

Original Research

Knowledge and Awareness Regarding Periodontal Medicine among medical undergraduates

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ABSTRACT:

Introduction: Periodontal medicine defines in what way periodontal infection/inflammation may influence extraoral health. Periodontal diseases have been interconnected to above 50 extra oral diseases and conditions. Its association with pathological conditions: diabetes mellitus, adverse pregnancy outcomes and cardiovascular disease has already been well established. Significant studies that showed solid involvement pertaining to its progression and its relationships to the systemic conditions. **Purpose:** To assess the awareness of periodontal medicine among medical students at AIMST University Malaysia. **Materials and Methods:** A total of 200 subjects were taken for the present study. Data was collected using a questionnaire which included questions used to assess the knowledge about periodontal diseases and its possible effects on systemic conditions. **Results:** More than 50% of the students agreed that bleeding gums, gum recession, gingival pain, malodor, tooth mobility, tooth migration and tooth loss are signs and symptoms of periodontal disease. Out of the total participants, more than half of the students admitted that they have only average knowledge about periodontal disease that affects systemic health and vice versa. **Conclusion:** Through this study, it can be concluded that students in the medical field should be encouraged to familiarize with, increasing their knowledge and understanding regarding periodontal medicine. It is no doubt vital that oral health and systemic health has an inseparable connection that affects each other

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INTRODUCTION

Periodontal disease is an immuno-inflammatory disease that occurs in the tissue surrounding the teeth as a result of interaction between bacterial pathogens and pro-inflammatory cytokines released due to host response. It is a multifactorial disease with numerous systemic or local risk factors playing a part in its pathogenesis and clinical sequences.⁽¹⁾ Periodontal diseases are influenced by various systemic risk factors signifying that periodontitis does not occur merely as a consequence of plaque accumulation but is also coupled with various host factors which could exaggerate the host response to the plaque on a particular individual.

Periodontal disease is predominantly a Gram-negative infection with *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, *Bacteroides forsythus*, *Prevotella intermedia*, *Campylobacter rectus*,

Treponema denticola, *Fusobacterium nucleatum* commonly detected in crevicular fluid. The mechanism underlying this destructive process involves both direct tissue damage resulting from plaque bacterial products and indirect damage through bacterial induction of the host inflammatory and immune responses. These periopathogens and their products such as Lipopolysaccharides (LPS) have great potential in vascular dissemination through the sulcular epithelium throughout the body. Hence periodontal-systemic interlink has been labelled as a two-way relationship.⁽²⁾

Periodontal disease is highly prevalent, contributing to the global burden of chronic diseases and constituting a major public health problem. Oral health is related to general health in many different ways. However, the general public as well as many medical practitioners are grossly unaware of the fact.

According to a study, majority of the medical interns (80%) admit their limited knowledge about periodontal diseases whereas the post-graduates (64%) show a moderate level of knowledge despite of the fact that 60% of the medical interns showed their awareness that bleeding gums, gum recession, unsteady teeth, and tooth loss are signs and symptoms of periodontal disease; on the contrary only 40% of the post-graduates were aware of it.⁽³⁾ This implies though significance of oral hygiene and maintenance of dental health is highlighted and emphasized in medical school, it is not fairly practiced overall among the post-graduates who are graduated from various universities. Hence, a research with aim to assess the awareness and knowledge of the final year medical students in AIMST University about the periodontal manifestation of systemic diseases is formulated.

A number of systemic factors have been documented as being capable of affecting the periodontium and treatment of periodontal disease. Systemic etiologic components may be suspected in patients who exhibit periodontal inflammation or destruction which appears disproportionate or inconsistent to the local irritants. Periodontal disease is strongly associated with particular systemic diseases for examples cardiovascular disease, hematological disease, metabolic disease such as diabetes, adverse pregnancy outcomes, respiratory diseases and so on.⁽⁴⁾ However, the main etiological factor in periodontal disease is microbial dental plaque but the actual form of disease progression can be modified by various systemic factors.

Coronary artery disease is the major cause of premature death among men in the developed world and its pathological basis is atherosclerosis. So far, the causality and possible pathways of the association between periodontal disease and cardiovascular disease remain obscure. New studies reveal increased odds ratios of 1.5 for coronary heart disease, 1.9 for fatal coronary heart disease and 2.8 for stroke linked to high incidence of periodontal bone loss.⁽⁵⁾

