ORIGINAL ARTICLE

Clinical Decision Making in Periodontal Diagnosis (According to 2017 Classification) and Treatment Planning by Specialists and General Dentists

Muhammad Haseeb[1]	**BDS, MDS, M.Perio RCS Ed, MCPS**
Arsala Khalid[2]	**BDS**
Myra Ahmed[3]	**BDS, FCPS**
Muhammad Faran[4]	**PhD**
Muhammad Hassan[5]	**PhD**
Zubair Ahmed Khan[6]	**BDS, MSc, MCPS**

OBJECTIVE: The aim of this study is to evaluate variation of the periodontal diagnosis (according to 2017 classification) and treatment planning of two periodontal cases among specialists and residents of Periodontics and other restorative dental specialists (Prosthodontics and Operative & Endodontics) and General Dental Practitioners.

METHODOLOGY: A cross-sectional study included 3 cohorts (general dental practitioners, periodontists and other restorative specialists). Stratified sampling technique by using proportional allocation was used to collect data. Electronic questionnaire was filled by the dentists in face-to-face meeting. The questionnaire contained two clinical cases of periodontitis, followed by a question regarding diagnosis using 2017 periodontal classification, treatment options and radiographic judgment about bone loss. There responses were compared among groups using descriptive statistics, Chi-square test, binary and multinomial logistic regression model.

RESULTS: 290 questionnaires were obtained in total. Multivariate regression analysis disclosed that highest number of correct diagnosis in case 1 and 2 were made by periodontists; Large proportion of general dentists diagnosed case 1 correctly but failed to correctly diagnose case 2. Restorative specialists fail to diagnose both cases ($p>0.05$) according to 2017 classification when compared to periodontists. Regarding questions about treatment planning, there was an agreement related to quadrant wise scaling over the other options but significant differences ($p<0.01$) was found among periodontists when compared to restorative specialists and general dentists in prescribing systemic antibiotics and local antimicrobials in the initial phase.

CONCLUSION: Periodontists had significantly more correct responses than general dentists in diagnosis and treatment plan. The study also showed that the overall agreement of practitioners towards diagnosis and clinical judgment about the bone loss was suboptimal but agreed to suggest appropriate initial non-surgical periodontal therapy for both cases irrespective of their specialty.

KEYWORDS: Periodontology, Evidence Based Practice, Diagnosis, Treatment planning, Periodontal classification 2017

HOW TO CITE: Haseeb M, Khalid A, Ahmed M, Faran M, Hassan M, Khan ZA. Clinical decision making in periodontal diagnosis (according to 2017 classification) and treatment planning by specialists and general dentists. J Pak Dent Assoc 2024;33(1):1-6.

DOI: https://doi.org/10.25301/JPDA.331.1

Received: *10 January 2024*, ***Accepted:*** *14 March 2024*

INTRODUCTION

Practitioners' initial diagnosis for a case is of great importance as the entire treatment plan and the outcomes depend on those evaluations. The evidence-based practice integrates the best available data from research into practice to improve the quality of decision making to attain the best possible outcome.[1] It reflects the practitioner's understanding, clinical perception and problem-solving skills.

The development of a classification system provides a framework to study the etiology, pathogenesis, and aids in diagnosis and treatment planning. The 1999 periodontal classification proposed by American Academy of Periodontology (AAP) has been in use for the last 19 years. However, this old system had some weaknesses, including significant overlap in disease categories, diagnostic uncertainty, difficulty implementing, and indistinct classification factors. To address this weakness, latest

1. Associate Professor & Head, Department of Periodontology, University College of Medicine and Dentistry, The University of Lahore.
2. House Office, Department of Periodontology, University College of Medicine and Dentistry, The University of Lahore.
3. Associate Professor & Head, Department of Periodontology, Lahore Medical and Dental College, Lahore.
4. Department of Statistics, University of Management and Technology
5. Associate Professor, Department Science of Dental Materials, University College of Medicine and Dentistry, The University of Lahore.
6. Associate Professor, Department of Periodontology, Fatima Memorial Hospital College of Medicine and Dentistry, Lahore.

