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Laboratory Research

Factors Affecting the Detection and Treatment of Occlusal Caries Using the International Caries Detection and Assessment System

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Clinical Relevance

Occlusal caries is the predominant form of dental caries at the present time. This study documents the variability in detection and treatment of occlusal caries among dentists graduating from different dental schools around the world and practicing in Kuwait. Furthermore, it shows that dentists tend to overtreat occlusal caries.

SUMMARY

Objective: To assess the variability in diagnosis and treatment of occlusal caries among dental practitioners in Kuwait using the International Caries Detection and Assessment System (ICDAS) criteria.

Methods: A representative random sample of 156 dentists were interviewed. After completing a survey that included information about their gender, age, years in practice, place of practice, place of dental education, and specialty, practitioners examined four separately mounted molars (I-IV) for probable occlusal caries according to the ICDAS-II visual criteria. They were then asked to answer a set of questions related to their diagnosis and treatment of each tooth. The teeth were then histologically sectioned, and two independent investigators evaluated the depth of the caries according to Hintze and Wenzel's histologic criteria.

Results: According to the histologic examination, tooth I and III had caries into enamel,

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DOI: 10.2341/10-346-L

while tooth II and IV had caries into dentin. About 50% of the participants diagnosed teeth with enamel caries as sound. About 60% of the participants correctly diagnosed teeth with caries extending into dentin. A restorative treatment modality was recommended for enamel caries by approximately 50% of the participants and for dentin caries by more than 80% of the participants. Dentists with a specialty in restorative dentistry had a tendency to underdiagnose enamel caries, while general practitioners and other specialists tended to overtreat enamel caries.

Conclusions: There was an evident variability in the diagnosis and treatment choices of occlusal caries among dentists working in Kuwait. Among the factors studied, the specialty of the participants was the only factor that had an effect on the participants' diagnosis and treatment of occlusal caries.

INTRODUCTION

The variability that exists between dentists in the way they practice clinical diagnosis and therapeutic decision-making related to caries is well known.[1] Part of this variability is due to the fact that dental caries is a symptomless chronic disease. Therefore, with the absence of symptoms, clinicians are often asked to make a diagnosis based entirely on their clinical examination.[2] The existence of such wide variability in the clinicians' diagnosis of dental caries raises the issue of underutilization and overutilization of dental procedures and services.[3] Furthermore, it underlines the importance of addressing the roots of this variation in order to improve clinical decision-making.[4]

Many researchers have struggled to develop diagnostic thresholds in the visual inspection of dental caries.[5] According to the WHO standards, caries have been traditionally examined at the cavitation level, ie, caries extending into the dentin that require restorative treatment.[6] The absence of a clear, defining index for the detection of early carious lesions channeled the development of different diagnostic systems.[7] The International Caries Detection and Assessment System (ICDAS) was developed to enable researchers to diagnose caries upon visual inspection.[8] The ICDAS system showed comparable results with previous systems in terms of accuracy and reproducibility in the detection of occlusal caries at varying stages of the disease process.[9,10]

Any diagnostic test for dental caries must be validated against a "gold standard."[11] Different validation methods have been used as gold standards in the evaluation of the various diagnostic tests resulting in significantly different caries diagnostic outcomes.[12] Histologic sectioning, which can be done only on extracted teeth, has been found to be by far the most popular gold standard.[11]

Treatment and management of carious lesions should ideally be based on severity and activity.[13] Monitoring, topical fluoride application, and fissure sealants have become a standard in treating initial carious lesions.[14] Unfortunately, recent studies have shown that initial carious lesions are usually managed restoratively.[3] The decision of when to treat occlusal caries begins with inspection of the caries, and since treatment is dependent on diagnosis, any variability in the diagnosis will inevitably lead to variability in treatment.

In Kuwait, dentists from a number of countries work in the oral health services. Factors such as dentists' age, experience, and educational background have been found to affect the decision-making process.[15] Consequently, the purpose of this study was to assess the variability in the diagnosis and treatment of occlusal caries among dental practitioners in Kuwait using the ICDAS criteria. The hypothesis that diagnosis and treatment of occlusal caries are independent of the dentist's gender, experience, educational background, specialty, and work place was tested.

