RESEARCH ARTICLE

Correlation Between Oral Health Behavior and Modified Gingival Index in Chronic Kidney Disease

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Abstract
Introduction : Chronic kidney disease (CKD) is related to poor oral health, including gingival and periodontal diseases. Poor oral health in CKD patients is an important problem, but often neglected. Oral health status also associated with the individual's Oral Health Behavior (OHB). The aim of this study is to assess the impact of OHB on gingival health status in CKD patients.

Methods: This study was conducted on 86 CKD subjects with eGFR <60 ml/min/1,73m^2, who were treated in Dr. Wahidin Sudirohusodo Hospital Makassar, Indonesia from October until December 2020. The OHB assessment was evaluated using Buunk-Werkhoven questionnaire, and the gingival status assessment was evaluated using non-probing (visual) method, namely Modified Gingival Index (MGI). The statistical analyses that used in this study were Chi Square test, Spearman's Correlation test and Mann-Whitney test (significance p<0,05).

Results: The subjects were 18-75 years old with a mean age 46.6 ± 13.2 years; gender were male 66,3%; had senior high school education were 40,7%; higher income than province minimal wage were 50,0% and with diabetes comorbid were 29,1%. From history taking and oral examination, we found that mean OHB was 8,38 ± 1,60SD and mean MGI was 1,34 ± 0,9SD. There was a significant negative correlation (r = -0,420) between OHB and MGI in CKD patients (p<0,001), where the lower OHB score, the higher MGI score.

Conclusion: Oral health behavior is related to gingival health status in chronic kidney disease patients, wherein poor oral health behavior is associated with poor gingival health status.

Keywords: CKD, OHB, MGI, gingivitis, periodontal,

1. Introduction

The incidence of CKD worldwide has increased in recent years.[1] Prevalence CKD in Indonesia according to Indonesian Nephrology Association (PERNEFRI) is 12.5% or ±18 million of the total population.[2]

Oral problems that often found in CKD patients including teeth, oral mucosa, salivary glands, tongue, bones and temporomandibular joints and periodontal diseases.[3] Periodontal disease is a spectrum of disease involving inflammation of gingival tissues caused by plaque accumulation, ranging from gingivitis alone to substantial inflammatory destruction of supporting periodontal tissues (periodontitis).[4] Gingivitis is the reversible stage, only the gums are affected, symptoms include redness, swelling, and bleeding. Gingivitis which goes untreated usually escalates/worsen to periodontitis, the irreversible stage of gum disease.[5]

Gum health status can be evaluated with probing method (invasive) or without probing (non-invasive) such as Modified Gingival Index. The variety of gingivitis indices in common use are all strongly correlated, including in particular MGI. The criteria for assessing MGI are : score 0 = absence of inflammation; score 1 = mild inflammation or with slight changes in color and texture but not in all portions of gingival marginal or papillary;score 2 = mild inflammation, such as the preceding criteria, in all portions of gingival marginal or papillary; score 3 = moderate, bright surface inflammation, erythema, edema and/or hypertrophy of gingival marginal or papillary; score 4 = severe inflammation: erythema, edema and/or marginal gingival hypertrophy of the unit or spontaneous bleeding, papillary, congestion or ulceration. Gingival units as well as the calculation of the index follow the same criteria described in GI.[6]

Periodontal disease is an independent contributor to systemic inflammation. It has been reported that periodontitis patients have elevated markers of systemic inflammation, such as C-reactive protein (CRP), interleukin 6 (IL-6), haptoglobin, and fibrinogen.[7] Localized infections in teeth and mouth are source of systemic low-grade inflammation.

Many studies have shown that low grade inflammatory processes are associated with cardiovascular disease and malnutrition, which increase morbidity and mortality.[8]

Oral health behavior is an important thing that plays role in oral health, which can be assessed by using a questionnaire. Oral health behavior index according to Buunk-Werkhoven questionnaire which assessing and scoring the frequency, moments, measure the force, duration, method of tooth brushing, the using of fluoride toothpaste, interdental and tongue cleaning. A high sum score indicates a high level of self-care OHB. [9]

This study's objective is to assess the impact of OHB on gingival health status in CKD patients.

