Frequency of systemic diseases in chronic generalized periodontitis in North Karnataka population

Praveenkumar Ramdurg[1], Naveen Srinivas[2*], Surekha Puranik[3], Abhijeet Sande[4], Vijaylaxmi Mendigeri[5]

[1,2,5]Reader, [3]Professor and Head, [4]Senior Lecturer, [4]Dept. of Oral Medicine and Radiology, [1,2,3,5]PMNM Dental College and Hospital, Bagalkot, Karnataka, [4]Krishna Institute of Dental Sciences, Karad, Maharashtra, India

***Corresponding Author: Naveen Srinivas**
Email: nvns03@gmail.com

Abstract
Introduction and Objectives: Periodontitis has been associated with a number of systemic diseases such as diabetes, cardiovascular diseases, respiratory diseases, bone disorders, kidney disease and drug allergies. This study aimed to determine whether there is a significant difference in the prevalence of systemic diseases in patients with periodontal disease and patients without periodontal disease.
Materials and Methods: 600 patients attending the outpatient department P.M.N.M dental college and Hospital, Bagalkot were included for the study. These patients were divided into two groups; Group I- patients with periodontal disease (cases) and Group II- patients without periodontal disease (controls). Prevalence of systemic diseases was evaluated using self-reported health questionnaire. The periodontal conditions were assessed by using Russell's Periodontal Index (PI).
Results: Patients with periodontal disease had a higher prevalence of systemic compared to the patients without periodontal disease. Further more prevalence of systemic diseases was more common in middle and elder age group. Hypertension, Diabetes Mellitus, Drug allergies, CVS disorders, Cancer and Radiotherapy were the most prevalent and statistically significant among cases and controls.
Conclusion: Due to the high frequency of medical conditions, thorough evaluation of patients medical history should be a mandatory first step in the diagnosis and management of dental diseases.

Keywords: Systemic diseases, Periodontal disease, Self-reported health questionnaire.

Introduction
Health sciences are in the midst of major transition. On macro levels, scientific and technologic advances are defining new paradigms for dentistry to which traditional theory may not apply. Periodontal disease might influence the morbidity and mortality of systemic diseases, constitutes a research topic of great current interest.[1]

Oral microbiological infections may also affect ones general health status. Indeed, animal and population-based studies now suggest that periodontal diseases may be linked with systemic diseases and conditions including cardiovascular diseases, diabetes, respiratory diseases, adverse pregnancy outcomes, and osteoporosis. Better understanding of this correlation will help both dental and medical professionals to determine the best approach to patient.[2] Page proposed that periodontitis may affect the hosts susceptibility to systemic disease in three ways: by shared risk factors, by subgingival biofilms acting as reservoirs of gram-negative bacteria, and through the periodontium acting as a reservoir of inflammatory mediators.[3] New investigations have definitely acknowledged a clinically relevant two-way relationship between periodontitis and certain systemic diseases and conditions which are significant for the dentist in daily practice, and for a physician as well.[4]

Periodontal diseases are oral disorders characterized by infection and inflammation of the supporting structures of the teeth, including periodontal ligament, cementum, and alveolar bone. The milder form of periodontal disease is gingivitis, which is the inflammation of the gums characterized by redness, swelling, and tendency to bleed. Whereas Periodontitis is a destructive and more severe form. It is associated with a complex microbial flora containing approximately 500 different bacterial entities and various human viruses. Many of these microorganisms possess significant virulence potential. Some periodontopathic bacteria such as *Actinomycetemcomitans* and *P. gingivalis* are unique to the oral cavity, where they can cause chronic periodontal infections and disseminate into the systemic circulation and affect other organs. Much of the periodontal tissue destruction observed in periodontitis is caused by host-mediated release of proinflammatory cytokines, such as IL-1 and TNF-α, by local tissue and immune cells in response to the bacteria.[2]

