they need 89%-97% to remove deposits of soft plaque and up to 92% of tartar - with unsatisfactory individual oral hygiene oral cavity (OHI-S - 1.8 ±0.16 and 2.1± 0.17 in groups B and C), and COPD diseases in patients with CKD are detected, on average, in 20% of cases.

Table 1. Methods used in the study

Groups of methods	Methods	Research volume, person		
		Group A	Group B	Group C
Clinical-anamnestic	anamnesis collection, survey	32	53	15
	Study of dental status	32	53	15
X-ray	Orthopantomography	32	53	15

Before the start of therapeutic and preventive measures, the study of dental health in patients of groups A, B and C showed that the prevalence of caries was 60.8%, 65.0% and 71.5%, respectively, non-carious lesions (wedge-shaped defects and erosion) in group A – in 32.1% of cases, in patients of group B - in 21.3% observations, in group B - 47.4%, endodontic treatment (for pulpitis and periodontitis) was carried out in 18, 27 and 9 teeth, respectively. The hygienic condition of the oral cavity was unsatisfactory: OHI-S - 1.81±0.12, 2.3±0.18 and 2.52±0.23 - in three groups. When assessing the periodontal CPITN index, the prevalence and intensity of individual signs of periodontal pathology (bleeding, tartar, periodontal pocket) were established and, depending on this, the need for periodontal care of the examined patients was determined.

An analysis of the effectiveness of dental treatment and preventive measures carried out six months later revealed their safety in 98.1% of cases, a year later - in 95.7% of patients in group A; in group B, an assessment of the condition of fillings in six months revealed their safety in 87.2% of cases, a year later – in 81.0%; in group B, an assessment of the condition of fillings in six months revealed their safety in 78.6% of cases, a year later – in 72.3%.

The X-ray method revealed the absence of periapical lesions in endodontically treated teeth in 97.3% after 6 months and 95.2% after 12 months in group A; in 89.1% after 6 months and 77.1% after 12 months in group B; and in 78.2% after 6 months and 74.4% after 12 months in group B. In group And six months after the oral sanitation measures, the hygienic condition of the oral cavity improved somewhat - 0.83± 0.29 ($p \leq 0.05$), and in groups B and C it was still unsatisfactory (1.3± 0.3 and 1.5± 0.19). After a year, the hygienic condition worsened in all groups - 0.97±0.12, 1.8±0.16 and 2.1±0.17 – but in healthy individuals it remained at a satisfactory level.

Therefore, the unsatisfactory hygienic condition of the oral cavity in persons with CKD, lesions of the hard tissues of the teeth, as well as common inflammatory periodontal diseases, require the development of special recommendations for oral care for such patients.

Also, based on such X–ray data - osteodystrophy was observed in patients with CKD - revealed a significant difference in the mandibular cortical index in patients with CKD and the control group ($P = 0.038$). Patients with CKD had more defects in the cortical layer of the mandible. C3 was observed in patients of groups B and C (3.9% and 8.6%, respectively), but was not detected in any of the healthy individuals. The number of healthy people with C1 was significantly higher than with C2 and C3. Thus, 83.3% of healthy people in group A belonged to class C1, the STC in patients with CKD was more porous than in the control group ($P = 0.001$). In group A, there was no pattern of loose calcification and loose calcification in the form of frosted glass, while these two patterns were observed in 8.6% and 17.7% of patients in groups B and C, respectively. A dense pattern was observed in the majority of healthy individuals (87.7%) - they indicate the need to improve dental treatment in patients with CKD, especially those receiving hemodialysis treatment, we proposed a treatment regimen for dental diseases in patients with CKD.