2. Methods
2.1. Research Design
This study was a cross sectional at Dr. Wahidin Sudirohusodo Hospital in Makassar, South Sulawesi Indonesia.

2.2. Research Subjects
The study population was CKD patients with eGFR <60 ml/menit/1.73m^2 in Wahidin Sudirohusodo Hospital Makassar, who were included into the inclusion criteria. The inclusion criteria was > 18 years old, hemodynamically stable. All subjects sign an informed consent form.

2.3. Research Data Analysis
Statistical analysis was performed with SPSS version 22. The statistical analysis performed was descriptive statistical calculation and frequency distribution as well as Chi-Square test, Spearman Correlation test and Mann-Whitney test. Significant if p<0,05.

2.4. Ethical Clearance
This study protocol was approved by the Health Research Ethics Commission of Hasanuddin University, Medical Faculty, following the ethical recommendations with approval letter number 505/UN4.6.4.5.31/PP36/2020.

3. Results
The study was conducted at Wahidin Sudirohusodo hospital from October to December 2020. This study involved 86 subjects CKD eGFR <60 ml/menit/1.73m^2 with whom met the inclusion criteria. The statistical analysis carried out was the frequency distribution, Chi Square test, Spearman Correlation test and Mann-Whitney test. Significant if p <0,05.

The research subjects characteristics can be seen in Table 1. The subjects were 18-75 years old with a mean age 46.6 ± 13.2 years; gender were male 66,3%; had senior high

school education were 40,7%; higher income than province minimal wage were 50,0%, and with diabetes comorbid were 29,1%.

The mean OHB was $8,38 \pm 1,60$SD and mean MGI was $1,34 \pm 0,9$SD. There was a significant negative correlation (r = -0,420) between OHB and MGI in CKD patients (p<0,001) which can be seen in Table 2. Where the lower OHB score, the higher MGI score. (figure 1).

4.Discussion

In this study, it was found that the mean OHB according to Buunk-Werkhoven questionnaire was $8,38 \pm 1,60$SD. Suryanti et al,[10] regarding the validity and reliability of the oral health behavior index in Indonesia in a population of young adolescents, found that the mean value of oral health behavior was 7.57 ± 2.45SD. The mean OHB in CKD was found acceptance, but many of them still had a poor OHB. This result in line with study in Marocco which reported that 51.8% of CKD G5D patients brushed their teeth twice a day, but still 25% did not brush their teeth.[11]

In this study, it was found that the mean MGI score was $1,34 \pm 0,9$SD. Study by Takeuchi Y. et al,[12] who reported that the mean Gingival Index (GI) in CKD HD 1.37 ± 0.50SD and in CKD non-HD 1.18 ± 0.80SD. Another study by Joseph R. et al,[13] reported that the mean values of MGI significantly higher in non-dialysis CKD patients compared to the normal control group. (1.58 ± 0.39SD vs 0.86 ± 0.53SD; p <0.001). The main etiology of periodontal diseases (gingivitis and periodontitis) is the formation and persistence of bacterial biofilms on dental surfaces.[14] The increase of urea levels occurs through the bacterial activity (especially anaerobic gram-negative bacteria) through enzymes that cause hydrolysis to ammonia which is toxic to the periodontal and gingival tissues.[15] Risk factors associated with periodontitis include diabetes mellitus, smoking, obesity, osteoporosis, low dietary calcium and vitamin D, stress, and inadequate coping.[16] Lower levels of health care are associated with lower understanding of the importance of prevention and maintenance, and consequently, lower health.[17]

In this study, also found a significant negative correlation (p <0.001) between OHB and MGI in CKD patients (r = -0,420), where the lower oral health behavior score, the higher MGI score. This result was consistent with study by Kawamura et al,[18] that reported a significant correlation between OHB and periodontal status. Another study by Lalani A. et al,[19] had reported that in students populations, there was a negative correlation between oral health behavior (according to Hiroshima University-Dental Behavioral Inventory questionnaire) with plaque ($r = -0.501$) and gingival scores ($r = -0.580$).