Corresponding author: "Dr. Muhammad Haseeb" < dr.haseeb@gmail.com >

periodontal classification was co-presented in 2017 by American Academy of Periodontology (AAP) and European Federation of Periodontology (EFP). In this classification system, grading estimates the disease's aggressiveness by taking into account the factors contributing to progression of periodontal disease. Staging depends on the severity of periodontitis and introduces the further aspects of complexity of the case.[2]

Many studies have shown controversies and variations in the diagnosis and treatment planning among general dental practitioners, students, and dental faculty because of differences in clinical knowledge, skills, or academic background.[3-11] There is a potential for variations across the dental profession with different educational backgrounds. Secondly, the 2017 perio classification is in the process of implementation by the periodontists and significant information is being shared through different means to help general dental practitioners as well as other specialists in understanding day-to-day patient care. However, differences in clinical knowledge and understanding of diagnostic features may not necessarily reflect one's ability to manage the patient differently. These factors increase the probability of variation amongst clinicians in establishing diagnosis of the complex cases, however treatment planning requires multipronged approach of evidence based, clinical and radiographic judgment and patient concerns and thus is partially dependent on change of periodontal classification. A key question arises regarding the predictability of correct diagnosis according to new periodontal disease classification amongst clinicians (with different educational background and experience) and subsequent variation in the treatment planning.

This study aimed to explore the above question and investigated the extent of variation in periodontal knowledge, diagnosis, judgment and treatment approach in managing periodontal diseases among different fields of restorative dentistry includes; periodontists, other specialists (including prosthodontists and endodontists) and general dental practitioners.

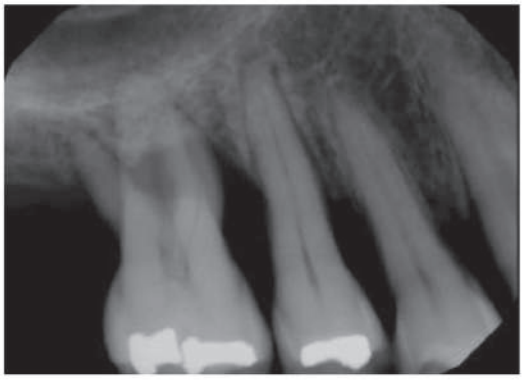
METHODOLOGY

This was an analytical cross-sectional study conducted at University College of Dentistry, The University of Lahore within a period of four months from July 2021 to October 2021. Study was granted permission from the institutional review board for human subjects (ref no: UCD/ERCA/20/11bt) and was conducted in accordance with Helsinki Declaration 1975 as revised in 2013. The study included participants from each of the three cohorts: (i) Periodontists and residents, other restorative specialties including (ii) Prosthodontists, Operative and Endodontic specialists and residents (iii) full time private general dental practitioners. Since number of periodontists and periodontology residents were less compared to other specialties therefore proportional allocation was used for collecting data from other restorative specialists and general dentists. Clinicians who do not want to participate in the study or had an absolute lack of Perio 2017 classification were excluded. House officers who had recently completed house job and practicing were included as general dentists. A self-developed questionnaire consisted of 12 items initially and was later edited/modified to 8 items after the content validation by a group of 7 subject experts. . After taking their consent the forms were filled out by them in face-to face meeting. The questionnaire comprised two sections. The first section comprises questions about demographics, such as gender, years of practice experience, and practice location; the second section contained two periodontal cases. Each presented case contained brief medical and dental history, information regarding bleeding on probing, probing depth, full mouth periodontal chart, intra-oral clinical photographs, and radiographs (selective periapical radiographs, panoramic / bitewing radiographs) (see Figure 1). At first, the clinicians were asked to diagnose each case according to the latest 2017 periodontal classification. Secondly, their radiographic judgment was evaluated about percentage and pattern of bone-loss of a selected tooth. A particular tooth per case was chosen on the basis to provide maximum insight into their radiographic judgment. Lastly, clinicians were asked to recommend initial treatment plan among the limited options, quadrant wise scaling and root surface debridement, extraction of hopeless tooth, systemic antibiotics and local antimicrobials for each case.

