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Assessment of periodontal abscess among diabetic patients visiting a dental college -a retrospective study

G. NITHYA KARPAGAM[1], SANKARI MALAIAPPAN[2]*, DINESH PRABU[3]

[1]Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077
[2]Professor, Department of Periodontics, Saveetha Dental College and Hospital, Saveetha Institute of Medical And Technical Science, Saveetha University 162, Poonamallee High Road, Chennai, India
[3]Senior Lecturer, Department of Oral and Maxillofacial Surgery, Saveetha Dental College And Hospitals, Saveetha Institute of Medical And Technical Science, Saveetha University, Chennai, India
*Corresponding Author
Email ID: 151501035.sdc@saveetha.com[1], sankari@saveetha.com, dineshprabum.sdc@saveetha.com

ABSTRACT
Periodontitis is a chronic inflammatory disease characterised by destruction of supporting structures of teeth.Diabetes mellitus is a syndrome of abnormal carbohydrate, fat and protein metabolism that result in acute, chronic complications due to the absolute or lack of insulin.The progression of periodontal disease is influenced by factors like microorganism, host response, systemic background and genetic makeup of the host.1 Chronic hyperglycemia results in production of advanced glycation end substances (AGEs) in the tissues, which have protean effects on the periodontal microenvironment.The aim of the study was to assess the periodontal abscess among diabetic patients visiting dental college. A retrospective data of all the patients reported for periodontal therapy to dental college was collected. The data was extracted from the patients records. Data segregation was done based on age, gender,site of periodontal abscess, blood sugar value probing depth, clinical attachment loss and mobility. After data collection statistical analysis was done in IBM SPSS software version 20. A total 50 diabetic patients with periodontal abscess were evaluated in this study and it showed about 64% of males and 36% % of females with periodontitis had diabetes. The most common age group that was affected was 36-45 years by 36%. The most prevalent site with periodontal abscess is lower left posterior by 24%. Probing depth of 5mm was seen mostly in patients with diabetes and periodontitis (34%). Clinical attachment loss of 6mm was seen mostly in patients with diabetes and periodontitis (50%). Grade 2 mobility was seen predominantly in patients with abscess(48%). Patients with periodontal abscess had blood sugar level above 200mg/dl by 50%. The chi square test was performed to determine the correlation between age of the periodontitis patients and the random blood sugar levels, the P value obtained was 0.045 ($p<0.05$) statistically significant. The most prevalent age group that was affected with periodontal abscess was between 36-45 years. The males were more affected with periodontal abscess among diabetics. The predominant site involved with periodontal abscess was the lower left posterior region. The association between the blood sugar levels and age was significant statistically.

Keywords: Periodontal abscess, Diabetic status, Probing depth, Clinical attachment loss, Mobility.

INTRODUCTION

Diabetes mellitus is a systemic disease with several major complications affecting both quality and length of life (Iacopino, 2001). Diabetes mellitus is a chronic metabolic disease which is characterised by hyperglycemia (Awuti *et al.*, 2012). Hyperglycemia triggers a wide variety of long term complications in diabetes such as large vessel disease,cardiomyopathy and kidney and eye impairments(Ren and Ceylan-Isik, 2004). Both type 1 and type 2 diabetes mellitus is associated with elevated levels of systemic markers of inflammation(Dandona, Aljada and Bandyopadhyay, 2004). The elevated inflammatory state in diabetes contributes to microvascular and macrovascular complications. Elevated levels of IL-6 and TNF alpha have been demonstrated in diabetes(Brownlee, 2005). From various studies it was found that there is a defect in the polymorphonuclear leukocyte activity in diabetes patients including impares chemotaxis, phagocytosis and microbial function(Rana, 2019). Diabetes mellitus and periodontitis share a common platform based on pathogenesis.
Periodontitis is a chronic inflammatory response which is due to excessive microbial load including bacterial and viral origin ,aggravated by effect of proinflammatory cytokines like TNF alpha and interleukin I beta,which leads

