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Original Research Article

Periodontal microbiology from undergraduate perspective: a questionnaire study

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ABSTRACT

Background: Periodontal diseases are inflammatory conditions affecting the supporting structure of the teeth, leading to potential consequences such as gingivitis and periodontitis. The intricate interaction between host's immune system and oral microbiome promotes this disease. The human oral cavity harbors a vast and diverse microbial community, collectively known as the oral microbiome comprising of bacteria, viruses, fungi, this ecosystem is influenced by factors such as genetics, host immunity, oral hygiene practices, diet and environmental variables. Among these microorganisms, bacteria take center stage in the initiation and progression of periodontal diseases. The objective was to assess the knowledge and awareness about the periodontal microbiology (periopathogens) among dental students.
Methods: A self-designed questionnaire in English language containing 26 items was circulated using Google forms and was distributed among third, final year students and interns of PMNM dental college and Hospital, Bagalkot, India. The framework covered 3 domains: The first domain containing microorganism's interaction in host causing periodontal disease, second domain about colonizers in dental plaque and certain aspects covered inflammatory response in host and the third domain containing therapeutic planning and future perspectives.
Results: When looked into 1st domain student had a good knowledge on microorganism interaction in host, student had fair knowledge about the 2nd domain, they lack knowledge about the 3rd domain that is about therapeutic planning.
Conclusions: Student have a fair knowledge about the periodontal pathogen and they lack knowledge about the therapeutic planning. It is indicative of students' commitment to understanding the complex dynamics of oral microbiology.

Keywords: Inflammation, Periodontal disease, Periodontal microbiology, Red complex, Therapeutic planning

INTRODUCTION

Periodontal diseases are inflammatory conditions affecting the supporting structure of the teeth, leading to potential consequences such as gingivitis and periodontitis. The intricate interaction between host's immune system and oral microbiome promotes this illness. The fields of periodontal microbiology explore the relationship among diverse microorganisms populating the oral cavity, shedding light on the etiology, progression and potential treatment strategies for periodontal diseases.

After tooth eruption, a more complex oral flora becomes established. It is estimated that more than 500 different species are capable of colonizing the adult mouth, and that any individual may typically harbor 150 or more different species.[1]

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microbiome comprising of bacteria, viruses, fungi, this ecosystem is influenced by factors such as genetics, host immunity, oral hygiene practices, diet and environmental variables. Among these microorganisms, bacteria take center stage in the initiation and progression of periodontal diseases. The colonization process begins with early bacterial colonizers, including Streptococcus and Actinomyces species binds to specific salivary molecules and get adhere to the tooth surface and plays a role in initiating biofilm formation through the synthesis of extracellular polysaccharides.[2,3]

Biofilm, a structured community of microorganisms encased in extracellular polymeric substances acts as the foundation for microbial colonization. As early colonizers pave the way, late colonizers such as *Porphyromonas gingivalis*, *Tannerella forsythia*, and *Treponema denticola* join the biofilm, forming consortia like the "red complex", strongly associated with periodontal disease progression.[4]

Anaerobic bacteria, including Prevotella species and *Fusobacterium nucleatum*, thrive in the anaerobic conditions of periodontal pockets, contributing to the inflammatory response and disease severity Anaerobic bacteria, including Prevotella species and *Fusobacterium nucleatum*, thrive in the anaerobic conditions of periodontal pockets, contributing to the inflammatory response and disease severity.[5]

Hence, the knowledge about periodontal microbiology is integral for both clinical practice and research in dentistry. It enhaces diagnostic accuracy, guides treatment strategies and contributes to the overall improvement of periodontal health.

Understanding of periodontal microbiology is incredibly valuable for dental students. It equips them with the knowledge and skills necessary for providing high-quality, evidence-based care and prepare them for a lifetime of professional growth and development in the field of dentistry among dental students.

Well-designed questionnaires are a useful method to collect data easily from participants in studies. To date, very few studies have assessed, which concludes the knowledge about the awareness of periodontal microbiology. Keeping this in view, the present survey has been designed to evaluate the acquaintance, orientation, Knowledge and its applications of the same in dental undergraduates towards periodontal microbiology.