Periodontal destruction is usually considered as a complication of diabetes due to the impairment of host immune system in hyperglycemic state rendering the patients more susceptible to infections. High blood glucose level also casts an adverse effect on collagen metabolism by increasing the collagenase activity and modifying the synthesis, maturation and maintenance of collagen.⁽⁴⁾ Apart from this, advanced glycation end-product (AGE) formed in diabetic patients play an important role in the exaggeration of host inflammatory response to dental plaque. The apoptosis of fibroblast and osteoblast eventually leads to the increased periodontal attachment loss and bone loss. Vascular changes in diabetic patient manifests as thickening of vascular blood vessel walls bring inhibitory effects on the transport of oxygen, white blood cells as well as the immune factors.⁽⁴⁾

HIV infected individuals may exhibit linear gingival erythema, necrotising ulcerative gingivitis (NUG),

severe localised periodontitis and severe destructive necrotising stomatitis affecting gingivae and bone. These features are necrotising form of periodontal disease which maybe more exaggerated in immunocompromised HIV-infected patients.⁽⁶⁾

Leukaemia is caused by proliferating white blood cell-forming tissues resulting in a marked increase in circulating immature or abnormal white blood cells and greatly depleted bone marrow function. Leukemic patients commonly present with anaemic gingival pallor, gingival bleeding, neutropenic ulceration and decreased inflammatory and immune response to periodontal infection. These manifestations are further complicated by the infiltration of proliferating leucocytes into gingiva and result in gingival enlargement.⁽⁷⁾

Periodontal disease is also known to have association with genetic conditions such as Down's syndrome, Papillon-Lefevre syndrome, hypophosphatasia and Ehlers-Danlos syndrome.⁽⁸⁾ These genetic disorders modify periodontal structure or host immune and inflammatory responses to plaque which consequently leads to severe periodontal destruction. Certain medications such as nifedipine, phenytoin and cyclosporin may predispose to gingival overgrowth.⁽⁹⁾ Membrane ion channel blockers influence gingival fibroblasts to overproduce collagen matrix and ground substance when stimulated by gingival inflammation following plaque accumulation. Antihypertensive calcium antagonist (nifedipine) is used extensively in the management of angina and sometimes hypertension and gingival overgrowth commonly accompanies its use. Pregnancy causes a modification in the host response to dental plaque but this is largely confined to the soft tissues and manifests as chronic gingivitis.⁽¹⁰⁾ Patients with adverse pregnancy outcome often present with varying degree of gingival redness, swelling, bleeding and exudation and even tooth loss in more advanced case.

Systemic factors affect the severity of periodontitis mainly through their effects on the normal host immune and inflammatory defences. Those systemic diseases cause the reduction in number or function of polymorphonuclear leucocytes (PMNs) which results in an increased rate and severity of periodontal destruction.⁽¹⁾ University students represent an important group of population that could be easily used for the purpose of assessing oral health status, awareness and practices among young adult and educated groups. Health care professionals come into contact with a large number of patients who are largely ignorant of dental health and periodontal diseases. If medical doctors are educated and made aware of the impact of systemic diseases on periodontitis, then this global epidemic may be made under control. This study aims to assess the knowledge of final year medical students of AIMST University regarding periomedicine and the impact of systemic conditions on periodontal diseases and vice versa.

MATERIALS AND METHODS

200 undergraduate students from Year 5 of AIMST University were specifically chosen to participate in this cross-sectional study as a measure to know the level of awareness regarding periomedicine. This research basically evaluated the extent of knowledge of medical undergraduates on association of systemic condition and its relationship with periodontium. Each participant was given a self-administered, pre-tested, Multiple-Choice questionnaire to solve on the spot. The questionnaire comprised of close-ended questions. The questionnaire assessed the knowledge of medical interns regarding etio-pathogenesis of periodontitis, its relationship with systemic diseases, its prevention and referral choices and training of year 5 medical students with regard to oral health.

The data collected were compiled, analyzed and interpreted. In order to summarize the awareness level, responses were graded from 0-15 based on the correct responses. The respondents securing 0-4, 5-6, 7 and above marks were graded as having awareness level as poor, fair and good, respectively. Results were expressed in terms of percentage. Results were expressed in terms of percentage.

DATA COLLECTION AND ANALYSIS OF RESULTS

100% response rate was observed for all the 200 questionnaires distributed to final year MBBS students of AIMST University. The questionnaire was divided into three parts. Part A that assessed the basic self-evaluation on the correlation between systemic condition and periodontal health, majority of participants claimed that they have average knowledge. The level of understanding pertaining to perio-systemic relation was questionable. Part B that focused on the facts of the influences of systemic conditions on periodontium and vice versa, clearly shown that most of the participants were well aware of the impact of diabetes mellitus and coronary heart disease on periodontal health. However, more than 50% of them were ignorant about the other health conditions affecting the periodontal health which includes respiratory infections, Vitamin C deficiency, adverse effects of drugs prescribed for epileptic, hypertensive & immunosuppressed patients, pregnancy, puberty, low birth weight babies etc. Part C assessed the medical students' attitude on treating patients with systemic condition and periodontal diseases as a whole. The response obtained were overwhelmingly great as nearly all of them strongly agree that periodontal disease prevention and appropriate management should be given more attention and thoughts for patients with systemic conditions.