Recent studies have indicated that periodontitis may produce any number of alterations in systemic health. Investigators have demonstrated significant association between periodontitis and acute cerebral infarction/ stroke,[5] failure of joint/organ replacement and kidney dialysis,[3] coronary heart diseases[6,7] preterm low birth weight, aspiration pneumonia[8] and diabetes.[9] Hippocrates and others throughout the centuries speculated that oral diseases might influence the morbidity and mortality of systemic diseases.[10] Walter D. Miller,[11] an American dentist, published in 1981 a classic article in Dental Cosmos entitled The Human Mouth as a Focus of Infection. He reported that microorganism or their waste products obtain entrance to parts of the body adjacent to or remote from the mouth. He listed several systemic diseases that he thought to originate from an oral focus of infection, including gangrene, tuberculosis, meningitis, syphilis, thrush, angina Ludovici, actinomycosis, noma, septicemia and pneumonia. In 1900, William Hunter,[12] a British physician, claimed that the chronic infection of oral cavity (oral sepsis) might induce infectious diseases such as tonsillitis, glandular swellings, middle ear infection, ulcerative endocarditis, empyema,

meningitis, and osteomyelitis. Frank Billings[13] replaced the term oral sepsis with the term focal infection (Focal infection is defined as any infection caused by the dissemination of either bacteria or their toxic products from a distant focus of infection) emphasizing the bacterial origin of the focus or lesion and the potential for dissemination to systemic infection. Galloway[14] implicated distant infection as the cause of miscarriage, mastitis, phlebitis, anemia and toxemia in pregnancy. Based on the focal infection theory some practitioners recommended the prophylactic removal of all the infected teeth to avoid possible foci of infection. Fascinating research has eroded the tradition- bond concept that the oral infections such as periodontitis are simply local entities whose effects are limited to the oral tissues. While the clinical observations of many practitioners have long suggested that periodontal diseases can have widespread systemic effects, only recently has rigorous scientific investigation supported this concept.

The study is undertaken to estimate:

1. The prevalence of systemic diseases in patients with periodontal diseases.
2. To determine whether there is a significant difference in prevalence of systemic diseases in patients with periodontal diseases and patients without periodontal disease.
3. To evaluate the varying severity of periodontitis in relation to age, gender and presence of systemic diseases.

Materials and Methods

Source of data

This case-control, epidemiological study was carried out in Department of Oral Medicine and Radiology, P. M. N. M. Dental College and Hospital, Bagalkot. The study was conducted for period of two years. Patients attending the outpatient department (Department of Oral Medicine and Radiology) were randomly selected. Among these patients, 400 patients with periodontal disease (cases) and 200 patients without periodontal disease (controls) were included in the study. A detailed case history of each patient was recorded on a pro forma. Prior to commencement of this study, ethical clearance was obtained from the institute.

The medical history like Diabetes, Respiratory diseases, Epilepsy, Hypertension, Cardiovascular disorders, Liver Diseases, Blood disorders, Kidney disorders, Cancer and Radiotherapy, Psychiatric problems, AIDS/HIV, Bone disorders, Gastro- intestinal problems and allergies was enquired through a health questionnaire and recorded.

The patients were divided into five groups according to age groups: 18-29, 30-39, 40-49, 50-59 and above 60 years.

Inclusion criteria

1. Patient who had history of systemic disease and diagnosed by the physician with relevant investigation reports.
2. Those who present suggestive signs or symptoms of systemic disorder were referred to appropriate medical clinics for evaluation.
3. Minimum of 20 teeth present.

For 400 patients with periodontal disease, the Russell periodontal index (Russell. A.I 1956)[15] was chosen as the guideline for assessment of periodontal status.

All of the gingival and periodontal tissue circumscribing each tooth (i.e. all of the tissue circumscribing a tooth is considered a scoring) is assessed for gingival inflammation and periodontal involvement.

Scoring criteria

Russell chose the scoring values (0, 1, 2, 6, and 8) in order to relate the stages of the disease in an epidemiological survey to the clinical conditions observed. The Russells rule state that when in doubt assign the lower score.

Calculation of the index

The periodontal index score (PI Score) per individual is obtained by adding all of the individual scores and divided by the number of teeth present or examined.

$$\text{PI Score per person} = \frac{\text{Sum of Individual Score}}{\text{Number of Teeth Present}}$$

The data was collected and analyzed statistically using Statistical Package for Social Sciences (SPSS version 11.0) with following procedure:

1. Independent t-test was used to find out significance difference between cases and controls. One way analysis was used to find out significant difference between more than two independent groups.
2. Newman- Keuls multiple post hoc for pair wise significance between different age groups. Yates corrected Chi- Square test and Odds ratio was used to assess the risk of occurrence of diseases in cases and controls.

