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Study of effect of normal occlusion and malocclusion on periodontal condition of diabetes mellitus patients in dental OPD (Orthodontics) at tertiary care centre, Patna, Bihar, India: A case-control study

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ABSTRACT

Aims and objectives: Diabetes mellitus is a metabolic disorder in which there is an abnormal elevation of blood glucose level. The periodontitis is recognized as the sixth complication of diabetes. The role of malocclusion in accelerating plague deposition is well known however in normal occlusion with well aligned teeth is less documented. So, the objectives of the study are to study the prevalence of periodontitis in diabetic patients with malocclusion and in normal occlusion and to study the effect of various determinants of diabetes mellitus if at all exists.

Study design: It is case-control observational study. Two hundred (200) patients were included in the study from the dental OPD (Orthodontics) of Dept. of Dentistry, and from the Dept. of Endocrinology, Indira Gandhi institute of medical sciences, Patna, Bihar, India. The statistical analysis was done Microsoft office excel. The results were analysed in frequencies and percentages to estimate the prevalence of malocclusion and occlusion in patients with diabetes mellitus and their effects on periodontium of the teeth.

Results: The prevalence rate of severe destructive periodontal diseases (SDPD) in malocclusion group was 81.72% than in normal occlusion group with less prevalence rate of 55.21%.

Conclusion: The prevalence of severe destructive periodontal diseases in the uncontrolled diabetes mellitus in malocclusion group was more than in normal occlusion group, with maximum periodontium destruction observed during first between 1-5 years of detection of diabetes.

1. Introduction

Periodontitis is a common chronic inflammatory disease characterised by destruction of the supporting structures of the teeth (gingiva, periodontal ligament, and the alveolar bone). Diabetes mellitus is a metabolic disease in which there is an abnormal elevation of blood glucose level. The high blood sugar produces the classical symptoms of polyuria, polydipsia and polyphagia. Increase in prevalence of diabetes mellitus, along with its complication. As per study done in phase one result of the Indian council of medical research – India) diabetes study indicates that diabetes prevalence in India is progressing rapidly across the nation, reaching a total of 62.4 million people with diabetes and 77.2 million people are pre-diabetic in 2011 and by 2025, 300 million people are as projected to be afflicted with diabetes worldwide. The periodontitis isconsidered as sixth complications in diabetic patients.[1] Cross-sectional and longitudinal studies identified that the risk of periodontitis is approximately 3–4 times higher in people with diabetes than in non-diabetic subjects. There are 90% people affected by the periodontitis of the world.[2–5]

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Diabetes and periodontal health status have long been biologically linked. The most common oral health problem associated with diabetes are periodontal disease, salivary gland dysfunction, fungal infection, dental caries, taste impairment, mucosal dryness and cracks, burning mouth syndrome, lichen planus, glosssodynia and alteration in the floor of oral cavity, etc.[5–8] At the same time there is evidence that the presence of chronic periodontitis may raise the risk of diabetes.[9] Studies have provided evidence that control of periodontal infection has an impact on improvement of glycemic control evidenced by a decrease in demand for insulin and decreased haemoglobin A-1c levels.[7,10–14] The chronic inflammatory condition of periodontitis is induced by pathogenic bio-films or dental plaque, which accumulates on the tooth surface.[15–17] Persistent hyperglycaemia leading to exaggerated immune-inflammatory responses that are induced by periodontal pathogens is likely to be responsible for the greater risk and severity of periodontal disease in diabetics. Moreover, severe periodontitis that results in alveolar bone loss is likely to involve the effect of inflammation on both osteoclasts and osteoblasts. Diabetes has an important effect on enhancing osteoclastogenesis and on increasing osteoblast apoptosis as well the inflammatory response is characterised by dysregulated secretion of host-derived mediators of inflammation and tissue breakdown. The most extensively studied include IL-1β, IL-6, prostaglandin E2 (PGE2), TNF-α, receptor activator of nuclear factor κB ligand (RANKL), and the matrix metalloproteinases (MMPs; particularly MMP-8, MMP-9 and MMP-13), as well as T cell regulatory cytokines (e.g. IL-12, IL-18), neutrophiles associated problems and the chemokines.[10,14,15,18–20] The literature are well documented with orthodontic treatment in diabetic patients poses more problems than in healthy non –diabetic patients because of more periodontal breakdown (due to low bone density, due to poor differentiation of fibroblast into collagens in both term of quantity and quality and other inflammatory cascades causing destruction of periodontal tissues etc.[8,11,21–25] The role of occlusion (trauma from occlusion) and the periodontal problems are also documented,[11–14] Most of the recent reviews and studies indicate that plaque- induced periodontal diseases was not aggravated by occlusal trauma.[23,26–28] The malocclusion deteriorates the periodontal condition and hence the treatment outcome in diabetic patients.[24,29,30] Orthodontic treatment should be avoided in patients with poorly controlled Insulin-dependent DM (type-1) as these patients are particularly susceptible to periodontal breakdown.[21,24] The role of malocclusion in diabetes patients could be logically explained and established fact for causation of periodontitis due to more plaque depositions and poor oral hygiene maintenance.[22,23,26,31] But the role of normal occlusion in diabetic mellitus patients with causation of periodontitis is less experimented and documented. So, objective of this research is to explore whether any relationship between normal occlusion and malocclusion in patients with diabetes that increases and/ or decreases the severity of periodontitis exists.