MATERIALS AND METHODS

A sample of 156 dentists (97 male and 59 female), randomly drawn from the membership of the Kuwait Dental Association and designed to proportionally represent all of the six governorates of Kuwait, participated in this study. The total number of dentists working in Kuwait was 1135. Sample size determination and randomization were done using computer software (power and precision). Ethical approval of the Human Rights Committee and Research Committee at Kuwait University was obtained. Each participant was met in person in his/her clinic and, after a verbal consent to participate in the study, asked to complete a survey questionnaire that included a number of independent variables, namely age, gender, nationality, country of dental education, specialty, work place, area of practice, and experience. After that, the dentists were given the following clinical scenario: A 25-year-old healthy patient presents to your clinic for an initial dental examination. The patient claims that

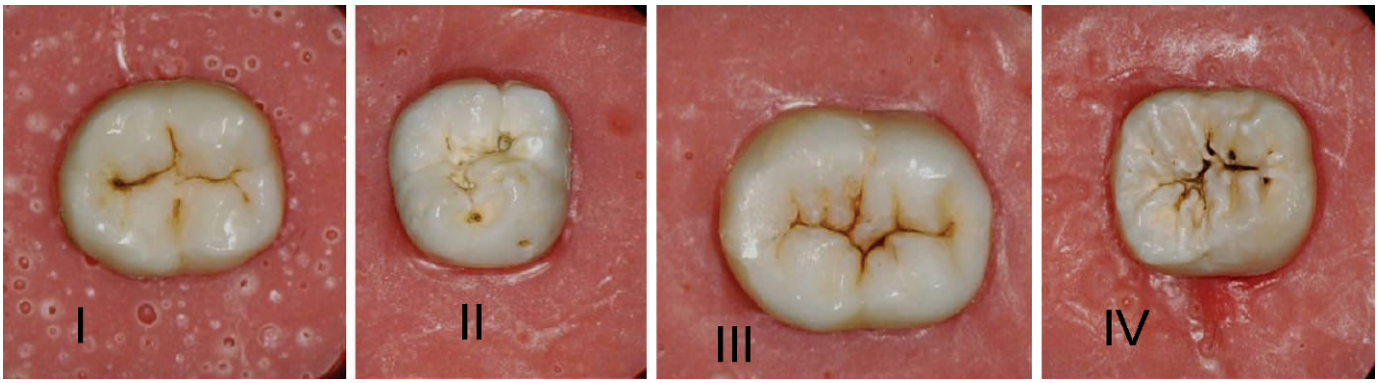

Figure 1. *Photograph of the four selected teeth mounted in acrylic resin blocks and coded I to IV.*

she brushes twice a day but does not use a dental floss. You are examining the dentition and notice three previous fillings and a probable carious lesion similar to the mounted teeth (Figure 1). The mounted teeth included one maxillary and three mandibular molars. Teeth were randomly selected based on their different occlusal appearances. The teeth were stored in 10% buffered formalin following extraction and had no occlusal restorations, fissure sealants, or developmental defects. The occlusal surfaces were cleansed for 60 seconds with a nylon-bristle brush with pumice and water. The teeth were mounted in four separate blocks of fiber heat-cured acrylic resin (25 mm × 20 mm), coded randomly from I to IV, and kept moist in water throughout the study.

The mounted teeth were handed to the examiners one at a time for them to inspect. They were allowed to dry them for 5 seconds and visually inspect the occlusal surface for probable occlusal carious lesions according to the ICDAS-II criteria (Table 1). Furthermore, they were asked to choose their management for each tooth from a set of options: no treatment, professional fluoride application, fissure sealant, preventive resin restoration, resin composite restoration, amalgam restoration, compomer restoration, or glass ionomer restoration. To protect the dentist's confidentiality, participants were asked to place their answered questionnaire in a sealed envelope.

