Oral Mucosal Lesion Detection Accuracy Post Lectures and Tests in Clinical Dental Students

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Abstract

The oral medicine field of dentistry comprises learning to diagnose oral soft tissue disease and is taught from the third year of dental school. Despite long-term learning on oral medicine, there are no data on the clinical accuracy of oral mucosal lesion (OML) diagnosis by clinical dental students (CDS). Purpose: to evaluate the effectiveness of oral medicine lectures prior to community service in Tanjung Pandan, Indonesia. Methods: An observational study was done by 60 CDS, divided into 3 groups, who were tested and/or given prior lectures. OML detection was performed by CDS and re-confirmed by an oral medicine specialist. The analyses were done by t-test, ANOVA, and Cohen's Kappa. The results: Out of 615 patients, only 243 patients had OML. There was a significant difference in test scores found between groups with or without prior lectures(P=.026; P=.015). The accuracy and inter-agreement of OML detection was good with substantial agreement (AUC=.825; κ=.629); however, there was fair agreement on normal variant oral lesions (AUC=.68; κ=.322), and all groups failed to detect and diagnose OPMD lesions (AUC=.501; κ=.003). There was a positive correlation between test #2 and AUC OML (R=.845), and with every increase in test score, the accuracy is expected to be .033 higher. Dental student OML knowledge should be upgraded by frequent oral lesion case practice. Further educational strategy is needed to develop dental student's knowledge and skill, so that they can integrate their learning into their practice.

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Introduction

Oral mucosal lesion clinically is very variable and have their own characteristic. Among the wide features, some are benign and some are called pre-malignant and oral cancer, that need to be detected early. The ability to examine the oral mucosa lesion become an important part for clinicians and reflects the competency during the schoolwork. First, the dentist must be able to indicate presence and absence of abnormalities in the oral mucosa. It further increases the ability to diagnose the oral lesions and what type of lesion is encountered. Oral disease science has been taught in Faculty of Dentistry Universitas Trisakti curriculum since 3rd to 5th year and all students were encouraged to do routine oral examination both theoretically or clinically. One way to evaluate the accuracy of student's ability besides the regular exam in examining the oral mucosal lesions is through the community service activities undertaken by faculty.

To date, Faculty of Dentistry Trisakti University has the highest graduates number of dentists in Indonesia (estimated 6,000 dentists). This high number of students provides a challenge for the educator in providing adequate training through clinical exposure, especially in the area of community service where students are exposed to a variety of oral lesions. In 2016, community service was held in Tanjung Pandan, a city within the Bangka-Belitung Province, Indonesia. Even though the city population is approximately 91,000 people, there are no reports on oral lesion epidemiology from this province. This city was chosen because of the high-risk habit of smoking in Indonesia.

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The study was conducted to evaluate the capability of the dental student to detect and diagnose oral mucosal lesion, and the effectiveness of oral medicine lectures and tests prior to community service, and the distribution of oral lesions. All oral examinations were done by clinical dental students and reviewed by oral medicine specialists.

Materials and methods

Sixty clinical dental students (CDS) participated in the lectures and oral screening. Two oral medicine specialists delivered the training prior to community service. Oral screening, as a part of community service, was organized by the Faculty of Dentistry Universitas Trisakti, Jakarta, Indonesia. This community service was done in Tanjung Pandan City, Bangka-Belitung Province, Indonesia. Approval and ethical clearance was given by the Ethics Committee, Faculty of Dentistry, Universitas Trisakti.

In *lux* Lectures

Lectures were done two days prior to oral screening community service. The students were divided into three groups. As describe in Table 1, the total time in *lux* lectures lasted for 3 hours, which was conducted by two oral medicine specialists. The lectures consisted of a review of normal variant oral lesions, oral potentially malignant disorders (OPMD) and oral lesions associated with trauma, infection, and autoimmunity. Each test consisted of 10 oral mucosal lesion (OML) pictures, which were equal to a score of 10. Statistical analysis was done by t-test and ANOVA. Differences were considered significant when $P<.05$.

Oral screening

The oral screening was performed by all students who followed the previous in *lux* lectures. Each student performed an examination using mouth mirror and probe under an artificial white light. Findings were recorded and evaluated by the same trainers. Cohen's Kappa (κ) was used to determine the inter-examiner agreement on an oral mucosal lesion, normal variant oral lesion and OPMD.[1] Sensitivity, specificity, positive and negative predictive values were established for each group. A linear regression model was used to determine the relationship between test score and accuracy.

Results

A total of 615 patients were screened; 225 (36.58%) were males and 390 (63.41%) were females. The mean age was 19.38±12.16 years old. Out of the 615 patients, 243 (39.51%) patients had one or more OML. Table 2 describes all OML found in Tanjung Pandan city.