Results

This case-control, epidemiological study was conducted from the period of October 2007 to April 2009, to estimate the prevalence of systemic diseases in patients with periodontal diseases.

Total 600 patients attending outpatient department gave consent for the study. These subjects were divided into cases and controls.

400 patients with periodontal diseases (cases)

200 patients without periodontal diseases (controls).

The total samples were grouped into the following age groups:

18- 29, 29- 39, 40- 49, 50- 59 and 60 years and above.

Information about medical conditions was obtained by health questionnaire. Periodontitis was assessed by Russell's Periodontal Index (PI).

Periodontitis group had 212 (53%) male patients and 188 female (47%) patients. Controls had 110 (55%) males and 90 (45%) females. In periodontitis group, mean age of male patients is 46.67, and for female patients mean age is 46.51. In controls, mean age of male patients is 32.29, and for female patients mean age is 31.39 which are significantly lower than group I patients. Prevalence of systemic diseases in cases is 51.5% i.e. 206 patients have systemic disease among 400. In periodontal patients, highest prevalence is in 50- 59 age group (70.52%) and other age

groups in decreasing order is; >60 (54.92%), 40- 49 (51.96%), 30- 39 (39.58%) and 18- 29 (25%). (Table 1)

In controls, prevalence is 18.5% i.e. 37 patients have systemic diseases among 200, which is considerably less than cases group. Highest prevalence is in 50- 59 age group (40%) and other age groups in decreasing order is; 40- 49 (33.33%), 18- 29 (17.20%), 30- 39 (13.15%) and >60 (0%) (Table 1).

The greatest single systemic factor is hypertension, with 68 patients (24.46%). The greatest single systemic factor in patients without periodontal diseases (controls) is Allergies, with 9 patients. Among cases, 132 (33%) patients are beginning destructive periodontal disease, 121(30.25%) patients are Established destructive periodontal disease, and 147(36.75%) patients are in Terminal disease (Table 2). Statistically significant difference between severities of periodontitis is observed (Chi-square=184.1401 df = 8 p=0.0000*). Independent t- test shows, mean number of teeth present in cases (n=400) is 28.18 and in controls (n=200) is 29.27, which is statistically significant (t- value -4.18 & p- value 0.0000*). Newman Keuls multiple post hoc procedure shows statistically significant results between following age groups; 18- 29 to >60 (p-value =0.0000*), 30- 39 to >60 (p-value =0.0000*), 40-49 to >60 (p-value =0.0000*), 50-59 to >60 (p-value =0.0000*). Patients with carious teeth in periodontal patients (cases) were found to be 58.5%. Age group 30-39 had highest percentage of carious teeth (67.70%). Smokers are most commonly found in CVS disorders (61.90%), respiratory diseases (57.14%) and Cancer (57.14%), GIT disorders (47.05%), hypertension (39.70%), allergies (35.13%) and diabetes (29.41%). Habits are found to be more common in cases when compared to controls.

Patients with periodontal diseases (cases) had higher prevalence (Table 3, Graph 1) of hypertension (17%), diabetes (12.75%) CVS disorders (5.25%) (Among 21 patients, 15-angina and 6-Myocardial Infarction) than patients without periodontal diseases (Controls) 2%, 2.5% and 0% respectively (Table 4, Graph 2). Yates corrected Chi-square test, showed a significant difference between cases and controls. Cases had a higher prevalence of 4.25% GIT disorders(among 17 patients; 6-Gastro-esophageal reflux, 8-gastritis, 3-peptic ulcer), 4% of bone disorders (among 16 patients; 15-arthritis and 1-osteomalacia), 3.5% of respiratory diseases (among 14 patients; 8- asthmatic 4-tuberculosis, 2- COPD), 2% of epilepsy than Controls**,** 2%, 1.5%, 1% and 0.5% respectively. Yates corrected Chi-square test assessed showed no significant difference between cases and controls. Prevalence of psychiatric disorders in both cases and controls are same (0.5%).