After the survey, the teeth were sectioned longitudinally in a buccolingual direction into three equidistant sections using a water-cooled slow-speed diamond blade (15HC, Buehler Ltd, Lake Bluff, IL, USA). A stereomicroscope (Leica MZ-6, Leica Microsystems Wetzlar, GmbH, Wetzlar, Germany) attached to a Leica DC200 camera of 1.3 megapixels (1.5 magnification lens) and to Leica Image Manager IM 500 software were used to view and capture pictures of the histologic sections. Two independent investigators evaluated the images of the cut sections for the depth of the carious lesion (if present). The sections were compared with Hintze and Wenzel's criteria (Table 3) for histologic examination.[12] Each tooth was then histologically diagnosed according to the most carious section from the three sections.

After data collection, the results were analyzed using the Statistical Package for Social Sciences, version 16.0 (SPSS Inc, Chicago, IL, USA). Descriptive exploratory analysis was done. The participants'

Table 1: *Visual Inspection Criteria (ICDAS-II) Used in the Study*

Score	Clinical Description
0	Sound; no change in enamel translucency after prolonged air drying (>5 seconds).
1	First visual changes in enamel; opacity or discoloration not visible on the wet surface, but distinctively visible after air drying, or changes seen on a wet surface, but limited to the confines of the pit and fissure area.
2	Distinct visual change in enamel; opacity or discoloration distinctly visible on a wet surface and/or wider than the fissure fossa area.
3	Localized enamel breakdown due to caries with no visible dentin or underlying shadow.
4	Underlying dark shadow from dentin with or without localized enamel breakdown.
5	Distinct cavity in opaque or discolored enamel exposing the dentin.
6	Extensive distinct cavity with visible dentin and more than half of the surface involved.

Table 2: *Demography of Dentists Who Participated in the Study According to Their Specialty*

Dentist's Factors	N	Specialty		
		General Practitioners, %	Restorative Dentistry, %	Others, %
Gender				
Male	97	34	33	33
Female	59	69	7	24
Nationality				
Kuwaiti	75	65	12	23
Non-Kuwaiti	81	31	33	36
Age, y				
< 30	43	96	0	4
30–49	90	28	33	39
≥ 50	23	29	29	42
Place of work				
Public	117	52	19	29
Private	39	33	36	31
Area of practice				
Urban	148	47	23	30
Rural	8	63	12	25
Dental education				
North America	22	36	23	41
Europe	21	24	38	38
Middle East	47	70	19	11
Asia	29	14	38	48
Africa	37	65	8	27
Years practicing				
<10	126	50	22	28
≥10	30	36	27	37
Total	156	47	23	30

diagnosis for each tooth was dichotomized into sound or carious at two cut-off points; namely E (ICDAS-II score > 0) and D (ICDAS-II score > 3). Furthermore, the treatment options for each tooth were regrouped into preventive (no treatment or any treatment that does not involve drilling) and restorative (any treatment that involves drilling into the tooth). Spearman correlation between diagnosis and treatment was performed for each tooth at the two cut-off points. Multivariate regression analysis was used to test the effect of dentists' gender, place of work, area of practice, country of dental education (grouped into continents), specialty, and experience on the diagnosis and treatment of each tooth.

RESULTS

The demographic distribution of the participants is presented in Table 2. The participants' mean age was 37 (±10.3) years ; 38% of them were female. As

Table 3: *Examiners' Histologic Classification of the Teeth (I to V) Based on Hintze and Wenzel's Criteria*

Score	Hintze and Wenzel's Histologic Criteria	Teeth
0	Sound	
1	Caries lesion in enamel	I and III
2	Caries lesion in outer dentin	II and IV
3	Caries lesion in inner dentin	

Table 4: *Distribution (%) of the ICDAS-II Scores Given by the Participants (n=156) for the Four Teeth*