Aim of the study

The aim of this questionnaire survey was to assess the knowledge and awareness about the periodontal microbiology (periopathogens) and their association between periopathogens and periodontal disease, and associated therapeutic approach and whether they are gaining enough knowledge about periodontal microbiology from their curriculum.

METHODS

Study design

A self-designed questionnaire in English language containing 26 items was circulated using Google forms and it was distributed among third, final year students and interns of PMNM dental college and Hospital, Bagalkot, India. The framework covered 3 domains: the first domain containing causative factors for periodontal disease, second domain about colonizers in dental plaque and certain aspects covered inflammatory response in host and the third domain containing therapeutic planning. Students was asked to choose one answer in multiple choice questions set up.

Method of collection of data

This study was carried out at the PMNM dental college and hospital, Bagalkot, Karnataka, India, within a period of December 2023 to February 2024.

Subjects were asked to respond to all items according to the response format provided during the study. Response format included options in which subjects choose one option from a provided list of options. Participation was volitional and all participants remained anonymous. The participants were always encouraged to approach the investigator whenever they needed clarification at any point.

The dental population included those who were interns and under graduate students were included and those who were not agreed to participate in the study were excluded from the survey.

Statistical analysis

Data was compiled using a Microsoft Excel sheet (2019, Microsoft Redmond Campus, Redmond, Washington, United States) and analyzed with the statistical program Statistical Package for Social Sciences (SPSS 26.0, IBM). For categorical data, descriptive statistics included frequencies and percentages; for numerical data, mean and standard deviation.

RESULTS

Using Google forms, a self-created survey in the English language was sent. Information was gathered and statistical analysis was performed.

Demographic data

A total of 249 students completed the questionnaire, with 71.60% being undergraduates and 28.40% being interns (Figure 1). Many participants (94%) were between the

ages of 18 and 25. Females made up 72.3% of the participants and male made up 27.20%.

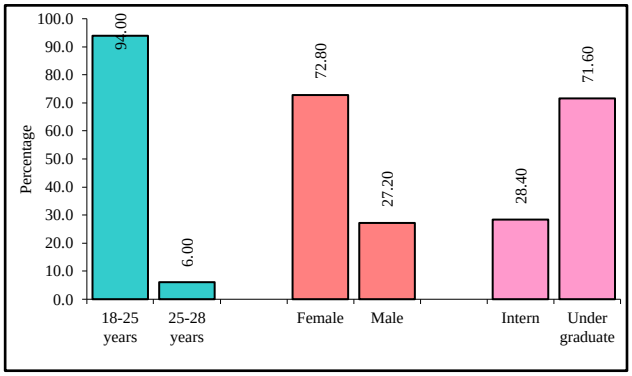

Figure 1: Demographic profile of participants.

Awareness about causative factors for periodontal disease

When queried about the components absent in the periodontium, the options were as follows PDL, bone, cementum and dentin, 91.20% responds accurately answered it as dentin. Regarding the texture of gingiva, an overwhelming 97.60% characterized it as firm and resilient, rest answered as hard (0.40%), soft (1.60%), enlarged (0.40%) (Figures 2 and 3).

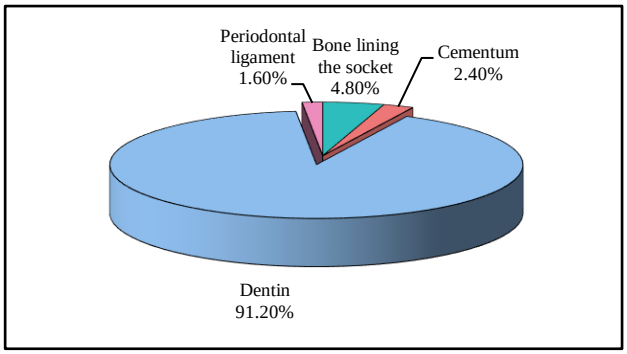

Figure 2: Components absent in the periodontium.

