Oral health status, knowledge, attitude and practice of patients with heart disease

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Original Article

Abstract

BACKGROUND: The aim of this study was to investigate knowledge, attitude and practice (KAP) of cardiovascular disease (CVD) patients about their oral health status.

METHODS: In this cross-sectional study, we analyzed the data of 150 CVD patients that collected by a self-administered questionnaire consists of demographic characteristics and KAP. Oral health indicators calculated based on the results of oral examination by an expert dentist.

RESULTS: CVD patients had an overall moderate level of knowledge and attitude, but their practice was lower than moderate. There were important associations between knowledge scores with gender, education, residential area and financial status, between attitude scores with education and residential area, and between practice scores with education and financial status. There were no associations between KAP and age, marital status or job. Significant positive correlations were found between KAP components. Significant negative correlations were found between oral hygiene index with knowledge and practice.

CONCLUSION: The practice of heart disease patients about their oral health was poor, and declares that increasing awareness and attitude may not promote practice. Efficient programs are needed to promote oral health practice of adult populations in special groups.

Keywords: Health Knowledge; Attitudes; Practice; Oral Health; Cardiovascular Diseases

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Introduction

In the past two decades, rapid increase has been occurred in the prevalence of cardiovascular disease (CVD) in many developing countries around the world, along with the obvious changes in lifestyle in terms of diet and physical activity.[1,2] CVDs with more than 45.0% of deaths are the first cause of mortality in Iran.[3] The prevalence of CVD in Iran is 37.5 and 22.2% in women and men, respectively.[4] Moreover, premature coronary heart diseases are increasing in Iran.[5]

Due to the high prevalence and significant social effects, oral disease can be considered as a public health problem.[6] An evidence is not adequate to support the hypothesis of oral infections as an independent risk factor for CVD events.[7] However, some studies have shown evidence of a weak association between the potential roles of periodontal infection as a risk factor for CVDs.[8-11] Based on these studies periodontal infection can increase the risk of CVD about 15-19%.[10,11] Furthermore, most of the drugs that used to treat CVDs have the potential to cause adverse reactions in the oral cavity and compromise oral health of these patients.[12]

In some cases, individual health status greatly depends on his/her knowledge, attitude and practice (KAP) in that area. Smyth et al.[6] showed better oral practice in the persons with strong knowledge of oral health. In planning and promoting oral health programs, it is important to recognize the knowledge and beliefs of the population about oral and dental health. Without the doubt, to rectify the oral and dental problems of the cardiac patients, the first thing is to evaluate

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their level of KAP. Oral health status and KAP of these patients have not been sufficiently studied yet, and we have assessed them in cardiovascular inpatients and outpatients of Tehran Heart Center, Iran, in this study.

Materials and Methods

In this cross-sectional study, 167 patients with heart diseases were interviewed, 17 of them were excluded from the analysis because of missing data of more than 40.0% of their data in every one area of the KAP. Patients were cases referring to Tehran Heart Center, Tehran University of Medical Sciences, between February 2011 and August 2012.

Subjects answered a self-administered questionnaire of KAP about oral health and its association with CVDs. This questionnaire has been standardized in a separate study, and the results have been published.[13] Reliability was 0.82 according to Cronbach's alpha score. A face validity was higher than 80.0%. A content validity of the whole parts of the questionnaire was 86.0% for clarity, 78.0% for relevancy, 85.2% for simplicity, and 82.3% for consistency of each question with the questions' set. Factor analysis showed that 15 components explain 74.0% of the total variance.[13]

Then, an expert dentist carried out the physical examination to determine oral health indicators.[14] He determined these indices: oral hygiene, debris, calculus, periodontal disease, and decayed, missed, and filled surfaces (DMFs), in addition, to exam for the presence and extent/severity of gingivitis, periodontitis, plaque, artificial teeth, loosed teeth, and gingival bleeding. One assistant helped assessment of the files of the hospitalized patients for completing demographic variables consist of age, gender, height, weight, marital status, education level, job, financial status, dental insurance, living place (rural/urban), were among our demographic variables.