Figure 1

Case 1: Generalized periodontitis, stage IV, Grade C, currently unstable

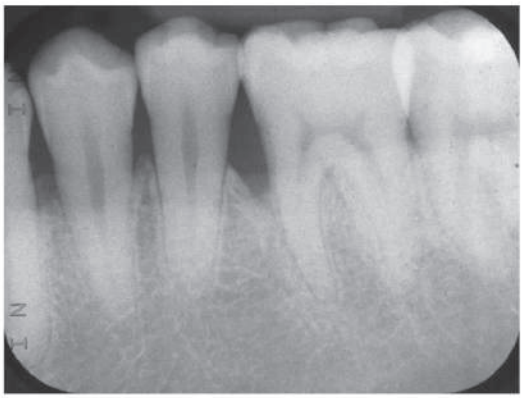
Figure 1a: Peri-apical radiograph for radiographic judgement



Data was analyzed by SPSS version 25.0. Descriptive statistics were used to calculate frequencies and percentages

Case 2: Molar-Incisor Pattern Periodontitis, Stage III, grade C, currently unstable

Figure 1b: Peri-apical radiograph for radiographic judgement



for demographic data and response of the questions. Binary and multinomial logistic regression analysis was performed to predict the diagnosis and judgment with independent variables such as fields of practice (specialty). Nagelkerke R^2 was used to check the fitness of the model of logistic regression analysis after adjusting the variables. Higher percentage suggests how well the dependent variables have been explained by the independent variable.

RESULTS

Demographics

A total of 350 practitioners were contacted and 82.85% response rate was achieved. Of the total 290 responders, 37 specialists periodontists and residents of periodontology, 128 general dentists and 125 specialists of prosthodontics and operative dentistry and residents of respective specialties filled the form. 51% of the responders were males and remainder were females. 64 (22%) responders were private practitioners, 115 (39.6%) were working in a teaching hospital only and 111 (38.2%) responders were working in both private practices and teaching hospitals.

Diagnoses and judgment

Table 1 summarizes the correct and incorrect responses of diagnosis, radiographic judgment of % bone loss (judgment 1) and nature of bone loss (judgment 2) set with an agreement of 7 subject experts, their agreed responses were set as reference.

Binary logistic and multinomial logistic regression model was conducted to predict differences among specialist groups based on specialty (see Table 2). General dentists were unable to correctly diagnose case 1 (O.R 10.2, P>0.001), whereas comparative difference in the said groups regarding correct diagnosis for case 2 was narrow but yet significantly lower

Table 1: Frequencies of participant's responses for Diagnosis and judgment

Participants	Diagnosis			Judgment 1		Judgment 2		
	Correct n (%)	Incorrect n (%)	Not sure n (%)	<30% n (%)	>30% n (%)	Horizontal n (%)	Angular n (%)	Not sure n (%)
CASE 1								
Periodontists & Residents	33 (89.2)	1 (2.7)	3 (8.1)	1 (2.7)	36 (97.2)	30 (81.0)	7 (19)	0
Restorative specialists & Residents	57 (45.6)	8 (6.4)	60 (48)	37 (29.6)	88 (70.4)	76 (60.8)	43 (34.4)	6 (4.8)
General dentists	63 (49.2)	10 (7.8)	55 (43)	45 (35.1)	83 (64.8)	83 (64.8)	28 (21.8)	17 (13.2)
CASE 2								
Periodontists & Residents	24 (64.8)	11 (29.7)	2 (54.0)	0	37 (100)	2 (5.4)	35 (94.6)	0
Restorative specialists & Residents	39 (31.2)	28 (22.4)	58 (46.4)	77 (61.6)	48 (38.4)	34 (27.2)	83 (66.4)	8 (6.4)
General dentists	24 (18.75)	43 (33.5)	61 (47.6)	82 (64.0)	46 (35.9)	20 (15.6)	94 (73.4)	14 (10.9)

(O.R 0.14, P=0.037) when compared with periodontists partly because few periodontists and residents marked the incorrect option too in the second case. On the other hand, no statistical significance was found between the group of

Table 2: Results from Binary and Multivariate logistic regression model of diagnosis and judgment depending on dentist qualification and experience.

