



Competency-Based Assessment of Periodontal Examination Skills of Dental Students in Comprehensive Clinics- an Observational Study

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ABSTRACT

Aim and objective: This study aims to assess and compare the clinical grades and examination skills of undergraduate students on gingival and periodontal parameters by using the newly developed assessment criteria framed by subject experts.

Material and methods: Gingival and periodontal examination skills of 100 students posted in clinics were assessed in module 1 and module 2 consisting of 5 case histories each. Scores were given and compared for each gingival and periodontal clinical parameter in module 1 and module 2.

Results: Gingival and periodontal examination skills were improved among all the students when compared with module 1 and module 2. A statistically significant difference was observed with a p-value of 0.000*.

Conclusion: Absolute improvement in gingival and periodontal examination skills was observed among all the students of the dental school by following a newly framed structured mini periodontal examination case format.

Keywords: Competency-based assessment; dental students; examination skills; gingival parameters; periodontal parameters

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Introduction

Dental education consists of both laboratory and clinical settings and both components are taught in pre-clinical and clinical departments during the dental curriculum. Students will learn and practice on dental simulators before practicing on patients. This will help in mastering hand skills for the students in dental practice.¹

Traditional clinical assessments of dental students will depend on the clinical subject expert who evaluates the student's examination and procedural skills. The clinical grades will be given daily based on the student's examination skills and by assessing each dental procedure in the dental clinics.²

In today's view of statistics, many dental students are graduating in large numbers every year. To compete and practice successfully every graduate should be skilled enough to examine, diagnose, and treat the needs of dental patients. Among many oral or dental examination skills, periodontal examination skills need practice and expertise for the correct diagnosis of gingival and periodontal diseases.³

To test the clinical efficiency of dental students, it is important to assess their skills in examination. The traditional way of assessing clinical skills of periodontal examination is the discussion of clinical case encounters of students with the clinical instructor. The traditional method of assessing the periodontal examination skills will miss the thorough cross-checking of findings written by the students.⁴

To overcome the errors in the identification and assessment of the clinical examination skills, the subject experts of periodontology reframed the case recording into a short clinical sheet that only comprised gingival and periodontal parameters. Clinical experts provide grades for each clinical parameter examined by the student cross-examine each parameter by the clinical instructor and clarify the errors then and there during the patient encounters. This feedback mechanism is unique to other observational studies in assessing the learning skills of dental students.⁵

The assessment criteria for periodontal clinical examination will be planned in two modules in which the student and subject expert will examine the patient one after the other and discuss the differences in identifying their clinical findings.^{5,6}

Students' gingival and periodontal clinical examination skills will be assessed and compared with clinical grades according to the new assessment criteria framed by the subject expert in two modules.

Hence, the present study has taken up a total of 100 third BDS students in module 1 and the same 100 final-year students in module 2 will be participating in this study during the academic year of 2020-21. All the students will be analyzed for their periodontal examination skills by newly framed criteria by the subject experts.

Methodology

Between June 2020 and June 2022, a pilot study was conducted in the Department of Periodontics and Implantology at Vishnu Dental College in Bhimavaram. The Institutional Assessment Board approved it and exempted it from ethical review. To familiarize the faculty with the new competency-based assessment criteria framed by the Periodontics department subject experts, an orientation session was held first to follow the newly framed rules in all five comprehensive clinics and to become familiar with the new structured criteria as shown in Annexure 1.

Undergraduate Students' Assignment:

Recording the major complaint and current illness history; recognizing signs and symptoms; accurately recording gingival and periodontal parameters; summarizing clinical findings; and obtaining an accurate diagnosis and treatment plan was the target of the students when posted in the comprehensive clinics.

Task for Undergraduate Students:

- Recording chief complaint and history of present illness
- Identification of signs and symptoms of gingivitis and periodontitis
- Correct recording of gingival and periodontal parameters
- Summarizing the clinical findings
- Drawing correct diagnosis, prognosis and, treatment plan.

Structural Criteria or Guidelines to Follow During Competency-Based Clinical Assessment

1. Each student was assessed by five calibrated examiners throughout the year to increase objectivity and reliability.

2. Checklists and/or criteria-based assessments formulated for gingival and periodontal examination skills.

Objective: To identify the potential areas where there is a need for improvement in the teaching process during clinical postings of the dental curriculum.