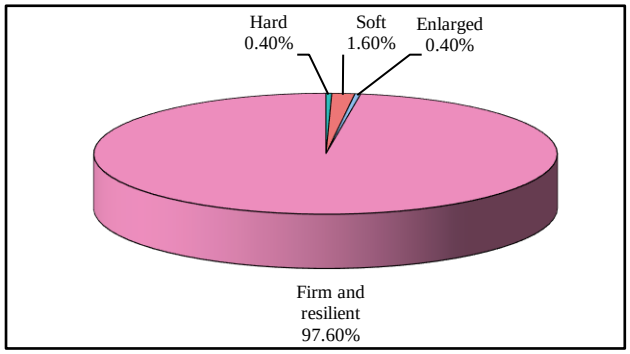

Figure 3: Texture of gingiva.

When queried about the biofilm present on the tooth surface, 60.80% accurately identified it as dental plaque, 30% answered it as pellicle, 2.40% referred as enamel, 0.8% answer it as saliva and regarding the substance that forms first after tooth brushing, 42.80% correctly identified it as material alba, whereas 24.80% identified it as pellicle.

When asked about primary consequences of supragingival plaque accumulation 85.60% answered it correctly as gingivitis. This condition is characterized by inflammation of the gingiva, often leading to redness, swelling, and sometimes bleeding during brushing or flossing. When asked which condition is more detrimental, periodontitis or gingivitis, 88.40% of respondents answered "periodontitis", while the remaining respondents said "gingivitis", indicating their understanding of the disease's extent. Therefore, compared to gingivitis, periodontitis is a more advanced stage of gingival disease. It involves infection and inflammation of the gingiva as well as the teeth's deeper supporting tissues (Figure 4).

90% of respondents accurately identified all of the

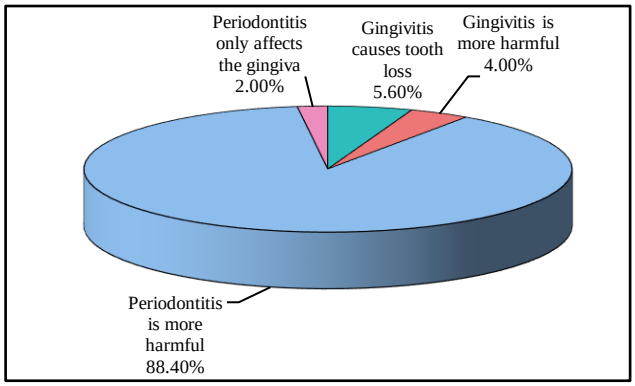

Figure 4: Which condition is more detrimental, periodontitis or gingivitis.

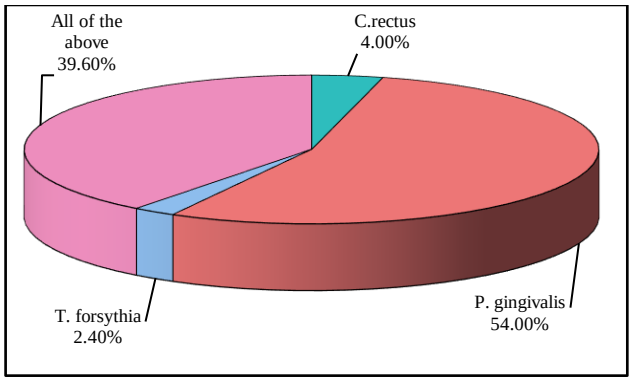

Figure 5: One of the major pathogens involved in periodontal disease.

following symptoms- bleeding gums, bad breath, and receding gums- as gingivitis signs. When these signs and

symptoms coexist, they are highly suggestive of gingivitis.

When asked about most initiative factor for periodontitis, 48.00% answered it correctly as dental plaque, 30%, 11% and 10% answered it as calculus, TFO, food debris respectively.

Participants displayed varying interpretations when quired about bacteria most often cultivated in chronic periodontitis. Understanding the role of these bacteria in chronic periodontitis is essential for developing effective treatment strategies, *P. gingivalis* is considered one of the major pathogens involved in periodontal disease (Figure 5).