Tooth	ICDAS-II Score*					
	0	1	2	3	4	5
Caries into enamel						
I	78 (50.0)	41 (26.3)	17 (11.0)	3 (2.0)	16 (10.2)	1 (0.6)
III	72 (46.2)	36 (23.1)	5 (3.2)	9 (5.8)	28 (17.9)	6 (3.8)
Caries into dentin						
II	6 (3.8)	17 (11.0)	22 (14.1)	16 (10.2)	30 (19.2)	65 (41.7)
IV	26 (16.7)	13 (8.3)	23 (14.7)	9 (5.8)	51 (32.7)	34 (21.8)

** None of the participants gave score 6 to any of the teeth.*

Table 5: *Percentages of Participants Who Diagnosed the Occlusal Surfaces of Teeth I to IV as Carious at the Two Cut-off Points E (ICDAS > 0) and D (ICDAS > 3), Their Suggested Treatment for Each Tooth, and the Spearman Correlations Between Treatment (T) and Diagnosis at the Two Cut-off Points*

Tooth	Diagnosis		Treatment		Correlations*	
	E, %	D, %	Preventive, %	Restorative, %	E & T	D & T
Caries into enamel						
I	50.0	10.9	57.1	42.9	0.7	0.4
III	53.8	21.8	52.6	47.4	0.7	0.4
Caries into dentin						
II	96.2	60.9	14.1	85.9	0.6	0.4
IV	83.3	54.5	18.6	81.4	0.6	0.4

** All Spearman correlations were statistically significant (p=0.000).*

presented in Table 3, the histologic examination revealed that tooth I and III had carious lesions restricted to enamel, and tooth II and IV had carious lesions extending into dentin.

Table 4 shows the distribution of the ICDAS-II scores given by the participants for each tooth. Teeth with caries confined to enamel (I and III) were mainly given scores of 0 and 1, while teeth with caries extending into dentin (II and IV) were mainly given scores of 4 and 5.

Table 5 presents the participants' diagnosis of each tooth at the two cut-off points (E and D). For teeth with caries limited to enamel (I and III), only 50.0% and 53.8% of the participants, respectively, diagnosed them as carious at E; this indicates that about 50% of the participants diagnosed these teeth as sound. For teeth with caries extending into dentin (II and IV), only 60.9% and 54.5% of the participants, respectively, diagnosed them as carious at D, which indicates that more than two-thirds of the partici-

pants scored these teeth as either sound or with caries limited to enamel.

The proposed treatment for each tooth varied. The treatment chosen by the participants for each tooth (preventive or restorative) is shown in Table 5. Of the participating dentists, 42.9% and 47.4% suggested restorative treatment for teeth with caries limited to enamel, I and III, respectively. On the other hand, 85.9% and 81.4% recommended restorative treatment for teeth with caries extending into dentin, II and IV, respectively.

Spearman correlations between diagnosis and treatment for each tooth are also presented in Table 5. Correlations were statistically significant for all teeth (p=0.000). As shown in the Table, the correlations were stronger at the cut-off point E than at the cut-off point D.

Table 6 shows the percentages of teeth correctly diagnosed by the participants according to their gender, work place, area of practice, place of dental education, specialty, and experience. Of the participants, 12.8% did not diagnose any tooth correctly, while only 5.8% of the participants diagnosed all four teeth correctly. The specialty of the participating dentist was the only factor that was associated with the number of correct diagnoses of teeth. In comparison with general practitioners, participants who specialized in restorative dentistry correctly diagnosed fewer teeth (p=0.005).

Table 7 shows the distribution of the participants who correctly diagnosed each of the four teeth in relation to the independent variables. The multinomial logistic regression analysis showed that dentists with specialty in restorative dentistry were less accurate in diagnosing teeth II and III (OR: 0.41 and 0.15; 95% CI: 0.16-1.04 and 0.05-0.49). On the other hand, there was no statistically significant difference in the diagnosis of teeth by dentists of different gender, from different places of work or areas of practice, or by years of practice.

