Conclusion

Oral health is extricably linked to general health and vice versa therefore maintaining healthy mouth is of vital importance for a person’s self esteem and general well-being. Gingival and periodontal diseases, in their various forms, have afflicted humans since dawn of history. The main function of the gingiva is protection of the underlying tissues, and the attachment apparatus, the periodontal ligament. The periodontium is subject to morphologic and functional variations as well as changes associated with age and diseased status of the individual. The microorganisms that colonize the oral cavity can often affect the delicate balance of host- bacterial interactions leading to health and disease of the host. These microorganisms exert pathogenic effect if the resistance of the host is lowered. Our study was mainly focused on the identification of the oral microflora that exist in the oral cavity of the Diabetic and non-diabetic patients suffering from periodontitis. Simultaneously, their direct or indirect affects in their respective immune system were studied by evaluating the immunoglobulin.

The pathogens of interest in our study were bacteria and fungus (candida). The prevalence of four pathogenic bacteria that are responsible for dental caries and periodontitis were studied in diabetic and non-diabetic patients suffering from periodontitis. Since it is well established from many epidemiological researches that diabetes mellitus increases the risk and severity of periodontal disease which are directly
associated with various degrees of dysfunction in the immune system. Numerous alterations in oral flora was seen when oral microorganism were evaluated and compared between diabetic and non-diabetic patients suffering from periodontitis, a shift from gram positive to gram negative and that too anaerobic ones were evidenced in our study. The predominance of gram negative bacteria was seen in diabetes and periodontitis patient. When the load of cultivated microorganisms was evaluated by colony count, it revealed that CFU was twice high in diabetic patients as compared to healthy sites. The increased glucose level in the gingival fluid and serum of diabetic patient could be the possible reason for such alterations in the environment of the oral cavity and thus contributed to the severity of periodontal disease. It is evident that glucose levels present in oral fluids may alter the presence of some organism; hence our results possibly supported the shift towards dominance of gram negative organism.

Fungal organisms are commonly seen to colonize the tongue, palate and buccal mucosa. If one turns around and check the prevalence of the occurrence of the number of fungal infections caused by *Candida* and related species, then we will find that there is dramatic and exponential increase in over the past several decades. *C. albicans* may play a vital role in the infrastructure of periodontal microbiota as well as on adherence of periodontal tissues *Candida* species have evolved as the most important opportunistic pathogens in immuno-compromised hosts and may play important role in life threatening infections. *Candida albicans* is said to be the species most often associated with oral lesions, but in our studies we found that *Candida* spp., including *C. glabrata*, *C. tropicalis*, *C. parapsilosis*, *C. krusei*, and *C. dubliniensis* as potential pathogens as isolated from the saliva of subjects belonging to different test groups. It is said that with the introduction of broad-spectrum antibiotics and increase in the incidence of consuming immunosuppressive corticosteroids and antitumor agents the prevalence of opportunistic pathogens has also increased greatly. Therefore for us priority of the utmost importance was to rapidly and reliably identify *C. albicans* as well as other Candida species in the test groups. In our study we found that patients with reduced immunity showed increased periodontal colonization by *Candida* sp.. The cases of severe and chronic periodontal infections were seen particularly mostly in immuno-compromised patients that patients of group 1 and 2. With respect to the invitro study carried out we can conclude that Candida albicans and NAC shows good potential to grow and multiply in group 1 and 2. Because of diabetes the immunity of the patient is debilitated and if it is associated with inflammatory condition, in our case, it is periodontitis, the condition of the patient worsens. *Candida* being an opportunistic pathogen take this opportunity and attacks the patients with lower immunity as evident in our study.

The successes of increased health awareness and preventive dentistry have led the people to get inclined towards the varied beneficial products that nature has bestowed to
us. The effects of this shift have not only increased oral health expectations but also life expectancy, so the products we use have to be evaluated and considered carefully. It is important not only to review the effects of herbs and its perspectives in the clinical significance to disease process and their possible effects on treatment outcomes.

For the prevention of bacteremia and endocarditis antibiotic administration prior to invasive dental procedure is recommended. Antibiotics play a very important role in preventing diseases of oral cavity but many studies reveal that many of such oral microorganisms tend to show resistance towards common antibiotic. Various studies also revealed that in most of the cases these antibiotics fails to eliminate the pathogens from oral cavity for which combination of drugs has to be suggested which impacts great adverse effect in the patients health like hypersensitivity, toxicity, tooth staining and drug resistance, their mental and also financial burden builds up. To overcome such adverse situations, the use of our traditional medicines are in now days considered as useful alternatives to synthetic drugs. Traditional medicines in the form of Herbal products are now very popular in dental products such as mouth rinse and tooth pastes. To evaluate the efficiency of these extracts of medicinal plants and routinely used tooth pastes, we conducted few antimicrobial susceptibility tests of the periodontopathogens against herbal extracts, tooth pastes and compared it with routinely used antibiotics. The role of herbal extracts and tooth pastes in the prevention of oral infection were concluded by the appearances of inhibition zones. In antimicrobial susceptibility tests against antibiotics, we found fusion of inhibition zones in most of the plates, suggestive of combined effect of two antibiotics so single therapy will not be effective against periodontopathogens and also data shows that particular antibiotic was effective against any one or two of the test isolates.