2. Aims and O bjectives

1. To study the prevalence of periodontitis in diabetic patients with malocclusion and in normal occlusion group.
2. To study the effect of various determinants of diabetes mellitus if at all exists.

3. Materials and Methods

This study design was prospective case-control observational study. The totals of two hundred (200) patients were included from the Dental opd, Dept. of Dentistry and from the Dept. of Endocrinology opd from the Indira Gandhi institute of medical sciences, Patna, Bihar, India. The number of case and controls subjects were decided 200 as per calculation done by Bio-statician of the Department of Community Medicine, IGIMS, Patna, Bihar, India based upon the frequency of the patients reporting to the respective opd as per inclusion and exclusion criteria. This study was approved by Institutional Ethics Committee of Indira Gandhi institute of medical sciences in the year 2017 (letter no.833/Acad/25.07/2017).

The numbers of control subjects were hundred (96) with normal occlusion with diagnosed diabetes. The numbers of case subjects were hundred and six (106) with malocclusion with diagnosed diabetes. The patient age group were between 20 years to 51 years for both sexes. Diabetes were determined by following biochemical tests random blood sugar level, fasting blood sugar test (FBS) and glycemic index HbAc1(first two test were mandatory and the HbAc1 test was optional). The controlled group diabetes patients was called so when their blood reports were normal range as follows, the random blood sugar level (80-160mg/dl), fasting blood sugar level (70-110mg/dl) and HbAc1 range between 5.6%-6.0% (as per normal norms acceptable at IGIMS, Patna, Bihar, India), and the diabetic patients with blood reports above the normal range were kept under subgroup as uncontrolled diabetic group. This division were based on the history of diabetes and their diabetic tests record. Periodontal disease in diabetes mellitus will be evaluated by Russell's periodontal index. The periodontal pocket depth was evaluated by graduated periodontal probe and the bone loss was evaluated by X-ray OPG-Pan wherever required. The calculations of periodontal status have been done and recorded as per Russell's index for individual periodontal score (Addendum no.01-C) and the based upon these score the patients periodontal status has been categorized. The malocclusion was recorded as per modified Angle's classifications of

malocclusion (Addendum no.01-B). We have also analysed the relationship of age, sex, duration of diabetes, types of diabetes, domicile status, education status, BMI, in diabetic patients (Addendum no.01-A).

3.1. Addendum no.01

3.1.1. A. General information record sheet of a patient

Name	**Age/sex**	**Opd no**
Address:		
Demographic details (tick one)	Urban	rural
Duration of diabetic history in (yrs.)		
Types of diabetics	Type-1 (insulin dependent diabetic mellitus)	Type-2(insulin resistant diabetic mellitus)
Education level(mention)		
BMI Index: (WHO criteria kg/m2)	Normal	Thin/ overweight/obese

3.1.2. B. Malocclusion will be recorded by Orthodontist as per modified Angle's classification of malocclusion:

1. Normal occlusion
2. Class 1 malocclusion (crowding, spacing etc)
3. Class11 malocclusion: Class 11 div.1 and class 11 div.2
4. Class 111 malocclusion
5. Class1 bimaxillary protrusion

C. Record sheet for evaluating periodontal conditions of a patient.

Russell's periodontal index (PI): The periodontal index (PI) was developed by Russell A.L. in 1956, over a trial period of ten years. The PI was intended to estimate deeper periodontal disease by measuring the presence or absence of gingival inflammation and its severity, pocket formation and masticatory function.

Method: All the teeth present are examined. All the gingival tissue circumscribing each tooth (i.e., all the tissue circumscribing a tooth is considered a scoring or gingival unit) is assessed for gingival inflammation and periodontal involvement.