Table 1: Prevalence of systemic diseases by age group (Cases and Controls)

Cases				Controls		
Age Group	**Total number of patient**	**Patients with systemic diseases**	**Percentage**	**Total number of patient**	**Patients with systemic diseases**	**Percentage**
18- 29	36	9	25	93	16	17.20
30- 39	96	38	39.58	76	10	13.15
40- 49	102	53	51.96	21	7	33.33
50- 59	95	67	70.52	10	4	40
60+	71	39	54.92	0	0	0
Total	400	206	51.5%	200	37	18.5%

Table 2: Distribution of study samples according to study groups with periodontitis (according to Russell's PI score)

Age group	**Beginning destructive periodontal disease**	**%**	**Established destructive periodontal disease**	**%**	**Terminal disease**	**%**	**Total**
18-29	30	83.33	6	16.67	0	0.00	36
30-39	48	50.00	40	41.67	8	8.33	96
40-49	36	35.29	35	34.31	31	30.39	102
50-59	18	18.95	35	36.84	42	44.21	95
60+	0	0.00	5	7.04	66	92.96	71
Total	132	33.00	121	30.25	147	36.75	400
Chi-square=184.1401 df=8 p=0.0000*							

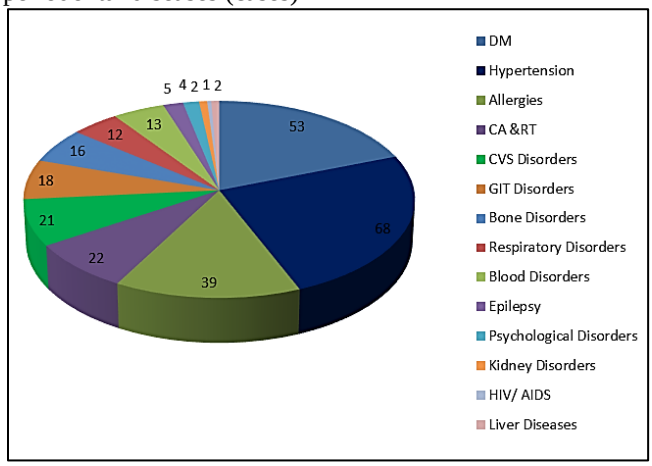
Table 3: Number of patients reporting various types of systemic diseases in cases

Type of systemic diseases	Males	Female	Total
Hypertension	35	33	68(17%)
Diabetes Mellitus	30	21	51(12.75%)
Drug Allergies	17	20	37(9.25%)
CVS disorders	14	7	21(5.25%)
CA and RT	12	9	21(5.25%)
GIT disorders	7	10	17(4.25%)
Bone disorders	8	8	16(4%)
Respiratory disorders	9	5	14(3.5%)
Epilepsy	3	5	8(2%)
Blood disorders	3	4	7(1.75%)
Liver disorders	1	1	2(0.5%)
Psychological disorders	0	2	2(0.5%)
AIDS/ HIV	0	1	1(0.25%)
Totals	139	126	265(69.5%)

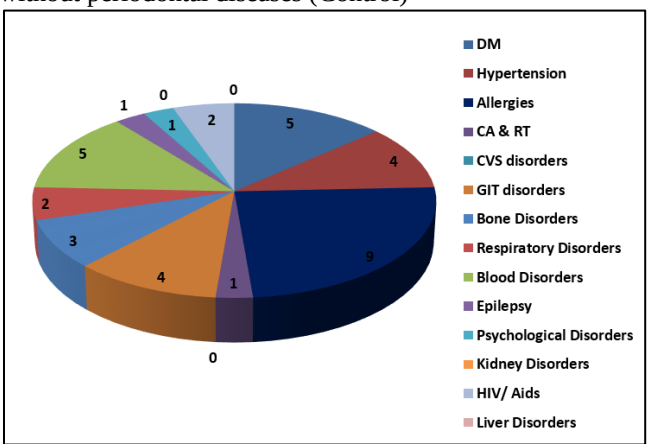
Table 4: Number of patients reporting various types of systemic diseases in controls

Type of systemic diseases	Males	Female	Total
Hypertension	3	1	4 (2%)
Diabetes Mellitus	2	3	5 (2.5%)
Drug Allergies	5	4	9 (4.5%)
CVS disorders	0	0	0 (0%)
CA and RT	1	0	1 (0.5%)
GIT disorders	1	3	4 (2%)
Bone disorders	1	2	3 (1.5%)
Respiratory disorders	2	0	2 (1%)
Epilepsy	1	0	1 (0.5%)
Blood disorders	2	3	5 (2.5%)
Liver disorders	0	0	0 (0%)
Psychological disorders	0	1	1 (0.5%)
AIDS/ HIV	2	0	2 (1%)
Totals	20	17	37 (18.5%)