Based on mean test score #2, among three groups, group A had the highest score compared to the other respectively (7.2±1.5; 6.1±.9; 5.5±1.6) (Table 3). Intra- and inter-group test score differences were found. For groups A and B, a significant difference was found between test #1 and #2 ($P=.026$; $P=.015$). When comparing test #2, significant differences were found between group A vs B ($P=.036$), group B vs C ($P=.004$) and all groups ($P=.007$) (Table 4).

To determine whether there is a correlation between tests, in *lux* lectures and the accuracy of diagnosis oral lesions, we performed Pearson's correlation. A positive correlation was found between test #2 and the area under curve (AUC) OML (R=.845; $P=.004$). A regression test between these variables (Figure1) concluded that AUC OML=.616+.033(Test #2).

Discussion

Despite advanced technology in the diagnosis of oral mucosal lesions, clinical visual examination is still an important diagnostic tool in a large population. The benefits of this technique are that it is simple, low cost and causes less discomfort for patients.[2-4] However, this technique also has several shortfalls, which are subjectivity, experience and the physical-emotional state of the examiner.[5] In our study, clinical diagnosis of OML was confirmed by oral medicine specialists to eliminate misdiagnosis of oral lesions.

The present study is the first epidemiological study to examine OML detection among CDS to use a study design combining lecture and epidemiological data from Indonesia. The community service location was inside a government elementary school building from 08.00 am to 03.00 pm.

According to RISKESDAS 2013[6], Bangka-Belitung Province has the highest cigarette consumption (18.3 cigarettes per person per day). In our study, we found that 5.36% of subjects were currently active smokers and 2.27% of subjects had stopped smoking. The youngest

smoker was 7 years old and the longest duration of smoking was 53 years. None of the respondents reported chewing betel quid or drinking alcohol. Kretek cigarettes are the most popular cigarettes in this city. Thus, with a low-risk population in Tanjung Pandan, oral lesions such as OPMD would likely be low (.91%). However, normal variant oral lesions were much higher than expected in this survey, (74.39%), especially tongue lesions. To date, no reports of epidemiology of oral lesion found in Indonesian population.

For in *lux* lectures, we found that there were intra- and inter-group test score differences. In groups A and B, a significant difference was found between tests #1 and #2. It seems that lecture "one-way communication" would not be beneficial for dental students. Implementation through discussion of oral lesion picture cases is more likely to be interesting for students, thus increasing their test scores. When comparing test #2, a significant difference was found between group A vs B, group B vs Can d all groups. We could see that calibration may have a small effect on test #2 compared to the group without a lecture and discussion. This study aimed not only to determine the passing score CDS but also to review the oral medicine cases that had been received by these students. Additionally, we sought to prove whether in *lux* lectures are beneficial for improving the accuracy of diagnosis OML.

In this study, we found that most of the CDS are able to detect normal variant and trauma oral lesions. These results are in accordance with the Competency Standards of Indonesian Dentistry 2015, which stated that dentists should be able to detect any oral lesion according to level of competence.[7] The dentist himself should be capable of independently diagnosing a normal variant oral lesion. In our study, CDS ability to diagnose correctly was 71.12% and they were more capable to detect rather than diagnose precisely. This result may differ from Ali et al[8] study in Kuwait which showed 72.5% correct diagnosis and they had difficulty in detecting than diagnosing. Moreover, most of the oral lesions found in the survey are mainly the above mentioned two types, while OPMD prevalence was low (.91%). Compare to dentist ability to detect of oral premalignant and malignant were .74 (95% CI, .62-.86) for sensitivity and .99 (95% CI, .98-.99) for specificity. The accuracy of detecting any OML was good (AUC=.825). However, to clinically diagnose normal variant oral lesions would be hard (AUC=.68; κ=.322) for CDS, even though they are already in their clinical years. In all groups, there was failure to detect and diagnose OPMD lesions (AUC=.501; κ=.003). Compare to study done by Patel et al[9], in New Zealand, dentist's accuracy to diagnose oral malignant and premalignant was moderate (50.6%). These results suggest that overall, the ability to detect any oral lesion is good, with moderate agreement, but not for obtaining the correct diagnosis, especially for OPMD lesions. Other factors that may have been involved in the low accuracy of oral screening were that the location was not suitable, and that there was a large number of patients. Additionally, the clinical features of OPMD are varied and may be similar to any other lesion, unless the operator has certain training and experience in oral medicine. It should be noted that clinical diagnosis alone could not represent the main diagnosis, thus confirmation of oral mucosal lesion should be done by histologic examination.[9,10] In this research, CDS showed 71.12% correct diagnosis. This suggest that CDS are more likely able to detect rather than to diagnose precisely the oral mucosal lesion. In Kuwait, DS ability to diagnosis correctly was 72.5% and they had more problem in detecting oral lesion.[8]