to destruction of the bone around the tooth, progression of attachment loss and mobility.(Sánchez-Pérez and Moya-Villaescusa, 2009; Varghese *et al.*, 2015; Khalid *et al.*, 2016, 2017). Plaque does not just contain bacteria but it also contains viruses which can cause disease progression (Priyanka *et al.*, 2017)Various antimicrobial and chemotherapeutic agents such as chlorhexidine mouth washes , triclosan are employed for the management of periodontitis . Herbal medicines and preparations can also be used for the management of periodontal diseases (Ramesh, Sheeja Saji Varghese, *et al.*, 2016; Ramamurthy and Mg, 2018).It is an infectious disease which leads to destruction of the alveolar bone around the teeth, progression of attachment loss,mobility.Similarly in a recent study it has been reported the association between Interleukin-21 levels with periodontitis(Mootha *et al.*, 2016). ET-1 has also been identified in periodontal diseases (Khalid *et al.*, 2016, 2017). Periodontitis can be associated with various systemic conditions(Ramesh, Sheeja S. Varghese, *et al.*, 2016) Presence of abscess is one of the clinical findings that helps in the diagnosis of advanced periodontitis(Batra, Das and Jain, 2018). The periodontal tissues include the gingiva, cementum, periodontal ligament and the alveolar bone(Patel and Kumar S, 2011).Abscess of the periodontium are localised acute bacterial infections which are confined to the tissues of the periodontium (Meng, 1999). Abscess of the periodontium have been classified primarily based on their anatomical location in the periodontal tissues. There are four types that involves the marginal gingiva or the interdental papillae, pericoronal abscess which are localised prudent infection within the tissue surrounding the crown of partial erupted tooth, combined periodontal endodontic abscess are the localised circumscribed abscess originating from the dental pulp or the periodontal tissue surrounding the tooth Apex and the apical periodontium(Herrera, Roldán and O'Connor, 2000)(BECKER and W, 1984).It is a destructive process occurring in the periodontium, resulting in localized collection of the pus, communicating with the oral cavity through the gingival sulcus or other periodontal site and not arising from the tooth pulp. (Priyanka *et al.*, 2017)The important characteristics of the periodontal abscess include localized accumulation of the pus in the gingival walls of the periodontal pocket.Depending on the nature and course of the periodontal abscess and immediate attention is required to relieve the pain and the systemic complications(McLeod, Lainson and Spivey, 1997).The presence of an abscess also modify their prognosis of the involved Tooth and in many cases may be responsible for its removal. Therefore accurate diagnosis and the immediate treatment of the abscess are important steps in the management of the patients presenting with such abscess. If the esthetics and function had to be restored dental implants and implant-supported prosthesis can be a predictable treatment modality in periodontal diseases (Ramesh, Ravi and Kaarthikeyan, 2017).While performing surgical therapy trauma to the inferior alveolar nerve is one of the complications during surgical procedures in the posterior mandible(Kavarthapu and Thamaraiselvan, 2018). The management for abscess is surgical therapy like free graft and pedicle flap are indicated when it causes functional or esthetic problems.Coronally displaced flap is a treatment of choice for recession defects (Thamaraiselvan *et al.*, 2015)Our team has worked on various regenerative therapy that has been indicated for periodontally affected patients(Panda *et al.*, 2014; Avinash, Malaippan and Dooraiswamy, 2017; Ravi *et al.*, 2017)and other treatments such as lip repositioning(Ramesh *et al.*, 2019).

Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham *et al.*, 2005; Devaki, Sathivel and BalajiRaghavendran, 2009; Neelakantan *et al.*, 2010, 2015; Arja *et al.*, 2013; Ramshankar *et al.*, 2014; Sumathi *et al.*, 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Ramamoorthi, Nivedhitha and Divyanand, 2015; Manivannan *et al.*, 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J *et al.*, 2018; Ravindiran and Praveenkumar, 2018; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Krishnaswamy *et al.*, 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020)

The aim of this study is to assess periodontal abscess among the diabetic patients visiting dental college.

MATERIALS AND METHODS

Study Setting: The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

Study Design: The study was designed to include all diabetic patients with chronic periodontitis and periodontal abscess. The patients who did not fall under this inclusion criteria were excluded.

Sampling technique: The study was based on retrospective analysis. To minimise the sampling bias, all the cases were reviewed priorly and included.

Data Collection and Tabulation: Data collection was done using the patient database with the timeframe work of 1st June 2019 to 31st th March 2020. About 86000 patients databases were reviewed and those fitting under the inclusion criteria were included. Cross verification of data was done by a reviewer. The collected data was tabulated based on the following parameters:

- Patients demographic details
- Site of the periodontal abscess

- Random blood sugar level in mg/dl
- Probing depth in mm
- Clinical attachment loss in mm
- Mobility

Statistical Analysis:
The variables were coded and the data was imported to SPSS. Using SPSS Version 20.0 categorical variables were expressed in terms of frequency and percentage and bar graphs were plotted. The statistical significance of the associations were tested using the Chi-square test.