Oral health indices (OHIs) consist of OHI, periodontal disease index (PDI), and DMFs were calculated for patients based on dentists' examination. Their definition and calculation described in details elsewhere.[13]

PDI (Ramfjord periodontal index) is a thorough clinical examination of the periodontal status of six teeth, with an evaluation of the gingival condition, pocket depth, calculus and plaque deposits, attrition, mobility, and lack of contact. Individuals with clinically normal gingiva have an index of 0-0.2. The index reaches a maximum of 8.0 in persons with severe terminal destructive periodontitis.[13,15]

In this study, heart disease is consisted of patients with ischemic heart disease (unstable angina and myocardial infarction).

Cases were defined as inpatient or outpatient cases with ischemic heart diseases. The oral disease was defined as any dental, gingival and periodontal problem according to physical examination.

In this study, sample size was estimated based on $\alpha = 0.05$, the percentage of cases with low dental health status equal to 11% (according to our pilot study), the accuracy around this prevalence equal to 5%, and considering 10% loss of the cases (due to different causes like drop out during the research and missing data) and according to the one proportion estimation formula. Hence, a total sample size was equal to 167 cases with ischemic heart disease. Selecting more than 70 cases in each group of inpatient or outpatient cases was only based on to consider relatively equal percentage (near 50%) in these two groups.

We used mean ± standard deviation (SD) for expressing quantitative variables. We calculated a modified standardized score for KAP components. We summed the scores of each part and subtracted the one-third of missing items from it because we assumed that not answering to three questions is equal to have one negative score for one question (as is usual in many exams like USMLE or TOEFL). Then, we divided the result by the number of questions and multiplied in 100. Hence, we obtained a score between 0 and 100 for all components. Therefore, the number of questions and missed answers did not affect the total scores and the scores of each part of KAP and each patient were comparable with other parts of the questionnaire in each patient or a total score of other participants. We used these modified standardized scores for all analysis. The difference in mean scores of 10 points was considered clinically important. We also categorized modified standardized scores of the KAP components into three categories to poor, moderate and good based on modified standardized scores under 40, 40-69 and 70 or more, respectively. One-way analysis of variance and independent t-test were used for comparison of mean scores of the KAP components by socio-demographic characteristics of participants. The correlations were evaluated by Pearson and partial correlation coefficients. Stepwise linear regression was also used for determining predictors of KAP and health status of participants. SPSS software (version 17, SPSS Inc., Chicago, IL, USA) was used for analysis the data.

All cases signed an informed written consent before entering to the study. This project is reviewed and accepted by Ethics Committee of Dental Implant Research Center, Faculty of Dentistry, Tehran University of Medical Sciences, with the code number: 90-03-104-17668.

Results

Sample characteristics

Demographic characteristics were no significantly different between those who remained in the analysis and those who excluded. Among them who remained in the study, 72 were outpatients and, 78 were in patients in Tehran.

The mean age (± SD) of the participants was 52.7 (± 8.8). Most of the participants were male (58.7%), married (90.0%), without university education (83.4%), residing in urban area (86.0%). More than 76.0% of them had good or very good financial status, but only about 9.0% of them had dental insurance. 93 patients (62.0%) had periodontitis (Table 1).

Table 2 shows the health status of the participants. 74.0% of participants reported their general health status as moderate, about 33.0% had co-morbidities, and 45.0% took medication. More than 37% of the study subjects had hypertension (HTN), 34.7% hypercholesterolemia/hypertriglyceridemia, and 28.0% diabetes mellitus (DM). 46.0% of them reported a family history of CVDs.

KAP about oral health

Participants' mean (± SD) score of knowledge was 57.7 (± 21.7). Among them, 69 (46.0%) had moderate and 48 (32.0%) had good knowledge about oral health. 44.0% of the respondents knew that gingivitis causes gingival bleeding, whereas about 17.0% did not know and the rest of them gave wrong answers. About 27.0% of them knew the cause of adding fluoride to toothpaste. 74.0% of the participants knew that dental plaque causes devastated teeth, and 75.3% were aware of the adverse effects of fizzy drinks on teeth.