The proposed scheme:

1. Dental examination of patients with CKD and professional cleaning of the oral cavity should be carried out every 4 months.
2. In connection with the processes of demineralization of hard tissues of teeth, it is recommended to use low-abrasive fluoride-containing dental gels. Rinsing with 0.05% sodium fluoride solution was prescribed 2 times a day. Mandatory replacement of toothbrushes every 3 months. The use of floss and tongue scrapers is mandatory.
3. Dental examination necessarily includes X-ray examination (orthopantomography) to analyze the indices of the mandibular cortical index and the structure of the trabecular bone in order to assess the degree of osteodystrophy; to identify hidden lesions of the hard tissues of the teeth and evaluate the effectiveness of endodontic treatment.
4. It is possible to reduce the amount of anesthetic administered, which is associated with osteodystrophy of the jaws.
5. When forming cavities for filling carious and non-carious lesions of hard tissues of teeth, it is necessary to create support points in the preserved walls of the cavity, to form a cavity with a gradual narrowing towards the entrance hole, when localizing the carious cavity according to class II according to Black - to bring the cavity to the chewing surface, for better fixation of the seal, in some cases – to form an additional a cavity with cavities of class III and IV

according to Black. Thinned edges of enamel should be excised.

6. In the absence of the effectiveness of endodontic treatment of periodontitis - removal of foci of periapical infection - apicotomy or removal of the causal tooth itself. With deep periodontal pockets - removal of the causal tooth.
7. To maintain periodontal health, Parodium gel was prescribed (applied 3 times a day for 2-3 weeks), Eludril rinse aid (2 teaspoons per ½ cup of water for 1-1.5 minutes, 3-4 times a day. For the treatment of periodontal pockets, "Cygerol" was used.
8. For the treatment of mucosal lesions, Lugol's glycerin solution and rosehip oil were used. At home, an infusion of chamomile flowers was used for rinsing (1 tablespoon of the collection was poured with 150 ml of water, heated in a water bath for 15 minutes, infused, filtered, topped up with boiled water to the original volume. Also, patients rinsed their mouth with propolis tincture – 25 drops per 1 glass of warm water.
9. The appointment and use of drugs – only after consultation with a nephrologist.

For its testing, 15 people were selected in group B, and group B was fully included in the study.

Table 2. Patients selected for testing of the scheme, according to the stages of CKD

Stages of CKD	Number of patients, n=30
Stage 3a: 45-59 ml/min/1.73 m2	7
Stage 3b: 30-44 ml/min/1.73 m2	5
Stage 4: GFR 15-29 ml/min/1.73 m2 (predialysis stage)	3
Stage 5: GFR <15 ml/min/1.73 m2 (dialysis stage)	15

Results of approbation of the treatment regimen of dental diseases in patients with CKD

12 months after the application of the new protocol, the following patient complaints were identified:

Table 3. Analysis of complaints and objective indicators of examination of patients with CKD

Manifestations of CKD in the oral cavity	Frequency of occurrence, %		P
	Group B	Group C	
Bleeding gums	73.3	73.33	<0.001
Xerostomia	46.7	33.3	<0.01
Difficulties in eating	26.7	55.3	<0.001
Gum recession (tooth necks exposed)	66.7	100.0	>0.1
Large volume of soft plaque	73.3	73.3	<0,01
Large volume of hard plaque	53.3	46.7	<0.001
Swelling of the cervical gum and interdental papillae, their looseness and hyperemia	46.7	80.0	<0.01
Plaque on the tongue	6.66	6.7	<0.001
Ulceration of the SOPR	6,67	6,7	>0,1

Gum bleeding decreased by 10.6-13.2%; difficulty eating decreased in 2.2-7.7% of patients; the amount of soft plaque decreased by 15.58-21.1%; tartar – by 41% and 15.2% in groups B and C, respectively; swelling of the cervical gum and interdental papillae, their looseness and hyperemia decreased by 18.9-21.3%.