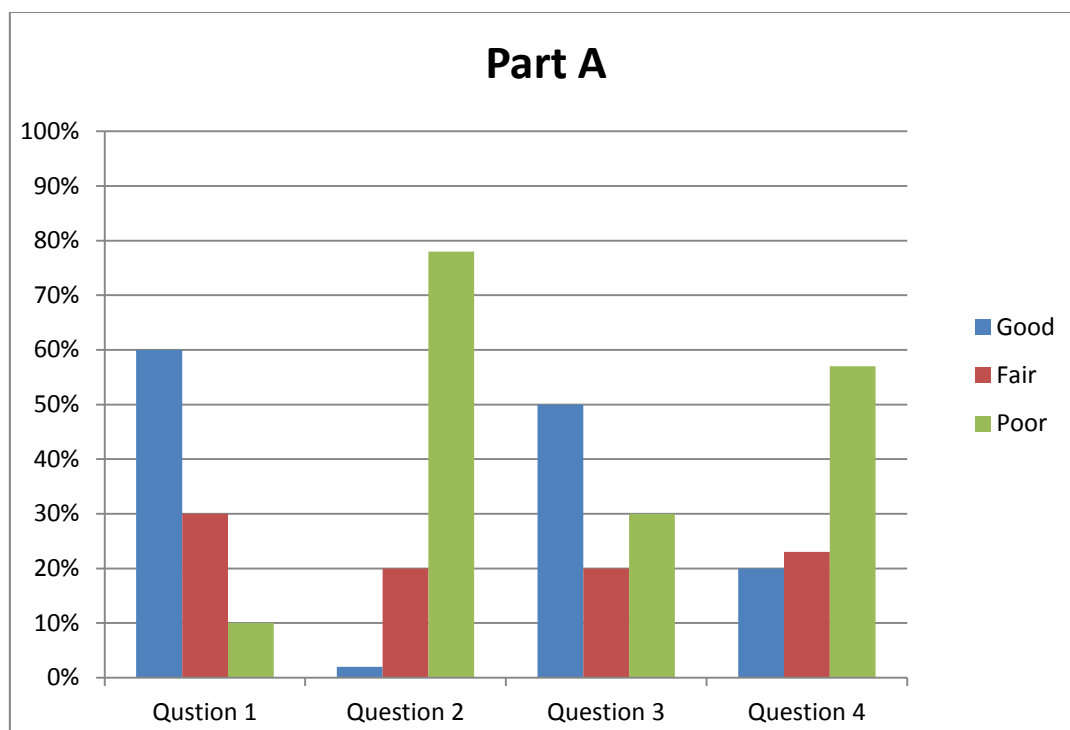


Figure1 shows the level of awareness of year five medical students about the relation of periodontal disease and systemic health. (Part A Question 1-4 in the questionnaire)