Instruments used: Mouth mirror, plain/graduated probe.

Scoring Criteria: Russell choose the scoring values (0, 1, 2, 4, 6, and 8) to relate the stages of the disease in an epidemiological survey to the clinical conditions observed.

Russell's Rule: The Russell's rule states that "when in doubt assign the lesser score"

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Score	Criteria	Additional radiographic features
0	Negative: There is neither overt inflammation in the investing tissues nor loss of function due to destruction of supporting tissue	Radiographic features essentially normal
1	MILD Gingivitis: There is an overt area of inflammation in the free gingival, which does not circumscribe the tooth	
2	Gingivitis: Inflammation completely circumscribes the tooth but there is no apparent break in the epithelial attachment.	
4	Used only when radiographs are available	There is early notch like resorption of the alveolar crest
6	Gingivitis with pocket formation: The epithelial attachment has been broken and there is a pocket. There is no interference with normal masticatory function, the tooth is firm in its socket and has not drifted	There is horizontal bone loss involving the entire alveolar crest up to half of the length of the root
8	Advanced destruction with loss of masticatory function: The tooth may be loose; may have drifted, may have dull sound on percussion with a metallic instrument, may be depressible in its socket.	Advanced bone loss involving more than half of the tooth root or a definite infra-bony pocket with widening of periodontal ligament. There may be root resorption or rarefaction at the apex.

3.2. Recording Format

3.3. Interpretations

Clinical Condition	**Individual PI score**
Clinically normal supportive tissues	0.02
Simple gingivitis	0.3-0.9
Beginning destructive periodontal disease	1.0-1.9
Established destructive periodontal disease	2.0-4.9
Terminal disease	5.0-8.0

3.4. Statistical analysis

Descriptive values of collected numerical data were calculated using Microsoft Office Excel. The statistical analysis results in form of frequencies and percentages were used to estimate the prevalence of malocclusion and occlusion in patients with diabetes mellitus and their effects on periodontium of the teeth.

3.5. Inclusion criteria

1. Patients reported to dental opd (Orthodontics), Dept. of Dentistry and Dept. of Endocrinology, opd at IGIMS, Patna, Bihar, India for their treatment.
2. Patient willing to participate in the study.
3. Patients with normal occlusion and malocclusion without complicated systemic and chronic diseases.
4. The patients age should be between 20-51 yrs. in both sexes.

3.6. Exclusion criteria

1. Patients unwilling to participate in study.
2. Those patients whose age was less than 20 yrs. or more than 51 yrs. we're not included.
3. Patients with acute febrile diseases.
4. Patients on drug that causing gingival hyperplasia and or hypertrophy etc were not included.
5. The female patients with gestational diabetes were not included.
6. Patients with the history of auto-immune disease and genetic disorders were not included.

4. Results

The data were collected from the record performa. It was analyzed by SPSS version of microsoft office excel. The results were collected in the form of tables in simple frequencies and percentages for interpretations. The total of 200 patients were grouped into with 96 subjects to normal occlusion group and 104 subjects with malocclusion group. The case-control groups were further sub-grouped into Type- 1 DM (also called as insulin dependent diabetes mellitus) and Type-2 DM (also called as non-insulin dependent diabetes mellitus) and between controlled DM (CDM) group and uncontrolled DM (UDM) group. The severe destructive periodontal disease (SDPD) was mentioned by author to denote the cumulative effect of beginning of destructive periodontal disease (BDPD), established destructive periodontal disease (EDPD) and terminal disease (TDS) for expression of ease and severity.

Table 1 indicates that the number of type- 1 DM patients were 14 and the type -2 DM patients were 186. In both the groups type- 1 DM shows severe destructive periodontal diseases in normal occlusion as well in malocclusion groups. Most of the patients in both group of type -2 DM shows (126 out of 186) with SDPD. But in normal occlusion group 48 patients out 90 shows SDPD which comes around 53.33% in comparison to malocclusion group 79 patients out 96 shows SDPD which comes around 82.30%. Table 2 indicates that in normal occlusion group 43(44.8%) of patients were with simple gingivitis and lesser number of patients with severe forms of periodontal destructive diseases (SDPD)1; e (53patients out of 96=55.22%) as beginning of destructive periodontal diseases (BDPD), established destructive periodontal disease (EDPD) and there was no terminal periodontal diseases (TDS), (hence forth (BDPD+EDPD+TDS) will be mentioned as severe destructive periodontal diseases (SDPD) in comparisons with malocclusion group with 18 (17.30%) patients were of simple gingivitis and higher number of patients with SDPD constitutes 85 patients out of 104(81.72%), which is clear indication that there is more severe chances of periodontal involvements in malocclusion occlusion group than in normal occlusion group.