RESULT AND DISCUSSION
A total of 50 patients with periodontal abscess and diabetes were evaluated in this study. It showed about 64% of males and 36% % of females with periodontitis had diabetes.(Figure 1) The most common age group that was affected was 36-45 years by 36%, 20% were between 25-35 years, 20% between 46-55 years, 20% between 56-65 years and 4% above 65 years(Figure 2)The most prevalent site with periodontal abscess is lower left posterior by 24%, upper right posterior with 20% , upper left posterior with 14%, lower right posterior with 14%, upper anterior with 14% and lower anterior with 14%.(Figure 3). The most prevalent grade of mobility associated with abscess is grade 2 with 48% followed by grade 1 with 32% and grade 3 with 20% (Figure 4).The most prevalent clinical attachment loss associated with abscess is 6mm with 50% followed by 5mm with 32%, 8mm with 16% and 7mm with 2%(Figure 5). The most prevalent probing depth associated with abscess is 5mm with 34% followed by 7mm with 18%, 10mm with 14%, 4mm with 10%,6mm with 10%,12mm with 6%,8mm with 6% and 9mm with 2%(Figure 6).The most prevalent random blood sugar levels mg/dl associated with abscess is above 200mg/dl by 50% followed by 150-200mg/dl by 42% and 120-150mg/dl by 8% (Figure 7)
(Figure 8) shows the association between age and the random blood sugar levels which showed the P Value of 0.045 and the association was statistically significant.
(Figure 9) shows the association between clinical attachment loss and the random blood sugar level showed the P Value of 0.773,and the association was statistically not significant.(Figure 10) shows the correlation between mobility and the random blood sugar level showed the P Value of 0.617,and the association was statistically not significant. (Figure 11) show the correlation between mobility and the random blood sugar levels showed the P Value of 0.345, and the association was statistically not significant. (Figure 12) shows the correlation between mobility and the random blood sugar levels which showed the P Value of 0.220 . and the association was statistically not significant
Diabetes is one of the most common non-communicable diseases found in older people.There are many factors which participate in the limitation and progression of the abscess involvement in the periodontitis. Some of them include smoking, age, dental plaque, gingival inflammation where significantly correlated.Plaque is the initial factor for all the inflammatory changes in the periodontal tissue. Prevalence of the periodontal abscess was found to be more common in males 64% than females 36%. In a previous study conducted it showed females were most commonly affected with uncontrolled diabetes by 60% (Haseeb *et al.*, 2012)And the most common age group with abscess is seen between 36-45 years with 36% with the least between above 65 years with 4%, 25 to 35 years with 20%, 46 to 55 years with 20%, 56 to 65 years with 20%.Previous studies showed mean age group of 59.50 ± 5.74 in uncontrolled diabetic patients(Haseeb *et al.*, 2012) And the most common site affected is lower left posterior with 24%, upper right posterior with 20%, upper left posterior with 14%, lower right posterior with 14%, upper anterior with 14% and lower anterior with 14%.
The mobility seen in abscess involved teeth is mostly grade 2 with 48% ,followed by grade 1 with 32% and grade 3 with 20%. Most prevalent clinical attachment loss associated with abscess is 6mm with 50% followed by 5mm with 32%, 8mm with 16% and 7mm with 2%.In another study it was reported that subjects with type 2 diabetes have an increased risk of destructive periodontitis with an odds ratio of 2.81 when clinical attachment loss is used to measure the disease.(Emrich and Shlossman, 1991) And in another study it is shown that the number of sites and mean percentage of sites with attachment loss of ≥ 4 and ≥ 6 mm was also significantly higher in poorly controlled diabetes compared to the control group (Haseeb *et al.*, 2012)And the most prevalent probing depth associated with abscess is 5mm with 34% followed by 7mm with 18%, 10mm with 14, 4mm with 10%,6mm with 10%,12mm with 6%,8mm with 6% and 9mm with 2%.Previous study showed about 97.3% probing depth noted in uncontrolled diabrtic patients.(Abdulbaqi, 2011)
It is shown that the random blood sugar level in which 50% showed above 200mg/dl, 42% showed 150-200mg/dl and 8% showed 120-150mg/dl. The association between the age and the random blood sugar among the study population showed the P Value <0.05(chi square value) was statistically significant.(0.045) and the correlation between the clinical attachment loss and the random blood sugar level showed p value of 0.773 which is statistically insignificant.The correlation between mobility and the random blood sugar level showed the P Value >0.05(chi square value) was statistically insignificant.(0.617). The correlation between mobility and the random blood sugar level showed the P Value >0.05(chi square value) was statistically insignificant.(0.345). And the