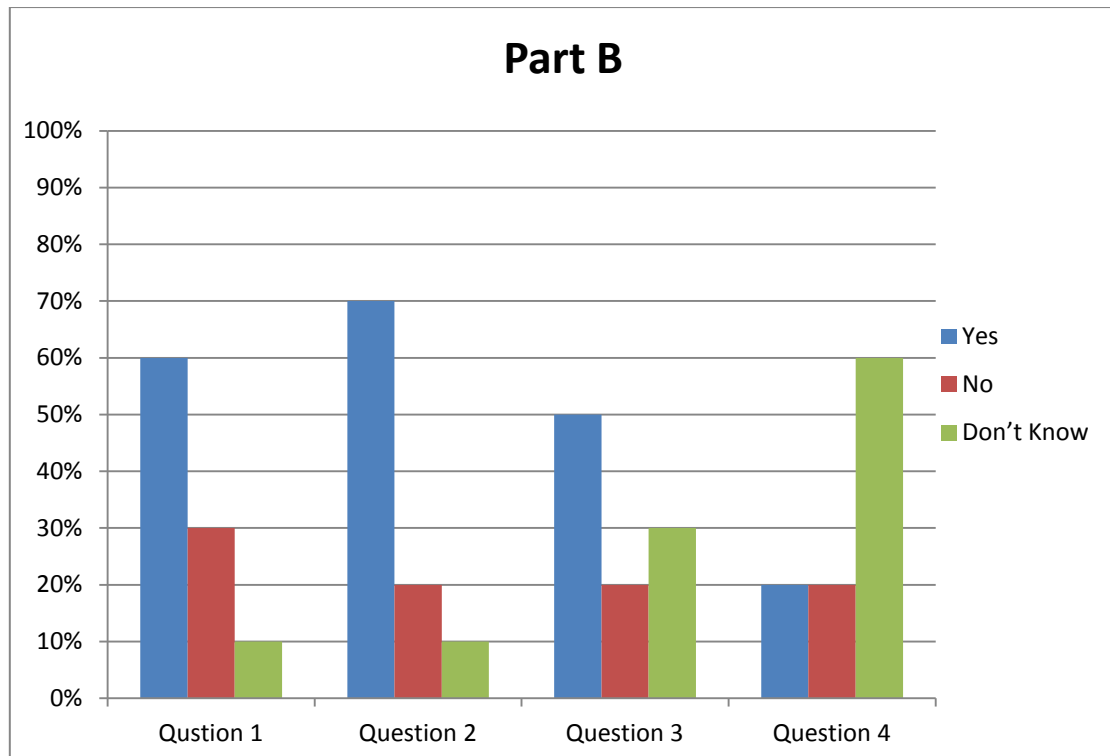


Figure 2 shows the knowledge of participant regarding periodontal disease affecting systemic disease like diabetes and coronary heart disease and vice versa (Part B Question 1-4 in the questionnaire)

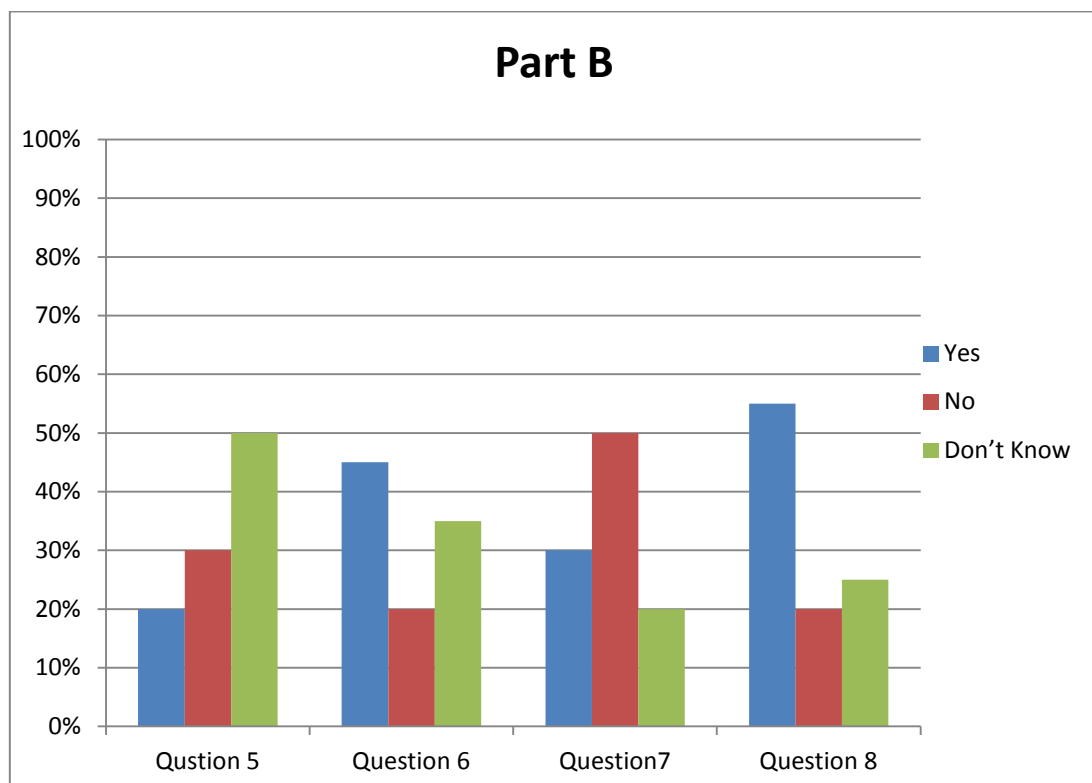


Figure 3 shows the knowledge of medical students regarding the role of subgingival plaque causing respiratory disorders as well as role of various systemic drugs causing periodontal disease (Part B Questions 5-8 in the questionnaire)