Table 3 indicates that 133 patients were recorded under controlled DM (CDM) group and 67 in uncontrolled DM (UDM) group out of 200 patients. If we club both types of diabetics groups (CDM+UDM) 138(69%) of patients were suffering from SDPD out of 200. If we see individually in UDM group 52 patients out of 67 (77.61%) patients recorded with SDPD in comparison with CDM group 86(64.66%) out of 133 patients were with SDPD, which shows 13% more chances for periodontal diseases in UDM group in this study.

Table 4 in case of type-1 diabetes in half of the patients 07 out of 14 with severity of periodontal involvements (SDPD) in early age groups i; e below 40 yrs. of age whereas in type- 11 diabetes group majority of patients reported with severe periodontal diseases (SDPD) I; e in 101 patients out of 144 patients in age groups of 41 yrs. and above. Table 5 indicates that in type-1 DM group 09 patients out of 11 patients and in type -11 DM group 96 patients out 0f 148 were noticed with severe destructive periodontal diseases (SDPD) during first 1-5 yrs. of detection of diabetes.

Table 6 There were general information noted for each patient which could affect the periodontal disease in diabetes patients directly or indirectly. The female patients were 110 in comparison to male 90. The urban diabetes patients were 121 in comparisons to 79 in rural diabetic patients. The normal built of the patients in diabetics constitutes 143 in both sexes, 08(eight) each in overweight and thin category consequently and 25 obese patients in both sexes. The majority of diabetic patients were educated in both sexes.

5. Discussions

Aim and objective of this study to know the prevalence of periodontal disease condition in diabetic patients with malocclusion and in normal occlusion. There are other

Table 1: Distribution ofperiodontal finding in patients with diabetes in malocclusion and in normalocclusion patients.

Types of Diabetes		Periodontal Finding					
	Types of malocclusion	**Normal gingivitis**	**Simple gingivitis**	**Beginning destructive periodontal disease**	**Established destructive periodontal disease**	**Terminal disease**	**Total**
	Normal occlusion		1	3	2	0	6
	Class I crowding		1	2	0	0	3
1.00	Class 1 spacing		0	1	0	0	1
	Class 1 Bimaxillary Protrusion		0	0	3	0	3
	Class II Div. 1		0	0	0	1	1
	Total		2	6	5	1	14
2.00	Normal occlusion	0	42	34	14	0	90
	Class I crowding	1	8	28	5	2	44
	Class 1 spacing	0	3	6	4	0	13
	Class 1 Bimaxillary Protrusion	0	5	6	7	0	18
	Class II Div. 1	0	0	10	8	0	18
	Class II Div. II	0	1	1	0	0	2
	Class III	0	0	1	0	0	1
Total		1	59	86	38	2	186

Table 2: Periodontal diseasesin normal occlusion and in malocclusion groups

Total no. of patients	**Normal occlusion with periodontal diseases (%age)**	**Malocclusion with periodontal diseases (%age)**	**inference**
200	96	104	Total:200
Severity of periodontal involvements (as per Russell's index)	No. of patients	No. of patients	——-
Normal gingiva	–	01 (0.96%)	
Simple gingivitis	43 (44.8%)	18 (17.30%)	Chances of Less periodontal involvements in normal occlusion group
Beginning of periodontal disease (BDPD)	37 (38.55%)	55(52.88%)	More involvements of periodontal diseases in malocclusion group.
Established destructive periodontal disease (EDPD)	16 (16.66%)	27(25.96%)	More involvements of periodontal diseases in malocclusion group
Terminal disease (TDS)	———	03(2.88%)	More destructive periodontal diseases are in malocclusion group.
Total	**96(100%)**	**104(100%)**	**200**

variables such as, type-1 and type -2 DM (diabetes mellitus), controlled DM and uncontrolled DM, age of the patients and duration of diabetics were correlated with periodontal damages in normal occlusion and in malocclusion group. There is plethora a of study available in literature explaining the effects of DM on periodontium, effect of diabetes and orthodontic treatment, effect of trauma from occlusion and periodontium, effect of oral hygiene maintenance and glycemic control 0.40% (as per one study), DM and oral complications etc. are well explained. [2–4,14,24,25,28–30] In this study results shows that type -1 DM severely damages the periodontium in both normal as well as in malocclusion group. [10,21] There is more predilection of SDPD observed in malocclusion group in type -2 DM (82.30%) in comparison to normal occlusion group with 53.33%. In totality with normal occlusion patients with DM shows more milder form of gingivitis (44.8%) in comparison to in malocclusion group with SDPD of 81.80%. In term of malocclusion types class1 crowding followed by class11 div.1 and followed by bimaxillary protrusion have more predilection for periodontal damage in both types of DM groups than in class1 spacing, Class11 div.2 and Class111 and