Table 8 presents the distribution of dentists who chose restorative treatment modality for each tooth according to the independent variables. The logistic regression model showed that restorative dentistry specialists had less tendency to treat teeth with enamel caries (I and III) restoratively as compared with general dentists and other specialists (OR: 0.57 and 0.54; 95% CI: 0.33-1.07 and 0.31-0.94). General dental practitioners were more likely to restore tooth IV than dental specialists.(OR: 2.34; 95% CI: 1.21–4.54).

DISCUSSION

Recently, the ICDAS-II has been introduced as a novel system to diagnose caries.[7-10] The advantage of this system is that different stages of dental caries have been identified, and therefore different treatment options for these stages should be considered.[7,8] Studies that have been previously conducted to assess the reproducibility and accuracy of this system relied on examiners who were trained using the ICDAS-II criteria.[10,16,17] In our study, the participants did not have any previous training on the system prior to their participation in the study. The criteria were presented to them without any further detail or any additive verbal explanation. The impact of training courses on improving the accuracy of the participants should be looked at in the future.

When the participants' scores were compared against the histology, accuracy for detection of carious lesions extending into dentin was higher than the accuracy for detection of lesions that were confined to enamel; this has also been seen in a previous study.[16] Therefore, the variability in diagnosis of occlusal caries is mostly seen in teeth that have no obvious cavitation. Training of dentists on accurately scoring these lesions is important, especially when it comes to patient education and monitoring of oral health status.

It is known that there is a substantial variation between dentists in the way they practice clinical diagnosis and therapeutic decision-making related to caries.[1,4,5,18] This variability was shown in this study in the way many dentists deviated from the correct diagnosis of occlusal caries derived from the histologic sectioning of the examined teeth. The results of this study revealed that the majority of dentists underdiagnosed teeth with caries restricted to enamel (I and III) and scored them as sound. As to teeth with caries extending to dentin, the majority underdiagnosed them as having caries in the enamel. This is in accordance with previous studies that argue that the absence of a definitive diagnostic step contributes to the variation in caries diagnoses among practitioners.[2]

It is very natural for a person to infer that there will be variation in the treatment of occlusal caries given that a variation in the diagnosis exists. Yet what appears evident is that there are variations in the treatment choices for a single diagnosis. Dentists who diagnosed the teeth with caries restricted to enamel varied in their treatment decisions by choosing to do preventive measures or to restore

Table 6: *Percentages of Teeth Correctly Diagnosed by the Participants According to Different Independent Variables*

Independent Variables	N	Number of Correctly Diagnosed Teeth, %					*p*-Value
		0	1	2	3	4	
Gender							
Male	97	13.4	26.8	30.9	24.7	4.1	0.769
Female	59	11.9	23.7	27.1	28.8	8.5	
Place of work							
Public	117	11.1	23.1	30.8	29.9	5.1	0.266
Private	39	17.9	33.3	25.6	15.4	7.7	
Area of practice							
Urban	148	12.8	26.4	28.4	27.0	5.4	0.551
Rural	8	12.5	12.5	50.0	12.5	12.5	
Dental education							
North America	22	13.6	54.6	31.8	0.0	0.0	0.359
Europe	21	23.8	33.3	33.3	4.8	4.8	
Middle East	47	12.8	36.2	36.2	14.9	0.0	
Asia	29	29.6	37.0	25.9	7.5	0.0	
Africa	37	2.7	27.0	51.4	13.5	5.4	
Specialty							
General dentistry	74	4.1	28.4	31.1	27.0	9.5	0.005
Restorative	36	30.6	27.8	27.8	13.9	0.0	
Others	46	13.0	19.6	28.3	34.8	4.3	
Years practicing							
<10	126	14.3	25.4	28.6	25.4	6.3	0.759
≥ 10	30	6.7	26.7	33.3	30.0	3.3	
Total	156	12.8	25.6	29.5	26.3	5.8	

Table 7: *Percentages of the Participants Who Diagnosed Each Tooth Correctly According to Different Independent Variables*