correlation between mobility and the random blood sugar level showed the P Value >0.05(chi square value) was statistically insignificant.(0.220)
The limitation of the study is the limited sample size and it does not include the insulin and non insulin dependent groups. It is a single centered study. The future scope of the study is that a prospective study can be performed with a larger population.

CONCLUSION

Within the limitations of the study, it was observed that the periodontal abscess presented with varied clinical features among diabetic patients. Periodontal abscess showed higher prevalence in male population among diabetic patients. This clinical condition was diagnosed predominantly in the age group of 36 - 45 years. Commonly affected site was observed to be the lower left posterior region. The patients with higher random blood sugar levels were associated with increased severity of the disease. However further research is required to establish this association. Further longitudinal studies are essential for assessment of pathogenesis of periodontal abscess among diabetic subjects.

AUTHORS CONTRIBUTION

G.Nihya karpagam , Dr Sankari Malaiappan were the main contributors to the concept, design, literature analysis, workshop discussions, and drafting and revising manuscript. Dr Sankari Malaiappan and Dr Dinesh Prabu contributed to drafting and revising manuscripts. All authors gave final approval of the version to be published.

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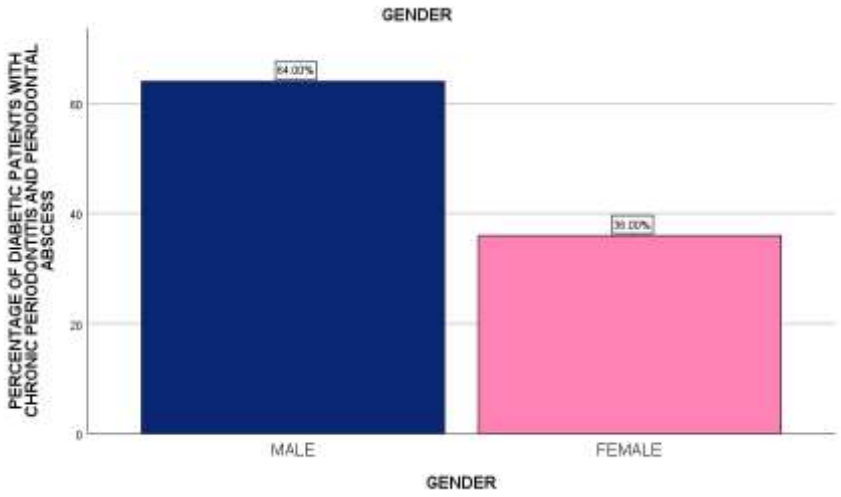

Fig.1: Bar graph depicting the distribution of gender among the study population. X axis represents the gender of the patients and Y axis represents the percentage of diabetic patients with chronic periodontitis and periodontal abscess. Majority of diabetic patients with chronic periodontitis and periodontal abscess were males (64%).

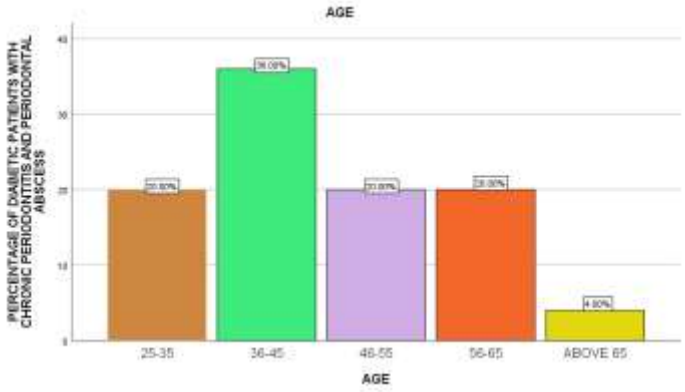

Fig.2: Bar graph depicting the distribution of age group among the study population. X axis represents the age group of the patients and Y axis represents the percentage of diabetic patients with chronic periodontitis and periodontal abscess. The most prevalent age group of diabetic patients with chronic periodontitis and periodontal is seen between 36-45 years.