Case 1	Multivariate logistic regression model		Binary regression model	
Variables	OR (95% CI)	*P*- value	OR (95% CI)	*P*- value
Diagnosis[a] as dependent variable				
Periodontists	0[b]	-		
Restorative specialists	.941 (.553-1.60)	.821		
General dentist	10.2 (2.96-35.31)	.000		
Judgment 1 as dependent variable				
Periodontists			0[b]	-
Restorative specialists			18.7(2.44-142.5)	.005
General dentist			20.4(2.70-154.5)	.003
Judgment 2[a] as dependent variable				
Periodontists	0[b]	-		
Restorative specialists	.907 (.164-5.00)	.911		
General dentist	.141 (.029-.699)	.016		
Case 2	Multivariate regression model		Binary regression model	
Variables	OR (95% CI)	*P*- value	OR (95% CI)	*P*- value
Diagnosis [a] as dependent variable				
Periodontists	0[b]	-		
Restorative specialists	.655 (.267-1.60)	.354		
General dentist	.378 (.152-.942)	.037		
Judgment 1 as dependent variable				
Periodontists			0[b]	-
Restorative specialists			1.44(.678-3.05)	.344
General dentist			2.51(1.18-5.34)	.017
Judgment 2[a] as dependent variable				
Periodontists	0[b]	-		
Restorative specialists	1.09 (.218-5.54)	.909		
General dentist	.444 (.092-2.15)	.313		
a. The reference category is: Unsure.				
b. This parameter is set to zero because it is redundant.				

other specialists and periodontists. The model explained 13.4% and 7.0% (Nagelkerke R^2) of the variance in case 1 and 2 respectively and 53.8%, 45.9% cases correctly predicted by a model (see Table 2).

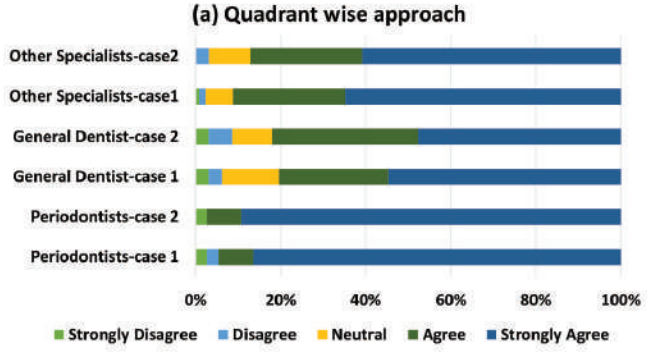
Binary logistic and multivariate logistic regression model was conducted to predict differences among specialist groups based on specialty. Regarding the percentage of bone-loss percentage of the given periapical radiographs (judgment 1), the results showed that Periodontists had significantly higher correct responses than general dentists (O.R 20.4, $p<0.05$) and other specialists (O.R 18.7, $p<0.05$) in case 1. However, for case 2, (judgment 1) periodontists and restorative specialists had insignificant differences in their responses but the general dentists again underestimate the percentage of bone loss (O.R 2.51, $P<0.05$). The model explained 12.9% and 5.3% (Nagelkerke R^2) of the variance and 70.7%, 63.1% cases correctly predicted by a model (see Table 2).

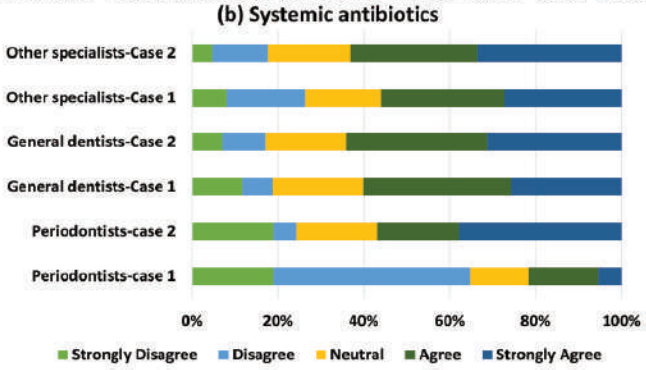
Responses about pattern of bone loss (judgment 2) in case-1 showed a similar trend between periodontists and other specialists however general dentists had significantly higher incorrect responses than periodontists (OR= 0.141, $P< 0.05$). Conversely, for case 2, neither of any group was found to differ in their responses. The model explained 10.7% and 7.2% (Nagelkerke R^2) of the variance and 61%, 73.8% cases correctly predicted by a model (see Table 2).