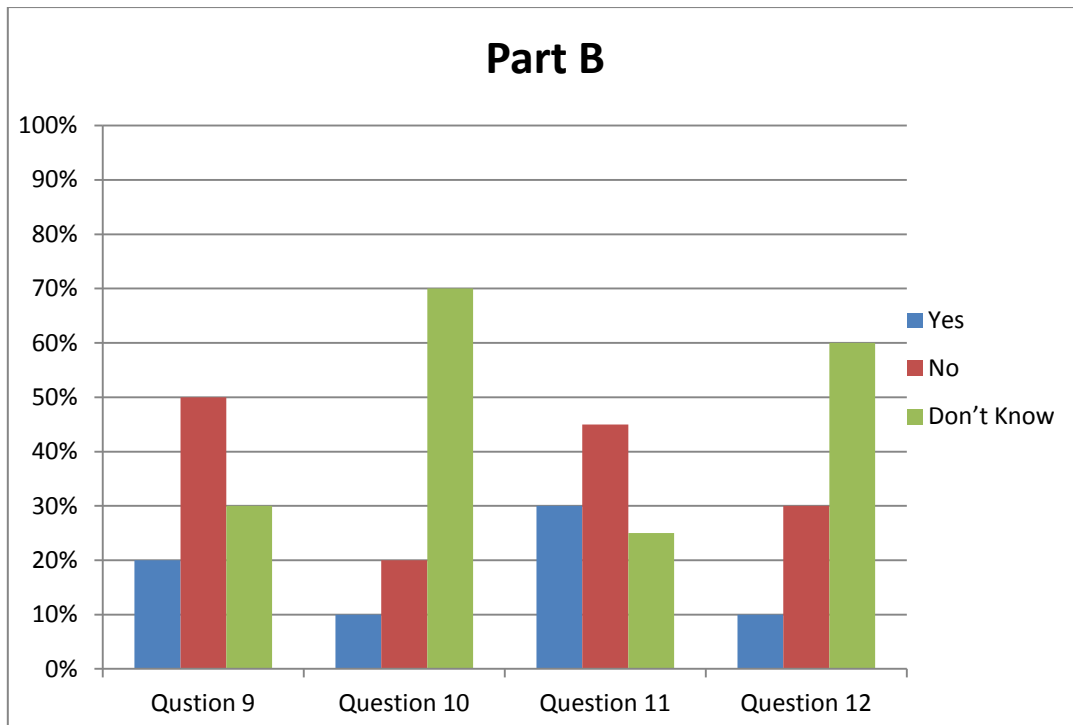


Figure 4 shows the knowledge of medical students regarding the role of periodontal disease in AIDS, puberty, pregnancy and birth weight.(Part B Questions 9-12 in the questionnaire)

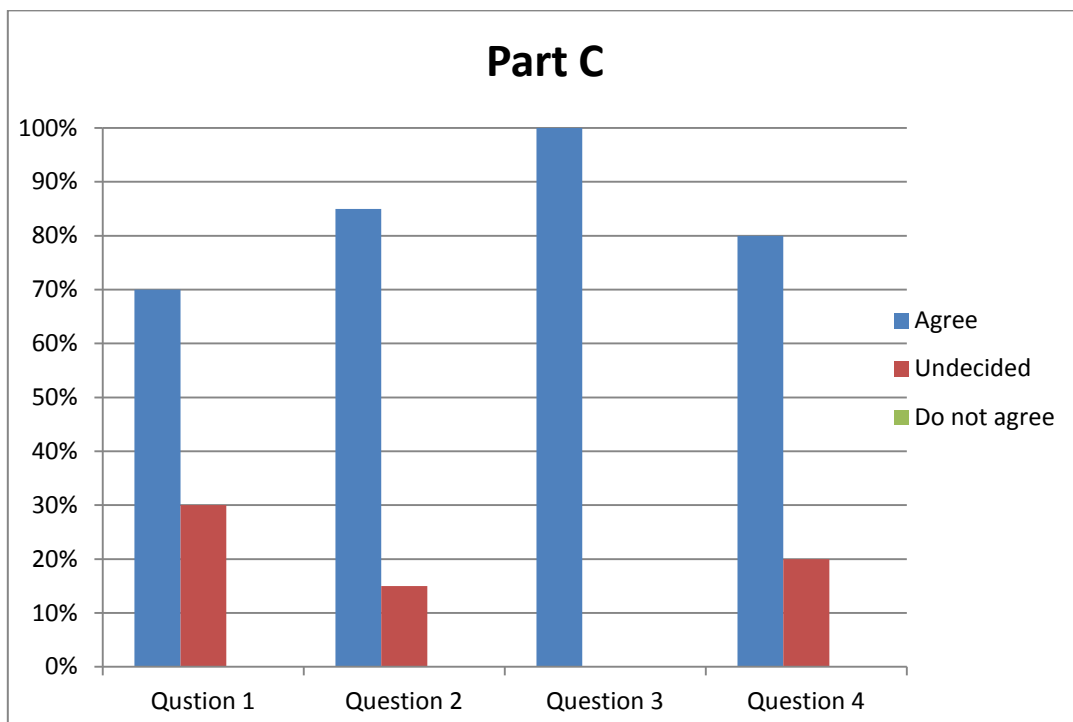


Figure 4 shows the knowledge of medical students regarding the attitude of medical students regarding the treatment for periodontal conditions and diseases.(Part C Questions 1-4 in the questionnaire)