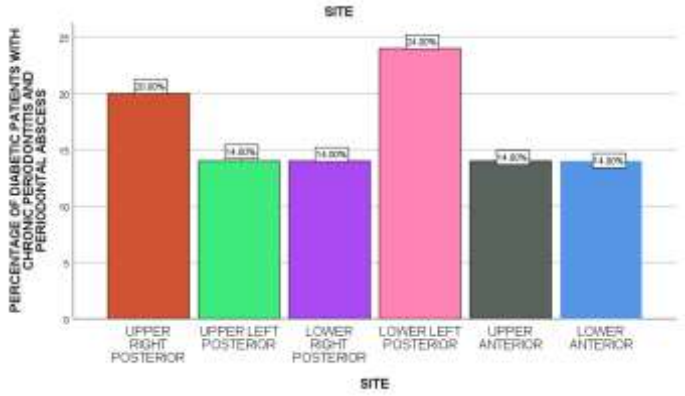

Fig.3: Bar graph depicting the distribution of site of periodontal abscess among the study population. X axis represents the site of periodontal abscess and Y axis represents the percentage of diabetic patients with chronic periodontitis and periodontal abscess . The most prevalent site with periodontal abscess was lower left posteriors.

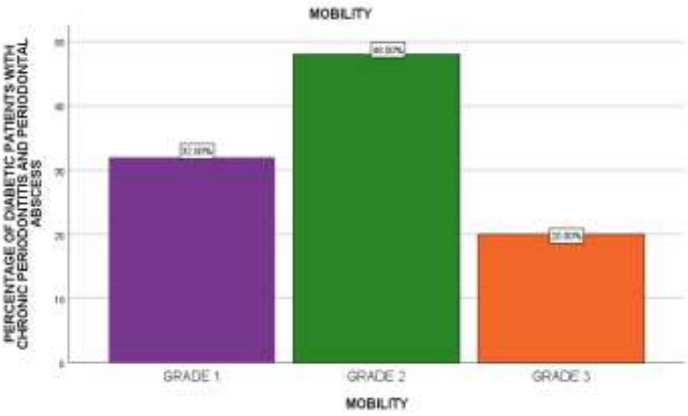

Fig.4: Bar graph depicts the grades of mobility among the diabetic patients with chronic periodontitis and periodontal abscess. X axis represents the grade of mobility and Y axis represents the percentage of diabetic patients with chronic periodontitis and periodontal abscess The most prevalent grade of mobility associated with periodontal abscess is grade 2.

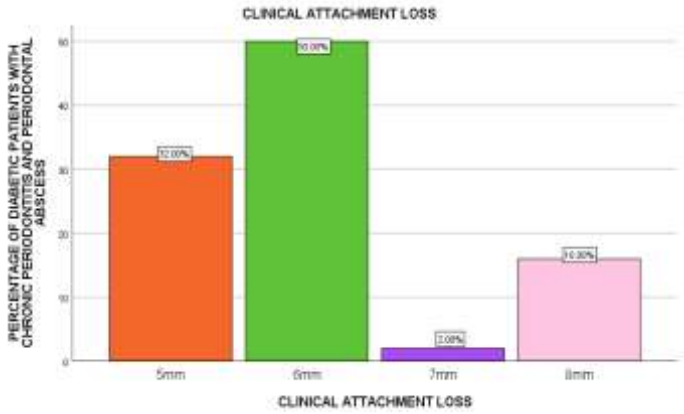

Fig.5: Bar graph depicts the clinical attachment loss (in mm) among the diabetic patients with chronic periodontitis and periodontal abscess. X axis represents the clinical attachment loss associated with periodontal abscess and Y axis represents the percentage of patients. From the graph we infer that the majority of the patients with diabetes and periodontal abscess had clinical attachment loss of about 6mm.