Graph 1: Prevalence of systemic diseases in patients with periodontal diseases (cases)



Graph 2: Prevalence of systemic diseases in Patients without periodontal diseases (Control)



Discussion

Recently, several reports have implicated long- standing periodontal diseases in the development of systemic diseases, the relationship between periodontal disease and systemic disease has given rise to a new discipline in periodontology termed Periodontal Medicine first proposed by Offenbacher at the 1996 World Workshop in Periodontics.[16] This new exciting era of research has far

reaching clinical and public health implications. Since oral health is intimately related to systemic health as mouth is truly connected to the rest of body, the directionality of special relationships has to be clarified. The possibility that morbidity and mortality from systemic diseases may be reduced at improving periodontal health makes it imperative that this relationship be examined more closely. The susceptibility of periodontal disease varies among people and is not even. Therefore attention is aimed at identifying specific attributes and exposures, which in turn may affect the systemic consequences of periodontitis. The risk factors may involve host response, pathogenic flora, age, gender, education and frequency of dental visits. Using data obtained from self-reported health questionnaire; we have been able to determine the extent of systemic conditions reported by patients attending general dental practices. Studies have shown that self-reported health questionnaire could be reliably used for clinical or social survey research.[17]

In our study, out of 400 patients (cases), 206 (51.5%) and in the 200 patients (controls) only 37 (18.5%) had one or more systemic diseases. The prevalence of systemic conditions found in our study (51.5%) is slightly higher, than the prevalence found in a similar study.[18] The prevalence of systemic diseases increased with increasing age in both cases and controls. Age groups 18- 29 (25%), 30- 39 (39.58%), 40- 49 (51.96%), 50-59 (70.52%) except in >60 (54.92%) and 18- 29 (17.20%), 40- 49 (33.33%), 50-59 (40%), respectively. No patients were found in age group above 60 without periodontal diseases, is in agreement with other studies.[18-20] In our study, prevalence of systemic diseases in males (53.77%) is higher than females (48.93%). In Brasher and Rees study same results were found.[18]

In our study most frequent conditions found in patients with periodontal disease were: hypertension (24.46%), diabetes mellitus (19.06%), drug allergies (14.02%), cancer and radiotherapy (7.91), cardiovascular disorders (7.55%), gastrointestinal disorders (6.47%), bone disorders (5.75%), blood disorders (4.67%), respiratory diseases (4.31%), epilepsy (2.87%), psychological disorders (1.79%), kidney disorders (0.71%) and AIDS (0.35%). In few studies,[21,18] the medical conditions encountered most frequently were drug allergy and cardiovascular disorders (note: authors included hypertension, which, when merged with their cardiac group, gave a combined incidence of 23.5%). Other investigators[19,20,22,23] reported that in dental patients, the systemic condition with the highest prevalence was cardiovascular disease. In a study[34] of 590 patients, 21.7% of them had drug allergy. Other author[24] reported that, overall gastrointestinal diseases was most prevalent (11.9%), followed by bleeding tendencies (9.3%), renal disorders (8.7%), respiratory diseases (8.3%) and hypertension (6.4%).

In our study, as the age of the patient increases, number of teeth present were less and severity of periodontitis increases similar results were found in some studies.[25,26] Smoking is an established risk factor of periodontal disease. The smokers of the present study sample were found to have a significant greater frequency of severity of periodontal disease compared to non-smokers. Similar to other studies.[27,28] Among smokers highest percentage (61.90%) of smokers were found in CVS disorder patients. In our study, single highest prevalent (17%) systemic disorder is hypertension in (cases) consistent with other studies[24]. In our study, the prevalence of Diabetes mellitus in cases (12.75%), and in patients in controls (2.5%) are higher when compared to the other studies.[21,17,20,29, 24] Drug allergies (9.25%) reported in our study is significantly lower than the findings of some investigators.[17,20,29] In our study, among 21 CA and RT patients, 17 were diagnosed with squamous cell carcinoma and 4 patients under RT. So, the prevalence of CA and RT in patients with periodontitis (cases) is 5.25% and patients without periodontitis (controls) are 0.5% is considerably more compared to other studies.[21,18,17,20,29] In the present study, prevalence of CVS disorders in patients (cases) was found to be 5.25%, whereas in the control group no patients with CVS disorders were found. Few studies[17,30] reported lesser prevalence of CVS disorders whereas few other studies [21,18,20,24] reported higher prevalence compared to our study. Periodontal disease and atherosclerosis both have complex causes genetic and sex related predispositions. In addition, they may share some risk factors, such as smoking.