Independent Variables	N	Teeth With Enamel Caries		Teeth With Dentin Caries	
		I	III	II	IV
Gender					
Male	97	35.1	34.0	58.8	51.5
Female*	59	45.8	28.8	64.4	59.3
Place of work					
Public*	117	40.2	33.3	64.1	57.3
Private	39	35.9	28.2	51.3	46.2
Area of practice					
Urban	148	37.8	32.4	59.5	56.1
Rural*	8	62.5	25.0	87.5	45.0
Dental education					
North America	22	50.0	22.7	72.7	27.3
Europe	21	23.8	42.9	42.9	66.7
Middle East	47	40.4	25.5	57.4	59.6
Asia	29	41.4	37.9	58.6	44.8
Africa*	37	37.8	35.1	70.3	64.9
Specialty					
General dentistry	74	41.9	32.4	71.6	63.5
Restorative	36	30.6	13.9**	38.9**	41.7
Others*	46	41.3	45.7	60.9	50.0
Years practicing					
<10	126	40.5	28.6	62.7	52.4
≥10*	30	33.3	46.7	53.3	63.3
Total	156	39.1	32.1	60.9	54.5

** Reference in logistic regression models fitted to the data separately for each tooth.*
*** Statistically significant in the logistic regression model (p=0.002 and 0.04; OR: 0.15 and 0.41; 95% CI: 0.05-0.49 and 0.16-1.04).*

the tooth with various restorative materials. Although a large percentage of participants underdiagnose occlusal caries, the results of this study showed that dentists tend to overtreat these lesions. This indicates that when dentists diagnose a tooth as carious, regardless of whether it is confined to enamel or extends into dentin, they tend to treat this tooth restoratively. For example, although only 11% scored tooth I as having caries extending into dentin, 43% of the participants chose to do restorative treatment for this tooth. The same applies for tooth II, III, and IV. These findings have also been found recently by another study. [18] When doing the correlation between diagnosis and treatment, it was evident that diagnosis at the cut-off point E (caries restricted to enamel are included) is more correlated to treatment than caries at the cut-off point D (only caries into dentin are included). This indicates that dentists tend to overtreat occlusal caries by restoring those that are restricted to enamel instead of managing them preventively.[19] This is different from a previous study done in Scandinavia that showed dentists tend to postpone operative treatment for occlusal caries until a definitive cavity or radiolucency in the outer third of dentin may be observed.[20] This variability in treatment choices and treatment rationale perhaps supports many studies that have advocated the placement of treatment scripts to narrow such variability.[7]

Visual inspection of a clean, dry occlusal surface should be the method of choice for caries diagnosis as proposed by the ICDAS visual criteria.[21] In this study, dentists were allowed to do visual examination only. Using more than one method of caries diagnosis has been discussed in the literature. Some studies showed that using multiple methods for caries diagnosis did not improve the accuracy of examiners in detection of early occlusal caries

Table 8: *Percentages of the Participants Who Chose Restorative Treatment for Each Tooth According to Different Independent Variables*

Independent Variables	N	Teeth With Enamel Caries		Teeth With Dentin Caries	
		I	III	II	IV
Gender					
Male	97	40.2	49.5	84.5	81.4
Female*	59	47.5	44.1	88.1	81.4
Place of work					
Public*	117	47.0	48.7	88.9	81.2
Private	39	30.8	43.6	76.9	82.1
Area of practice					
Urban	148	41.9	48	85.8	81.8
Rural*	8	62.5	37.5	87.5	75.0
Dental education					
North America	22	59.1	36.4	95.5	77.3
Europe	21	23.8	43.0	81	81
Middle East	47	42.6	47.0	87.2	85.1
Asia	29	38.0	45.0	79.3	79.3
Africa*	37	48.6	59.5	86.5	81.1
Specialty					
General dentistry	74	48.6	50	89.2	89.2**
Restorative	36	27.8**	33.3**	80.6	75
Others*	46	45.7	54.3	84.8	73.9
Years practicing					
<10	126	40.5	44.4	86.5	81.0
≥10*	30	53.3	60.0	83.3	83.3
Total	156	42.9	47.4	85.9	81.4