Table 3: Periodontal disease correlation in normal occlusion and malocclusion group with controlled and uncontrolled diabetes mellitus patients

Types of occlusion	Controlled DM (CDM)	Uncontrolled DM (UDM)	Total cases
Normal occlusion	73	23	96
Malocclusion	60	44	104
Total	133	67	200
Periodontal diseases (as per Russell's index)	——	——-	———
Beginning of destructive periodontal disease (BDPD)	63(47.36%)	29(43.28%)	92
Established destructive periodontal disease (EDPD)	22(16.54%)	21(31.34%)	43
Terminal periodontal disease (TDS)	01(0.75%)	02(2.98%)	03
Total =Severe destructive periodontal diseases (SDPD) after arbitrarily adding (BDPD+EDPD+TDS)	86(64.66%)	52(77.61%)	138 (69%)
Total no. of Normal and simple gingivitis patients	(1+46) =47(35.33%)	15	62(31%)
Grand total of all types of periodontal condition recorded	133(100.0%)	67	200(100.0%)

Table 4: Periodontal diseases finding in various age groups in diabetic groups

Types of Diabetes			Periodontal findings					Total
			Normal gingiva	**Simple gingivitis**	**Beginning destructive periodontal disease**	**Established destructive periodontal disease**	**Terminal disease**	**—**
	Age Group	23-30yrs		0	3	2	0	5
		31-40yrs		1	2	0	0	3
1.00		41-50yrs		1	1	2	1	5
		=>51yrs		0	0	1	0	1
	Total		2	6	5	1	14	2
2.00	Age Group							
		23-30yrs	0	5	3	2	0	10
		31-40yrs	1	11	15	4	1	32
		41-50yrs	0	33	51	21	1	106
		=>51yrs	0	10	17	11	0	38
	Total		**1**	**59**	**86**	**38**	**2**	**186**

Table 5: Periodontal findings in relationships with duration of diabetes

Types of Diabetes			Periodontal Finding				
			Normal gingivitis	**Simple gingivitis**	**Beginning destructive periodontal disease**	**Established destructive periodontal disease**	**Terminal disease**
	Diabetes	0.1-5 Yrs.		2	5	3	1
1.00	Duration Group	5.1-10 Yrs.		0	1	2	0
	Total			2	6	5	1
	Diabetes	0.1-5 Yrs.	1	51	71	24	1
2.00	Duration Group	5.1-10 Yrs.	0	5	12	10	0
		>=10.1 Yrs.	0	3	3	4	1
			1	59	86	38	2

Table 6: General information regarding sex predilection, urban vs. rural, education level and built of the patients in diabetic persons

Male	Education level	Urban diabetic persons	Rural diabetic persons	WHO BMI (kg/m $^{2)}$	No. of patients
—	Below 10 class	02	07	No. of normal built male patients:	78
—	Intermediate	14	16	- No. of thin built & overweight persons	08 each (16)
–	graduate	46	14	No. of obese patients	16
—	Post-graduate	10	01	–	–
Total	- Total male:110	72	38	Total male patients as per BMI	110
Female	Below 10^{th}	04	12	No. of normal built female patients	65
—	intermediate	15	11	– No. of thin built & overweight patients	-08 each (16)
—	graduate	29	17	– No. of obese patients	09
—	Post-graduate	01	01	– Total female as per BMI	90
Total	Total female: 90	49	41	–	–
	Grand total for education level and sex predilection) =200	121	79	Grand total of patients as per BMI:	200

normal occlusion group. So, orthodontic intervention for malocclusion should be started to deaccelerate plaque deposition hence improve the glycemic control as well to achieve normal range of blood sugar.[7,24,29] The normal occlusion provides less periodontal diseases due to the self-cleansing environment in the oral cavity. But maintaining the blood sugar level is more important and hence forth it is advisable for more stringent oral hygiene maintenance along with immediate consultation with periodontitis and orthodontist for maintaining good oral hygiene and normal alignment of teeth. When orthodontic treatment is started in plaque free oral cavity there is only 0.03mm of mm of gingival recession and 0.13mm of alveolar bone loss when compared with no treatment.[28]