For attitude, their mean (± SD) score was 52.3 (± 19.0). Most of the participants had moderate and good scores for attitude questions (55.3 and 19.3%, respectively). Three questions that had the most wrong answers were CVDs cause oral diseases (75.7%), what the dentist cares about is treatment not prevention (56.3%), and regular dental visits is not necessary (56.9%). 55.0% agreed that oral diseases cause CVDs and about 38.0% had not any idea.

Table 1. Socio-demographic characteristics of the participants

Participants (n = 150)	n (%)
Age (year)	
≤ 49	48 (32.0)
> 50	97 (64.7)
Not specified	5 (3.3)
Gender	
Male	88 (58.7)
Female	55 (36.7)
Not specified	7 (4.7)
Marital status	
Single	4 (2.7)
Married	135 (90.0)
Divorced	2 (1.3)
Widowed	6 (4.0)
Not specified	3 (2.0)
Education	
Illiterate	29 (19.3)
Primary school	46 (30.7)
Secondary school	16 (10.7)
Diploma	34 (22.7)
University	23 (15.3)
Not specified	2 (1.3)
Job	
Retired	23 (15.3)
Householder	37 (24.7)
Employed	11 (7.3)
Private	57 (38.0)
Unemployed	15 (10.0)
Not specified	7 (4.7)
Residential area	
Rural	13 (8.7)
Urban	129 (86.0)
Not specified	8 (5.3)
Financial status*	
Very good	17 (11.3)
Good	95 (65.3)
Moderate	34 (22.7)
Poor	1 (0.7)
Not specified	3 (2.0)
Dental insurance	
Yes	13 (8.7)
No	127 (84.7)
Not specified	10 (6.7)
Periodontitis	
Yes	93 (62.0)
No	57 (38.0)

*We judge for this variable according to both self-assessment by the patients and their monthly income

Mean (± SD) of practice score was 44.9 (± 15.5). 58.0% of participants had moderate scores, whereas only 3.3% had good scores. About 42.0% of participants stated that brushed their teeth once a day and 15.5% of them twice or more a day. Remaining participants do not brush regularly.

Moreover, 71.0% of cases spent 1-2 minutes or more to brush their teeth. Different questions about patterns of washing their mouths showed that 80.0% of the participants reported using of toothbrush and toothpaste, 55.8% used fluorinated toothpaste, and 74.1% reported using mouthwash. 9.0% of participants reported regular dental visits, whereas 61.5% visited their dentists only when they had a toothache. The high cost of dental visit singly or along with other causes was expressed by 53.0% of respondents as one of the common causes of not visiting the dentist.

Association between socio-demographic characteristics and KAP of oral health

The difference of the separate parts of KAP scores with socio-demographic characteristics included age, gender, education, residential area, and financial status had been shown in table 2. Mean scores of KAP for females were higher than males but only the difference for knowledge was significant ($P = 0.001$). There were significant difference for mean scores of KAP among different levels of education ($P = 0.006$, $P = 0.004$, and $P < 0.001$, receptively) (Table 2). The higher the education level of people, the greater the scores of KAP, except for attitude score of the participants who had university education. The participants who lived in urban area had higher mean scores than residents of the rural area; but, the differences were statistically significant only for knowledge and attitude scores ($P = 0.005$ and $P = 0.002$, respectively). Furthermore, there were significant differences for mean scores of knowledge and practice among different levels of financial status ($P = 0.009$ and $P = 0.004$, respectively), but the difference for mean scores of attitude was not significant ($P = 0.348$). There were no significant differences between mean scores of KAP in different levels of marital status and different job groups.