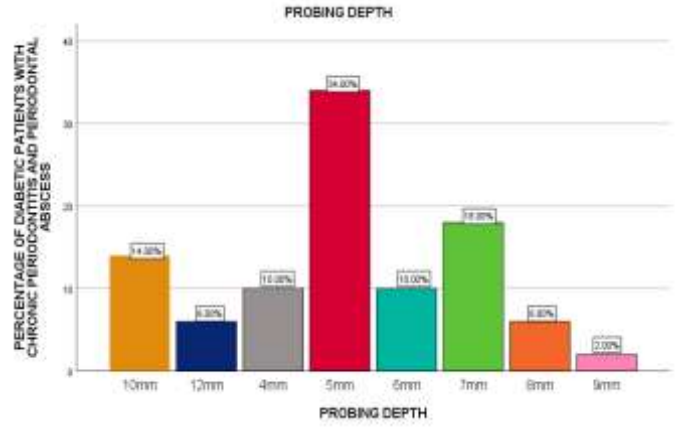

Fig.6: Bar graph depicts the probing depth (in mm) among diabetic patients with chronic periodontitis with periodontal abscess. X axis represents the probing depth (in mm) and Y axis represents the percentage of patients. The predominant pocket depth with periodontal abscess was 5mm followed by 7mm.

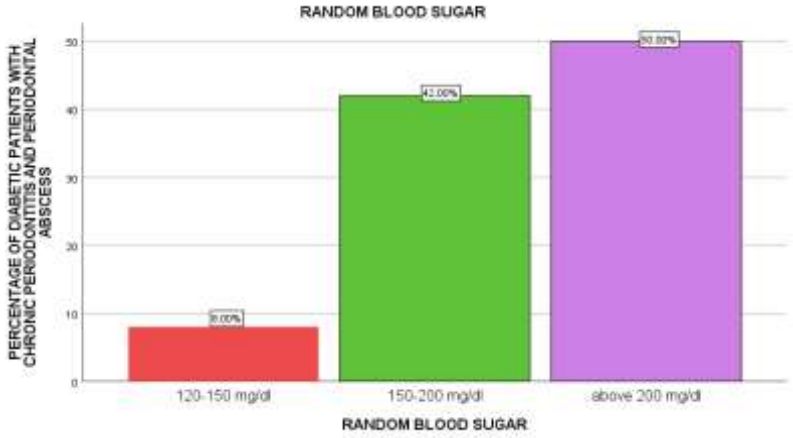

Fig.7: Bar graph depicts the distribution of Random blood sugar levels (in mg/dl) among the diabetic patients with chronic periodontitis and periodontal abscess. X axis represents the random blood sugar levels (in mg/dl) and Y axis represents the percentage of patients. Majority of the patients had random blood sugar levels above 200mg/dl.

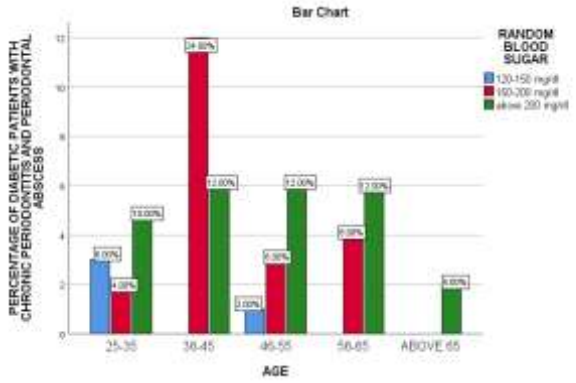

Fig.8: Bar graph depicts the association between the age group and the random blood sugar levels. X axis represents the age group (in years) and Y axis represents the percentage of patients. The association between the age and the random blood sugar levels mg/dl were assessed using chi square test and it showed a p value of 0.045 which is statistically significant. From this we infer that the predominant random blood sugar level was seen between 150-200mg/dl in the age group 36 - 45 years, and the association was statistically significant.

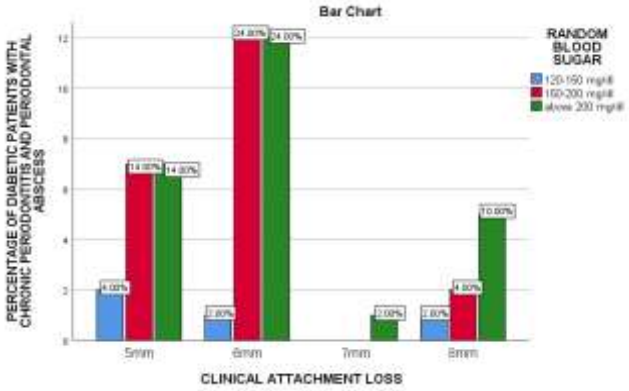

Fig.9: Bar graph depicting the association between the clinical attachment loss and the random blood sugar level mg/dl. X axis represents the clinical attachment loss (in mm) and Y axis represents the percentage of diabetic patients with chronic periodontitis and periodontal abscess. Clinical attachment loss of about 6mm was predominantly observed and this was associated with random blood sugar level of 150-200mg/dl and above 200mg/dl. However, the association assessed using chi square test showed p Value of 0.773 (p>0.05) which was not significant statistically.