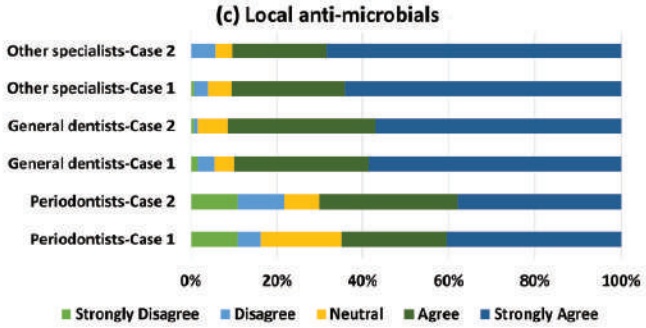
Treatment plan

Figure 2a-2c; responses were presented as percentages towards initial treatment options.1) Quadrant-wise approach (>2visits opposed to single visit scaling and root surface debridement. 2) Systemic Antibiotics for 1 week. 3) Local antimicrobials (such as chlorhexidine gel, mouthwash) for which respondents had to show agreement or disagreement on a 5-point Likert scale. Doing quadrant wise scaling and root surface debridement during initial visit for Case 1 and 2 revealed, (86.5%, 89.2%) periodontists and (64.80%, 60.8%) restorative specialists were strongly agreed to the statement when compared to general dentists who preferred a single visit approach (54.69%, 47.66%) in both cases respectively (X^2=18.584, 25.713 P=0.017,0.001). However, prescribing systemic antibiotics and local antimicrobial were subjective, about (45.94%) periodontists had disagreement on prescribing systemic antibiotics for case 1 but (32.84%) recommend in case 2 whereas restorative specialists and general dentists were not affirmative of their answer and therefore responses were mixed when compared to periodontists. (X^2= 39.53, 11.36 P=0.000, 0.181). The trend of recommending local antimicrobials found to be quite overstressed among general dentist group and restorative specialists but differed from periodontists who were somewhat reluctant to prescribe local antimicrobials but majority of them nevertheless did (X^2=25.32, 35.53 P=0.001, 0.000).

Figure 2: Dentist's responses to initial treatment planning







DISCUSSION

Diagnosis is central because it envisioned the explanation that signifies the analysis of all collected information. Armitage & Cullinan recommended specialists should not oppose the accuracy of diagnosis if the provided treatment does not vary regardless of the condition considered.[3] However, there is a rationale for professionals to agree on the diagnosis. Diagnosis serves as a basis for deciding the proper therapeutic regimen for the patient, and it additionally signifies the correspondence among clinicians.

Dentists approach towards periodontal diagnosis and treatment planning remains the topic of reoccurring discussion.

In a survey of diagnostic judgment and treatment decision among periodontists and general dentist in Sweden, there exist greater variations among them regarding clinical judgment, prognostic assessment and treatment decision for patient with different periodontal conditions.[4] Another study by Lanning et al.[5] found variation among faculty and perio-postgraduate residents in which postgraduate showed more consistency in their responses compared to faculty members indirectly because of their involvement in case discussion, collaboration sessions, conferences.

Participants in the present study were asked to diagnose the 2 presented cases according to 2017 periodontal classification. In case respondents were not sure about the 2017 periodontal classification, they had the option to choose the "not sure" option. Results showed that there were great variation among three groups, the percentages of correct responses were in general much lower for diagnosis compared to treatment plan and variation was found more in case 2 diagnosis (Molar-incisor pattern). Intra-observer agreement of periodontists on diagnosis was significantly greater for case 1 compared to case 2 (89.2% vs 64.8%). However, general dentists and other restorative specialists had lower percentage of agreement on correct diagnosis, case 1 (49.2% and 45.6%) and case 2 (18.8% and 31.2%) respectively. It is encouraging to note that half of the general dentists and restorative specialists diagnosed cases as periodontitis because of bone loss however the consistency does not truly imply to correct diagnosis (extent and severity) and the other half reported not sure about 2017 periodontal classification and about diagnosis. The study of Marlow et al. found that diagnosis by full or part time perio-faculty are higher than private practice periodontists because of calibration sessions and great exposure to graduate teaching courses.[6] Periodontists group in present study includes periodontal faculty members also doing private practice and postgraduate residents to make a consistent group for comparison but case 2 proposed controversies among them based on radiographic bone loss and case features and it however, does not support our hypothesis.