When asked which bacterial complex was generating the bleeding upon probing, 80.40% of respondents stated red, 10% stated orange, 6.40% said green, while 3.20% said yellow. Regarding the "red" complex bacteria, 64.40% correctly identified *P. gingivalis* and *T. denticola* as the answers, with the other responses being incorrect. The "red" complex of bacteria, which includes *T. denticola*, *P. gingivalis*, and *T. forsythia*, is known for its extreme virulence and is linked to more advanced stages of periodontal disease (Figures 6 and 7).

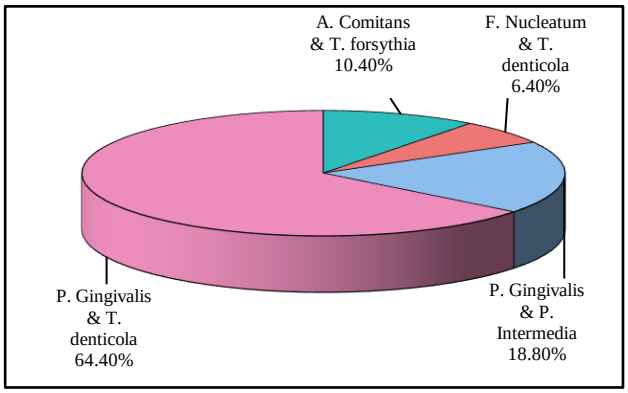

Figure 6: "Red" complex of bacteria.

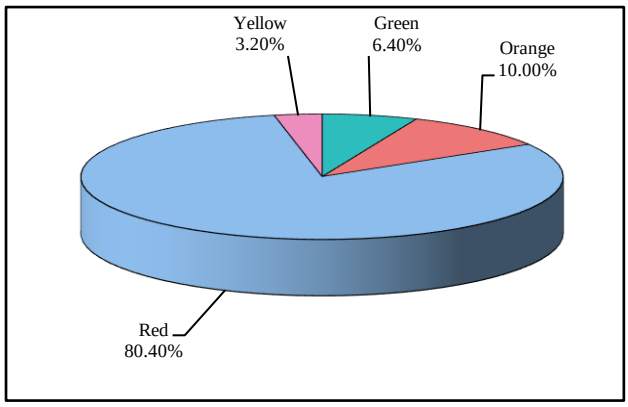

Figure 7: Which bacterial complex was generating the bleeding upon probing.

A. actinomycetemcomitans is most strongly associated with aggressive periodontitis, it can also be found in chronic periodontitis cases, although less frequently.

When quired about the treatment planning in periodontal disease, 36.40% answered it as phase III restorative, 16.80% phase I emergency phase, 34.40% phase II oral prophylaxis, 12.40% stated as surgical treatment.

When asked that about periodontal microbiology in your curriculum is sufficient or some more topics has to be added, 55.20% answered that its sufficient whereas 18.80% stated some more topics need to be added in the curriculum, 18% answered maybe and 8% don't know.

DISCUSSION

Periodontal diseases are inflammatory conditions affecting the supporting structure of the teeth. The intricate interaction between host's immune system and oral microbiome promotes this illness.[1] Pathogenesis is defined as "the organization and development of a disease". Knowledge of pathogenesis helps as to understand about the process that led to the development of this diseases and consequently the changes it produces in the structure and function of the periodontium. In broad terms, the pathogenesis of a disease is a mechanism by which a causative factor or factors cause the diseases.[6]

The ability of the bacterium to adhere to its host is crucial for the induction of infectious diseases, such as gingivitis or periodontitis. Oral bacteria and especially pathogenic bacteria have a large battery of virulence factors, one of which is the ability to adhere to hard intraoral surfaces and/or to the oral mucosa.[7,8]

The bacteria are significant because they produce and maintain the inflammation, but they are only directly accountable for a small percentage of the tissue damage that takes place. With advances in science, our understanding of the pathophysiology and etiology of oral diseases and conditions is constantly evolving.[9]