Table 4. The volume of therapeutic and preventive dental care for the examined persons

Performed therapeutic and hygienic dental manipulations	Patients	
	Group B, n=15	Group B, n=15
Treatment of uncomplicated caries	11 teeth	12 teeth
Treatment of non-carious lesions	6 teeth	12 teeth
Endodontic treatment of pulpitis	5 teeth	5 teeth
Endodontic treatment of periodontitis	4 teeth	4 teeth
Removal	6 teeth	4 teeth
Treatment of inflammatory periodontal diseases	13 people	14 people
Professional oral hygiene	15 people	15 people
Treatment of diseases of the oral mucosa	4 people	5 people

Table 5. Changes in the prevalence (%) and intensity of dental caries in group B patients

Inspection	Prevalence	Intensity (CPU) (M±m)	K (M±m)	N (M±m)	Y (M±m)
Examination 12 months after standard treatment	70,2	6,6±0,43	1,7±0,15	3,43±0,33	1,24±0,15
Inspection 12 months after the application of the new scheme	70,4	6,68±0,27	1,81±0,12	3,91±0,65	0,97±0,15
P<0,001					

Table 6. Causes of tooth extraction in group B patients

The reason for tooth extraction	Complications of pulpitis and periodontitis	Periodontal disease (periodontitis and periodontal disease)
	4 teeth (66.67%)	2 teeth (33,33%)

In total, 17 teeth were cured for carious and non-carious lesions in this group, 9 teeth were endodontically treated for pulpitis and periodontitis, and 6 teeth were removed (the reason was ineffective endodontic treatment and periodontal lesions). The number of filled teeth was 3.91±0.65 (an increase of 14.0%). The number of teeth affected by the

carious process increased from 1.7 ± 0.15 to 1.81± 0.12 (an increase of 6.47%, earlier in the same period the increase was 33.8%). The increase in the prevalence of caries for 1 year is 0.2%.

The assessment of the condition of the fillings revealed their safety after a year – in 87.9% (earlier for the same period - 81.0%).

The X-ray method revealed the absence of periapical lesions in endodontically treated teeth in 78.3% after 12 months (previously 77.1% for the same period of time).

Table 7. Changes in the prevalence (%) and intensity of dental caries in group B patients

Inspection	Prevalence	Intensity (CPU) (M±m)	K (M±m)	N (M±m)	Y (M±m)
Examination 12 months after standard treatment	76,1	7,26±0,43	1,87±0,15	3,77±0,33	1,62±0,15
Inspection 12 months after the application of the new scheme	76,7	7,34±0,27	1,6±0,13	4,57±0,26	1,17±0,12
P<0,001					

In total, 24 teeth were cured for carious and non-carious lesions in this group, 9 teeth were treated endodontically for pulpitis and periodontitis, and 4 teeth were removed (the reason is ineffective endodontic treatment and periodontal lesions). When examined a year later, the number of filled teeth was 4.57 ± 0.26 (an increase of 21.22% compared to the same period). The number of teeth affected by the carious process decreased from 1.87± 0.15 to 1.6± 0.13 (reduction of caries growth by 16.87%). The increase in the prevalence of caries for 1 year is 0.6%.

An assessment of the condition of the seals a year later revealed their safety at 76.7% (an increase of 4.4%).

The X-ray method revealed the absence of periapical lesions in endodontically treated teeth in 77.3% after a year (previously 74.4% for the same period of time).

Table 8. Causes of tooth extraction in group B patients

The reason for tooth extraction	Complications of pulpitis and periodontitis	Periodontal disease (periodontitis and periodontal disease)
	2 teeth (50.0%)	2 teeth (50,0%)

Thus, it can be argued that the effectiveness of endontic treatment in patients with CKD has practically not changed, but more effective treatment of carious and non-carious lesions will, in our opinion, reduce the need for endodontic treatment in this category of patients.

Dynamics of the hygienic state of the oral cavity of patients with CKD.

Table 9. Changes in the hygienic index OHI-S in the examined patients

Inspection	Group B	Group C
Examination 12 months after standard treatment	1.8±0.16	2.1±0.17
Inspection 12 months after the application of the new scheme	1.34±0.17	1.52±0.12
* statistically significant differences according to the Student's t-test (p<0.001) between the stages ** statistically significant differences in Student's t-test (p<0.001) between groups		

Examination after 12 months revealed that OHI-S in group B patients was 1.34±0.17 (p<0.001) (a decrease of 34.32% compared to the previous examination), in group B - 1.52±0.12 (p<0.001) (a decrease of 38.16% compared to the previous examination).