Oral pemalignant and oral cancer detection study done by Julien et al[11] showed that the dentist ability to detect of oral premalignant and malignant were .74 (95% CI, .62-.86) for sensitivity, .99 (95% CI, .985-.994) for specificity. Other study done by Seoane et al[12], showed diagnostic sensitivity and specificity for oral cancer and pecancer vs benign lessions was 57.8 and 73.2 respectively. In this study, CDS ability to detect OPMD was quite 33.33 (95% CI, .84-90.57) for sensitivity, 71.38 (95% CI, 66.14-76.24) for specificity for all groups.

To assess the correlation between the knowledge and practice of OML screening, linear regression test between test #2 and accuracy OML showed positive correlation (R=.845) and 71.5% of the variation in accuracy in detecting OML is explained by test #2. For every one-unit increase in score in test #2, accuracy is expected to be.033 higher. It suggested that in all groups, the accuracy of OML increased 33% after test was done. Thus

the increasing percentage of an accuracy of oral mucosal lesion detection could be achieved by carrying out another test.

Conclusions

Dental student knowledge in oral medicine should be upgraded by oral lesion case practice, instead of solely utilizing lectures or one-way communication. Two-way communication, such as case discussion and interactive picture cases, between the lecturer and students is crucial for a fuller understanding in oral medicine. The accuracy of OML detection can be increased by carrying out frequent test.

Declaration of Interest

The authors report no conflict of interest and the article is not funded or supported by any research grant.

Student (number)	Pre-test (10 min)	Discussion after pre-test (10 min)	Lectures (2 hours)	Test #1 (10 min)	Discussion after test #1 (10 min)	Test #2 (10 min)	Discussion after test #2 (10 min)
Group A (20 CDS)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group B (19 CDS)	-	-	-	Yes	Yes	Yes	Yes
Group C (21 CDS)	-	-	-	-	-	Yes	Yes

Table 1. The method of in *lux* lectures varies for each group.

Oral medicine specialist diagnosis	Number of lesions	Student		
		Correct diagnosis	Not detected	Incorrect diagnosis
Normal variant oral lesion				
Morcicacio buccarum	11	9	1	1
Leukoedema	24	9	11	4
Frictional keratosis	48	25	15	8
Geographic tongue	6	5	1	-
Fissure tongue	84	72	9	3
Crenated tongue	71	61	7	3
Trauma lesion				
Stomatitis nicotine	6	-	4	2
Recurrent aphthous stomatitis	25	22	1	2
Angular cheilitis	6	2	4	-
Smoker melanosis	20	17	1	2
Traumatic ulcer	17	11	3	3
Infection				
Denture sore mouth	2	-	2	-
Oral hairy leukoplakia	3	-	3	-
Proliferative oral lesion				
Fibroepithelial polyp	2	-	-	2
Fibroma	1	-	-	1
OPMD				
Oral lichen planus	1	-	-	1
Leukoplakia homogenous	2	1	1	-
Total	329	234	63	32

Table 2. Frequency of oral mucosal lesions found in Tanjung Pandang based on oral medicine specialist and dental student diagnosis.

Group	n	Mean score test					
		Pre-test	SD	Test #1	SD	Test #2	SD
A	20	6.9	1.9	6.2	1.2	7.2	1.5
B	19	-	-	5.2	1.3	6.1	.9
C	21	-	-	-	-	5.5	1.6

Table 3. Mean test scores for all groups of lectures.

Test score	Group	P
Test #1	Group A vs B	.77
Test #2	All groups	.007 **
	Group A vs B	.036 *
	Group A vs C	.551
	Group B vs C	.004 **

Table 4. T-test analysis of groups between tests #1 and #2. * *P*<.05; ** *P*<.01