Correlation of dental indices and KAP scores

As table 3 illustrates, Pearson correlation coefficient between age and DMFs was moderate and significant ($r = 0.40$, $P < 0.001$). There were similar strength significant correlation between OHI and knowledge ($r = -0.32$, $P < 0.001$), knowledge and attitude ($r = 0.40$, $P < 0.001$), and knowledge and practice ($r = 0.32$, $P < 0.001$) too. Furthermore, there were significant but small correlations between OHI and attitude, OHI and practice, attitude and practice ($r = -0.20$; $P = 0.012$, $r = -0.26$; $P < 0.001$ and $r = 0.18$; $P = 0.024$, respectively) (Table 3).

Table 2. Comparison of mean scores of knowledge, attitude and practice (KAP) by socio-demographic characteristics of participants

Characteristics	Knowledge score (mean ± SD)	P	Attitude score (mean ± SD)	P	Practice score (mean ± SD)	P
Age* (year)		0.707		0.862		0.820
≤ 49	58.8 ± 21.4		52.1 ± 20.5		44.5 ± 16.2	
> 50	57.4 ± 21.9		52.7 ± 18.5		45.1 ± 15.1	
Gender*		0.001		0.214		0.309
Male	53.8 ± 23.2		50.9 ± 18.4		43.9 ± 15.8	
Female	65.7 ± 16.8		55.1 ± 20.2		46.7 ± 15.4	
Education**		0.006		0.004		< 0.001
Illiterate	47.1 ± 25.6		42.0 ± 16.7		35.3 ± 13.1	
Primary school	56.5 ± 21.1		51.1 ± 20.8		39.2 ± 14.7	
Secondary school	53.5 ± 19.9		57.0 ± 11.4		48.7 ± 8.9	
Diploma	62.5 ± 18.7		59.7 ± 18.0		52.8 ± 11.9	
University	67.5 ± 17.7		53.6 ± 19.6		52.6 ± 16.6	
Residential area*		0.005		0.002		0.162
Rural	41.3 ± 24.9		37.5 ± 18.5		39.1 ± 19.0	
Urban	58.8 ± 20.9		54.2 ± 18.6		45.2 ± 14.6	
Financial status**		0.009		0.348		0.004
Very good	64.7 ± 17.7		58.1 ± 23.8		55.7 ± 12.4	
Good	59.6 ± 21.7		52.2 ± 18.4		43.8 ± 14.8	
Moderate and poor	48.2 ± 20.8		49.9 ± 18.9		41.5 ± 15.9	
Total	57.7 ± 21.7		52.3 ± 19.0		44.9 ± 15.5	

*Independent t-test, **One-way analysis of variance; SD: Standard deviation

In regard to inter-correlations among KAP, we used partial correlation to obtain the correlation between two scores with control for the third one. After controlling for attitude, the correlation coefficient for knowledge and practice was 0.27 (P = 0.001). The correlation coefficient for attitude and practice after controlling for knowledge was 0.06 (P = 0.450) and for knowledge and attitude after controlling for practice was 0.37 (P < 0.001).

We also evaluated the relationships between OHIs and KAP components with control for education level and financial status with multiple linear regression models in men and women separately. Significant relationships were seen between OHI with attitude (β = -0.024, P = 0.030) and DMFs with knowledge and attitude (β = 0.493, P = 0.050 and β = 0.428, P = 0.040, respectively) in women. But in men, all KAP components were removed from the model and only education level and/or financial status were related with OHIs.

Association between patient's co-morbidities and KAP and oral indices

Table 4 shows the health status of the participants based on their self-reporting. About 37.0% of participants stated that had HTN, 34.7% had hyperlipidemia (HLP), and 28.0% had DM. 46.0% of the participants expressed that had family history of CVDs. 74.0% of participants had evaluated their health status as moderate.

Table 5 shows the comparison of mean scores of dental indices in HTN, DM, and HLP patients. There were significant differences in mean scores of DMFs and PDI indices in patients with HLP (P = 0.003 and P < 0.001, respectively), and in mean scores of OHI in patients with DM (P = 0.020).