DISCUSSION

Health education and promotion is a major endeavour for the healthcare professionals. In order to expand the role of physicians in addressing oral health, physicians themselves should have adequate knowledge regarding association between systemic diseases and oral health. This study was aimed at

undergraduate final year medical students as they are the primary channel in future for reaching the people and imparting information about health in such a way that the recipient is motivated to use that information for the protection or advancement of his own, his family's or his community's oral health. Integration and coordination between medicine and dentistry

would be beneficial to the community to attain health as a whole.

In the present study, limited awareness about periomedicine is observed among the final year medical students as only 20% of them rated excellent for their extent of knowledge concerning periomedicine whereas 57% were unaware of the importance of periomedicine. Only 2% of them graded good for the level of awareness regarding the periodontal disease received in medical school. Based on the study by Varghese M et al, it has been found that majority of the medical interns (80%) admit their limited knowledge about periodontal diseases whereas the post-graduates (64%) show a moderate level of knowledge in spite of the fact that 60% of the medical interns showed their awareness that bleeding gums, gum recession, mobile teeth, and tooth loss are signs and symptoms of periodontal disease, on the contrary only 40% of the post-graduates were aware of it.⁽³⁾ This implies that the significance of oral hygiene and maintenance of dental health is inadequate in medical school and it is not fairly practiced overall.

The association between diabetes and periodontal health is bidirectional. Diabetes can exaggerate the host response to the local microbial factors such as endotoxin, resulting in unusually destructive periodontal breakdown.⁽⁴⁾ Periodontal disease is associated with hyperglycemia, the poorer the control of diabetes mellitus is, the greater the risk of developing periodontal disease. DF Kinane et al stated that chronic periodontitis is recognized as the sixth complication of diabetes and concluded that multiple epidemiological studies both type 1 and type 2 diabetes are predictors of periodontal disease when the systemic condition is poorly controlled.⁽¹¹⁾ Periodontal inflammation negatively affecting glycaemic control contributes to increased periods of hyperglycemic state and consequently increase the risk for diabetic complications. In the present study, 10% of the final year medical students have the misconception that diabetes mellitus and periodontal health are in unidirectional relationship with diabetes being the potential risk factor for periodontitis. They were not aware of the impact of periodontal disease on diabetic progression due to insufficient exposure to the integrated knowledge of medicine and dentistry. In comparison to the survey concerning the association between periodontal diseases and systemic illnesses among medical doctors in Nigeria, only 25.4% of them displayed the knowledge of periodontal disease as a risk factor for poor glycemic control^[11]. This phenomenon is possibly due to insufficient education regarding periodontal-systemic diseases interactions during their medical undergraduate course. Coronary artery disease is the major cause of premature death among men in the developed world and its pathological basis is atherosclerosis. Gram negative bacteremia caused by periodontitis induces endothelial damage and eventually leads to atherosclerosis. According to a cross sectional studies

done by Arbes and colleagues, association between periodontal disease and coronary heart disease was emphasized due to the fact of having history of heart attack increased with the severity of periodontal disease.⁽¹²⁾ The current survey shows that almost 50% medical students know that periodontal disease can lead to coronary heart disease but only 20% are aware in certain of the pathogenesis of the relation between the same. Based on a survey among internal medicine residents in Nigeria, 45.9% of them managed to identify periodontal disease as risk factor for coronary heart disease.⁽¹³⁾ This implies that knowledge of periodontal disease as a risk factor for systemic illnesses among medical residents is inadequate. These relationships should be emphasized in continuing medical education courses.

Kimihiro Igari et al stated that respiratory infections such as pneumonia and certain chronic obstructive diseases are related to aspiration of bacteria from the oropharynx into the lower respiratory tract due to swallowing insufficiency.⁽¹⁴⁾ Current evidence suggests that oral bacteria, poor oral hygiene and periodontitis may influence the initiation and course of pulmonary infections, including community-acquired, hospital-acquired and ventilator-acquired pneumonia. The oral cavity is contiguous with the trachea and may be a portal for respiratory pathogen colonization. Dental plaque can be colonized by respiratory pathogens, which may be aspirated from the oropharynx into the upper airway and then into the lower airway and adhere to the bronchial or alveolar epithelium.