In our study, the prevalence of Respiratory Diseases in patients (cases) was 3.5% and patients (controls) found to be 1%. Other respiratory diseases reported were tuberculosis, COPD (Chronic Obstructive Pulmonary Disease). Significant difference between cases and controls was observed. Few studies[17,29] reported less prevalence and higher in one study[24] compared to our study. Few studies[30-32] reported that the prevalence of potential respiratory pathogens increases in periodontal patients. Several mechanisms can be hypothesized to explain oral colonization of microorganism caused by respiratory pathogens in susceptible patients. Medically compromised patients may be prone to oropharyngeal colonization by potential respiratory pathogens. Dental plaques of these subjects may also provide a surface to which respiratory pathogens adhere to provide a reservoir for infection to distal portion of the respiratory tract. In our study, other systemic diseases like, GIT disorders, bone disorders blood disorders, epilepsy, psychological disorders, liver diseases, kidney disorders and HIV/AIDS were found to be less than 5%. Similar to results found in other studies[17,30,33,20,29,24]

On the basis of this study it is evident that systemic diseases often play an important role in the diagnosis and management of the patients with periodontal disease. The high prevalence of systemic diseases dictates that the oral physician should always obtain a thorough medical history for each patient.

Conclusion

The future of dental practice will be dramatically altered if subsequent research confirms that periodontal disease is a true risk factor for systemic disease and that the initiation or progression of these medical conditions can be reduced by

periodontal treatment. Most obviously, there will be further integration of dental and general medicine that will bring new opportunities for diagnosis and collaboration across specialities. Dental practitioners may also contribute their expertise in assessing risk for several systemic conditions. The fact that the oral diagnostic samples (saliva, crevicular blood) can be readily obtained non-invasively, and at potentially lower costs, may offer important advantages to some traditional medical testing. A greater integration of medicine and dentistry will likely require that dentists take more responsibility for the management of their patients systemic health and conversely that physician assume a more active role in their patients oral health.

Source of funding
None.

Conflict of interest
None.