Table 3. Pearson correlation (P) of knowledge, attitude and practice (KAP) with each other, age and oral health indicators

Variable	Age		Knowledge		Practice		Attitude	
	Pearson correlation	P	Pearson correlation	P	Pearson correlation	P	Pearson correlation	P
DMFs	0.407	< 0.001	0.006	0.944	−0.094	0.262	0.132	0.114
PDI	0.164	0.049	−0.109	0.187	−0.167	0.042	0.040	0.624
OHI	−0.004	0.967	−0.320	< 0.001	−0.268	< 0.001	−0.207	0.012
Age			0.037	0.663	−0.029	0.728	0.031	0.707
Knowledge					0.321	< 0.001	0.407	< 0.001
Practice							0.184	0.024

DMFs: Decayed, missed, and filled surfaces; OHI: Oral hygiene index; PDI: Periodontal disease index

Table 4. Health status of the participants based on self-reporting

Variable	Yes [n (%)]	No [n (%)]	Do not know [n (%)]	Not specified [n (%)]
Co-morbidity	50 (33.3)	53 (35.3)	25 (16.7)	22 (14.7)
Medication	68 (45.3)	65 (43.3)	-	17 (11.3)
HTN	56 (37.3)	68 (45.3)	13 (8.7)	13 (8.7)
HLP	52 (34.7)	81 (54.0)	8 (5.3)	9 (6.0)
DM	42 (28.0)	98 (65.3)	8 (5.3)	2 (1.3)
Family history of CVD	69 (46.0)	71 (47.3)	5 (5.3)	5 (5.3)
	Good	**Moderate**	**Without problem**	**Not specified**
General health status	14 (9.3)	111 (74.0)	5 (3.3)	20 (13.3)

CVD: Cardiovascular disease; HTN: Hypertension; HLP: Hyperlipidemia; DM: Diabetes mellitus

Table 5. Comparison of mean scores of dental indices in patients with hypertension, diabetes mellitus, and hyperlipidemia

Patients	DMFs			PDI			OHI		
	n	Mean ± SD	P	n	Mean ± SD	P	n	Mean ± SD	P
HTN			0.283			0.758			0.573
Yes	54	57.6 ± 32.4		56	3.8 ± 1.5		56	4.2 ± 2.1	
No	66	57.6 ± 32.4		68	3.7 ± 3.2		67	4.4 ± 1.5	
DM			0.533			0.909			0.020
Yes	40	53.0 ± 34.1		42	3.5 ± 1.7		42	5.0 ± 2.2	
No	94	49.1 ± 29.8		97	3.6 ± 2.8		96	4.2 ± 1.7	
HLP			0.003			< 0.001			0.192
Yes	51	59.8 ± 31.7		52	4.6 ± 3.2		52	4.7 ± 1.9	
No	76	43.1 ± 28.7		80	2.9 ± 1.6		79	4.3 ± 1.7	
Total	150	51.4 ± 31.7			3.6 ± 2.4			4.5 ± 1.9	

DMFs: Decayed, missed, and filled surfaces; DM: Diabetes mellitus; HLP: Hyperlipidemia; HTN: Hypertension; OHI: Oral hygiene index; PDI: Periodontal disease index

Table 6. Comparison of mean scores of knowledge, attitude and practice (KAP) in patients with hypertension, diabetes mellitus, and hyperlipidemia

Patients	Knowledge			Attitude			Practice		
	n	Mean ± SD	P	n	Mean ± SD	P	n	Mean ± SD	P
HTN			0.890			0.120			0.360
Yes	56	58.5 ± 21.7		56	49.9 ± 19.1		56	46.9 ± 15.5	
No	68	58.0 ± 20.9		68	55.2 ± 17.9		68	44.4 ± 14.9	
DM			0.041			0.096			0.101
Yes	42	51.9 ± 24.4		42	48.3 ± 19.2		42	42.2 ± 13.9	
No	98	60.2 ± 20.8		98	54.1 ± 18.2		98	46.8 ± 15.9	
HLP			0.867			0.617			0.003
Yes	52	58.5 ± 21.8		52	51.8 ± 18.5		52	39.8 ± 16.3	
No	81	59.1 ± 21.5		81	53.5 ± 19.3		81	47.8 ± 14.1	

DM: Diabetes mellitus; HLP: Hyperlipidemia; HTN: Hypertension

Table 6 shows the comparison of mean scores of KAP in HTN, DM, and HLP patients. There were no significant differences between mean scores of KAP with HTN, DM, and HLP except for DM and knowledge (P = 0.041) and HLP and practice (P = 0.003).