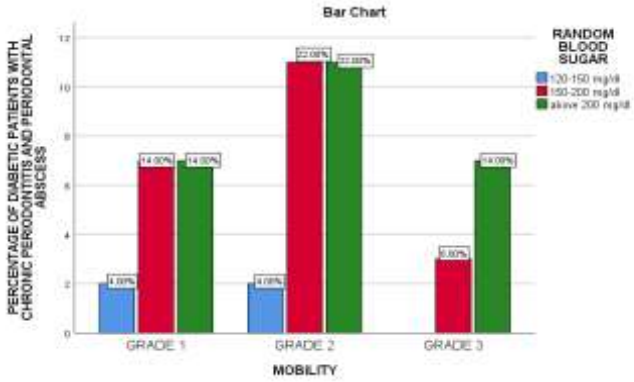

Fig.10: Bar graph depicting the association between the grades of mobility and the random blood sugar level mg/dl. X axis represents the grades of mobility and Y axis represents the percentage of patients. Grade 2 mobility was predominantly observed and this was associated with random blood sugar level of 150-200mg/dl and above 200mg/dl. However, the association assessed using chi square test showed p Value of 0.617 (p>0.05) which is statistically not significant.

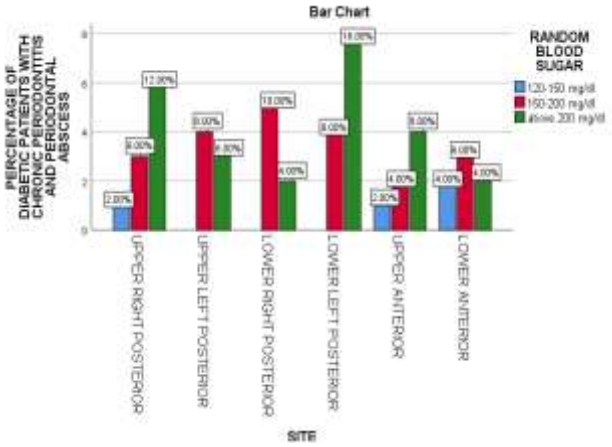

Fig.11: Bar graph depicting the association between the site of the periodontal abscess and the random blood sugar level mg/dl. X axis represents the site associated with periodontal abscess and Y axis represents percentage of patients. Lower left posteriors were predominantly affected and it was associated with the blood sugar level of above 200mg/dl. Chi square test showed P value of 0.345 (p>0.05). Hence the association was statistically not significant.

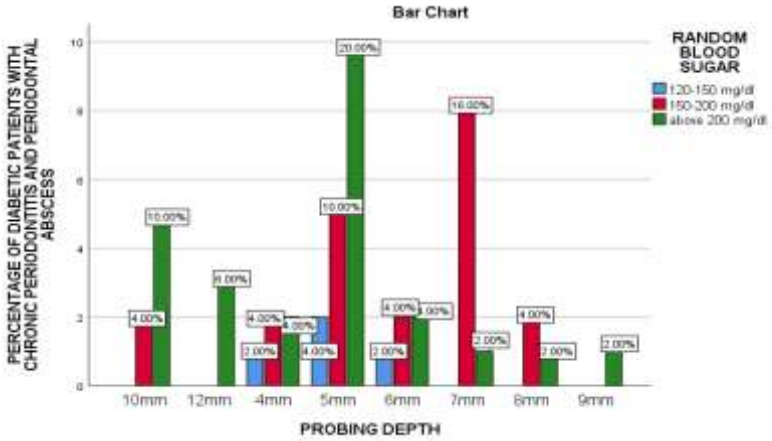

Fig.12: Bar graph depicting the association between the probing depth in mm and the random blood sugar level mg/dl. X axis represents the probing depth in mm associated with periodontal abscess and Y axis represents percentage of patients. From this we infer that the maximum probing depth associated with the periodontal abscess seen was 5mm and 7mm, which was associated with random blood sugar levels of 'above 200mg/dl', and '150-200mg/dl' respectively. (Chi square test, P value - 0.220, p >0.05) However the association was statistically not significant.