Module 1: Subject expert discussion on gingival and periodontal examination:

After the discussion by the subject expert on gingival and periodontal examination, the students were asked to perform the gingival and periodontal examination on the patients visiting comprehensive clinics. The updated

periodontal examination sheet was distributed to the students and they were asked to examine the color, contour, consistency, size & shape, surface texture, exudates, the position of gingival margin and, bleeding on probing under gingival examination. The students also record periodontal pocket depth, mucogingival problems, clinical attachment loss, furcation involvement, tooth mobility, trauma from occlusion and, pathologic tooth migration under periodontal examination in module 1. Annexure: 1

Then the subject expert examines the gingival and periodontal tissues and gives scores according to the new structured format of the case sheet. The clinical parameters were compared and discussed between the student and the subject specialist and the clarifications were given to the students where they had gone wrong in examining the gingival and periodontal examination.

Module 2: Student's gingival and periodontal examination

The students were asked to perform the gingival and periodontal examination on the patients visiting comprehensive clinics in module 2. The subject expert examines the gingival and periodontal tissues and gives scores according to the new structured format of the case sheet. The clinical parameters were compared and discussed between the student and the subject specialist. The subject expert compares the scores obtained in module 1 and module 2 after gingival and periodontal examination. Annexure: 2

Gingival examination skills scoring criteria: Assessing and rating clinical criteria like as color, contour, consistency, surface texture, size, and shape during a gingival examination done for ten cases in module 1 and ten cases in module 2. Also, have to locate the marginal gingiva, and examine for exudate, and bleeding on probing. When the identified clinical finding is incorrect, the score is zero. When the identified clinical parameter is only partially right, a score of 1 is assigned. When the identified clinical parameter is correct following examination by the assessor, the score is 3. Annexure: 3

Periodontal examination skills scoring criteria: Assessing and grading clinical characteristics such as periodontal pocket depth, recession, clinical attachment loss, furcation involvement, occlusion trauma, tooth mobility, and pathologic migration for ten cases in module 1 and ten cases in module 2. Score 1 is given when the identified clinical parameter is partially correct. Score 3 is given when the identified clinical parameter is correct after assessment by the assessor. Annexure: 4

Results

A hundred third-year BDS students assigned to the Department of Periodontics and Implantology underwent five newly framed clinical examination experiences in module 1 and five newly framed clinical examination encounters in each of the remaining two years of the BDS program.

The newly constructed standardized criteria for assessing periodontal examination skills were deemed

adequate by all students to be easy to follow, well organized, and clear. The comparative examination of clinical parameters and conversation between the student and subject expert for all ten cases recorded in their 3rd and 4th BDS courses are the highlights of the methodology.

Compared to Module 1 and Module 2, the newly developed periodontal examination standards offer more opportunities than traditional formats, and all 100 students can demonstrate their skills in the examination. Each of the five faculty members evaluated five reconstructed history encounters in Module 1 and five history encounters in Module 2.

Gingival Examination: During Module 1 clinical gingival examination, color, contour, consistency, size and shape, surface quality, exudate, gingival line location, and bleeding during probing were examined in 5 patients and immediately. It was inspected and discussed by an inspector. Expert. In Module 2, all gingival examination parameters were examined and evaluated in the same way. The mean gingival clinical parameters were 0.9295 (SD = 0.23685) in Module 1 and 1.8385 (SD = 0.24758) in Module 2, which is statistically significant with a p-value of 0.000*.

Periodontal examination: Periodontal examination includes periodontal pockets, mucosal gingival problems, clinical loss of adhesion, bifurcation involvement, tooth mobility, occlusal trauma, and pathological tooth movement in 5 of Module 1. It was evaluated on the patient, immediately evaluated and, discussed by the inspector/evaluator. In Module 2, all periodontal test parameters were tested and evaluated in the same way. The mean gingival clinical parameters were 0.9065 (SD = 0.24440) in Module 1 and 1.9067 (SD = 0.13220) in Module 2, which is statistically significant with a p-value of 0.000*.

In Module 1, examining the clinical parameters of the gingiva, 28.4% of students scored 0, 70% of students scored 1, and only 1.6% of students scored 2 in the first case encounter. In Module 2, when examining the clinical parameters of the gingiva, 0% of students received "0", 7.1% of students received "1" and 92.9% of students received "2" when the last case was encountered. In Module 1, when examining the clinical parameters of periodontal disease, 32% of students scored 0, 67.9% of students scored 1, and only 0.1% of students scored 2 in the first case encounter. In Module 2, when examining the clinical parameters of periodontal disease, 0% of students gave "0", 0.9% of students scored "1" and 99.1% of students scored "2" in the last case encounter.