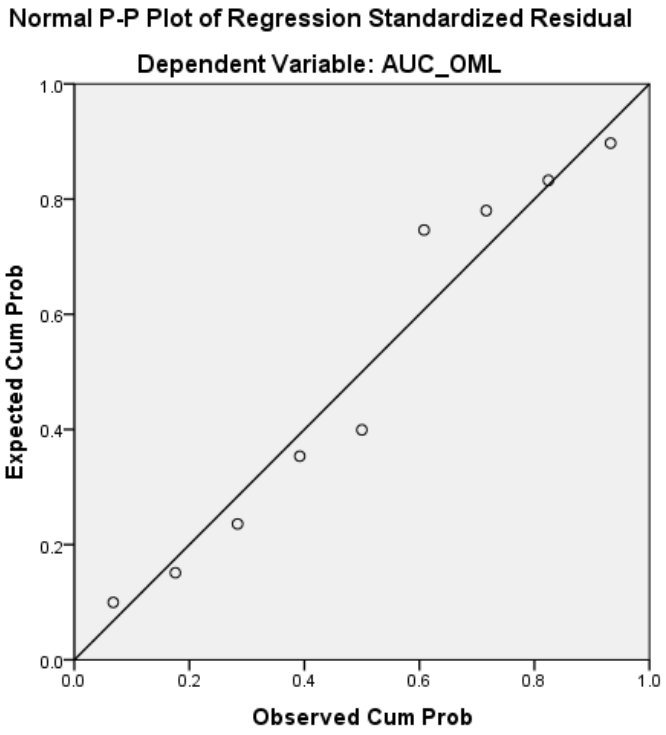

Figure 1. ROC curve for linear regression between test #2 and area under curve oral mucosal lesion.

Group	Oral lesion	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	LR+ (95% CI)	LR- (95% CI)	AUC (95% CI)	κ	Disease prevalence
A	OML	71.30 (61.80-79.59)	97.18 (90.19-99.66)	97.47 (91.15-99.69)	69.00 (58.97-77.87)	25.31 (6.42-99.75)	.3 (.22-.40)	.832 (.771-.894)	.64	
	Normal	76.83 (65.96-85.13)	53.85 (33.75-72.86)	84 (73.32-91.11)	42.42 (25.95-60.61)	1.66 (1.08-2.56)	.43 (.27-.68)	.653 (.527-.780)	.281	
	OPMD	NC NC	70.00 (60.52-78.37)	0 (.00-10.58)	100 (95.32-100)	NC NC	1.43 NC	.5 NC	NC	
B	OML	68.75 (59.30-77.17)	97.01 (89.63-99.64)	97.47 (19.15-99.69)	65 (54.82-74.27)	23.03 (5.85-90.71)	.32 (.24-.43)	.812 (.748-.876)	.598	
	Normal	72.15 (60.75-81.37)	60.61 (42.24-76.57)	81.43 (69.98-89.36)	47.62 (32.29-63.38)	1.83 (1.17-2.86)	.46 (.31-.68)	.664 (.551-.777)	.303	
	OPMD	0 (.00-84.19)	70.00 (60.52-78.37)	0 (.00-10.58)	97.47 (91.15-99.69)	0 NC	1.43 (1.26-1.61)	.487 (.371-.604)	-.035	
C	OML	73.15 (63.76-81.22)	98.36 (91.20-99.96)	98.75 (93.23-99.97)	67.42 (56.66-76.98)	44.62 (6.37-312.75)	.27 (.20-.37)	.831 (.767-.895)	.65	
	Normal	73.49 (62.48-82.31)	72 (50.40-87.13)	89.71 (79.35-95.41)	45 (29.60-61.34)	2.62 (1.38-4.99)	.37 (.25-.54)	.727 (.611-.843)	.376	
	OPMD	100 (2.50-100)	72.90 (63.45-81.04)	3.33 (.08-17.22)	100 (95.38-100)	3.69 (2.70-5.03)	0 NC	.517 (.393-.640)	.047	
All	OML	71.04 (65.80-75.89)	97.49 (94.23-99.18)	97.90 (95.17-99.31)	67.13 (61.38-72.52)	28.27 (11.87-67.36)	.3 (.25-.35)	.825 (.789-.862)	.629	62.24 (57.95-66.39)
	Normal	74.18 (68.12-79.45)	61.90 (50.61-72.09)	84.97 (79.30-89.35)	45.21 (36.01-54.75)	1.94 (1.47-2.58)	.41 (.33-.52)	.68 (.612-.749)	.322	74.39 (69.24-78.95)
	OPMD	33.33 (.84-90.57)	71.38 (66.14-76.24)	1.06 (.03-5.79)	99.15 (96.95-99.90)	1.16 (.23-5.82)	.93 (.42-2.08)	.501 (.432-.570)	.003	.91 (.19-2.65)

Table 5. In *lux* lectures and oral screening reproducibility and validity. OML oral mucosal lesion; NORMAL normal variant oral lesion; OPMD oral potentially malignant disorders; PPV positive predictive value; NPV negative predictive value; LR+ positive likelihood ratio; LR- negative likelihood ratio; AUC area under the curve; κ Kappa value; NC cannot be calculated.

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