There were 133 patients with controlled DM group and 67 with uncontrolled DM. In uncontrolled DM group 52(77.61%) patients were with severe form of destructive periodontal diseases (SDPD) out of 67 patients, in comparison to 86 (86.66%) patients in controlled DM group out of 133 patients which is more in controlled DM is unusual finding. But strikingly in uncontrolled DM group 23 patients with severest form of destructive periodontal diseases (EDPD &TDS) were recorded out of 67 patients whereas in controlled DM group only 23 patients with severest form of destructive periodontal diseases (EDPD&TDS) were recorded in out of 133 patients.so, in this study it was concluded that in malocclusion with uncontrolled DM has more periodontal damages than in controlled DM group with normal occlusion. The central point of this findings is that malocclusion with uncontrolled DM shows more SDPD cases because the periodontal damages are added up due to persistent high blood sugar level, accelerated by attack of bacteria induced plaque (bio-film) for periodontal damages where in normal occlusion group periodontal damages are less severe due to only periodontal damage may be noticed due to persistent high blood sugar with less and or no plaque deposition.[15–19]

The HbA1c test provides an estimate of the average glucose level over the 30 to 90 days preceding the test. It does not account for short-term fluctuations in plasma glucose levels. In a patient with diagnosed diabetes, the haemoglobin A1c test (HbA1c) is used to monitor the patient's overall glycemic control. It is not recommended for diagnosis because there is not a gold standard assay for the HbA1c and because many countries do not have ready access to the test.[7,11]

In type-1DM group maximum cases with periodontal damages are seen between 23-41 yrs. of age and during 0.1-5.0 yrs. of age of onset of DM, whereas in type-2 DM group most of the periodontal disease cases are seen in above 41 yrs. of age and between 0.1-5.0 yrs. of detection of DM. so therefore it is also advisable that in both types-DM early detection of diabetes should be done. If any patients complain of periodontal problems should be taken as suspect of DM case and timely investigation should be prescribed.[31] This two-way relationship points to a need to promote oral health in DM patients, and to implement a joint management protocol between endocrinologist and dentist/orthodontists that aims to create adequate conditions for early diagnosis and the effective treatment of both disease.[5,13,21,29] Many studies have been published describing the bidirectional inter-relationship exhibited by diabetes and periodontal disease and has an impact on improvement of glycemic control evidenced by a decrease in demand for insulin and decreased also. But very few researches have been

retrieved from literature showing malocclusion is also a determinate in periodontal disease, because malocclusion predisposes plaque deposition faster and hence induces faster periodontal diseases by increasing destruction of periodontium by various mechanism explained in review of literature. [13,14,18–20]

In this study in case of normal occlusion diabetic group most of the patients presented with simple gingivitis and less severe form of periodontal destructions could be explained as less plaque deposition. It is also observed in this study that patients with normal occlusion group with diabetes shows less severity of periodontal disease stage transition (as per Russell's index scoring) than in malocclusion group. So, it is recommended to prevent and effectively treat diabetes-associated oral and systemic disorders.it is also good to mention here as per this study the distribution of DM patients was as male/female ratio as (110/90), ratio of normal built male/female ratio (78/65 in number) and were mostly educated urban based. These findings are in concordance with the finding of many studied. It will be easy to explain them about practices of keeping good oral hygiene and correction of malaligned and crooked teeth. [2–5,22,31]

6. Conclusions

The effect of diabetes mellitus on periodontal diseases was more prevalence in malocclusion group of patients than in normal occlusion group of patients. Though in the normal occlusion group patient's periodontal diseases with severe destructive periodontal diseases were more than simple gingivitis patients. Strikingly, in uncontrolled DM has more severe effects on periodontium of teeth in both groups of occlusions patients. It was also observed that in malocclusion group patients with Class1 crowding, Class11 div.1 & Class1 bimaxillary protrusion have more periodontal diseases than in Class1 spacing, Class 11 div. 2 and Class 111 malocclusions.

7. Limitations of the study

In strict sense prospective cohort study with minimum of 1-5 yrs. Follow-up is required to evaluate the effects of DM on periodontium of the teeth especially in patients with normal occlusion having clinically no plaque deposition to observe the effect of diabetes mellitus on periodontal disease.

8. Source of Funding

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9. Conflicts of Interest

There are no conflicts of interest.

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