Discussion

Traditionally, dental student clinical assessments included daily grades, clinical performance assessments, and procedural requirements. According to the American Dental Education Association (ADEA), clinical assessment tests the acquisition of abilities defined as "complex

behaviors or skills essential for a general dentist to initiate an independent, unsupervised dental practice.^{7,8}

Clinical assessment of dental students can be difficult due to the complexity of many factors involved in student-teacher interactions during medical history recording. Therefore, the purpose of this observational study was to introduce a new framed medical history form as a tool for formative assessment of students in the fields of periodontology and implantology.^{9,10}

An important part of the newly designed medical history form is structured one-to-one feedback that takes place immediately after the student-patient encounter. [11,12] This was greatly appreciated by all the students. Even all reviewers reported the benefits of redesigned history acquisition.^{13,14}

Comparing the results of student clinical examinations in periodontology between the first and tenth encounters with clinical practice, almost all students were evaluated for all gingival and periodontal clinical parameters. It shows improvement and confirms the effectiveness of this evaluation method.^{15,16}

Bertoli E *et al.* 2018 compared the daily clinical outcomes of third-year dental students during routine clinical activities, including direct and indirect surgical procedures, with clinical and laboratory assessments. The results were statistically significant and the procedure was highly evaluated in the clinical setting. These results are consistent with our research.

Some previous observational studies have shown that miniCEX is an effective technique for assessing students' clinical laboratory skills. Rathod, *et al.*⁵ in their study, used the miniCEX tool to assess clinical performance and observed improvement in all clinical performance of students. The results are consistent with the results of this study.

Feedback on student-patient interactions has proven to be an invaluable learning tool in our research. Subject experts recognized the need for effective feedback after student case studies and were willing to incorporate the newly designed clinical assessment form into the curriculum in the third BDS.^{17,18} This was pointed out by Kogan and Hauer, who successfully associated and implemented miniCEX in an undergraduate medical education program.¹⁹

Few studies have used this miniCEX sheet, and have used it only on postgraduate students' examination skills, the sample sizes used were less, and case ratings got only as high as 4-5. In our study, we evaluated 10 cases per student and the sample size was 100 and all the students got the highest case ratings at the end of the module. These results are unique in the present study when compared to previous observational studies.²⁰⁻²⁴

Therefore, the clinical environment is an important environment for training new future dentists to be fully globally competent and also helps to instill confidence in their dental practice. This method provides the opportunity to create a personalized and tailored training plan for individual students, targeting specific weaknesses in identifying the clinical skills of dental students.

Conclusion

Students' clinical abilities can be improved by instant evaluation and clarification by the subject specialists, according to the novel structured case format used for instruction and assessment of periodontal examination skills. By contrasting the clinical results and abilities of undergraduate students on gingival and periodontal

examination, this technique also acted as a motivating factor for students to learn further through clinical learning.

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None

Table 1: Comparing the gingival and periodontal examination skills of the students in module 1 and module2.

Clinical parameters	Module	Mean	Standard deviation	T value	P value
Gingival clinical parameters	Module 1	.9295	.23685	-75.664	0.000*
	Module 2	1.8385	.24758		
Periodontal clinical parameters	Module 1	.9065	.24440	-112.779	0.000*
	Module 2	1.9067	.13220		

*Statistically significant, Paired t-test.

Table 2: Comparing the gingival and periodontal examination parameters scores of the student's first case in module 1 to the student's last case in module 2.

Clinical parameters	Module	Score 0	Score 1	Score 2	Chi-square value	P value
Gingival clinical parameters	Module 1	227 (28.4%)	560 (70%)	13 (1.6%)	1696.916	0.000*
	Module 2	0	57 (7.1%)	743 (92.9%)		
Periodontal clinical parameters	Module 1	224 (32%)	475 (67.9%)	1 (0.1%)	1847.348	0.000*
	Module 2	0	6 (0.9%)	694 (99.1%)		

*Statistically significant, Fisher Exact test.