3. Study of the Periodontal Condition

In patients with CKD, inflammatory processes of periodontal tissues are common. Their occurrence is shown in table 39.

Table 10. Prevalence of inflammatory periodontal diseases in patients with CKD

Periodontal lesion	Group B	Group C	x^2	P
Healthy periodontal	2 (13,33%)	1 (6,67%)	6,96	<0,008
Gingivitis	3(20,0%)	3(20,0%)	1,72	>0,1
Periodontitis of mild severity	6 (40,0%)	4 (26,67%)	4,83	=0,028
Periodontitis of moderate severity	3 (20,0%)	5 (33,33%)	1,58	>0,1
Severe periodontitis	1 6,67%	2(13,33%)	0,09	>0,1

After applying the proposed treatment regimen, the prevalence of periodontal diseases in patients with CKD is 86.67% in group B (a decrease of 7.67%) and 93.33% in group B (unchanged). Among group B individuals, gingivitis occurs in 20.0% (an increase of 8.68%), periodontitis of mild severity occurs in 40.0% (a decrease of 3.4%), moderate severity occurs in 20% (a decrease of 6.4%), severe severity occurs in 6.67% (a decrease of 0.83%). In group B: gingivitis – 20.0% (unchanged) of observations, mild periodontitis - 26.67% (decreased by 6.66%), moderate periodontitis - 33.33% (decreased by 6.67%), severe periodontitis - 13.33% (decreased by 6.67%).

When evaluating the periodontal CPITN index, individual signs of periodontal pathology (bleeding, tartar, periodontal pocket) are still detected.

Table 11. Results of the study of the need for treatment of periodontal diseases

Scores	Signs	Group B, n=15	Group B, n=15	x^2	P
0	No disease	2 (13,33%)	1 (6,67%)	0,01	>0,10
1	Bleeding during insertion of the probe, no tartar, no pocket	2(20,0%)	1(20,0%)	0,67	>0,10
2	The phenomenon of inflammation of gum edema, tartar, periodontal pocket is not present	1 (6,67%)	2 (13,33%)	5,66	=0,016
3	Periodontal pocket 3.5 - 5.5 mm deep	3 (20,0%)	5 (33,33%)	0,89	>0,10
4	Periodontal pocket with a depth of 6 mm or more	1 6,67%	2(13,33%)	0,41	>0,10

Differences in the prevalence and intensity of individual signs of periodontal pathology (bleeding, tartar, periodontal pocket) were revealed (p=0.082). Bleeding of the gums during the introduction of the probe in group B increased by 8.68%, in group B remained unchanged; swelling of the gums and periodontal pockets was no longer detected in 93.3% of patients in group B and 86.67% of patients in group B. Periodontal pockets with a depth of 3.5 mm or deeper were twice as often observed in group B.

Lesions of the

Table 12. Identified lesions of the SOPR

Identified lesions of the SOPR	Frequency of occurrence, %		P
	Group B	Group C	
Pallor of the SOPR	73.8	38.2	<0.001
Depapilated language	2.7	1.4	<0.01
Petechiae SOPR	14,1	22,2	<0,001
Pigmentation on the SOPR	25.3	13.9	>0.1
Candidiasis	0	0	<0.001
Ulceration of the SOPR	6.2	11.5	<0.01
Uremic stomatitis	2,4	0	<0,001

The analysis of the lesions of the SOPR in patients with CKD showed that the changes, compared with the data of the previous examination, are very small. The reason for this, in our opinion, is that the lesions of the COPD in CKD are not independent, but are symptoms of a systemic disease.

Based on the above data, it can be concluded that the proposed protocol for the treatment of dental diseases in patients with CKD has shown effectiveness in the treatment of carious and non-carious lesions of the hard tissues of the teeth, in maintaining a satisfactory hygienic condition of the oral cavity. Also, the proposed protocol has shown satisfactory results in maintaining periodontal health, but in our opinion, it is impossible to completely rid a patient with CKD of periodontal diseases by dental measures alone and requires coordinated, comprehensive work of a dentist and a nephrologist.

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