Conclusion

Oral health behavior is related to gingival status in chronic kidney disease patients. Poor oral health behavior will result to a poor gingival health status.

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'Table 1 , Characteristics of research subjects ι=86)

Characteristics		n = 86	(%)
Age	< 30 years	10	(11,6%)
	30-39 years	16	(18,6%)
	40-49 years	18	(20,9%)
	50-59 years	30	(34,9%)
	≥ 60 years	12	(14,0%)
Gender	Male	57	(66,3%)
	Female	29	(33,7%)
Education	Prmary – junior high school	19	(22,1%)
	Senior high school	35	(40,7%)
	College	32	(37,2%)
Income	> PMW (> Rp. 2,86 million)	43	(50,0%)
	< PMW (< Rp. 2,86 million)	43	(50,0%)
Diabetes mellitus	Yes	25	(29,1%)
	No	61	(70,9%)

PMW (Province Minimum Wage in South Sulawesi

Table 2. Correlation of Oral Health Behavior score with Modified Gingival Index

Variable	Statistics	OHB
MGI	**R**	**-0,420**
	P	**0,000***
	N	**86**

OHB = *Oral health behavior*, MGI = *Modified Gingival Index*, *** = p-value < 0,05**
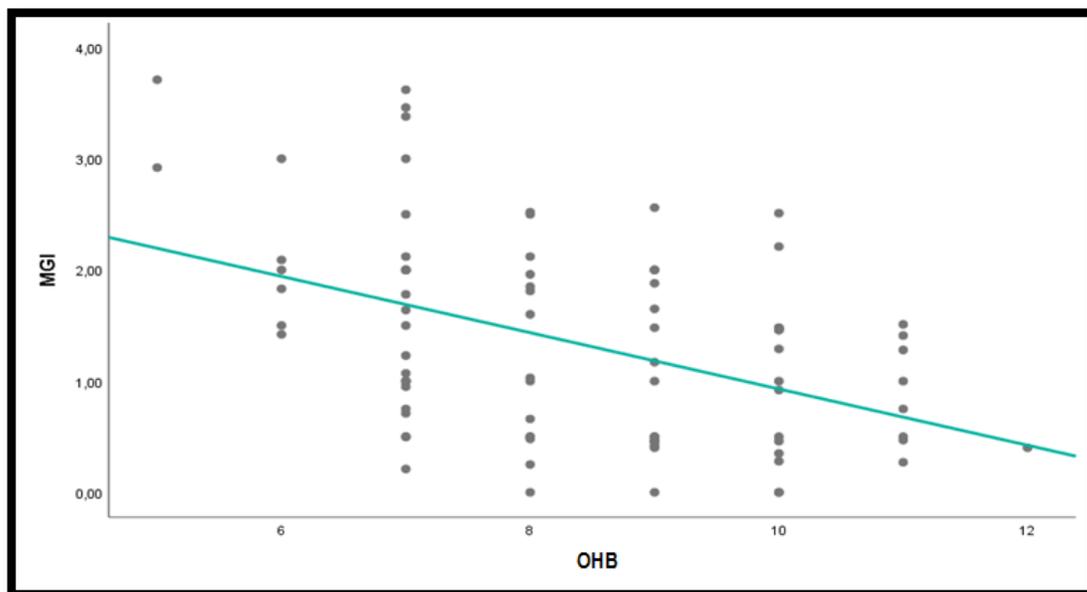
Figure 1. Correlation of OHB score and MGI score. OHB = *Oral health behavior*, MGI = *Modified Gingival Index*.