Discussion

Oral health is one of the important indicators of individual and public health. For planning in the areas of health education and health services, it is substantial to have accurate information of oral health status among different population groups, particularly patients, students, children, and adults.

Our study showed that the overall level of knowledge and attitude of our participants were moderate, but their practice was lower than 50.0%. Based on categorized scores, about half of the respondents had moderate scores in all components of KAP. Most of the patients with a moderate and good knowledge had similar attitude scores while their practice was poor and moderate. This indicates knowledge can affect the attitude. Furthermore, most of the respondents with poor and moderate attitude had a similar level of practice, too. In our study, only five people had good practice. This is inconsistent with the results obtained in pregnant women in Iran[16] that 34.4% of them had good practice. It might be due to the impact of their ill-health that can affect other aspects of their daily life. In addition, they are people in older age groups and it is possible that they simply did not acquire appropriate healthy behavior in their childhood and adolescence.

In our study, women's knowledge about oral health was better than men. Since the proportion of both groups in younger and old age groups were approximately equal, and a higher proportion of women had lower literacy level than men, thus the difference might be attributable to the women's interest to their health status. In addition, attitude and practice of females were better than males, but the differences were not significant. Furthermore, higher proportion of females had moderate and good practice scores than males.

In regard to high scores of knowledge in patients with CVDs, and the questions about dental decay, gingivitis, brushing the teeth, the role of dental plaque in the distraction of teeth and the relationship between general health and oral health, it seemed that these patients had background information about oral health. This can be due to repeated health education programs, especially oral health in the community.

In terms of educational level, patients with a higher education had higher levels of KAP, except for knowledge of secondary school education and attitude for academic degree. Illiterate persons had the lowest mean scores for each component of KAP. In every level of education, women had higher scores than men. In a study on KAP of pregnant women about oral and dental care, women with high school diploma had higher scores than women with an educational level under high school diploma.[16] These confirm that people in higher levels of education has more knowledge, better attitude and practice than those with lower levels of education.

In our study, 41.3% of respondents believed that regular dental visits every 6-12 months are necessary, but only 8.7% of them had a regular dental visit. In regard to knowledge and attitude of our participants, this showed that good knowledge and even good attitude did not influence dental practice. Low dental visit in our study might be due to not having dental insurance and high costs of dental services so that 84.7% of respondents had not dental insurance and about 53.0% of them specified high costs as one of the causes of referring to dentist. Zhu et al.[17] showed that about 67.0% of

Chinese adults in urban areas and 50.0% of them in rural areas had economic support for dental visits and treatments. While, in our study, 84.7% of the cases had not any insurance (Table 1).

Brushing the teeth, twice daily with fluorinated toothpaste recommended by dentists to promote the oral health and prevent the decay. In our study, 15.5% of the respondents stated that brushed their teeth once daily. This was a very lower than the results that Kelly et al.[18] reported for the UK (74.0%) and the results that reported for Kuwait adults of 84.6%.[19] The difference between the results for Kuwaiti adults is most likely due to special group of our study-heart disease patients- and the high proportion of low educational level of them. Although just 27.0% of our participants knew the cause of adding fluoride to toothpaste, about 56.0% of the respondents used fluorinated toothpaste. This might be due to the fact that the most available toothpaste in markets and drugstores are fluorinated ones.

Studies have shown that people mostly estimate the time they brush the teeth longer than actual time.[20,21] In our study about 30.0% of respondents stated that they brushed their teeth more than 2 minutes. However, there were no significant differences in their OHI or PDI with others.