References
1. Slots J. and Kamma J. J. General health risk of periodontal disease. *Int Dent J* 2001;51:417-27.
2. Salomon Amar, Xiaozhe Han; The impact of periodontal infection on systemic Disease. *Med Sci Monit* 2003;9(12): RA291-9.
3. Page RC. The Pathology of Periodontal Disease may Affect Systemic Disease Inversion of a Paradigm. *Ann Periodontal* 1998;3;108-20.
4. Andrija Bosnjak, Darije Plan Eak, Zvonimir Curilovic Advances in the Relationship between Periodontitis and systemic diseases. *Acta Stomatol Croat* 2001;35:267-71.
5. Syrjanen J, Peltola J, Valtonen V, Kaste M, Huttunen JK, Dental infections in association with certain infarction in young and middle- aged men. *J Intern Med* 1989; 225; 179-184
6. DeStefano F, Anda RF, Khan HS, Williamson DF, Russell CM. Dental diseases and risk of coronary heart diseases and mortality. *Br Dent J* 1993;306;688-91.
7. Mattila KJ, Nieminen MS, Valtonen VV, Rasi VP, Syajala Sl. Association between dental health and acute myocardial infarction. *Br Med J* 1989;298;779-81.
8. Anthony M. Iacopino and Christopher W. Cutler. Pathophysiological Relationship between Periodontitis and Systemic Disease: Recent Concepts Involving Serum Lipids. *J Periodontol* 2000;71;1375-84.
9. L. J. Cianciola, B. H. Park, E. Bruck, L. Mosovich, R. J. Genco. Prevalence of periodontal disease in insulin- dependent diabetes mellitus (juvenile diabetes) *JADA* 1982;104;653-60.
10. Pallasch T. J. The Focal Infection Theory: Appraisal and reappraisal. *J Cal Dent Asso* 2000;28:194-200.
11. Miller W. D. The human mouth as a focus of infection. *Dent Cosmos* 1891;33:689- 713
12. Hunter W. Oral sepsis as a cause of disease. Br Med J 1900;1:215-6.
13. Billings F. Chronic focal infection and their etiologic relations to arthritis and nephritis. *Arch Intern Med* 1912;9:484-98.
14. Galloway C. E. Focal infection. *Am J Surg* 1931;14:643-5
15. Soben Peter Essentials of Preventive and community Dentistry. 3rd edition. Arya Publication. 154-6.
16. William RC, Offenbacher S. Periodontal Medicine. *Periodonto*l 2000;23 9-156
17. Suomi JD, Horowitz HS, Barbano JP. Self reported systemic conditions an adult study population. *J Dent Res* 1975;54:1092.
18. Brasher WJ, Rees TD. Incidence of Certain Systemic Conditions Among patients presenting for Periodontal Treatment. *J Periodontol* 1974:669-71.
19. Stephen T. Sonis, Robert Fazio, Ann Setkowicz, David Gottlieb, Carol Vorhaus. Comparison of the nature and frequency of medical problems among patients in general, speciality and hospital dental practices. *J Oral Med* 1983;38;(2).
20. Mark E Peacock and Robert E. Carson. Frequency of self reported medical conditions in periodontal patients. *J Perio* 1995;66;1004-7.
21. Brasher WJ, Rees TD. Systemic Conditions in the Management of Periodontal Patients. *J Periodontol* 1970;41:349-52
22. Dunne SM, Clark CG. The identification of the medically compromised patient in dental practice. *J Dent* 1985;13;45-51.
23. Ho AW, Grossi SG, Dunford RG, Genco RJ. Reliability of a self reported health questionnaire in a periodontal study. *J Periodontal Res* 1997;32:646-50.
24. Yousef Saleh Khader, Oula Alsaeed, Samar Zaal Burgan, Zouhair Odeh Amarin. Prevalence of medical conditions among patients attending dental teaching clinics in north Jordan. *J Contemp Dentl Pract* 2007;(8)1:60-7.
25. Jansson L, Lavstedt S, Frithiof L, Theobald H. Relationship between oral health and mortality in cardiovascular diseases. *J Clin Periodontol* 2001;28;762-8.
26. Holmstrup P, Poulsen AH, Andersen L, Skudbol T, Fiehn NE. Oral infections and systemic diseases. *Dent Clin North Am* 2003;47:575-98.
27. Bergstrom J, Eliasson S & Dock J. A 10 year prospective study of tobacco smoking and periodontal health. *J Periodontal* 2000;71:1338-47.
28. Bergstrom J, & Preber H. Tobacco use as a risk factor. *J Periodontal* 1994;65:545-50
29. T O. Georgio, RI Marshall, PM Bartold. Prevalence of systemic diseases in Brisbane general and periodontal practice patients. *ADJ* 2004;49(4)177-84.
30. Nery EB, Meister Jr F, Ellinger RF, Eslami A, McNamara TJ. Prevalence of medical problems in periodontal patients obtained from three different population. *J Periodontol* 1987;58:564-8.
31. Rams TE, Babalola OO, Slots J. Subgingival occurrence of enteric rods, yeasts and staphylococci after systemic doxycycline therapy. *Oral Microbiol Immunol* 1990;5:166-8.
32. Helovuo H, Hakkarainen K, Paunio K. Changes in the prevalence of subgingival enteric rods, yeasts and staphylococci after treatment with penicillin and erythromycine. *Oral Microbiol Immunol* 1993;8:75-9.
33. Lawrence J. Emrich, Marc Shlossman, and Robert J. Genco. Periodontal disease in non- insulin dependent diabetes mellitus. *J Periodontal* 1991;62;123-30.
34. Scully C, Boyle P, Reliability of self- administered questionnaire for screening for medical problems in dentistry. *Community Dent Oral Epidemiol* 1983;11;105-8.

How to cite this article: Ramdurg P, Srinivas N, Puranik S, Sande A, Mendigeri V. Frequency of systemic diseases in chronic generalized periodontitis in North Karnataka population. *J Oral Med, Oral Surg, Oral Pathol, Oral Radiol* 2019;5(3):62-7.