** Reference in logistic regression models fitted to the data separately for each case.*
*** Statistically significant in the logistic regression model (p=0.04, 0.03, and 0.01; OR: 0.57, 0.54, and 2.34; 95% CI: 0.33-1.07, 0.31-0.94, and 1.21–4.54).*

lesions, but multiple methods did influence the number of teeth indicated for operative treatment.[22-24] Another study showed that using a combination of visual examination, laser fluorescence, and radiographs results in the most accurate form of detection of occlusal caries.[25]

The results of this study showed that participants who have specialty in restorative dentistry were more conservative in diagnosis and treatment of occlusal caries than general dentists or dentists from other specialties. They leaned towards diagnosing teeth with enamel caries as sound and teeth with dentinal caries as caries restricted to enamel. Furthermore, they had fewer tendencies to treat teeth with enamel caries restoratively. The reason for these findings might be the fact that when dentists diagnose a tooth as carious, they have in mind that they have to do something about it; that is why dentists with specialty in restorative dentistry tend to diagnose teeth with enamel caries as sound. This contradicts the recent recommendations that early carious lesions confined to enamel should be treated preventively.[21]

Most restorative dental treatment is provided for free at the public health service clinics in Kuwait, and those who choose to go to the private sector do so to have better service and perhaps even a better quality of treatment. Our results showed that there was no difference between dentists working in the public clinics and dentists working in the private practice in terms of their accuracy in diagnosing occlusal caries or in the way they treat occlusal caries. A previous study performed in Sweden showed that dentists working for the public health service tend to overtreat carious lesions.[26]

The experience of dentists was not associated with accurate diagnosis or overtreatment of occlusal

caries. This agrees with a previous study that showed no strong correlation between the experience of dentists and a more accurate diagnosis or more conservative treatment for occlusal carious lesions.[27] On the other hand, a previous study showed that older dentists tend to overtreat carious lesions.[26] The reason for this variability in the results between studies can be due to the cut-off points for experience or due to the age range of the participants.

Histology is frequently used as a gold standard to validate caries detection. In this study, the evaluation of the histologic sections was performed by two evaluators who examined the captured pictures of the sections on a computer screen. A recent study found that viewing digital images of tooth sections produces results comparable to viewing images directly under the microscope.[28]

Regional differences are known to exist in the emphasis placed on conservatism or minimalism in restorative procedures.[29] In Kuwait, dentists from a number of countries work in the oral health services. These individuals are likely to have different educational backgrounds and work experiences. Previous study found the so-called "school effect" to be the main source of variation in endodontic retreatment decisions.[30] Surprisingly, there was no effect of educational background on both diagnosis and treatment decisions. This emphasizes the fact that variability in diagnosis and treatment of occlusal caries is common among dentists worldwide and should be addressed.

It should be noted that a very big part of the dental service in Kuwait is provided by governmental clinics. Thus, any variability in treatment options and use of restorative materials affects the clinic's expenditure and indirectly affects the treatment provision. Previous research has found a profound effect of dentists' restorative decisions on the cost of treatment.[3,19,31] The results of this study demonstrate the need for continuing education courses to improve on caries diagnostic abilities among dentists and to emphasize the fact that early carious lesions that are confined to enamel can be managed preventively.[21]

An obvious limitation of this study is that dentists were required to diagnose occlusal caries from a set of teeth mimicking as much as possible the true oral environment, albeit still an artificial one. Diagnosing teeth inside a patient's mouth surely differs from diagnosing teeth in acrylic blocks; however, under such a simulated situation all of the patient's factors were controlled, providing the opportunity to assess an unbiased variability.

CONCLUSIONS

A wide variability was seen in the diagnosis of occlusal caries. This study showed that the majority of dentists working in Kuwait tended to underdiagnose occlusal caries. Likely variation was seen in the treatment choices provided by the same dentists. The majority of the dentists tended to overtreat occlusal caries. Specialty of the participants was the main factor that affected diagnosis and treatment decisions of occlusal caries.

(Accepted 14 February 2011)

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