The level of KAP of our respondents based on having the status of co-morbidities of interest in this study did not differ meaningfully. There were statistically significant differences for knowledge based on DM status and for practice in patients with and without HLP. The difference observed in DM could be due to a small number of diabetic patients in comparison with non-diabetics ones. The observed difference in HLP group was not clinically important and it could be because of the higher proportion of HLP patients with poor practice compared with a higher proportion of non-HLP respondents with moderate practice. So, having another disease along with CVDs did not influence the KAP of our participants.

In the evaluation of the effects of co-morbidities of the participants-HTN, HLP, and DM- on their oral health, our study revealed that DMFs and PDI of our patients differed significantly according to the status of HLP. Participants with HLP had higher DMFs and PDI than those without that. Since, DMFs shows the past experience of the patients, HLP could not cause increased DMFs. As an indicator of the present oral health, PDI score of the patients with HLP were higher than patients without that and the difference was significant. On the other hand, as mentioned above, HLP patients had poor practice in comparison with patients without HLP. Therefore, the difference might be due to the relatively better practice of later patients. This can be the case in a significant difference that was seen between OHI and DM status. Patients with diabetes mellitus had a lower mean score in practice, although it was not significant.

Our study indicated a relationship between KAP components. The relationship between knowledge and attitude was stronger than the attitude-practice and knowledge-practice relationships. We controlled the correlations between two areas for the third one, the relationship between attitude and practice were very weak and non-significant. In usual KAP model, that attitude has an intermediate role in the causal relationship between the knowledge and attitude. But in our study, it seemed that knowledge affected attitude and practice directly. When we considered the relationships in men and women independently and with control for the third factor, we saw the similar pattern in men. In women, however, the correlation between attitude and practice was stronger than the correlation between knowledge and attitude. In addition, there was a relationship between knowledge and practice. These showed in women knowledge influenced the practice of respondents directly and indirectly, and attitude was the intermediate variable in the causal relationship between knowledge and practice. This is consistent with the fourth type of the relationship between KAP that Schwartz[22] suggested. Anyway, we should be cautious in interpreting these results because these are the results of partial correlation and did not adjust for any other confounder.

In the context of oral health, without controlling for the effect of determinants such as education level and financial status, negative and significant correlations existed between KAP with OHI. These correlations were stronger in women than men. These relationships could indicate that the people who had high scores in KAP had better oral health, too. In women, despite their higher scores in knowledge and attitude, there were positive and significant relationships between knowledge and attitude with DMFs. The reason could be that in this study participants were adult and sick people and their high scores in DMFs could be in result of their lifestyle, lack of knowledge, and inappropriate practice in the past, especially in childhood and adolescence. On the other hand, women usually experience hormonal changes during their life,

because of pregnancy that can affects their oral and dental health, and make their teeth prone to decay. But after considering education level and financial status, in most of the models, KAP components were not related to oral health status. The reason could be that KAP components are related to education level and financial status of people.

This study was based on self-administered questionnaire on KAP of participants and dental and oral examination by a dentist. Therefore, one of our major limitations is that their performance assessed by self-reporting rather than monitoring. Another limitation of our study is that we evaluated the relationships among the three components of KAP by Pearson correlation coefficient and partial correlation rather than statistical modeling hence it is possible that relationships confounded by some confounding factors such as residential area or the education levels, and some unmeasured cultural and social factors.

Conclusion

These findings clearly showed that despite the moderate and good knowledge and attitude of 75.0% of patients about oral health, about half of them had poor practice. The score of OHIs confirm poor practice of these patients in the past and present. Co-morbidities did not associate with meaningful differences in KAP levels and OHIs. This study revealed that in adult patients, an increase in knowledge and attitude does not necessarily accompany with better practice or behavior.

We recommend other researchers design some new teaching techniques for patients at risk of CVDs to promote their knowledge and improve their attitude and practice for caring about their dental health. Our result showed that current educational system by academicians and media is not working.

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Conflict of Interests

Authors have no conflict of interests.

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