The same trend observed among practitioners' group in determining the percentage and pattern of bone loss. Interpreting the percentage of bone loss depends on the relationship between anatomical factors that can be measured subjectively. Bony defect contributes to residual pockets after periodontal therapy that increases the risk of further periodontal breakdown and loss of tooth. It is commonly accepted in the periodontal literature that prevalence and severity of periodontitis increased with aging, following chronological aging pattern.[7] However, the effect of shape (angular/vertical type) and position of bone resorption have not been deliberated in previous studies. In the recent periodontal classification, aging is directed as an indirect source of disease progression linking with bone-loss ratio with both position and shape of bone loss are essential for the correct staging of periodontitis and most commonly in the case of unknown pervious periodontal history for that most severely affected tooth have taken into consideration.[8] In the present study, bone loss responses for tooth number #16 and #36 (in both cases respectively) was more than 30 percent and pattern of bone loss was angular in case 2 however, fair level of agreement was found among general dentists and other restorative specialists whereas, periodontists had more agreement about the pattern of bone-loss in case 2 and percentage of bone-loss in case 1. Radiographic accuracy about the bony defect plays an important role for the prognostic assessment of the provided treatment.

Periodontal disease is treated merely through non-surgical therapy in the initial phase. Irrespective of their diagnosis the results of this study showed that dentists mostly preferred to do quadrant wise scaling and root surface debridement compared to single visit instrumentation. Preference of multiple visits could be due to lesser fatigue of dentist and the patient and better acceptance of the procedure.[9] However, the percentage of dentists' choosing systemic antibiotics and local antimicrobials with scaling and root surface debridement varies with cases and dentist groups. Because of the problems related to the use of systemic or local antibiotics it is not indicative for all periodontal cases. However, in order to gain biological and clinical advantage by using adjunct with non-surgical therapy there exists some evidence to suggest prescribing systemic antibiotics in case of aggressive periodontitis (old terminology), recurrent or persistent deep pocket depth or for the patient where mechanical debridement alone presents some limitations.[10,11,12] General dentists, restorative specialists and periodontists tended to choose local antimicrobials including gels or mouthwash significantly for both cases. The tendency to recommend local antimicrobials also been noticed in other studies.[13] Results of present study found similar to the results of Choudhury et al. study concluded that periodontists prescribed systemic antimicrobials frequently for treating Molar-incisor pattern periodontitis but infrequently for chronic periodontitis.[13] However, general dentists and other restorative specialist tend to prescribe local as well as systemic antibiotics. The results could be due to the possibility that majority of restorative specialists and general dentists are still making clinical decisions based on their experiences and personal observations rather than treatment guidelines. All three dentists group especially periodontists of present study agreed more to prescribe systemic antibiotics for case 2 collaborates with the findings of Padtong et al.[14]

Shortcomings of the study include limited participation of practitioners from different cities, restricting the treatment

planning options to initial therapy, not including surgical phase options and maintenance phase. Sutthiboonyapan et al. Tonetti and Sanz et al., Karo Parsegian et al. underwent some of the queries that arose while applying a new classification in their studies. They proposed the flowcharts that assist clinicians in making the diagnosis. This illustrative approach will help general practitioners, other specialists and graduate students who have limited exposure to conditions of periodontal diversity.[15,16,17]

CONCLUSION

The study showed that the overall agreement of practitioners towards diagnosis and clinical judgment about the bone loss was suboptimal compared to periodontists but agreed to suggest appropriate initial non-surgical periodontal therapy for both cases irrespective of their specialty. From a practical perspective, this study used the 2017 periodontal classification to identify the knowledge and practices of general dentists and restorative specialists, in diagnosis and treatment planning. This study could potentially help in directing our efforts in disseminating awareness regarding the new classification and its impact on treatment guidelines.

ACKNOWLEDGMENT

Parts of this research were presented as poster presentation at 7th PADR conference Oct 2021. Authors would like to acknowledge Miss Amina Tariq for her help in data entry in SPSS. There was no source of funding for the present study. The authors of this article have declared no conflicts of interest related to the authorship and/or publication.