Score 0= Completely wrong

Score 1 =Partially correct

Score 2 =Absolutely correct

Annexure: 1

Competency-based assessment of periodontal examination skills of dental students in comprehensive clinics

Name of the student: Patient name: OP No: Date:

Gingival examination parameters	MODULE:1 (During Learning Examination Skills)			
	Examination by Student	Score	Remarks	Examination by Subject Expert
Color				
Contour				
Consistency				
Size & shape				
Surface texture				
Exudate				
Position of the gingival margin				
Bleeding on probing				

Periodontal examination parameters	MODULE:1 (During learning examination skills)			
	Examination by Student	Score	Remarks	Examination by Subject Expert
Periodontal Pocket				
Mucogingival problems				
Clinical Attachment Loss				
Furcation Involvement				
Tooth Mobility				
Trauma From Occlusion				
Pathologic tooth migration				

Faculty Signature:

Annexure: 2

Competency-based assessment of periodontal examination skills of dental students in comprehensive clinics

Name of the student: Patient name: OP No: Date:

Gingival examination parameters	MODULE:2 (After Attaining Examining Skills)			
	Examination by Student	Score	Remarks	Examination by Subject Expert
Color				
Contour				
Consistency				
Size & shape				
Surface texture				
Exudate				
Position of the gingival margin				
Bleeding on probing				

Periodontal examination parameters	MODULE:2 (After attaining Examining skills)			
	Examination by Student	Score	Remarks	Examination by Subject Expert
Periodontal Pocket				
Mucogingival problems				
Clinical Attachment Loss				
Furcation Involvement				
Tooth Mobility				
Trauma From Occlusion				
Pathologic tooth migration				

Faculty Signature:

Scoring criteria for gingival examination and periodontal examination

Each criterion was graded on a scale of

- 0= clinically unacceptable,
- 1= clinically acceptable, or
- 2= clinically very good

Inference of total score

- 0-7= Unacceptable
- 8-12= partially acceptable

13-16= Completely acceptable

Annexure: 3

RUBRICS for assessment of gingival examination

An important part of oral health examination is evaluating gingival health. A RUBRIC is a scoring tool used to assess an individual's or group's work by outlining precise standards and performance levels. This is an example of a rubric for rating gingival examinations. An

organized method for assessing a student's or practitioner's gingival examination performance is provided by this rubric.

Criteria	Excellent (4)	Good (3)	Fair (2)	Poor (1)	Comments
Gingival Inspection	Carries out a comprehensive visual and tactile examination of the gingiva to spot any anomalies or subtle alterations. Exhibits a thorough comprehension of both normal and pathological gingival conditions.	Sufficiently examines the gingiva to detect the majority of alterations and anomalies. shows a thorough knowledge of both normal and pathological gingival conditions.	Examines the gingiva in part, finding some alterations and anomalies. shows a fundamental knowledge of both normal and pathological gingival conditions.	Inadequately examines the gingiva, failing to notice a number of alterations and anomalies. lacks a thorough knowledge of what constitutes normal and pathological gingival conditions.	
Measurement of Gingival Parameters	Recession, probing depths, and other pertinent data are measured and recorded with accuracy. makes use of the appropriate probing technique and takes reliable measurements.	Measures and records recession, probing depths, and other parameters with a reasonable degree of accuracy. Shows mastery of the probing technique and accuracy of the measurement recording	Measures and documents, although somewhat inaccurately, recession, probing depths, and other parameters. shows that the consistency of measuring and the probing technique need to be improved.	Probing depths, recession, and other parameters are measured and recorded with notable errors. lacks consistency in recording measurements and expertise with probing technique.	
Documentation and Charting	Correctly records gingival findings, including the location and degree of anomalies, in the patient's chart. gives precise and thorough remarks.	Omits or records minor details from the patient's chart regarding gingival results. gives notes that are comparatively clear and thorough.	Gingival findings are not fully recorded in the patient's chart, and there are obvious errors or omissions. Notes are unclear and incomplete.	Fails to appropriately record gingival findings in the patient's record. There are ambiguous, lacking, or nonexistent notes.	
Communication with Patient	Effectively informs the patient of their gingival health state, including any necessary medications and oral hygiene advice. answers the queries and concerns of the patient.	Informs the patient on the state of their gingiva, making suggestions and skillfully responding to their inquiries.	Conveys to the patient the state of their gingival health, although not very successfully. may fail to address some queries or concerns raised by patients.	Conveys gingival health condition to the patient in an inefficient manner, confusing or alarming them. fails to sufficiently respond to queries or concerns raised by patients.	
Professionalism	Exhibits professionalism in manner, speech, and regard for privacy and comfort of patients. carries on keeping their workspace tidy and orderly.	Demonstrates professionalism in speech and manner, with only sporadic transgressions in patient privacy or comfort. carries on with a sufficiently tidy workspace.	Demonstrates a lack of professionalism in speech and manner, with clear neglects of patient privacy or comfort. The workspace is a little messy.	Communicates and behaves unprofessionally, showing serious shortcomings in patient comfort and confidentiality. The workspace is haphazard.	