Traditional herbal extracts have the maximum ability to synthesise aromatic substances, most of which are phenols or their oxygen substituted derivatives. Amongst all the herbal extracts used, Triphala, Neem and Tulsi were found to be most effective against all the pathogenic bacteria, whereas Aloevera and Garlic was comparatively found to be less effective. However, Meetha Neem showed intermediate zone of inhibition against all the test isolates. Similarly when checked against toothpastes almost all the toothpastes were found potent to check the growth of bacterial isolates.

Periodontal health can be considered to be a state of balance when the bacterial population coexists with the host and no irreparable damage occurs to either the bacteria or the host tissues. Disruption of this balance causes alterations in both the host and biofilm bacteria and results ultimately in the destruction of the connective tissues of the periodontium.

The common periodontal diseases found in humans are gingivitis and periodontitis. These are inflammatory responses in the periodontal tissues induced by microorganisms
present in the dental plaque, in our study they were identified as *A. actinomycetcomitans*, *F. nucleatum*, *S. mutans*, *P. micros* and *Candida* sps. This antigen increases the immune responses of the host leading to exaggerated secretion of Immunoglobulin which opsonise the antigen so that it is easily identifiable by the immune cells. When the host is in inflammatory status, the B-cells of the host produces IgG or IgA mediated anti-inflammatory along with IgM.

Whenever an antigen enters the host, it provokes the immune response and as a result Immunoglobulins are secreted against the pathogen and the same can be quantified in the serum of the patient. Immunoglobulins are produced by specific Immune cells called as plasma, in response to bacteria, viruses and other micro organisms. To detect and monitor increased or decreased level of one or more Immunoglobulin types especially IgG, IgA and IgM are together used to evaluate a person’s immune status. This test is generally suggested to the patients showing signs and symptoms of Inflammation, etc. This test becomes mandatory if the patient shows high glucose level. Keeping this concept in our thoughts we evaluated IgG, IgA and IgM levels in the sera of the patients of the all study groups. When test was carried to check the glucose level, the random blood glucose and HbA1c test results showed increased level in study group A (patients suffering from both the diseases) and B (diabetic patients) as compared to study group C (periodontitic patients) and D (healthy control). In our study we evidenced combination of increased and decreased levels where IgG and IgA were found in elevated levels and IgM was in low level and when evaluated together this served as strong indicator of a disease or condition. Abnormal test result usually indicates that there is something affecting the immune system. In our study we evaluated the IgG, IgA and IgM levels by turbidimetric methods. Diabetics as evident are more prone towards the infection, so were seen to harbour twice number of microorganisms than the non-diabetics as a result the diabetic patient with periodontitis show elevated Immunoglobulin levels in their sera.

Numerous mechanisms of serum mediated bacterial killing are available which suggests why the serum of Diabetic and Periodontitic patient showed high levels of immunoglobulins.

Diabetes and periodontitis are interlinked mechanism as proven by many studies and referentially the HbA1c level and Immunoglobulin levels was found to be increased in group A, B and C as compared to control group. In our study we found the IgG level was highly elevated in periodontitis patients irrespective of the glucose level which shows that the patient is having past history of inflammation and is in diseased condition since long time. The IgA is known to be associated with mucosal immunity, its level as suspected was found increased in all three test group as compared to test group, suggestive of high loads of pathogenic attacks. The result of IgM as recorded was found to be low in all study group patients showing no recent infection and less load of microorganism. The
increased IgG and low IgM reveals that the patients had past infection which was evident from the HbA1c level which shows glycosylated haemoglobin levels of the last six months. Overall the patients with high HbA1c showed high levels of IgG and IgA confirming that being diabetic these patients had more severity of infection and also the number of microorganism was more so more of immunoglobulins and that too IgG showing past infection.

In our study there was increased in IgG and IgA in study group A and B, but since this two group showed high HbA1c levels depicting immuno-compromised state suggesting that most of the Immunoglobulin is abnormal and did not contributed to Immune response. Measurement of indicators of immune and inflammatory competency suggested that, within the parameters tested, there was clear cut difference in the levels of IgG and IgA among group A, B and C. This change in host defences clearly co-relates periodontitis with diabetes among the group of individuals tested. In summary section, we have already discussed a huge survey of literature demonstrating that presence of diabetes causes changes in periodontium and also host response and also that this is vice versa. With this study we can very well conclude that these changes are significant in altering the progression of periodontal diseases or the response of the herbal extracts in checking the growth of the test isolates was also significant in achieving the goal. The clinical manifestations of periodontal disease are the result of complex interplay between the etiological agents, in this study the specific bacteria and candida sps. found in the oral cavity of the propositas. These agents produce their effect on immune system and there by showing elevated immunoglobulin level as found in our study.

Thus we can conclude that the specific microorganisms that have been found to be associated with periodontitis were the cause for the elevated level of serum Immunoglobulins.