In the present study, 50% of the subjects are unaware that periodontal disease can exacerbate respiratory disease and are unaware of the relation of subgingival plaque in causing respiratory diseases. Potential respiratory pathogens include *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Haemophilus influenzae* and *parainfluenzae*, *Streptococcus constellatus* and pneumonia and oral bacteria such as *A. actinomycetemcomitans*, *Actinomyces israelii*, *Capnocytophaga* spp., *Eikenella corrodens* and *P. intermedia*. These pathogens may be aspirated into the lower respiratory tract and lungs and cause infection. Cytokines and enzymes released from periodontal tissues may alter the respiratory epithelium and promote infection by potential respiratory pathogens. Moreover, enzymes derived from bacteria in saliva may damage the surface of the oral mucosa and expose receptors that promote adhesion and colonization of potential respiratory pathogens. Finally, enzymes associated with chronic periodontitis may degrade the film of saliva, decreasing the protection of nonspecific host defence mechanisms against potential respiratory pathogens.⁽²⁾

Drug-induced gingival overgrowth or enlargement is the periodontal manifestation which is caused by the adverse drug reactions of certain systemic drugs administered mainly antihypertensives, anticonvulsant

and immunosuppressant. The drugs which induce such gingival enlargement is the antihypertensive calcium channel blocker namely nifedipine, amlodipine, verapamil and diltiazem. The clinical manifestation of gingival enlargement frequently appears within 1 to 3 months after initiation of the drug administration. The initial growth starts as painless beadlike enlargement involving the interdental papilla, and extends to facial and lingual aspects of gingival margins. As this condition continues to aggravate, they will transform into a massive tissue fold with the lobulated appearance which might even cover a considerable amount of teeth. This will further increase the difficulty in oral hygiene maintenance and leads to more plaque accumulation which consequently induce secondary gingival inflammation.⁽¹⁵⁾ Phenytoin which is used for treating epileptic patients also have similar adverse effect. Some degree of gingival enlargement is present in patients taking anticonvulsant and is seen primarily in young individuals. The metabolite known as 5-parahydroxy phenyl-5-phenylhydantoin causes the excessive proliferation of fibroblasts and secretion of collagen fibers. Hence the collagen deposition-degradation balance is disrupted and lead to gingival overgrowth. According to the informational paper on drug-associated gingival enlargement published by the Journal of Periodontology Online, the prevalence for phenytoin-induced gingival enlargement is 50%, while 25-30% in adults and more than 70% in children, 6-15% for nifedipine.^(9,15) Based on the similar research done on general population of Lucknow, it had shown that the general population who are in the educational level of graduates have only around 30% of them being aware of the drugs which leads to drug-induced gingival enlargement. AIMST University medical students nearing to 50% and above are aware of drug induced periodontal diseases. Thus, it is supposed that medical students have better awareness and knowledge regarding the possible adverse effect of certain drugs that affect periodontium and this may be due to adequate exposure to the pharmacology in their curriculum and impacts on periodontium during their collaboration with oral healthcare providers.

A number of alterations in the oral cavity may become more prevalent during pregnancy, and pregnancy gingivitis is characterized by hyperaemia, edema, and a considerable tendency for bleeding. This type of gingivitis occurs at a frequency ranging from 35 to 100%, and the severity gradually increases until the 36th week of gestation. It is known that gingival bleeding and overgrowth like swelling can be observed during pregnancy and puberty.^(10,16) This fact however is not known by majority of the medical students as shown by the result obtained by survey among final year medical students. Regarding the fact that periodontal disease is a potential risk factor of low birth weight babies, majority of samples are oblivious. About 11% of singleton births in the United

States occur before 37 weeks of gestation,¹ and the rate of premature delivery has increased during the past 15 years.^(10,17) Preterm and low-birth-weight infants are at elevated risk for death, neurodevelopmental disabilities, cognitive impairment, and behavioral disorders. About half of mothers delivering preterm infants have no known risk factors. Recent studies suggest that periodontitis, an inflammatory disease caused primarily by gram-negative bacteria that destroy tooth-supporting connective tissue and bone, is associated with an increased risk of preterm birth, as well as low birth weight and preeclampsia. In summary, the treatment of periodontitis in pregnant women is safe and effective in improving periodontal disease. However, it did not significantly alter the rates of preterm birth, low birth weight, fetal growth restriction, or preeclampsia.