Annexure: 4

RUBRICS for assessment of periodontal examination

In order to evaluate periodontal health, one must look beyond the gingiva and take into account a variety of clinical indicators, including attachment levels, bleeding on probing, and probing depths. This is an example of a

periodontal examination assessment rubric. This rubric offers a methodical way to evaluate how accurately and comprehensively a student or practitioner performed their periodontal examination.

Criteria	Excellent (4)	Good (3)	Fair (2)	Poor (1)	Comments
Probing Depths and Attachment Levels	Shows accuracy and consistency in measuring attachment levels and probing depths at various places. detects and documents even minute alterations in periodontal health.	Precisely, with very slight deviations, measures attachment levels and probing depths. demonstrates competence and reliability in the evaluation. detects and documents the majority of changes in periodontal health.	Has various errors when measuring attachment levels and probing depths. demonstrates the need for increased consistency and accuracy. detects and documents a few alterations in periodontal health.	Has notable errors when measuring attachment levels and probing depths. Inaccurate and inconsistent. fails to accurately detect and document changes in periodontal health.	
Bleeding on Probing (BOP)	Examines bleeding on probing in a methodical manner, correctly documenting findings. Understands the importance of BOP in connection to periodontal health and conveys this information.	Methodically assesses bleeding upon probing, with a few small errors. acknowledges the importance of BOP but might not always explain its ramifications.	Evaluates bleeding upon probing with a few errors and omissions. shows that there is room for improvement in understanding and conveying the importance of BOP.	Evaluates bleeding on probing insufficiently and with a lot of mistakes. fails to adequately identify and convey the importance of BOP.	
Mobility and Furcation Involvement	Accurately detects and evaluates the furcation involvement and tooth mobility. acknowledges the seriousness of these disorders and how they affect periodontal health.	Detects and evaluates, with a small degree of error, the furcation involvement and tooth mobility. shows that they are aware of the severity and effects of these conditions.	Identifies and inaccurately evaluates the furcation involvement and tooth mobility. Shows that there is room for improvement in terms of assessing impact and severity.	Insufficiently detects and evaluates tooth mobility and furcation involvement. Lacks knowledge of these conditions, consequences and severity.	
Radiographic Interpretation	Properly interprets radiographs to determine periodontal signs such as calculus deposits, bone levels, and other. Connects clinical observations to radiological findings.	Accurately interprets radiographs but might overlook certain small cues. Demonstrates how radiographic results and clinical observations are correlated.	Interprets radiographs rather inaccurately, leaving out important cues. Shows that there is room for improvement in the way that radiography results are correlated with clinical observations.	Interprets radiographs inadequately, leaving out important cues. lacks association between clinical observations and radiographic results.	
Treatment Planning and Recommendations	Creates a thorough, empirically supported treatment strategy	Creates a well-considered treatment strategy, but may fail to take into account several	Creates a treatment plan with glaring omissions related to the severity of periodontal diseases.	Creates a treatment strategy without taking the severity of periodontal	

	while taking the severity of periodontal diseases into account. Clearly conveys to the patient the recommended course of action.	factors that affect how severe periodontal diseases are. effectively conveys therapy advice to the patient.	Conveys therapeutic suggestions in an ineffective manner.	diseases into account. Ineffectively conveys treatment advice.
Professionalism	Exhibits professionalism when interacting with patients by being understanding, communicating clearly, and showing respect for the privacy and comfort of the patient.	Shows professionalism when interacting with patients, yet there may be sporadic failures in confidentiality, empathy, or communication..	Demonstrates a lack of professionalism while interacting with patients, making clear mistakes in communication, empathy, and confidentiality.	Shows a lack of professionalism while interacting with patients, exhibiting serious shortcomings in communication, empathy, and confidentiality.

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