CONFLICT OF INTEREST

None to declare

REFERENCES

1. McGlone P, Watt R, Sheiham A. Evidence-based dentistry: an overview of the challenges in changing professional practice. British Dent J. 2001;190: 636-39.
https://doi.org/10.1038/sj.bdj.4801062a

2. Caton JG , Armitage G, Berglundh T, Chapple I L, Jepsen S, Kornman KS, Tonetti MS. (2018). A new classification scheme for periodontal and peri implant diseases and conditions-Introduction and key changes from the 1999 classification. J Periodontol. 2018;89: S1-8.
https://doi.org/10.1002/JPER.18-0157

3. Armitage GC, Cullinan MP. Comparison of the clinical features of chronic and aggressive periodontitis. Periodontology 2000. 2010; 53:12-27. *https://doi.org/10.1111/j.1600-0757.2010.00353.x*

4. Milosavljevic A, Stavropoulos A, Bertl K, Götrick, B. Diagnostic Judgement and Treatment Decisions in Periodontology by Periodontists and General Dental Practitioners in Sweden-A Questionnaire-based Study. Oral Health Preventive Dentist. 2019; 17: 329-37.

5. Lanning SK , Pelok SD , Williams BC, Richards PS, Sarment DP, Oh T J, McCauley LK. Variation in periodontal diagnosis and treatment planning among clinical instructors. J Dent Educ. 2005; 69:325-37.
https://doi.org/10.1002/j.0022-0337.2005.69.3.tb03919.x

6. Marlow AK , Hamada Y, Maupome G, Eckert G J, John, V. Periodontal Diagnosis and Treatment Planning Among Indiana Dental Faculty, Periodontists, and General Practice Dentists: A Multi-Group Comparison. J Dent Educ. 2018; 82: 291-98.
https://doi.org/10.21815/JDE.018.029

7. Ebersole JL, Dawson DA, Huja P E, Pandruvada S, Basu A, Nguyen L, Gonzalez OA. Age and periodontal health-immunological view. Current Oral Health Reports. 2018; 5:229-41.
https://doi.org/10.1007/s40496-018-0202-2

8. Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Periodontol. 2018; 89: S159-S172.
https://doi.org/10.1002/JPER.18-0006

9. Haseeb, M; Khan, Z.A; Qureshi, F; Sharjeel, M; Hussain, S; Nawaz, M.S. Perception of patients regarding periodontal disease and its management. P.J.M.H.S 2021. 15;2728-32
https://doi.org/10.53350/pjmhs211592728

10. Cortellini P, Tonetti MS. Focus on intrabony defects: guided tissue regeneration. Periodontology 2000. 2000; 22: 104-132.
https://doi.org/10.1034/j.1600-0757.2000.2220108.x

11. Jepsen K, Jepsen S. Antibiotics/antimicrobials: systemic and local administration in the therapy of mild to moderately advanced periodontitis. Periodontology 2000. 2016; 71: 82-112.
https://doi.org/10.1111/prd.12121

12. Kaner D, Christan C, Dietrich T , Bernimoulin JP, Kleber B M, Friedmann A. Timing affects the clinical outcome of adjunctive systemic antibiotic therapy for generalized aggressive periodontitis. J Periodontol. 2007;78: 1201-08.
https://doi.org/10.1902/jop.2007.060437

13. Choudhury M, Needleman I, Gillam D, Moles DR. Systemic and local antimicrobial use in periodontal therapy in England and Wales. J Clin Periodontol. 2001; 28: 833-39.
https://doi.org/10.1034/j.1600-051x.2001.028009833.x

14. Padtong EA, Turner W, Gillam D. UK Specialists' and GDPs' Use of Systemic and Local Antimicrobial Administration in Periodontal Therapy: A Questionnaire Study. J Dent Maxillofac Res. 2020.

15. Sutthiboonyapan P, Wang HL, Charatkulangkun O. Flowcharts for easy periodontal diagnosis based on the 2018 New Periodontal Classification. Clinical Advances in Periodontics. 2020;10:155-60.
https://doi.org/10.1002/cap.10095

16. Tonetti MS, Sanz M. Implementation of the new classification of periodontal diseases: Decision-making algorithms for clinical practice and education. J Clin Periodontol. 2019;46:398-405.
https://doi.org/10.1111/jcpe.13104

17. Parsegian K, Ayilavarapu S, Patel T, Henson HA, Angelov N. Flowcharts improve periodontal diagnosis by dental and dental hygiene students. Can J Dent Hyg. 2021;55:137-47.