Oral diseases like periodontal disease have always been associated with mankind, but they are rarely life-threatening. The prevention or treatment is often given a low priority by health policy makers. Lack of awareness and knowledge among medical students, even among those that are about to graduate is a clear proof that greater effort should be instilled to educate them on periodontal diseases and its influence systemically. This is especially important as the oral health of public rests on the hands of these future professional physicians, acting as the primary channel for community to seek health treatments and advice. According to the study done regarding subject of treatment modalities of periodontal condition and diseases, all the samples agree that physicians/surgeons should recommend oral prophylaxis before radiation/chemotherapy/ organ transplantation. This point stresses the importance of prevention as the main source of treatment. Majority of the sample agree that patients with systemic diseases practicing proper oral hygiene habits can reduce the risk of acquiring gum diseases. This point emphasizes the need to give priority to good oral hygiene practice. Most all of the subjects agree that it is important for dentists to know their patients' past/present medical conditions, hospitalization and medication prior to any treatment. This is vital as shown in this study that periodontal disease and systemic disease is a close knitted two-way process. Almost all of the samples agree to refer their patients to a dentist for evaluation and care for oral health. This proves that even though there is limited accurate knowledge and awareness regarding the subject periomedicine and the correlation among periodontal disease and systemic diseases, there is still presence of positive attitude regarding the need to care and refer oral conditions of their patients to the professional healthcare sector. Regardless so, it would be ideal if the medical team and dental sector can have full cooperation, working side by side and correlate in the same line of thinking and field of healthcare industry. This in turn, would definitely produce an effective and knowledgeable

community with a higher standard of health status as a whole.

Growing evidence states that periodontal disease is a common finding among the community regardless of gender, race, age and country. Evidence highlights that the level of knowledge and awareness of periodontal disease and its effects on systemic health is limited among students in the medical field. In short, this study suggests a higher necessity for the medical schools to have a more comprehensive training in oral and periodontal health. Various strategies can be implemented to achieve this goal. Use of audiovisual aids, conducting workshops and awareness camps, having fixed dental postings, Imparting sufficient theoretical knowledge and support sessions with small group discussions incorporating medical-dental students would improvise the future efforts of

physicians in contributing to the oral health of the public.

CONCLUSION

Within the limitation of this study, it could be concluded that students in the medical field should be encouraged to familiarize with, increasing their knowledge and understanding regarding periomedicine. It is no doubt vital that oral health and systemic health has an inseparable connection that affects each other. Therefore, it should be stressed that future physicians are well informed and well equipped. Even though inadequate knowledge of the correlation between periodontal disease and systemic condition is evident in some areas among the medical students, the AIMST medical students portrays a positive attitude regarding periodontal health.

**APPENDIX
QUESTIONNAIRE**

Part A- Basic evaluation on self and subject

Part B- Systemic disease and periodontal health

Part C- Treatment modalities

Part A – Basic evaluation on self and subject

	Good	Average	Poor
1. Level of awareness about periodontal disease received in medical school.			
2. How sufficient and reliable the lessons &workshops serves as primary source of information regarding periodontal-systemic relationship?			
3. How well do you know periodontal diseases can affect systemic health and vice versa?			
4. How well do you understand the term ‘Periomedicine’?			

Part B – Systemic Disease and the Periodontal Health

	Yes	No	Don’t know
1. Bleeding gums, gum recession, gingival pain, malodor, tooth mobility, tooth migration and tooth loss are signs and symptoms of periodontal disease.			
2. Diabetes mellitus may aggravate existing periodontal disease and periodontal disease is a potential risk factor for diabetes mellitus.			
3. Periodontal disease can cause thickening of arteries leading to heart attack.			
4. Atherosclerosis can be caused by periodontal disease due to Gram-negative bacteremia induced endothelial damage which eventually leads to atheroma formation.			
5. Potential respiratory pathogens such as streptococcus pneumonia and hemophilus influenza found in subgingival plaque being aspirated into lungs will lead to respiratory infection.			
6. Does vitamin C play a role in mantaining health of periodontium instead of only being beneficial to our human skin?			
7. Drugs used like Phenytoin, Cyclosporin can cause gingival enlargement.			
8. Patients with hypertension under medication (calcium channel blocker) are prone to gingival overgrowth/enlargement.			
9. Will HIV/AIDS be able to worsen oral health and exacerbate periodontal diseases?			
10. Gingival bleeding can be observed during puberty phase.			
11. Do you think that during pregnancy bleeding gums/overgrowth is a common finding?			
12. Gingival diseases can be a cause for low birth weight babies.			

Part C – Treatment modalities of Periodontal Condition & Diseases

	Agree	Undecided	Disagree
1. Do you agree that physicians/surgeons should recommend oral prophylaxis (cleaning of teeth) before radiation/chemotherapy/organ transplantation?			
2. Do you agree that patients with systemic diseases practicing proper oral hygiene habits can reduce the risk of acquiring gum diseases?			
3. It's important for dentists to know their patients' past/present medical conditions, hospitalization and medication prior to any treatment.			
4. Do you agree to refer your patients to a dentist for evaluation/care?			

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