The most prevalent kind of gingival disease is gingivitis, which is linked to dental plaque buildup. The combination of the host's inflammatory cells, tissues, and microorganisms in the dental plaque biofilm leads to plaque-induced gingival disease. The clinical hallmark that sets periodontitis apart from gingivitis is the presence of clinically discernible attachment loss. Periodontitis is an inflammatory disease of the supporting tissues of teeth that is brought on by particular microorganisms.[10]

Understanding the spectrum of microorganisms responsible for periodontal diseases is fundamental for dental students as they evolution into clinical practice. This discussion delves into a recent study that sheds light on the level of knowledge dental students possess regarding periodontal pathogens.

The study, conducted among a cohort of dental students, uncovered promising results regarding their knowledge of microorganisms implicated in periodontal diseases. A notable majority, surpassing 65% of the surveyed students, demonstrated a fair understanding of these micropathogens and their impact on host. This finding suggests a commendable baseline comprehension among dental students, laying a solid foundation for further exploration and refinement.

A related study by Sudhakar et al revealed similar findings, with a sizable portion of students mentioning that bleeding occurs during probing due to red complex organisms. There is little knowledge among the students about the majority of pathogens that are absent from a healthy periodontium and about the communication between bacteria in biofilms. Furthermore, their understanding of the third domain-therapeutic planning- is lacking. They must be made aware of the same.

The revelation of a substantial proportion of students possessing a fair knowledge of periodontal pathogens is encouraging on multiple fronts. Firstly, it underscores the efficacy of current educational methodologies in imparting essential microbiological concepts to future dental practitioners. Additionally, it reflects positively on the dedication of both educators and students towards comprehending the intricate dynamics of oral microbiology.

The study was limited to a specific student population and does not suggest that it is suitable for other students.

CONCLUSION

According to the study mentioned above, students have a reasonable understanding of microbial complexes and periodontal micropathogens, but they are not well-versed in therapeutic planning, which is the third domain in our survey. Thus, they need to update their expertise more effectively. It is indicative of students' commitment to understanding the complex dynamics of oral microbiology.

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REFERENCES

1. Moore WE, Moore LV. The bacteria of periodontal diseases. Periodontology. 2000;5(66):1994.
2. Kilian M, Chapple IL, Hannig M, Marsh PD, Meuric V, Pedersen AM, et al. The oral microbiome- an update for oral healthcare professionals. Br Dent J. 2016;221(10):657-66.
3. Flemming T, Sorensen J, Newman M. Gingival enhancement in fixed prosthodontics. Part II: microbiologic findings. J Prosth Dentist. 1991;65:365.
4. Hajishengallis G, Darveau RP, Curtis MA. The keystone-pathogen hypothesis. Nat Rev Microbiol. 2012;10(10):717-25.
5. Holt S, Ebersole J. Porphyromonas gingivalis, Treponema denticola, andTannerella forsythia: the 'red complex', a prototype polybacterial pathogenic consortium in periodontitis. Periodontology 2000. 2005;38(1).
6. Nagrik A. Knowledge awareness and attitude of medicalstudents and teachers towards oral hygiene-a questionnaire study. Int J Dentist. 2017;2:01-8.
7. Reed WP, Williams RC. Bacterial adherence: first step in pathogenesis of certain infections. J Chronic Dis. 1978;31:67.
8. Christersson LA, Albini B, Zambon JJ, Wikesjö UM, Genco RJ. Tissue localization of *Actinobacillus actinomycetemcomitans* in human periodontitis: I. light, immunofluorescence and electron microscopic studies. J Periodontol. 1987;58(8):529-39.
9. Razi MA, Debnath S, Kumari P, Singh S, Kumar N, Prashant S. Assessment of attitude, knowledge and awareness towards oral health and periodontal diseases among medical professionals in Hazaribag district, Jharkhand, India. EC Dent Sci. 2018;17:1685-92.
10. Oyetola EO. Knowledge and awareness of medical doctors, medical students and nurses about dentistry in Nigeria. Pan Afr Med J. 2016;23:172.

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